UNITED STATES TARIFF COMMISSION

SUMMARIES OF TRADE AND TARIFF INFORMATION

Prepared in Terms of the Tariff Schedules of the United States (TSUS)

Schedule 4
Chemicals and Related Products
(In 12 volumes)

Volume 10

Pigments, Inks, Paints,
and Related Products

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F O R E W O R D

In an address delivered in Boston on May 18, 1917, Frank W. Taussig, distinguished first chairman of the Tariff Commission, delineated the responsibility of the newly established Commission to operate as a source of objective, factual information on tariffs and trade. He stated that the Commission was already preparing a catalog of tariff information--

> designed to have on hand, in compact and simple form, all available data on the growth, development and location of industries affected by the tariff, on the extent of domestic production, on the extent of imports, on the conditions of competition between domestic and foreign products.

The first such report was issued in 1920. Subsequently three series of summaries of tariff information on commodities were published--in 1921, 1929, and 1948-50. The current series, entitled Summaries of Trade and Tariff Information, presents the information in terms of the tariff items provided for in the eight tariff schedules of the Tariff Schedules of the United States (abbreviated to TSUS in these volumes), which on August 31, 1963, replaced the 16 schedules of the Tariff Act of 1930.

Through its professional staff of commodity specialists, economists, lawyers, statisticians, and accountants, the Commission follows the movement of thousands of articles in international commodity trade, and during the years of its existence, has built up a reservoir of knowledge and understanding, not only with respect to imports but also regarding products and their uses, techniques of manufacturing and processing, commercial practices, and markets. Accordingly, the Commission believes that, when completed, the current series of summaries will be the most comprehensive publication of its kind and will present benchmark information that will serve many interests. This project, although encyclopedic, attempts to conform with Chairman Taussig's admonition to be "exhaustive in inquiry, and at the same time brief and discriminating in statement."

This series is being published in 62 volumes of summaries, each volume to be issued as soon as completed. Although the order of publication may not follow the numerical sequence of the items in the TSUS, all items are to be covered. As far as practicable, each volume reflects the most recent developments affecting U.S. foreign trade in the commodities included.

SUMMARIES OF TRADE AND TARIFF INFORMATION

SCHEDULE 4

VOLUME 10

C O N T E N T S

Numerical List of TSUS Items in This Volume

INTRODUCTION

Volume 4:10 is the fourth in a series of twelve volumes on "Chemicals and Related Products", which are the products covered by schedule 4 of the Tariff Schedules of the United States.

Volume 10 is comprised of summaries on nearly all of the items specified in subparts 9B and 9C of schedule 4. The complete list of products included in these two subparts is shown in appendix A; summaries on those products which are covered in these subparts but not discussed in this volume are identified in appendix A by shading, and the summaries covering these products are presented in volume 4:2.

Subpart 9B covers both pigments and pigment-like materials. Pigments as defined in the interpretive headnote to this subpart are products either dry or ground in oil or other vehicle, and "commonly known as pigments and suitable for use in imparting color (including black and white)". The pigment-like materials, in general, are products which, although they possess properties of pigments, require further processing before they can be used as pigments. Pigment-like materials include crude natural iron oxides which may have been washed but which have not been ground.

Subpart 9C covers surface coatings such as paints and varnishes, as well as related products such as artists' colors, inks and ink powders, stains, and caulking or glazing products. Many of the products covered by subpart 9C contain benzenoid (or modified benzenoid or quininoid) ingredients. The latter products are dutiable under the provisions of Part 1 of Schedule 4, unless specifically excepted under the provisions of headnote 1 to Part 9; the excepted products are varnishes, inks, artists', students', and children's pigments or paints. Thus, paints, stains, ink powders, and caulking or glazing products that contain benzenoid ingredients are not dutiable in this subpart but under the provisions of part 1. The distinction between benzenoid and non-benzenoid products is made for tariff purposes, and ordinarily is not made in commerce. Therefore, both benzenoid and non-benzenoid products have been considered in some of the summaries. Most paints and substantial quantities of stains contain benzenoid materials. On the other hand, most caulking or glazing products consist entirely of non-benzenoid ingredients. Ink powders, whether benzenoid or non-benzenoid, are of nominal importance.

The value of the domestic consumption of the products discussed in volume 4:10 is estimated to be about $3 billion annually, with paints, varnishes, and stains accounting for about 80 percent of the total. The remaining 20 percent is chiefly accounted for by two inorganic pigments, of which titanium white (titanium dioxide) and carbon black are the most important commercially, and their annual consumption exceeds $300 million and $180 million, respectively. Domestic production supplies most of the total U.S. consumption of the

products discussed herein, and is somewhat greater than consumption (U.S. exports exceeded imports by about $45 million in 1966). For certain products, however, such as crude chalk and chalk whiting, umbers, zinc sulfide, lithopone, and Vandyke brown, imports supply all or nearly all of the domestic requirements. These products are either mined materials or are made from mined materials of which there are not suitable domestic deposits, or they are manufactured products which are of only minor importance.

In recent years, U.S. annual imports of pigments, paints, and related products have been substantially less than exports. U.S. imports of materials covered by this volume of summaries were valued at $39.8 million in 1966. In that year, imports of titanium dioxide were by far the largest; they accounted for $17.2 million, or about 45 percent of the aggregate value of the imports of the products included herein. Imports of litharge were the second greatest in value, with imports amounting to almost $5.7 million in that year. For certain pigments, such as synthetic iron oxides, cuprous oxide, pearl essence, and ultramarine blue, imports, although small on an absolute basis, supplied substantial proportions of domestic consumption in 1966.

U.S. exports of the products discussed in this volume are estimated to have exceeded $83.0 million in 1966. Exports of carbon black were the greatest in value and they amounted to $28.4 million, or about 35 percent of the aggregate exports in that year. Export data for some of the products covered herein, are not available; it is believed that, for the most part, such exports have been small or insignificant.

Commodity	TSUS item
Crude chalk	472.20
Chalk whiting	472.22

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

Crude chalk is not produced in the United States; domestic needs have always been wholly supplied by imports. Crude chalk is used entirely in the production of chalk whiting. In 1966, domestic consumption of chalk whiting amounted to 20.9 million pounds, with imports furnishing the bulk of consumption; exports were nil.

Comment

Crude chalk, a natural calcium carbonate composed of the calcareous remains of minute marine organisms, is converted to chalk whiting by grinding. Chalk whiting, a fine white powder, is used principally in cosmetics and dentifrices; it is also used in paints, ceramics, and chalk whiting putty, item 474.60. The use of crude chalk and chalk whiting declined rapidly in the 1940's owing to inroads made by the less expensive limestone whiting (see summary on nonlead pigments not specially provided for, item 473.88), and the more expensive, but more nearly pure, precipitated calcium carbonate, item 472.24. Whiting obtained from chalk, however, differs physically from that obtained from the other sources in that the particles are more nearly round and have a greater surface area, and hence, greater adsorptive capacity.

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1968) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
472.20	Crude chalk-----	Free	1/
472.22	Chalk whiting---	0.1¢ per lb.	0.05¢ per lb.

1/ Rate not affected by the sixth round of trade negotiations.

The rate of 0.1 cent per pound on item 472.22 was equivalent to 11.2 percent ad valorem, based on the total imports in 1966.

The duty-free status of crude chalk was provided for in the original Tariff Act of 1930, and in the TSUS, effective August 31, 1963, and has been bound since January 1, 1948, in a concession granted by the United States in the General Agreement on Tariffs and Trade (GATT). The rate of duty applicable to chalk whiting which is to become effective January 1, 1972, represents the final stage of a concession granted by the United States in the sixth round of trade negotiations under GATT. The first of five annual stages of the reduction became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1968, an excerpt from which is reproduced as appendix A to this volume. The rate shown above as existing prior to January 1, 1968, are the rates applicable on August 31, 1963, the effective date of the TSUS.

There are no commercial deposits of natural chalk in the United States; domestic needs are supplied wholly by imports. Since 1960, however, U.S. imports of crude chalk have been small; in 1962-66, annual imports declined from 125,000 pounds, valued at $1.2 million, to 85,000 pounds, valued at $984,000 (table 1). All U.S. imports of crude chalk during that period were supplied by the United Kingdom and France, countries richly endowed with deposits of natural chalk.

Domestic consumption of chalk whiting declined from 23.4 million pounds in 1962 to 20.9 million pounds in 1966 (table 2). U.S. imports of chalk whiting supplied the great bulk of consumption during 1962-66. France has been the principal source of chalk whiting and in 1966 furnished more than 70 percent of the total imports; the United Kingdom and Belgium have been other important sources (table 3). U.S. exports of chalk whiting have been nil.

Table 1.--Crude chalk: U.S. imports for consumption, by sources, 1962-66

Source	1962	1963	1964	1965	1966
	Quantity (pounds)				
United Kingdom	125,440	1/ 20,000	-	60,480	42,560
France	-	76,160	20,160	40,320	42,560
Total	125,440	96,160	20,160	100,800	85,120
	Value				
United Kingdom	$1,203	$583	-	$779	$647
France	-	467	$123	302	337
Total	1,203	1,050	123	1,081	984

1/ Corrected: official entry apparently erroneous.

Source: Compiled from official statistics of the U.S. Department of Commerce, except as noted.

Table 2.--Chalk whiting: U.S. production, imports for consumption, and apparent consumption, 1962-66

(In thousands of pounds)

Year	Production 1/	Imports	Apparent consumption 2/
1962	119	23,326	23,443
1963	92	22,511	22,639
1964	19	22,039	22,058
1965	96	19,549	19,643
1966	81	20,817	20,898

1/ Quantity of chalk whiting produced estimated from amount of crude chalk imported.

2/ Equals production plus imports; exports were nil.

Source: Compiled from official statistics of the U.S. Department of Commerce, except as noted.

Table 3.--Chalk whiting: U.S. imports for consumption, by principal sources, 1962-1966

Source	1962	1963	1964	1965	1966
	Quantity (1,000 pounds)				
France	12,400	11,313	12,194	12,852	14,934
United Kingdom	5,993	5,618	5,329	3,860	3,314
Belgium	4,854	5,130	4,266	2,578	2,324
All other	79	450	250	259	245
Total	23,326	22,511	22,039	19,549	20,817
	Value (1,000 dollars)				
France	96	85	93	98	127
United Kingdom	44	41	42	30	29
Belgium	38	39	30	17	17
All other	1	4	5	3	6
Total	179	169	170	148	179

Source: Compiled from official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Precipitated calcium carbonate----------	472.24

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

In recent years U.S. production and consumption of precipitated calcium carbonate have increased; consumption in 1966, which amounted to 401.3 million pounds, was about 27 percent greater than that in 1962. U.S. imports supplied only a nominal portion of consumption; exports were virtually nil.

Comment

Commercial types of finely-divided calcium carbonate consist of both natural and synthetic varieties. Precipitated calcium carbonate is the synthetic variety. The natural varieties, such as limestone whiting, item 473.88, and chalk whiting, item 472.22, are manufactured by mechanical treatment of the mined material; these varieties are discussed in separate summaries.

Precipitated calcium carbonate is produced as a principal product by two methods--the calcium chloride process (by adding a solution of calcium chloride to a solution of sodium carbonate) and the carbonation process (by passing carbon dioxide through a suspension of calcium hydroxide). It is also obtained as a byproduct of the chemical conversion of soda ash to caustic soda. By control of reaction conditions, numerous grades of the material are made by each process.

Precipitated calcium carbonate ($CaCO_3$) is a fine white microcrystalline powder that is odorless, tasteless, and stable in air. Major uses of precipitated calcium carbonate are in paper coatings, paints, and plastics; other uses are as a reinforcing agent in rubber, and as an antacid in pharmaceuticals. Although precipitated calcium carbonate is more expensive than chalk whiting or limestone whiting and except for purity, chemically identical to both, it is preferred chiefly because of its purity and texture.

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1968) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
472.24	Precipitated calcium carbonate.	6.5% ad val.	3% ad val. 1/

1/ This rate, as well as the rates for 1970, and 1971, is contingent; see footnote 1 to Staged Rates and Historical Notes to part 2 of schedule 4 of the TSUSA-1968, as shown in appendix A to this volume.

The rate effective January 1, 1972, represents the final stage of a concession granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT). The first of five annual stages of the reduction became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1968, an excerpt from which is reproduced as appendix A to this volume. The rate shown above as existing prior to January 1, 1968, is the rate applicable on August 31, 1963, the effective date of the TSUS.

Precipitated calcium carbonate is produced domestically by 10 firms which operate 12 plants situated in the Atlantic Coast States and the North Central States. Most of the production, however, is accounted for by five firms operating seven plants--two each in Massachusetts and Ohio and one each in California, Michigan, and Mississippi. One of the plants listed in Massachusetts is a recently constructed facility for the specific production of this material.

In 1962-66, annual domestic consumption of precipitated calcium carbonate increased from 316.6 million pounds to 401.3 million pounds (table 1). The principal reasons for the increased consumption are that precipitated calcium carbonate is replacing clay as a filler in paper--making a lighter weight paper possible--and it is now used also in making "permanent" (age-resistant) papers. U.S. production of the pigment also increased during this period, from 314.0 million pounds, valued at $9.1 million, in 1962 to 396.9 million pounds, valued at $10.7 million, in 1966 (table 2). About 15 percent of annual domestic production is consumed captively.

During 1962-66, annual U.S. imports of precipitated calcium carbonate increased by more than 65 percent, from 2.7 million pounds, valued at $82,000, to 4.4 million pounds, valued at $165,000 (table 3). Imports from all sources, however, supplied only a nominal portion of consumption during that period--less than 2% in any year. The United Kingdom was the chief supplier of U.S. imports of precipitated calcium carbonate during 1962-66, accounting for almost 90 percent of the

total imports in the latter year. Domestic exports were probably nominal during that period.

Precipitated calcium carbonate is an increasingly important article of commerce for the more highly industrialized countries. The United States is the world's foremost producer and consumer; other major producers include the United Kingdom, West Germany, France, and Japan.

Table 1.--Precipitated calcium carbonate: U.S. production, imports for consumption, and apparent consumption, 1962-66

Year	Production	Imports	Apparent consumption 1/	Ratio of imports to consumption
	1,000 pounds	1,000 pounds	1,000 pounds	Percent
1962	313,962	2,668	316,630	0.8
1963	317,546	4,264	321,810	1.3
1964	346,620	6,566	353,186	1.9
1965	377,358	4,501	381,859	1.2
1966	396,888	4,450	401,338	1.1

1/ Equals production plus imports, since exports have been virtually nil.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 2.--Precipitated calcium carbonate: U.S. production and total shipments, 1962-66

Year	Production		Total shipments including interplant transfers	
	Quantity	Value 1/	Quantity	Value
	1,000 pounds	1,000 dollars	1,000 pounds	1,000 dollars
1962	313,962	9,080	276,166	7,988
1963	317,546	8,860	279,426	7,749
1964	346,620	9,510	303,708	8,372
1965	377,358	9,931	325,536	8,553
1966	396,888	10,660	339,632	9,122

1/ Estimated from unit value of sales.

Source: Compiled from official statistics of the U.S. Department of Commerce, except as noted.

Table 3.--Precipitated calcium carbonate: U.S. imports for consumption, by principal sources, 1962-66

Source	1962	1963	1964	1965	1966
	Quantity (1,000 pounds)				
United Kingdom	2,521	3,617	5,644	4,098	4,061
Japan	140	106	337	310	240
All other	7	541	585	93	149
Total	2,668	4,264	6,566	4,501	4,450
	Value (1,000 dollars)				
United Kingdom	75	121	223	150	149
Japan	4	3	11	9	8
All other	3	22	31	5	8
Total	82	146	265	164	165

Source: Compiled from official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Precipitated calcium sulfate and satin white	472.30

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

Precipitated calcium sulfate and satin white are of nominal importance, since they have been almost wholly replaced in their uses by other materials. Neither is produced domestically as such. However, some calcium sulfate is produced as an unseparated component in certain composite pigments. Imports of both products have been meager and sporadic.

Comment

Precipitated calcium sulfate is a white pigment prepared by calcining the hydrate obtained by reacting sulfate mother liquors with lime. Satin white, a related pigment, is prepared by combining the sulfate mother liquors with aluminum hydroxide. Precipitated calcium sulfate was formerly used as a filler for paper and as an extender for paints; it has been replaced in these uses, owing to cost considerations, by naturally occurring gypsum (item 512.21). On the other hand, satin white, which was formerly used extensively in paper coatings, has been replaced by more efficient materials, such as the modified clays, and titanium dioxide (item 473.70).

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1968) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
472.30	Precipitated calcium sulfate and satin white.	0.5¢ per lb.	0.25¢ per lb. 1/

1/ This rate, as well as those for 1970 and 1971, is contingent; see footnote 1 to Staged Rates and Historical Notes to pt. 2 of schedule 4 of the TSUSA -1968, as shown in appendix A to this volume.

The rate effective January 1, 1972, represents the final stage.

of a concession granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT). The first of five annual stages of the reduction became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1968, an excerpt from which is reproduced as appendix A to this volume. The rate shown above as existing prior to January 1, 1968, is the rate applicable on August 31, 1963, the effective date of the TSUS.

Neither precipitated calcium sulfate nor satin white is produced domestically for sale as such. However, substantial quantities of precipitated calcium sulfate are marketed as a component of certain composite pigments, such as extender rutile titanium dioxide and Venetian red, in the manufacture of which it is formed as a co-precipitate.

Imports of precipitated calcium sulfate and satin white have been meager and sporadic. The only imports in recent years were 551 pounds, valued at $1,995, in 1963 and 3,300 pounds, valued at $258, in 1960; all such imports were supplied by Japan.

Commodity	TSUS item
Synthetic iron oxides	473.30

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

The United States is the world's largest consumer of synthetic iron oxides. During 1962-66, domestic production increased by almost 30 percent, amounting to 117 million pounds in 1966. U.S. imports, which increased at a much more rapid rate during the same period, totaled 30 million pounds in 1966 and greatly exceeded exports.

Description and uses

Synthetic iron oxides are manufactured products, whereas natural iron oxides, including the ochers, siennas, and umbers, items 472.40 to 472.50 and 473.32 to 473.40, are obtained by extractive processes and are discussed elsewhere in this volume. Although synthetic iron hydroxides are specified in the TSUS and would be included in item 473.30 with synthetic iron oxides, they are no longer commercial products.

Synthetic iron oxides are produced by either chemical or calcining processes from iron salts, such as copperas (ferrous sulfate), item 418.92. The synthetic iron oxides of commerce consist of red, yellow, black, and brown varieties. Red iron oxide is ferric oxide and is commercially the most important synthetic iron oxide. It is used principally in paints, rubber, and plastics, but also in magnetic recording tapes, and ferrites (ceramic materials which are nonconductive and non-metallic, but magnetic). Red iron oxide is also marketed as a composite pigment, Venetian red, in which the oxide content ranges from 5 to 55 percent, the remainder being calcium sulfate. Venetian red is used almost entirely in certain exterior paints, principally for painting barns and freight cars.

Yellow iron oxide is hydrated ferric oxide, and like the red is also used almost entirely in paints, rubber, and plastics. Black iron oxide, or ferrosoferric oxide, is used extensively as a pigment; large quantities of special high-purity grades are also used in magnetic inks and ferrites. Brown iron oxide is essentially a mixture of the red, yellow, and black varieties, and is principally used as a pigment in paints and allied products.

U.S. tariff treatment

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1968) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
473.30	Synthetic iron oxides	10% ad val.	5% ad val.

The rate effective January 1, 1972, represents the final stage of a concession granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT). The first of five annual stages of the reduction became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1968, an excerpt from which is reproduced as appendix A to this volume. The rate shown above as existing prior to January 1, 1968, is the rate applicable on August 31, 1963, the effective date of the TSUS.

U.S. consumption

U.S. consumption of synthetic iron oxides increased from 94.9 million pounds in 1962 to 137.7 million pounds in 1966, or by almost 50 percent (table 1). Recently developed markets, such as magnetic recordings and ferrites have more than offset a decline in a traditional market, plate-glass polishing.

U.S. producers

Synthetic iron oxides are produced domestically by 13 firms, which operate 17 plants--4 in New Jersey, 3 each in Illinois, Pennsylvania, and Virginia, and 1 each in California, Georgia, Maryland, and Ohio. The plant in Maryland was substantially expanded in 1965, and another plant is being constructed in Missouri. Most iron oxide plants produce the entire range of synthetics, that is, the red, yellow, black, and brown varieties, as well as one or more types of the natural varieties, such as the ochers and siennas.

The chief raw material used in the manufacture of synthetic iron oxides is copperas, which is obtained at present, in virtually limitless amounts, as a byproduct of the manufacture of titanium dioxide by the sulfate process and as a byproduct of the pickling of steel by sulfuric acid. The ready availability of byproduct copperas could change drastically, however, if hydrochloric acid replaces sulfuric acid in steel pickling and the chloride process replaces the sulfate process in the manufacture of titanium dioxide.

Some producers of synthetic iron oxides are large, diversified companies; the sales of the synthetics constitute a minor portion of their total sales. Some of the large producers, moreover, are engaged in forward vertically integrated operations, such as production of paints and magnetic tapes, which result in a substantial portion of their output being consumed captively. Some of the other producers, however, are small and heavily dependent on sales of the synthetic oxides as their source of income.

U.S. production

Domestic production of the synthetic iron oxides, as measured by sales, increased from 90.0 million pounds in 1962, to 116.7 million pounds in 1966, or by almost 30 percent (table 1). During 1962-66, most of the increased U.S. production was attributable to the expanded output of the pure synthetic red variety, especially by the chemical treatment of copperas. The bulk of the domestic output consists of the pure red oxide; in 1966, the red variety accounted for about 50 percent of the total output. Next in importance is the yellow variety, output of which amounted to more than 30 percent of the total in 1966; the remaining percentage was shared, in order of importance, by the brown, black, and Venetian red varieties.

U.S. exports

Although natural iron oxides are included with synthetic iron oxides in export statistics, exports probably consist almost entirely of the latter. U.S. exports of synthetic iron oxides increased from 7.5 million pounds, valued at $1.1 million, in 1962 to 9.5 million pounds, valued at $1.4 million, in 1966 (table 1). Although U.S. exports of these materials increased in 1962-66, the increase in exports was much less pronounced than the corresponding increase in imports. Canada has been the largest market for U.S. exports of synthetic iron oxides; in 1966 that country took almost 50 percent of the total. Other major export markets have been the United Kingdom, Japan, and Australia; in 1966, they took about 25 percent of the total, with the remainder of exports distributed to more than 15 other countries.

U.S. imports

U.S. imports of synthetic iron oxides have increased substantially in recent years, rising from 12.4 million pounds, valued at $960,000 in 1962, to 30.5 million pounds, valued at $2.6 million, in 1966 (table 2). Most of the increase, however, was registered in 1966, when imports of these materials were almost 50 percent greater

than in the preceding year. Imports supplied 22.1 percent of consumption in 1966, compared with 13.1 percent in 1962.

More than 90 percent of the total imports in 1966 were supplied by two countries: West Germany, which accounted for 63 percent of the total, and Canada, which accounted for about 30 percent. The imports from West Germany consisted chiefly of the red variety, whereas those from Canada were of both the red and yellow types.

Foreign production and trade

West Germany, with an annual capacity in excess of 300 million pounds, is the world's leading producer of synthetic iron oxides; other major foreign producers include the United Kingdom, Canada, and Japan. Although the manufacturing processes employed in these foreign countries may differ from those used in the United States, the products of these foreign countries are virtually identical and completely competitive with the domestic material. For example, West Germany and Japan make the iron oxides as a byproduct in the manufacture of aniline, whereas the United Kingdom and Canada make these oxides from the natural yellow oxide.

Table 1.--Synthetic iron oxides: U.S. production, imports for consumption, exports of domestic merchandise, and apparent consumption, 1962-66

Year	Production 1/	Imports	Exports 2/	Apparent consumption	Ratio of imports to consumption
	1,000 pounds	1,000 pounds	1,000 pounds	1,000 pounds	Percent
1962	90,000	12,411	7,508	94,903	13.1
1963	98,000	14,429	8,378	104,051	13.9
1964	115,502	17,658	10,194	122,966	14.4
1965	114,536	20,141	9,312	125,365	16.1
1966	116,716	30,468	9,506	137,678	22.1

1/ As measured by sales.

2/ Classified as "iron oxide and hydroxide pigments" but believed to consist entirely of synthetic iron oxides.

Source: Production compiled from official statistics of the U.S. Bureau of Mines, except as noted; imports and exports compiled from official statistics of the U.S. Department of Commerce.

Note.--Owing to a statistical reclassification of these materials by the Bureau of Mines in 1964, production data for earlier years are estimated.

Table 2.--Synthetic iron oxides: U.S. imports for consumption, by principal sources, 1962-66

Source	1962	1963	1964	1965	1966
	Quantity (1,000 pounds)				
West Germany	7,836	9,494	11,015	12,648	19,267
Canada	2,287	2,858	3,569	4,231	8,746
United Kingdom	2,132	1,782	2,483	1,643	1,852
All other	156	295	591	1/1,619	603
Total	12,411	14,429	17,658	20,141	30,468
	Value (1,000 dollars)				
West Germany	565	685	832	977	1,552
Canada	219	300	365	420	888
United Kingdom	163	136	186	126	145
All other	13	29	43	1/ 225	41
Total	960	1,150	1,426	1,748	2,626

1/ Includes 1.3 million pounds, valued at 199 thousand dollars from Japan.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Ochers:	
Crude	472.40
Ground	473.32
Siennas:	
Crude	472.42
Washed	472.44
Ground	473.36

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

U.S. requirements of ochers and siennas have been largely supplied by domestic limonite ores. In recent years, domestic consumption of ground ochers increased; most of the increase occurred in 1966, when consumption amounted to 10 million pounds. On the other hand, annual U.S. consumption of ground siennas was relatively constant during 1962-66, averaging about 4 million pounds. Imports of ground ochers and siennas have constituted a nominal portion of consumption, while exports have been nil or negligible.

Comment

Ochers and siennas are obtained by mining and beneficiating certain limonite ores (item 601.51) and are composed essentially of yellow hydrated ferric oxide, together with silica and alumina. Umbers and other natural iron oxides (items 472.46 to 472.50, 473.38 and 473.40) and the synthetics (item 473.30) are prepared from different sources and are discussed in separate summaries. Crude ochers and siennas, and ochers and siennas which have been washed but not ground, are considered in the TSUS as pigment materials rather than as pigments within the meaning of the headnote to subpart 9B of schedule 4. Siennas have a higher iron oxide content than ochers and thus are a deeper yellow color. The crude ochers and siennas are used to make the respective ground ocher and sienna pigments of commerce. Sienna pigments are marketed in two types, the raw and burnt varieties; the burnt variety is prepared by calcining the raw sienna, and ranges in color from yellowish red to reddish brown.

Ground ochers are used chiefly in paints, but also in floor coverings and paper coatings. Both types of ground siennas (raw and

burnt), owing to their relative transparency in oils, are principally used in wood stains and specialty finishes; other uses include artists' and graining colors.

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1968) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
	Ochers:		
472.40	Crude	0.125¢ per lb.	0.06¢ per lb.
473.32	Ground	0.125¢ per lb.	0.06¢ per lb.
	Siennas:		
472.42	Crude	0.0625¢ per lb.	0.03¢ per lb.
472.44	Washed	0.25¢ per lb.	0.1¢ per lb.
473.36	Ground	0.25¢ per lb.	0.1¢ per lb.

Based on imports for 1966, the rates for crude and ground ochers were equivalent to ad valorem rates of 5.0 and 4.9 percent, respectively; the rates for siennas, which varied with the degree of processing, were for the unwashed and washed crudes equivalent to ad valorem rates of 1.2 and 2.6 percent, respectively, while the rate for the ground material had an ad valorem equivalent rate of 3.0 percent.

The rates effective January 1, 1972, represent the final stage of concessions granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT). The first of five annual stages of the reductions became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1968, an excerpt from which is reproduced as appendix A to this volume. The rates shown above as existing prior to January 1, 1968, are the rates applicable on August 31, 1963, the effective date of the TSUS.

Ochers and siennas are ground domestically by eight firms which operate nine plants: three in Pennsylvania, two each in Illinois and Virginia, and one each in Georgia and Maryland. The producing firms process mainly domestic limonite ores from Georgia and Virginia, in addition to the small amount of crude that is imported. Some producers are large and diversified, with the output of ochers and siennas constituting a small portion of their total production; other firms, however, are small, with these materials being virtually their entire production.

U.S. consumption of ground ochers increased from 8.0 million pounds in 1962 to 10.0 million pounds in 1966; most of the increase occurred in 1966, when consumption rose by about 25 percent from the

preceding year (table 1). U.S. consumption of ground siennas has been relatively constant during 1962-66, averaging about 4 million pounds (table 2). Most of the consumption consisted of burnt siennas, with the consumption by types during that period being stable.

The demand for ground ochers and siennas has been supplied principally by domestic production, either from native limonite ores or by grinding the imported crudes. Domestic production of ground ochers increased from 7.7 million pounds, valued at $185,000, in 1962, to 9.8 million pounds, valued at $277,000, in 1966. On the other hand, U.S. output of ground siennas amounted to 3.7 million pounds, valued at $411,000, in 1962, compared with 3.7 million pounds, valued at $566,000, in 1966. In the latter year, the burnt variety accounted for 60 percent of the total output of siennas.

During 1962-66, U.S. imports of crude ochers were irregular and exhibited no apparent trend, while imports of ground ochers, which were larger than imports of the crudes, showed an upward trend, except for 1966. Overall, U.S. imports of ochers were relatively constant amounting to 292,000 pounds, valued at $8,000, in 1962 compared to 293,000 pounds, valued at $8,000, in 1966 (table 3). Ground ochers accounted for 85 percent of the total imports in 1966, whereas they were 70 percent of the total in 1962. South Africa was the foremost supplier of ochers to the United States and in 1966 furnished the entire quantity of such imports.

In recent years, U.S. imports of crude siennas have tended to increase, while imports of ground siennas, which were smaller than imports of the crudes, have declined. Overall, U.S. imports of crude and ground siennas increased from 1.76 million pounds, valued at $84,000, in 1962 to 2.38 million pounds, valued at $145,000, in 1966 (table 4). Most of the siennas imported during 1962-66 consisted of the crude variety; in 1966, it accounted for 85 percent of the total. Italy and Cyprus supplied the bulk of U.S. imports of crude and ground siennas during 1962-66. The United Kingdom was also a substantial supplier of ground siennas, which it probably manufactured from imported crudes.

U.S. exports of ochers and siennas have been virtually nil.

Table 1.--Ground ochers: U.S. production, imports for consumption, and apparent consumption, 1962-66

Year	Production 1/	Imports	Apparent consumption 2/	Ratio of imports to consumption
	1,000 pounds	1,000 pounds	1,000 pounds	Percent
1962	7,736	221	7,957	2.8
1963	6,838	266	7,104	3.7
1964	6,312	281	6,593	4.3
1965	7,774	347	8,121	4.3
1966	9,762	253	10,015	2.5

1/ As measured by sales; also includes some yellow iron oxide.
2/ Equals production plus imports since exports were probably nil.

Source: Production, compiled from official statistics of the U.S. Bureau of Mines; imports, compiled from official statistics of the U.S. Department of Commerce.

Table 2.--Ground siennas: U.S. production, imports for consumption, and apparent consumption, 1962-66

Year	Production 1/	Imports	Apparent consumption 2/	Ratio of imports to consumption
	1,000 pounds	1,000 pounds	1,000 pounds	Percent
1962	3,676	413	4,089	10.1
1963	3,630	303	3,933	7.7
1964	3,524	362	3,886	9.3
1965	3,658	332	3,990	8.3
1966	3,666	339	4,005	8.5

1/ As measured by sales.
2/ Equals production plus imports since exports were probably nil.

Source: Production, compiled from official statistics of the U.S. Bureau of Mines; imports, compiled from official statistics of the U.S. Department of Commerce.

Table 3.--Crude and ground ochers: U.S. imports for consumption, total and from South Africa, 1962-66

Year	Total		South Africa	
	Crude	Ground	Crude	Ground
	Quantity (1,000 pounds)			
1962	71	221	71	181
1963	22	266	22	266
1964	102	281	102	170
1965	1/ 26	347	-	336
1966	40	253	40	253
	Value (1,000 dollars)			
1962	2	6	2	5
1963	1	8	1	8
1964	3	14	3	5
1965	1/ 1	12	-	11
1966	1	7	1	7

1/ All from Sweden.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 4.--Crude and ground siennas: U.S. imports for consumption, total and from Italy and Cyprus, 1962-66

Year	Total		Italy		Cyprus	
	Crude	Ground	Crude	Ground	Crude	Ground
	Quantity (1,000 pounds)					
1962	1,346	413	769	325	533	79
1963	881	303	495	228	385	61
1964	1,090	362	726	296	349	37
1965	1,717	332	847	262	870	22
1966	2,044	339	1,307	263	610	22
	Value (1,000 dollars)					
1962	58	26	46	23	11	3
1963	40	19	33	16	8	2
1964	62	35	53	32	8	1
1965	78	27	61	21	17	1
1966	117	28	93	21	14	1

Source: Compiled from official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Umbers:	
Crude	472.46
Washed	472.48
Ground	473.38

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

Domestic production of ground umbers, which averaged about 7.6 million pounds during 1962-66, consists chiefly of processing the imported crude. U.S. imports of umbers increased during that period, while exports were nominal.

Comment

Umbers are natural iron oxides obtained by mining and beneficiating certain limonite ores and are composed essentially of hydrated ferric oxide, manganese dioxide, elemental carbon, and clay minerals. Ochers and siennas and other related natural iron oxides (items 472.40 to 472.44, 472.50, 473.32, 473.36 and 473.40), are discussed in separate summaries. Crude umbers, and umbers which have been washed but not ground, are considered in the TSUS as pigment materials rather than as pigments within the meaning of the headnote to subpart 9B of schedule 4. The umbers of commerce consist of raw and burnt varieties. The distinctive greenish-brown color of raw umber is attributable to the combined colorations of yellow hydrated ferric oxide, brownish-black manganese dioxide, and black elemental carbon. Burnt umbers, which are made by calcining raw umbers, have a deeper brown color. While the major use of raw umbers is in nonfading stains, the major use of burnt umber is in providing color to plastics; other uses of both types include artists' and graining colors.

The column 1 rates of duty applicable to imports (see general

headnote 3 in the TSUSA-1968) are as follows:

TSUS item		Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
	Umbers:		
472.46	Crude----------	0.0625¢ per lb.	Free
472.48	Washed----------	0.1875¢ per lb.	0.09¢ per lb.
473.38	Ground----------	0.1875¢ per lb.	0.09¢ per lb.

For imports in 1966, the rates of duty on umbers, unwashed or washed, were equivalent to ad valorem rates of 3.9 and 5.4 percent, respectively, while the rate for the ground umbers had an ad valorem equivalent rate of 4.8 percent.

The rates, effective January 1, 1972, including the duty-free status of item 472.46, represent the final stage of concessions granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT). The first of five annual stages of the reductions became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1968, an excerpt from which is reproduced as appendix A to this volume. The rates shown above as existing prior to January 1, 1968, are the rates applicable on August 31, 1963, the effective date of the TSUS.

Raw and burnt umbers are ground domestically by six firms which operate seven plants: three in Pennsylvania, two in Virginia, and one each in Illinois and Maryland. All the producing firms also manufacture synthetic iron oxides, item 473.30, as well as other natural iron oxides, such as ochers and siennas. While most of the producers are small or medium-sized firms, some companies are large corporations that produce diverse products, such as pharmaceuticals and explosives.

Statistics on the domestic output of crude umbers are not available. However, since all imported crude is ground domestically, the mine output of domestic crude is indicated roughly by the difference between U.S. production of ground umbers, as shown in table 1, and imports of crude umbers. It appears that the U.S. production of crude umbers has declined from over 3 million pounds in 1962 to less than 2 million pounds in 1966.

Annual domestic consumption of umbers, which averaged about 8 million pounds in 1962-66, consisted chiefly of burnt umbers, most of which were used in the manufacture of plastics (table 1). U.S. production of umbers accounted for a large and relatively stable portion of domestic consumption during that period, or about 95 percent of the total.

U.S. imports of crude and ground umbers increased from 5.3 million pounds, valued at $95,000, in 1962 to 7.5 million pounds, valued at $135,000, in 1966 (table 2). Most of the U.S. imports of umbers in recent years consisted of the crude material, and in 1966 it accounted for about 95 percent of the total. During 1962-66, Cyprus supplied virtually all of the imports of crude and ground umbers. Although umber deposits are found wherever iron and manganese are closely associated, the world's finest umber ores are located in Cyprus. Annual production of umbers by Cyprus is about 12 million pounds, about half of which is exported to the United States.

Table 1.--Ground umbers: U.S. production, imports for consumption, and apparent consumption, 1962-66

Year	Production 1/	Imports	Apparent consumption 2/	Ratio of imports to consumption
	1,000 pounds	1,000 pounds	1,000 pounds	Percent
1962	7,452	416	7,868	5.3
1963	7,818	406	8,224	4.9
1964	7,318	498	7,816	6.4
1965	6,956	363	7,319	5.0
1966	8,296	570	8,866	6.4

1/ As measured by sales.
2/ Equals production plus imports since exports were probably nil.

Source: Production, compiled from official statistics of the U.S. Bureau of Mines; imports, compiled from official statistics of the U.S. Department of Commerce.

Table 2.--Crude and ground umbers: U.S. imports for consumption, total and from Cyprus, 1962-66

Year	Total		Cyprus	
	Crude	Ground	Crude	Ground
	Quantity (1,000 pounds)			
1962	4,911	416	4,414	245
1963	4,876	406	4,809	241
1964	6,327	498	6,129	406
1965	6,029	363	6,019	265
1966	6,955	570	6,926	349
	Value (1,000 dollars)			
1962	80	15	71	7
1963	80	15	76	7
1964	103	15	98	11
1965	105	13	104	8
1966	113	22	113	11

Source: Compiled from official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Natural pigment iron oxides not elsewhere enumerated:	
Crude	472.50
Ground	473.40

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

Domestic consumption and production of these natural iron oxides have increased substantially in recent years, with production of the ground pigments amounting to 106 million pounds in 1966. U.S. imports have also increased but have accounted for only a minor portion of consumption; exports have been virtually nil.

Comment

The iron oxides covered in this summary include all such naturally occurring oxides except the ochers, siennas, and umbers, items 472.40 to 472.48 and items 473.32 to 473.38; these other natural iron oxides, as well as the synthetic iron oxides, item 473.30, are discussed in other summaries. Iron oxides discussed herein which are crude, or which have been washed but not ground, are considered in the TSUS as pigment materials rather than as pigments within the meaning of the headnote to subpart 9B of schedule 4.

The natural iron oxides covered here consist of red, black and brown varieties. They are similar to the synthetically produced iron oxides but have less tinctorial strength. Natural red iron oxide, which is by far the most important of these oxides, is used almost entirely as a pigment in paints. It is composed chiefly of ferric oxide and occurs naturally as the mineral, hematite. The pigment is obtained either by beneficiating hematite or calcining pyrite ores. Black iron oxide, which is essentially ferrosoferric oxide, consists almost entirely of naturally occurring magnetite. Brown iron oxide is in effect a complex mixture of natural red, black, and yellow (ocher) iron oxides, being made from an iron ore which contains the different minerals in various proportions. Black and brown oxides are used almost entirely as pigments, their chief advantages being low cost and chemical and heat resistance; they contain impurities, however, such as copper and manganese, that preclude their competing with the synthetic iron oxides in certain applications.

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1968) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
	Natural pigment iron oxides not elsewhere enumerated:		
472.50	Crude	16% ad val.	10% ad val.
473.40	Ground	16% ad val.	10% ad val.

The rates effective January 1, 1972, represent the final stage of concessions granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT). The first of five annual stages of the reductions became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1968, an excerpt from which is reproduced as appendix A to this volume. The rates shown above as existing prior to January 1, 1968, are the rates applicable on August 31, 1963, the effective date of the TSUS.

These iron oxides are produced domestically by about 10 firms. Most of these firms are large, diversified companies; the sales of these materials constitute a minor portion of their total sales. Some firms, however, are small concerns that process the iron oxides from their own mines.

Statistics on the domestic output of these iron oxides are available only for the ground product, and include oxides made by grinding both imported and domestic crudes. However, since imports of the crude are relatively small, the output of the ground oxides (table 1) is a rough indication of the U.S. mine output of crude. It appears that the U.S. production of the crude iron oxides covered by this summary has increased from about 75 million pounds in 1962 to more than 100 million pounds in 1966.

Annual U.S. consumption of ground natural iron oxides increased by more than 40 percent in 1962-66, from 79.3 million pounds in 1962 to 112.5 million pounds in 1966 (table 1). The increase in domestic consumption is chiefly attributable to the expanded domestic output of paints and related products. U.S. production of ground natural iron oxides also increased during this period in response to the increase in demand, from an estimated 74.0 million pounds in 1962, to 105.8 million pounds in 1966.

U.S. imports of crude and ground natural oxides increased from 5.9 million pounds, valued at $128,000 in 1962, to 7.3 million pounds, valued at $200,000, in 1966 (table 2). Most of these imports, which

consisted chiefly of ground pigments, were supplied by Spain, the world's leading producer of these iron oxides. Spanish oxide is a natural red material obtained from hematite; extensive deposits of that ore are located near Malaga, Spain.

U.S. exports of these iron oxides have been nil.

Table 1.--Ground natural iron oxide pigments not elsewhere enumerated: U.S. production, imports for consumption, and apparent consumption, 1962-66

Year	Production 1/	Imports	Apparent consumption 2/	Ratio of imports to consumption
	1,000 pounds	1,000 pounds	1,000 pounds	Percent
1962	74,000	3/ 15,287	79,287	6.6
1963	75,000	3/ 5,179	80,179	6.4
1964	4/ 89,238	5,074	94,312	5.4
1965	4/ 106,672	5,820	112,492	5.2
1966	4/ 105,780	6,687	112,467	5.9

1/ As measured by sales.
2/ Equals production plus imports; exports have been nil.
3/ Estimated.
4/ Includes some Vandyke brown.

Source: Production, compiled from official statistics of the U.S. Bureau of Mines, except as noted; imports compiled from official statistics of the U.S. Department of Commerce.

Note.--Owing to a statistical reclassification of iron oxides by the U.S. Bureau of Mines in 1964, production data are estimated for earlier years.

Table 2.--Crude and ground natural iron oxide pigments not elsewhere enumerated: U.S. imports for consumption, total and from Spain, 1962-66

Year	Total	Spain
	Quantity (1,000 pounds)	
1962	5,874	5,671
1963	5,754	4,876
1964	5,804	5,517
1965	5,955	5,657
1966	7,325	6,630
	Value (1,000 dollars)	
1962	128	118
1963	137	106
1964	136	116
1965	155	131
1966	200	162

Source: Compiled from official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Iron blues	473.28

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

The United States, with an annual output of about 11 million pounds, is the world's largest producer of iron blues. In recent years, domestic production, as well as imports for consumption, have increased. U.S. exports of iron blues have been nominal.

Comment

Iron blues are a class of inorganic pigments consisting of complex ferriferrocyanide salts. They are manufactured mostly by batch processes, although the material may also be produced by a continuous process. Apparently, the rigorous specifications for pigment shade and performance have resulted in the batch method being the more desirable. Iron blues are usually prepared by a two-step reaction: initially, ferrous sulfate, ammonium sulfate, and sodium ferrocyanide are combined; then the intermediate white product is oxidized with sodium chlorate or sodium chromate to produce the iron blues of commerce.

These blue pigments are of low cost and they are characterized by high tinting strength as well as good hiding power. Their use is limited, however, because they develop a reddish chalk in oil vehicles ("bronzing") and exhibit poor alkali resistance, especially in water-based paints.

Iron blues are marketed in a variety of tones and tints; the variations depend mostly on the pigment particle size and the method of processing used. Iron blues are commonly characterized by three main classes: Chinese and milori blues (very dark masstones, green tint), Prussian blues (dark masstones, red tint), and toning blues (dull masstones, and intense red tint). Chinese and milori type blues are used extensively in printing inks and paints and as the blue ingredient in "chrome green" (item 473.10). Prussian blues, which are hard to grind, are used almost entirely in paints. Toning blues are widely used as an ingredient in carbon-paper inks. Iron blues, with the exception of toning blues, are also used in crayons, linoleum, and composition flooring.

IRON BLUES

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1968) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
473.28	Iron blues----------	3.4¢ per lb.	1.7¢ per lb. 1/

1/ This rate, as well as those for 1970 and 1971, is contingent; see footnote 1 to Staged Rates and Historical Notes to pt. 2 of schedule 4 of the TSUSA-1968, as shown in appendix A to this volume.

The average ad valorem equivalent of the column 1 rate based on 1966 imports was 7.6 percent; the ad valorem equivalent rate varied from 7.4 percent (on imports from the United Kingdom, the principal supplier) to 16.1 percent (on those from Canada).

The rate effective January 1, 1972, represents the final stage of a concession granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT). The first of five annual stages of the reduction became operative January 1, 1968, an excerpt from which is reproduced as appendix A to this volume. The rate shown above as existing prior to January 1, 1968, is the rate applicable on August 31, 1963, the effective date of the TSUS.

Iron blues are produced domestically by nine firms which operate two plants each in New Jersey, New York, and Ohio; and one plant each in Michigan, Illinois, and West Virginia. Most of these firms produce numerous chemicals, as well as complementary inorganic colorants.

Domestic consumption of iron blues increased from 10.5 million pounds in 1962 to 12.2 million pounds in 1966 (table 1). The increase in consumption was due chiefly to the expanded domestic output of printing inks, paints, and related products. The increase in demand for iron blues during this period was supplied principally by the increase in domestic production. U.S. output of iron blues increased from 9.9 million pounds, valued at $5.3 million, in 1962, to 11.1 million pounds, valued at $6.2 million, in 1966. Substantial quantities of iron blues, equivalent to about 10 to 15 percent of the total domestic output, were consumed captively in the manufacture of chrome green.

U.S. imports of iron blues increased by more than 70 percent in 1962-66, from 628,000 pounds, valued at $262,000, in 1962, to 1.07 million pounds, valued at $475,000, in 1966 (table 2). The United Kingdom and the Netherlands were the principal sources of such imports,

in 1966, supplying about 95 percent of the total. Exports of iron blues, which are not separately classified in official statistics, have probably been nominal.

The United Kingdom, the foremost foreign producer, manufactures iron blues from hydrogen cyanide, a byproduct of the coke and steel industries. Other major foreign producers include the Netherlands and West Germany; the latter, although a large producer, exports relatively small quantities to the United States.

Table 1.--Iron blues: U.S. production, imports for consumption, and apparent consumption, 1962-66

Year	Production	Imports	Apparent consumption 1/	Ratio of imports to apparent consumption
	1,000 pounds	1,000 pounds	1,000 pounds	Percent
1962	9,870	628	10,498	6.0
1963	10,060	755	10,815	7.0
1964	10,072	831	10,903	7.6
1965	10,968	829	11,791	7.0
1966	11,138	1,068	12,206	8.7

1/ Equals production plus imports since exports have been virtually nil.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 2.--Iron blues: U.S. imports for consumption, by principal sources, 1962-66

Year	Total	United Kingdom	Netherlands	All other
	Quantity (1,000 pounds)			
1962	628	511	51	66
1963	755	605	123	27
1964	831	640	119	72
1965	829	600	172	57
1966	1,068	825	209	34
	Value (1,000 dollars)			
1962	262	217	17	28
1963	319	266	42	11
1964	354	285	41	28
1965	357	271	64	22
1966	475	381	81	13

Source: Compiled from official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Bone black----------	473.02

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

U.S. consumption and production of bone black has declined in recent years owing to displacement of sales by other, less expensive blacks. U.S. imports of bone black which have been small, amounted to 20,000 pounds in 1966; exports have probably been nonexistent.

Comment

Bone black is a black pigment which consists of 10 to 20 percent finely divided elemental carbon (that constituent is chiefly responsible for its pigmentary properties) and the remainder of calcium carbonate and calcium phosphate. Bone black is characterized by its jet-blackness, low oil absorption, and its resistance to flocculation. It is principally used in artists' colors, crayons, and shoe polishes. Bone black is obtained from the destructive distillation of animal bones. Bone char, which is prepared similarly to bone black, is used as an adsorbent in sugar refining. Bone char, item 493.25, is discussed in a separate summary in volume 4:12.

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1968) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
473.02	Bone black----------	10% ad val.	5% ad val.

The rate effective January 1, 1972, represents the final stage of a concession granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT). The first of five annual stages of the reduction became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1968, an excerpt from which is reproduced as appendix A to this volume. The rate shown above as existing prior to January 1, 1968, is the rate applicable on August 31, 1963, the effective date of the TSUS.

In recent years U.S. consumption of bone black has declined, owing to its displacement in some uses by other, less expensive blacks. Domestic production is accounted for by two firms. Official statistics on domestic production are not available owing to the small number of producers. These firms use imported cattle bones, mostly from Argentina, as their raw material. Domestic cattle bones are used primarily in the manufacture of more expensive products, such as the gelatins, item 455.16 to 455.24, and animal glue, items 455.40 and 455.42.

U.S. imports of bone black constitute a very small portion of total domestic consumption. During 1962-66, imports ranged from 10,009 pounds, valued at $715, in 1963 and also in 1965, to 23,021 pounds, valued at $1,362, in 1964.

Except for 100 pounds, valued at $149, from Switzerland in 1962, all U.S. imports of bone black during 1962-66, were supplied by West Germany. The imports of bone black from West Germany in those years, as reported in official statistics, were:

Year	Quantity (pounds)	Value
1962	20,018	$756
1963	10,009	715
1964	23,021	1,362
1965	10,009	715
1966	20,010	1,313

U.S. exports of bone black are believed to have been virtually nil.

Commodity	TSUS item
Carbon black	473.04

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

The United States is the world's foremost producer, consumer, and exporter of carbon black. Domestic production, which exceeds 2 billion pounds a year, is chiefly for internal consumption. In recent years, U.S. exports have declined substantially owing to a number of carbon black plants being built abroad. Imports supply a nominal portion of domestic consumption.

Description and uses

Carbon black is an important class of industrial carbons that consist of finely divided, particulate types of carbon. The predominant use of carbon black, which accounts for more than 90 percent of its consumption, is as a reinforcing agent in rubber products, chiefly tires and tire tubes; other important uses include those in printing inks, plastics, and paints. The consumption of carbon black in paints, however, will probably not grow as rapidly in future years as the other major consuming areas.

Carbon black is produced from crude petroleum oil or natural gas by either partial-combustion or thermal-decomposition processes; the types are differentiated in commerce, according to the method of manufacture, as either channel black, furnace black, or thermal black. In partial-combustion processes, by which both channel and furnace blacks are produced, hydrocarbons are burned in a limited supply of air; a portion of the hydrocarbon undergoes combustion and supplies energy for the thermal decomposition of the remainder. Lampblack, item 473.06, is also made by a partial-combustion process, but the properties of lampblack are different from those of either channel or furnace black; it is discussed elsewhere in a separate summary.

Channel black is made only from natural gas, whereas furnace black is made from either natural gas (gas furnace black) or, more commonly, from crude petroleum oil (oil furnace black). The channel process consists of burning natural gas so that the flame impinges

on channels (metal bars of U-shaped cross section) which cool it, allowing the unburned carbon to be deposited. The furnace process consists usually of partially burning petroleum oil in furnaces, that is, refractory-lined retorts, and separating the residual carbon from the spent gases.

In the thermal-decomposition process, air and natural gas are initially burned in a fixed ratio in order to heat the furnace; then natural gas alone is passed through the preheated furnace, where it undergoes thermal decomposition. The type of carbon black produced by this process is designated as thermal black. Acetylene black is made similarly, except that the preheating of the furnace is not required, since the decomposition of the feedstock (acetylene) is highly exothermic. Acetylene black, item 415.15, is discussed elsewhere in a separate summary.

All types of carbon black, regardless of method of manufacture or the raw material used in their production, have many similar properties. The distinctions between the various types are one of degree rather than of kind, and include particle size (particle diameter) and extent of particle-to-particle association (chain structure). The particle diameters of carbon black range from 50 angstroms to more than 5,000 angstroms (1 angstrom is equal to one-hundred-millionth of a centimeter). The average particle diameters of the thermal blacks are considerably larger than those of the channel blacks, and the furnace types are intermediate in size. While the channel and thermal blacks exhibit a low degree of chain structure, the particles of the furnace blacks may be either highly or lowly associated.

Carbon black is marketed by type, that is, furnace, thermal, or channel, the latter being the highest in price. Furnace black, the foremost carbon black of commerce, is sold in numerous grades for use in rubber. These include the following: Semireinforcing, SRF; high-modulus, HMF; general-purpose, GPF; fast-extrusion, FEF; high-abrasion, HAF; intermediate-superabrasion, ISAF; and superabrasion, SAF. About 60 percent of the total shipments of carbon black are in bulk (carlots). Bulk shipments of carbon black are made at lower freight rates and with lower handling costs; other advantages include cleaner operations and elimination of product contamination.

U.S. tariff treatment

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1968) effective January 1, 1972, are indicated below:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
473.04	Carbon black----------	5% ad val.	Free

The duty-free status represents the final stage of a concession granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT). The first of the five annual stages of the reduction became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1968, an excerpt from which is reproduced as appendix A to this volume.

U.S. consumption

Annual U.S. apparent consumption of carbon black increased from 1.6 billion pounds in 1962 to 2.3 billion pounds in 1966, or by about 40 percent (table 1). The increase in consumption of carbon black during 1962-66 largely reflected the expanded domestic output of automobiles, particularly tires and tubes. While it is expected that the output of automobile tires will continue to increase, the possible substitution of "light" elastomers such as ethylene-propylene terpolymer (EPT) for the types of rubber currently employed in making tires could have considerable impact on the consumption of carbon black. In addition to the producers of tires, other major consumers during 1962-66 were the manufacturers of printing inks and plastics. The latter particularly increased their consumption, owing chiefly to the enhanced ultraviolet (uv.) resistance which carbon black imparts to plastics.

U.S. producers

Carbon black is produced domestically by nine firms. Three of the larger producers, however, account for about 60 percent of total domestic capacity. Many domestic producers of carbon black are actually subsidiaries of companies which market petroleum, natural gas, and/or synthetic rubber; the output of carbon black by such firms represents a vertical integration of these operations.

The domestic producers of carbon black operate 34 plants; 18 plants in Texas account for about 50 percent of total capacity;

eight plants in Louisiana account for 34 percent; and eight plants in five other States (three in California, two in New Mexico, and one each in Arkansas, Kansas, and Oklahoma) account for the remainder.

During 1962-66, total annual domestic capacity to produce carbon black increased from 2.2 billion pounds to 2.9 billion pounds, or by more than 30 percent. In 1966 U.S. producers of carbon black operated their plants at about 85 percent of annual capacity. In that year 26 plants produced furnace black; three plants produced thermal black; and five plants, channel black.

The United States is plentifully endowed with the raw materials required for the production of carbon black; it has about one-ninth of the world's proved petroleum reserves, and about one-third of the world's proved natural gas reserves. In recent years, however, domestic capacity to produce channel black and the number of plants for its production has decreased. The decrease is attributed, in part, to the impact of the oil-furnace process, which produces a competitive carbon black product at a lower operational cost. The premium grades of channel black used by paint producers and printing-ink manufacturers, however, cannot be readily substituted by the other types of carbon black.

A substantial number of plants manufacturing carbon black abroad are owned or controlled by U.S. producers. Such plants are located in many countries, including Canada, Argentina, Australia, India, and France. In Western Europe alone, U.S. producers own or control capacity to produce carbon black in excess of 650 million pounds a year.

U.S. production

U.S. production of carbon black increased from 2.1 billion pounds, valued at $145.3 million, in 1962 to 2.6 billion pounds, valued at $184.3 million, in 1966. During 1962-66, Texas and Louisiana accounted for the bulk of the domestic output (table 2), with the remainder produced in Arkansas, California, Kansas, New Mexico, and Oklahoma. Texas, which increased its output during that period by about 20 percent, accounted for half of the total production of carbon black in the latter year, while Louisiana increased its production by more than 30 percent, and also produced one-third of the total in 1966.

Although the U.S. output of both furnace black and thermal black increased during 1962-66, the output of channel black declined, from 207.4 million pounds in 1962 to 153.1 million pounds in 1966 (table 3). Furnace black has been the chief carbon black of commerce; in

1966, that type accounted for more than 80 percent of the total carbon black produced. Moreover, two grades, high-abrasion-furnace (HAF), and intermediate-superabrasion-furnace (ISAF), accounted for almost half of the total furnace black production in that year.

U.S. exports

U.S. exports of carbon black decreased from 442.4 million pounds, valued at $41.0 million, in 1962 to 297.3 million pounds, valued at $28.4 million, in 1966 (table 4), yet they greatly exceeded imports during 1962-66. The decline in exports primarily reflected the increase in the capacity of foreign countries for producing carbon black.

France and West Germany were, for the most part, the principal recipients of domestic exports of carbon black during 1962-66. The latter year, however, marked the emergence of Canada as a leading market for U.S. exports, probably owing to the effects of the Automobile Products Trade Act of 1965 (P.L. 89-293), which gave impetus to the production of automobiles in Canada and aided the consumption of rubber tubes and tires, and also of carbon black in that country. In 1966, Canada, France, and West Germany took 15 percent, 13 percent, and 12 percent, respectively, of the total exports, with the remainder distributed among more than 50 other countries. The predominant type of carbon black exported was furnace black; in 1966, that type accounted for about 80 percent of the total.

U.S. imports

Imports of carbon black have never constituted more than a negligible portion of domestic consumption. In recent years, U.S. imports of carbon black have been variable, ranging from 1.3 million pounds, valued at $225,000, in 1964 to 186,000 pounds, valued at $36,000, in 1965 (table 5). Most of the imports of carbon black during 1962-66 were supplied by Canada; in 1966, that country furnished 177,000 pounds, or 45 percent of the total imports in that year.

Foreign production and trade

Prior to World War II, natural gas was the principal raw material for manufacturing carbon black. Natural gas, with no other outlets, was chiefly available only in the oil fields of the United States; hence, the United States was virtually the

sole source of the world's supply of carbon black. During the 1940's, the development of the oil-furnace process, which used liquid hydrocarbons as the feedstock, significantly changed that situation.

In recent years the rapid growth in the capacity of foreign countries to produce carbon black has tended to outpace that of the United States. In 1965 the foreign producers of carbon black achieved a combined production of about 1.6 billion pounds, equivalent to about 75 percent of the total U.S. output in that year (table 6). The major foreign producers and their respective outputs in that year were the United Kingdom, 353 million pounds; West Germany, 276 million pounds; Japan, 271 million pounds; and France, 220 million pounds. It is estimated that more than 90 percent of the foreign productive capacity is of the oil-furnace process.

Table 1.--Carbon black: U.S. production, imports for consumption, exports of domestic merchandise, and apparent consumption, 1962-66

Year	Production	Imports	Exports	Apparent consumption	Ratio of exports to consumption
	1,000 pounds	1,000 pounds	1,000 pounds	1,000 pounds	Percent
1962	2,056,464	284	442,437	1,614,311	27.4
1963	2,058,916	1,261	370,928	1,689,249	22.0
1964	2,223,216	1,338	333,907	1,890,647	17.7
1965	2,353,776	186	274,609	2,079,353	13.2
1966	2,571,552	385	297,281	2,274,656	13.1

Source: Production, compiled from official statistics of the U.S. Bureau of Mines; imports and exports, compiled from official statistics of the U.S. Department of Commerce.

Table 2.--Carbon black: U.S. production, by principal producing States, 1962-66

(In thousands of pounds)

State	1962	1963	1964	1965	1966
Texas	1,106,874	1,105,189	1,165,593	1,172,693	1,296,292
Louisiana	608,499	649,170	725,669	820,552	899,178
All other	341,091	304,557	331,954	360,531	376,082
Total	2,056,464	2,058,916	2,223,216	2,353,776	2,571,552

Source: Compiled from official statistics of the U.S. Bureau of Mines.

Table 3.--Carbon black: U.S. production, by types, 1962-66

(In thousands of pounds)

Year	Furnace black	Thermal black	Channel black	Total
1962	1,677,088	171,938	207,438	2,056,464
1963	1,686,310	193,594	179,012	2,058,916
1964	1,821,606	231,691	169,919	2,223,216
1965	1,932,530	273,337	147,909	2,353,776
1966	2,142,836	275,599	153,117	2,571,552

Source: Compiled from official statistics of the U.S. Bureau of Mines.

Table 4.--Carbon black: U.S. exports of domestic merchandise, by principal markets, 1962-66

Market	1962	1963	1964	1965	1966
	Quantity (1,000 pounds)				
France	48,474	33,905	41,583	27,825	39,287
Canada	25,540	29,265	22,578	17,909	45,243
West Germany	48,543	39,446	41,713	37,595	35,225
United Kingdom	23,576	19,418	25,384	18,691	17,436
Italy	47,206	32,746	21,317	21,919	15,862
India	39,409	30,948	24,146	22,086	16,117
All other	209,689	185,200	157,186	128,584	128,111
Total	442,437	370,928	333,907	274,609	297,281
	Value (1,000 dollars)				
France	4,842	3,574	3,987	2,778	3,979
Canada	2,177	2,434	1,905	1,623	3,511
West Germany	4,120	3,242	3,420	3,045	2,809
United Kingdom	3,180	2,780	3,408	2,705	2,506
Italy	4,369	3,194	2,129	2,262	1,797
India	3,300	2,575	1,987	1,829	1,285
All other	19,048	17,648	15,093	12,416	12,520
Total	41,036	35,447	31,929	26,658	28,407

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 5.--Carbon black: U.S. imports for consumption, by principal sources, 1962-66

Source	1962	1963	1964	1965	1966
	Quantity (1,000 pounds)				
Canada	277	1,029	1,245	59	177
East Germany	-	190	63	62	165
West Germany	7	9	23	25	40
All other	-	33	7	40	3
Total	284	1,261	1,338	186	385
	Value (1,000 dollars)				
Canada	48	173	212	13	32
East Germany	-	36	8	8	22
West Germany	1	1	2	1	5
All other	-	6	3	14	2
Total	49	216	225	36	61

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 6.--Carbon black: World production, by countries,[1] 1962-66

Country	1962	1963	1964	1965	1966 [2]
	Quantity (1,000 pounds)				
United States	2,056,464	2,058,619	2,223,216	2,353,776	2,571,552
United Kingdom	281,700	308,000	338,200	[3] 353,400	[4] 368,800
West Germany	201,549	221,119	269,371	[3] 276,380	[4] 308,600
Japan	147,025	176,882	[3] 244,567	270,970	[5]
France	[3] 139,110	167,991	[3] 189,507	220,019	[5]
Italy	65,426	96,341	141,756	162,920	[5]
Netherlands	[5]	[5]	[3] 114,198	136,244	153,881
Rumania	65,082	73,142	78,030	80,918	[4] 81,600
Brazil	43,430	54,784	52,699	49,780	[5]
Argentina	[5]	12,820	25,132	31,967	[5]
India	...	26,455	[5]	31,901	[5]
South Africa, Republic of	16,840	21,402	26,334	29,020	[5]
Venezuela	[5]	10,000	13,499	15,000	[5]
Yugoslavia	8,234	9,438	10,818	[3] 11,241	13,228
Spain	2,866	2,866	3,307	3,748	[5]
Taiwan	454	425	434	1,404	[5]
Korea, South	...	276	694	725	[4] 880

1/ Australia, Belgium, China, Colombia, Mexico, and Sweden also produce carbon black, but production data are not available. Production of carbon black in Canada is not published, to avoid disclosure of company data; the capacity is estimated to be about 100 million pounds per annum.
2/ Preliminary.
3/ Revised.
4/ Estimate.
5/ Not available.

Source: Compiled from official statistics of the U.S. Bureau of Mines.

Commodity	TSUS item
Lampblack----------	473.06

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

Annual U.S. production of lampblack is 20 to 30 million pounds. In recent years exports, which have amounted to about 5 percent of domestic production, have greatly exceeded imports. In 1966, moreover, there were no U.S. imports of lampblack.

Comment

Lampblack is a particulate type of elemental carbon produced by partially burning a hydrocarbon-rich oil, such as petroleum or coal tar residues, in open shallow pans. Other particulate carbons such as acetylene black and carbon black, items 415.15 and 473.04, respectively, are discussed in other summaries. Lampblack is the least abrasive of the inorganic pigments, as well as being light-fast, and resistant to heat, acids, and alkalis. It is, however, relatively expensive; thus it is used only when a specific property makes it the preferable material. Lampblack is principally used in the manufacture of arc brushes and electrodes and in specialty-type inks and paints.

The column 1 rates of duty applicable to imports (see general headnote 3 in the Tariff Schedules of the United States) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
473.06	Lampblack----------	10% ad val.	5% ad val.

The rate effective January 1, 1972, represents the final stage of a concession granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT). The first of five annual stages of the reduction became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1968, an excerpt from which is reproduced as appendix A to this volume. The rate shown above as existing prior to January 1, 1968, is the rate applicable on August 31, 1963, the effective date of the TSUS.

Statistics on the domestic production of lampblack are not available owing to the small number of producers; it is estimated, however, that annual U.S. output is 20 to 30 million pounds, valued at $6 to $10 million. Lampblack is produced by three firms, which operate four plants: two plants in Texas and one plant each in California and New Jersey. Two of these firms are large and diversified, with the sales of lampblack constituting a minor portion of their total sales. The other firm is much smaller but does make ancillary materials, such as arc carbons and brushes.

During 1962-66, U.S. exports of lampblack greatly exceeded imports (table 1). Moreover, exports increased by about 120 percent in that period, from 784,000 pounds, valued at $145,000, in 1962 to 1.75 million pounds, valued at $375,000, in 1966. Canada, the principal export market for lampblack, took 650,000 pounds, valued at $157,000, in 1966 or about 35 percent of the total, with the remainder distributed among more than seven other countries. Except for 1964, when U.S. imports of lampblack reached a high point when Canada was the major supplier, such imports declined during 1962-65 and were nonexistent in 1966 (table 2). Belgium was the principal supplier of U.S. imports of lampblack in the other years during that period, and in 1965 supplied 15,000 pounds, valued at $1,400, or all of such imports in that year.

Table 1.--Lampblack: U.S. imports for consumption and exports of domestic merchandise, 1962-66

Year	Imports		Exports	
	Quantity	Value	Quantity	Value
	Pounds		Pounds	
1962	20,592	$1,917	783,934	$144,810
1963	20,454	1,927	632,256	117,260
1964	66,671	10,142	800,227	145,669
1965	15,000	1,403	1,504,706	352,965
1966	-	-	1,754,796	375,367

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 2.--Lampblack: U.S. imports for consumption, by principal sources, 1962-65

Source	1962	1963	1964	1965
	Quantity (pounds)			
Belgium	20,000	20,000	19,973	15,000
Canada	-	-	46,000	-
West Germany	592	454	698	-
Total	20,592	20,454	66,671	15,000
	Value			
Belgium	$1,812	$1,815	$1,869	$1,403
Canada	-	-	8,120	-
West Germany	105	112	153	-
Total	1,917	1,927	10,142	1,403

Source: Compiled from the official statistics of the U.S. Department of Commerce.

Note.--There were no U.S. imports of lampblack in 1966.

Commodity	TSUS item
Enumerated pigments containing chromium:	
Chrome green	473.10
Chrome yellow	473.12
Chromium oxide green	473.14
Hydrated chromium oxide green	473.16
Molybdenum orange	473.18
Strontium chromate	473.19
Zinc yellow	473.20

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

The United States, with an annual output exceeding 100 million pounds, ranks first in the world as a producer and consumer of chrome pigments. While U.S. imports of chrome colors have increased substantially in recent years, they supply a small portion of domestic consumption. U.S. exports of chrome pigments have been small.

Description and uses

The basic raw materials used in the manufacture of chrome pigments are sodium dichromate and potassium dichromate (items 420.08 and 420.98); these chemicals, which are made from chromite ores (item 601.15) are converted by either of two processes--precipitation or calcination--into the chrome colors of commerce.

Chrome pigments may be broadly grouped into yellows and greens. The yellow group can be considered as comprising chrome yellow, molybdenum orange, zinc yellow, and strontium chromate, all of which are made by precipitation processes. Chrome yellow, whose color is a characteristic medium yellow, is essentially lead chromate. Chrome yellows in commerce, however, range in color from greenish-yellow, or primrose (which contain co-precipitated lead sulfate), to deep orange (chrome oranges and chrome reds which are actually basic lead chromates). Molybdenum (molybdate) oranges are closely related pigments made by coprecipitating lead chromate and lead molybdate, and often contain lead sulfate as well; they are more brilliant than the older chrome oranges. Zinc yellow (zinc chromate) is a complex salt of zinc, potassium, and chromium with its color being similar to the lighter shades of chrome yellow. Strontium chromate is a pale yellow compound of definite chemical composition.

The three types of green chrome colors are chrome green, chromium (chrome) oxide green, and hydrated chromium (chrome) oxide. Chrome greens are composite pigments made by blending chrome yellows with iron blues (item 473.28). Chrome oxide green is nearly pure chromic oxide; it is made by calcining sodium dichromate or potassium dichromate. Hydrated chromium oxide, also known as Guignet's green, is made by initially fusing sodium dichromate with boric acid, and then hydrolyzing the intermediate product.

Chrome pigments are generally used as colorants in paints and related products, floor coverings, and coated fabrics. Large quantities of some chromes are used in rust-inhibitive coatings.

Chrome yellow, the foremost chrome pigment of commerce, is principally used in paints. The extensive use of chrome yellow, however, is predicated on cost considerations, since the pigment lacks chemical resistance and is neither acid nor alkali proof. The increase in use of chrome yellow in recent years is largely attributable to its application in marking highway traffic lanes, particularly as a uniform interstate designation to indicate that changing lanes is prohibited.

Molybdenum orange is used primarily in automotive finishes, inks, and plastics; the increase in the use of molybdenum orange in recent years is attributable largely to the growth in its use in plastics. Zinc yellow and strontium chromate are principally used as primers for metal surfaces; strontium chromate is the more expensive pigment and is usually reserved for special types of applications. Chrome oxide green, the most stable of all green pigments, is used where chemical and heat resistance are required and is particularly valuable as a ceramic material; it is also employed in roofing granules, floor coverings, coated fabrics, and camouflage paints. Hydrated chrome oxide green is also a nonreactive, heat-resistant green pigment, and it is principally used in automobile finishes and paper coatings. Chrome green is mostly used in paints, inks, and related products.

U.S. tariff treatment

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1968) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
473.10	Chrome green	10% ad val.	5% ad val.
473.12	Chrome yellow	10% ad val.	5% ad val.
473.14	Chromium oxide green	10% ad val.	5% ad val.
473.16	Hydrated chromium oxide green.	10% ad val.	5% ad val.
473.18	Molybdenum orange	10% ad val.	5% ad val.
473.19	Strontium chromate	10% ad val.	5% ad val.
473.20	Zinc yellow	10% ad val.	5% ad val.

The rates effective January 1, 1972, represent the final stage of concessions granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT). The first of five annual stages of the reductions became operative January 1, 1968, an excerpt from which is reproduced as appendix A to this volume. The rates shown above as existing prior to January 1, 1968, are the rates applicable on August 31, 1963, the effective date of the TSUS.

U.S. consumption

Annual U.S. apparent consumption of chrome pigments increased from 96.9 million pounds in 1962 to 128.0 million pounds in 1966, or by more than 30 percent (table 1). During 1962-66, U.S. demand for chrome colors was supplied predominantly by domestic production, although the proportion supplied by imports increased.

On the basis of quantities consumed, chrome yellow is the most important of the chrome pigments. In 1966, U.S. consumption of chrome yellow amounted to 67.0 million pounds, or more than half of the total quantity of chrome colors (table 2).

U.S. producers

Chrome pigments are produced domestically by about 20 firms. Most of these are large, diversified firms which also make paints; hence, they consume captively considerable quantities of chrome colors. The domestic producers operate modern and efficient chrome pigment plants, chiefly in the more populous States of New York and

Illinois, where certain major industrial consumers of these materials are also situated. In recent years U.S. capacity to produce molybdenum orange has been increased by the construction of three plants, while the capacity to produce zinc yellow has declined as one plant discontinued operations.

Chrome yellow is the basic chrome pigment. Most plants which produce that material make other chrome colors but confine their production to certain kinds of chromes; only a few plants produce an entire line of such colors. Although the production of chrome colors is essentially a batch type operation, there has been some automation of the process.

U.S. production

The United States is believed to be the world's largest producer of chrome pigments. Domestic output of these pigments increased from 95.4 million pounds, valued at $34.2 million, in 1962 to 119.9 million pounds, valued at $45.1 million, in 1966 (table 3), or by more than 25 percent. During 1962-66, chrome yellow accounted for about half of the total quantity of chrome colors produced. Domestic output of chrome yellow increased from 48.9 million pounds, valued at $15.5 million in 1962 to 62.8 million pounds, valued at $21.8 million, in 1966, or by almost 30 percent. The greatest percentage increase in U.S. output of chrome colors, however, was registered by molybdenum orange; output of that pigment increased by about 45 percent over the same period, from 14.9 million pounds, valued at $7.6 million, in 1962 to 21.7 million pounds, valued at $10.2 million, in 1966. Chrome green was the only chrome pigment to experience a decline in output in that period, decreasing from 6.5 million pounds, valued at $2.6 million, in 1962 to 5.9 million pounds, valued at $2.6 million, in 1966. The decrease in the production of chrome green is attributable to its being replaced by another composite pigment consisting of chrome yellow and phthalocyanine blue. U.S. production of hydrated chrome oxide and strontium chromate are not separately reported in official statistics. Annual domestic output of these materials has been relatively constant in recent years and believed to have averaged about 750,000 pounds and 1 million pounds, respectively.

U.S. exports and imports

Chrome pigments are not separately listed in official export statistics; exports, however, were probably small.

Annual U.S. imports of chrome pigments increased rapidly and continuously from 1.6 million pounds, valued at $355,000, in 1962 to 8.1 million pounds, valued at $1.8 million, in 1966 (table 4). Most of the increase in U.S. imports of chrome colors occurred in 1966, when imports rose by about 5 million pounds, or by 170 percent, from the preceding year with Japan by far the principal supplier. In 1966 that country supplied 4.4 million pounds, valued at $946,000, or 55 percent of total U.S. imports of chrome pigments. Virtually all of the imports from Japan in that year were of chrome yellow (table 5). Other major suppliers of chrome pigments to the United States have been Poland, Norway, and Belgium; in 1966 these countries furnished 25 percent of the total imports of these materials.

Sodium or potassium dichromate, the basic raw material for the production of chrome colors, is manufactured in the United States exclusively from imported chromite ores, item 601.15. Much of the imported chrome color is equivalent to the domestic product in quality, except possibly for imported chrome yellow, which may lack purity and lightfastness. The shortcomings of the imported chrome yellow, however, have not precluded its use as a pigment in traffic markings.

Foreign production and trade

Chrome pigments, owing to their extensive use as colorants and corrosion inhibitors, constitute an important class of chrome chemicals for the more advanced countries. Major foreign producers of chrome pigments include West Germany, France, and Japan. While the United States and France are large producers, they import considerable quantities of these chromes, whereas Belgium, a relatively small producer, exports a major part of its output. Most major producing countries, including the United States, West Germany, and France, are heavily reliant on imported chromite ores but Japan, a major producer of chrome pigments, obtains its chromite ores domestically. The chrome ores are supplied chiefly by the U.S.S.R., the Republic of South Africa, the Philippine Republic, Turkey, and Rhodesia.

Table 1.--Chrome pigments: U.S. production, imports for consumption, and apparent consumption, 1962-66

Year	Production	Imports	Apparent consumption 1/	Ratio of imports to consumption
	1,000 pounds	1,000 pounds	1,000 pounds	Percent
1962	95,356	1,553	96,909	1.6
1963	96,262	1,733	97,995	1.8
1964	104,686	2,529	107,215	2.4
1965	112,204	2,987	115,191	2.6
1966	119,908	8,068	127,976	6.3

1/ Equals production plus imports; exports are not separately classified in official statistics, but they were probably nominal.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Note.--Data above do not include statistics for hydrated chrome oxide green or strontium chromate because they are unavailable; combined U.S. production of these materials is estimated to be about 1,750 thousand pounds a year.

Table 2.--Chrome pigments: U.S. production, imports for consumption, and apparent consumption, by kinds, 1966

Chrome pigment	Production	Imports	Apparent consumption 1/	Ratio of imports to apparent consumption
	1,000 pounds	1,000 pounds	1,000 pounds	Percent
Chrome green	5,930	134	6,064	2.2
Chrome yellow	62,818	4,230	67,048	6.3
Chrome oxide green	12,914	1,520	14,434	10.5
Molybdenum orange	21,716	177	21,893	.8
Zinc yellow	16,530	1,896	18,426	10.3
Total	119,908	2/ 8,068	2/127,976	6.3

1/ Equals production plus imports; exports are not separately classified in official statistics, but they were probably nominal.

2/ Includes 111 thousand pounds of hydrated chrome oxide green; there were no imports of strontium chromate.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Note.--No data on production and consumption of hydrated chrome oxide green or strontium chromate are available; combined annual U.S. production is estimated to be about 1,750 thousand pounds.

Table 3.--Chrome pigments: U.S. production, by kinds, 1962-66

Chrome pigment	1962	1963	1964	1965	1966
	Quantity (1,000 pounds)				
Chrome green	6,526	5,734	6,226	6,116	5,930
Chrome yellow and orange	48,904	49,496	53,032	58,496	62,818
Chromium oxide green	11,748	10,434	11,222	12,792	12,914
Molybdenum orange	14,934	16,872	18,674	18,896	21,716
Zinc yellow	13,244	13,726	15,532	15,904	16,530
Total	95,356	96,262	104,686	112,204	119,908
	Value (1,000 dollars) 1/				
Chrome green	2,582	2,220	2,606	2,648	2,589
Chrome yellow and orange	15,506	15,211	17,131	19,830	21,763
Chromium oxide green	4,963	4,586	5,012	5,686	6,129
Molybdenum orange	7,640	8,606	8,391	9,142	10,212
Zinc yellow	3,481	3,314	3,761	4,435	4,420
Total	34,172	33,937	36,901	41,741	45,113

1/ Estimated from unit value of total shipments.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Note.--This table does not include statistics on hydrated chromium oxide and strontium chromate because they are not available; estimate of annual U.S. output of these materials is 750 thousand pounds, and 1,000 thousand pounds, respectively.

Table 4.--Chrome pigments: U.S. imports for consumption, by principal sources, 1962-66

Source	1962	1963	1964	1965	1966
	Quantity (1,000 pounds)				
Japan	766	811	1,492	1,744	4,418
Poland	135	66	210	175	898
Norway	81	-	-	174	1,120
Belgium	210	251	286	630	682
Australia	181	466	479	144	-
All other	180	139	62	120	950
Total	1,553	1,733	2,529	2,987	8,068
	Value (1,000 dollars)				
Japan	170	173	319	416	946
Poland	40	15	52	52	265
Norway	15	-	-	34	216
Belgium	34	51	57	126	143
Australia	55	142	146	44	-
All other	41	31	13	45	188
Total	355	412	587	717	1,758

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 5.--Chrome pigments: U.S. imports for consumption, by principal sources and kinds, 1966

Chrome pigment	Japan	Poland	Norway	Belgium	All other	Total
	Quantity (1,000 pounds)					
Chrome green	-	41	-	-	93	134
Chrome yellow	4,185	-	-	-	45	4,230
Chrome oxide green	-	746	-	-	774	1,520
Hydrated chrome oxide green	-	111	-	-	-	111
Molybdenum orange	123	-	-	38	16	177
Zinc yellow	110	-	1,120	644	22	1,896
Total	4,418	898	1,120	682	950	8,068
	Value (1,000 dollars)					
Chrome green	-	12	-	-	29	41
Chrome yellow	881	-	-	-	15	896
Chrome oxide green	-	220	-	-	135	355
Hydrated chrome oxide green	-	33	-	-	-	33
Molybdenum orange	41	-	-	14	5	60
Zinc yellow	24	-	216	129	3	372
Total	946	265	216	143	187	1,757

Source: Compiled from official statistics of the U.S. Department of Commerce.

Note.--In 1966 there were no imports of strontium chromate.

Commodity	TSUS item
Cuprous oxide----------	473.24

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

In recent years, domestic production and consumption of cuprous oxide have increased, with consumption amounting to 6.7 million pounds in 1966. U.S. imports of cuprous oxide supplied about 17 percent of consumption in that year, while exports were virtually nil.

Comment

The two oxides of copper are cuprous oxide and cupric oxide. Cuprous oxide, the subject of this summary, is the less oxidized material, while cupric oxide, item 418.74, which is discussed in a separate summary of another volume, is the more highly oxygenated product.

Cuprous oxide, also known as red copper oxide, is a crystalline powder produced either by the furnaced oxidation of copper (the only process currently employed in the United States) or by the electrolytic reduction of cupric oxide. Cuprous oxide is used principally in antifouling paints to prevent the growth of barnacles and other marine organisms on ship bottoms; it is also used as a red glaze in ceramics and as a fungicide.

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1968) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
473.24	Cuprous oxide----------	1.275¢ per lb. + 15% ad val.	0.6¢ per lb. + 7.5% ad val.

Based on imports in 1966, the compound rate for cuprous oxide was equivalent to an ad valorem rate of 17.4 percent.

The rate effective January 1, 1972, represents the final stage of a concession granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT). The first of five annual stages of the reduction became

operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1968, an excerpt from which is reproduced as appendix A to this volume. The rate shown above as existing prior to January 1, 1968, is the rate applicable on August 31, 1963, the effective date of the TSUS.

Cuprous oxide is produced domestically by five firms which operate five furnace-type plants--one each in California, Indiana, Michigan, Pennsylvania, and Rhode Island. Two of these producers are copper-mining companies; the others make a variety of inorganic pigments in addition to cuprous oxide.

Domestic consumption and production of cuprous oxide has increased in recent years, with production rising from 3.8 million pounds, valued at $2.6 million, in 1962 to 5.6 million pounds, valued at $3.1 million, in 1966 (table 1). Most of the increase occurred in 1965, however, when output rose by more than 140 percent from the preceding year. The increases in consumption and production during 1962-66 are attributable, in part, to the growth in the use of cuprous oxide for military purposes.

U.S. imports of cuprous oxide were relatively constant during 1962-66 and amounted to 1.2 million pounds, valued at $413,000, in 1962, compared to 1.1 million pounds, valued at $604,000, in 1966 (table 2). The ratio of imports to consumption declined, however, from 24 percent in 1962 to 17 percent in 1966. Norway was the principal supplier of cuprous oxide to the United States during 1962-66 and in the latter year furnished 792,000 pounds, or about 70 percent of the total imports. West Germany, a major U.S. supplier of cuprous oxide during that period, accounted for virtually all of the remainder in 1966.

U.S. exports of cuprous oxide are not separately classified in official statistics; however, such exports have been negligible.

Major foreign producers of cuprous oxide are Norway, West Germany, and the United Kingdom. Norway, probably Europe's leading producer, utilizes an electrolytic process to manufacture cuprous oxide whereas all U.S. producers use a furnace type process; the difference in processes may have resulted from differences in the cost of electrical power in Norway and the United States.

Table 1.--Cuprous oxide: U.S. production, imports for consumption, and apparent consumption, 1962-66

Year	Production	Imports	Apparent consumption 1/	Ratio of imports to consumption
	1,000 pounds	1,000 pounds	1,000 pounds	Percent
1962	2/ 3,826	1,225	5,051	24.3
1963	2/ 2,552	928	3,480	26.7
1964	2/ 2,132	1,091	3,223	33.8
1965	5,212	1,157	6,369	18.2
1966	5,552	1,128	6,680	17.0

1/ Equals production plus imports; exports have been negligible.
2/ Revised by the U.S. Bureau of the Census to exclude mixed copper oxides.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 2.--Cuprous oxide: U.S. imports for consumption, by principal sources, 1962-66

Source	1962	1963	1964	1965	1966
	Quantity (1,000 pounds)				
Norway	644	585	743	736	792
West Germany	535	275	323	416	336
All other	46	68	25	5	1/
Total	1,225	928	1,091	1,157	1,128
	Value (1,000 dollars)				
Norway	220	202	269	321	433
West Germany	177	92	114	167	170
All other	16	25	9	2	1
Total	413	319	392	490	604

1/ Less than 500 pounds.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Litharge	473.52
Orange mineral	473.54
Red lead	473.56
Suboxide of lead	473.58

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

The United States is the world's foremost producer, importer, and consumer of lead oxides. In recent years, domestic production and consumption of these materials, especially suboxide of lead and red lead, have increased. U.S. consumption of these lead products now exceeds 700 million pounds annually, and accounts for a sizable share of the lead consumed in the United States. While U.S. imports have risen rapidly, they supply only a small portion of consumption.

Description and uses

Litharge, or lead monoxide, contains about 93 percent elemental lead by weight. The term litharge is sometimes reserved for the fused oxide while the unfused oxide is known as massicot. Litharge is made from lead metal by several methods based on furnace techniques, and may be converted to red lead by further oxidation. The color of litharge ranges from yellow to reddish-yellow depending on its crystalline structure. About one-third of the litharge consumed domestically is used to make chrome pigments (items 473.12 and 473.18), and the remainder is consumed in automotive brake linings, varnishes, floor coverings, oil refining, rubber, and insecticides.

Red lead, or trilead tetroxide, is also frequently known as minium. Red lead, which contains about 91 percent elemental lead by weight, is made by the further oxidation of litharge, sometimes in the same furnace in which the litharge was produced. Commercial red lead is marketed in several grades according to the true red lead content. The color of red lead ranges from bright red to orange-red. Its major uses are in the manufacture of protective coatings (paints), for preventing the rusting and corrosion of steel products, and in the manufacture of storage battery pastes and plates; these uses account equally for about 90 percent of the total red lead consumed annually. Virtually all of the remainder of red lead is consumed in ceramics.

Orange mineral is an outdated term for high-purity grades of red lead used principally to make printing inks. Formerly, a sufficiently high grade of red lead could not be made from litharge, and basic carbonate white lead (item 473.60) was used as the raw material for orange mineral. Technological advances in the production of red lead have made the distinction between red lead and orange mineral unnecessary.

Suboxide of lead, more commonly known as black oxide, and sometimes termed leaded (leady) litharge, is a mixture of litharge and finely divided metallic lead; it contains about 96 percent by weight of elemental lead. Because of its free-lead content, it is considerably darker than litharge. Its method of manufacture is similar to that of litharge, but is less exacting; only 60 to 80 percent of the lead needs to be oxidized. Virtually all of the black oxide consumed in the United States is used in storage batteries, where it has to some extent displaced litharge.

U.S. tariff treatment

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1968) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
473.52	Litharge	1.25¢ per lb.	1/
473.54	Orange mineral	2¢ per lb.	1¢ per lb.
473.56	Red lead	1.875¢ per lb.	1/
473.58	Suboxide of lead	15% ad val.	1/

1/ Rate not affected by sixth (Kennedy) round of trade negotiations under the General Agreement on Tariffs and Trade (GATT).

The rates of duty for litharge and red lead were equivalent to ad valorem rates of 11.4 percent and 13.4 percent, respectively, for imports in 1966. The ad valorem equivalent of the rate for orange mineral could not be ascertained since there have been no imports in recent years.

The rate effective January 1, 1972, for orange mineral represents the final stage of a concession granted by the United States in the sixth round of trade negotiations under the GATT. The first of five annual stages of this reduction became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1968, an excerpt from which is reproduced as appendix A to this volume. The rate shown above as existing prior to January 1, 1968, are the rates applicable on August 31, 1963, the effective date of the TSUS.

U.S. consumption

Annual U.S. apparent consumption of lead oxides increased from 606.5 million pounds in 1962 to 726.6 million pounds in 1966, or by about 20 percent. Most of domestic consumption consists of black oxide, and the increase in consumption during 1962-66 is attributable to the rapid growth in the demand for that product (table 1). The increased use of black oxide largely reflected the expanded domestic output of storage batteries.

U.S. producers

Owing to the similarity of the production processes involved, all of the eight firms that manufacture litharge also make red lead. Three of these firms are large and diversified, and they produce the bulk of the domestic output. Moreover, some of the larger producers of litharge and red lead are also paint and battery manufacturers; they consume in their own operations considerable quantities of their output of these oxides. A few of them also produce basic carbonate white lead, item 473.60, and black oxide, item 473.58. For some of the smaller producers, however, litharge and red lead account for a large part of the firms' output and sales; one such firm discontinued its operations in 1963. The eight producers of these lead materials operate 17 plants--four in California, two each in Illinois and Missouri, and one each in Colorado, Georgia, Indiana, New Jersey, New York, Pennsylvania, Texas, Washington, and West Virginia.

Black oxide is produced almost exclusively by the battery manufacturers, which consume all their own output; commercial sales have been virtually nil. There are 14 producers of black oxide; they operate 21 plants--three each in California, Michigan, and Pennsylvania, two each in Indiana and Texas, and one each in Georgia, Minnesota, Missouri, New York, Ohio, Oklahoma, Washington, and Wisconsin.

U.S. production

Domestic production of lead oxide pigments increased from 577.7 million pounds in 1962 to 676.2 million pounds in 1966, or by about 17 percent. Black oxide accounted for most of the output and a large portion of the increase in output during 1962-66; in 1962, U.S. output of that product amounted to 322 million pounds, whereas in 1966 it reached 398 million pounds (official statistics do not include value data for black oxide since virtually the entire production is consumed by its producers). The percentage increase in the production of red lead during the same period was slightly greater than that in the output of black oxide. U.S. production of red lead increased

from 49.8 million pounds, valued at $7.1 million, in 1962 to 62.2 million pounds, valued at $11.2 million, in 1966, or by about 25 percent. Domestic production of litharge also increased during this period but by the relatively small proportion of 5 percent, from 205.8 million pounds, valued at $23.8 million, in 1962 to 216.2 million pounds, valued at $36.9 million, in 1966.

U.S. exports

Exports of lead oxide pigments were not separately classified in official statistics prior to 1965, when the export schedule was revised to reflect the increased importance of these products. U.S. exports of lead oxide pigments increased from an estimated 3.4 million pounds, valued at $540,000, in 1962 to 5.2 million pounds, valued at $1,040,000, in 1966. U.S. exports of lead oxide pigments, which probably consisted chiefly of litharge and black oxide, did not constitute more than 1 percent of total domestic production during the 5-year period. In recent years, South Viet-Nam has been the most important market for these exports; substantial shipments to that country were made under the aegis of the Agency for International Development. In 1966, South Viet-Nam took 30 percent of the total U.S. exports of lead oxide pigments, Canada took 20 percent, and the rest was distributed to more than 10 other countries.

U.S. imports

From 1962 to 1966, U.S. imports of lead oxides increased by more than 70 percent, from 32.3 million pounds, valued at $2.3 million, to 55.5 million pounds, valued at $6.3 million. Imports from all sources supplied 7.7 percent of consumption in 1966, compared with 5.3 percent in 1962.

Litharge accounted for most of the lead oxide pigments that entered the United States during 1962-66; in 1966, U.S. imports of litharge amounted to 51.3 million pounds or more than 90 percent of the total (table 2). Most of the remainder of U.S. imports of these materials during that period consisted of red lead; in 1966, imports of red lead amounted to 4.3 million pounds (table 3). In recent years the bulk of the imports of litharge and red lead have been supplied by Mexico; in 1966 that country supplied more than 95 percent of the imports of litharge and about 60 percent of the imports of red lead. U.S. imports of black oxide, which have been minimal and sporadic, occurred only in 1962, 1963, and 1966. In 1966, U.S. imports of black oxide, all from West Germany, amounted to 20,000 pounds, valued at $2,900. There were no imports of orange mineral during 1962-66.

Foreign production and trade

The United States, Mexico, and Australia are the world's leading producers of lead oxide pigments; these countries are richly endowed with the lead from which these pigments are manufactured. Although Mexico is a large producer, its consumption is small. As a result, Mexico has been the world's largest exporter of these lead oxides; other major exporting countries include Australia, West Germany, France, and Belgium. On the other hand, the United States, the world's largest producer, has also been the world's largest importer of lead oxide pigments. The countries of the European Economic Community, particularly the Netherlands and Italy, also import substantial quantities of lead oxides; other major importing countries include Brazil, Venezuela, and New Zealand.

Table 1.--Lead oxide pigments: U.S. production, imports for consumption, exports of domestic merchandise, and apparent consumption, 1962-66

Category	1962	1963	1964	1965	1966
Production:					
Red lead--1,000 pounds	49,796	51,560	55,624	59,630	62,160
Litharge--1,000 pounds	205,816	187,916	200,460	211,268	216,196
Suboxide of lead--1,000 pounds	322,046	365,868	356,076	385,310	397,882
Total--1,000 pounds	577,658	605,344	612,160	656,208	676,238
Imports--1,000 pounds	32,305	47,222	42,749	45,463	55,516
Exports 1/--1,000 pounds	3,455	3,321	3,023	4,573	5,199
Apparent consumption 2/--1,000 pounds	606,507	649,245	651,886	697,098	726,555
Ratio of imports to consumption--percent	5.3	7.3	6.6	6.5	7.6

1/ Exports for 1962-64 are estimated since lead oxide pigments were not specially provided for in official statistics prior to 1965.
2/ Equals production plus imports minus exports.

Source: Production, compiled from official statistics of the U.S. Bureau of Mines; imports and exports, compiled from official statistics of the U.S. Department of Commerce, except as noted.

Note.--Data on production of orange mineral are included with those for red lead; imports and exports of this pigment are virtually nil.

Table 2.--Litharge: U.S. imports for consumption, by principal sources, 1962-66

Source	1962	1963	1964	1965	1966
	Quantity (1,000 pounds)				
Mexico	30,634	44,153	38,116	44,093	50,381
France	-	-	442	180	762
Belgium	267	44	33	45	101
West Germany	10	400	-	44	12
All other	283	282	934	53	-
Total	31,194	44,879	39,525	44,415	51,256
	Value (1,000 dollars)				
Mexico	2,176	3,518	3,830	5,318	5,562
France	-	-	50	26	104
Belgium	24	5	3	7	14
West Germany	1	33	-	17	2
All other	28	36	118	7	-
Total	2,229	3,592	4,001	5,375	5,682

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 3.--Red lead: U.S. imports for consumption, by principal sources, 1962-66

Source	1962	1963	1964	1965	1966
	Quantity (1,000 pounds)				
Mexico	885	1,034	2,263	170	2,463
France	-	-	-	223	898
West Germany	110	1,071	886	590	777
All other	116	238	75	65	122
Total	1,111	2,343	3,224	1,048	4,260
	Value (1,000 dollars)				
Mexico	63	83	239	24	314
France	-	-	-	30	155
West Germany	10	95	98	83	106
All other	10	20	10	8	16
Total	83	198	347	145	591

Source: Compiled from official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Blue lead	473.44
Basic carbonate white lead	473.60
Basic sulfate white lead (sublimed white lead)	473.62
Lead pigments not elsewhere enumerated	473.90

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

Lead pigments other than the oxide types are of minor commercial importance. Owing chiefly to inroads on sales by other pigments, such as red lead and titanium dioxide, domestic production and consumption of the lead pigments discussed herein declined substantially in 1962-66. U.S. imports were variable, and amounted to 3.9 million pounds in 1966 (virtually all consisted of basic carbonate white lead); exports were small.

Comment

The principal lead pigments other than the oxide types are the varieties of white lead; this excludes, however, those pigments that contain lead but are described in the TSUS as chrome pigments, items 473.12 and 473.18. Lead oxide pigments, items 473.52 to 473.58, and leaded zinc oxides, items 473.46 to 473.50, are discussed more appropriately in separate summaries in this volume.

The commercial varieties of white lead are basic carbonate white lead, basic sulfate white lead, and basic lead silicate. (Item 473.90 of the TSUS covers basic lead silicate and all other lead pigments not specially provided for elsewhere in the tariff schedules.)

Commercial basic carbonate white lead is composed of several kinds of lead carbonates, principally the dihydroxydicarbonate, and contains about 80 percent by weight of elemental lead. It is prepared by several processes, all of which are based on reacting lead metal with acetic acid (item 425.70) to form lead acetate, which is, in turn, converted to the basic carbonate by the reaction with carbon dioxide. Basic carbonate white lead is used generally in conjunction with other white pigments, in exterior paints for wood surfaces; other uses are in putty and ceramics. In recent years, titanium dioxide (item 473.70) has taken over much of the former market in paints for basic carbonate white lead.

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Basic sulfate white lead is essentially a monobasic lead sulfate whose elemental lead content is 75 percent by weight. It can be made directly from a lead sulfide ore by the fume process, and from finely divided metal, or from a mixture of metal and litharge, by the precipitation process. Basic sulfate white lead is used principally in outside white paints; minor uses are in ceramics and rubber.

Basic silicate white lead is of two types. One type is essentially a lead silicate-lead hydroxide complex containing about 77 percent by weight of elemental lead. The newer type consists of a silica core and an outer layer of basic lead silicate and basic lead sulfate. It is manufactured by heating a mixture of silica (quartz), litharge, and either lead sulfate or sulfuric acid. Like the other white lead pigments, it is used in mixed-pigment exterior house paints.

Blue lead, or blue basic lead sulfate, is a mixture of the sulfate, monoxide, and sulfide of lead, together with smaller amounts of lead sulfide, zinc oxide, and carbon. It is made by fuming a mixture of lead ore and either coal or coke in a furnace. Blue lead has been used as a component of structural metal priming paints, but has been almost entirely displaced in recent years by products such as red lead (item 473.56).

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1968) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
473.44	Blue lead----------	20% ad val.	10% ad val.
473.60	Basic carbonate white lead---	1.05¢ per lb.	0.5¢ per lb. 1/
473.62	Basic sulfate white lead (sublimed white lead).	20% ad val.	10% ad val.
473.90	Lead pigments, not elsewhere enumerated.	20% ad val.	10% ad val.

1/ This rate, as well as those for 1970 and 1971, is contingent--see footnote 1 to Staged Rates and Historical Notes to pt. 2 of schedule 4 of the TSUSA-1968, as shown in appendix A to this volume.

Based on imports in 1966, the rate for basic carbonate white lead was equivalent to an ad valorem rate of 6.2 percent.

The rates effective January 1, 1972, represent the final stage of concessions granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT). The first of five annual stages of the reductions became

operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1968, an excerpt from which is reproduced as appendix A to this volume. The rates shown above as existing prior to January 1, 1968, are the rates applicable on August 31, 1963, the effective date of the TSUS.

White lead pigments are produced domestically by three firms which operate nine plants--two in California, two in Pennsylvania, and one each in Illinois, Indiana, Kansas, New Jersey, and Missouri. Two of these firms are large and diversified; one produces zinc and lead ores, and the other makes numerous pigments, paints, and allied products. The third firm, however, is smaller and relies on sales of these lead materials.

Statistics on domestic production of blue lead, basic sulfate white lead, and basic silicate white lead are not available. It is believed, however, that the U.S. production of blue lead is insignificant and that of basic sulfate white lead and basic silicate white lead is small.

Basic carbonate white lead is produced and consumed in the United States in larger quantities than the other three mentioned pigments, but both production and consumption of it have declined in recent years. In 1962, domestic production of basic carbonate white lead amounted to 31.1 million pounds, valued at an estimated $5.9 million, whereas in 1966, U.S. production amounted to only 24.6 million pounds, valued at $6.7 million, representing a decline of more than 20 percent (table 1). The decrease in both U.S. production and consumption of basic carbonate white lead is mostly attributable to its displacement by the more efficient white pigment titanium dioxide, item 473.70.

In recent years there have been no domestic imports of either blue lead or basic sulfate white lead. U.S. imports of basic carbonate white lead decreased from 4.7 million pounds, valued at $578,000, in 1962 to 3.8 million pounds, valued at $668,000, in 1966 (table 2). The decrease in U.S. imports of basic carbonate white lead is attributable, in part, to the continued decline in the demand for this particular pigment and, in part, to the increase in the price of the product. Imports from all sources supplied 13.5 percent of consumption of basic carbonate white lead in 1966, compared with 13.2 percent in 1962. Canada and West Germany were the principal suppliers; in 1966 they supplied about 40 percent and 35 percent, respectively, of the total imports. During 1962-66, U.S. imports of miscellaneous lead pigments were small; in 1966 such imports, which amounted to 36,000 pounds, valued at $13,000, were also chiefly supplied by Canada and West Germany (table 3). A sizable portion of U.S. imports reported as miscellaneous lead pigments, however, were probably misclassified.

U.S. exports of lead pigments other than the oxide types are small and probably consist almost entirely of basic carbonate white lead.

Table 1.--Basic carbonate white lead: U.S. production, imports for consumption, and apparent consumption, 1962-66

Year	Production	Imports	Apparent consumption 1/	Ratio of imports to consumption
	1,000 pounds	1,000 pounds	1,000 pounds	Percent
1962	31,142	4,723	35,865	13.2
1963	27,994	4,869	32,863	14.8
1964	25,192	5,348	30,540	17.5
1965	23,080	3,263	26,343	12.4
1966	24,598	3,829	28,427	13.5

1/ Equals production plus imports, since exports are believed to have been small.

Source: Production, compiled from official statistics of the U.S. Bureau of Mines; imports, compiled from official statistics of the U.S. Department of Commerce.

Note.--Reported data include small quantities of white lead other than basic carbonate white lead.

Table 2.--Basic carbonate white lead: U.S. imports for consumption, by principal sources, 1962-66

Source	1962	1963	1964	1965	1966
	Quantity (1,000 pounds)				
Canada	1,994	1,745	1,781	1,447	1,617
West Germany	1,438	1,582	2,023	1,049	1,318
Netherlands	307	448	694	416	587
United Kingdom	984	1,094	762	312	270
All other	-	-	88	39	37
Total	4,723	4,869	5,348	3,263	3,829
	Value (1,000 dollars)				
Canada	323	251	314	278	305
West Germany	136	149	257	158	180
Netherlands	29	44	79	58	80
United Kingdom	90	105	91	47	37
All other	-	-	7	40	66
Total	578	549	748	581	668

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 3.--Lead pigments not elsewhere enumerated: U.S. imimports for consumption, by principal sources, 1962-66

Source	1962	1963	1964	1965	1966
	Quantity (1,000 pounds)				
Canada	-	1	8	8	4
West Germany	1/	3	2	2	26
All other	-	1	1/	1/	6
Total	1/	5	10	10	36
	Value (1,000 dollars)				
Canada	-	2	10	11	6
West Germany	1	6	3	4	4
All other	-	2	2/	2/	3
Total	1	10	13	15	13

1/ Less than 500 pounds.
2/ Less than $500.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Zinc oxide:	
Dry	473.76
Other	473.78

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

The United States is the world's foremost consumer and producer of zinc oxide. During 1962-66, domestic consumption and production of zinc oxide increased, with output totaling 405.6 million pounds, valued at $54.8 million in 1966. While imports of zinc oxide were variable from 1962-66, they registered an overall increase during 1962-66 and amounted to 29.0 million pounds in the latter year; exports were small during that period.

Description and uses

The lead-free varieties of zinc oxide are covered in this summary. Leaded zinc oxides are included under other TSUS items, particularly items 473.46, 473.48, and 473.50, and are discussed in a separate summary in this volume.

Zinc oxide is an amorphous white inorganic powder. It is made by two processes, the American process and the French process. In the American process, zinc oxide is produced by a single-step, zinc-ore furnacing operation, whereas in the French process, zinc oxide is made by a two-step process in which the ore is initially furnaced to produce zinc metal (slab zinc) and then oxidized by an added roasting operation. Smaller quantities of zinc oxide are also made as a byproduct of processes which use secondary zinc materials, such as scrap residues.

French-process zinc oxide is marketed in three "seal" grades--red-, green-, and white-seal--which are listed in order of increasing product purity and increasing price. The red- and green-seal grades are no longer extensively produced in the United States; the white-seal (the highest purity) zinc oxide is still produced in considerable quantities and is used in premium products, such as pharmaceuticals and photoconductive papers. American-process zinc oxide, which

is lower priced than the French-process grades, is the type employed in most uses. Zinc oxide from both processes is generally marketed in dry form as a powder, although it is sometimes ground in oil and sold as a paste.

About 55 percent of the zinc oxide consumed in the United States is used in processing rubber, to activate and accelerate the vulcanizing process. About 15 percent of the domestic consumption of zinc oxide is used in paints, the second largest market; the chemical increases the durability and preservative characteristics of surface coatings, particularly of exterior paints and enamels. A rapidly expanding market for zinc oxide in recent years has been for use as photoconductive coating on a special type of reproductive paper; however, not all reproductive papers require a zinc oxide coating. Zinc oxide is also used in ceramics, pharmaceuticals, and greases and oils.

U.S. tariff treatment

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1968) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
	Zinc oxide:		
473.76	Dry	0.6¢ per lb.	1/
473.78	Other	1.0¢ per lb.	1/

1/ Rate not affected by sixth (Kennedy) round of trade negotiations under the General Agreement on Tariffs and Trade.

The rate of 0.6 cent per pound on item 473.76 was equivalent to 6.3 percent ad valorem, based on the total imports in 1966. Based on imports of this item from individual countries during that year, however, the 0.6-cent rate was equivalent to ad valorem rates ranging from 4.1 (on those from Canada) to 8.5 percent (on those from Mexico, the principal supplier). Based on imports in 1966, the rate of 1.0 cent per pound on item 473.78 was equivalent to 7.8 percent ad valorem; all imports were supplied by Belgium.

U.S. consumption

U.S. consumption of zinc oxide increased from 338.6 million pounds in 1962 to 427.3 million pounds in 1966, or by about 26 percent (table 1). The increase is primarily attributable to the expanded domestic output of rubber and the increased production of photoconductive papers.

The use of zinc oxide in paints has declined in recent years, owing chiefly to its displacement in certain formulations by the more opaque white pigment, titanium dioxide (item 473.70).

U.S. producers

Zinc oxide is produced domestically by 14 firms which operate 16 plants; most of these plants are in Illinois, Kansas, Missouri, and Pennsylvania. The producers are chiefly medium-to-large-size concerns engaged in the smelting and refining of zinc and in the manufacture of a variety of zinc products. Most of the domestic output of zinc oxide is for open-market shipments. One producer, however, a large paint manufacturer, consumes a substantial portion of its output of zinc oxide in its own operations.

U.S. production

The domestic production of zinc oxide increased from 317.7 million pounds in 1962 to 405.6 million pounds in 1966 (table 1). About 60 percent of the zinc oxide produced in the United States is made by the American process, 25 percent is accounted for by the French process, and the remainder is a byproduct of other operations.

Since it consists of about 80 percent by weight of elemental zinc, the pigment zinc oxide is an important outlet for that metal. In 1966, 323.8 million pounds of slab zinc, secondary zinc, and zinc in the form of domestic and foreign ores were consumed in the manufacture of zinc oxide.

U.S. exports

U.S. exports of zinc oxide increased from 4.1 million pounds, valued at $590,000, in 1962 to 7.3 million pounds, valued at $1,090,000, in 1966 (table 1). In recent years Canada has been the largest market for domestic exports of zinc oxide. In 1966, Canada took about 30 percent of the zinc oxide exports, Belgium took 15 percent, and the remainder was distributed to more than 10 countries.

U.S. imports

U.S. imports of zinc oxide have been variable in recent years, but they registered an overall increase from 25.0 million pounds, valued at $2.3 million, in 1962 to 29.0 million pounds, valued at $2.8 million, in 1966 (table 2). Imports supplied a declining share

of domestic consumption in 1962-66; however, imports from all sources supplied 6.8 percent of consumption in 1966, compared with 7.4 percent in 1962.

Since 1963, Mexico and Canada have been the principal foreign suppliers of zinc oxide to the United States. In 1966, they supplied 60 percent and 27 percent, respectively, of the total imports of zinc oxide. Both countries are richly endowed with zinc-bearing mineral deposits; in recent years Canada has been the world's largest producer of mined zinc, and Mexico has been one of the larger producers of the mined material.

Foreign production and trade

Since zinc oxide is used principally in the processing of rubbers and as an ingredient in paints, it is a major material of commerce for both the more highly developed and the less developed countries.

Most of the industrially developed countries manufacture zinc oxide for home market consumption. West Germany, the United Kingdom, France, and Canada are major producers and exporters of zinc oxide. Although Italy manufactures some zinc oxide, its needs are supplemented considerably by imports.

On the other hand, many of the less developed countries do not manufacture zinc oxide; these countries, such as Indonesia and Syria, are entirely dependent upon imports for their supply. Mexico produces large quantities of zinc oxide but it exports most of its production.

Table 1.--Zinc oxide: U.S. production, imports for consumption, exports of domestic merchandise, and apparent consumption, 1962-66

Year	Production	Imports	Exports	Apparent consumption	Ratio of imports to apparent consumption
	1,000 pounds	1,000 pounds	1,000 pounds	1,000 pounds	Percent
1962	317,688	25,008	4,121	338,575	7.4
1963	314,742	27,146	5,923	335,965	8.1
1964	326,610	16,903	4,870	338,643	5.0
1965	375,658	22,992	5,320	393,330	5.8
1966	405,612	28,983	7,266	427,329	6.8

Source: Production, compiled from official statistics of the U.S. Bureau of Mines; imports and exports, compiled from official statistics of the U.S. Department of Commerce.

Table 2.--Zinc oxide: U.S. imports for consumption, by principal sources, 1962-66 .

Source	1962	1963	1964	1965	1966
	Quantity (1,000 pounds)				
Mexico	2,623	4,627	6,630	13,161	17,628
Canada	3,800	7,871	6,752	7,930	7,780
Netherlands	7,919	6,097	1,371	1,266	2,118
United Kingdom	8,111	5,569	945	277	561
All other	2,555	2,982	1,205	358	896
Total	25,008	27,146	16,903	22,992	28,983
	Value (1,000 dollars)				
Mexico	221	331	504	964	1,243
Canada	431	891	821	1,122	1,129
Netherlands	676	499	129	137	256
United Kingdom	704	490	85	29	56
All other	224	253	119	41	103
Total	2,256	2,464	1,658	2,293	2,787

Source: Compiled from official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Leaded zinc oxides:	
Containing not over 25 percent of lead by weight:	
Dry	473.46
Other	473.48
Containing over 25 percent of lead by weight	473.50

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

In recent years the commercial importance of leaded zinc oxides has declined substantially. During 1962-66, domestic production decreased by slightly more than 25 percent, with output amounting to 21.3 million pounds in 1966. U.S. imports of leaded zinc oxides also decreased considerably during the same 5-year period; exports were probably nil.

Comment

Leaded zinc oxides are composite pigments of zinc oxide and basic lead sulfate produced either by blending the components mechanically or by smelting and cofuming lead-containing zinc ores. They are used almost entirely as white pigments for exterior oil-base paints, in which they impart excellent durability to the paint film. They are marketed in three grades, designated according to their content of basic sulfate white lead as 18-percent, 35-percent, and 50-percent leaded. (The 35-percent leaded grade contains about 25 percent of elemental lead.)

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1968) are as follows:

TSUS item		Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
	Leaded zinc oxides:		
	Containing not over 25 percent of lead by weight:		
473.46	Dry----------	0.6¢ per lb.	0.3¢ per lb. 1/
473.48	Other----------	0.1¢ per lb.	0.5¢ per lb. 1/
473.50	Containing over 25 percent of lead by weight.	20% ad val. 1/	10% ad val. 1/

1/ This rate, as well as those for 1970 and 1971, is contingent; see footnote 1 to Staged Rates and Historical Notes to pt. 2 of schedule 4 of the TSUSA-1968, as shown in appendix A to this volume.

Based on imports in 1966, the rate for item 473.46 was equivalent to an ad valorem rate of 4.9 percent. The ad valorem equivalent of the rate for item 473.48 could not be ascertained because there have been no imports in recent years.

The rates effective January 1, 1972, represent the final stage of concessions granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT). The first of five annual stages of the reductions became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1968, an excerpt from which is reproduced as appendix A to this volume. The rates shown above as existing prior to January 1, 1968, is the rate applicable on August 31, 1963, the effective date of the TSUS.

The producers of leaded zinc oxides are medium- to large-size manufacturers primarily engaged in the smelting and refining of zinc, but also producing a variety of zinc materials. The five producers, which operate one plant each (two in Kansas and one each in Illinois, Montana, and Pennsylvania), also make lead-free zinc oxides within the same plants.

Domestic consumption of leaded zinc oxides decreased from 29.5 million pounds in 1962 to 21.5 million pounds in 1966, or by about 35 percent (table 1). U.S. production also decreased during that period, from 28.8 million pounds in 1962 to 21.3 million pounds in 1966. The decline in consumption and production of leaded zinc oxides

is chiefly attributable to the displacement of these oxides by a more efficient white pigment, titanium dioxide, item 473.70. The latter material is considerably more opaque (hence has greater hiding power) and much less toxic.

U.S. imports of leaded zinc oxides have declined substantially, decreasing from 773,000 pounds, valued at $70,000, in 1962 to 156,000 pounds, valued at $19,000, in 1966, or by almost 80 percent (table 2). A decline in shipments of leaded zinc oxides from all major supplying countries, with the exception of West Germany, and the virtual discontinuance of supplies from Canada and the Netherlands characterized the 1962-66 period. The foreign suppliers, being major paint manufacturers, have also been substantial consumers, as well as producers, of leaded zinc oxides; the decline in the use of these materials in paints, however, is occurring in these countries also.

There were no imports of leaded zinc oxide pastes containing not more than 25 percent of lead during 1962-66. The bulk of the imports during that period consisted of the dry grade which contained not more than 25 percent of lead, and in 1966 that grade accounted for the total (table 3). The preference for imports of leaded zinc oxides which contain less lead may be predicated on the lower rate of duty for those materials. If an importer or consumer desired a more highly leaded zinc oxide, he could simply add and mix in sufficient quantities of basic sulfate white lead with the low leaded zinc oxide to increase the metal content of the latter to the desired proportion.

U.S. exports of leaded zinc oxides in recent years have been virtually nil.

Table 1.--Leaded zinc oxides: U.S. production, imports for consumption, and apparent consumption, 1962-66

Year	Production	Imports	Apparent consumption 1/	Ratio of imports to apparent consumption
	1,000 pounds	1,000 pounds	1,000 pounds	Percent
1962	28,754	773	29,527	2.6
1963	30,120	770	30,890	2.5
1964	24,474	514	24,988	2.1
1965	25,108	240	25,348	.9
1966	21,324	156	21,480	.7

1/ Equals production plus imports; exports are not specially provided for in official statistics, but they were probably nominal.

Source: Production compiled from official statistics of the U.S. Bureau of Mines; imports compiled from official statistics of the U.S. Department of Commerce.

Table 2.--Leaded zinc oxides: U.S. imports for consumption, by principal sources, 1962-66

Source	1962	1963	1964	1965	1966
	Quantity (1,000 pounds)				
United Kingdom	251	129	220	-	80
West Germany	43	99	125	85	60
Belgium	21	21	154	-	15
Canada	118	157	-	100	1
Netherlands	245	274	-	1/	-
All other	95	90	15	55	-
Total	773	770	514	240	156
	Value (1,000 dollars)				
United Kingdom	22	11	18	-	9
West Germany	4	13	11	9	7
Belgium	2	2	15	-	3
Canada	13	18	-	14	2/
Netherlands	21	22	-	2/	-
All other	8	7	2	9	-
Total	70	73	46	32	19

1/ Less than 500 pounds.
2/ Less than $500.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 3.--Leaded zinc oxides: U.S. imports for consumption, by types, 1962-66

Type	1962	1963	1964	1965	1966
	Quantity (1,000 pounds)				
Leaded zinc oxides:					
Containing not over 25 percent of lead by weight	773	768	514	200	156
Containing over 25 percent of lead by weight	1/	2	-	40	-
Total	773	770	514	240	156
	Value (1,000 dollars)				
Leaded zinc oxides:					
Containing not over 25 percent of lead by weight	69	68	46	27	19
Containing over 25 percent of lead by weight	1	5	-	5	-
Total	70	73	46	32	19

1/ Less than 500 pounds.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Lithopone:	
Containing under 30 percent zinc sulfide by weight	473.72
Containing 30 percent or more zinc sulfide by weight	473.74
Zinc sulfide	473.80

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

Zinc sulfide and lithopone, once commercially important white pigments, are now of minor importance because they have been extensively replaced in recent years by the more opaque white pigment titanium dioxide. In recent years U.S. imports of lithopone have increased, while imports of zinc sulfide have decreased; however, in 1966, imports of the latter were 100 percent larger than those of lithopone and amounted to 727,000 pounds, valued at $119,000. U.S. exports of lithopone have probably been small.

Comment

Zinc sulfide and lithopone are opaque white pigments; the former is a distinct chemical compound, while the latter is actually a composite product containing zinc sulfide and barium sulfate. Zinc sulfide is produced either by a calcining process with zinc oxide (item 473.76) and sulfur (item 415.45) or by a precipitation process involving zinc chloride and hydrogen sulfide, sodium sulfide, or barium sulfide. Lithopone is made by the double decomposition reaction of zinc sulfate (item 422.76) and barium sulfide. The so-called "normal" lithopone contains slightly less than 30 percent by weight of zinc sulfide; however, "high-strength" grades containing up to 50 percent by weight of zinc sulfide (sometimes designated as zinc sulfide-barium pigments) are available commercially. Formerly, zinc sulfide and lithopone were extensively used as pigments in paints; in recent years both have been almost entirely replaced in that use by the more opaque white pigment titanium dioxide (item 473.70). Zinc sulfide containing traces of certain materials, such as copper, possesses phosphorescent properties; hence it has been used to some extent in the manufacture of luminous dials and television picture tubes. Lithopone is still used in certain specialty type of paints

and printing inks in which some particular property of lithopone makes it the preferable white pigment.

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1968) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
	Lithopone:		
473.72	Containing under 30 percent zinc sulfide by weight----	0.875¢ per lb.	0.43¢ per lb.
473.74	Containing 30 percent or more zinc sulfide by weight----------	0.875¢ per lb. + 7.5% ad val.	0.43¢ per lb. + 3.5% ad val.
473.80	Zinc sulfide----------	2.5¢ per lb.	1.2¢ per lb.

Based on imports in 1966, the rates for lithopone were equivalent to an ad valorem rate of 16.8 percent for item 473.72 and 14.2 percent for item 473.74; the rate for zinc sulfide was equivalent to an ad valorem rate of 15.3 percent.

The rates effective January 1, 1972, represent the final stage of concessions granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT). The first of five annual stages of the reductions became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1968, an excerpt from which is reproduced as appendix A to this volume. The rates shown above as existing prior to January 1, 1968, are the rates applicable on August 31, 1963, the effective date of the TSUS.

While zinc sulfide is no longer produced domestically, there is one firm that manufactures lithopone. Official statistics on production of lithopone are not available, however, because their publication would reveal confidential information on the operations of the one producing firm. That manufacturer consumes substantial quantities of the lithopone it produces, since the company, which is large and diversified, makes numerous kinds of household paints and industrial coatings.

During 1962-66, U.S. imports for consumption of zinc sulfide decreased from 922,000 pounds, valued at $140,000, in 1962 to 727,000 pounds, valued at $119,000, in 1966, or by about 25 percent (table 1). West Germany was the principal supplier of zinc sulfide to the United States during that period; in the latter year, it supplied almost 90 percent of the total imports.

U.S. imports of lithopone have increased in recent years, rising from 195,000 pounds, valued at $13,000, in 1962 to 364,000 pounds, valued at $33,000, in 1966 (table 2). The increase in U.S. imports of lithopone is accounted for by its expanded use in specialty types of paints and printing inks. During 1962-66, all U.S. imports of lithopone were supplied by West Germany and the Netherlands; in 1966, their respective shares of the market were about 70 and 30 percent. Virtually all imports of lithopone which were supplied by West Germany during 1962-66 contained more than 30 percent of zinc sulfide by weight, whereas practically all such imports from the Netherlands contained less than 30 percent of zinc sulfide. Lithopone is not specially provided for in official export statistics; exports of this pigment, however, were probably small.

Countries that are major producers of zinc sulfide and lithopone include West Germany and the United Kingdom. Although these pigments have been almost entirely displaced by titanium dioxide in the United States, they are still used in several other countries; consuming countries, in addition to the aforementioned producers, include France, Brazil, and Greece.

Table 1.--Zinc sulfide: U.S. imports for consumption, by principal sources, 1962-66

Source	1962	1963	1964	1965	1966
	Quantity (1,000 pounds)				
West Germany	827	766	605	607	643
United Kingdom	95	80	120	177	-
All other	-	1	60	-	84
Total	922	847	785	784	727
	Value (1,000 dollars)				
West Germany	127	117	96	97	106
United Kingdom	13	15	16	23	-
All other	-	1	11	-	13
Total	140	133	123	120	119

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 2.--Lithopone: U.S. imports for consumption, by sources, 1962-66

Source	1962	1963	1964	1965	1966
	Quantity (1,000 pounds)				
West Germany	91	140	121	227	253
Netherlands	104	177	223	153	111
Total	195	317	344	380	364
	Value (1,000 dollars)				
West Germany	7	13	10	24	28
Netherlands	6	8	11	10	5
Total	13	21	21	34	33

Source: Compiled from official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Vermilion reds	473.66

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

In recent years, vermilion reds have been of minor commercial importance because they have been largely replaced by the cadmium reds, which are lower in price. Since there is only one manufacturer, official statistics on domestic production are not published; imports and exports have been virtually nil.

Comment

Vermilion reds are manufactured by heating mercury with sulfur to produce mercuric sulfide; numerous shades of the pigment are made by varying the process conditions. (A poisonous black mercuric sulfide can also be produced by the reaction of mercury and sulfur.) The commercial grades of vermilion reds consist of fine, bright scarlet powders which exhibit excellent brilliance and permanence; they also manifest a high specific gravity and a high hiding power. The major uses of these pigments are in heat-resistant tin-printing inks, in bulletin colors, and to color rubber goods, plastics, and sealing wax.

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1968) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
473.66	Vermilion reds	30¢ per lb.	15¢ per lb. 1/

1/ This rate, as well as those for 1970 and 1971, is contingent; see footnote 1 to Staged Rates and Historical Notes to pt. 2 of schedule 4 of the TSUSA-1968, as shown in appendix A to this volume.

There have been no imports of vermilion reds in recent years. Imports in 1961 were not representative; based on imports in 1958 and 1959, the rate of 30 cents a pound had an ad valorem equivalent of 8.2 percent for each of those years.

The rate effective January 1, 1972, represents the final stage of a concession granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT). The first of five annual stages of the reduction became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1968, an excerpt from which is reproduced as appendix A to this volume. The rate shown above as existing prior to January 1, 1968, is the rate applicable on August 31, 1963, the effective date of the TSUS.

Since World War II the use of vermilion reds has been almost entirely replaced by cadmium reds, which cost less. U.S. production and consumption of vermilion reds are small. The only producer operates a plant in New Jersey for the manufacture of vermilion reds and other inorganic pigments. There are probably no U.S. exports of these pigments and there have been no imports since 1961, when 24 pounds, valued at $435, were obtained from Japan.

Commodity	TSUS item
Titanium dioxide	473.70

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

Titanium dioxide, having replaced most other white pigments in much of their former markets, is now the foremost white pigment of commerce. The United States, with an annual output of more than 1 billion pounds in 1962-66, is the world's largest producer and consumer of titanium dioxide. Imports, which supplied 8 percent of consumption in 1966, substantially exceed exports.

Description and uses

Titanium dioxide (TiO_2) is the "whitest" of the white pigments; that is, its hiding power (opacity per unit weight) is greater than that of any other white pigment. The two commercial types of titanium dioxide are rutile and anatase; these types differ with respect to crystalline structure. In rutile titanium dioxide the crystal lattice is more compact, which results in a higher refractive index and about 30 percent more hiding power for that type than for anatase.

The two titanium ores used in the commercial production of titanium dioxide are ilmenite, which contains 50 to 60 percent of TiO_2 by weight, and rutile, which contains 90 to 95 percent. The pigment is manufactured from these ores by either the sulfate or the chloride process. In the sulfate process, ilmenite is chiefly used; the ore is reacted with sulfuric acid, and both the rutile and anatase types of pigment are produced. Rutile ore is used in the chloride process; it is reacted with chlorine, and produces only the rutile type of pigment. The United States has been the principal source of ilmenite ore, and Australia and West Africa, the principal sources of rutile ore (see summary for item 601.51).

Both types of titanium dioxide are marketed in several grades having properties designed for intended use. These grades are produced by adding small quantities of such compounds as aluminum oxide, silica, and zinc oxide to improve chalking resistance, dispersibility, color retention, and other properties. Rutile titanium dioxide is

also marketed as a composite or extended pigment; that is, it contains either 30 or 50 percent by weight of TiO_2, the remainder being calcium sulfate. The entire production of the extended pigment has been in connection with the sulfate process titanium dioxide.

In the United States, about 60 percent of all titanium dioxide is used in the manufacture of paint and related products, and about 15 percent is used in paper; the rest is used in floor coverings, coated fabrics, printing inks, plastics, ceramics, and other products. Rutile titanium dioxide, owing to its greater hiding power, is usually preferred to the anatase type in paints and floor coverings. Anatase, which is lower in price than rutile, is used principally in the manufacture of paper and rubber products.

U.S. tariff treatment

The column 1 rates of duty applicable to imports (see general headnote 3 in the Tariff Schedules of the United States Annotated) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
473.70	Titanium dioxide----------	15% ad val.	7.6% ad val.

The rate effective January 1, 1972, represents the final stage of a concession granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT). The first of five annual stages of the reduction became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1968, an excerpt from which is reproduced as appendix A to this volume. The rate shown above as existing prior to January 1, 1968, is the rate applicable on August 31, 1963, the effective date of the TSUS.

U.S. consumption

Annual U.S. apparent consumption of titanium dioxide increased from 1.04 billion pounds in 1962 to 1.25 billion pounds in 1966, or by more than 15 percent (table 1). The increase largely reflected the expansion in the domestic output of paints, paper, and plastics. The rutile type of titanium dioxide, used mainly by paint manufacturers, accounted for a larger share of the increase than did anatase; consumption of anatase also increased, however, with the expanded output of lightweight paper.

U.S. producers

Titanium dioxide is produced by seven firms, all of which are large and diversified; sales of titanium dioxide constitute a small part of each firm's total sales. Five of the producers also mine ilmenite ore, one of the precursors of titanium dioxide, or have a financial interest in such mining operations. Moreover, many manufacturers of titanium dioxide are also major paint producers; hence, in their own operations they consume large quantities of the pigment, equivalent to about 10 percent of total shipments.

The domestic producers operate 11 plants; four use the sulfate process, four use the chloride process, and three use both processes. On a plant basis, the sulfate capacity to produce titanium dioxide is usually greater than the chloride capacity owing to economies of scale; that is, a larger sulfate plant is generally required to minimize costs per unit of output. Six titanium dioxide plants are situated along the Atlantic seaboard--two are in New Jersey, and one each in Delaware, Georgia, Maryland, and Virginia; one plant is in California; and the remaining four plants are in Mississippi, Missouri, Ohio, and Tennessee. Important factors that influence site selection for titanium dioxide plants are market locations, raw materials, and water supplies.

In recent years, all new titanium dioxide plants built in the United States have been based on the chloride process as that process is probably less costly than the sulfate, particularly with respect to waste disposal costs. Two firms not previously engaged in the production of titanium dioxide, both of which are large paint producers, are constructing facilities, one in Ohio and the other in West Virginia, for the manufacture of titanium dioxide by the chloride process. One of these firms will employ its own chloride technology, while the other is obtaining rights to use certain proprietary methods via licensing from one of the larger manufacturers. Moreover, another manufacturer has announced its plans to discontinue production at one of its sulfate-process plants. With these developments, it is estimated that more than one-third of the total U.S. capacity will soon be based on the chloride process.

U.S. production

Domestic production of titanium dioxide increased from 1.05 billion pounds, valued at about $276 million, in 1962 to 1.19 billion pounds, valued at $293 million, in 1966 (table 2). Official statistics on production are reported on a 100 percent TiO_2 (pure) basis; such data does not include the substantial quantities of calcium sulfate which are incorporated in the extended TiO_2 pigment that contain 50 percent or 70 percent calcium sulfate by weight. Production statistics

moreover, are not reported separately for the two types of titanium dioxide, but it is estimated that about 75 percent of domestic production is of the rutile type. The rutile portion of the production of titanium dioxide is expected to continue to increase with the growing use of the chloride process, since that process currently produces only the rutile type. Although shipments generally correlate closely with domestic output, annual domestic production declined slightly from 1962 to 1963, while shipments increased (table 2), owing to producers' efforts to reduce inventories.

U.S. exports

Exports of titanium dioxide decreased from 33.8 million pounds in 1962 to 32.2 million pounds in 1966 (table 1). The predominant portion of the titanium dioxide exported by the United States is probably in the form of the composite pigments; hence, data for "pure" titanium dioxide have been estimated from official export statistics. In 1962, exports were slightly higher than imports, whereas in 1966 they were one-third the size of the imports.

Canada, the largest market for U.S. exports of titanium dioxide, took about 40 percent of the exports in 1966. The Philippine Republic, the Republic of Korea, West Germany, Italy, the Netherlands, and Belgium together took about 35 percent, and the remainder were distributed to more than 30 other countries.

U.S. imports

Annual U.S. imports of titanium dioxide pigments increased rapidly from 32.3 million pounds, valued at $6.1 million, in 1962 to 96.0 million pounds, valued at $17.2 million, in 1966 (table 3). The greatest growth in annual imports in that period occurred in 1964, when the increase amounted to more than 30 million pounds; in 1966, however, imports declined slightly from the high mark of 99.2 million pounds, reached in the previous year. Imports from all sources supplied 7.7 percent of consumption in 1966, compared with 3.1 percent in 1962.

In recent years Japan has been the principal source of titanium dioxide imported into the United States; in 1966, that country supplied 34.1 million pounds, or about 35 percent of the total. Other important sources of U.S. imports of titanium dioxide during 1962-66 were Finland, West Germany, and France; these countries furnished about 50 percent of the total in 1966, with the remainder accounted for by eight other countries.

The Tariff Commission has completed investigations under section 201(a) of the Antidumping Act, 1921, as amended, to determine whether a domestic industry was being or was likely to be injured, or prevented from being established by reason of the importation of titanium dioxide from France, Japan, and West Germany. In these investigations the Commission determined that no injury had occurred to a domestic industry as a result of such importation. 1/

Foreign production and trade

The free world, exclusive of the United States, has the capacity to produce approximately 1.8 billion pounds of titanium dioxide annually; this capacity is about equal to that of the United States. The major foreign producing countries and their estimated annual productive capacities are as follows: West Germany, 340 million pounds; the United Kingdom, 250 million pounds; Japan, 240 million pounds; France, 160 million pounds; and Canada, 140 million pounds. Finland, although a major source of U.S. imports, has a relatively small productive capacity of 50 million pounds. U.S. firms own or control a substantial portion of the total foreign capacity. The bulk of the foreign capacity controlled by U.S. producers is located in West Germany, with the remainder situated principally in the Netherlands, Norway, Canada, Belgium, and Mexico. Foreign capacity to produce the TiO_2 pigment has been expanded in recent years. Japan, Finland, West Germany, and France (the principal sources of U.S. imports), as well as Canada (the chief market for U.S. exports) and a number of other countries, have built or are building additional plants to produce titanium dioxide. In the free-world countries other than the United States, titanium dioxide has been produced by the sulfate process exclusively. A number of plants now being built abroad, however, such as those in France, West Germany, and the United Kingdom, will use the chloride process.

Communist countries that produce titanium dioxide include the U.S.S.R., East Germany, Czechoslovakia, and China. In such countries the TiO_2 pigment is usually produced in proximity to paint factories and on a much smaller scale than in Western countries. It is believed that the combined capacity of all Communist countries, a capacity which is entirely of the sulfate process, does not exceed 150 million pounds.

1/ See U.S. Tariff Commission, Titanium Dioxide From France, TC Publication 109, 1963 (processed); Titanium Dioxide From Japan, TC Publications 125 and 174, 1964 and 1966 (processed); Titanium Dioxide from West Germany, TC Publication 172, 1966 (processed).

Table 1.--Titanium dioxide: U.S. production, imports for consumption, exports of domestic merchandise, and apparent consumption, 1962-66

Year	Production	Imports	Exports 1/	Apparent consumption 2/	Ratio of imports to apparent consumption
	1,000 pounds	1,000 pounds	1,000 pounds	1,000 pounds	Percent
1962	1,046,402	3/32,278	33,750	1,044,930	3.1
1963	1,038,916	3/50,554	30,974	1,058,496	4.8
1964	1,117,072	81,156	34,056	1,164,172	7.0
1965	1,153,400	99,206	32,275	1,220,331	8.3
1966	1,188,972	95,976	32,247	1,252,701	7.7

1/ Estimated titanium dioxide content of exports.
2/ Equals production plus imports minus exports.
3/ Includes small amounts of non-pigmentary titanium compounds and mixtures.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 2.--Titanium dioxide: U.S. production and total and commercial shipments, 1962-66

Year	Production	Total shipments including interplant transfers		Commercial shipments	
		Quantity	Value	Quantity	Value
	1,000 pounds	1,000 pounds	1,000 dollars	1,000 pounds	1,000 dollars
1962	1,046,402	1,027,644	270,438	959,888	252,802
1963	1,038,916	1,056,832	278,477	973,066	257,471
1964	1,117,072	1,098,658	288,031	1,009,006	266,216
1965	1,153,400	1,146,182	298,842	1,039,684	274,718
1966	1,188,972	1,187,866	303,902	1,075,830	279,716

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 3.--Titanium dioxide: U.S. imports for consumption, by principal sources, 1962-66

Source	1962 1/	1963 1/	1964	1965	1966
	Quantity (1,000 pounds)				
Japan	5,824	10,212	20,758	25,426	34,083
Finland	8,716	17,887	16,835	21,755	20,826
West Germany	3,931	3,774	14,916	16,409	15,655
France	7,775	9,855	13,572	12,955	11,116
All other	6,032	8,826	15,075	22,661	14,296
Total	32,278	50,554	81,156	99,206	95,976
	Value (1,000 dollars)				
Japan	945	1,620	3,341	4,192	5,417
Finland	1,526	3,202	3,101	3,938	4,261
West Germany	710	680	2,914	3,077	2,900
France	1,551	1,972	2,702	2,582	2,190
All other	1,329	1,799	2,940	4,233	2,431
Total	6,061	9,273	14,998	18,022	17,199

1/ Data include small amounts of non-pigmentary titanium compounds and mixtures.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Pearl essence----------	473.82

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

The United States is the world's foremost producer and consumer of natural pearl essence. In 1966, domestic production of natural pearl essence was about 90,000 pounds; imports, which amounted to 22,000 pounds and approximately equaled exports, supplied about 25 percent of consumption.

Comment

Pearl essence is the chemical guanine (2-aminohypoxanthine), deposited as a lustrous, crystalline secretion on the scales and skin of certain species of fish, particularly herring. The term also includes suspensions of the pigment in a suitable liquid vehicle. So-called "synthetic" pearl essence is not based on guanine; it is usually a dispersion of bismuth oxychloride or a lead compound in a liquid vehicle. Such products are provided for elsewhere in the TSUS.

Pearl essence is obtained by washing the silvery secretion from the scales and skin of the fish, after which the extract is thoroughly washed to remove fats, oils, and other organic matter. It may then be sold as a paste containing a small amount of preservatives, or dried to form an anhydrous pigment that can be incorporated in a lacquer.

As its name implies, pearl essence is used to impart a pearl-like, iridescent lustre to articles such as buttons and statuary, and in cosmetics, particularly nail polishes.

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1968) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
473.82	Pearl essence--------	9% ad val.	4.5% ad val.

The rate effective January 1, 1972, represents the final stage of a concession granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT). The first of five annual stages of the reduction became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1968, an excerpt from which is reproduced as appendix A to this volume. The rate shown above as existing prior to January 1, 1968, is the rate applicable on August 31, 1963, the effective date of the TSUS.

Pearl essence is produced domestically by five firms in Maine, which operate one plant each. In 1962-66, U.S. production ranged from 50,000 pounds in 1963, to 144,000 pounds in the preceding year (see accompanying table). While the demand for pearlized products increased during 1962-66, to a large extent consumers shifted their purchases from pearl essence to "synthetic" pearl essence, owing chiefly to the lower price of the latter.

In recent years U.S. imports of pearl essence have supplied a substantial portion of domestic consumption. In 1966, U.S. imports of pearl essence, which amounted to 22,000 pounds, valued at $178,000, supplied nearly 25 percent of domestic consumption, with the Netherlands accounting for almost 70 percent of the total. Prior to 1966, however, the Netherlands was only a nominal supplier of pearl essence to the United States.

Exports of pearl essence are not separately reported in official statistics, but they probably amount to 25 percent of annual production, or about 20,000 pounds. While the United States exports pearl essence to many nations, most exports of this product go to industrialized countries, particularly in Western Europe.

World production of natural pearl essence is about 300,000 pounds a year. Major foreign producers are Norway, the Netherlands, Japan, and West Germany. Recently, Argentina also commenced production of pearl essence.

Pearl essence: U.S. production and imports for consumption, by principal sources, 1962-66

Year	Production	Imports from--			
		All countries	Netherlands	Japan	Norway
	Quantity (1,000 pounds)				
1962	144	43	1/	38	1/
1963	50	36	1/	30	6
1964	70	40	1/	33	5
1965	63	23	1/	15	2
1966	90	22	15	5	2
	Value (1,000 dollars)				
1962	1,092	294	2/	241	2
1963	455	153	2/	85	68
1964	676	175	2/	103	57
1965	622	88	2/	50	22
1966	816	178	107	49	22

1/ Less than 500 pounds.
2/ Less than $500.

Source: Production, compiled from official statistics of the U.S. Bureau of Commercial Fisheries; imports, compiled from official statistics of the U.S. Department of Commerce.

Note.--Exports are estimated to have been about 20,000 pounds annually during the period shown.

Commodity	TSUS item
Ultramarine blue	473.84

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

Ultramarine blue is of minor importance, with annual domestic production estimated to be more than twice as great as that of imports. U.S. imports of ultramarine blue, which in recent years have amounted to more than 3 million pounds, valued at $500,000 to $600,000, greatly exceed exports.

Comment

This summary covers the pigments ultramarine blue and other blues containing ultramarine. Ultramarine blue, which consists of a complex salt of sulfur-alumina silicate is a fire-process inorganic pigment. It is colorfast to heat, soap, and alkalis, but sensitive to acids. Although ultramarine blue generally has good lightfastness, it does show fading on exterior exposure.

Ultramarine blue is manufactured by means of a batch operation. The raw materials (China clay, sulfur, soda ash, and a reducing agent, such as charcoal) are charged in a pot or muffle kiln and roasted. Sodium sulfate (item 421.42) is obtained as a byproduct of this process. Each batch of ultramarine blue produced consists of a continuous gradation of pigment particles, ranging in size from coarse to fine. The prepared batch is then separated by selective sedimentation into uniform particle-size fractions. Ultramarine blue is marketed as a blend of graded fractions, often formulated to customer specifications. The profitable production of ultramarine blue, however, necessitates that all fractions be sold. The more coarse fractions are not usually incorporated in a pigment blend but are used to make laundry blue by mixing the coarse material with an extender, such as sodium bicarbonate (item 420.72). Ultramarine blue is principally used in making paints and roofing granules; it is also used in printing inks and plastics.

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1968) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
473.84	Ultramarine blue----------	2.125¢ per lb.	1¢ per lb.

Based on imports of ultramarine blue in 1966, the specific rate was equivalent to an ad valorem rate of 11.9 percent.

The rate effective January 1, 1972, represents the final stage of a concession granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT). The first of five annual stages of the reduction became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1968, an excerpt from which is reproduced as appendix A to this volume. The rate shown above as existing prior to January 1, 1968, is the rate applicable on August 31, 1963, the effective date of the TSUS.

The U.S. Tariff Commission instituted an escape clause investigation on ultramarine blue in 1960 under section 3(b)(1) of the Trade Agreements Extension Act of 1951, as amended. As a result of that investigation, the Commission found that ultramarine blue was not being imported in such increased quantities by reason of trade agreement concessions as to cause or threaten serious injury to the domestic industry. 1/

Official statistics on annual U.S. production of ultramarine blue are not publishable, since publication would reveal confidential information on the operations of the one domestic producer. This firm operates one plant in West Virginia for the production of ultramarine blue. In addition to producing ultramarine blue (which accounts for about one-fourth of its total sales), this concern also makes several synthetic organic colorants and dyes.

The consumption of ultramarine blue declined rapidly in the 1950's owing to its displacement by the synthetic pigment phthalocyanine blue, which is largely produced by domestic manufacturers. Ultramarine blue cannot be readily replaced, however, in certain uses, particularly in roofing granules, and the domestic consumption of ultramarine blue is believed to have stabilized.

1/ See U.S. Tariff Commission, Ultramarine Blue, Report on Escape-Clause Investigation, No. 7-93, T.C. Publication 5, 1961 [processed].

Imports of ultramarine blue into the United States increased from 2.9 million pounds, valued at $489,000, in 1962 to 3.1 million pounds, valued at $551,000, in 1966 (see accompanying table). The United Kingdom and West Germany were the principal suppliers of ultramarine blue during 1962-66; in 1966 these two countries supplied about 75 percent of the total imports. The United Kingdom is the world's largest producer of ultramarine blue; other major foreign producers, in addition to West Germany, are Belgium and the Netherlands.

It is believed that the United States exports about 300,000 pounds of ultramarine blue and 100,000 pounds of laundry blue annually. The exports of laundry blue have gone chiefly to the less developed countries, where hand washing of clothes is prevalent.

Ultramarine blue: U.S. imports for consumption, by principal sources, 1962-66

Source	1962	1963	1964	1965	1966
	Quantity (1,000 pounds)				
United Kingdom	945	990	1,256	1,147	1,096
West Germany	1,790	2,255	2,000	1,629	1,236
Belgium	10	20	43	25	612
All other	201	110	147	328	133
Total	2,946	3,376	3,446	3,129	3,077
	Value (1,000 dollars)				
United Kingdom	211	235	291	271	261
West Germany	247	316	287	227	178
Belgium	2	3	7	5	93
All other	29	16	27	47	19
Total	489	570	612	550	551

Source: Compiled from official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Vandyke brown	473.86

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

Domestic production of Vandyke brown consists chiefly of refining the imported crude, all of which has been supplied, in recent years, by West Germany. U.S. imports increased during 1962-66 and amounted to 1.1 million pounds, valued at $49,000, in 1966; exports have been nil.

Comment

Vandyke brown is a brownish-black vegetable decomposition product which is similar to lignite or peat. Although the material is composed almost entirely of organic matter, it frequently contains small quantities of iron oxides.

Vandyke brown is used principally as a pigment in formulating specialty types of furniture stains. The pigment is generally sold as a powder to manufacturers of paints and stains. Stains made from Vandyke brown are less important commercially than those made from other natural colorants, such as the raw and burnt umbers (items 472.46, 472.48, and 473.38), or synthetic products, such as the coal tar dyes (item 406.50).

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1968) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
473.86	Vandyke brown--	17% ad val.	8.5% ad val.

The rate effective January 1, 1972, represents the final stage of a concession granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT). The first of five annual stages of the reduction became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1968, an excerpt from which is repro-

duced as appendix A to this volume. The rate shown above as existing prior to January 1, 1968, is the rate applicable on August 31, 1963, the effective date of the TSUS.

Domestic sales of Vandyke brown amounted to 512,000 pounds, valued at $61,000, in 1963; official statistics have not been available, however, for later years, owing to an official reclassification of natural iron oxides. The predominant portion of the Vandyke brown sold by domestic processors probably consists of the imported material which has been, in some measure, refined in this country.

In the years 1962-66, annual U.S. imports of Vandyke brown, all of which were supplied by West Germany, averaged about 641,000 pounds, with a value of $27,000. West Germany has been the foremost producer of Vandyke brown, since the world's principal deposits are located near two West German cities--Kassel and Cologne.

The imports of Vandyke brown in 1962-66, as reported in the official statistics of the U.S. Department of Commerce, were as follows:

Year	Quantity (1,000 pounds)	Value (1,000 dollars)
1962	513	21
1963	434	18
1964	558	23
1965	592	25
1966	1,108	49

Commodity	TSUS item
Nonlead pigments not specially provided for	473.88

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

Domestic production of the nonlead pigments covered in this summary increased during 1962-66, and was estimated to be about $30 million in 1966. U.S. imports of these materials also increased, but they supplied only a minor portion of consumption; exports, which were small, probably consisted mostly of aluminum paste and cadmium pigments.

Description and uses

This summary covers nonlead pigments not specially provided for in the TSUS. These pigments are either manufactured materials or natural products. The principal manufactured nonlead pigments covered here are aluminum paste and the cadmium colors, and the principal natural products are limestone whiting, carmine, and sap brown.

Aluminum paste consists of finely divided aluminum particles dispersed in an inert solvent. The dry forms of finely divided aluminum--aluminum flakes, item 618.40, and aluminum powder, item 618.42--are discussed in the summary on aluminum mill products in volume 6:1. Aluminum paste is prepared by grinding aluminum grains or clippings in mineral spirits with a lubricant, such as stearic acid. The two commercial types of aluminum paste are the leafing and the nonleafing varieties. The leafing type of aluminum paste is one in which the lubricant has thoroughly coated the metal particles; as a result, the particles exhibit a marked tendency to float or orient themselves upon the surface of a wet paint film. The nonleafing type of aluminum paste is one in which the lubricant content is substantially reduced, and consequently the leafing property is minimized. The leafing type is used principally in topcoats (for metal) over rust-inhibitive primers; it is also suitable for use on wood, either as an undercoat or as a finish. The nonleafing type is used primarily in connection with other pigments for metallic finishes that have an iridescent sheen.

The cadmium colors constitute an entire class of pigments that range in color from primrose yellow to dark maroon. The yellows

consist essentially of cadmium sulfide, whereas the maroons are mixtures of cadmium sulfide, mercuric sulfide, and/or cadmium selenide. Generally, these colorants are prepared by calcining the precipitate obtained from the reaction of aqueous cadmium salts and sulfur compounds, such as hydrogen sulfide or selenium sulfide. Cadmium colors are mostly used in automotive paints and enamels, printing inks, and plastics.

Limestone whiting is a low-cost, white extender pigment, similar to chalk whiting (item 472.20) and precipitated calcium carbonate (item 472.24). It is actually ground calcium carbonate, prepared by pulverizing a natural limestone. Whiting is mostly used in the manufacture of paints, putty, and rubber goods.

Carmine is a bright red, decorative pigment prepared from the dried bodies of certain insects; it is used almost entirely in artists' colors. Sap brown is a natural dye obtained by treating the mineral earth Vandyke brown, item 473.86, with ammonium hydroxide; it is used mostly as a paper tint.

U.S. tariff treatment

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1968) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
473.88	Nonlead pigments, not specially provided for.	8.5% ad val.	4% ad val.

The rate effective January 1, 1972, represents the final stage of a concession granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT). The first of five annual stages of the reduction became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1968, an excerpt from which is reproduced as appendix A to this volume. The rate shown above as existing prior to January 1, 1968, is the rate applicable on August 31, 1963, the effective date of the TSUS.

U.S. producers

Aluminum paste is manufactured domestically by six firms. Three firms, which account for the bulk of the output, are principally engaged in the smelting and refining of the metal, and they also produce

a variety of other aluminum products. These firms are global in character, and they are responsible for a substantial share of the world's supply of aluminum. Some of the other producers of aluminum paste are secondary producers of aluminum; that is, they produce the metal from recovered sources. Similarly, the seven domestic producers of cadmium colors are also large and diversified firms; the sales of these cadmium colors constitute a minor portion of each firm's total sales; most of the firms are principally engaged in the manufacture of pigments, paints or protective coatings. In the manufacture of these products, some domestic producers of cadmium colors consume substantial proportions of their own output.

Limestone whiting is produced domestically by about 30 to 35 firms; some of them are large and manufacture a large number of products, while others are small and rely heavily on sales of whiting. The raw material, limestone, is readily available but the cost of shipping it is high relative to its value. Hence, limestone whiting is mostly manufactured near the limestone quarries. Neither carmine nor sap brown is produced domestically.

U.S. production

Domestic production of aluminum paste increased by approximately 20 percent from 16.1 million pounds, valued at an estimated $9.6 million, in 1962 to 19.0 million pounds, valued at about $11.4 million, in 1966. Most of the increased output during 1962-66 was brought about by the expanded need for anticorrosive materials, particularly for national defense.

Domestic production of cadmium colors increased from 4.3 million pounds in 1962 to 5.6 million pounds in 1966, or by about 35 percent. (Data on value of production of cadmium colors are not published in official statistics.) The increase in U.S. production of these materials is probably largely attributable to the increased consumption of plastics.

U.S. production of limestone whiting declined slightly from 1.7 billion pounds, valued at $9.6 million, in 1962 to 1.60 billion pounds, valued at $9.9 million, in 1966. The decline in quantity produced, however, was more than offset by the rise in the price of the material, that is, the value of shipments registered an overall increase during that period.

U.S. imports and exports

U.S. imports of the nonlead pigments covered here increased from 391,000 pounds, valued at $186,000, in 1962 to 830,000 pounds, valued

at $718,000, in 1966 (see accompanying table). This group comprises a number of different pigments and there is wide variation in the unit values of imports from different sources. The unit values of imports from the same source also vary considerably from year to year.

A sampling of import data indicates that imports consisted of carmine (from the United Kingdom and France), cadmium colors (from the United Kingdom and Japan), aluminum paste (from West Germany and the United Kingdom), and sap brown (from West Germany). Additionally, small quantities of numerous other materials, such as manganese blue, cobalt violet, and bronze paste, from these and other countries were reported. There were no imports of limestone whiting, however, as this low-cost commodity is probably unable to bear the freight charges which would be incurred in transit.

These nonlead pigments are not separately listed in the official export schedule, but exports were probably small and almost entirely of aluminum paste and cadmium colors.

Nonlead pigments not specially provided for: U.S. imports for consumption, by principal sources, 1962-66

Source	1962	1963	1964	1965	1966
	Quantity (1,000 pounds)				
United Kingdom	122	122	205	179	246
West Germany	185	215	314	359	474
All other	84	63	80	19	110
Total	391	400	599	557	830
	Value (1,000 dollars)				
United Kingdom	97	139	414	531	448
West Germany	27	55	80	94	131
All other	62	97	63	75	139
Total	186	291	557	700	718

Source: Compiled from official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Artists' colors----------	474.02, -.04, -.06, -.08

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

The United States is the world's leading producer of artists' colors, with an average annual output valued at about $20 million. U.S. exports of artists' colors, which amounted to $1.4 million--or 7 percent of domestic production--in 1966, were slightly greater than imports in that year.

Comment

Artists' colors for the purpose of this summary are considered to consist of children's and students' pigments and paints, as well as the fine-arts colors. Artists' colors have as a base a coloring agent (a dry color, coal-tar dye, or color lake) which is mixed with an inert chemical filler. This composition is ground with water for water colors, with oil for oil colors, or with egg albumin or colloidal substitute for tempera colors. Artists' colors are marketed either as individual units--in cakes, jars, or tubes--or assembled into paint sets, which contain complementary or accessory articles, such as brushes, pans, and stencils. For tariff purposes, the sets include the container and the assortment of articles and are suitable for sale at retail to artists, students, or children as a paint set, kit, or color outfit. The net weight of the articles in these tariff provisions is limited to $1\frac{1}{2}$ pounds.

Children's colors consist chiefly of moderately priced water colors, generally marketed as assembled paint sets in which the value of the colors is often exceeded by the value of the paint box, brushes, and other materials comprising the assembly. Students' colors are primarily medium-priced oil and water colors which are marketed either as individual pieces or assembled into sets. Professional artists' colors are high-grade oil and water colors used by artists and art students. Most of the higher priced colors, including tempera colors, are sold unassembled. Tempera colors are used principally for poster work, scene painting, and interior decorating.

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1968) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
	Artists' colors in any form, not over 1.5 pounds net weight:		
	Not assembled into sets:		
474.02	Valued under 20 cents per dozen pieces.	0.75¢ per piece	0.37¢ per piece
	Valued 20 cents or more per dozen pieces:		
474.04	In jars or tubes---------	1.4¢ per piece + 8.5% ad val.	0.7¢ per piece + 4% ad val.
474.06	In cakes, pan, or other forms.	1.25¢ per piece + 8.5% ad val.	0.62¢ per piece + 6% ad val.
474.08	Assembled into sets, either with or without complementary articles, such as brushes and pans.	24% ad val. on the entire set.	12% ad val. on the entire set.

Based on imports in 1966, the average ad valorem equivalents of the specific rates of duty were 20.7 percent for item 474.04, and 23.2 percent for item 474.06; imports from the United Kingdom, which supplied the bulk of the imports of these items, had ad valorem equivalents of 21.6 percent and 23.7 percent, respectively. In 1964, the most recent year for which imports of item 474.02 were reported (all from the United Kingdom), the ad valorem equivalent was 57.9 percent.

The rates effective January 1, 1972, represent the final stage of concessions granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT). The first of five annual stages of the reductions became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1968, an excerpt from which is reproduced as appendix A to this volume. The rates shown above as existing prior to January 1, 1968, are the rates applicable on August 31, 1963, the effective date of the TSUS.

Artists' colors are produced domestically by approximately 25 firms. While some of these firms produce related articles, such as stencils and brushes, most of them are small--some family owned--with artists' colors being their sole source of income. The producing firms operate 30 plants, most of which are located east of the Mississippi and concentrated particularly in the more populous States of New York, Ohio, and Illinois.

Official statistics on domestic production of artists' colors are not available. U.S. output is estimated to amount to about $20 million a year.

The value of U.S. imports of artists' colors increased from $856,000 in 1962 to $1,284,000 in 1966 (see accompanying table). During 1962-66, the United Kingdom was the chief source of artists' colors and in 1966 it supplied about 75 percent of the total. Most of the imports of artists' colors during 1962-65 and more than 60 percent of the total in 1966 were not in paint sets but were packaged in jars or tubes and valued at 20 cents or more per dozen; virtually all of the remainder of the imports were assembled into paint sets before importation. Imports of artists' colors in jars or tubes were probably preferred by consumers to those in cakes or pans because the former are ready for immediate use, whereas the latter have to be mixed with oil or water prior to use.

During 1962-66, the value of U.S. exports of artists' colors increased from $464,000 to $1,389,000. The predominant portion of U.S. exports of artists' colors in 1962-65 and about 70 percent of the total in 1966 went to Canada; a substantial share of the remainder in 1966 went to Venezuela with small quantities supplied to more than 70 other countries.

Artists' colors: U.S. imports for consumption and exports of domestic merchandise, 1962-66

(In thousands of dollars)

Artists' colors	1962	1963	1964	1965	1966
Imports:					
Not in sets:					
Valued under 20 cents per dozen, in any form	-	1/	6	-	-
Valued 20 cents or more per dozen:					
In jars or tubes	508	518	606	584	807
In cakes, pans, or other forms	11	6	5	6	7
In sets	337	329	367	391	470
Total	856	863	984	981	1,284
Exports	464	606	501	1,191	1,389

1/ Less than $500.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Note.--Quantity data for artists' colors on imports and exports are reported in different units in official statistics; such data are not comparable and hence not shown.

Commodity	TSUS item
Ink powders (nonbenzenoid)-----	474.20
Drawing inks----------	474.22
Other inks----------	474.26

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

The United States is the world's leading producer and consumer of inks and ink powders, particularly printing inks. Domestic consumption and production of ink materials increased during 1962-66, with the total value of production probably exceeding $286 million in 1966. In recent years, exports have greatly exceeded imports, although the former have constituted only a small portion of U.S. production.

Description and uses

Inks and ink products are discussed in this summary in the order of their tariff enumeration as ink powders, writing and drawing inks, and miscellaneous inks. Ink powders, however, are of nominal importance, while printing inks, which for tariff purposes are included with other inks, are by far the most important inks of commerce.

Ink powders are materials that become inks upon the addition of a liquid, usually water. Ink powders are used mostly in the preparation of writing or drawing inks. Only ink powders which consist entirely of nonbenzenoid ingredients are covered herein; those which contain benzenoid constituents are covered elsewhere, particularly under part 1 of schedule 4.

Inks consist essentially of pigment-vehicle dispersions which are used to mark, write, or print on various surfaces; the pigment is the coloring agent, and the disperse vehicle serves as the carrier, in most instances binding the pigment to the substrate. Both benzenoid and nonbenzenoid inks are covered by this summary (see headnote 1, schedule 4, pt. 9).

Inks are generally designated according to use, as writing and drawing inks, printing inks, and miscellaneous inks. Writing and drawing inks consist of pigmented aqueous dispersions, with drawing inks containing added gum arabic, shellac, or inedible gelatin. Permanent writing inks, such as the familiar black and blue-black writing

inks, are usually pigmented with gallotannic acid, whereas washable writing inks are pigmented with soluble blacks or colored dyes. Black drawing inks, such as India ink, are chiefly pigmented with finely divided carbon (carbon black or lampblack), while colored drawing inks are frequently pigmented with other inorganic colorants.

Printing inks are more important than all other kinds of inks combined. They are divided into four types of inks, according to the nature of the printing process in which they are used: Letterpress inks--those used in printing from a typographic (raised) plate; flexographic inks--those used in printing from a typographic rubber plate; lithographic inks, those used in printing from a planographic plate; and gravure inks, those used in printing from a recessed plate. Letterpress inks, the most important type of printing inks, are extensively used in long-run printing operations, particularly in printing publications such as newspapers, books, and periodicals. Lithographic inks, the next most important, are used in medium- or long-run printing operations, and they compete with letterpress inks, especially in the publication of periodicals. Gravure inks are used mostly for color publication work, such as the Sunday news supplements. Flexographic inks are used primarily to print on plastic films, such as coated cellophane and polyethylene.

Miscellaneous inks include duplicating inks, ballpoint inks, and recording inks. Duplicating inks generally consist of carbon black in a glycol vehicle, together with a cellulose binder, castor oil, and lanolin. Duplicating inks are widely used in mimeographing, multigraphing, and typewriting. Ballpoint inks are either dye solutions or pigment dispersions in vehicles such as ethylene glycol or castor oil. Ballpoint inks, which are of high tinctorial strength, must be virtually nondrying in the pen and free of contaminants, to prevent pen clogging. Recording inks, which usually consist of a soluble dye in a water-glycerol or water-ethylene glycol vehicle, are employed in various recording instruments.

U.S. tariff treatment

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1968) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972 1/
474.20	Ink powders (nonbenzenoid)--	3% ad val.	1.5% ad val.
474.22	Drawing inks----------	5.5% ad val.	2.5% ad val.
474.26	Other inks----------	3% ad val.	1.5% ad val.

1/ This rate, as well as those for 1970 and 1971, is contingent; see footnote 1 to Staged Rates and Historical Notes to pt. 2 of schedule 4 of the TSUSA-1968, as shown in appendix A to this volume.

The rates effective January 1, 1972, represent the final stage of concessions granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT). The first of five annual stages of the reductions became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1968, an excerpt from which is reproduced as appendix A to this volume. The rates shown above as existing prior to January 1, 1968, are the rates applicable on August 31, 1963, the effective date of the TSUS.

U.S. consumption

Consumption of inks and ink powders in the United States increased from some $259.7 million in 1962 to about $278.6 million in 1966 (table 1). The predominant portion of the increase in the consumption of inks was attributable to the rapid growth in the consumption of printing inks. The consumption of ballpoint inks has risen also, largely at the expense of fountain pen inks and powders.

Although the consumption of all types of printing inks increased during 1962-66, the types that registered the most rapid growth during this period were flexographic inks and gravure inks. The rapid rise in the consumption of flexographic inks resulted chiefly from their expanded use in printing films for packaging whereas the increase in consumption of gravure inks reflected the growing use of such inks in color publication work, and the printing of magazines.

U.S. producers

Inks and ink powders are produced domestically by 200 to 225 firms. The manufacturers of writing and drawing inks, however, are different from the manufacturers of printing inks. Writing and drawing

inks are made by 20 to 25 firms, which operate about the same number of plants; most of these plants are situated in Massachusetts, New York, Ohio, Washington, and Wisconsin. Of this group, the five largest firms, which account for the bulk of the domestic output of writing and drawing inks, are diversified; they make other products, such as fountain and ballpoint pens, pencils, and a variety of office supplies that include typewriter ribbon, carbon paper, and stamp pads. Some of the manufacturers of writing and drawing inks also produce small quantities of ink powders.

Printing inks are produced by 180 to 200 other firms, which operate about 350 plants; most of these plants are situated in the more populous States of California, New Jersey, New York, Ohio, and Pennsylvania. The three largest firms, which account for half of the total printing ink sales, are considerably diversified, producing numerous related materials, such as pigments, dyes, and surface coatings. The larger manufacturers of printing inks, as well as some of the manufacturers of writing and drawing inks, have established plants abroad and participated in licensing and technical agreements with foreign producers.

Printing inks are also produced by a large number of small firms, many of which are family owned. The fact that printing inks are generally manufactured in batches for specific customer requirements minimizes the opportunities to automate processes, and attracts competition. Moreover, customer servicing in the pressroom by the ink manufacturer is an important adjunct of ink marketing. It is largely owing to these factors--batch processing and customer servicing--that the smaller firms have been able to compete effectively with the larger firms.

U.S. production

The value of domestic production of inks and related products increased from $265.8 million in 1962 to $286.1 million in 1966 (table 1). During 1962-66, U.S. production of inks--consisting mostly of printing inks--and ink powders continually exceeded consumption, with substantial quantities of ink being exported. It is estimated that the sales of printing inks in 1966 were distributed as follows: Letterpress--37 percent, lithographic--22 percent, gravure--17 percent; flexographic--11 percent, and specialty types--13 percent.

U.S. exports

U.S. exports of inks and ink powders increased from an estimated 19.9 million pounds, valued at $8.1 million, in 1962 to about 21.2 million pounds, valued at $10.5 million, in 1966. Canada was the

major market for such exports during 1962-66, taking in 1966 about 4.4 million pounds, valued at $2.1 million, or 22 percent of the total. Other important markets for U.S. exports of printing inks in that year included Venezuela, France, Peru, and the United Kingdom; these countries took an additional 20 percent, and the remainder of the exports were distributed among 50 other countries. Exports of inks and ink powders are small compared with total domestic production owing in part to the difficulties encountered in merchandising abroad, such as providing adequate technical services to consumers.

U.S. imports

During 1962-66, imports of inks and ink powders that entered the United States averaged about 3.3 million pounds, valued at $2.4 million (table 2). In 1966, U.S. imports of these materials, which amounted to 3.5 million pounds, valued at $3.0 million, consisted mostly of miscellaneous inks and printing inks, or 71 percent and 24 percent, respectively. Imports constituted only a very small portion of U.S. consumption of these materials, or about 1 percent in each of the years 1962-66.

The United Kingdom was the chief foreign supplier of inks and ink powders in each of the 5 years under consideration; in 1966, it furnished 1.6 million pounds, valued at $1.9 million, or 45 percent of the total imports (table 3). Other important suppliers were France, the Netherlands, Denmark, and West Germany; in 1966, these countries accounted for most of the remainder of such imports.

Foreign production and trade

The United States is by far the world's largest producer of printing inks, the principal products of this summary. Japan is probably the leading foreign producer, with an annual output about 25 percent of that of the United States; other major foreign producers include West Germany and the United Kingdom. The combined production of the European Economic Community (including West Germany) is equivalent to only about 40 percent of the U.S. total. Printing inks are also manufactured in the Union of Soviet Socialist Republics, as well as other East European countries; the per capita consumption in these countries is low, however, owing chiefly to minimal advertising and the absence of supermarket methods of merchandising.

World trade in printing inks is small. The more developed countries mostly manufacture these materials for their own needs, and the less developed countries have a minimal need for such products. Japan, the leading foreign producer, exports less than 2 percent of its production.

Table 1.--Inks and nonbenzenoid ink powders: U.S. production, imports for consumption, exports of domestic merchandise, and apparent consumption, 1962-66

Year	Production 1/	Imports	Exports	Apparent consumption	Ratio of imports to consumption
	1,000 dollars	1,000 dollars	1,000 dollars	1,000 dollars	Percent
1962	265,750	2,061	8,143	259,668	0.8
1963	268,020	1,926	8,080	261,866	0.7
1964	273,930	2,390	9,894	266,426	0.9
1965	279,960	2,404	9,628	272,736	0.9
1966	286,120	2,985	10,534	278,571	1.1

1/ Estimated.

Source: Compiled from official statistics of the U.S. Department of Commerce, except as noted.

Table 2.--Inks and nonbenzenoid ink powders: U.S. imports for consumption, by types, 1962-66

Type	1962	1963	1964	1965	1966
	Quantity (1,000 pounds)				
Ink powders	47	3	2	2	4
Drawing inks	143	178	129	151	202
Printing inks	1,145	1,013	1,081	841	841
Miscellaneous inks	2,127	1,874	2,299	2,007	2,494
Total	3,462	3,068	3,511	3,002	3,541
	Value (1,000 dollars)				
Ink powders	39	6	2	2	4
Drawing inks	199	201	162	168	229
Printing inks	638	619	866	664	735
Miscellaneous inks	1,185	1,100	1,360	1,570	2,017
Total	2,061	1,926	2,390	2,404	2,985

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 3.--Inks and nonbenzenoid ink powders: U.S. imports for consumption, by principal sources, 1962-66

Source	1962	1963	1964	1965	1966
	Quantity (1,000 pounds)				
United Kingdom	2,026	1,571	1,812	1,356	1,566
France	36	94	140	217	307
Netherlands	631	649	719	589	596
Denmark	454	487	555	439	557
West Germany	199	204	188	214	327
All other	116	63	97	187	188
Total	3,462	3,068	3,511	3,002	3,541
	Value (1,000 dollars)				
United Kingdom	769	604	772	725	857
France	82	204	311	485	713
Netherlands	527	502	576	475	482
Denmark	355	355	457	336	436
West Germany	245	204	208	226	330
All other	83	57	66	157	167
Total	2,061	1,926	2,390	2,404	2,985

Source: Compiled from official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Paints and enamel paints:	
Not containing titanium pigments--	474.30
Containing titanium pigments------	474.35

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

The United States, the world's leading producer of paints and enamels, accounts for about half of the free world's total production. During 1962-66, domestic production of paints increased continually; in 1966, output amounted to an estimated 672.5 million gallons, valued at $1.9 million. U.S. imports of paints increased during 1962-66, while exports were variable; trade is small relative to domestic production.

Description and uses

Paints and enamels (see headnote 2, schedule 4, subpart 9c, TSUS) are surface coatings used for decorative and/or protective purposes. With the exception of minute quantities of plasticizers, the ingredients of the paints and enamels covered by item numbers 474.30 and 474.35 are entirely nonbenzenoid. Paints which contain benzenoid ingredients, such as the alkyd paints, are covered by other item numbers, chiefly item 409.00. For purposes of discussion, however, both types are considered.

Paints and enamels consist essentially of pigments dispersed in a vehicle, which when applied to a surface, dry (harden) to an opaque, solid film. The pigment, which is the coloring agent, opacifies the paint film. The vehicle, which consists of drying oils and/or resins, serves to bind the pigment particles together in the hardened film. Linseed oil, item 176.26, is the drying oil mostly used in paints. Other vegetable oils, which include tung oil, item 176.60, and soybean oil, item 176.52, are also used as drying oils. The chief resins used in paints are the alkyds; other important types include the vinyls, acrylics, and latex.

Paints which contain titanium pigments include virtually all of the white paints, as well as many of the nonwhite paints. Titanium pigments of commerce are the rutile and anatase types of titanium dioxide; these white pigments, item 473.70, are discussed in a separate summary.

For purposes of analysis, paints can be conveniently divided into two broad categories--industrial and trade sales paints--according to the nature of the market. Consumption of industrial paints, which now accounts for about 40 percent of the total market for paints, is growing more rapidly than that of trade sales paints. Industrial paints or finishes are sold directly to consumers, either for the maintenance and protection of building and related facilities or for application to their products. About 15 percent of the industrial paints sold go to automobile manufacturers and allied transportation industries; such paints are also sold for industrial maintenance, furniture and fixtures, and machinery equipment. Trade sales paints or shelf goods, which are sold to the public, to private contractors, and to professional painters primarily in retail packages through paint and hardware stores, include exterior and interior house paints, concrete and stucco paints, and asphalt and roof paints. About 75 percent of trade sales paints are sold for general use in homes, apartments, and offices, and most of the remainder are used for refinishing, particularly of automobiles and machines.

U.S. tariff treatment

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1968) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
	Paints and enamel paints:		
474.30	Not containing titanium pigments.	8.5% ad val.	4% ad val.
474.35	Containing titanium pigments.	15% ad val.	7.5% ad val.

The rates effective January 1, 1972, represent the final stage of concessions granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT). The first of five annual stages of the reductions became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1968, an excerpt from which is reproduced as appendix A to this volume. The rates shown above as existing prior to January 1, 1968, are the rates applicable on August 31, 1963, the effective date of the TSUS.

U.S. consumption

U.S. apparent consumption of paints and enamels increased from 514.5 million gallons in 1962 to 665.9 million gallons in 1966, or by about 30 percent (table 1). During the same period, the share of the

total paint market accounted for by industrial paints increased from about 30 percent to more than 40 percent. The more rapid increase in the demand for industrial paints largely reflects the expanded domestic output of automobiles and capital equipment. Since the newly developed industrial paints, however, have an extended serviceability which often approximates the life of the product, trade sales paints for refinishing purposes have decreased.

Although domestic consumption of paints has increased in recent years, it has lagged behind the economy's gross national product. The moderate growth rate for paints is partly attributable to the aforementioned development of more durable coatings, as well as the employment of more efficient application techniques, such as electrostatic spraying, which has markedly reduced the amount of waste during application. Also, new kinds of surface coatings, for example, transparent and pigmented polyvinyl fluorides, are now competing directly with traditional paints. While these novel coatings are considerably more expensive, their serviceable life exceeds that of paints. Moreover, many end users of paints, particularly in the construction industry, are turning to materials that do not require periodic painting, such as glass, aluminum, and stainless steel.

U.S. producers

Paints and enamels are produced domestically by 1,600 firms operating 1,800 plants. These plants are distributed throughout the United States, but California, Illinois, New Jersey, New York, and Ohio are the principal producing States.

Although there is a large number of paint producers, most of the domestic output is accounted for by 15 companies. The largest producer, which is chiefly concerned with trade sales paints, accounts for about 15 percent of the total output of paints. Two other producers, one of which is the largest manufacturer of industrial paints, account for another 15 percent of the total output. Some of the larger paint firms, moreover, are parts--often relatively small parts--of large, diversified companies, many of which also either make pigments and related materials that are used in paints or have captive outlets for paint products. On the other hand, many of the small firms produce only paint products and have no other source of income.

While some of the larger producers are using advanced techniques, such as electronic computers, to increase output and color-match formulation, the manufacture of paint is still largely a batch-type operation rather than a flow process. The persistent presence of numerous small firms in a manufacturing activity which is dominated by giant companies is attributable partly to this batch method of manufacture. Additionally, raw material suppliers, such as pigment

and varnish manufacturers, frequently furnish technical skills and formulations to the small paint producers, thus enabling these producers to be more competitive than their own facilities would permit.

U.S. production

The United States is the world's largest producer and consumer of paints and enamels; it accounts for almost 40 percent of the paints produced--and about 50 percent of the paints consumed--in the countries outside the Sino-Soviet bloc. Domestic output of paints and enamels increased from 522.3 million gallons in 1962 to 672.5 million gallons in 1966 (table 1). During 1962-66, U.S. production continually exceeded consumption, with substantial quantities exported. About 40 percent of the domestically produced paints are for residential applications, 45 percent are for metal and wood products, and 15 percent are for maintenance of facilities in industry, commerce, and government.

U.S. exports

U.S. exports of paints increased from 7.8 million gallons in 1962 to 10.1 million gallons in 1964, but declined to 6.3 million gallons in 1965 and recovered to 6.7 million gallons in 1966 (table 1). In 1966 the principal export markets were Canada, Thailand, the Republic of Korea, and Japan, with the remainder being distributed to more than 70 other countries. The overall decline in U.S. exports is attributable partly to the increase in U.S.-owned or controlled paint firms abroad and partly to the increased licensing arrangements between U.S. companies and independent foreign firms, particularly in West Germany, Belgium, and Italy, which gives these countries access to advanced technologies. In earlier years, even though U.S. exports of paints increased, they accounted for a declining proportion of domestic production; exports now constitute about 1 percent of total paint sales.

U.S. imports

U.S. imports of paints and enamels almost doubled during 1962-66, from 45,000 gallons, valued at $245,000, in 1962 to 90,000 gallons, valued at $290,000, In 1966 (table 1). Most of the increase occurred in 1965, when imports of paints rose almost 70 percent from the preceding year. U.S. imports, however, have supplied a very minor share of total domestic consumption of paints--less than 0.1 percent. The predominant portion of imports, about 95 percent of the total in 1966, did not contain titanium pigments. Canada was the principal supplier of U.S. imports of paints during 1962-66; other sources were the United Kingdom and West Germany (table 2).

Foreign production and trade

The principal producers of paints and enamels are the more highly industrialized countries of the world. The combined production of paints by the free-world countries, exclusive of the United States, is about equal to that of the latter. The leading foreign producers are West Germany and Japan, each having an annual output of paints equivalent to about 10 percent of U.S. production. Other important producing countries are France, the United Kingdom, and Italy. All of these countries export more paints than they import.

European countries are experiencing an average annual growth in paint use of about 6 percent, compared with a growth rate of about 3 percent in the United States. The less developed countries are increasing their use of paint at an even more rapid rate--8 percent a year.

Table 1.--Paints and enamels: U.S. production, imports for consumption, exports of domestic merchandise, and apparent consumption, 1962-66

Year	Production 1/	Imports 2/	Exports 3/	Apparent consumption
	Quantity (1,000 gallons)			
1962	522,300	45	7,810	514,500
1963	557,800	54	8,987	548,900
1964	601,100	52	10,057	591,100
1965	642,300	88	6,266	636,000
1966	672,500	90	6,692	665,900
	Value (1,000 dollars)			
1962	1,522,000	245	25,946	1,496,000
1963	1,563,000	287	25,420	1,538,000
1964	1,662,000	216	29,181	1,633,000
1965	1,851,000	328	24,956	1,826,000
1966	1,938,000	290	29,079	1,909,000

1/ Estimates made from official statistics include substantial quantities of paints not covered by item 474.30 and 474.35.

2/ Converted from pounds, in which official import statistics are reported on the basis of 15 pounds to a gallon.

3/ Except for 1965 and 1966, export statistics did not include quantity data; estimates for earlier years were derived from unit values of production.

Source: Compiled from official statistics of the U.S. Department of Commerce, except as noted.

Note.--Data on exports are not strictly comparable with those on imports.

Table 2.--Paints and enamels: U.S. imports for consumption, by principal sources, 1962-66

Source	1962	1963	1964	1965	1966
	Quantity (1,000 pounds)				
Canada	450	408	492	986	1,165
West Germany	12	41	27	123	90
United Kingdom	136	168	172	120	63
All other	71	187	85	75	36
Total	669	804	776	1,304	1,354
	Value (1,000 dollars)				
Canada	75	54	80	182	165
West Germany	11	27	17	57	52
United Kingdom	120	104	89	62	48
All other	39	102	30	27	25
Total	245	287	216	328	290

Source: Compiled from official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Varnishes:	
Shellac	474.40
Oleoresinous	474.42
Cellulose derivative	474.44
Other	474.46

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

The United States is the world's foremost producer and consumer of varnishes, with an estimated output of about 140 million gallons in 1966. U.S. foreign trade in varnishes, although small, has been increasing in recent years. Canada, the leading export market for U.S. varnishes, has also been the chief supplier of these materials to the United States.

Description and uses

Varnishes (see headnote 3, schedule 4, Pt. 9C, TSUS) are transparent coatings used to accentuate, as well as to protect, the texture of various surfaces. They consist essentially of unpigmented colloidal dispersions or solutions which spread rapidly to thin smooth films and dry to thin continuous coatings when heated or exposed to air. For tariff purposes, pigmented varnishes are considered to be enamel paints or varnish stains; these products, which are covered mainly by items 474.30, 474.35, and 474.50, as well as 409.00 are discussed in separate summaries.

Varnishes consist of a varied combination of resins, drying oils, thinners, and driers. Resins, either the naturally occurring types (such as shellac or copal) or the synthetics (such as the alkyds or vinyls), are the fundamental film-forming materials. Drying oils, chiefly modified linseed oil, tung oil, and dehydrated castor oil, impart flexibility to the varnish film. Thinners, such as aliphatic or aromatic napthas, benzol, or denatured ethyl alcohol, serve as solvents and facilitate application of the varnish matrix. Driers are acid salts of certain metals, chiefly cobalt, manganese, and lead; these materials accelerate the drying rate and intensify the degree of hardening of the varnish film.

Varnishes may be classed by manner of drying as being either nonconvertible, those in which drying occurs exclusively by solvent

evaporation, or convertible, those in which drying occurs chiefly by air oxidation and/or polymerization of the varnish matrix. Although nonconvertible varnishes dry more rapidly than convertible varnishes, they frequently lack the tenacity or adhesiveness of the latter type. Shellac varnishes and varnishes which contain cellulose derivatives are nonconvertible coatings, whereas oleoresinous varnishes are of the convertible type.

Shellac varnish is a solution of lac resin in denatured alcohol; lac, item 188.10, is a natural product obtained from coccid insects, Coccus lacca, indigenous to certain Asian countries, particularly India. Shellac varnish is mostly used as a clear finish for wood furniture and floors, for which its unique combination of properties that include good sealing qualities cannot be readily matched; it is also used as a clear coating for playing cards and bowling pins and as a sizing for hats of vegetable fibers.

Oleoresinous varnishes--which consist of resins in a drying oil, together with driers and thinners--dry by air oxidation, as well as by solvent evaporation. Alkyd varnishes, which may be considered to be a class of oleoresinous varnishes, are the most important varnishes of commerce. They consist essentially of an alkyd resin dissolved or dispersed in a drying oil; the former is a synthetic polymeric material made by a condensation reaction betweeen a dibasic acid or anhydride and a polyhydric alcohol. The customary method of manufacture consists of "cooking" the drying oil with the alkyd resin precursors, e.g., phthalic anhydride and glycerine. Oleoresinous varnishes, particularly alkyd varnishes, are used as coatings for Venetian blinds, hardwood floors, and interiors of food and beverage cans, as a marine spar varnish, and as a concrete sealer. While most manufacturers of high-quality furniture use nitrocellulose lacquers, the oleoresinous varnishes are used extensively in lower priced merchandise.

Varnishes which contain cellulose derivatives, such as nitrocellulose or cellulose acetate, in volatile thinners are commonly known as a kind of lacquer. Frequently lacquers contain plasticizers as well as synthetic polymeric materials, the latter being chiefly acrylics, to enhance certain coating properties. Lacquers are used principally as finishes for automobiles, furniture, and textiles. Lacquers containing nitrocellulose are also used as a coating for simulated leather products; in that use vinyls have recently offered considerable competition to lacquers.

Other varnish formulations include nonconvertible varnishes in which the shellac or cellulosic material is replaced by other natural and/or synthetic resins, such as an acrylic, and convertible varnishes in which the drying oil is replaced by a reactive polymeric material, such as a liquid epoxy. These newly developed varnishes generally serve the same purposes as the aforementioned varnishes but may excel them in certain considerations, such as lightfastness and durability; the choice for any particular use is determined by a balance between price and performance.

U.S. tariff treatment

The column 1 rates of duty applicable to imports (see general headnote 3 to the TSUSA-1968) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
	Varnishes:		
474.40	Shellac	8.5% ad val.	4% ad val.
474.42	Oleoresinous	10% ad val.	5% ad val.
474.44	Cellulose derivative	12¢ per lb.	6¢ per lb.
474.46	Other	10% ad val.	5% ad val.

Based on imports for 1966, the rate for item 474.44 was equivalent to an average ad valorem rate of 15.4 percent, with the ad valorem equivalents of the rates for imports from individual countries ranging from 4.9 percent, for those supplied by the United Kingdom, to 19.2 percent, for those supplied by Italy.

The rates effective January 1, 1972, represent the final stage of concessions granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT). The first of five annual stages of the reductions became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1968, an excerpt from which is reproduced as appendix A to this volume. The rates shown above as existing prior to January 1, 1968, are the rates applicable on August 31, 1963, the effective date of the TSUS.

U.S. consumption

U.S. consumption of varnishes increased from an estimated 106 million gallons in 1962 to 137 million gallons in 1966, or by almost 35 percent (table 1). Unlike paints, most sales of which consist of trade sales paints (that is, shelf goods sold to consumers), most varnishes are industrial finishes that are sold directly to manufacturers either for the maintenance and protection of facilities or for coating a multitude of finished products.

The increase in the consumption of varnishes during 1962-66 largely reflected the growth in certain segments of the economy, particularly the expanded domestic output of automobiles, furniture, and canned goods. Domestic consumption will probably continue to increase as the national economy expands, but at a slower pace than that of the entire economy. Factors working against the increase in consumption are the development of more durable coatings, which decrease the necessity for continued recoatings, and the enhanced effectiveness of varnish films, which enables them to be applied in thinner coats than formerly, while still providing the same degree of protection.

The composition of domestic consumption with respect to types of varnishes, moreover, is expected to change. Although oleoresinous and cellulose-derived varnishes offer good all-round performance at moderate costs, they are encountering severe competition in certain markets from the novel types of varnishes. Acrylics are making inroads into the major appliance market, and polybutadienes are moving into the metal can market as base coats for beer and beverage can interiors; both of these markets are currently dominated by the alkyd varnishes. On the other hand, the polyesters and polyurethanes are competing with nitrocelluloses as finishes for wood furniture. While polyesters present certain use problems and polyurethanes are expensive, they both give hard, durable finishes.

U.S. producers

Varnishes are produced domestically by about 800 firms, most of which are medium to large size companies that generally make paints as well as other allied products. Although there is a large number of producers, most of the domestic output is probably accounted for by about 20 firms. Domestic producers of varnish operate about 1,000 plants, which are distributed throughout the United States; California, Illinois, New Jersey, New York, and Ohio are the principal producing States.

U.S. production

U.S. production of varnishes increased from an estimated 107 million gallons, valued at $254 million, in 1962 to 139 million gallons, valued at $327 million, in 1966, or by about 30 percent (table 1).

Oleoresinous varnishes, which include the alkyd types, are the major varnishes of commerce, and they account for more than 50 percent of the total domestic production of varnishes. Cellulose-derived varnishes or lacquers, and the recently developed varnishes, such as the epoxies and the acrylics, share about equally most of the remainder of the domestic output. Shellac varnishes constitute only a nominal portion of production, usually less than 3 percent. Shellac varnishes have probably reached their minimal level of output after having been entirely replaced by vinyls for use in phonograph records.

U.S. exports

U.S. exports of varnishes increased from 1.6 million gallons, valued at $6.5 million, in 1962 to 2.5 million gallons, valued at $11.9 million, in 1966. Canada was the major market for U.S. exports of varnishes during this period and in 1966 took about 605,000 gallons, valued at

$3.3 million, or about 25 percent of the total exports. Sizable quantities of U.S. exports of varnishes also went to Japan, West Germany, and the United Kingdom in that year; the remainder were distributed among more than 50 countries. U.S. exports consist, in large part, of specialty industrial finishes which go to the more highly developed countries. Import permits (exchange controls) have frequently curtailed trade with some of the less developed countries, such as India, Mexico, Pakistan, and New Zealand.

U.S. imports

U.S. imports of varnishes were sporadic during 1962-66 but they registered an overall increase of about 60 percent in that period, from 72,000 gallons, valued at $135,000, in 1962 to 114,000 gallons, valued at $211,000, in 1966 (table 2). U.S. imports from all sources, however, supply only a nominal portion of total domestic consumption of varnishes; in 1962-66, they supplied less than 0.1 percent of consumption. Most imports of varnishes during that period, and more than 90 percent of the total in 1966, consisted of specialty finishes which are not manufactured in the United States. Canada, previously mentioned as being the leading export market for U.S. varnishes, has been the chief supplier of U.S. imports of these materials in the most recent years. In 1966 Canada supplied 53,000 gallons, valued at $109,000, or more than 50 percent of the total imports.

Foreign production and trade

The most highly industrialized countries are the major producers of varnishes. West Germany is the world's second largest producer, ranking after the United States and before the United Kingdom. Other major foreign producers include the remaining European Economic Community countries and Japan. In recent years the percentage increase in international trade in varnishes has exceeded the percentage increase in output in the major producing countries; the importance of trade, however, as a proportion of total production, is nominal. The United Kingdom is believed to be the foremost foreign exporter of varnishes; other major exporting countries include Germany, the Netherlands, and France.

Table 1.--Varnishes: U.S. production, imports for consumption, exports of domestic merchandise, and apparent consumption, 1962-66

Year	Production 1/	Imports 2/	Exports	Apparent consumption
	Quantity (1,000 gallons)			
1962	107,200	72	1,610	105,662
1963	112,900	73	1,553	111,420
1964	120,700	92	1,805	118,987
1965	129,200	55	2,055	127,200
1966	139,400	114	2,460	137,054
	Value (1,000 dollars)			
1962	253,500	135	6,454	247,179
1963	261,400	141	6,380	255,161
1964	277,000	162	7,534	269,627
1965	300,100	119	10,056	290,163
1966	327,100	211	11,872	315,439

1/ Estimated.

2/ Quantity figures include estimates for cellulose-derived varnishes.

Source: Compiled from official statistics of the U.S. Department of Commerce, except as noted.

Note.--Ratio of imports to consumption is insignificant.

Table 2.--Varnishes: U.S. imports for consumption, by principal sources, 1962-66

Source	1962	1963	1964	1965	1966
	Quantity (1,000 gallons)				
Canada	30	32	34	30	53
United Kingdom	19	3	6	20	23
West Germany	15	34	48	1	27
All other	8	4	4	4	11
Total	72	73	92	55	114
	Value (1,000 dollars)				
Canada	54	58	66	70	109
United Kingdom	41	19	18	28	46
West Germany	22	50	66	8	30
All other	19	14	12	13	26
Total	135	141	162	119	211

Source: Compiled from official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Stains (nonbenzenoid)	474.50

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

In recent years, domestic consumption of stains, which now exceeds 7 million gallons a year, has increased substantially; nonbenzenoid stains, however, constitute only a small portion of consumption. U.S. imports of nonbenzenoid stains, which were variable during 1962-66, supplied only a nominal portion of total consumption in that period; exports were virtually nil.

Comment

Stains are liquids containing transparent or semi-transparent pigments, dyes, or chemicals, chiefly used to deepen or otherwise alter the color of wood, but which will not obscure its grain, texture or markings. The stains covered by item 474.50 consist entirely of nonbenzenoid ingredients whereas stains containing benzenoid materials are covered, under subpart C of schedule 4, particularly by item 406.50. Although for tariff purposes these two types are considered separately, such distinction is not ordinarily made in commerce. For practical reasons, both types of stains are discussed to some extent in this summary.

Stains consist essentially of a benzenoid dye solution or an inorganic pigment dispersion; most of them are of the former type, however, owing chiefly to the greater brilliance in color obtained from benzenoid dyes. Inorganic pigments are chiefly used in less expensive stains or in certain specialty stains where enhanced lightfastness or permanence is essential. Stains are commonly classified according to the composition of the solvent vehicle as non-grain-raising (NGR), oil, spirit, or water stains. NGR stains generally contain glycols or alkyl ethers as a solvent; they exhibit a minimal tendency to raise the grain of wood and are used extensively for high-quality wood staining. Oil stains, which contain vegetable oil, such as linseed oil, item 176.26, or tung oil, item 176.60, are principally used for coating inexpensive wood products and for refinishing purposes; oil stains are also used in concrete, typewriter ribbon, and carbon papers. Spirit stains, which are alcohol solutions of benzenoid dyes, have a low degree of permanence, and are thus restricted to specialty

applications, such as branding or stenciling. Water stains are aqueous solutions of benzenoid dyes; their extensive application--to shipping crates, backs of furniture, and similar surfaces--is chiefly attributable to their lower price. The use of water stains, however, is limited by their tendency to raise the grain of wood and their relatively slow dry.

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1968) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
474.50	Stains (nonbenzenoid)----------	8.5% ad val.	4% ad val.

The rate effective January 1, 1972, represents the final stage of a concession granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT). The first of five annual stages of the reduction became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1968, an excerpt from which is reproduced as appendix A to this volume. The rate shown above as existing prior to January 1, 1968, is the rate applicable on August 31, 1963, the effective date of the TSUS.

Domestic manufacturers of stains are located in several regions of the United States but are concentrated particularly in the East, South, and Midwest, near to the woodworking and furniture industries. The producers number about 100 firms; six of them, however, account for almost 65 percent of the total U.S. output. Statistics on domestic shipments of stains (production data are unavailable) are published only every 5 years in the Census of Manufactures. Moreover, official statistics do not differentiate between benzenoid and nonbenzenoid stains but characterize stains by type of consumer as industrial or trade sales stains (that is, stains sold at retail to consumers). Most of the domestic production consists, however, of benzenoid stains. Overall domestic shipments of stains increased from 7.3 million gallons, valued at $17.0 million, in 1958 to 11.0 million gallons, valued at $25.9 million, in 1963, or by about 55 percent. During 1958-63, sales of industrial stains grew more rapidly than those of trade sales stains and accounted for about 35 percent of the total market for stains in 1963. It is believed that domestic shipments of stains have continued to rise in recent years, with industrial stains comprising an increased portion of production.

Prior to the effective date of the TSUS, stains were not specially provided for in official import statistics. U.S. imports of nonbenzenoid stains have been small since then, as shown in the following tabulation: 1/

Year	Quantity (gallons)	Value
1964----------	110	$1,499
1965----------	32	530
1966----------	232	2,398

During 1964-66, U.S. imports of stains ranged from 32 gallons, valued at $530, in 1965, to 232 gallons, valued at $2,398 in 1966. Most of the imports of stains in recent years have been supplied by Canada; in 1966 that country supplied more than 50 percent of the total.

Nonbenzenoid stains are not specifically enumerated in official export statistics; exports, however, were probably nominal.

1/ Gallonage estimated by the U.S. Tariff Commission; value as reported in official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Caulking and glazing products:	
Chalk whiting putty	474.60
Other	474.62

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

The United States is the world's foremost producer of caulking and glazing products, with an annual output of about 250 million pounds and exports of several million pounds. While imports have increased in recent years, they constitute only a minor portion of domestic consumption.

Comment

The caulking and glazing products covered by the item numbers shown above consist of nonbenzenoid components; those which contain benzenoid constituents are dutiable elsewhere, particularly in part 1 of schedule 4.

Caulking and glazing products are sealants used to fill voids or joints. They consist of the traditional caulking compounds and glazing products, as well as the newly developed polymeric materials. The traditional caulking compounds and glazing products are now employed principally for residential and light service industrial applications whereas the polymeric materials are used mostly in applications where joint activity is considerable.

Caulking compounds and glazing products are essentially dispersions of fillers in a raw or heat-bodied vegetable oil, such as linseed or soybean oil. The filler imparts body to the oil and contributes to the flow and handling properties of the composition, while the oil serves to bind the composition in the void or joint. Caulking compounds must retain their elasticity in the seal. Glazing products, whose primary purpose is to hold glass in a sash or frame, ordinarily do not have this requirement. Putty is a glazing product which consists of whiting, either chalk whiting or limestone whiting, dispersed in oil. Chalk whiting putty is made exclusively from imported chalk, items 472.20 and 472.22. Most of the putty used domestically, however, is made from limestone whiting, that is, ordinary whiting made by grinding limestone from domestic deposits.

Polymeric materials are high-solids elastomers, which consist chiefly of three families of polymers: The polysulfides, the polyurethanes, and the silicones. They are specially designed for modern applications, such as sealing of metal panels and curtain-wall construction. Although polymeric materials now supply only about 10 percent of the total market, the demand for them could double within the next 5 years, while the traditional caulking and glazing products should experience a more moderate growth.

The column 1 rates of duty applicable to imports (see general headnote 3 of the TSUSA-1968) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
	Caulking and glazing products:		
474.60	Chalk whiting putty-----	0.25¢ per lb.	0.1¢ per lb. 1/
474.62	Other	10% ad val.	5% ad val.

1/ This rate, as well as those for 1970 and 1971, is contingent; see footnote 1 to Staged Rates and Historical Notes to pt. 2 of schedule 4 of the TSUSA-1968, as shown in appendix A to this volume.

The ad valorem equivalent of the specific rate for chalk whiting putty, based on 1966 imports, was about 0.4 percent.

The rates effective January 1, 1972, represent the final stage of concessions granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT). The first of five annual stages of the reductions became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1968, an excerpt from which is reproduced as appendix A to this volume. The rates shown above as existing prior to January 1, 1968, is the rate applicable on August 31, 1963, the effective date of the TSUS.

Caulking and glazing products are produced domestically by an estimated 70 firms. Some of these firms are large, diversified companies for which the sales of these materials constitute a minor portion of total sales; most of the firms, however, are small companies whose sales of these products are the major source of income. The 70 firms operate about 140 plants, which are chiefly located in the highly industrialized States of California, Illinois, New Jersey, New York, and Ohio.

Annual U.S. production of caulking and glazing products is about 250 million pounds, valued at about $50 million. In recent years, the polymeric materials have made inroads on sales formerly held by the traditional caulking and glazing products. This trend will probably continue as modern construction imposes more stringent demands on functional performance.

U.S. imports of caulking and glazing products increased significantly, from 372 pounds, valued at $136, in 1962 to 58,382 pounds, valued at $41,883, in 1966 (see accompanying table). Virtually all imports during 1962-66 consisted of caulking and glazing products other than chalk whiting putty. In recent years, Canada has been the principal supplier of these materials; in 1966, that country supplied about 60 percent, Denmark accounted for an additional 30 percent, and four other countries supplied the remainder.

Exports of caulking and glazing products are not separately shown in official statistics, but such exports have probably amounted to several million pounds annually.

Caulking and glazing products: U.S. imports for consumption, by principal sources, 1962-66

Source	1962	1963	1964	1965	1966
	Quantity (pounds)				
Canada	372	58,566	4,040	350,407	35,942
Denmark	-	-	9,634	6,517	16,624
All other	-	8,960	8,321	55,485	5,816
Total	372	67,526	21,995	412,409	58,382
	Value				
Canada	$136	$2,574	$1,440	$207,957	$26,920
Denmark	-	-	7,341	6,590	8,527
All other	-	553	1,300	17,326	6,436
Total	136	3,127	10,081	231,873	41,883

Source: Compiled from official statistics of the U.S. Department of Commerce.

A P P E N D I X A

Tariff Schedules of the United States Annotated (1968): General headnotes and rules of interpretation, and excerpts relating to the items included in this volume.

NOTE: The shaded areas in this appendix cover headnotes and TSUS items not included in the summaries in this volume.

GENERAL HEADNOTES AND RULES OF INTERPRETATION

1. Tariff Treatment of Imported Articles. All articles imported into the customs territory of the United States from outside thereof are subject to duty or exempt therefrom as prescribed in general headnote 3.

2. Customs Territory of the United States. The term "customs territory of the United States", as used in the schedules, includes only the States, the District of Columbia, and Puerto Rico.

3. Rates of Duty. The rates of duty in the "Rates of Duty" columns numbered 1 and 2 of the schedules apply to articles imported into the customs territory of the United States as hereinafter provided in this headnote:

(a) Products of Insular Possessions.

(i) Except as provided in headnote 6 of schedule 7, part 2, subpart E, [and] except as provided in headnote 4 of schedule 7, part 7, subpart A, articles imported from insular possessions of the United States which are outside the customs territory of the United States are subject to the rates of duty set forth in column numbered 1 of the schedules, except that all such articles the growth or product of any such possession, or manufactured or produced in any such possession from materials the growth, product, or manufacture of any such possession or of the customs territory of the United States, or of both, which do not contain foreign materials to the value of more than 50 percent of their total value, coming to the customs territory of the United States directly from any such possession, and all articles previously imported into the customs territory of the United States with payment of all applicable duties and taxes imposed upon or by reason of importation which were shipped from the United States, without remission, refund, or drawback of such duties or taxes, directly to the possession from which they are being returned by direct shipment, are exempt from duty.

(ii) In determining whether an article produced or manufactured in any such insular possession contains foreign materials to the value of more than 50 percent, no material shall be considered foreign which, at the time such article is entered, may be imported into the customs territory from a foreign country, other than Cuba or the Philippine Republic, and entered free of duty.

(b) Products of Cuba. Products of Cuba imported into the customs territory of the United States, whether imported directly or indirectly, are subject to the rates of duty set forth in column numbered 1 of the schedules. Preferential rates of duty for such products apply only as shown in the said column 1. 1/

(c) Products of the Philippine Republic.

(i) Products of the Philippine Republic imported into the customs territory of the United States, whether imported directly or indirectly, are subject to the rates of duty which are set forth in column numbered 1 of the schedules or to fractional parts of the rates in the said column 1, as hereinafter prescribed in subdivisions (c)(ii) and (c)(iii) of this headnote.

(ii) Except as otherwise prescribed in the schedules, a Philippine article, as defined in subdivision (c)(iv) of this headnote, imported into the customs territory of the United States and entered on or before July 3, 1974, is subject to that rate which results from the application of the following percentages to the most favorable rate of duty (i.e., including a preferential rate prescribed for any product of Cuba) set forth in column numbered 1 of the schedules:

(A) 20 percent, during calendar years 1963 through 1964,

(B) 40 percent, during calendar years 1965 through 1967,

(C) 60 percent, during calendar years 1968 through 1970,

(D) 80 percent, during calendar years 1971 through 1973,

(E) 100 percent, during the period from January 1, 1974, through July 3, 1974.

(iii) Except as otherwise prescribed in the schedules, products of the Philippine Republic, other than Philippine articles, are subject to the rates of duty (except any preferential rates prescribed for products of Cuba) set forth in column numbered 1 of the schedules.

(iv) The term "Philippine article", as used in the schedules, means an article which is the product of the Philippines, but does not include any article produced with the use of materials imported into the Philippines which are products of any foreign country (except materials produced within the customs territory of the United States) if the aggregate value of such imported materials when landed at the Philippine port of entry, exclusive of any landing cost and Philippine duty, was more than 20 percent of the appraised customs value of the article imported into the customs territory of the United States.

(d) Products of Canada.

(i) Products of Canada imported into the customs territory of the United States, whether imported directly or indirectly, are subject to the rates of duty set forth in column numbered 1 of the schedules. The rates of duty for a Canadian article, as defined in subdivision (d)(ii) of this headnote, apply only as shown in the said column numbered 1.

(ii) The term "Canadian article", as used in the schedules, means an article which is the product of Canada, but does not include any article produced with the use of materials imported into Canada which are products of any foreign country (except materials produced within the customs territory of the United States), if the aggregate value of such imported materials when landed at the Canadian port of entry (that is, the actual purchase price, or if not purchased, the export value, of such materials, plus, if not included therein, the cost of transporting such materials to Canada but exclusive of any landing cost and Canadian duty) was --

(A) with regard to any motor vehicle or automobile truck tractor entered on or before December 31, 1967, more than 60 percent of the appraised value of the article imported into the customs territory of the United States; and

(B) with regard to any other article (including any motor vehicle or automobile truck tractor entered after December 31, 1967), more than 50 percent of the appraised value of the article imported into the customs territory of the United States.

1/ By virtue of section 401 of the Tariff Classification Act of 1962, the application to products of Cuba of either a preferential or other reduced rate of duty in column 1 is suspended. See general headnote 3(e), infra. The provisions for preferential Cuban rates continue to be reflected in the schedules because, under section 401, the rates therefor in column 1 still form the bases for determining the rates of duty applicable to certain products, including "Philippine articles".

(e) Products of Communist Countries. Notwithstanding any of the foregoing provisions of this headnote, the rates of duty shown in column numbered 2 shall apply to products, whether imported directly or indirectly, of the following countries and areas pursuant to section 401 of the Tariff Classification Act of 1962, to section 231 or 257(e)(2) of the Trade Expansion Act of 1962, or to action taken by the President thereunder:

Albania
Bulgaria
China (any part of which may be under Communist domination or control)
Cuba 1/
Czechoslovakia
Estonia
Germany (the Soviet zone and the Soviet sector of Berlin)
Hungary
Indochina (any part of Cambodia, Laos, or Vietnam which may be under Communist domination or control)
Korea (any part of which may be under Communist domination or control)
Kurile Islands
Latvia
Lithuania
Outer Mongolia
Rumania
Southern Sakhalin
Tanna Tuva
Tibet
Union of Soviet Socialist Republics and the area in East Prussia under the provisional administration of the Union of Soviet Socialist Republics.

(f) Products of All Other Countries. Products of all countries not previously mentioned in this headnote imported into the customs territory of the United States are subject to the rates of duty set forth in column numbered 1 of the schedules.

(g) Effective Date; Exceptions - Staged Rates of Duty. Except as specified below or as may be specified elsewhere, pursuant to section 501(a) of the Tariff Classification Act of 1962 (P.L. 87-456, approved May 24, 1962), the rates of duty in columns numbered 1 and 2 become effective with respect to articles entered on or after the 10th day following the date of the President's proclamation provided for in section 102 of the said Act. If, in column numbered 1, any rate of duty or part thereof is set forth in parenthesis, the effective date shall be governed as follows:

(i) If the rate in column numbered 1 has only one part (i.e., 8¢ (10¢) per lb.), the parenthetical rate (viz., 10¢ per lb.) shall be effective as to articles entered before July 1, 1964, and the other rate (viz., 8¢ per lb.) shall be effective as to articles entered on or after July 1, 1964.

(ii) If the rate in column numbered 1 has two or more parts (i.e., 5¢ per lb. + 50% ad val.) and has a parenthetical rate for either or both parts, each part of the rate shall be governed as if it were a one-part rate. For example, if a rate is expressed as "4¢ (4.5¢) per lb. + 8% (9%) ad val.", the rate applicable to articles entered before July 1, 1964, would be "4.5¢ per lb. + 9% ad val."; the rate applicable to articles entered on or after July 1, 1964, would be "4¢ per lb. + 8% ad val.".

(iii) If the rate in column numbered 1 is marked with an asterisk (*), the foregoing provisions of (i) and (ii) shall apply except that "January 1, 1964" shall be substituted for "July 1, 1964", wherever this latter date appears.

1/ In Proclamation 3447, dated February 3, 1962, the President, acting under authority of section 620(a) of the Foreign Assistance Act of 1961 (75 Stat. 445), as amended, prohibited the importation into the United States of all goods of Cuban origin and all goods imported from or through Cuba, subject to such exceptions as the Secretary of the Treasury determines to be consistent with the effective operation of the embargo.

4. Modification or Amendment of Rates of Duty. Except as otherwise provided in the Appendix to the Tariff Schedules --

(a) a statutory rate of duty supersedes and terminates the existing rates of duty in both column numbered 1 and column numbered 2 unless otherwise specified in the amending statute;

(b) a rate of duty proclaimed pursuant to a concession granted in a trade agreement shall be reflected in column numbered 1 and, if higher than the then existing rate in column numbered 2, also in the latter column, and shall supersede but not terminate the then existing rate (or rates) in such column (or columns);

(c) a rate of duty proclaimed pursuant to section 336 of the Tariff Act of 1930 shall be reflected in both column numbered 1 and column numbered 2 and shall supersede but not terminate the then existing rates in such columns; and

(d) whenever a proclaimed rate is terminated or suspended, the rate shall revert, unless otherwise provided, to the next intervening proclaimed rate previously superseded but not terminated or, if none, to the statutory rate.

5. Intangibles. For the purposes of headnote 1 --

(a) corpses, together with their coffins and accompanying flowers,
(b) currency (metal or paper) in current circulation in any country and imported for monetary purposes,
(c) electricity,
(d) securities and similar evidences of value, and
(e) vessels which are not "yachts or pleasure boats" within the purview of subpart D, part 6, of schedule 6,

are not articles subject to the provisions of these schedules.

6. Containers or Holders for Imported Merchandise. For the purposes of the tariff schedules, containers or holders are subject to tariff treatment as follows:

(a) Imported Empty: Containers or holders if imported empty are subject to tariff treatment as imported articles and as such are subject to duty unless they are within the purview of a provision which specifically exempts them from duty.

(b) Not Imported Empty: Containers or holders if imported containing or holding articles are subject to tariff treatment as follows:

(i) The usual or ordinary types of shipping or transportation containers or holders, if not designed for, or capable of, reuse, and containers of usual types ordinarily sold at retail with their contents, are not subject to treatment as imported articles. Their cost, however, is, under section 402 or section 402a of the tariff act, a part of the value of their contents and if their contents are subject to an ad valorem rate of duty such containers or holders are, in effect, dutiable at the same rate as their contents, except that their cost is deductible from dutiable value upon submission of satisfactory proof that they are products of the United States which are being returned without having been advanced in value or improved in condition by any means while abroad.

(ii) The usual or ordinary types of shipping or transportation containers or holders, if designed for, or capable of, reuse, are subject to treatment as imported articles separate and distinct from their contents. Such holders or containers are not part of the dutiable value of their contents and are separately subject to duty upon each and every importation into the customs territory of the United States unless within the scope of a provision specifically exempting them from duty.

(iii) In the absence of context which requires otherwise, all other containers or holders are subject to the same treatment as specified in (ii) above for usual or ordinary types of shipping or transportation containers or holders designed for, or capable of, reuse.

7. Commingling of Articles. (a) Whenever articles subject to different rates of duty are so packed together or mingled that the quantity or value of each class of articles cannot be readily ascertained by customs officers (without physical segregation of the shipment or the contents of any entire package thereof), by one or more of the following means:

(I) sampling,

(II) verification of packing lists or other documents filed at the time of entry, or

(III) evidence showing performance of commercial settlement tests generally accepted in the trade and filed in such time and manner as may be prescribed by regulations of the Secretary of the Treasury,

the commingled articles shall be subject to the highest rate of duty applicable to any part thereof unless the consignee or his agent segregates the articles pursuant to subdivision (b) hereof.

(b) Every segregation of articles made pursuant to this headnote shall be accomplished by the consignee or his agent at the risk and expense of the consignee within 30 days (unless the Secretary authorizes in writing a longer time) after the date of personal delivery or mailing, by such employee as the Secretary of the Treasury shall designate, of written notice to the consignee that the articles are commingled and that the quantity or value of each class of articles cannot be readily ascertained by customs officers. Every such segregation shall be accomplished under customs supervision, and the compensation and expenses of the supervising customs officers shall be reimbursed to the Government by the consignee under such regulations as the Secretary of the Treasury may prescribe.

(c) The foregoing provisions of this headnote do not apply with respect to any part of a shipment if the consignee or his agent furnishes, in such time and manner as may be prescribed by regulations of the Secretary of the Treasury, satisfactory proof --

(I) that such part (A) is commercially negligible, (B) is not capable of segregation without excessive cost, and (C) will not be segregated prior to its use in a manufacturing process or otherwise, and

(II) that the commingling was not intended to avoid the payment of lawful duties.

Any article with respect to which such proof is furnished shall be considered for all customs purposes as a part of the article, subject to the next lower rate of duty, with which it is commingled.

(d) The foregoing provisions of this headnote do not apply with respect to any shipment if the consignee or his agent shall furnish, in such time and manner as may be prescribed by regulations of the Secretary of the Treasury, satisfactory proof --

(I) that the value of the commingled articles is less than the aggregate value would be if the shipment were segregated;

(II) that the shipment is not capable of segregation without excessive cost and will not be segregated prior to its use in a manufacturing process or otherwise; and

(III) that the commingling was not intended to avoid the payment of lawful duties.

Any merchandise with respect to which such proof is furnished shall be considered for all customs purposes to be dutiable at the rate applicable to the material present in greater quantity than any other material.

(e) The provisions of this headnote shall apply only in cases where the schedules do not expressly provide a particular tariff treatment for commingled articles.

8. Abbreviations. In the schedules the following symbols and abbreviations are used with the meanings respectively indicated below:

$	-	dollars
¢	-	cents
%	-	percent
+	-	plus
ad val.	-	ad valorem
bu.	-	bushel
cu.	-	cubic
doz.	-	dozen
ft.	-	feet
gal.	-	gallon
in.	-	inches
lb.	-	pounds
oz.	-	ounces
sq.	-	square
wt.	-	weight
yd.	-	yard
pcs.	-	pieces
prs.	-	pairs
lin.	-	linear
I.R.C.	-	Internal Revenue Code

9. Definitions. For the purposes of the schedules, unless the context otherwise requires --

(a) the term "entered" means entered, or withdrawn from warehouse, for consumption in the customs territory of the United States;

(b) the term "entered for consumption" does not include withdrawals from warehouse for consumption;

(c) the term "withdrawn for consumption" means withdrawn from warehouse for consumption and does not include articles entered for consumption;

(d) the term "rate of duty" includes a free rate of duty; rates of duty proclaimed by the President shall be referred to as "proclaimed" rates of duty; rates of duty enacted by the Congress shall be referred to as "statutory" rates of duty; and the rates of duty in column numbered 2 at the time the schedules become effective shall be referred to as "original statutory" rates of duty;

(e) the term "ton" means 2,240 pounds, and the term "short ton" means 2,000 pounds;

(f) the terms "of", "wholly of", "almost wholly of", "in part of" and "containing", when used between the description of an article and a material (e.g., "furniture of wood", "woven fabrics, wholly of cotton", etc.), have the following meanings:

(I) "of" means that the article is wholly or in chief value of the named material;

(II) "wholly of" means that the article is, except for negligible or insignificant quantities of some other material or materials, composed completely of the named material;

(III) "almost wholly of" means that the essential character of the article is imparted by the named material, notwithstanding the fact that significant quantities of some other material or materials may be present; and

(IV) "in part of" or "containing" mean that the article contains a significant quantity of the named material.

With regard to the application of the quantitative concepts specified in subparagraphs (II) and (IV) above, it is intended that the de minimis rule apply.

10. General Interpretative Rules. For the purposes of these schedules --

(a) the general, schedule, part, and subpart headnotes, and the provisions describing the classes of imported articles and specifying the rates of duty or other import restrictions to be imposed thereon are subject to the rules of interpretation set forth herein and to such other rules of statutory interpretation, not inconsistent therewith, as have been or may be developed under administrative or judicial rulings;

(b) the titles of the various schedules, parts, and subparts and the footnotes therein are intended for convenience in reference only and have no legal or interpretative significance;

(c) an imported article which is described in two or more provisions of the schedules is classifiable in the provision which most specifically describes it; but, in applying this rule of interpretation, the following considerations shall govern:

(i) a superior heading cannot be enlarged by inferior headings indented under it but can be limited thereby;

(ii) comparisons are to be made only between provisions of coordinate or equal status, i.e., between the primary or main superior headings of the schedules or between coordinate inferior headings which are subordinate to the same superior heading;

(d) if two or more tariff descriptions are equally applicable to an article, such article shall be subject to duty under the description for which the original statutory rate is highest, and, should the highest original statutory rate be applicable to two or more of such descriptions, the article shall be subject to duty under that one of such descriptions which first appears in the schedules;

(e) in the absence of special language or context which otherwise requires --

(i) a tariff classification controlled by use (other than actual use) is to be determined in accordance with the use in the United States at, or immediately prior to, the date of importation, of articles of that class or kind to which the imported articles belong, and the controlling use is the chief use, i.e., the use which exceeds all other uses (if any) combined;

(ii) a tariff classification controlled by the actual use to which an imported article is put in the United States is satisfied only if such use is intended at the time of importation, the article is so used, and proof thereof is furnished within 3 years after the date the article is entered;

(f) an article is in chief value of a material if such material exceeds in value each other single component material of the article;

(g) a headnote provision which enumerates articles not included in a schedule, part, or subpart is not necessarily exhaustive, and the absence of a particular article from such headnote provision shall not be given weight in determining the relative specificity of competing provisions which describe such article;

(h) unless the context requires otherwise, a tariff description for an article covers such article, whether assembled or not assembled, and whether finished or not finished;

(ij) a provision for "parts" of an article covers a product solely or chiefly used as a part of such article, but does not prevail over a specific provision for such part.

11. Issuance of Rules and Regulations. The Secretary of the Treasury is hereby authorized to issue rules and regulations governing the admission of articles under the provisions of the schedules. The allowance of an importer's claim for classification, under any of the provisions of the schedules which provide for total or partial relief from duty or other import restrictions on the basis of facts which are not determinable from an examination of the article itself in its condition as imported, is dependent upon his complying with any rules or regulations which may be issued pursuant to this headnote.

12. The Secretary of the Treasury is authorized to prescribe methods of analyzing, testing, sampling, weighing, gauging, measuring, or other methods of ascertainment whenever he finds that such methods are necessary to determine the physical, chemical, or other properties or characteristics of articles for purposes of any law administered by the Customs Service.

General statistical headnotes:

1. Statistical Requirements for Imported Articles. Persons making customs entry or withdrawal of articles imported into the customs territory of the United States shall complete the entry or withdrawal forms, as provided herein and in regulations issued pursuant to law, to provide for statistical purposes information as follows:

(a) the number of the Customs district and of the port where the articles are being entered for consumption or warehouse, as shown in Statistical Annex A of these schedules;

(b) the name of the carrier or the means of transportation by which the articles were transported to the first port of unloading in the United States;

(c) the foreign port of lading;

(d) the United States port of unlading;

(e) the date of importation;

(f) the country of origin of the articles expressed in terms of the designation therefor in Statistical Annex B of these schedules;

(g) a description of the articles in sufficient detail to permit the classification thereof under the proper statistical reporting number in these schedules;

(h) the statistical reporting number under which the articles are classifiable;

(ij) gross weight in pounds for the articles covered by each reporting number when imported in vessels or aircraft;

(k) the net quantity in the units specified herein for the classification involved;

(l) the U.S. dollar value in accordance with the definition in Section 402 or 402a of the Tariff Act of 1930, as amended, for all merchandise including that free of duty or dutiable at specific rates; and

(m) such other information with respect to the imported articles as is provided for elsewhere in these schedules.

2. Statistical Annotations. (a) The statistical annotations to the Tariff Schedules of the United States consist of --

(i) the 2-digit statistical suffixes,
(ii) the indicated units of quantity,
(iii) the statistical headnotes and annexes, and
(iv) the italicized article descriptions.

(b) The legal text of the Tariff Schedules of the United States consists of the remaining text as more specifically identified in headnote 10(a) of the general headnotes and rules of interpretation.

(c) The statistical annotations are subordinate to the provisions of the legal text and cannot change their scope.

3. Statistical Reporting Number. (a) General Rule: Except as provided in paragraph (b) of this headnote, and in the absence of specific instructions to the contrary elsewhere, the statistical reporting number for an article consists of the 7-digit number formed by combining the 5-digit item number with the appropriate 2-digit statistical suffix. Thus, the statistical reporting number for live monkeys dutiable under item 100.95 is "100.9520".

(b) Wherever in the tariff schedules an article is classifiable under a provision which derives its rate of duty from a different provision, the statistical reporting number is, in the absence of specific instructions to the contrary elsewhere, the 7-digit number for the basic provision followed by the item number of the provision from which the rate is derived. Thus, the statistical reporting number of mixed apple and grape juices, not containing over 1.0 percent of ethyl alcohol by volume, is "165.6500-165.40".

4. Abbreviations. (a) The following symbols and abbreviations are used with the meanings respectively indicated below:

s. ton	-	short ton
C.	-	one hundred
Cwt.	-	100 lbs.
mg.	-	milligram
M.	-	1,000
bd. ft.	-	board feet
M. bd. ft.	-	1,000 board feet
mc.	-	millicurie
cord	-	128 cubic feet
square	-	amount to cover 100 square feet of surface
sup. ft.	-	superficial foot
oz.	-	ounces avoirdupois
fl. oz.	-	fluid ounce
oz. troy	-	troy ounce
pf. gal.	-	proof gallon

(b) An "X" appearing in the column for units of quantity means that no quantity (other than gross weight) is to be reported.

(c) Whenever two separate units of quantity are shown for the same article, the "v" following one of such units means that the value of the article is to be reported with that quantity.

APPENDIX A

TARIFF SCHEDULES OF THE UNITED STATES ANNOTATED (1968)

HISTORICAL NOTES

Notes p. 1
General
Headnotes

Amendments and Modifications

PROVISIONS	
Gen Hdnte 3(a)(i)	Language "Except as provided in headnote 6 of schedule 7, part 2, subpart E," added; language "except that all articles" deleted and language "except that all such articles" inserted in lieu thereof. Pub. L. 89-805, Secs. 1(a), (c), Nov. 10, 1966, 80 Stat. 1521, 1522, effective date Jan. 1, 1967.
	Language "Except as provided in headnote 4 of schedule 7, part 7, subpart A," added. Pub. L. 89-806, Secs. 2(b), (c), Nov. 10, 1966, 80 Stat. 1523, effective date March 11, 1967.
Gen Hdnte 3(d), (e), (f) and (g)	Headnotes 3(d), (e), and (f) redesignated as headnotes 3(e), (f), and (g), respectively, and new headnote 3(d) added. Pub. L. 89 283, Secs. 401(a), 403, Oct. 21, 1965, 79 Stat. 1021, 1022; entered into force Oct. 22, 1965, by Pres. Proc. 3682, Oct. 21, 1965, 3 CFR, 1965 Supp., p. 68.
Gen Hdnte 6(b)(i)	Language "and containers of usual types ordinarily sold at retail with their contents," added. Pub. L. 89-241, Secs. 2(a), 4, Oct. 7, 1965, 79 Stat. 933, 934, effective date Dec. 7, 1965.

SCHEDULE 4.- CHEMICALS AND RELATED PRODUCTS

SCHEDULE 4. - CHEMICALS AND RELATED PRODUCTS

Schedule 4 headnotes:

1. This schedule does not include --
   (i) any of the mineral products provided for in schedule 5;
   (ii) metal-bearing ores and other metal-bearing materials, provided for in part 1 of schedule 6; or
   (iii) metals provided for in part 2 of schedule 6.

2. (a) The term "compounds", as used in this schedule, means substances occurring naturally or produced artificially by the reaction of two or more ingredients, each compound --
   (i) consisting of two or more elements,
   (ii) having its own characteristic properties different from those of its elements and from those of other compounds, and
   (iii) always consisting of the same elements united in the same proportions by weight with the same internal arrangement.

The presence of impurities which occur naturally or as an incident to production does not in itself affect the classification of a product as a compound.

(b) The term "compounds", as used in this schedule, includes a solution of a single compound in water, and, in determining the amount of duty on any such compound subject to duty in this schedule at a specific rate, an allowance in weight or volume, as the case may be, shall be made for the water in excess of any water of crystallization which may have been in the compound.

3. (a) The term "mixtures", as used in this schedule, means substances consisting of two or more ingredients (i.e., elements or compounds), whether occurring as such in nature, or whether artificially produced (i.e., brought about by mechanical, physical, or chemical means), which do not bear a fixed ratio to one another and which, however thoroughly commingled, retain their individual chemical properties and are not chemically united. The fact that the ingredients of a product are incapable of separation or have been commingled in definite proportions does not in itself effect the classification of such product as a mixture.

(b) The term "mixtures", as used in this schedule, includes solutions, except solutions defined as compounds in headnote 2(b) of this schedule.

Item	Stat. Suf-fix	Articles	Units of Quantity	Rates of Duty 1	Rates of Duty 2
		PART 9. - DYEING AND TANNING PRODUCTS; PIGMENTS AND PIGMENT-LIKE MATERIALS; INKS, PAINTS, AND RELATED PRODUCTS			
		Part 9 headnote:			
		1. Any product described in this part and also in part 1 of this schedule is classifiable under said part 1, except varnishes, inks, and artists', students', and children's pigments or paints.			
		Subpart A. - Dyeing and Tanning Products			
		Subpart A headnotes:			
		1. This subpart covers only materials, extracts, decoctions, and other preparations suitable for coloring (including dyeing and staining) or for tanning. All the products provided for are of vegetable origin except cochineal (item 470.05) which is of animal origin.			
		2. For the purposes of this subpart -- (a) the term "crude or processed" means materials which are crude or which have been processed by shredding, grinding, chipping, crushing, or any similar process, but not otherwise processed; and (b) the term "cutch" refers to products obtained from the Acacia catechu or Areca catechu trees.			
470.05	00	Annato, archil, cochineal, cudbear, and litmus	lb	Free	Free
		Brazil wood, cutch, fustic, henna, logwood, madder, Persian berry, safflower, and saffron:			
470.10	00	Crude or processed	lb	Free	Free
470.15	00	Other	lb	4.5% ad val.	15% ad val.
		Canaigre, chestnut, curupay, divi-divi, eucalyptus, hemlock, larch, and tara:			
470.20	00	Crude or processed	lb	Free	Free
		Other:			
470.23	00	Chestnut, divi-divi, and hemlock	lb	3% ad val. 1/	15% ad val. 1/
470.25	00	Other	lb	6% ad val. 1/	15% ad val. 1/
470.30	00	Gall nuts, crude or processed	lb	Free	Free
470.40	00	Gambier	lb	Free	Free
		Mangrove, myrobalan, oak, quebracho, sumac, urunday, and wattle:			
470.50		Crude or processed		Free	Free
	30	*Quebracho*	lb		
	40	*Wattle*	lb		
	70	*Other*	lb		
		Other:			
470.55	00	Myrobalan and sumac	lb	4.5% ad val. 1/	15% ad val. 1/
470.57		Other		6.5% ad val. 1/	15% ad val. 1/
	40	*Quebracho*	lb		
	60	*Wattle*	lb		
	90	*Other*	lb		
		1/ Duty temporarily suspended by legislation. See Appendix to Tariff Schedules.			

Item	Stat. Suf-fix	Articles	Units of Quantity	Rates of Duty 1	Rates of Duty 2
		Valonia:			
470.60	00	Crude or processed	Lb	Free	Free
470.65	00	Other	Lb	3% ad val. 1/	15% ad val. 1/
		Products of vegetable origin used chiefly for coloring or tanning, not specially provided for:			
470.80	00	Crude or processed	Lb	Free	Free
470.85	00	Other	Lb	4.5% ad val.	15% ad val.
		Subpart B. - Pigments and Pigment-Like Materials			
		Subpart B headnote: 1. The term "pigments", as used in this subpart, means products consisting of fine solid particles or powder, in dry form, in pulp, or ground in or mixed with oil, water, or other vehicle, commonly known as pigments and suitable for use in imparting color (including black and white) to paints, inks, rubber, plastics, linoleum, and other products.			
		Barium carbonate:			
		Natural (witherite):			
472.02	00	Crude	Lb	Free	Free
472.04	00	Ground	Lb	11% ad val.	30% ad val.
472.06	00	Precipitated	Lb	1.08¢ per lb	1.5¢ per lb.
		Barium sulfate:			
		Natural (barytes):			
472.10	00	Crude	Ton	$2.29 per ton	$4 per ton
472.12	00	Ground	Ton	$5.85 per ton	$7.50 per ton
472.14	00	Precipitated (blanc fixe)	Lb	0.55¢ per lb.	1.25¢ per lb.
		Calcium carbonate:			
		Natural:			
472.20	00	Chalk, crude	Ton	Free	Free
472.22	00	Chalk whiting	Lb	0.09¢ per lb.	0.4¢ per lb.
472.24	00	Precipitated	Lb	5.5% ad val.	25% ad val.
472.30	00	Calcium sulfate, precipitated, and satin white	Lb	0.45¢ per lb.	0.5¢ per lb.
		Iron-oxide and iron-hydroxide pigment materials, natural, if crude or washed but not ground:			
472.40	00	Ochers	Lb	0.1¢ per lb.	0.375¢ per lb.
		Siennas:			
472.42	00	Crude	Lb	0.05¢ per lb.	0.125¢ per lb.
472.44	00	Washed	Lb	0.2¢ per lb.	0.375¢ per lb.
		Umbers:			
472.46	00	Crude	Lb	0.05¢ per lb.	0.125¢ per lb.
472.48	00	Washed	Lb	0.15¢ per lb.	0.375¢ per lb.
472.50	00	Other	Lb	14.5% ad val.	20% ad val.

1/ Duty temporarily suspended by legislation. See Appendix to Tariff Schedules.

Item	Stat. Suf-fix	Articles	Units of Quantity	Rates of Duty	
				1	2
		Pigments (except pigments, in dry form, described in the foregoing provisions of this subpart):			
		Containing carbon:			
473.02	00	Bone black	Lb.	9% ad val.	20% ad val.
473.04	00	Carbon black	Lb.	4% ad val.	20% ad val.
473.06	00	Lampblack	Lb.	9% ad val.	20% ad val.
		Containing chromium:			
473.10	00	Chrome green	Lb.	9% ad val.	25% ad val.
473.12	00	Chrome yellow	Lb.	9% ad val.	25% ad val.
473.14	00	Chromium oxide green	Lb.	9% ad val.	25% ad val.
473.16	00	Hydrated chromium oxide green	Lb.	9% ad val.	25% ad val.
473.18	00	Molybdenum orange	Lb.	9% ad val.	25% ad val.
473.19	00	Strontium chromate	Lb.	9% ad val.	25% ad val.
473.20	00	Zinc yellow	Lb.	9% ad val.	25% ad val.
		Containing copper:			
473.24	00	Cuprous oxide	Lb.	1¢ per lb. + 13.5% ad val.	3¢ per lb. + 35% ad val.
		Containing iron:			
473.28	00	Ferricyanide and ferrocyanide blues	Lb.	3¢ per lb.	8¢ per lb.
		Iron oxides and iron hydroxides:			
473.30	00	Synthetic	Lb.	9% ad val.	20% ad val.
		Natural:			
473.32	00	Ochers	Lb.	0.1¢ per lb.	0.375¢ per lb.
473.36	00	Siennas	Lb.	0.2¢ per lb.	0.375¢ per lb.
473.38	00	Umbers	Lb.	0.16¢ per lb.	0.375¢ per lb.
473.40	00	Other	Lb.	14.5% ad val.	20% ad val.
		Containing lead:			
473.44	00	Blue lead (sublimed blue lead)	Lb.	18% ad val.	30% ad val.
		Leaded zinc oxides:			
		Containing not over 25 percent of lead by weight:			
473.46	00	Dry	Lb.	0.5¢ per lb.	1.75¢ per lb.
473.48	00	Other	Lb.	0.9¢ per lb.	2.25¢ per lb.
473.50	00	Containing over 25 percent of lead by weight	Lb.	18% ad val.	30% ad val.
473.52	00	Litharge	Lb.	1.25¢ per lb.	2.5¢ per lb.
473.54	00	Orange mineral	Lb.	1.8¢ per lb.	3¢ per lb
473.56	00	Red lead	Lb.	1.875¢ per lb.	2.75¢ per lb.
473.58	00	Suboxide of lead (leady litharge)	Lb.	15% ad val.	30% ad val.
		White lead:			
473.60	00	Basic carbonate	Lb.	0.9¢ per lb.	2.5¢ per lb.
473.62	00	Basic sulfate (sublimed white lead)	Lb.	18% ad val.	30% ad val.
		Containing mercury:			
473.66	00	Vermilion reds	Lb.	27¢ per lb.	35¢ per lb.
		Containing titanium:			
473.70	00	Titanium dioxide	Lb.	13% ad val.	30% ad val.
		Containing zinc:			
		Lithopone:			
473.72	00	Containing under 30% zinc sulfide by weight	Lb.	0.78¢ per lb.	1.75¢ per lb.
473.74	00	Containing 30% or more zinc sulfide by weight	Lb.	0.78¢ per lb. + 6.5% ad val.	1.75¢ per lb. + 15% ad val.
		Zinc oxide:			
473.76	00	Dry	Lb.	0.6¢ per lb.	1.75¢ per lb.
473.78	00	Other	Lb.	1¢ per lb.	2.25¢ per lb.
473.80	00	Zinc sulfide	Lb.	2.2¢ per lb.	3¢ per lb.
		Other pigments:			
473.82	00	Pearl essence	Lb.	8% ad val.	25% ad val.
473.84	00	Ultramarine blue and blues containing ultramarine	Lb.	1.9¢ per lb.	4¢ per lb.
473.86	00	Vandyke brown (Cassel earth or Cassel brown)	Lb.	15% ad val.	25% ad val.
		Not specially provided for:			
473.88	00	Not containing lead	Lb.	7.5% ad val.	25% ad val.
473.90	00	Containing lead	Lb.	18% ad val.	30% ad val.

SCHEDULE 4. - CHEMICALS AND RELATED PRODUCTS
Part 9. - Dyeing and Tanning Products; Pigments and Pigment-Like Materials; Inks, Paints, and Related Products

Item	Stat. Suf-fix	Articles	Units of Quantity	Rates of Duty 1	Rates of Duty 2
		Subpart C. - Inks, Paints, and Related Products			
		Subpart C headnotes:			
		1. The provision in this subpart for artists', students', and children's pigments and paints assembled into sets (item 474.08) covers only pigments and paints assembled in such container and form, and with such assortment of articles, as to be suitable for sale at retail to artists, students, or children as a paint set, kit, or color outfit.			
		2. The term "paints and enamel paints" in this subpart covers dispersions of pigments or pigment-like materials with a liquid (vehicle) which are suitable for application to surfaces as a thin layer, and which dry (harden) to an opaque, solid film. The vehicle of paints consists of drying oils or resins which bind the pigment particles together in the film; and the vehicle of enamel paints is principally varnish. Paints and enamel paints may also contain thinners, driers, plasticizers, or other agents.			
		3. The term "varnishes" in this subpart covers liquid surface-coating products which contain no pigments or pigment-like materials, and which dry (harden) to a transparent or translucent film. Shellac varnishes are solutions of shellac or any other form of lac in a volatile solvent such as ethyl alcohol. Oleoresinous varnishes consist of resins dissolved in or reacted with a drying oil, to which thinners, driers, and plasticizers may be added. Cellulose-derivative varnishes (lacquers) are solutions of cellulose nitrate or other cellulose derivatives in a volatile solvent.			
		4. The term "stains" in this subpart covers liquids containing transparent or semi-transparent pigments, dyes, or chemicals, chiefly used to deepen or otherwise alter the color of wood, but which will not obscure its grain, texture, or markings.			
		Artists', students', and children's pigments and paints, in cakes, jars, pans, tubes, or other forms, and such pigments and paints assembled into sets with or without brushes, outline drawings, stencils, water pans, or other articles:			
		In any form not over 1.5 pounds net weight each:			
		Not assembled into sets:			
474.02	00	Valued under 20 cents per dozen pieces	Doz.	0.67¢ per piece	0.75¢ per piece
		Valued 20 cents or more per dozen pieces:			
474.04	00	In jars or tubes	Doz.	1.2¢ per piece + 7.5% ad val.	2¢ per piece + 40% ad val.
474.06	00	In cakes, pans, or other forms	Doz.	1.1¢ per piece + 11% ad val.	1.25¢ per piece + 40% ad val.
474.08	00	Assembled into sets with or without brushes, outline drawings, stencils, water pans, or other articles	X	21.5% ad val. on the entire set	70% ad val. on the entire set

TARIFF SCHEDULES OF THE UNITED STATES ANNOTATED (1968)

SCHEDULE 4. - CHEMICALS AND RELATED PRODUCTS
Part 9. - Dyeing and Tanning Products; Pigments and Pigment-Like Materials; Inks, Paints, and Related Products

Item	Stat. Suf-fix	Articles	Units of Quantity	Rates of Duty	
				1	2
		Inks and ink powders:			
474.20	00	Ink powders	Lb.	2.5% ad val.	10% ad val.
474.22	00	Drawing ink	Lb.	4.5% ad val.	15% ad val.
474.26		Other inks		2.5% ad val.	10% ad val.
	20	*Printing and lithographic inks*	*Lb.*		
	40	*Other*	*Lb.*		
		Paints and enamel paints:			
474.30	00	Not containing titanium pigments	Lb.	7.5% ad val.	25% ad val.
474.35	00	Containing titanium pigments	Lb.	13% ad val.	30% ad val.
		Varnishes:			
474.40	00	Shellac	Gal.	7.5% ad val.	25% ad val.
474.42	00	Oleoresinous	Gal.	9% ad val.	25% ad val.
474.44	00	Cellulose derivative	Lb.	10.5¢ per lb.	30¢ per lb.
474.46	00	Other	Gal.	9% ad val.	25% ad val.
474.50	00	Stains	Lb.	7.5% ad val.	25% ad val.
		Putty and similar caulking or glazing products:			
474.60	00	Chalk whiting putty	Lb.	0.2¢ per lb.	0.75¢ per lb.
474.62	00	Other	Lb.	9% ad val.	20% ad val.

APPENDIX A

TARIFF SCHEDULES OF THE UNITED STATES ANNOTATED (1968)

STAGED RATES AND HISTORICAL NOTES

Notes p. 1
Schedule 4,
Part 9

Staged Rates

Modifications of column 1 rates of duty by Pres. Proc. 3822 (Kennedy Round), Dec. 16, 1967, 32 F.R. 19002:

TSUS item	Prior rate	Rate of duty, effective with respect to articles entered on and after January 1 --				
		1968	1969	1970	1971	1972
470.15 1/	5.5% ad val.	4.5% ad val.	4% ad val.	3.5% ad val.	3% ad val.	2.5% ad val.
470.23	4% ad val.	3% ad val.	2% ad val.	1.5% ad val.	0.5% ad val.	Free
470.55	5.5% ad val.	4.5% ad val.	4% ad val.	3.5% ad val.	3% ad val.	2.5% ad val.
470.57	7.5% ad val.	6.5% ad val.	6% ad val.	5% ad val.	4% ad val.	3.5% ad val.
470.65	3.75% ad val.	3% ad val.	2% ad val.	1% ad val.	0.5% ad val.	Free
470.85 1/	5.5% ad val.	4.5% ad val.	4% ad val.	3.5% ad val.	3% ad val.	2.5% ad val.
472.04	12.5% ad val.	11% ad val.	10% ad val.	8.5% ad val.	7% ad val.	6% ad val.
472.06	1.2¢ per lb.	1.08¢ per lb.	0.96¢ per lb.	0.84¢ per lb.	0.72¢ per lb.	0.6¢ per lb.
472.10	$2.55 per ton	$2.29 per ton	$2.04 per ton	$1.78 per ton	$1.53 per ton	$1.27 per ton
472.12	$6.50 per ton	$5.85 per ton	$5.20 per ton	$4.55 per ton	$3.90 per ton	$3.25 per ton
472.14	0.625¢ per lb.	0.55¢ per lb.	0.5¢ per lb.	0.43¢ per lb.	0.35¢ per lb.	0.3¢ per lb.
472.22	0.1¢ per lb.	0.09¢ per lb.	0.08¢ per lb.	0.07¢ per lb.	0.06¢ per lb.	0.05¢ per lb.
472.24 1/	6.5% ad val.	5.5% ad val.	5% ad val.	4.5% ad val.	3.5% ad val.	3% ad val.
472.30 1/	0.5¢ per lb.	0.45¢ per lb.	0.4¢ per lb.	0.35¢ per lb.	0.3¢ per lb.	0.25¢ per lb.
472.40	0.125¢ per lb.	0.1¢ per lb.	0.1¢ per lb.	0.08¢ per lb.	0.06¢ per lb.	0.06¢ per lb.
472.42	0.0625¢ per lb.	0.05¢ per lb.	0.03¢ per lb.	0.03¢ per lb.	0.03¢ per lb.	0.03¢ per lb.
472.44	0.25¢ per lb.	0.2¢ per lb.	0.2¢ per lb.	0.15¢ per lb.	0.15¢ per lb.	0.1¢ per lb.
472.46	0.0625¢ per lb.	0.05¢ per lb.	0.03¢ per lb.	0.02¢ per lb.	0.01¢ per lb.	Free
472.48	0.1875¢ per lb.	0.15¢ per lb.	0.15¢ per lb.	0.13¢ per lb.	0.1¢ per lb.	0.09¢ per lb.
472.50	16% ad val.	14.5% ad val.	13.5% ad val.	12% ad val.	11% ad val.	10% ad val.
473.02	10% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
473.04	5% ad val.	4% ad val.	3% ad val.	2% ad val.	1% ad val.	Free
473.06	10% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
473.10	10% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
473.12	10% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
473.14	10% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
473.16	10% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
473.18	10% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
473.19	10% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
473.20	10% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
473.24	1.275¢ per lb. + 15% ad val.	1¢ per lb. + 13.5% ad val.	1¢ per lb. + 12% ad val.	0.8¢ per lb. + 10.5% ad val.	0.7¢ per lb. + 9% ad val.	0.6¢ per lb. + 7.5% ad val.
473.28 1/	3.4¢ per lb.	3¢ per lb.	2.7¢ per lb.	2.3¢ per lb.	2¢ per lb.	1.7¢ per lb.
473.30	10% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
473.32	0.125¢ per lb.	0.1¢ per lb.	0.1¢ per lb.	0.08¢ per lb.	0.06¢ per lb.	0.06¢ per lb.
473.36	0.25¢ per lb.	0.2¢ per lb.	0.2¢ per lb.	0.15¢ per lb.	0.15¢ per lb.	0.1¢ per lb.
473.38	0.1875¢ per lb.	0.16¢ per lb.	0.15¢ per lb.	0.13¢ per lb.	0.1¢ per lb.	0.09¢ per lb.
473.40	16% ad val.	14.5% ad val.	13.5% ad val.	12% ad val.	11% ad val.	10% ad val.
473.44	20% ad val.	18% ad val.	16% ad val.	14% ad val.	12% ad val.	10% ad val.
473.46 1/	0.6¢ per lb.	0.5¢ per lb.	0.45¢ per lb.	0.4¢ per lb.	0.3¢ per lb.	0.3¢ per lb.
473.48 1/	1¢ per lb.	0.9¢ per lb.	0.8¢ per lb.	0.7¢ per lb.	0.6¢ per lb.	0.5¢ per lb.
473.50	20% ad val.	18% ad val.	16% ad val.	14% ad val.	12% ad val.	10% ad val.
473.54	2¢ per lb.	1.8¢ per lb.	1.6¢ per lb.	1.4¢ per lb.	1.2¢ per lb.	1¢ per lb.
473.60 1/	1.05¢ per lb.	0.9¢ per lb.	0.8¢ per lb.	0.7¢ per lb.	0.6¢ per lb.	0.5¢ per lb.
473.62	20% ad val.	18% ad val.	16% ad val.	14% ad val.	12% ad val.	10% ad val.
473.66 1/	30¢ per lb.	27¢ per lb.	24¢ per lb.	21¢ per lb.	18¢ per lb.	15¢ per lb.
473.70	15% ad val.	13% ad val.	12% ad val.	10% ad val.	9% ad val.	7.5% ad val.
473.72	0.875¢ per lb.	0.78¢ per lb.	0.7¢ per lb.	0.6¢ per lb.	0.52¢ per lb.	0.43¢ per lb.
473.74	0.875¢ per lb. + 7.5% ad val.	0.78¢ per lb. + 6.5% ad val.	0.7¢ per lb. + 6% ad val.	0.6¢ per lb. + 5% ad val.	0.5¢ per lb. + 4.5% ad val.	0.43¢ per lb. + 3.5% ad val.
473.80	2.5¢ per lb.	2.2¢ per lb.	2¢ per lb.	1.7¢ per lb.	1.5¢ per lb.	1.2¢ per lb.
473.82	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.	4.5% ad val.

1/ See footnote 1 at the end of this list of Staged Rates.

Notes p. 2
Schedule 4.
Part 9

Staged Rates

Modifications of column 1 rates of duty by Pres. Proc. 3822 (Kennedy Round), Dec. 16, 1967, 32 F.R. 19002 (con.):

TSUS item	Prior rate	Rate of duty, effective with respect to articles entered on and after January 1 --				
		1968	1969	1970	1971	1972
473.84	2.125¢ per lb.	1.9¢ per lb.	1.7¢ per lb.	1.4¢ per lb.	1.2¢ per lb.	1¢ per lb.
473.86	17% ad val.	15% ad val.	13.5% ad val.	11.5% ad val.	10% ad val.	8.5% ad val.
473.88	8.5% ad val.	7.5% ad val.	6.5% ad val.	5.5% ad val.	5% ad val.	4% ad val.
473.90	20% ad val.	18% ad val.	16% ad val.	14% ad val.	12% ad val.	10% ad val.
474.02	0.75¢ per piece	0.67¢ per piece	0.6¢ per piece	0.52¢ per piece	0.45¢ per piece	0.37¢ per piece
474.04	1.4¢ per piece + 8.5% ad val.	1.2¢ per piece + 7.5% ad val.	1.1¢ per piece + 6.5% ad val.	0.9¢ per piece + 5.9% ad val.	0.8¢ per piece + 5% ad val.	0.7¢ per piece + 4% ad val.
474.06	1.25¢ per piece + 12.5% ad val.	1.1¢ per piece + 11% ad val.	1¢ per piece + 10% ad val.	0.85¢ per piece + 8.5% ad val.	0.75¢ per piece + 7% ad val.	0.62¢ per piece + 6% ad val.
474.08	24% ad val. on the entire set	21.5% ad val. on the entire set	19% ad val. on the entire set	16.5% ad val. on the entire set	14% ad val. on the entire set	12% ad val. on the entire set
474.20 1/	3% ad val.	2.5% ad val.	2% ad val.	2% ad val.	1.5% ad val.	1.5% ad val.
474.22 1/	5.5% ad val.	4.5% ad val.	4% ad val.	3.5% ad val.	3% ad val.	2.5% ad val.
474.26 1/	3% ad val.	2.5% ad val.	2% ad val.	2% ad val.	1.5% ad val.	1.5% ad val.
474.30	8.5% ad val.	7.5% ad val.	6.5% ad val.	5.5% ad val.	5% ad val.	4% ad val.
474.35	15% ad val.	13% ad val.	12% ad val.	10% ad val.	9% ad val.	7.5% ad val.
474.40	8.5% ad val.	7.5% ad val.	6.5% ad val.	5.5% ad val.	5% ad val.	4% ad val.
474.42	10% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
474.44	12¢ per lb.	10.5¢ per lb.	9.5¢ per lb.	8¢ per lb.	7¢ per lb.	6¢ per lb.
474.46	10% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
474.50	8.5% ad val.	7.5% ad val.	6.5% ad val.	5.5% ad val.	5% ad val.	4% ad val.
474.60 1/	0.25¢ per lb.	0.2¢ per lb.	0.2¢ per lb.	0.15¢ per lb.	0.15¢ per lb.	0.1¢ per lb.
474.62	10% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.

1/ In accordance with general note 3(f) to Schedule XX (Geneva - 1967), the rates of duty for this item in the columns headed 1970, 1971, 1972 will become effective unless the European Economic Community and the United Kingdom do not proceed with certain reductions provided for in their respective schedules annexed to the Geneva (1967) Protocol to the GATT. If these two participants do not so proceed, the President shall so proclaim, and the rate of duty in the column headed 1969 will continue in effect unless or until the President proclaims that they have agreed so to proceed. See related footnote 1 to Kennedy Round Staged Rates at the end of schedule 4, parts 3, 4, 5, 7, 8, 9, and 13; schedule 5, part 1; schedule 6, part 2; and schedule 7, parts 2, 9, 12, and 13.

Other Amendments and Modifications

PROVISION
Subpt B--Language "chiefly used to impart color" deleted and hdnte 1 language "commonly known as pigments and suitable for use in imparting color" inserted in lieu thereof. Pub. L. 89-241, Secs. 2(a), 26, Oct. 7, 1965, 79 Stat. 933, 939, effective date Dec. 7, 1965.

PROVISION
472.50--Column 1 rate of duty of 18% ad val. reduced to 16% ad val. on Jan. 1, 1964. General headnote 3(g).
473.40--Column 1 rate of duty of 18% ad val. reduced to 16% ad val. on Jan. 1, 1964. General headnote 3(g).

Statistical Notes

PROVISION	Effective date
470.23--See Amendments and Modifications (item 907.80)	
470.35--See Amendments and Modifications (item 907.80)	
470.60--	
20--Disc. (transferred to 470.6070).....	*Jan. 1, 1966*
60--Disc.	*do*
70--Estab. (transferred from 470.5020 & 60)....	*do*
470.65--See Amendments and Modifications (item 907.80)	

PROVISION	Effective date
470.67--See Amendments and Modifications (item 907.80)	
20--Disc. (transferred to 470.5790).....	*Jan. 1, 1966*
20--Disc.	*do*
80--Estab. (transferred from 470.5720 & 80)....	*do*
470.68--See Amendments and Modifications (item 907.80)	
Subpt. B, hdnte. 1--See Other Amendments and Modifications for clarifying language covering items 472.02-473.90	
472.50--See Other Amendments and Modifications	
473.40--See Other Amendments and Modifications	

A P P E N D I X B

Value of U.S. imports for consumption, by TSUS items included in the individual summaries of this volume, total and from the 3 principal suppliers, 1967.

Value of U.S. imports for consumption, by TSUS items included in the individual summaries of this volume, total and from the 3 principal suppliers, 1967

(In thousands of dollars. The dollar value of imports shown is defined generally as the market value in the foreign country and therefore excludes U.S. import duties, freight, and transportation insurance)

TSUS item	All countries		First supplier		Second supplier		Third supplier	
	Amount in 1967	Percent change from 1966	Country	Value	Country	Value	Country	Value
Crude chalk and chalk whiting (p. 3)								
472.20	15	+1379	Canada	13	U.K.	2	-	-
472.22	206	+15	France	153	U.K.	36	Belgium	13
Precipitated calcium carbonate (p. 9)								
472.24	156	-5	U.K.	139	Japan	12	W. Germany	2
Precipitated calcium sulfate and satin white (p. 15)								
472.30	-	1/	-	-	-	-	-	-
Ochers and siennas (p. 23)								
472.40	-	-100	-	-	-	-	-	-
472.42	92	3/	Italy	77	Cyprus	13	U.K.	2
472.44	5	-80	Italy	4	Cyprus	2	-	-
473.32	16	+139	Rep. SAF	16	-	-	-	-
473.36	7	-75	Italy	4	U.K.	2	Cyprus	1
Umbers (p. 31)								
472.46	134	+21	Cyprus	128	Italy	6	-	-
472.48	3	+13	Cyprus	2	U.K.	1	-	-
473.38	25	+14	Cyprus	14	U.K.	11	-	-
Pigmentiron oxides not elsewhere enumerated (p. 37)								
472.50	27	+77	Spain	13	U.K.	9	Canada	4
473.40	244	+32	Spain	212	U.K.	26	France	5
Synthetic iron oxides (p. 17)								
473.30	2,626	3/	W. Germany	1,513	Canada	969	U.K.	125
Iron blues (p. 43)								
473.28	404	-15	U.K.	281	Netherlands	72	Poland	32
Bone black (p. 49)								
473.02	1	-46	W. Germany	1	-	-	-	-
Carbon black (p. 51)								
473.04	56	-8	Canada	20	U.K.	14	W. Germany	9
Lampblack (p. 63)								
473.06	7	1/	Canada	6	Belgium	1	-	-
Chrome pigments (p. 67)								
473.10	88	+116	Japan	47	Poland	28	W. Germany	12
473.12	1,514	+69	Japan	1,492	W. Germany	10	Canada	9
473.14	247	-30	Poland	227	Japan	16	U.K.	4
473.16	65	+97	Poland	65	-	-	-	-
473.18	35	-42	Japan	15	Belgium	10	W.Germany	7
473.19	5	1/	W. Germany	5	-	-	-	-
473.20	476	+28	Norway	237	Belgium	119	Japan	115
Cuprous oxide (p. 77)								
473.24	631	+5	Norway	437	W. Germany	194	-	-
Lead oxides (p. 81)								
473.52	4,969	-13	Mexico	4,866	France	67	W. Germany	17
473.54	3	1/	Italy	3	-	-	-	-

See footnotes at end of table.

Value of U.S. imports for consumption, by TSUS items included in the individual summaries of this volume, total and from the 3 principal suppliers, 1967--Continued

(In thousands of dollars. The dollar value of imports shown is defined generally as the market value in the foreign country and therefore excludes U.S. import duties, freight, and transportation insurance)

TSUS item	All countries		First supplier		Second supplier		Third supplier	
	Amount in 1967	Percent change from 1966	Country	Value	Country	Value	Country	Value
473.56	761	+29	Mexico	322	France	208	W. Germany	193
473.58	-	-100	-	-	-	-	-	-
Lead pigments other than the oxide types (p. 89)								
473.44	2/	1/	Belgium	2/	-	-	-	-
473.60	670	3/	Canada	229	W. Germany	182	Netherlands	159
473.62	2	1/	Japan	2	-	-	-	-
473.90	3	-75	W. Germany	2	U.K.	1	-	-
Zinc oxide (p. 95)								
473.76	2,562	-8	Mexico	1,113	Canada	1,055	Netherlands	204
473.78	5	+102	U.K.	5	-	-	-	-
Leaded zinc oxides (p.101)								
473.46	8	-56	U.K.	5	W. Germany	3	-	-
473.48	-	1/	-	-	-	-	-	-
473.50	8	1/	Belgium	7	U.K.	1	-	-
Zinc sulfide and lithopone (p.107)								
473.72	6	-35	Netherlands	5	W. Germany	1	-	-
473.74	16	-33	W. Germany	16	-	-	-	-
473.80	143	+20	W. Germany	138	Netherlands	3	U.K.	2
Vermilion reds (p. 113)								
473.66	-	1/	-	-	-	-	-	-
Titanium dioxide (p.115)								
473.70	16,039	-4	Japan	4,198	Finland	3,162	W. Germany	3,007
Pearl essence (p.123)								
473.82	581	+227	Netherlands	304	Japan	223	Norway	49
Ultramarine blue (p.127)								
473.84	564	+2	U.K.	287	W. Germany	228	Belgium	49
Vandyke brown (p.131)								
473.86	24	-50	W. Germany	24	-	-	-	-
Nonlead pigments not specially provided for (p.133)								
473.88	918	+28	U.K.	615	W. Germany	210	France	71
Artists' colors (p.139)								
474.02	1	1/	Japan	4/	W. Germany	4/	-	-
474.04	785	-3	U.K.	541	Netherlands	147	Japan	70
474.06	21	+200	U.K.	16	W. Germany	4	Japan	1
474.08	476	+1	U.K.	268	Japan	136	W. Germany	58
Inks and ink powders (p.143)								
474.20	3	-19	W. Germany	2	Canada	1	-	-
474.22	246	+7	W. Germany	242	Japan	3	U.K.	1
474.26	3,281	+19	U.K.	965	Netherlands	733	W. Germany	93
Paints and enamels (p.151)								
474.30	157	-39	Canada	95	W. Germany	42	U.K.	8
474.35	56	+73	U.K.	28	Canada	21	Japan	6

See footnotes at end of table.

Value of U.S. imports for consumption, by TSUS items included in the individual summaries of this volume, total and from the 3 principal suppliers, 1967 -- Continued

In thousands of dollars. The dollar value of imports shown is defined generally as the market value in the foreign country and therefore excludes U.S. import duties, freight, and transportation insurance)

TSUS item	All countries		First supplier		Second supplier		Third supplier	
	Amount in 1967	Percent change from 1966	Country	Value	Country	Value	Country	Value
Varnishes (p.159)								
474.40	2	-29	U.K.	2	Italy	2/	Switzerland	2/
474.42	1	-76	Austria	1	W. Germany	2/	-	-
474.44	21	+42	W. Germany	8	Canada	6	U.K.	5
474.46	134	-28	Canada	85	Sweden	15	U.K.	13
Stains (p.167)								
474.50	5	+97	France	2	W. Germany	2	Canada	2/
Caulking and glazing products (p.171)								
474.60	1	+77	Austria	1	-	-	-	-
474.62	38	-8	Canada	23	Denmark	8	U.K.	5

1/ None imported in 1966.
2/ Less than $500.
3/ Less than +0.5 percent.
4/ Slightly more than $500.

Source: Compiled from official statistics of the U.S. Department of Commerce.