

UNITED STATES TARIFF COMMISSION

**SUMMARIES OF TRADE AND TARIFF
INFORMATION**

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

Schedule 6

**Metals and Metal Products
(In 11 volumes)**

VOLUME 8

**Machinery: General Purpose, Construction, Mining,
Agricultural, Food Industries, Paper Industries,
and Printing**

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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 6

Volume 8

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INTRODUCTION

This volume is one of a series of 11 volumes of Summaries of Trade and Tariff Information on metals and metal products. It includes summaries relating to most of the machinery which is provided for in part 4, subparts A, B, C, and D of Schedule 6 of the Tariff Schedules of the United States (TSUS). This volume is identified as volume 6:8.^{1/}

The value of apparent U.S. consumption (U.S. producers' shipments plus imports minus exports) in 1967 of the articles discussed in the 29 summaries in this volume is estimated at about \$26.5 billion. This is about \$2.5 billion less than the estimated value of U.S. producers' shipments of these articles in the same year because the value of U.S. exports was significantly larger than that of imports.

The total value of imports of the articles covered by this volume amounted to \$1,082 million in 1968--about 20 percent more than in 1967 (\$903 million) and 40 percent more than in 1966 (\$775 million). The aggregate value of the imports in 1967 accounted for about 3.4 percent of the estimated value of apparent U.S. consumption. The value of imports as used in this volume is generally the foreign market value and therefore excludes U.S. import duties, freight, and transportation insurance; if the ratio of imports to consumption were based on landed, duty-paid value of imports, the ratio would be somewhat larger. The products included in this volume were imported from many countries; however, the three principal sources--Canada, West Germany, and the United Kingdom--accounted for more than three-fourths of the total.

Of the principal product groups discussed in this volume, the most important in terms of the foreign value of imports in 1968 were internal combustion engines and parts (\$494 million) and agricultural and horticultural machinery and parts (\$190 million).

Based on imports (dutiabale and duty-free) in 1968, the average ad valorem equivalent of the many rates applicable at the end of 1968 to the articles covered in this volume was 4.8 percent. The average ad valorem equivalent for the dutiable articles only was 9.3 percent. Duty-free imports in 1968 were valued at about \$524 million, or the equivalent of 48 percent of the value of all imports considered here. Duty-free imports consisted principally of agricultural and horticultural machinery and parts which have been duty-free since adoption of the Tariff Act of 1930 and Canadian articles entered under the provisions of the Automotive Products Trade Act of 1965. Of the 88 items

^{1/} For this and other summary volumes, the number to the left of the colon designates the TSUS schedule involved and the number to the right of the colon indicates the sequence of the volume in the series for that schedule, as listed on p. ii in this volume for schedule 6. Volumes published heretofore are listed on the inside of the back cover.

in the Tariff Schedules of the United States discussed in this volume (listed on page vii), 58 were the subject of concessions granted by the United States in the sixth (Kennedy) round of trade negotiations under the General Agreement on Tariffs and Trade (GATT). The great bulk of the concessions amounted to 50 percent reductions in the applicable duties. The rates of duty applicable to the other 30 TSUS items were not affected by the trade conference; however, the articles covered by 18 of these items are entitled to free entry under the provisions of the Automotive Products Trade Act of 1965 and 8 items are entitled to duty free entry under the provisions of the Tariff Act of 1930, as originally enacted.

Appendix A to this volume reproduces pertinent segments of the Tariff Schedules of the United States Annotated (1969) relating to the items covered by this volume. It includes the general headnotes to the TSUS, the headnotes to schedule 6, the headnotes to part 4 and subparts A, B, C, and D of part 4, and the individual product descriptions. The interpretive headnotes clarify the relationships between the various tariff items and define many of the terms used in the descriptions. Appendix A also gives the rates of duty applicable to the individual TSUS items, including the staged annual rate modifications that resulted from concessions granted by the United States in the sixth round of trade negotiations under the GATT. Notes in the appendix also document changes in the legal text of the tariff schedules after these schedules went into effect on August 31, 1963, including changes in the statistical annotations of items. The shaded areas in appendix A cover headnotes and TSUS items not included in the summaries in this volume.

Appendix B to this volume provides data on the value of the U.S. imports in 1968 by TSUS items included in the individual summaries of this volume. The data also show the percentage changes in imports from 1967 and the three principal countries which supplied imports in 1968.

<u>Commodity</u>	<u>TSUS item</u>
Steam and other vapor-generating boilers, and parts-----	660.10
Economizers, superheaters, and certain equipment for use with such boilers; condensers for vapor engines and power units; and parts-----	660.15

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1969).

U.S. trade position

The United States is the world's largest producer and consumer of vapor-generating boilers and auxiliary equipment; the value of U.S. consumption in 1967 was about \$666 million. U.S. exports of these products during 1958-67 accounted for 9 to 28 percent of the value of U.S. producers' annual shipments; U.S. imports have been relatively insignificant.

Description and uses

This summary covers boilers that are used for generating steam and other vapors (e.g., mercury vapor units) and auxiliary apparatus, such as economizers, superheaters, soot removers, and gas recoverers, which are used to improve or maintain the efficiency of boilers. Boilers as separate articles or together with auxiliary apparatus, whether or not assembled, are provided for under TSUS item 660.10. Condensers for use with vapor engines and power units and parts of boilers, auxiliary apparatus, and condensers are also included here. Central-heating hot-water boilers capable of producing low-pressure steam, however, are not included (see separate provisions such as items 653.45 to 653.50 and 688.40).

Boilers vary widely in size and design, depending on their end use. They are generally fired by such fossil fuels as coal, fuel oil, coke, or natural gas and are designed to provide liquids with maximum exposure to heat in order to facilitate their vaporization.

An economizer consists of headers and a bank of tubes arranged so that boiler feedwater can be preheated as it passes through the tubes to the boiler; economizers utilize the waste heat of flue gases or exhaust steam as a source of heat. Superheaters are coils or other devices through which steam from a boiler passes in order to be further heated (above a temperature of 100° centigrade). One type of soot

remover consists of a tube (fixed or retractable) with a number of jets controlled by a valve; steam or compressed air is blown through the jets to remove soot and other deposits from the tubular parts of steam-generating installations. Gas recoverers are devices used to return exhaust gases to boiler furnaces for combustion of unburnt particles. Steam condensers are of various types. One type of steam condenser is a surface condenser which consists of a cylindrical shell enclosing a system of tubes; steam enters the cylinder and is condensed by cold water passing through the tubes. Steam condensers are used primarily to condense exhaust steam from an engine or turbine into water, thereby reducing the back pressure of the steam and increasing the power of the engine; water from the condenser is returned to the boiler at as high a temperature as possible for use as feedwater.

The boilers, auxiliary apparatus, and condensers considered here are used in combination with prime movers to generate electricity and propel marine vessels; they are also used in supplying power and process steam to industrial plants, for institutional cooking and heating, and for various other applications.

In the United States, the installation and operation of boilers and pressure vessels are regulated by laws of the individual States. The States generally require that boilers conform to design standards and specifications set forth in the Boiler and Pressure Vessel Code of the American Society of Mechanical Engineers (ASME) or to State codes, which are often identical to the ASME code. Many States further require that boilers and pressure vessels be stamped with the official ASME code symbol, which indicates that they have been produced and inspected in accordance with the code. Since the ASME does not authorize manufacturers other than those situated in the United States and Canada to use their code symbol stamp, this practice has restricted imports of boilers and boiler parts.

Related products discussed in summaries in volume 6:7 are central-heating hot-water boilers which are also capable of producing low-pressure steam (item 653.50). Those discussed in this volume (6:8) are steam engines and turbines (items 660.25 and 660.30), heat exchangers (item 661.70) and certain nuclear powerplant components (various items); and furnace burners, mechanical stokers, mechanical grates, and mechanical ash dischargers (item 661.25). Steel plates and tubing which have not been advanced to the stage where they are identifiable as finished or unfinished parts of boilers are excluded from this summary.

U.S. tariff treatment

The column 1 (trade-agreement) rates of duty applicable to imports (see general headnote 3 in the TSUSA-1969) are as follows:

TSUS item	Commodity	Rate		
		U.S. concessions granted in 1964-67 trade confer- ence (Kennedy Round)	Second stage, effective Jan. 1, 1969	Final stage, effective Jan. 1, 1972
660.10:	Steam and other vapor-	13% ad	10.5% ad	6.5% ad
	generating boilers (ex-	val.	val.	val.
	cept central-heating			
	hot-water boilers cap-			
	able also of producing			
	low-pressure steam), and			
	parts.			
660.15:	Economizers, superheaters,	14% ad	11% ad val.	7% ad val.
	soot removers, gas re-	val.		
	coverers, and auxiliary			
	plants for use with			
	steam and other vapor-			
	generating boilers; con-			
	densers for vapor en-			
	gines and power units;			
	all of the foregoing			
	and parts.			

The tabulation above shows the column 1 rates of duty in effect prior to January 1, 1968, and modifications therein as a result of concessions granted by the United States in the sixth (Kennedy) round of trade negotiations under the General Agreement on Tariffs and Trade (GATT). Only the second and final stages of the five annual rate modifications are shown above (see the TSUSA-1969 for all of the staged rates).

The prior rate shown in the preceding tabulation for item 660.15 had remained unchanged from the effective date of the TSUS, August 31, 1963, through 1967. The prior rate for item 660.10 had been in effect since January 1, 1966, when the first stage of a compensatory concession granted to Canada (Presidential Proclamation 3694, Dec. 27, 1965) reduced the initial TSUS rate of 14 percent to 13 percent. This latter rate was scheduled to be further reduced to 11 percent in two additional stages; however, these stages were not implemented, and instead a concession was granted by the United States on this item in the GATT negotiations concluded on June 30, 1967.

U.S. consumption

The estimated value of apparent U.S. consumption (new installations) of vapor-generating boilers and auxiliary equipment declined from about \$440 million in 1958 to \$280 million in 1962 and then increased annually to \$666 million in 1967 (table 1). Consumption declined from 1958 to 1962 mainly because domestic utility companies interconnected and pooled their electrical generating capacities and began using computers effectively to forecast power requirements for their systems, thereby reducing the need for constructing additional reserves of generating capacity. The sustained growth in consumption from 1962 to 1967 was due primarily to increasing requirements for electrical energy. This growth was also stimulated by the passage of investment tax credit legislation in 1962 and by major power blackouts that have occurred in recent years.

As in recent years, consumption of vapor-generating boilers in the future will probably be affected by increased competition between fossil-fueled powerplants (which use these boilers), nuclear power plants, and hydro-powerplants. The abundant domestic reserves of low-cost fossil fuels and the continuing advances in the development of highly efficient steam boilers indicate that these boilers will be used extensively in the construction of new power plants for many years; however, it is forecast by the U.S. Department of Commerce that more than 60 percent of all generating capacity to be installed in the 1970's will be nuclear. Thus, the relative importance of conventional power boilers in generating electricity will apparently decline.

U.S. producers

It is estimated that more than 100 U.S. establishments produce vapor-generating boilers and auxiliary equipment as their primary products. The four largest boiler producers are believed to account for substantially more than half of the value of total U.S. production of the equipment considered here. Producing establishments are situated principally in the East North Central and Middle Atlantic States, especially in Pennsylvania and Ohio. The major manufacturers of steam boilers are sharing in the rapidly expanding market for nuclear power-generating equipment and are expanding their manufacturing facilities accordingly. This is due primarily to the fact that essentially the same types of facilities, know-how, and experience required to fabricate conventional steam generators and auxiliary equipment are required to produce heavy-walled pressure vessels, heat exchangers, and other nuclear power equipment.

Small boilers are frequently shipped as complete units; however, boilers used by utility companies are so large that they are shipped

"knocked down". Therefore, manufacturers of these boilers generally furnish crews to assemble and test the boilers at the installation sites.

U.S. boiler producers are believed to have a definite technological lead over their foreign competitors, particularly in the field of power-generating boilers. Metallurgical advances, improved designs, and improved manufacturing processes have permitted the construction of large boilers which operate at very high pressures and temperatures. These supercritical pressure units produce substantially more steam per hour than older boilers and consequently have resulted in improved efficiency. Some of the most efficient new steam-generating units require less than three-fourths of a pound of coal to produce a kilowatt hour of electricity, whereas in the early days of the utility industry, more than 3 pounds of coal was required to produce each kilowatt hour.

U.S. production

The estimated value of U.S. producers' shipments of the equipment considered here declined from \$485 million in 1958 to \$355 million in 1960, and then increased annually to \$735 million in 1967. Data from the U.S. Department of Commerce on new orders received by U.S. producers for steel power boilers indicate that shipments will remain at a high level during 1969 and 1970. Although new orders received from electric utility customers for boilers declined slightly during 1966 and 1967, orders received for them for use in ship propulsion, in water desalinization plants, and for other applications continued to increase. The long lead time (12 to 24 months) required in manufacturing power boilers makes it possible to forecast industry shipments reliably for a 2-year period.

U.S. exports

During 1958-68 the value of U.S. exports of boilers and auxiliary equipment fluctuated between \$34 million in 1960 and \$108 million in 1962. As a percentage of the total value of U.S. producers' shipments, U.S. exports amounted to 9.5 percent in 1960, 27.6 percent in 1962, and 9.7 percent in 1967. The strong domestic demand for power boilers during the past several years is believed to have resulted in such a high level of activity in domestic boiler-manufacturing plants that U.S. producers have limited their efforts to secure export orders.

The principal markets for U.S. exports of boilers and auxiliary equipment during 1965-68 were Spain, Japan, Canada, India, Iran, and Italy (table 2). Exports have consisted predominantly of high-pressure boilers used for generating electricity, and parts and

accessories for such boilers (table 3). Exports of boilers to less developed countries have been stimulated by loans obtained through the Agency for International Development; a condition of such loans is that they be used to purchase goods produced in the United States.

U.S. exports of boilers and auxiliary equipment have been adversely affected by ocean freight rates, which generally result in U.S. exporters paying higher rates than their foreign competitors over the same distances. Because of the weight and bulk of the articles considered here, freight rates are an important factor in determining the cost of exporting them. Exports have also been affected by certain foreign boiler codes which are less stringent than U.S. codes. These less stringent codes permit products of lesser quality to compete with U.S.-produced units that generally conform to higher standards.

U.S. imports

U.S. imports of boilers and auxiliary equipment were not separately reported in official statistics prior to the adoption of the TSUS on August 31, 1963. The value of U.S. imports of these products increased from \$0.7 million in 1964 to \$2.4 million in 1967 and 1968; however, in 1967, imports were still insignificant in relation to domestic production, consumption, and exports. Canada has been the principal source of imports, accounting for more than 50 percent of the total during 1964-68. Other sources of imports have included Japan, the United Kingdom, West Germany, and Switzerland (table 4). Imports have consisted of such items as steel castings (boiler parts), principally from Canada, and economizers.

The small volume of imports of the articles considered here in relation to U.S. consumption is attributable to (1) the high quality and efficiency of equipment supplied by domestic producers, (2) the expense foreign suppliers encounter in furnishing U.S. customers with design, engineering, and installation services, and (3) the difficulty foreign suppliers have in complying with U.S. boiler codes, which are often quite different from those applicable to articles produced for their home markets.

Table 1.--Steam boilers and auxiliary equipment: U.S. producers' shipments, imports for consumption, exports of domestic merchandise, and apparent consumption, 1958-68

(In thousands of dollars)

Year	U.S. producers' shipments ^{1/}	Imports	Exports	Apparent consumption ^{1/}
1958-----	485,000	<u>2/</u>	45,729	440,000
1959-----	395,000	<u>2/</u>	50,166	345,000
1960-----	355,000	<u>2/</u>	33,894	320,000
1961-----	365,000	<u>2/</u>	44,409	320,000
1962-----	390,000	<u>2/</u>	107,604	280,000
1963-----	405,000	<u>2/</u>	67,493	340,000
1964-----	455,000	690	47,398	408,000
1965-----	540,000	660	72,643	468,000
1966-----	635,000	1,378	76,429	560,000
1967-----	735,000	2,387	71,521	666,000
1968-----	<u>2/</u>	2,402	66,509	<u>2/</u>

^{1/} Estimated by the staff of the U.S. Tariff Commission.

^{2/} Not available.

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

Table 2.--Steam boilers and auxiliary equipment: U.S. exports
of domestic merchandise, by principal markets, 1965-68

(In thousands of dollars)

Market	1965	1966	1967	1968
Spain-----	13,473	13,250	19,782	11,680
Republic of Korea-----	180	678	4,706	7,189
Canada-----	6,156	6,915	5,753	6,398
Chile-----	1,256	645	778	3,006
Japan-----	8,436	12,714	3,440	2,559
Taiwan-----	4,331	720	2,492	2,521
Italy-----	2,960	2,016	3,149	2,363
Iran-----	319	5,194	3,932	2,043
Turkey-----	433	1,139	35	1,756
Saudi Arabia-----	1,334	257	146	1,577
Venezuela-----	1,702	1,878	1,368	1,146
Philippine Republic-----	1,359	715	1,522	1,034
Libya-----	46	65	2,897	924
Netherlands-----	382	452	1,993	824
India-----	5,805	10,557	1,152	803
Belgium and Luxembourg-----	1,283	896	1,476	728
All other-----	23,188	18,338	16,900	19,958
Total-----	72,643	76,429	71,521	66,509

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

Table 3.--Steam boilers and auxiliary equipment: U.S. exports of domestic merchandise, by types, 1965-68

(In thousands of dollars)

Type	1965	1966	1967	1968
Steam-generating power boilers:				
Fire tube, stationary-----	4,640	4,816	4,185	3,730
Water tube, stationary, with a per hour capacity of--				
Not over 100,000 pounds of steam-----	4,580	4,931	5,367	5,072
100,000 to 400,000 pounds of steam-----	3,048	1,954	3,024	4,106
Over 400,000 pounds of steam---	22,432	21,409	24,881	12,482
Marine-----	175	766	269	1,337
Not elsewhere classified (n.e.c.)--	4,655	4,507	3,387	2,846
Parts of steam-generating power boilers, n.e.c-----	15,182	18,996	15,151	13,383
Steam-generating power boiler accessories: <u>1/</u>				
Steam condensers-----	3,597	2,570	2,761	2,778
Heat exchangers-----	1,964	1,929	1,155	3,109
Accessories, n.e.c., and parts				
for accessories, n.e.c-----	12,370	14,551	11,341	17,666
Total-----	72,643	76,429	71,521	66,509

1/ The "accessories" reported in export statistics, although not identical in coverage with the imports considered here, are roughly comparable to the auxiliary apparatus covered by this summary.

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

Table 4.--Steam boilers and auxiliary equipment: U.S. imports
for consumption, by principal sources, 1964-68

(In thousands of dollars)

Source	1964	1965	1966	1967	1968
Canada-----	476	307	889	1,103	1,196
Netherlands-----	-	-	-	1/	498
Japan-----	7	1	-	732	317
United Kingdom-----	55	135	31	39	244
Italy-----	-	-	-	35	73
West Germany-----	57	73	26	162	16
Switzerland-----	84	35	322	158	1
All other-----	11	109	110	158	57
Total-----	690	660	1,378	2,387	2,402

1/ Less than \$500.

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

<u>Commodity</u>	<u>TSUS item</u>
Apparatus for the generation of acetylene gas from calcium carbide-----	660.20
Other gas generators, with or without purifiers-----	660.22

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1969).

U.S. trade position

U.S. imports of gas generators are insignificant in relation to domestic production, consumption, and exports.

Description and uses

The principal types of gas generators considered here are those used in producing acetylene, water, and producer gases. Acetylene is produced by the action of water on calcium carbide, by the cracking of petroleum hydrocarbons with steam, or by the burning of a mixture of methane-rich natural gas and oxygen. Acetylene is used in chemical processes for producing solvents, plastics, and other products and combined with oxygen is widely used in the welding and cutting of metals.

Producer gas, like water gas (or blue gas), is generally produced in closed cylinders fitted with refractory linings or water-cooled double walls which enclose a grate. Fuel is burned on the grate while air (or air and steam) is circulated through the apparatus. The flow of air (or air and steam) is regulated so that combustion is incomplete, leaving a mixture of carbon monoxide, hydrogen, and nitrogen (producer gas), or carbon monoxide and hydrogen (water gas). Producer-gas and water-gas generators may be adapted to burn such solid fuels as coal, coke, charcoal, wood, and certain waste materials. Producer gas and water gas are used principally for lighting, heating and as fuels for some gas engines.

Other gas generators considered here are used in the production of oxygen, hydrogen, and other gases; however, the great bulk of domestic requirements for these gases are obtained by separating the gases from liquefied air. The cryogenic apparatus (item 661.70) used in producing liquefied air is discussed elsewhere in this volume.

GAS GENERATORS

Gas generators with or without purifiers are classifiable under the provision for generators. Gas purifiers as separate articles are classified under item 661.95 and are covered by another summary in this volume. Gas purifiers are used to clean gases, especially those that are to be used as fuel in gas engines, of such impurities as dust, tars, and sulfurous compounds.

U.S. tariff treatment

The column 1 (trade-agreement) rates of duty applicable to imports (see general headnote 3 in the TSUSA-1969) are as follows:

TSUS item	Commodity	Rate		
		U.S. concessions granted in 1964-67 trade confer- ence (Kennedy Round)	Second stage, effective	Final stage, effective
		to Jan. 1, 1968	Jan. 1, 1969	Jan. 1, 1972
	Producer-gas and water-gas generators, with or without purifiers; acetylene gas genera- tors (water process) and other gas genera- tors, with or without purifiers; and parts:			
660.20:	Apparatus for the genera- tion of acetylene gas from calcium carbide, and parts thereof.	8% ad val.	6% ad val.	4% ad val.
660.22:	Other gas generators, with or without puri- fiers, and parts.	13% ad val.	10.5% ad val.	7% ad val.

The tabulation above shows the column 1 rates of duty in effect prior to January 1, 1968, and modifications therein as a result of concessions granted by the United States in the sixth (Kennedy) round of trade negotiations under the General Agreement on Tariffs and Trade (GATT). Only the second and final stages of the five annual rate modifications are shown above (see the TSUSA-1969 for all of the staged rates).

The prior rate of duty for item 660.20 (8 percent ad valorem) had remained unchanged from the effective date of the TSUS, August 31, 1963, through 1967. The prior rate of duty for item 660.22 had been in effect

since January 1, 1966, when the first stage of a compensatory concession granted to Canada (Presidential Proclamation 3694, Dec. 27, 1965) reduced the initial TSUS rate of 14 percent to 13 percent. This latter rate was scheduled to be further reduced to 11 percent in two additional stages; however, these stages were not implemented, and instead a concession was granted by the United States on this item in the GATT negotiations concluded on June 30, 1967.

U.S. consumption and production

The estimated value of apparent U.S. consumption and production of gas generators increased from \$26 million and \$28 million, respectively, in 1958 to \$37 million and \$40 million in 1963. No data are available that would provide a meaningful basis for estimating consumption and production during 1964-68; however, it is likely that the value of both U.S. production and consumption increased significantly during this period.

It is estimated that the production of acetylene gas generators represents 40 percent of the value of total domestic production of the gas-generating apparatus considered here. Increased consumption of acetylene gas in metalworking and chemical industries has resulted in a growing demand for acetylene generators. However, the use of acetylene gas for lighting, which once represented a large market for this gas, has virtually ceased as the result of rural electrification programs.

Demand for producer-gas and water-gas generators has been adversely affected by an expanding network of pipelines bringing natural gas, a competitive product, to more and more consumers. The use of gas generators for producing oxygen and hydrogen is believed to have increased at a much slower rate than the consumption of these gases during 1963-68. This is due to the fact that where large quantities of such gases are required (e.g., for use in oxygen steel furnaces and chemical plants) they can be produced more economically by an air reduction process than by utilizing the gas generators considered in this summary. Shipments of gas generators for use in providing a controlled atmosphere in industrial metal-processing furnaces increased in value from about \$4 million in 1958 to \$7 million in 1965. These generators provide an atmosphere in furnace chambers which eliminates such undesirable effects as scaling, pitting, discoloration, and decarburization of metal and metal products.

U.S. producers

Gas generators are produced in approximately 30 U.S. establishments and acetylene generators are produced in about 12 of these establishments. Producing establishments are situated principally in the East North Central and Middle Atlantic States. Most of the manufacturers of gas generators are diversified to the extent that they produce other products such as furnaces and gas liquefaction, separation, and purification equipment. Several producers of gas generators also produce and sell industrial gases and chemicals.

U.S. exports

The value of annual U.S. exports of gas generators and parts increased from \$4.2 million in 1965 and 1966 to \$7.0 million in 1968 (see accompanying table). Canada was the principal export market during 1965-68, receiving 25 percent of the total value of U.S. exports during that period. Other significant export markets in 1968 included Mexico, India, the Republic of South Africa, and Denmark.

U.S. imports

During 1964-68, the value of annual U.S. imports of apparatus for generating acetylene gas from calcium carbide (item 660.20) ranged between \$51,000 in 1966 and \$1,000 in 1968. Imports of other gas-generating equipment (item 660.22) were also small, ranging between \$159,000 in 1967 and \$88,000 in 1965. Canada and West Germany have supplied virtually all of the U.S. imports of gas-generating apparatus (see accompanying table).

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Gas generators and parts: U.S. exports of domestic merchandise, by principal markets and imports for consumption, by principal sources, 1964-68

(In thousands of dollars)

Principal markets or sources	1964	1965	1966	1967	1968
Exports, by principal markets:					
Canada-----	1/	1,598	1,144	823	1,459
Mexico-----	1/	459	297	462	1,047
India-----	1/	107	158	233	504
Republic of South Africa----	1/	23	16	91	482
Denmark-----	1/	16	1	7	450
Italy-----	1/	54	507	313	393
Spain-----	1/	36	23	8	364
Australia-----	1/	40	73	80	260
All other-----	1/	1,837	1,971	2,634	2,009
Total exports-----	1/	4,170	4,190	4,651	6,968
Imports, by principal sources:					
Canada-----	136	39	115	136	70
West Germany-----	21	82	25	24	24
All other-----	-	2	3	1	18
Total imports-----	157	123	143	161	112

1/ Not available.

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

Note.--Data on U.S. production are not separately reported in official statistics. It is estimated, however, that U.S. producers' shipments of gas-generating apparatus of the types considered here were valued at 40 million dollars in 1963, and that shipments increased significantly during 1964-68.

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<u>Commodity</u>	<u>TSUS item</u>
Steam engines and parts-----	660.25
Steam turbines and parts-----	660.30
Other vapor power units and parts----	660.35

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1969).

U.S. trade position

The United States is the world's largest consumer and producer of steam turbines, which account for the great bulk of the trade in the articles considered in this summary. In 1967 the estimated value of U.S. consumption was \$374 million, and the estimated value of U.S. producers' shipments was \$410 million. Annual U.S. exports and imports of these articles fluctuated widely during 1963-67; however, the aggregate value of exports during this period was equal to about 18 percent of the value of U.S. producers' shipments, and the aggregate value of imports was equal to less than 2 percent of the value of U.S. consumption.

Description and uses

This summary covers steam or other vapor power units, whether they are operated by self-contained or independent boilers. Steam power units fall into two distinct categories: piston-valve engines (item 660.25) and turbines (item 660.30). In the piston-valve units, mechanical energy is produced by applying steam pressure to a piston(s). The steam pressure causes the piston to move within a cylinder; the reciprocating action of the piston is converted into rotary motion through a connecting rod and crankshaft or flywheel.

Steam turbines are driven by applying steam pressure to the vanes or blades of a wheel. These units consist essentially of (1) a rotor comprising a shaft on which is mounted a wheel (or wheels) the rim of which carries a row of closely spaced vanes or blades generally of curved cross section and sometimes referred to as buckets, and (2) a stator consisting of a casing (in which the revolving rotor is supported) containing a system of stationary blades or nozzles to direct the steam onto the blading of the rotor.

Other vapor power units (item 660.35) are generally similar in construction to steam turbines but use mercury vapor or some other vapor in lieu of steam.

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Piston-valve steam engines (frequently referred to as reciprocating steam engines) are relatively inefficient power sources; consequently, the demand for these units has declined significantly over the years, particularly where large amounts of power are required. Such engines, however, are still used where exhaust steam, waste wood, or some other cheap fuel is available for powering sawmills, pumps, and other machines. Steam turbines and other vapor power units are used principally to drive generators for producing electricity. Such turbines drive generators that produce about 80 percent of all the electrical power now consumed in the United States. Steam turbines are also used as mechanical drives for compressors, centrifugal pumps, ventilators, and other machines; when coupled with suitable gears, they are also used for ship propulsion. Related articles not covered by this summary include steam boilers and auxiliary equipment (items 660.10 and 660.15) and such competitive prime movers as hydraulic turbines (item 660.70) and gas turbines (item 660.46), all of which are discussed elsewhere in this volume.

Some of the advantages of steam turbines as prime movers are that they require small amounts of floor space and light foundations; that they have no rubbing parts except the bearings, and no reciprocating masses that cause vibrations; that they have substantial overload capacity, uniform torque, high rotation speed, good reliability, and low maintenance costs; and that single units of this type of prime mover can be built with a larger capacity than can those of other types of prime movers.

U.S. tariff treatment

The column 1 (trade-agreement) rates of duty applicable to imports (see general headnote 3 in the TSUSA-1969) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	U.S. concessions granted in 1964-67 trade confer- ence (Kennedy Round)	
			Second stage, effective Jan. 1, 1969	Final stage, effective Jan. 1, 1972
	Steam engines, steam turbines, and other vapor pow- er units, and parts:			
660.25:	Steam engines and parts.	8% ad val.	6% ad val.	4% ad val.
660.30:	Steam turbines and parts.	15% ad val.	12% ad val.	7.5% ad val.
660.35:	Other-----	9% ad val.	7% ad val.	4.5% ad val.

The tabulation above shows the column 1 rates of duty in effect prior to January 1, 1968, and modifications therein as a result of concessions granted by the United States in the sixth (Kennedy) round of trade negotiations under the General Agreement on Tariffs and Trade. The prior rates applicable to the items considered here are to be reduced by 50 percent, in five annual stages, as a result of the aforementioned concessions. Only the second and final stages of the annual rate modifications are shown above (see the TSUSA-1969 for all of the staged rates). The prior rates shown in the preceding tabulations had remained unchanged under the TSUS from August 31, 1963, through 1967.

Consumption

The estimated value of apparent U.S. consumption (domestic producers' shipments plus imports minus exports) of the vapor engines considered here declined annually from a record high of \$435 million in 1958 to \$229 million in 1964 and then increased to \$374 million in 1967 (data for 1963-67 in table 1). The decline in the value of consumption from 1958 to 1964 was due in part to the shift to higher capacity units, which lowered the costs per unit of rated capacity of new units produced, and to intense competition between domestic producers, which resulted in depressed selling prices. In addition, the requirements for new electrical generating capacity were at a somewhat reduced level during those years because public utility companies pooled their generating capacities and used improved computer techniques to forecast their system loads, thereby reducing the need for large standby reserves of generating capacity.

As a result of the need for new electric generating capacity to meet the continuing strong demand for electrical energy in the United States (U.S. requirements for electricity are doubling about every 10 years), the downward trend in consumption of vapor engines was reversed in 1965. Consumption increased again in 1966 and 1967; furthermore, the large and increasing backlog of orders for this equipment indicates that the present trend toward increased consumption will continue at an accelerated rate for the next several years.

U.S. producers

Steam turbines are produced in about 20 U.S. establishments. It is believed that only two domestic firms produce reciprocating steam engines. The number of establishments producing the other vapor engines covered by item 660.35 is not known, but in view of the similarity between steam turbines and these units, it is likely that all producers of steam turbines could produce other vapor engines if there were sufficient demand.

U.S. production of the articles considered here is highly concentrated in the northeastern part of the United States, particularly in Pennsylvania, New York, Massachusetts, and New Jersey. The great bulk of domestic production of steam turbines is accounted for by two large diversified companies which make heavy electrical apparatus (including generators) and by other companies which make such products as gears, pumps, and compressors.

The two U.S. producers of large steam turbine generator sets for the electric utility industry (General Electric and Westinghouse) announced in 1967 that they would double their capacity for producing this equipment by 1971. Both concerns indicated that they would build major new plants for manufacturing steam turbines in addition to expanding their existing facilities.

U.S. production

The estimated value of U.S. producers' shipments of steam turbines (including mercury vapor units) and parts increased annually from \$310 million in 1963 to \$410 million in 1967 (table 1); about 90 percent of the value of annual shipments of steam turbines during 1963-67 consisted of units for use in turbine generator sets, assuming the value of the turbines contained in U.S. producers' shipments of steam turbine generator sets represents about 75 percent of the value of the complete sets. The remaining 10 percent of the shipments consisted of turbine gear units and mechanical drive turbines.

It is believed that U.S. producers' shipments of reciprocating steam engines were valued at less than \$2 million a year during 1963-67; however, data on such shipments are not separately reported.

Since World War II, the average size and the maximum unit size of steam turbine generator sets have increased because of the efficiencies and economies obtained with the larger units. Maximum capacity has increased about eightfold to a rating of 1.3 million kilowatts for units now on order. Units having a capacity of 2.0 million kilowatts are reported in the preliminary design stage. In recent years, nuclear reactors have emerged as commercially important sources of steam for use with these turbines. Orders placed with U.S. manufacturers for steam turbine generating equipment during 1967-68 were almost equally divided in terms of generating capacity between units to be used in nuclear powerplants and those to be used in fossil-fueled powerplants.

U.S. exports

The estimated value of U.S. exports of steam engines, turbines, and parts fluctuated during 1963-68 from \$96 million in 1964 to \$43

million in 1967. Exports represented about 30 percent of the value of U.S. producers' shipments in 1964 and about 10 percent of the value of such shipments in 1967. The decline in exports between these years is attributable in part to the fact that the domestic producers were operating at low levels during the early 1960's, when orders for 1964 exports were booked, whereas a sharp increase in orders for domestic consumption (particularly for steam turbine generator sets) limited U.S. producers' capacity to produce for export in 1967.

Exports during 1965-68 consisted principally of steam turbines contained in steam turbine generator sets with rated capacities of 10,000 kilowatts or more and of steam turbines and parts for mechanical drives (table 2). During 1965-68, these two classes represented 56 and 38 percent, respectively, of total U.S. exports of the articles considered here.

The value of exports of reciprocating steam engines and parts declined from \$1.7 million in 1965 to \$1.2 million in 1968. A significant part of these exports probably consisted of used engines and parts.

U.S. export markets for steam turbines are numerous; in 1968, turbines and parts were exported to more than 50 countries. The principal markets during 1965-68 were Japan and Spain; these two countries received 20 and 15 percent, respectively, of the total exports, by value, during the 4-year period (table 3).

U.S. imports

The value of U.S. imports of vapor engines and parts declined sharply from \$9.1 million in 1963 to \$0.7 million in 1965 and 1966 and then increased to \$13.1 million in 1968. Imports accounted for about 3.4 percent of the value of apparent consumption in 1963, 0.3 percent in 1965 and 1966, and 1.9 percent in 1967. If the ratios were based on the landed, duty-paid value of imports (rather than on the foreign value thereof) the ratios would be somewhat higher. During 1964-68, imports of parts of steam turbines accounted for two-thirds of the value of the imports considered in this summary (table 4). Imports of complete steam turbines were insignificant during 1964-66; however, such imports were valued at \$3.1 million in 1967 and \$3.3 million in 1968. Switzerland, West Germany, Canada, and Japan supplied the bulk of U.S. imports of vapor engines and parts during 1963-68 (table 5).

In recent years, U.S. Government agencies, such as the Tennessee Valley Authority (TVA), and municipal power authorities have been the principal importers of steam turbines and steam turbine generator sets, including parts. Imports by U.S. Government agencies are subject to

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the Buy-American Act, but these agencies may purchase products of foreign origin for delivery in the continental United States if the cost of the domestic product exceeds the cost of the foreign product, including duty, by 6 percent (or 12 percent in certain circumstances if the domestic firm is situated in a "labor distress" area).

During 1967-68, private utility companies and U.S. Government agencies placed large contracts with foreign producers for steam turbine generator sets. These contracts will result in a much higher level of imports during the early 1970's of the articles considered here than was experienced during 1963-68. The aforementioned orders include two units of 1.3 million kilowatts capacity and two units of 1.1 million to 1.3 million kilowatts capacity (with options for two more) ordered from a Swiss concern and a unit of 1.1 million kilowatts capacity ordered from a British concern.

Announcements made by the purchasers of these large turbine generator sets at the time the orders were placed indicated that the foreign producers' prices were considerably lower than the prices quoted by domestic bidders. The successful foreign bid of \$28.5 million for two turbine generator sets ordered by TVA in 1967--including approximately \$4 million in duty--was about \$10 million, or 35 percent less than that of the low domestic bid.

Table 1.--Steam engines, steam turbines, and other vapor power units (including parts): U.S. producers' shipments, imports for consumption, exports of domestic merchandise, and apparent consumption, 1963-68

Year	U.S. producers' shipments <u>1/</u>	Imports	Exports <u>1/</u>	Apparent consumption <u>1/</u>	Ratio of imports to consumption <u>1/</u>
	<u>1,000 dollars</u>	<u>1,000 dollars</u>	<u>1,000 dollars</u>	<u>1,000 dollars</u>	<u>Percent</u>
1963-----	310,000	9,141	50,000	269,141	3.4
1964-----	320,000	4,846	96,000	228,846	2.1
1965-----	330,000	673	62,218	268,455	.3
1966-----	370,000	676	56,844	313,832	.2
1967-----	410,000	7,261	43,004	374,257	1.9
1968-----	<u>2/</u>	13,118	49,414	<u>2/</u>	<u>2/</u>

1/ Data are partly estimated by the staff of the U.S. Tariff Commission; they represent 75 percent of the total value of U.S. producers' shipments (including exports) of steam turbine generator sets.

2/ Not available.

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

Note.--The ratios of imports to consumption are based on the foreign market value of imports and essentially U.S. factory value of shipments. If the ratios were computed on the basis of foreign value of imports plus U.S. import duties and costs of transportation, insurance, and other handling to deliver the merchandise to the United States, the ratios would be larger.

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Table 2.--Steam engines and turbines (including parts): U.S.
exports of domestic merchandise, by types, 1965-68

(In thousands of dollars)

Type	1965	1966	1967	1968
Steam engines and parts-----	1,701	1,054	1,107	1,214
Steam turbines and parts for mechanical drives-----	16,928	17,404	21,453	25,401
Steam turbines contained in steam turbine generator sets, assem- bled or unassembled: <u>1/</u>				
Under 10,000 kilowatt-----	2,232	1,647	1,634	932
10,000 kilowatt and more-----	41,357	36,739	18,810	21,867
Total-----	62,218	56,844	43,004	49,414

1/ The value of the steam turbines contained in exports of steam turbine generator sets was estimated at 75 percent of the value of the complete sets.

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

Table 3.--Steam engines and turbines (including parts): U.S. exports of domestic merchandise, by principal markets, 1965-68 1/

(In thousands of dollars)

Market	1965	1966	1967	1968
Taiwan-----	1,586	35	2,494	6,728
Japan-----	13,058	19,539	3,447	5,923
Canada-----	2,276	3,470	3,887	4,323
Israel-----	2,637	737	733	3,277
Colombia-----	545	999	260	2,610
Chile-----	378	71	120	2,457
Spain-----	10,008	9,034	10,928	2,293
All other-----	<u>2/</u> 31,730	22,959	21,135	21,803
Total-----	62,218	56,844	43,004	49,414

1/ Data are partly estimated by the staff of the U.S. Tariff Commission; they include 75 percent of the value of U.S. exports of steam turbine generator sets.

2/ Includes exports to Brazil valued at 8,246 thousand dollars.

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

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Table 4.--Steam engines, steam turbines, and other vapor power units (including parts): U.S. imports for consumption, by types, 1964-68

(In thousands of dollars)

Type	1964	1965	1966	1967	1968
Steam engines and parts-----	29	42	17	229	16
Steam turbines-----	129	185	9	3,071	3,326
Parts of steam turbines-----	4,523	356	607	3,341	9,063
Other vapor power units and parts-----	165	90	43	620	713
Total-----	4,846	673	676	7,261	13,118

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

Table 5.--Steam engines, steam turbines, and other vapor power units (including parts): U.S. imports for consumption, by principal sources, 1963-68

(In thousands of dollars)

Source	1963 ^{1/}	1964	1965	1966	1967	1968
Japan-----	9	-	8	6	770	3,188
Switzerland-----	5,294	4,180	219	22	1,348	2,665
Norway-----	-	11	-	20	495	1,872
Canada-----	105	122	54	85	1,564	1,679
Italy-----	-	6	-	230	408	1,318
Sweden-----	9	-	-	-	1,811	1,008
France-----	64	1	-	13	8	447
West Germany-----	3,233	369	30	216	103	380
United Kingdom-----	199	137	268	41	577	287
All other-----	228	20	94	43	177	274
Total-----	9,141	4,846	673	676	7,261	13,118

^{1/} Data for 1963 do not include the value of imports of vapor power units other than steam engines and steam turbines; therefore, 1963 data are not fully comparable with those for subsequent years.

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

<u>Commodity</u>	<u>TSUS</u> <u>item</u>
Internal combustion engines and parts:	
Piston-type engines---	660.40, -.42, -.43, -.44, -.45
Nonpiston-type engines-----	660.46, -.47
Parts-----	660.50, -.51, -.52, -.53, -.54, -.55

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1969).

U.S. trade position

The United States is the world's largest consumer, producer, exporter, and importer of internal combustion engines and parts. The value of apparent U.S. consumption of these articles increased from about \$6.0 billion in 1963 to about \$8.0 billion in 1967; the value of annual U.S. producers' shipments during the same period rose from \$6.4 billion to \$8.6 billion. Although U.S. imports have increased at a more rapid rate than U.S. exports in recent years, the value of exports was more than double that of imports in 1968. Trade in automotive engines and parts between the United States and Canada has increased rapidly since the United States-Canadian automobile agreement was signed on January 16, 1965.

Description and uses

The principal types of internal combustion engines considered in this summary are piston engines, gas turbines, and turbojets. Piston engines convert into mechanical power the force exerted on a piston by the burning of gas or some flammable vapor within an enclosed cylinder. Such engines are divided into two classes according to the method used to ignite the fuel: spark-ignition or compression-ignition. Spark-ignition engines, which generally use gasoline for fuel, are used to propel automobiles, trucks, buses, motorcycles, tractors, boats, and aircraft and also for driving electric generators, compressors, pumps, chain saws, lawnmowers, and numerous other machines. Most automobile engines are of the spark-ignition type. Compression-ignition engines, which are commonly called diesel engines, use diesel oil or some other heavy oil for fuel. These fuels are less refined and cheaper than gasoline. Diesel engines are used for many of the same applications for which spark-ignition engines are used; however, the heavier construction of diesel units makes them better suited for use as stationary power sources or for propelling heavy transport equipment, such as trucks, buses, tractors, locomotives, and marine vessels.

A gas turbine engine consists of a compressor, a combustion chamber, and a turbine. The compressor supplies air under pressure to the

combustion chamber, where it is combined with burning gas or liquid fuel. The expanding hot gases thus produced exert a force against the turbine blades, which rotate and drive the power shaft. Gas turbines are used to propel aircraft and marine vessels and to drive electric generators and various types of industrial machinery.

Turbojet engines, which are used almost exclusively to propel aircraft, are similar to gas turbines in that each type consists of a compressor, a combustion system, and a turbine. In the turbojet engines, unlike the gas turbine aircraft engines discussed above, the power shaft is not connected to a propeller; instead the turbojet engine derives its motive force or thrust from the reaction of hot gases issuing from peripheric combustion chambers and expanding very rapidly into a convergent exhaust pipe. The turbine merely drives the compressor which supplies air to the combustion system.

Other internal combustion engines considered in this summary include variations of the types discussed above, such as semidiesels and compound engines that combine a piston engine with a gas turbine. Rocket engines such as those used in the launching and propulsion of space vehicles are also included.

The size and complexity of the internal combustion engines covered by this summary range from certain miniature units valued at about \$2 each, for use in model airplanes, to large turbojet aircraft engines which develop thousands of pounds of thrust and cost as much as half a million dollars each.

Parts of internal combustion engines which are more specifically provided for elsewhere in the TSUS, such as spark plugs and fuel injection pumps--are not within the scope of this summary. Generally, the tariff classification of parts of internal combustion engines depends on whether the parts are used chiefly for "piston-type engines other than compression ignition engines" (item 660.52) or for other internal combustion engines (item 660.54).

Articles not considered in this summary include fuel injection pumps for compression-ignition engines (item 660.92), other pumps used with internal combustion engines (item 660.94), and hydrojet engines for motorboats (item 660.75), which are all discussed elsewhere in this volume, and kits containing three or more replacement parts for the repair of internal combustion engine pumps or carburetors (item 680.70) and electrical starting and ignition equipment for internal combustion engines (item 683.60), which are both discussed in volume 6:10.

U.S. tariff treatment

The column 1 (trade-agreement) rates of duty applicable to imports (see general headnote 3 in the TSUSA-1969) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	U.S. concessions granted in 1964-67 trade confer- ence (Kennedy Round)	
			Second stage, effective Jan. 1, 1969	Final stage, effective Jan. 1, 1972
	Internal combustion en- gines and parts:			
	Piston-type engines:			
660.40	To be installed in tractors suitable for agricultural use (item 692.30) or in agricultural or horticultural machinery or imple- ments (item 666.00)	Free	<u>1/</u>	<u>1/</u>
	Other:			
660.42	Compression-igni- tion engines.	10% ad val.	8% ad val.	5% ad val.
660.43	If Canadian article and original motor-vehicle equipment.	Free	<u>1/</u>	<u>1/</u>
660.44	Engines other than compression-ig- nition engines.	8.5% ad val.	6.5% ad val.	4% ad val.
660.45	If Canadian article and original motor-vehicle equipment.	Free	<u>1/</u>	<u>1/</u>
660.46	Nonpiston-type engines---	10% ad val.	8% ad val.	5% ad val.
660.47	If Canadian article and original motor- vehicle equipment.	Free	<u>1/</u>	<u>1/</u>

See footnote at end of table.

INTERNAL COMBUSTION ENGINES

TSUS item	Commodity	Rate prior to Jan. 1, 1968	U.S. concessions granted in 1964-67 trade confer- ence (Kennedy Round)	
			Second stage, effective Jan. 1, 1969	Final stage, effective Jan. 1, 1972
	Internal combustion en- gines and parts--Con.			
	Parts:			
660.50	Cast-iron (except malleable cast- iron) parts, not alloyed and not advanced be- yond cleaning, and machined only for the removal of fins, gates, sprues, and risers or to permit location in finishing machinery.	3% ad val.	1.5% ad val.	Free
660.51	If Canadian arti- cle and original motor-vehicle equipment.	Free	<u>1/</u>	<u>1/</u>
	Other parts:			
660.52	Parts of piston- type engines other than compression- ignition en- gines.	8.5% ad val.	6.5% ad val.	4% ad val.
660.53	If Canadian article and original motor-vehicle equipment.	Free	<u>1/</u>	<u>1/</u>
660.54	Other-----	10% ad val.	8% ad val.	5% ad val.
660.55	If Canadian article and original motor-vehicle equipment.	Free	<u>1/</u>	<u>1/</u>

1/ Duty-free status not affected by the trade conference.

The tabulation above shows the column 1 rates of duty in effect prior to January 1, 1968, and modifications therein as a result of concessions granted by the United States in the sixth (Kennedy) round of trade negotiations under the General Agreement on Tariffs and Trade. Only the second and final stages of the five annual rate modifications are shown above (see the TSUSA-1969 for all of the staged rates).

The prior rate of duty on items 660.40, 660.42, 660.44, 660.46, 660.50, 660.52, and 660.54 had remained unchanged under the TSUS from August 31, 1963, through 1967. However, the description of item 660.40 was expanded to include engines to be installed in agricultural or horticultural machinery or implements provided for in item 666.00 pursuant to enactment of the Tariff Schedules Technical Amendments Act, effective December 7, 1965.

Items 660.43, 660.45, 660.47, 660.51, 660.53, and 660.55 provide for the duty-free entry of Canadian articles that are original motor-vehicle equipment (see general headnote 3 of the TSUS). These provisions were established pursuant to the enactment of the Automotive Products Trade Act of 1965 (see Presidential Proclamation 3682 of October 21, 1965), which provided for duty-free entry retroactive to January 18, 1965. From the effective date of the TSUS, August 31, 1963, to January 17, 1965, these articles were classifiable under the appropriate dutiable provisions of the TSUS. The duty-free status of the Canadian articles was not affected by the recent trade conference.

U.S. consumption

The value of apparent U.S. consumption of internal combustion engines and parts increased annually from about \$6.0 billion in 1963 to \$8.0 billion in 1967 (table 1). All of the principal classes of internal combustion engines considered here except spark-ignition automotive engines shared in this growth in consumption. Consumption of spark-ignition automotive engines closely parallels U.S. production of motor vehicles, which increased from 9.0 million units in 1963 to 11.0 million in 1965 and then declined to 8.7 million in 1967.

U.S. producers

Data on U.S. producers of internal combustion engines are compiled and reported in official statistics under several major product classes.

Aircraft engines (including missile and space-vehicle engines) and parts were produced in about 200 domestic establishments in 1963, the most recent year for which such data were reported. Seventeen of these establishments, each with 2,500 or more employees, accounted for more than three-fourths of the total value of industry shipments.

Facilities for producing aircraft engines are concentrated in New England, Ohio, and California.

About 12 concerns produce spark-ignition automotive engines; of this number, three large automobile producers account for the great bulk of the domestic output. A large number of concerns produce automotive engine parts. Establishments for producing spark-ignition automotive engines and parts are concentrated in the East North Central States.

Internal combustion engines other than aircraft engines and spark-ignition automotive engines were produced in 143 establishments in 1963. Secondary products which are produced in some of these establishments include gray iron castings, diesel and gasoline engine generator sets, and parts and accessories for motor vehicles. About 80 percent of the value of the industry's shipments of engines and parts is accounted for by establishments in the East North Central States.

U.S. production

The estimated value of U.S. producers' shipments of internal combustion engines and parts increased from \$6.4 billion in 1963 to \$8.6 billion in 1967. The value of annual shipments, by types, during 1963-66 is shown in table 2.

Approximately 40 percent of the total value of U.S. production of internal combustion engines and parts during 1963-67 was accounted for by engines and parts for aircraft, missiles, and space vehicles (principally turbojets for aircraft). There has been a growing demand for these engines owing to military requirements resulting from the war in Viet-Nam and the rapid transition from piston to jet engines for powering civilian aircraft, particularly commercial transports. The value of annual U.S. producers' shipments of aircraft engines for military customers increased irregularly from \$644 million in 1963 to \$760 million in 1966, whereas the value of shipments to nonmilitary customers during the same period increased much more rapidly, from \$150 million to \$496 million (table 2).

During 1963-67, spark-ignition automotive engines and parts accounted for about 35 percent of the aggregate value of domestic production of the articles considered here. Shipments of these engines are not reported separately in official statistics because the bulk of the shipments are interplant transfers between engine-producing plants and automobile assembly plants of the same concerns. It is estimated that the value of shipments of these engines and parts increased from \$2.5 billion in 1963 to \$3.0 billion in 1965 and then declined to \$2.8 billion in 1967.

Other internal combustion engines considered here, which represent the remaining 25 percent of domestic production, consist of many different types of engines. These include gas turbines for generating electricity and for mechanical drive applications. Demand for gas turbines has grown very rapidly since the 1965 power failure in the Northeastern States. These engines are considered a particularly economical and reliable source for providing standby power for emergency use or in meeting a utility system's peak load requirements. Outboard engines for motorboats are another important item of trade considered here. Increased leisure time and growth in the disposable income of consumers have contributed to the growing demand for these engines. A trend toward increased mechanization of farming has stimulated the demand for internal combustion engines for use in tractors and farm machinery. Other markets which have contributed to the growth in shipments of piston-type internal combustion engines (both gasoline and diesel units) are the construction, mining, materials handling, and general industrial equipment industries. Shipments of small engines also increased significantly during 1963-67 because of the growth in demand for such consumer products as lawnmowers, snow plows, garden tractors, and chain saws.

U.S. exports

The value of U.S. exports of internal combustion engines and parts increased from an estimated \$455 million in 1963, when they were equal to 7 percent of domestic producers' total shipments, to \$918 million in 1967, when they were equal to 11 percent of such shipments. Exports increased again in 1968, when they were valued at \$1,025 million. During 1965-68, exports of engine parts accounted for more than half of the aggregate value of U.S. exports of the articles considered here.

The rapid growth in exports of internal combustion engines and parts is largely attributable to increased exports of nonmilitary aircraft engines and spark-ignition automotive engines and parts for both types (table 3). Canada, Japan, the United Kingdom, and the countries of the European Economic Community have been the principal export markets for aircraft engines; however, since virtually all of the airlines of the free world operate some U.S.-built aircraft, there is a broad and growing foreign market for U.S. aircraft engines.

Canada is the dominant market for exports of spark-ignition automotive engines. In 1968, total exports of these engines were valued at \$116 million, of which \$108 million was accounted for by exports to Canada. U.S. exports of automotive engines to Canada have increased sharply since the signing of the United States-Canadian automobile agreement on January 16, 1965. The great bulk of these exports are shipments from the plants of United States automobile manufacturers to the plants of their Canadian subsidiaries.

The magnitude of the export market for internal combustion engines is indicated by the fact that in 1967 the exports of parts and accessories for internal combustion engines other than aircraft and automotive engines were valued at \$193 million and were shipped to more than 120 foreign countries. Official statistics on exports of engines and parts understate the importance of foreign markets to domestic manufacturers because these data do not include significant exports of internal combustion engines which are incorporated into such products as aircraft, tractors, motor vehicles, construction equipment, farm machinery, powersaws, and motor generator sets.

U.S. imports

The value of U.S. imports of internal combustion engines and parts increased annually from an estimated \$80 million in 1963 to \$494 million in 1968. Imports as a percent of the value of apparent domestic consumption increased from 1.3 percent in 1963 to 4.6 percent in 1967. If these ratios had been based on the landed duty-paid values of imports, they would have been somewhat larger. In 1964, parts accounted for 56 percent of the value of total imports of the articles considered here, but in 1968, for only 35 percent. The decline in the relative importance of parts in the import trade is due to the sharp increase in imports of complete motor-vehicle engines from Canada subsequent to the enactment of the Automotive Products Trade Act (APTA).

The value of imports of piston-type engines for installation in tractors suitable for agricultural use or in agricultural machinery (item 660.40) increased from \$7.2 million in 1964 to \$30.8 million in 1968 (table 4). During 1964-68 the United Kingdom accounted for more than 90 percent of the aggregate value of these duty-free imports.

The value of imports of compression-ignition engines other than those entered under item 660.40 increased from \$13.7 million in 1964 to \$21.4 million in 1968. These engines consisted primarily of units for use in motor vehicles and marine vessels; the great bulk of these imports were from the United Kingdom and West Germany. Imports of compression-ignition engines entered under the APTA provision (item 660.43) have been negligible.

The value of imports of automobile, truck, and bus engines--other than compression-ignition engines--increased annually from \$18.1 million in 1964 to \$197.7 million in 1968. This increase of almost 1000 percent is directly attributable to the United States-Canadian automobile agreement. Duty-free imports of these engines entered under the APTA provision--virtually all of which were made by Canadian subsidiaries of United States automobile manufacturers--totaled 760,040 units, valued at \$184.8 million, in 1968. Imports of automobile, trucks, and bus engines entered under item 660.44 declined annually from \$27.3

million in 1965 to \$13.0 million in 1968. Based on value, approximately half of these imports, most of which were of Canadian origin, entered the United States free of duty for manufacture in bonded warehouse and export.

The value of imports of all nonpiston-type internal combustion engines (item 660.46) increased from \$7.3 million in 1964 to \$50.0 million in 1968. In the latter year, 14 percent of the value of these imports was accounted for by U.S. goods returned and hence was entitled to duty-free entry under the provision of item 807.00. ^{1/} The value of imports of new turbojet and gas turbine aircraft engines increased from \$5.6 million in 1964 to \$30.0 million in 1968. The United Kingdom and Canada together accounted for 98 percent of the total value of imports of these engines during 1964-68. Orders placed with a British firm for turbojet engines to be delivered in the early 1970's indicate that imports of these engines will be at a much higher level during those years than in 1966-68.

The value of imports of internal combustion engine parts, including those entered under the APTA provisions, increased from \$64.1 million in 1964 to \$175.3 million in 1968. Imports from Canada that were entered free of duty under the APTA provisions totaled \$29.8 million in 1966, \$24.5 million in 1967, and \$35.5 million in 1968. Imports of internal combustion engine parts that were entered free of duty for U.S. Government use--most of which were of Canadian origin--totaled \$24.1 million in 1966, \$35.2 million in 1967, and \$52.2 million in 1968.

In 1964-68 more than half of the value of all the imports of parts covered by this summary was accounted for by parts of piston-type engines other than compression-ignition engines (item 660.52 and 660.53). Articles entered under these items have included engine blocks, pistons, piston rings, connecting rods, cylinder liners, crankshafts, valves, carburetors, gaskets, and exhaust manifolds. Canada accounted for about 60 percent of the value of imports of these parts during 1964-68. Other important sources include West Germany, the United Kingdom, and Japan.

The United Kingdom and Canada supplied about 85 percent of the 1964-68 imports of the residual class of internal combustion engine parts (item 660.54). The great bulk of the articles entered under this item have

^{1/} Articles assembled abroad in whole or in part of fabricated components, the product of the United States, which (a) were exported in condition ready for assembly without further fabrication, (b) have not lost their physical identity in such articles by change in form, shape, or otherwise, and (c) have not been advanced in value or improved in condition abroad except being assembled and except by operations incidental to the assembly process such as cleaning, lubricating, and painting.

consisted of parts of compression-ignition and turbojet engines. Such parts have included nozzles for fuel injection systems, ducts, turbine casings, heat shields, rotor blades, and engine insulation blankets.

Imports of the internal combustion engines and parts considered in this summary are shown, by principal sources, in table 5.

Table 1.--Internal combustion engines and parts: U.S. producers' shipments, imports for consumption, exports of domestic merchandise, and apparent consumption, 1963-68

Year	U.S. producers' shipments <u>1/2/</u>	Imports	Exports	Apparent consumption <u>1/</u>	Ratio of imports to consumption <u>1/</u>
	Million dollars	Million dollars	Million dollars	Million dollars	Percent
1963-----	6,370.0	80.0	<u>1/</u> 455.0	5,995.0	1.3
1964-----	6,750.0	114.4	<u>1/</u> 470.0	6,395.0	1.8
1965-----	7,675.0	178.4	728.4	7,125.0	2.5
1966-----	8,335.0	321.4	828.5	7,830.0	4.1
1967-----	8,550.0	366.2	918.0	8,000.0	4.6
1968-----	<u>3/</u>	494.4	1,025.1	<u>3/</u>	<u>3/</u>

1/ Partly estimated by the staff of the U.S. Tariff Commission.

2/ Data include interplant transfers.

3/ Not available.

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

INTERNAL COMBUSTION ENGINES

Table 2.--Internal combustion engines and parts: U.S. producers' shipments, by types, 1963-66

(In millions of dollars)

Type	1963	1964	1965	1966
Aircraft engines for U.S. military customers-----	644.4	602.7	598.0	759.9
Aircraft engines for other than U.S. military customers-----	150.0	238.7	374.6	496.2
Aircraft engine parts-----	932.1	850.0	925.2	1,269.6
Complete missile or space-vehicle engines and/or propulsion units-----	582.6	728.0	728.4	612.0
Missile or space-vehicle engines and/or propulsion unit parts or accessories-----	147.8	174.7	184.0	168.0
Gas turbines and parts-----	72.4	1/ 90.0	1/ 120.0	1/ 180.0
Gasoline engines and parts, automotive 1/-----	2,450.0	2,500.0	3,000.0	2,750.0
Gasoline engines (except aircraft, automotive, and outboard)-----	270.1	304.6	323.7	407.2
Diesel and semidiesel, automotive type-----	165.5)	(199.7	242.2
Diesel and semidiesel, except automotive type-----	289.9)	(517.5	447.5
Other internal combustion engines, including outboards---	186.7	186.5	194.9	251.6
Parts and accessories of internal combustion engines, not elsewhere classified----	480.6	559.1	617.8	748.7
Total-----	6,372.1	6,751.8	7,673.5	8,332.9

1/ Estimated by the staff of the U.S. Tariff Commission.

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

Table 3.--Internal combustion engines and parts: U.S. exports of domestic merchandise, by types, 1965-68

(In millions of dollars)

Type	1965	1966	1967	1968
Aircraft engines:				
Piston-type, military-----	2.9	7.3	5.2	4.2
Piston-type, nonmilitary-----	17.4	27.7	31.6	23.4
Parts and accessories for piston-				
type engines-----	116.2	115.8	122.1	121.7
Jet and gas turbines, military----	22.1	19.8	18.7	24.2
Jet and gas turbines, nonmilitary--	38.8	49.3	69.6	95.4
Parts and accessories for jet and				
gas turbines-----	52.9	67.5	84.6	110.9
Missile turbines and parts-----	5.7	4.8	3.2	3.4
Gas turbines and parts for mechan-				
ical drives-----	25.8	21.8	23.6	42.8
Automobile, truck, and bus engines:				
Diesel (compression-ignition)-----	20.7	16.2	16.8	22.5
Gasoline (spark-ignition)-----	46.4	85.0	118.2	116.4
Parts and accessories for automobile,				
truck, and bus engines-----	1/	98.8	89.8	106.0
Outboard motors-----	17.8	23.7	19.6	23.2
Marine, diesel engines-----	18.7	16.7	24.9	24.6
Gasoline engines, other than auto-				
motive and outboard motors-----	40.6	45.6	43.1	46.6
Diesel engines, other than automotive:				
and marine-----	64.2	61.9	59.7	63.3
Other internal combustion engines----	4.6	4.3	5.1	3.3
Other parts and accessories for in-				
ternal combustion engines-----	233.6	162.3	182.2	193.2
Total-----	728.4	828.5	918.0	1,025.1

1/ Not separately reported; included in "Other parts and accessories for internal combustion engines."

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

Table 4.--Internal Combustion engines and parts: U.S. imports for consumption, by types, 1964-68

(In millions of dollars)

Type and TSUSA item	1964	1965	1966	1967	1968
Piston-type engines:					
For installation in tractors:					
suitable for agricultural use or in agricultural machinery (660.40)-----	7.2	19.3	28.5	30.4	30.8
Compression-ignition engines (other than those for installation in tractors suitable for agricultural use) (660.42 and 660.43)-----	13.7	15.5	21.0	17.3	21.4
Aircraft engines (660.4415)-	.3	.4	.2	1.0	.6
Automobile, truck, and bus engines (other than compression-ignition engines) (660.4430 and 660.45)-----	18.1	27.3	114.4	130.9	197.7
Outboard motors for marine craft (660.4440)-----	2.6	2.9	1.6	2.1	2.2
Other piston-type engines (660.4450)-----	1.1	3.9	2.8	7.4	16.4
Nonpiston-type engines:					
Turbojet and gas turbine aircraft engines, new (660.4620)-----	5.6	17.0	30.2	27.9	30.0
Other nonpiston-type aircraft engines (660.4640)--	1.4	2.8	2.4	1.9	7.3
Other nonpiston-type engines (660.4660 and 660.4700)---	.3	.8	2.8	10.3	12.7
Parts:					
Cast-iron parts, not further advanced (660.50 and 660.51)-----	3.3	7.0	7.6	5.9	8.8
Parts of piston-type engines other than compression-ignition engines (660.52 and 660.53)-----	31.3	49.3	68.1	70.1	93.8
Other parts (660.54 and 660.55)-----	29.5	32.2	41.8	61.0	72.7
Total-----	114.4	178.4	321.4	366.2	494.4

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

Table 5.--Internal combustion engines and parts: U.S. imports for consumption, by principal sources, 1964-68

(In millions of dollars)

Source	1964	1965	1966	1967	1968
Canada ^{1/} -----	57.9	84.7	193.0	222.8	313.7
United Kingdom-----	32.8	61.7	90.8	91.8	101.8
West Germany-----	15.3	20.4	23.7	32.7	46.1
Japan-----	1.5	4.1	5.1	7.6	14.2
Sweden-----	1.9	2.2	1.8	2.4	4.9
France-----	1.3	1.9	2.6	2.6	3.3
All other-----	3.7	3.4	4.4	6.3	10.4
Total-----	114.4	178.4	321.4	366.2	494.4

^{1/} Data include imports valued at \$3.2 million in 1965, \$124.9 million in 1966, \$139.7 million in 1967, and \$220.4 million in 1968 that were entered free of duty under the provisions of the Automotive Products Trade Act of 1965.

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

<u>Commodity</u>	<u>TSUS</u> <u>item</u>
Water engines, including governors and other parts-----	660.65, -.70

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1969).

U.S. trade position

Annual U.S. producers' shipments of the water engines and parts considered here (primarily hydraulic turbines and parts thereof) fluctuated during 1963-67 without any apparent trend. During 1965-67 the value of U.S. imports averaged \$6.5 million a year, the equivalent of 17 percent of estimated domestic consumption; during the same period, the value of exports averaged \$5.1 million a year, the equivalent of about 14 percent of U.S. producers' shipments.

Description and uses

This summary covers those engines which transform the energy possessed by moving water or water under pressure into mechanical power. These engines are generally operated by directing a moving mass of water, impelled by the force of gravity, onto paddles, blades, or helicoidal elements fitted to a wheel. This summary also includes governors and other parts.

A water wheel is a simple engine which consists of a large wheel fitted with flat or hollow paddles around its periphery, the axle of the wheel being generally fitted with a step-up gear. The mechanical power for water wheels is derived from the flow or fall of water against the paddles. The use of water wheels as a power source has declined for a number of years; however, such engines are still used in some rural communities, principally for grinding grain.

Hydraulic turbines, which account for virtually all of the trade in the water engines considered here, are used primarily to drive electric generators. These engines consist of a central rotating part, called a runner, which is encased in a scroll or housing. The runner is revolved by the flow or pressure of water being directed onto its blades; in generating electricity, the shaft of the runner is connected to the shaft of a generator.

Hydraulic turbines are built to last 50 years or more. The units are specially designed and constructed for each installation and therefore are not adaptable to mass production techniques. Their size

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and type are carefully adapted to the requirements of specific power sites. Four characteristic types of hydraulic turbines now in general use are the impulse wheel (Pelton) type, the reaction (Francis) type, the propeller reaction (Kaplan) type, and the reversible pump-turbine. The design and construction of large turbines often require two or more years. Some of the large units that have been built in the United States have ratings in excess of 300,000 horsepower; units currently being built for installation at Grand Coulee Dam will have ratings of about 800,000 horsepower. Hydraulic turbines and parts are generally large, bulky, and heavy, and their manufacture requires oversized plants and mammoth machine tools and related production machinery.

Large hydraulic turbines are generally delivered to the power sites in segments or subassemblies as the construction of the hydro-powerplant progresses. Their installation involves much steel and concrete work. In addition to the basic hydraulic turbine units, each hydroelectric powerplant includes governors. Governors (item 660.65) are devices that automatically regulate the flow of water to maintain a uniform speed of rotation of the runner despite variations in the load or head. The flow of water is regulated by moving the wicket gate of reaction turbines and the needle valve or jet deflector of impulse turbines.

Other water engines include units that produce mechanical power by utilizing the energy of the waves or the tides, and water column machines that are operated by the pressure of water on pistons. There has been no significant U.S. trade in these articles.

The U.S. Bureau of Customs held on April 6, 1964 (Treasury Decision 56-457 (45)), that certain reversible pump-turbines equipped with both a turbine runner and a pump impeller mounted on a common shaft and placed in a common housing were classifiable as turbines under item 660.70. These units operate as pumps by forcing water from a lower reservoir to a higher reservoir, thus creating a hydraulic power potential. These units also operate as turbines when water flows through them in the reverse direction. They are equally efficient as a pump or a turbine. In another decision, Treasury Decision 68-170(16), on May 28, 1968, the Bureau of Customs held that certain other reversible pump turbines which were much more efficient when used as pumps than as turbines--and which probably would be used as pumps approximately 70 percent of the time--were provided for as pumps under item 660.94 (discussed elsewhere in this volume).

Following the principle of Bureau of Customs decisions in other cases, a hydraulic turbine imported with an electric generator is an entirety if fitted thereto when imported, or if the machine or its framework is designed to receive the power unit, or if the shipment

includes a common base designed to receive both the turbine and the generator (see headnote 3, part 4, schedule 6). The entirety is classifiable under item 682.60 covering generators (see volume 6:10).

U.S. tariff treatment

The column 1 (trade-agreement) rates of duty applicable to imports (see general headnote 3 in the TSUSA-1969) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	U.S. concessions granted in 1964-67 trade conference (Kennedy Round)
			Second stage, effective Jan. 1, 1969
			Final stage, effective Jan. 1, 1972
	Water wheels, water turbines, and other water engines, and parts including governors therefor:		
660.65	Governors-----	\$2.25	\$1.80 each + \$1.12 each
			each + 28% ad val. + 17.5%
			35% ad val. ad val.
660.70	Other-----	15% ad val.	12% ad val. 7.5% ad val.

The tabulation above shows the column 1 rates of duty in effect prior to January 1, 1968, and modifications therein as a result of concessions granted by the United States in the sixth (Kennedy) round of trade negotiations under the General Agreement on Tariffs and Trade. The rates applicable to the items considered here will be reduced by 50 percent in five annual stages as a result of the aforementioned concessions. Only the second and final stages of the annual rate modifications are shown above (see the TSUSA-1969 for all of the staged rates). The prior rates shown in the preceding tabulation had remained unchanged under the TSUS from August 31, 1963, through 1967.

The average ad valorem equivalent of the compound rate of duty applicable to item 660.65, in effect on December 31, 1968, based on dutiable imports in 1968, was 31.6 percent.

U.S. consumption and production

Estimated apparent U.S. consumption (new installations) of water engines and parts declined in value from \$44 million in 1965 to \$34 million in 1967.

Significant fluctuations in consumption and shipments are attributable in part to the unique nature of the hydraulic turbine business. The value of individual turbine contracts is large; many are in the \$1 million to \$3 million range, and some are much larger. Thus the number of contracts awarded each year is small, and an individual contract may represent a substantial share of the average annual bookings of the entire domestic industry. U.S. producers have advised the U.S. Tariff Commission that in some years certain domestic producers failed to receive a single order for hydraulic turbines.

Important factors that will affect future consumption of hydraulic turbines are the availability of suitable sites for new hydro-power-plants and the cost effectiveness of these plants in relation to thermal powerplants (both nuclear and fossil-fueled types). The development of pump-turbines (which has made possible a new method of meeting peak load demands on electric power systems) has increased the market potential for hydraulic turbines. Nevertheless, hydraulic turbines, which currently provide mechanical power for producing about 18 percent of all the electric power consumed in the United States, will probably account for a diminishing share of the power-generating capacity to be installed in the United States in future years.

Domestic customers for hydraulic turbines include such Federal Government agencies as the U.S. Army Corps of Engineers, the Tennessee Valley Authority, and the U.S. Bureau of Reclamation; others include municipal and State power authorities and private utility companies. Approximately half of the total orders placed with domestic turbine producers in recent years, based on value, have been awarded by U.S. Government agencies.

The estimated value of U.S. producers' shipments of water engines and parts increased from \$25 million in 1963 to \$40 million in 1965, and then declined to \$35 million in 1966 and 1967 (table 1). These estimates are based in part on reports by the Edison Electric Institute on U.S. producers' shipments of hydraulic turbines rated at 5,000 horsepower and more. Such shipments (including exports) for 1963-67 are as follows:

<u>Year</u>	<u>Number of units</u>	<u>Rated capacity in 1,000 horsepower</u>
1963-----	26	2,175
1964-----	28	3,063
1965-----	33	3,854
1966-----	30	3,192
1967-----	28	3,028

U.S. producers

There are four U.S. producers of hydraulic turbines: Allis Chalmers Manufacturing Co., York, Pa.; Baldwin-Lima-Hamilton Corp., Eddystone, Pa.; Newport News Shipbuilding & Dry Dock Co., Newport News, Va.; and The James Leffel & Co., Springfield, Ohio. Each of these firms operates a hydraulic-turbine-manufacturing facility at the location noted. The Willamette Iron & Steel Co., Portland, Oreg., also bids on and accepts contracts for hydraulic turbines; however, much of its work in this field is subcontracted, especially to Canadian firms.

The number of producers of water wheels, governors, and parts for the articles considered here is unknown.

The number of establishments in which hydraulic turbines were produced declined from six in 1958 to five in 1959 and to four in 1963. It is believed that employment in the production of turbines and such component parts as castings and controls has also declined during the past decade.

Because of the wide fluctuations in the number and value of orders received for hydraulic turbines, producers endeavor to supplement turbine operations by securing other business for production in their turbine-manufacturing establishments. Such production, which consists largely of machining components for heavy industrial equipment and defense material, permits the producers to allocate part of their high fixed costs to production of articles other than turbines.

U.S. exports

The value of annual U.S. exports of water turbines and other water engines, including parts, increased from \$4.8 million in 1965 to \$5.5 million in 1967, and then declined to \$4.9 million in 1968. During 1965-68, exports of parts of water turbines and other water engines accounted for 48 percent of the total value of exports; water turbines and other water engines accounted for 45 percent, and hydraulic turbines contained in hydraulic turbine generator sets accounted for the remaining 7 percent (for dollar amounts, see table 2).

Since the early 1950's, U.S. producers of hydraulic turbines have encountered severe price competition in export markets. In recent years, exports of turbines have been limited almost exclusively to those destined to areas where financing by Federal Government agencies required the purchase of equipment built in the United States. U.S. producers, however, sometimes have an advantage in competing for orders for repair parts because many of the units installed in foreign countries during past years were of U.S. origin; the U.S. producer of the original turbine possesses patterns for castings and has manufacturing experience which is often of value in competing for the replacement parts.

The principal markets for U.S. exports of water engines and parts during 1965-68 were Greece, Canada, and Brazil (table 3).

U.S. imports

The value of U.S. imports of water engines and parts increased from \$3.1 million in 1963 to \$8.6 million in 1965, and then declined to \$3.8 million in 1968. The foreign value of imports was equal to 20, 17, and 14 percent of the estimated value of apparent U.S. consumption in 1965, 1966, and 1967, respectively. If these ratios were based on the landed duty-paid values of imports, they would have been somewhat larger.

During 1964-68, imports of parts for water engines (other than governors) represented 87 percent of the total value of the imports of all articles covered by this summary (for dollar amounts, see table 4); imports of complete water engines accounted for the remaining 13 percent, imports of governors were insignificant (less than half of 1 percent). Parts account for the great bulk of the imports because (1) large hydraulic turbines are almost invariably shipped as parts--with shipments spread over an extended period of time--with the result that shipments of some units may not be completed in any given calendar year and (2) certain U.S. turbine producers have found it necessary to purchase major components (e.g., integrally cast runners) from foreign

sources in order to compete successfully in obtaining new business; this practice has resulted in U.S. producers importing significant quantities of parts.

The great bulk of the hydraulic turbines and parts imported during 1963-68 were for U.S. Government projects, principally those of the U.S. Bureau of Reclamation. An analysis of bid abstracts relating to these procurements indicates that foreign bidders frequently underbid the low domestic bidder for these contracts by more than 50 percent.

In 1965-68, Japan was the principal source of the imports considered here, accounting for 65 percent of the aggregate value of such imports during the 4-year period. Other important sources of imports in recent years have been Sweden, Canada, and West Germany (table 5).

Imports and the Buy-American Act.--Since a large part of the hydraulic turbine projects in the United States are Federal Government projects, the extent to which domestic producers rather than foreign producers provide the turbines and parts for these projects is greatly influenced by the Buy-American Act and the manner in which it is interpreted and applied. The Buy-American Act as supplemented by Executive Order 10582 (3 CFR, 1954-1958 Comp., 230) and pertinent Federal procurement regulations permits purchase by executive departments of the U.S. Government of products of foreign origin to be delivered in the continental United States, generally, if the cost of the domestic product exceeds the cost of the foreign product, including duty, by 6 percent (or by 12 percent if the domestic firm is situated in a "labor distress" area). Executive Order 10582 also provides that--

For the purposes of this order materials shall be considered to be of foreign origin if the cost of the foreign products used in such materials constitutes fifty per centum or more of the cost of all the products used in such materials.

This latter provision has made it possible for domestic producers of hydraulic turbines to benefit from Buy-American Act protection even though the turbines may contain foreign components equal to 49.9 percent of the contract price.

Investigation by the Office of Emergency Planning (OEP) concerning the effect of imports on the national security.--In accordance with the provisions of section 232 of the Trade Expansion Act of 1962, the OEP initiated an investigation in January 1963, at the request of the four domestic producers of hydraulic turbines to determine whether U.S. imports of hydraulic turbines were threatening to impair the national security. As a result of the investigation, on December 30, 1963, the Director of OEP announced his finding that such imports

were not threatening to impair the national security. The Director's announcement further stated that the difficulties of the domestic producers "can be traced largely to the uneven pattern of hydraulic-turbine contract awards, burdens of unused capacity, rising costs, and the problems of maintaining a competitive status."

In a report issued simultaneously with the aforementioned announcement, the OEP noted that from 1958 through October 1963 domestic producers of hydraulic turbines were awarded 58 percent of the horsepower and 68 percent of the value of the cumulative contract awards for hydraulic turbines that were placed by Federal Government agencies. During the January 1958-October 1963 period, awards to both foreign and domestic producers by Federal Government agencies involved equipment with a total of 10 million horsepower and a value of \$79.3 million.

Table 1.--Water turbines and other water engines, including parts:
U.S. producers' shipments, imports for consumption, exports of domestic merchandise, and apparent consumption, 1963-68

Year	U.S. producers' shipments ^{1/}	Imports	Exports	Apparent consumption ^{1/}	Ratio of imports to consumption ^{1/}
	<u>1,000 dollars</u>	<u>1,000 dollars</u>	<u>1,000 dollars</u>	<u>1,000 dollars</u>	<u>Percent</u>
1963-----	25,000	^{2/} 3,087	^{3/}	^{3/}	^{3/}
1964-----	35,000	5,113	^{3/}	^{3/}	^{3/}
1965-----	40,000	8,617	^{4/} 4,778	43,839	20
1966-----	35,000	6,146	^{4/} 5,037	36,109	17
1967-----	35,000	4,625	^{4/} 5,463	34,162	14
1968-----	^{3/}	3,847	^{4/} 4,881	^{3/}	^{3/}

^{1/} Estimated by the staff of the U.S. Tariff Commission (estimates based in part on data published by the Edison Electric Institute on U.S. producers' shipments of hydraulic turbines rated at 5,000 horsepower and more).

^{2/} Does not include the value of governors; however, such imports are believed to have been negligible.

^{3/} Not available.

^{4/} Includes two-thirds of the value of U.S. exports of hydraulic turbine generator sets.

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

WATER ENGINES

Table 2.--Water turbines and other water engines, including parts:
U.S. exports of domestic merchandise, by types, 1965-68

(In thousands of dollars)

Type	1965	1966	1967	1968
Water turbines and water engines--	947	3,122	2,565	2,459
Parts for water turbines and water engines-----	2,847	1,887	2,733	2,278
Hydraulic turbines contained in hydraulic turbine generator sets, assembled or unassem- bled <u>1/</u> -----	984	28	165	144
Total-----	4,778	5,037	5,463	4,811

1/ The value of hydraulic turbines contained in hydraulic turbine generator sets was estimated at two-thirds of the value of the complete sets.

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

Table 3.--Water turbines and other water engines, including parts:
U.S. exports of domestic merchandise, by principal markets,
1965-68 1/

(In thousands of dollars)

Market	1965	1966	1967	1968
Greece-----	1	659	1,190	1,505
Canada-----	826	761	988	858
Japan-----	55	26	106	550
West Germany-----	42	46	433	375
France-----	57	21	398	330
Brazil-----	15	2,077	1,234	223
Mexico-----	94	122	43	192
All other-----	<u>2/</u> 3,688	<u>3/</u> 1,325	1,071	848
Total-----	4,778	5,037	5,463	4,881

1/ Partly estimated by the staff of the U.S. Tariff Commission.

2/ Includes exports valued at 938 thousand dollars to Peru, 761 thousand dollars to Liberia, 514 thousand dollars to Turkey, and 463 thousand dollars to Libya.

3/ Includes exports valued at 303 thousand dollars to Liberia.

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

WATER ENGINES

Table 4.--Water wheels, water turbines, and other water engines, including parts: U.S. imports for consumption, by types, 1964-68

(In thousands of dollars)

Type	1964	1965	1966	1967	1968
Water wheels, water turbines, and other water engines-----	1,269	1,182	14	695	334
Governors-----	4	41	-	1	9
Parts (except governors) for water wheels, water turbines, and other water engines-----	3,840	7,394	6,132	3,929	3,504
Total-----	5,113	8,617	6,146	4,625	3,847

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

Table 5.--Water wheels, water turbines, and other water engines, including parts: U.S. imports for consumption, by principal sources, 1963-68

(In thousands of dollars)

Source	1963 ^{1/}	1964	1965	1966	1967	1968
Japan-----	6	590	5,223	4,079	3,314	2,520
West Germany-----	34	180	995	292	11	1,154
United Kingdom-----	7	19	55	293	457	67
Canada-----	2,398	2,971	1,253	10	91	33
Sweden-----	37	-	949	1,466	718	18
Switzerland-----	3	2	142	6	30	9
Belgium and Luxembourg-----	595	1,351	-	-	1	-
All other-----	7	-	-	-	3	46
Total-----	3,087	5,113	8,617	6,146	4,625	3,847

^{1/} Data do not include the value of imports of governors and therefore, are not fully comparable with those for subsequent years. It is believed that imports of governors were negligible in 1963.

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

<u>Commodity</u>	<u>TSUS</u> <u>item</u>
Hydrojet engines for motorboats and parts---	660.75
Spring-operated and weight-operated motors--	660.80
Nonelectric engines and motors, not specially provided for; and parts---	660.85, -.86

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1969).

U.S. trade position

The aggregate value of U.S. production and consumption of the diverse group of nonelectric engines and motors considered here is believed to have increased annually during 1964-68, probably rising from \$30 million to \$60 million a year. In that period, imports (consisting primarily of hydraulic motors) averaged about \$1.4 million a year, and were small in relation to estimated production, consumption, and exports.

Description and uses

Hydrojet engines, for propelling motorboats (item 660.75) consist of a pump which takes in water and ejects it with varying amounts of force through an adjustable nozzle under or behind the boat.

Spring-operated motors (item 660.80) include mechanisms which are driven, in the manner of clockworks, by the energy of a woundup spring. (Clock movements and watch movements as such are covered by item 720.02 to 720.18 and 716.08 to 719.--, respectively). Spring-operated motors are used to operate such articles as toys, phonographs, music boxes, barbecue turnspits, and moving-picture cameras. Weight-operated motors, also included in item 660.80, are operated by gravity through the utilization of counterweights or similar devices. These units are used for such applications as raising and lowering garage doors.

Other nonelectric engines and motors considered here (items 660.85 and 660.86) include, but are not limited to, wind engines (windmills) and pneumatic and hydraulic motors. Wind engines convert the force of the wind on the blades of a propeller or rotor into mechanical energy. Propellers for these engines are usually mounted on a tower; they have an arm perpendicular to their plane of rotation which forms a vane for orienting the propeller according to the direction of the wind. Wind engines are used principally in rural areas

for driving pumps or small electric generators. Pneumatic engines in principle resemble steam engines or turbines; however, they are driven by compressed air (or a gas) rather than by expanding steam. These engines are sometimes used as auxiliary starting motors for internal combustion engines and to provide power for tractors, winches, or drills in mines. Their use in mines is in part attributable to their safety value in guarding against firedamp explosions. Hydraulic motors, as distinguished from the water wheels, water turbine, and other water engines referred to in the TSUS (item 660.70), convert pressure applied to a fluid (generally oil) into mechanical energy. Pressure for actuating the piston(s) or rotor(s) of the motor is developed by a pump which may be a separate unit or an integral part of the motor covered by this summary. Hydraulic motors are used primarily as secondary power sources in farm machinery, machine tools, motor vehicles, aircraft, materials-handling equipment, and construction machinery. In recent years most of the value of imports, as well as U.S. production and consumption of all engines and motors discussed in this summary, has been accounted for by hydraulic motors.

Other nonelectric engines and motors, not covered by this summary, are steam engines and turbines, internal combustion engines (some used with hydrojet engines for boats), and water engines, all of which are discussed in other summaries in this volume. Articles related to the engines and motors covered by this summary but discussed in other summaries of this volume are air or gas compressors for use with pneumatic motors (item 661.12) and pumps for use with hydraulic motors (item 660.94). Certain hydraulic or pneumatic cylinders, which are referred to as linear motors are entered under item 678.50 as machines not specially provided for.

U.S. tariff treatment

The column 1 (trade-agreement) rates of duty applicable to imports (see general headnote 3 in the TSUSA-1969) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	U.S. concessions granted in 1964-67 trade conference (Kennedy Round)	Second stage, effective Jan. 1, 1969	Final stage, effective Jan. 1, 1972
	Nonelectric engines and motors not specially provided for, and parts:				
660.75	Hydrojet engines for motorboats, and parts.	12% ad val.	9.5% ad val.	6% ad val.	
660.80	Spring-operated and weight-operated motors.	20% ad val.	16% ad val.	10% ad val.	
660.85	Other-----	9% ad val.	7% ad val.	4.5% ad val.	
660.86	If Canadian article and original motor-vehicle equipment.	Free	<u>1/</u>	<u>1/</u>	

1/ Duty-free status not affected by the trade conference.

The tabulation above shows the column 1 rates of duty in effect prior to January 1, 1968, and modifications therein as a result of concessions granted by the United States in the sixth (Kennedy) round of trade negotiations under the General Agreement on Tariffs and Trade. Only the second and final stages of the five annual rate modifications are shown above (see the TSUSA-1969 for all of the staged rates).

Item 660.86 provides for duty-free entry of Canadian articles that are original motor-vehicle equipment (see general headnote 3 of the TSUS). This provision was established pursuant to the enactment of the Automotive Products Trade Act of 1965 (see Presidential Proclamation 3682 of October 21, 1965) which provided for duty-free entry retroactive to January 18, 1965. From the effective date of the TSUS, August 31, 1963, to January 17, 1965, these articles were classified under the appropriate dutiable provisions of the TSUS. The duty-free status of the Canadian articles was not affected by the recent trade conference. The prior rates shown in the preceding tabulation for the other items considered here had remained unchanged under the TSUS from August 31, 1963, through 1967.

U.S. producers

There are about eight U.S. producers of hydrojet engines for boats, three producers of windmills, and about 40 producers of hydraulic motors. The number of producers of the other types of nonelectric engines considered here is unknown. Production of hydrojet engines for boats is concentrated in California and Ohio; production of windmills, in Oklahoma, Nebraska, and Ohio; and that of hydraulic motors, in the East North Central and West North Central States.

The concerns that produce the nonelectric engines and motors covered here almost invariably produce other articles. For example, producers of hydrojet engines for boats also produce pumps; producers of hydraulic and pneumatic motors frequently produce hydraulic fluid power pumps, compressors, fluid power cylinders, or fluid power valves; and concerns that make spring-operated motors generally also make toys and other assemblies that utilize such motors. It is believed that nonelectric engines and motors account for a relatively small part of the total output of most producers of these articles.

U.S. production, consumption, and exports

Data are not separately reported in the official statistics on U.S. production, consumption, or exports of most of the articles considered in this summary; however, it is known that hydraulic motors represented the greatest part of the aggregate value of both production and consumption of these articles. The U.S. Department of Commerce reported that in 1964 U.S. producers' shipments of hydraulic motors were valued at \$27.8 million and those of pneumatic motors at \$1.8 million. Annual shipments of hydraulic motors increased substantially during 1965-68 because of increased production of aircraft, farm machinery, machine tools, construction machinery, and specialized motor vehicles that utilize these motors; furthermore, producers of the aforementioned products are making more extensive use of these motors within their product lines.

Consumption and production of hydrojet engines for boats has also increased during recent years and will probably continue to increase for the next several years owing to the anticipated growth in demand for pleasure boats and to the shallow water operating characteristics of the hydrojet engines.

Spring-operated motors have been largely replaced by electric motors in such appliances as phonographs and barbecue turnspits; however, it is likely that the decline in consumption for these purposes has been somewhat offset by the increased usage of spring motors in toys, music boxes, and other articles.

U.S. producers' shipments of windmill heads declined irregularly during 1962-65 (the most recent years for which such data are available), as indicated in the following tabulation:

<u>Year</u>	<u>Quantity</u> <u>(number)</u>	<u>Value</u> <u>(1,000 dollars)</u>	<u>Unit</u> <u>value</u>
1962----	6,521	1,010	\$155
1963----	7,562	1,597	211
1964----	5,619	456	81
1965----	5,608	496	88

Shipments of windmills in recent years have been only a small part of the record high of 99,000 units shipped by 25 U.S. producers in 1928. The decline in shipments has resulted from widespread rural electrification programs. However, working windmills are still sold to cattle and sheep ranchers for pumping water in remote areas where it would cost too much to string power lines; another market includes persons who buy windmills for nostalgic reasons or for use as advertising devices. Members of some religious sects also buy windmills for use on their farms because their faith forbids the use of gasoline engines or electricity.

Exports of nonelectric engines and parts probably accounted for about 15 percent of the value of U.S. producers' annual shipments during 1965-68. Exports of the various types of motors considered here were not separately reported, but it is believed that exports of hydrojet engines for boats, hydraulic motors, and windmills were large in relation to domestic production, whereas exports of spring-operated and weight-operated motors were negligible.

U.S. imports

The value of U.S. imports of nonelectric engines and motors declined from \$1.3 million in 1964 to \$0.8 million in 1966 and then increased to \$2.2 million in 1968 (table 1). Imports of hydrojet engines for motor boats (item 660.75) and spring-operated and weight-operated motors (item 660.80) have been small. During 1964-68 almost 95 percent of the aggregate value of the imports considered here was accounted for by entries under item 660.85. The great bulk of these imports consisted of hydraulic motors from the United Kingdom (table 2). During 1965-68, no imports were entered free of duty under item 660.86.

NONELECTRIC ENGINES AND MOTORS, NOT ELSEWHERE ENUMERATED

Table 1.--Nonelectric engines and motors, not elsewhere enumerated, including parts: U.S. imports for consumption, by type, 1964-68

(In thousands of dollars)

Type	1964	1965	1966	1967	1968
Hydrojet engines for motorboats: and parts thereof-----	-	<u>1/</u>	-	1	38
Spring-operated and weight- operated motors-----	28	130	35	23	149
Other, principally hydraulic motors-----	1,255	1,038	729	1,532	2,017
If Canadian article and original motor-vehicle equipment-----	<u>2/</u>	<u>2/</u>	-	-	-
Total-----	1,283	1,168	764	1,556	2,204

1/ Less than \$500.

2/ Not separately reported in this year.

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

Note.--Data on production, exports, and consumption of the nonelectric engines and motors considered here are not separately reported in the official statistics; it is estimated, however, that the value of annual U.S. producers' shipments of these engines, and parts thereof, during 1964-68 ranged from \$30 million to \$60 million; exports probably accounted for about 15 percent of the total value of U.S. producers' shipments.

Table 2.--Miscellaneous nonelectric engines and motors, including parts: U.S. imports for consumption, by principal sources, 1964-68

(In thousands of dollars)

Source	1964	1965	1966	1967	1968
United Kingdom-----	252	456	539	1,221	1,200
West Germany-----	7	7	33	30	410
Canada-----	988	569	126	58	146
Japan-----	2	8	48	34	114
Denmark-----	-	-	-	125	86
Finland-----	-	-	-	48	51
Switzerland-----	28	127	4	3	47
All other-----	6	1	14	37	1/ 150
Total-----	1,283	1,168	764	1,556	2,204

1/ Includes imports from Sweden valued at 102 thousand dollars.

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

<u>Commodity</u>	<u>TSUS</u> <u>item</u>
Fuel injection pumps for compression-ignition engines, and parts-----	660.92, --.93
Pumps for liquids, other than fuel injection pumps for compression-ignition engines, and parts-----	660.94, --.95
Air and gas compressors and parts-----	661.12, --.13
Air pumps and vacuum pumps and parts-----	661.15, --.16

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1969).

U.S. trade position

Annual U.S. consumption, production, imports, and exports of pumps and compressors increased substantially during 1964-68. In 1968 the value of apparent U.S. consumption was probably about \$2.4 billion. The value of imports of these articles increased from \$16.1 million in 1964 to \$52.7 million in 1968; however, the value of imports in 1968 was still small in relation to consumption (accounting for slightly more than 2 percent of apparent U.S. consumption) and was equal to about 14 percent of the value of exports.

Description and uses

This summary covers pumps for liquids, whether or not fitted with measuring devices; liquid elevators of bucket, chain, screw, band, and similar types; air or gas compressors; air pumps; vacuum pumps; and parts of all of the foregoing. These articles may be operated by hand or by any kind of power unit, integral or otherwise. The summary does not include those pumps or compressors which are upon importation, entireties with other articles such as engines. As separate items of commerce, however, they are included in this summary whether or not they are parts for engines or other articles.

Fuel-injection pumps for compression-ignition (diesel) engines (items 660.92 and 660.93) are used to pump measured amounts of fuel into the combustion chambers of these engines. The fuel is injected into the combustion chamber through an atomizing nozzle. Such nozzles as separate articles, in accordance with a Bureau of Customs ruling (Treasury Decision 56241(30)) are not parts of fuel injection pumps but are for tariff purposes parts of compression-ignition engines (item 660.54, included in another summary in this volume).

Other pumps for liquids and liquid elevators (items 660.94 and 660.95) include many devices for raising, displacing, or applying pressure to liquids. These devices vary widely in size, cost, design, complexity, and method of operation. They are used in such diverse applications as pumping water in domestic and municipal water systems, circulating oil and water in internal combustion engines (including those used in motor vehicles), removing water from construction sites, and moving petroleum products by pipeline; they are also used in hydraulic mining and quarrying, in irrigation systems, and in moving liquids in chemical plants, petroleum refineries, and other manufacturing plants. Hydraulic fluid power pumps are used to drive hydraulic motors (items 660.85 and 660.86, discussed elsewhere in this volume). Pumps fitted with measuring (and sometimes price-computing) mechanisms are used to dispense gasoline and oil in motor-vehicle service stations.

Air and gas compressors (items 661.12 and 661.13) fall into two broad categories: displacement and rotodynamic machines. The displacement category includes reciprocating-piston units and several types of rotary compressors. The principal type of rotodynamic machine is the centrifugal compressor, which depends upon its high impeller velocity to develop pressure. Compressors are used extensively in moving gas by pipeline; in chemical processing plants; in air-conditioning and refrigeration equipment (items 661.20 and 661.35, discussed in this volume); in pneumatic conveyors and certain other materials-handling equipment (item 664.10, in this volume); in certain motor-vehicle brake systems (item 692.27, vol. 6:11); in driving compressed-air engines (items 660.85 and 660.86, in this volume); and in pneumatic tools (items 674.60 and 674.70, vol. 6:6).

Air pumps and vacuum pumps (items 661.15 and 661.16) include simple hand-operated air pumps used to inflate footballs, bicycle tires, air mattresses, and other articles; vibrating diaphragm pumps for use in small home aquariums; and vacuum pumps for use with milking machines, for evacuating electric lamps and electronic tubes, for degassing molten steel, and for reducing air pressure to facilitate such processes as boiling, distilling, and evaporating.

U.S. tariff treatment

The column 1 (trade-agreement) rates of duty applicable to imports (see general headnote 3 in the TSUSA-1969) are as follows:

PUMPS AND COMPRESSORS

TSUS item	Commodity	Rate prior to Jan. 1, 1968	U.S. concessions granted in 1964-67 trade conference (Kennedy Round)	
			Second stage, effective Jan. 1, 1969	Final stage, effective Jan. 1, 1972
	Pumps for liquids, whether or not fitted with measuring devices; liquid elevators of bucket, chain, screw, band, and similar types; all the foregoing, whether operated by hand or by any kind of power unit, and parts:			
660.92	Fuel injection pumps for compression-ignition engines, and parts.	6% ad val.	4.5% ad val.	3% ad val.
660.93	If Canadian article and original motor-vehicle equipment.	Free	<u>1/</u>	<u>1/</u>
660.94	Other-----	10% ad val.	8% ad val.	5% ad val.
660.95	If Canadian article and original motor-vehicle equipment.	Free	<u>1/</u>	<u>1/</u>
	Air pumps, vacuum pumps, and air or gas compressors (including free-piston compressors for gas turbines); all the foregoing, whether operated by hand or by any kind of power unit, and parts:			
661.12	Compressors and parts----	9.5% ad val.	7.5% ad val.	4.5% ad val.
661.13	If Canadian article and original motor-vehicle equipment.	Free	<u>1/</u>	<u>1/</u>

See footnote at end of table.

PUMPS AND COMPRESSORS

TSUS item	Commodity	Rate prior to Jan. 1, 1968	U.S. concessions granted in 1964-67 trade confe rence (Kennedy Round)	
			Second stage, effective Jan. 1, 1969	Final stage, effective Jan. 1, 1972
661.15	Air pumps, vacuum pumps, and air or gas com- pressors (including free-piston compres- sors for gas turbines); all the foregoing, whether operated by hand or by any kind of power unit, and parts--Con. Other-----	10.5% ad val.	8% ad val.	5% ad val.
661.16	If Canadian article and original motor- vehicle equipment.	Free	<u>1/</u>	<u>1/</u>

1/ Duty-free status not affected by the trade conference.

The tabulation above shows the column 1 rates of duty in effect prior to January 1, 1968, and modifications therein as a result of concessions granted by the United States in the sixth (Kennedy) round of trade negotiations under the General Agreement on Tariffs and Trade. Only the second and final stages of the five annual rate modifications are shown above (see the TSUSA-1969 for all of the staged rates).

The prior rates of duty applicable to items 661.12 and 661.15 had remained unchanged under the TSUS from August 31, 1963, through 1967.

The Tariff Schedules Technical Amendments Act of 1965 (TAA) created a specific provision for fuel injection pumps for compression-ignition engines (item 660.92) making them dutiable at 6 percent ad valorem. These pumps, as well as other pumps for liquids, had been dutiable at 12 percent ad valorem under previous item 660.90 from August 31, 1963, to December 7, 1965, the effective date of the TAA. The TAA at the same time created a new provision for "other pumps for liquids" (item 660.94) with duty at the rate of 10 percent ad valorem instead of the rate of 12 percent. These changes made the rates applicable to the aforementioned items consistent with the weighted average rates that had been applicable to such items prior to adoption of the TSUS (effective August 31, 1963). Although previously classified under item 660.90 as pump parts, ball bearings with integral shafts were shifted by the TAA to a new classification, item 680.33 (see summary in volume 6:10).

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Items 660.93, 660.95, 661.13, and 661.16 provide for duty-free entry of Canadian articles that are original motor-vehicle equipment (see general headnote 3 of the TSUS). These provisions were established pursuant to the enactment of the Automotive Products Trade Act of 1965 (see Presidential Proclamation 3682 of October 21, 1965), which provided for duty-free entry retroactive to January 18, 1965. From the effective date of the TSUS, August 31, 1963, to January 17, 1965, these articles were classified under the appropriate dutiable provisions of the TSUS. The duty-free status of the Canadian articles was not affected by the recent trade conference.

U.S. producers

In 1963, measuring and dispensing pumps were produced in 43 U.S. establishments, which employed about 6,800 workers. During that year five establishments that had between 500 and 1,000 employees each accounted for more than half of the total value of industry shipments; establishments that accounted for about two-thirds of the value of shipments were situated in the East North Central and Northeast States.

Compressors for use in air-conditioning and refrigeration equipment were produced as the primary product of 14 establishments, which employed about 6,300 persons in 1963. In addition to the establishments that produced such compressors as primary products, a number of establishments that primarily produced other air-conditioning and refrigeration equipment made these compressors as secondary products. Establishments in the East North Central States account for about three-fourths of the value of annual shipments of these compressors.

In 1967 pumps and compressors, including parts, for general industrial use were produced in more than 640 establishments, which employed more than 80,000 workers; 28 of these establishments accounted for approximately half of the total shipments. The principal secondary products produced by the industry making pumps and compressors are metal valves and fittings and parts and accessories for internal combustion engines. In recent years establishments in the East North Central States have accounted for about two-thirds of the value of domestic shipments of pumps and compressors for general industrial use.

Data on producers of fuel injection pumps for compression-ignition engines, automotive circulating pumps, and hydraulic fluid power pumps for automotive power-steering units are not separately reported in the official statistics. It is estimated that there are 10 producers of fuel injection pumps; although the number of manufacturers of automotive pumps is unknown, it is likely that the three largest U.S. automobile manufacturers account for the great bulk of the domestic output of these units.

U.S. consumption and producers' shipments

Annual U.S. consumption and producers' shipments of pumps and compressors increased substantially in 1964-68. The trend of annual U.S. consumption during this period was similar to that of annual producers' shipments (discussed below); however, the value of apparent U.S. consumption (estimated at about \$2.4 billion in 1968) was smaller than the value of producers' shipments because the value of annual exports was substantially larger than the value of annual imports (table 1).

The value of U.S. producers' shipments of pumps and compressors, according to official statistics of the U.S. Department of Commerce, rose from about \$1.8 billion in 1964 to \$2.3 billion in 1966; the value of shipments of comparable pumps and compressors in 1968 was estimated by the staff of the U.S. Tariff Commission at \$2.7 billion. The foregoing data on shipments, however, do not include all of the types of pumps and compressors that come within the scope of this summary. ^{1/}

All the principal categories of pumps and compressors for which data are available shared in the growth of shipments (table 2). The growth was especially rapid during 1964-66 in shipments of hydraulic fluid power pumps and vacuum pumps and of air and gas compressors, except refrigeration and air-conditioning compressors. The value of annual shipments of these two classes increased by 38 and 47 percent, respectively, during this 3-year period. The growth in consumption of pumps and compressors during 1964-68 is largely attributable to the broad-based demand for these products by such industries as steel, chemicals, oil and gas, paper and pulp, construction, and power generating. Demand for pumps and compressors has also continued to benefit from the stimuli of the 1962 investment tax credit legislation and the revised depreciation allowances of the Internal Revenue Service for capital equipment.

The outlook for continued growth in consumption of pumps and compressors is favorable because domestic producers are developing new and improved products and are aggressively promoting these products

^{1/} Data are not separately reported in official statistics for an undetermined value of producers' shipments of hand-operated pumps, fuel injection pumps for compression-ignition engines, automobile circulating pumps, hydraulic fluid power pumps for automobile power-steering units, and replacement and repair parts for pumps and compressors. Moreover, no data are available on U.S. production of the articles covered by this summary by the concerns that produce such articles exclusively for their own consumption (e.g., concerns that produce hydraulic fluid power pumps for incorporation into hydraulic systems for aircraft produced within the same establishment).

for use in hydraulic fluid power equipment (e.g. hydrostatic transmissions which utilize a fixed or variable displacement pump and motor are rapidly replacing conventional gear transmission for numerous applications), cryogenics, generating nuclear power, water desalinization, and vacuum degassing of steel.

U.S. exports

The value of U.S. exports of pumps and compressors, including parts, increased from \$263 million in 1965 to \$364 million in 1968, when they were equal to about 13 percent of U.S. producers' total shipments. In 1968 the value of these exports was almost equally divided between compressors and pumps for liquids (table 3). The success of U.S. producers' efforts to export pumps and compressors is largely attributable to the technological advances incorporated into domestic products. These products often feature sophisticated designs, high capacities, and special alloy construction. Export sales have also been aided by a growing demand in foreign countries for pumps and compressors for use in manufacturing synthetic fertilizers and for use in oil and gas industries.

Exports of parts and attachments for pumps and compressors, the value of which increased from \$94.9 million in 1965 to \$143.4 million in 1968, have benefited significantly from the establishment by U.S. producers of manufacturing plants in foreign countries and by the licensing of foreign firms to manufacture products that were developed in the United States.

Some of the important export markets for pumps and compressors during 1965-68 included Canada, Mexico, Venezuela, Iran, Japan, and the United Kingdom.

U.S. imports

The value of U.S. imports of pumps and compressors, including parts, rose from \$16.1 million in 1964 to \$52.7 million in 1968, representing an increase of 227 percent. In the aggregate, U.S. imports accounted for 2.2 percent of the value of apparent U.S. consumption of pumps and compressors in 1968; however, it is known that imports account for a much larger percentage of domestic consumption of certain types of pumps for which trade data are not separately reported, e.g., hand-operated pumps for inflating bicycle and automobile tires and vibrating diaphragm pumps for aerating home aquariums.

Imports of fuel injection pumps and parts for compression-ignition engines, which were not separately reported in the official statistics until December 1965, declined in value from \$4.6 million in 1966 to \$4.0 million in 1967, and then rose to \$4.5 million in 1968 (table 4). West Germany and Italy supplied 48 and 31 percent, respectively, of imports of these pumps and parts in 1968.

Imports of pumps for liquids, other than fuel injection pumps and parts, were valued at \$11.5 million in 1966 and \$15.4 million in 1968. Many different types of pumps have been entered under this provision; they include pumps for use in aircraft hydraulic systems, aircraft fuel pumps, automotive circulating pumps, submersible pumps, metering pumps, portable water pumps, and many other types.

Imports of refrigeration and air-conditioning compressors increased from 9,947 units, valued at \$0.2 million, in 1964 to 192,113 units, valued at \$3.6 million, in 1968. The average unit value of 1968 imports was \$18.89 (based on unrounded figures), which indicates that the imports were probably small units, such as those used in household refrigerators. Denmark and Italy have been the principal sources of these imports. The value of imports of all other types of compressors and parts of compressors rose from \$6.3 million in 1964 to \$19.0 million in 1968. These imports included sophisticated, large-capacity units for industrial applications, e.g., those for use in air separation plants; some of these units were produced by foreign affiliates of U.S. concerns.

Imports of articles considered here which were entered free of duty under the Automotive Products Trade Act of 1965 increased from \$2.1 million in 1966 to \$4.8 million in 1968. The great bulk of these imports (93 percent of the total in 1968) consisted of articles entered under item 660.95, which covers pumps for liquids, other than fuel injection pumps.

Aggregate imports in 1964-68 of the articles considered in this summary, by principal sources, are shown in table 5.

Table 1.--Pumps and compressors, including parts: U.S. producers' shipments, imports for consumption, exports of domestic merchandise, and apparent consumption, 1964-68

Year	U.S. producers' shipments ^{1/}	Imports	Exports	Apparent consumption	Ratio of imports to consumption
	Million dollars	Million dollars	Million dollars	Million dollars	Percent
1964-----	1,836.0	16.1	<u>2/</u>	<u>2/</u>	<u>2/</u>
1965-----	2,095.4	27.5	<u>262.7</u>	1,860.2	1.5
1966-----	2,331.2	36.1	307.4	2,059.9	1.8
1967-----	<u>3/</u> 2,550.0	43.6	355.1	<u>3/</u> 2,238.5	<u>3/</u> 1.9
1968-----	<u>3/</u> 2,700.0	52.7	364.1	<u>3/</u> 2,388.6	<u>3/</u> 2.2

^{1/} U.S. producers' shipments are understated in relation to imports and exports because they do not include the value of shipments and interplant transfers of certain types of pumps and compressors for which data are not separately reported in the official statistics (see footnote 1 to section on U.S. consumption and producers' shipments.

^{2/} Not available.

^{3/} Estimated by the staff of the U.S. Tariff Commission.

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

Note.--The ratios of imports to apparent consumption would be somewhat higher if import values used in the computations represented landed duty-paid values rather than foreign values.

Table 2.--Pumps and compressors, including parts: U.S. producers' shipments, by types, 1964-66 ^{1/}

(In millions of dollars)

Type	1964	1965	1966
Measuring and dispensing pumps-----	133.9	144.6	163.6
Hydraulic fluid power pumps and vacuum pumps-----	153.2	179.5	211.9
Industrial pumps, except hydraulic fluid power pumps and vacuum pumps-----	361.3	392.3	417.9
Domestic water systems and pumps-----	83.4	83.7	96.5
Refrigeration and air-conditioning compressors-----	304.0	336.5	380.3
Air and gas compressors, except refrigeration and air-conditioning compressors-----	318.7	389.5	467.4
Pumps and compressors, not elsewhere classified-----	195.2	220.2	229.0
Parts and attachments for pumps and compressors-----	286.3	349.1	364.6
Total-----	1,836.0	2,095.4	2,331.2

^{1/} The data shown are understated in that they do not include the value of shipments and interplant transfers of certain types of pumps and compressors for which data are not separately reported in the official statistics (see text, p. 72).

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

Table 3.--Pumps and compressors, including parts: U.S. exports of domestic merchandise, by types, 1965-68

(In millions of dollars)

Type	1965	1966	1967	1968
Measuring and dispensing pumps for liquids-----	7.0	7.1	8.3	6.5
Hydraulic fluid power pumps-----	13.3	21.5	21.9	20.2
Other pumps for liquids-----	67.4	80.0	83.9	84.0
Parts and attachments for pumps for liquids-----	50.0	54.8	63.2	74.0
Vacuum pumps and air pumps-----	4.9	6.2	7.4	6.6
Refrigeration and air-conditioning compressors-----	18.6	21.8	25.1	29.9
Parts for refrigeration and air-conditioning compressors-----	10.5	11.0	12.8	15.2
Air compressors, n.e.c. 1/-----	28.2	31.2	27.3	31.5
Gas compressors, n.e.c. 1/-----	28.4	29.3	54.3	42.0
Parts and attachments for pumps for gases and air and gas compressors, n.e.c. 1/-----	34.4	44.5	50.9	54.2
Total-----	262.7	307.4	355.1	364.1

1/ Not elsewhere classified.

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

PUMPS AND COMPRESSORS

Table 4.--Pumps and compressors, including parts: U.S. imports for consumption, by types, 1964-68

(In thousands of dollars)					
Type	1964	1965	1966	1967	1968
Pumps for liquids, including parts:					
Fuel injection pumps for compression-ignition engines and parts-----:)			(4,556	3,973	4,530
If Canadian article and original motor-:)			(
vehicle equipment--:)			(46	20	11
Other, including parts-:)	7,365	12,280	(11,466	13,442	15,407
If Canadian article and original motor-:)			(
vehicle equipment--:)			(2,054	2,282	4,506
Compressors, including parts:					
Refrigeration and air-conditioning compressors-----:)	157	1,419	(2,459	3,182	3,630
Other (except parts)---:)			(8,269	10,905	9,967
Parts of compressors---:)			(4,143	6,158	8,989
If Canadian article and original motor-:)	6,298	10,636	(
vehicle equipment--:)			(13	28	182
Air pumps and vacuum pumps, including parts-----:)			(3,105	3,552	5,311
If Canadian article and original motor-:)	2,237	3,189	(
vehicle equipment----:)			(1	78	133
Total-----:)	16,057	27,524	(43,619	42,810	52,666

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

Table 5.--Pumps and compressors, including parts: U.S. imports for consumption, by principal sources, 1964-68

(In thousands of dollars)

Source	1964	1965	1966	1967	1968
West Germany-----	2,307	3,630	8,629	10,090	10,311
United Kingdom-----	4,695	8,029	9,509	9,824	9,128
Canada-----	3,108	7,571	8,199	8,577	15,854
Switzerland-----	1,312	1,198	1,343	2,362	1,896
Italy-----	137	223	1,296	3,688	4,046
France-----	1,243	1,009	1,030	1,865	1,439
Japan-----	700	1,775	1,231	1,911	3,770
Sweden-----	1,049	1,417	1,544	1,642	2,227
Denmark-----	163	1,222	1,801	1,754	985
All other-----	1,343	1,450	1,530	1,906	2,961
Total-----	16,057	27,524	36,112	42,810	52,666

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

CommodityTSUS
item

Fans and blowers, and parts thereof-- 661.09, -.10, -.11

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1969).

U.S. trade position

The value of U.S. consumption of fans and blowers, mostly industrial types, increased annually during 1964-67 and was about \$399 million in 1967. Imports have accounted for less than 1 percent of the value of apparent consumption in recent years, whereas exports represented about 4 percent of the value of U.S. producers' shipments in 1965-67.

Description and uses

This summary covers fans and blowers, whether operated by hand or by any kind of power unit, and their parts. The great bulk of these devices are powered by electric motors. Fans and blowers are used to create a movement of air for heating, cooling, and ventilating purposes or for delivering or exhausting large volumes of air (or gas) at relatively low pressure. Fans and blowers are similar, except that a blower is designed to direct the air current, often through a tube, to a particular place, such as a working area in a mine or factory. An axial-flow (or screw type) fan or blower is designed to direct the flow of air in the direction of the axis of its rotor; a radial-flow fan or blower is one in which the air enters axially at the center and is discharged radially by centrifugal force.

Industrial fans and blowers and household fans are the two principal product classes considered here. Industrial fans and blowers vary widely in size and design. They are used in wind tunnels; in air pollution cleaning systems; in heating and cooling systems for residential, commercial, and public buildings (e.g., as parts of air-conditioning machines and furnaces); in snow-removal equipment; and for exhausting fumes and gases in mines, steel mills, factories, and chemical plants. Household fans include room fans (whether or not equipped with a tilting or oscillating device), table fans, wall-bracket fans, window-mounted fans, range and oven hood fans, kitchen fans, and floor or hassock types of fans. Household fans are used primarily for ventilating individual rooms.

Other articles covered by this summary include blowers for pipe organs and fans and blowers that are components for motor vehicles (e.g. fans for engine cooling, defrosting, and ventilating).

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FANS AND BLOWERS

U.S. tariff treatment

The column 1 (trade-agreement) rates of duty applicable to imports (see general headnote 3 in the TSUSA-1969) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	U.S. concessions granted in 1964-67 trade confer- ence (Kennedy Round)	
			Second stage, effective Jan. 1, 1969	Final stage, effective Jan. 1, 1972
	Fans and blowers, whether operated by hand or by any kind of power unit, and parts:			
661.09:	Blowers for pipe organs--	10% ad val.	8% ad val.	5% ad val.
661.10:	Other-----	14% ad val.	11% ad val.	7% ad val.
661.11:	If Canadian article and original motor- vehicle equipment.	Free	<u>1/</u>	<u>1/</u>

1/ Duty-free status not affected by the trade conference.

The tabulation above shows the column 1 rates of duty in effect prior to January 1, 1968, and modifications therein as a result of concessions granted by the United States in the sixth (Kennedy) round of trade negotiations under the General Agreement on Tariffs and Trade. Only the second and final stages of the five annual rate modifications are shown above (see the TSUSA-1969 for all of the staged rates).

Prior to the enactment of the TSUS on August 31, 1963, blowers for pipe organs were dutiable, as parts of pipe organs, at the trade-agreement rate of 10 percent ad valorem. After enactment of the TSUS, these blowers were classified under the provision for fans and blowers, dutiable at the trade-agreement rate of 14 percent ad valorem. The Tariff Schedules Technical Amendments Act of 1965 established a separate item (661.09), effective December 7, 1965, which provided for blowers for pipe organs, at the pre-TSUS rate.

The prior rate of duty applicable to item 661.10 had remained unchanged under the TSUS from August 31, 1963, through 1967. Item 661.11 provides for duty-free entry of Canadian articles that are original motor-vehicle equipment (see general headnote 3 of the TSUS). This provision was established pursuant to the enactment of the Automotive Products Trade Act of 1965 (see Presidential Proclamation 3682 of October 21, 1965),

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which provided for duty-free entry retroactive to January 18, 1965. From the effective date of the TSUS, August 31, 1963, to January 17, 1965, these articles were classified under the appropriate dutiable provisions of the TSUS. The duty-free status of the Canadian articles was not affected by the recent trade conference.

U.S. consumption

The value of apparent U.S. consumption of fans and blowers, not including automotive engine fans and automotive defrosting and ventilating fans, which are not separately reported in the official statistics, increased from about \$324 million in 1965 to \$399 million in 1967 (table 1). In 1967 industrial fans and blowers, including parts, accounted for about 70 percent of the value of aggregate U.S. consumption of both industrial and household types of fans and blowers.

The growth in consumption of industrial fans and blowers in recent years is attributable largely to the sustained strong demand for capital goods that has resulted from the construction of new industrial plants and the modernization and expansion of existing plants. The value of annual consumption of household types of fans declined slightly during 1964-66 as a result of a drop in new housing starts and the increased use of air-conditioners in lieu of fans; apparent consumption of household fans increased significantly in 1967.

U.S. producers

It is estimated that fans and blowers and parts thereof are produced in 300 U.S. establishments. A broad line of industrial or household types of fans and blowers is produced in some establishments, whereas only one type of fan (such as that used in motor-vehicle engine cooling systems) is produced in other establishments. Products other than fans and blowers as such are produced in certain of the establishments considered here; these products include electric motors, anti-air-pollution equipment, dust-collection equipment, air-conditioning equipment, furnaces, heaters, and motor-vehicle parts. Producing establishments are located primarily in the East North Central and Middle Atlantic States.

U.S. producers' shipments

Annual U.S. producers' shipments during 1964-67 of the two major product classes considered here were as follows (in millions of dollars):

<u>Class</u>	<u>1964</u>	<u>1965</u>	<u>1966</u>	<u>1967</u>
Industrial fans and blowers (including parts)-----	205	225	266	279
Household fans-----	<u>115</u>	<u>113</u>	<u>113</u>	<u>133</u>
Total-----	320	338	379	412

FANS AND BLOWERS

Shipments of fans and blowers, by type, in 1967, the most recent year for which such data are available, were valued as follows:

	<u>1,000</u> <u>dollars</u>
Industrial fans and blowers:	
Axial fans-----	38,297
Centrifugal fans and blowers-----	135,496
Propeller fans-----	24,318
Parts for industrial fans and blowers-----	40,072
Power roof ventilators-----	40,362
Total industrial blowers and fans-----	<u>278,545</u>
Electric fans other than industrial types:	
Desk and wall bracket (all sizes)-----	13,341
Window types of propeller fans (household)---	45,964
Rollabouts (mounted on portable stand), all sizes-----	9,008
Kitchen ventilating and exhaust fans-----	58,000
Other household electric fans (including high pedestal fans and floor or hassock types of fans-----	<u>7,154</u>
Total electric fans other than industrial type-----	<u>133,467</u>
Grand total-----	412,012

U.S. exports

The total value of annual U.S. exports of fans and blowers remained virtually unchanged during 1965-68, averaging \$15.7 million a year. Exports accounted for about 4 percent of the value of U.S. producers' **annual** shipments. The value of exports of industrial fans and blowers and their parts averaged about \$14 million a year during 1965-68 (table 2). In this period about 38 percent of the value of exports of industrial fans and blowers was accounted for by shipments to Canada.

U.S. exports of electric household types of fans declined in value from \$1.9 million in 1965 to \$1.6 million in 1968 (table 3). Canada and Venezuela were the principal markets for exports of these fans.

U.S. imports

The aggregate value of U.S. imports of fans, blowers, and parts increased annually, advancing from about \$1.2 million in 1964 to \$5.3 million in 1968 (table 4), or by more than 300 percent. The value of annual imports of blowers for pipe organs (item 661.09) averaged \$75,000 during 1966-68, the only years for which separate data are available. Imports of fans, blowers, and parts which are Canadian articles and original motor-vehicle equipment increased in value from \$0.4 million in 1966 to \$2.2 million in 1968. The value of imports of the other fans, blowers, and parts considered in this summary (item 661.10) rose from \$2.1 million in 1966 to \$3.0 million in 1968.

Canada accounted for 53 percent of the total value of U.S. imports of all types of fans, blowers, and parts during 1964-68 as indicated in table 5; a significant part of the imports from Canada consisted of snow blowers and parts and motor-vehicle fans and blowers. West Germany and Japan were other important sources of imports.

FANS AND BLOWERS

Table 1.--Fans and blowers: U.S. producers' shipments, imports for consumption, exports of domestic merchandise, and apparent consumption, 1964-68

(In thousands of dollars)

Year	: U.S. pro- : ducers' : shipments <u>1/</u> :	: Imports :	: Exports :	: Apparent : consump- : tion
1964-----	320,000	1,205	<u>2/</u>	<u>2/</u>
1965-----	338,000	1,708	15,491	324,000
1966-----	379,000	2,571	15,657	366,000
1967-----	412,000	3,312	15,849	399,000
1968-----	<u>2/</u>	5,286	15,891	<u>2/</u>

1/ Data on U.S. producers' shipments are not fully comparable with those shown for imports and exports because they do not include the value of shipments of automotive engine fans and automotive defrosting and ventilating fans.

2/ Not available.

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

Table 2.--Industrial fans, blowers, and parts: U.S. exports of domestic merchandise, by principal markets, 1965-68

(In thousands of dollars)

Market	1965	1966	1967	1968
Canada-----	5,279	5,683	5,638	4,717
Mexico-----	480	537	661	795
Chile-----	296	161	296	636
Netherlands-----	129	495	744	554
Japan-----	711	351	290	553
United Kingdom-----	458	644	421	513
Venezuela-----	353	287	278	452
Spain-----	329	156	124	441
West Germany-----	258	443	455	431
Australia-----	201	172	357	305
Philippines-----	211	217	347	277
Taiwan-----	249	45	339	201
All other-----	4,680	4,890	4,300	4,369
Total-----	13,634	14,081	14,250	14,244

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

Table 3.--Electric household types of fans: U.S. exports of domestic merchandise, by principal markets, 1965-68

Market	1965	1966	1967	1968
Canada-----	672	535	447	664
Venezuela-----	333	321	370	351
Mexico-----	67	57	87	117
Bahamas-----	53	73	92	101
Peru-----	23	34	59	25
France-----	103	22	26	23
All other-----	606	534	518	366
Total-----	1,857	1,576	1,599	1,647

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

FANS AND BLOWERS

Table 4.--Fans, blowers, and parts: U.S. imports for consumption, by types, 1964-68

(In thousands of dollars)

Description	1964 ^{1/}	1965 ^{1/}	1966	1967	1968
Blowers for pipe organs-----:)			(77	65	83
Other fans and blowers; and :)			(
parts, including parts for :)			(
pipe organ blowers-----:)	1,205	1,708	(2,090	2,570	2,996
Fans, blowers, and parts :)			(
which are Canadian arti- :)			(
cles and original motor- :)			(
vehicle equipment-----:)			(404	677	2,207
Total-----:)	1,205	1,708	2,571	3,312	5,286

^{1/} Data by TSUS item description are not available for 1964 and 1965.

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

Table 5.--Fans, blowers, and parts: U.S. imports for consumption, by principal sources, 1964-68

(In thousands of dollars)

Source	1964	1965	1966	1967	1968
Canada ^{1/} -----:)	677	706	1,166	1,882	3,051
West Germany-----:)	256	402	555	548	916
Japan-----:)	71	279	293	371	836
United Kingdom-----:)	50	99	126	101	126
Netherlands-----:)	39	25	27	74	111
Switzerland-----:)	36	50	142	52	69
Hong Kong-----:)	31	74	149	131	66
All other-----:)	45	73	113	153	111
Total-----:)	1,205	1,708	2,571	3,312	5,286

^{1/} Data include imports in 1965 valued at 27 thousand dollars, in 1966 valued at 404 thousand dollars, in 1967 valued at 677 thousand dollars, and in 1968 valued at 2,206 thousand dollars which were entered duty free under the Automotive Products Trade Act of 1965.

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

<u>Commodity</u>	<u>TSUS</u> <u>item</u>
Air-conditioning machines, and parts-----	661.20, -.21
Refrigerators and refrigerating equipment, and parts-----	661.35, -.36

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1969).

U.S. trade position

The value of U.S. consumption of air-conditioning and refrigerating equipment increased annually during 1965-68; it is estimated to have been about \$4.2 billion in 1968, with about half of the total represented by air-conditioning equipment. Imports accounted for less than 1 percent of the value of apparent consumption during 1965-68, whereas exports accounted for about 7 percent of the value of U.S. producers' shipments during that period.

Description and uses

This summary covers two major groups of products, namely, air-conditioning machines and refrigerators and refrigerating equipment, and parts thereof.

Items 661.20 and 661.21 cover air-conditioning machines, which consist of motor-driven fans and elements for changing the temperature and humidity of air, and parts of such machines. These machines include self-contained units complete with compressors, motors, condensers, fans, and related parts, such as individual room air conditioners and other so-called packaged air-conditioning units. These items also include units which have heating elements or air-purification elements incorporated as integral parts of the air-conditioning machines; parts of the aforementioned machines; and parts of non-self-contained air-conditioning systems such as those used in automobiles and in central systems for large buildings. Items 661.20 and 661.21 do not include the following components of air-conditioning machines when imported separately: Fans and blowers (item 661.10) and compressors (item 661.12), which are discussed in other summaries in this volume; electric motors (item 682.40) and humidifiers or dehumidifiers (item 683.32), discussed in volume 6:10; and thermostats (item 711.84) discussed in volume 7:2.

Air-conditioning machines are used for comfort cooling and for control of atmospheric conditions for industrial and scientific purposes. These machines provide climate control in closed spaces, such

as individual rooms, homes, automobiles, aircraft, ships, stores, hotels, factories, hospitals, sports arenas, and office and apartment buildings.

Refrigerators and refrigerating equipment, whether or not electric, and parts thereof, are covered by items 661.35 and 661.36. These machines or assemblies of apparatus, which function in a continuous cycle of operations, are designed to produce and maintain temperatures ordinarily near or below freezing. The two items cover the following articles:

- (1) Units comprising a compressor (with or without motor) and condenser mounted on a common base, whether or not complete with evaporator; or self-contained absorption units. These units are commonly fitted into household types of refrigerators or other refrigerating cabinets.
- (2) Refrigerating cabinets or other refrigerating containers or appliances incorporating refrigerating units, or designed to be fitted (either internally or externally) with such units. These appliances include household types of refrigerators, refrigerated display cases, ice-cream or other frozen-food storage containers, beer coolers, and other refrigerating equipment.
- (3) Large installations, comprised of components enumerated in (1) above, not mounted on a common base or in the form of self-contained units but as separate elements designed to operate together.

Parts or components of refrigerators (such as compressors, electric motors, and thermostats) are more specifically provided for under other provisions of the TSUS and are classified there even when specially designed for use in refrigeration equipment. Other related articles not considered here but discussed elsewhere in this volume are industrial and laboratory equipment for the treatment of materials by a change of temperature (item 661.70). Automatic vending machines equipped with refrigerating units (item 678.40), such as those used for dispensing cold beverages and food, are discussed in volume 6:10.

Refrigerators and refrigerating equipment are used primarily to provide cold temperatures for the processing, shipping, storage, and marketing of food and beverages, and to make ice.

U.S. tariff treatment

The column 1 (trade-agreement) rates of duty applicable to imports (see general headnote 3 in the TSUSA-1969) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	U.S. concessions granted in 1964-67 trade confer- ence (Kennedy Round)	
			Second stage, effective Jan. 1, 1969	Final stage, effective Jan. 1, 1972
661.20	Air-conditioning machines, comprising a motor- driven fan and ele- ments for changing the temperature and humid- ity of air, and parts.	11% ad val.	8.5% ad val.	5.5% ad val.
661.21	If Canadian article and original motor-vehicle equipment.	Free	<u>1/</u>	<u>1/</u>
661.35	Refrigerators and refrig- erating equipment, whether or not elec- tric, and parts.	10.5% ad val.	8% ad val.	5% ad val.
661.36	If Canadian article and original motor-vehicle equipment.	Free	<u>1/</u>	<u>1/</u>

1/ Duty-free status not affected by trade conference.

The tabulation above shows the column 1 rates of duty in effect prior to January 1, 1968, and modifications therein as a result of concessions granted by the United States in the sixth (Kennedy) round of trade negotiations under the General Agreement on Tariffs and Trade. Only the second and final stages of the five annual rate modifications are shown above (see the TSUSA-1969 for all of the staged rates).

The prior rates shown in the preceding tabulation for items 661.20 and 661.35 had remained unchanged under the TSUS from August 31, 1963, through 1967. Items 661.21 and 661.36 provide for duty-free entry of Canadian articles that are original motor-vehicle equipment (see general headnote 3 of the TSUS). These provisions were established pursuant to the enactment of the Automotive Products Trade Act of 1965 (see Presidential Proclamation 3682 of October 21, 1965), which provided for duty-free entry retroactive to January 18, 1965. From the effective date of the TSUS, August 31, 1963, to January 17, 1965, these articles were classified under the appropriate dutiable provisions of the TSUS. The duty-free status of the Canadian articles was not affected by the recent trade conference.

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U.S. consumption

The value of apparent U.S. consumption of air-conditioning and refrigerating equipment increased from about \$3.2 billion in 1965 to an estimated \$4.2 billion in 1968 (table 1). In 1966, the most recent year for which data on U.S. producers' shipments, by types, are available, household refrigerators and freezers accounted for about 25 percent of the value of aggregate consumption of the articles considered here. Packaged air-conditioning equipment including room and other unitary air conditioners also accounted for 25 percent of consumption.

Consumption of air-conditioning equipment increased more rapidly than that of refrigeration equipment during 1964-68. Factors that have contributed to the growth in consumption of air-conditioning equipment are the increases in disposable consumer income, the overall stability of prices of air conditioners (prices declined in 1964-65 and increased in 1966-68), improvements in the performance of air-conditioning apparatus, improved design and styling of room air conditioners, and technological changes in consuming industries that require certain operations to be performed under controlled atmospheric conditions.

U.S. producers

Air-conditioning and refrigeration equipment other than household refrigerators and home and farm freezers are produced in about 700 U.S. establishments, which employ about 85,000 workers. In addition to the equipment covered in this summary, these establishments produce certain items of industrial refrigeration equipment and refrigeration compressors as primary products. More than 50 percent of the value of the industry's total output is accounted for by establishments situated in the East North Central and Middle Atlantic States.

Household refrigerators and home and farm freezers were produced in 34 establishments, which employed 43,000 workers in 1963. Establishments in the East North Central States account for about 80 percent of the value of this industry's shipments.

U.S. producers of the articles considered here range from small, single-plant firms whose total output consists of a limited line of air-conditioning and refrigerating equipment to large, diversified, multi-plant concerns that make a complete line of major home appliances, automobiles, and other products.

U.S. producers' shipments

The value of U.S. producers' shipments of air-conditioning and refrigerating equipment increased from \$2.6 billion in 1963 to an esti-

mated \$4.5 billion in 1968, or by about 70 percent. The value of annual shipments of the principal classes of this equipment during 1963-66 is shown in table 2.

The continuous growth in shipments of air-conditioning equipment during 1963-68 indicates that air conditioning is no longer considered a luxury; this growth occurred despite declines in new housing starts and automobile production and despite cool summers in some years. The growing consumer acceptance of automobile air conditioning is evidenced by the fact that the proportion of new cars that were factory equipped with air conditioners rose from 14 percent in 1963 to more than 50 percent in 1968.

The rise in shipments of household refrigerators and farm and home freezers during 1963-66 largely reflects the growth in population and the formation of new family units.

U.S. exports

The total value of U.S. exports of both air-conditioning and refrigerating equipment increased from about \$216 million in 1965 to \$299 million in 1968; during 1965-68, exports accounted for about 7 percent of the value of annual U.S. producers' shipments. During this period, exports of self-contained air conditioners and automotive air conditioners increased rapidly whereas exports of household refrigerators and freezers declined (table 3).

The overall growth in exports is attributable to the advanced technology of domestically produced air-conditioning and refrigerating equipment, the aggressive sales efforts of U.S. producers, and a rising standard of living in many foreign countries. In 1968 the major export markets were Canada, Japan, West Germany, Venezuela, Kuwait, and Mexico.

U.S. imports

The value of U.S. imports of air-conditioning and refrigerating equipment increased annually from \$11.9 million in 1964 to \$44.7 million in 1968 (table 4), or by 275 percent. Refrigerating equipment accounted for 82 percent of the total value of imports during 1964-68. These imports have consisted principally of small-capacity refrigerators (both compression and absorption types), such as those used in mobile homes, travel trailers, campers, offices, recreation rooms, and home bars. Other imported articles include small-capacity freezers, refrigerated display cases, beverage dispensers, and refrigerator parts, such as ice cube trays, wire shelves, crispers, door handles, burners, and evaporators. Italy supplied 40 percent of the total imports of refrigerating equipment and parts during 1966-68 (table 5). Other im-

portant sources were Sweden, the United Kingdom, Canada, and Japan.

The value of imports of air-conditioning machines and parts increased from \$1.8 million in 1964 to \$8.8 million in 1968. These imports included equipment valued at \$0.9 million in 1966, \$0.8 million in 1967, and \$1.1 million in 1968 that was entered free of duty under the provisions of the Automotive Products Trade Act of 1965. Canada supplied 91 percent of the total imports of air-conditioning machines and parts during 1964-68 (table 6); a significant share of these imports consisted of articles produced by Canadian affiliates of U.S. firms.

With the exception of certain small-capacity refrigerators and specialty items, which are not produced in large quantities in the United States, imports of air-conditioning and refrigerating equipment have not secured a significant share of the U.S. market, owing in part to the fact that the large U.S. market makes it possible for domestic producers to achieve mass production economies and hence to price their products competitively.

Table 1.--Air-conditioning and refrigerating equipment and parts:
U.S. producers' shipments, imports for consumption, exports of
domestic merchandise, and apparent consumption, 1963-68

(In millions of dollars)					
Year	U.S. pro- ducers' shipments 1/	Imports	Exports	Apparent consumption	
1963-----	2,638.0	2/	2/	2/	
1964-----	2,960.6	11.9	2/	2/	
1965-----	3,355.5	18.2	215.7	3,158.0	
1966-----	3,723.1	23.0	248.0	3,498.1	
1967-----	3/ 4,100.0	25.7	269.3	3/ 3,850.0	
1968-----	3/ 4,500.0	44.7	298.7	3/ 4,250.0	

1/ The value of U.S. producers' shipments is overstated inasmuch as the value of shipments of refrigerating machinery includes extensive duplication resulting from the use of products of some establishments in the industry as materials by others within the same industry.

2/ Not available.

3/ Estimated by the staff of the U.S. Tariff Commission.

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

Note: Owing to variations in the coverage of the statistical classifications used in compiling and reporting U.S. producers' shipments, imports, and exports of the articles considered in this summary, the data shown for U.S. producers' shipments and exports are not fully comparable with those shown for imports.

Table 2.--Air-conditioning and refrigerating equipment: U.S. producers' shipments, by product classes, 1963-66

(In millions of dollars)

Product class	1963	1964	1965	1966
Heat-transfer equipment:				
Room air conditioners-----	301	358	383	431
Unitary air conditioners <u>1</u> /-----	319	365	425	496
Mechanical air-conditioning systems				
for passenger automobiles-----	140	176	239	267
Other air-conditioning and heat-				
transfer equipment <u>2</u> /-----	379	464	511	614
Home and farm freezers-----	143	153	164	167
Household refrigerators-----	689	743	797	806
Commercial refrigeration equipment-----	254	276	325	357
Condensing units, all refrigerants-----	64	75	73	88
Other refrigeration and air-condition-				
ing equipment <u>3</u> /-----	349	351	439	497
Total-----	2,638	2,961	3,356	3,723

1/ Includes air conditioners (except window and wall types); year-round air conditioners, self-contained and remote condenser types (except heat pumps); heat pumps (except room air conditioners); and split systems (air-conditioning condensing units and coils).

2/ Includes evaporative condensers; room fan-coil air-conditioning units; central station air-conditioning units, motor-driven fan types; unit coolers (refrigeration); and air-cooled refrigerant condensers, remote types.

3/ Includes soda fountain and beer dispensing equipment and evaporative air coolers.

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

Note.--The value of shipments of refrigerating machinery includes extensive duplication resulting from the use of products of some establishments in the industry as materials by others within the same industry, thus the value of U.S. producers' shipments is overstated. The data above also include the value of shipments of certain articles which if imported might not be entered under the TSUS items considered in this summary.

Table 3.--Air-conditioning and refrigerating equipment: U.S. exports of domestic merchandise, by types, 1965-68

(In thousands of dollars)

Type	1965	1966	1967	1968
Air conditioners, self-contained:				
Window and wall types-----	42,009	49,430	58,803	64,220
Other (including heat pumps):	<u>1/</u>	11,847	14,563	15,321
Air conditioners, automotive--	<u>1/</u>	5,867	12,558	21,527
Electric refrigerators and freezers, household types---	32,389	33,327	28,566	24,802
Parts for household types of electric refrigerators and freezers, n.e.c. <u>2/</u> -----	12,584	14,373	12,953	14,899
Nonelectric, domestic refrigerators, freezers, and parts, n.e.c. <u>2/</u> -----	558	852	783	645
Commercial types of refrigerators and freezers-----	13,440	13,720	12,865	13,903
Icemaking machines-----	4,865	5,068	6,737	7,090
Centrifugal refrigeration units-----	14,819	16,218	14,939	18,753
Condensing units (compressor with condenser)-----	11,425	11,832	12,587	11,446
Drinking-water coolers, self-contained, with mechanical refrigeration-----	2,820	3,650	3,454	2,843
Soda fountain and beer dispensing equipment, and parts, n.e.c. <u>2/</u> -----	2,921	8,218	4,110	4,366
Other air-conditioning and refrigeration equipment-----	<u>3/</u> 52,237	44,232	46,592	53,274
Parts, n.e.c., <u>2/</u> for air-conditioning and refrigeration equipment-----	25,681	29,390	39,832	45,586
Total-----	215,748	248,024	269,342	298,675

1/ Not separately reported; included in "Other air-conditioning and refrigeration equipment."

2/ Not elsewhere classified.

3/ Includes automotive air-conditioners and self-contained air conditioners except window and wall types.

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

Note: The data shown may include the value of exports of certain articles which if imported might not be entered under the TSUS items considered in this summary.

AIR-CONDITIONING AND REFRIGERATING EQUIPMENT

Table 4.--Air-conditioning and refrigerating equipment and parts:
U.S. imports for consumption, by TSUSA item, 1964-68

(In thousands of dollars)

TSUSA item	Description	1964	1965	1966	1967	1968
661.2020	Air-conditioning : machines-----	1,698	2,683	2,349	3,119	6,156
661.2040	Parts for air- : conditioning : machines-----	124	329	329	484	1,502
661.2100	Air-conditioning : machines, and : parts, which : are Canadian : articles and : original motor- : vehicle equip- : ment-----	<u>1/</u>	<u>1/</u> 40	880	802	1,133
661.3525	Refrigerators : and refrigera- : tion equipment, : compression : types-----)			(6,184	5,683	11,487
661.3545	Refrigerators and : refrigeration : equipment, not : elsewhere spec- : ified-----)	8,523	13,401	((((11,709	14,662	22,589
661.3550	Parts of refrig- : erators and : refrigeration : equipment-----	1,533	1,759	1,588	990	1,827
661.3600	Refrigerators : and refrigera- : tion equipment, : and parts, : which are : Canadian arti- : cles and orig- : inal motor- : vehicle equip- : ment-----	<u>1/</u>	<u>1/</u>	-	-	-
	Total-----	11,878	18,212	23,039	25,740	44,694

1/ Data on imports were not separately reported in the official statistics prior to Dec. 20, 1965.

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

Table 5.--Refrigerating equipment and parts (items 661.35 and 661.36):
U.S. imports for consumption, by principal sources, 1964-68

(In thousands of dollars)

Source	1964	1965	1966	1967	1968
Italy-----	513	1,967	6,211	9,133	15,115
Sweden-----	2,049	2,781	3,222	4,219	9,777
United Kingdom-----	890	1,210	1,261	1,426	3,871
Canada-----	2,496	2,559	3,767	915	2,619
Japan-----	943	2,116	2,106	1,687	2,503
Spain-----	254	227	348	186	841
West Germany-----	2,035	3,409	1,771	2,972	632
Belgium and Luxembourg-----	586	483	489	338	144
All other-----	290	408	306	459	401
Total-----	10,056	15,160	19,481	21,335	35,903

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

Table 6.--Air-conditioning equipment and parts (items 661.20 and 661.21): U.S. imports for consumption, by principal sources, 1964-68

(In thousands of dollars)

Source	1964	1965	1966	1967	1968
Canada <u>1/</u> -----	1,769	2,976	3,426	4,130	7,417
United Kingdom-----	3	48	30	66	625
France-----	<u>2/</u>	<u>2/</u>	5	36	556
Japan-----	2	2	3	44	71
Sweden-----	11	<u>2/</u>	8	30	36
West Germany-----	20	16	63	84	17
All other-----	17	10	23	15	68
Total <u>1/</u>-----	1,822	3,052	3,558	4,405	8,790

1/ Data include imports valued at 40 thousand dollars in 1965, 880 thousand dollars in 1966, 802 thousand dollars in 1967, and 1,133 thousand dollars in 1968 which were entered duty-free under the Automotive Products Trade Act of 1965.

2/ Less than \$500.

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

<u>Commodity</u>	<u>TSUS item</u>
Furnace burners; mechanical stokers, grates, ash dischargers and similar appliances; and parts-----	661.25
Nonelectric industrial and laboratory furnaces and ovens and parts-----	661.30

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1969).

U.S. trade position

The value of apparent U.S. consumption of the furnaces, ovens, and parts covered by this summary increased from about \$266 million in 1965 to an estimated \$297 million in 1967. Imports accounted for less than 1 percent of the value of U.S. consumption during each of the years 1965-67. Exports are many times larger than imports and in 1967 accounted for about 16 percent of the value of U.S. producers' shipments.

Description and uses

This summary covers nonelectric industrial and laboratory furnaces and ovens; principally industrial types of furnace burners for liquid fuel (atomizers), for solid fuel, or for gas; mechanical stokers, grates, ash dischargers and similar mechanical appliances; and parts. It does not include stoves, central-heating furnaces and burners of the type used in households or in nonindustrial establishments (items 653.45 and 653.50). A furnace burner, depending on the type, may consist in part of a housing, a motor, a pump, an air blower, nozzles, and a fan. It has been administratively determined that furnaces and ovens which have such features as an electric blower, a motor, and automatic controls are "nonelectric" because the heat source is not electricity

Furnace burners may be divided into three principal categories: oil burners, solid fuel burners, and gas burners. Combination burners (where there is a simultaneous combustion of more than one type of fuel) are of much less importance. The oil-burning types of furnaces (atomizers) use fuel oil divided into a mist of fine globules for combustion. This type of unit uses compressed air, high-pressure steam, or direct atomization of the oil to provide the means for getting the fuel into the furnace burner. Units that utilize solid fuel, such as pulverized coal, usually employ an air blast to force the fuel into the furnace and also to provide the primary air supply. Gas burners utilize a mixture of air and gas fed through converging or concentric tubes which lead into the furnace burner. Furnace burners are used to fire boilers for steam generators, blast furnaces, open-hearth steel furnaces,

rotary kilns, and various other heating units. Furnace burners project a flame directly into the furnace.

Mechanical stokers are used for feeding solid fuel to furnaces or for forming the fuel bed; they usually consist of a coal hopper and devices for regulating the coal supply. Mechanical grates distribute coal over the fuel bed and move the coal through the furnace for even combustion. Ash dischargers are ordinarily separate mechanical units which automatically remove the slag and ash after the fuel is burned. A fully automatic installation uses a combination mechanical stoker, grate, and ash discharger.

The nonelectric furnaces and ovens considered here (item 661.30) are used to heat materials in laboratories and in mineral-processing chemical, glass, ceramic, metal-fabricating, and other industrial plants. Various types of furnaces and ovens, including kilns, are used for processes such as roasting, baking, cementation, metallurgical melting, annealing, and tempering. In recent years many traditional methods of applying heat as an industrial manufacturing technique have been replaced by new or alternate processes which use nonelectric furnaces or ovens; on the other hand, other processes which utilized certain fuel-fired furnaces and ovens have been replaced by electrically operated units. In the metals industry, furnaces for reheating metals are often designed especially for a specific purpose to solve a particular problem. Self-generating atmosphere furnaces for deep-drawn steels, rapid plate quenching, and high-speed heating for galvanizing lines are examples of recent developments in heat-treating equipment.

Related articles not included in this summary are certain refractory products (items 531.11 to 531.39), discussed in volume 5:3; machinery and equipment for treatment of materials by a process involving a change of temperature (item 661.70), discussed elsewhere in this volume; converters, ingot molds, and casting machines (item 674.10), discussed in volume 6:9; industrial and laboratory electric furnaces and ovens (item 683.95) and household electric furnaces and ovens (item 684.40), discussed in volume 6:10.

U.S. tariff treatment

The column 1 (trade-agreement) rates of duty applicable to imports (see general headnote 3 in the TSUSA-1969) are as follows:

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TSUS item	Commodity	Rate prior to Jan. 1, 1968	U.S. concessions granted in 1964-67 trade conference (Kennedy Round)	
			Second stage, effective Jan. 1, 1969	Final stage, effective Jan. 1, 1972
661.25	Furnace burners for liquid fuel (atomizers), for pulverized solid fuel, or for gas; mechanical stokers, mechanical grates, mechanical ash dischargers, and similar appliances; and parts.	9% ad val.	7% ad val.	4.5% ad val.
661.30	Industrial and laboratory furnaces and ovens, nonelectric, and parts.	19% ad val.	15% ad val.	9.5% ad val.

The tabulation above shows the column 1 rates of duty in effect prior to January 1, 1968, and modifications therein as a result of concessions granted by the United States in the sixth (Kennedy) round of trade negotiations under the General Agreement on Tariffs and Trade. Only the second and final stages of the five annual rate modifications are shown above (see the TSUSA-1969 for all of the staged rates).

The prior rates of duty for items 661.25 and 661.30 had remained unchanged under the TSUS from August 31, 1963, through 1967.

U.S. consumption

The estimated value of apparent U.S. consumption of furnace burners and nonelectric heating equipment and parts increased from \$266 million in 1965 to about \$297 million in 1967 (table 1). The growth in consumption of fuel-fired heating equipment reflects both the overall industrial growth of the United States and the development of new and technologically improved heating equipment, which has resulted in the replacement of less efficient equipment.

The bulk of the consumption of industrial heating equipment represents the investment expenditures of such sectors of the economy as the primary metal industries, the electric utility industry, and the glass, cement, and chemical industries.

U.S. producers

In 1963, according to the U.S. Census of Manufactures, 164 U.S. establishments produced the types of heating equipment provided for under items 661.25 and 661.30. It is believed that most of this equipment is made by a few large producers. The smaller firms make only limited lines of heating equipment or specialize in the production of parts for ovens and furnaces. In 1965, output of the 12 largest firms represented more than 50 percent of the total production of industrial heating equipment. The industry is concentrated in the Middle Atlantic and East North Central States.

U.S. producers' shipments

The value of U.S. producers' shipments of the heating equipment covered by this summary increased from about \$229 million in 1963 to an estimated \$350 million in 1967 (table 1). The value of shipments of fuel-fired industrial furnaces and ovens, however, is understated because certain components such as motors, conveyors, and instruments are not included in the values of shipments of large furnaces and ovens which are assembled at the site of the installation. Domestic shipments of industrial stokers have decreased significantly in recent years because of the improved economy achieved by using oil, gas, or pulverized-coal fuels.

The value of shipments of oil burners increased from \$42 million in 1963 to \$49 million in 1966, and that of fuel-fired furnaces and ovens for metal processing increased from \$76 million in 1963 to \$152 million in 1966.

U.S. producers' shipments of the various types of heating equipment considered here, as reported in the 1963 Census of Manufactures, were as follows:

	<u>Million dollars</u>
Oil burners and parts-----	57
Gas burners and parts-----	35
Mechanical stokers and parts---	12
Fuel-fired kilns-----	22
Fuel-fired furnaces and oven, and parts-----	<u>103</u>
Total-----	229

U.S. exports

The value of annual U.S. exports of furnace burners and industrial heating equipment covered by this summary increased from \$37 million in 1965 to more than \$43 million in 1968 (table 1). In 1967, exports represented about 16 percent of the total value of U.S. producers' shipments of furnace burners and industrial heating equipment.

The value of exports, by types, for 1965-68 was as follows (in millions of dollars):

	<u>1965</u>	<u>1966</u>	<u>1967</u>	<u>1968</u>
Furnace burners-----	6	7	7	8
Mechanical stokers, grates, ash dischargers, and parts--	8	10	9	10
Nonelectric furnaces, ovens, and parts-----	<u>23</u>	<u>32</u>	<u>38</u>	<u>25</u>
Total-----	37	49	54	43

Canada was the leading market for U.S. exports in 1965-68, accounting for about 21 percent of total exports in 1968. Japan and Mexico were other important export markets (table 2).

U.S. imports

U.S. imports of the heating equipment considered here have been insignificant in relation to U.S. producers' shipments, consumption, and exports during recent years; however, the value of such imports increased from less than \$0.5 million in 1964 to more than \$1.6 million in 1968, or by 260 percent (table 1). The value of articles entered under item 661.25 increased from \$153,000 in 1964 to \$528,000 in 1968. The value of imports entered under item 661.30 increased from \$304,000 in 1964 to \$1.5 million in 1967, and then dropped to \$1.1 million in 1968 (table 3).

Articles entered under items 661.25 and 661.30 have included bakery ovens, paint-drying ovens, coke ovens, metal-processing furnaces, cementmaking and brickmaking kilns, oil burners, gas burners, oil-burner combustion heads, furnace nozzles, steel tires, and nose blocks for rotary kilns.

Canada and West Germany were the principal sources of imports of heating equipment and parts during 1964-68 (table 4). These countries supplied 38 and 22 percent, respectively, of the total value of imports during 1964-68. Other important sources in recent years have included the United Kingdom and Japan.

Table 1.--Nonelectric industrial and laboratory furnace burners and ovens, nonelectric furnace burners and related equipment, and parts: U.S. producers' shipments, imports for consumption, exports of domestic merchandise, and apparent consumption, 1963-68

(In thousands of dollars)

Year	U.S. producers' shipments	Imports	Exports	Apparent consump- tion
1963-----	1/ 229,000	2/	2/	2/
1964-----	1/ 256,000	457	2/	2/
1965-----	1/ 302,000	1,069	36,814	266,255
1966-----	1/ 329,000	1,939	49,205	281,734
1967-----	3/ 350,000	1,727	54,378	3/ 297,349
1968-----	2/	1,643	43,159	2/

1/ Partly estimated by the staff of the U.S. Tariff Commission.

2/ Not available.

3/ Estimated by the staff of the U.S. Tariff Commission.

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

Table 2.--Nonelectric industrial and laboratory furnace burners and ovens, nonelectric furnace burners and related equipment, and parts: U.S. exports of domestic merchandise, by principal markets, 1965-68

(In thousands of dollars)

Market	1965	1966	1967	1968
Canada-----	8,574	12,603	10,596	9,130
Japan-----	1,966	2,180	3,391	4,960
Mexico-----	6,046	5,482	5,228	3,398
Jamaica-----	126	691	1,593	2,939
Brazil-----	117	312	2,039	2,091
Spain-----	485	5,965	7,910	1,677
Italy-----	1,182	1,443	1,920	1,546
West Germany-----	1,383	1,087	1,869	1,357
Republic of Korea-----	120	40	220	1,169
Republic of South Africa-----	576	383	759	1,119
United Kingdom-----	1,254	1,177	749	1,043
France-----	1,023	1,466	1,198	967
Philippines-----	452	188	594	822
Australia-----	503	563	1,065	665
All other-----	13,007	15,625	15,247	10,276
Total-----	36,814	49,205	54,378	43,159

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

Table 3.--Nonelectric industrial and laboratory furnace burners and ovens, nonelectric furnace burners and related equipment, and parts: U.S. imports for consumption, 1964-68

(In thousands of dollars)

Description	1964	1965	1966	1967	1968
Furnace burners, mechanical stokers, and related equipment, and parts-----	153	271	449	186	528
Nonelectric industrial furnaces and ovens and parts-----	304	798	1,490	1,541	1,115
Total-----	457	1,069	1,939	1,727	1,643

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

Table 4.--Nonelectric industrial and laboratory furnace burners and ovens, nonelectric furnace burners and related equipment, and parts: U. S. imports for consumption, by principal sources, 1964-68

(In thousands of dollars)

Source	1964	1965	1966	1967	1968
Canada-----	208	389	436	863	740
West Germany-----	145	100	444	540	275
United Kingdom-----	77	527	235	149	216
Japan-----	7	29	430	52	144
Sweden-----	1	-	-	19	90
Denmark-----	1	-	289	8	53
Belgium and Luxembourg-----	-	-	37	41	31
Italy-----	12	-	3	10	31
Mexico-----	-	20	-	-	28
All other-----	6	4	65	45	35
Total-----	457	1,069	1,939	1,727	1,643

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

<u>Commodity</u>	<u>TSUS item</u>
Calendering and similar rolling machines (except metalworking and rolling machines, glass-working machines, and textile calendering and rolling machines), and parts-----	661.40, -.45, -.55

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1969).

U.S. trade position

The value of apparent annual consumption of the calendering and similar rolling machines and parts covered by this summary increased significantly during 1963-67 and is estimated to have been \$34 million in 1967. Imports in that year accounted for about 1 percent of the value of consumption. Exports declined sharply during 1965-68 and accounted for about 5 percent of domestic producers' shipments in 1967.

Description and uses

The machinery covered by this summary includes calendering and similar rolling machines (not including textile calendering machines), such as those for the manufacture of paper, plastics, rubber, and other products. The process called calendering flattens the material, removes inequalities, and imparts a smooth surface. Calender bowls or rolls for use in these machines are made of a great variety of materials, such as cotton, paper, corn husks, wool, or mixtures thereof (item 661.40), or of solid stone (item 661.55). Calender rolls are generally made by compressing these materials on steel shafts by the use of hydraulic presses. The surface is made smooth by grinding or turning and must be truly cylindrical, free of imperfections, and capable of withstanding heavy pressure and high temperatures.

Supercalender machines used for papermaking have alternate soft, compressed, fiber-filled rolls and hard, chilled, cast-iron rolls. The soft nonmetallic roll provides a flexible surface between non-resilient metal rolls.

Embossing machines, which are similar to calendering machines, utilize metal cylinders or rollers on which surface designs or patterns have been cut or engraved. The design is formed or embossed onto the material being processed by pressure applied to the rolls. Embossing rollers of metal are usually made of high-grade steel and are used for embossing paper, plastics, leather, and other materials.

Related articles not included in this summary are textile calendering and rolling machines and parts thereof (item 661.50) and metal-rolling mills and parts thereof (item 674.20), which are discussed in volume 6:9, and glassworking machines and parts thereof (item 678.30) and certain cast-iron rollers (item 680.60), which are discussed in volume 6:10.

U.S. tariff treatment

The column 1 (trade-agreement) rates of duty applicable to imports (see general headnote 3 in the TSUSA-1969) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	U.S. concessions granted in 1964-67 trade confer- ence (Kennedy Round)	
			Second stage, effective Jan. 1, 1969	Final stage, effective Jan. 1, 1972
	:Calendering and similar : rolling machines (ex- : cept metalworking and : metalrolling machines, : glassworking machines, : and textile calendering : and rolling machines), : and parts:			
661.40:	Calender bowls or rolls : of textile fibers, : husk, paper or mixtures: : thereof, compressed be- : tween and held together: : by iron or steel heads : or washers fastened to : iron or steel cores or : mandrels, for calender- : ing, embossing, mang- : ling, or pressing oper- : tions.	28% ad : val.	22% ad val.	14% ad val.
661.45:	Embossing rollers of : metal.	10% ad : val.	8% ad val.	5% ad val.
661.55:	Other-----	10% ad : val.	8% ad val.	5% ad val.

The tabulation above shows the column 1 rates of duty in effect prior to January 1, 1968, and modifications therein as a result of concessions granted by the United States in the sixth (Kennedy) round of

trade negotiations under the General Agreement on Tariffs and Trade. Only the second and final stages of the five annual rate modifications are shown above (see the TSUSA-1969) for all of the staged rates).

The prior rates of duty for the items considered here had remained unchanged under the TSUS from August 31, 1963, through 1967.

U.S. consumption, producers, and producers' shipments

No data are available on consumption of calendering and similar rolling machines; however, since both imports and exports are small in relation to producers' shipments, consumption has followed the same trend as producers' shipments. It is estimated that the value of such shipments of calendering and similar rolling machines increased from \$20 million in 1963 to \$35 million in 1967 (table 1). Approximately half of the value was accounted for by calenders and supercalenders used in the manufacture of paper.

Calendering and similar rolling machines are principally made by companies that make other types of machinery for the paper, textile, rubber, and plastics industries. For most producers, production of the articles considered here accounts for only a small part of their total output. About 10 firms--primarily in the New England and Middle Atlantic States--produce the types of calendering machinery covered by this summary. Most calender rolls or bowls are produced by some of the same firms that make calendering machines. Producers of embossing rolls of metal generally make other metal rolls that are used in photography and in metalrolling and glassworking machines.

U.S. exports

The value of U.S. exports of calendering and similar rolling machines and parts declined from \$4.0 million in 1965 to \$1.8 million in 1967, and then rose to \$2.2 million in 1968. U.S. exports of these machines and parts by types, for 1965-68 were as follows (in thousands of dollars):

<u>Type</u>	<u>1965</u>	<u>1966</u>	<u>1967</u>	<u>1968</u>
Paper-working-----	961	801	938	768
Plastics-working-----	1,166	666	446	497
Rubber-working-----	1,825	526	261	760
Other-----	57	275	129	146
Total-----	4,009	2,268	1,774	2,171

Canada was the leading market for U.S. exports during 1965-68, accounting for about 39 percent of the total value of exports in 1968. Mexico and the United Kingdom were other important export markets (table 2).

U.S. imports

The aggregate value of U.S. imports of the articles considered here declined from \$1.5 million in 1964 to \$0.4 million in 1966 and 1967, and then rose to \$0.5 million in 1968 (table 1). It is estimated that imports accounted for about 1 percent of the value of apparent U.S. consumption of these articles in 1967.

The value of imports of calender bowls or rolls of nonmetallic materials entered under item 661.40 were insignificant during 1964-68 (table 3). The value of imports of embossing rolls of metal (item 661.45) increased annually from \$100,000 in 1964 to \$254,000 in 1968. Imports of other calendering and rolling machines and parts (item 661.55) decreased from \$1.4 million in 1964 to \$0.2 million in 1968; it is believed that most of these imports have consisted of parts rather than complete machines.

Imports of calendering and similar rolling machines have included complete supercalenders for papermaking, steel rollers for embossing various materials, paper napkin press rolls, roll presses for embossing leather, swimming rolls and expansion rolls for papermaking, a five-bowl calender for shoe manufacturing, and machinery used in glove-making.

West Germany accounted for 76 percent of the total value of U.S. imports of calendering and similar rolling machines during 1964-68. Other sources of such imports in recent years have included the United Kingdom, Canada, and Japan (table 4).

Table 1.--Calendering and similar rolling machines and parts:
U.S. producers' shipments, imports for consumption, exports
of domestic merchandise, and apparent consumption, 1963-68

(In thousands of dollars)

Year	: Producers' : : shipments :	: Imports :	: Exports :	: Apparent : consumption :
1963-----	1/ 20,000	2/	2/	2/
1964-----	2/	1,506	2/	2/
1965-----	2/	1,115	4,009	2/
1966-----	2/	433	2,268	2/
1967-----	3/ 35,000	423	1,774	3/ 33,649
1968-----	2/	530	2,171	2/

1/ Partly estimated by the staff of the U.S. Tariff Commission.

2/ Not available.

3/ Estimated by the staff of the U.S. Tariff Commission.

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

Table 2.--Calendering and similar rolling machines and parts: U.S. exports of domestic merchandise, by principal markets, 1965-68

(In thousands of dollars)

Market	1965	1966	1967	1968
Canada-----	747	823	730	850
Mexico-----	121	241	47	533
United Kingdom-----	584	54	178	142
Japan-----	46	90	74	75
Australia-----	100	38	92	57
Italy-----	488	20	101	29
All other-----	1/ 1,923	1,002	552	485
Total-----	4,009	2,268	1,774	2,171

1/ Includes exports to Venezuela valued at 375 thousand dollars, and exports to Argentina valued at 261 thousand dollars.

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

Table 3.--Calendering and similar rolling machines and parts:
U.S. imports for consumption, by types, 1964-68

(In thousands of dollars)

Type	1964	1965	1966	1967	1968
Calender bowls or rolls of non-metallic materials-----	5	6	-	3	78
Embossing rolls of metal-----	100	170	197	207	254
Calendering and rolling machines and parts not elsewhere enumerated-----	1,401	939	236	213	198
Total-----	1,506	1,115	433	423	530

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

Table 4.--Calendering and similar rolling machines and parts:
U.S. imports for consumption, by principal sources, 1964-68

(In thousands of dollars)

Source	1964	1965	1966	1967	1968
West Germany-----	1,434	887	293	282	159
United Kingdom-----	2	11	17	20	148
Canada-----	17	9	73	51	77
Japan-----	21	31	44	33	80
Italy-----	-	127	3	16	45
All other-----	32	50	3	21	21
Total-----	1,506	1,115	433	423	530

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

<u>Commodity</u>	<u>TSUS item</u>
Industrial machinery and plant and laboratory equipment for treating materials by a process involving a change in temperature, and parts--	661.70

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1969).

U.S. trade position

The United States is probably the world's leading producer of equipment used to treat materials by a process involving a change in temperature. Complete data on U.S. consumption and production of such equipment are not available; it is estimated, however, that the value of annual U.S. consumption during 1963-68 ranged between \$500 million and \$1 billion. U.S. imports in 1968 were valued at \$23 million and exports in that year were valued at about \$109 million.

Description and uses

This summary covers industrial machinery and plant and laboratory equipment, including parts, designed to submit materials to a heating or cooling process which results in a simple change of temperature or in the transformation of the materials. In general, it excludes those articles and parts more specifically provided for elsewhere in the TSUS. However, a machine or appliance which is described in TSUS item 661.70, part 4A of schedule 6, and also in other subparts of part 4 is included in this summary. Thus, for example, machinery and equipment for use in the preparation and manufacture of food (where the process primarily involves a change in temperature) is properly included here and not under item 666.25 of subpart C.

The machinery and equipment considered here is that used to treat materials primarily by heating or cooling; other equipment in which heating or cooling, even if essential, is merely a secondary function designed to facilitate the main function is excluded. A few types of the machinery and equipment provided for here are stills, dryers, digesters, vulcanizers, heat exchangers, steam condensers, sterilizers, pasteurizers, high- and low-temperature testing chambers, cooling tunnels, and annealing machines. This summary does not include those items which are agricultural implements, sugar machinery, and machinery or equipment for the heat treatment of textile yarns, fabrics, or made-up textile articles.

The machinery and equipment discussed here is used by many different industries to treat a great variety of materials. The diverse nature of this apparatus is indicated by its use in the following applications: Pasteurizing milk, freeze-drying food, production of liquid gases, manufacture of pulp and paper, petroleum refining, production of chemicals, rubber processing, water desalinization, and nuclear power generation.

Related articles not considered here include water heaters, items 661.65 (discussed in volume 6:7) and 684.40 (in volume 6:10); electric furnaces and ovens, item 683.95 (in volume 6:10); steam and other vapor-generating boilers, item 660.10; economizers and superheaters, item 661.15, air conditioners, item 661.20, nonelectric furnaces and ovens, items 661.25 and 661.30, and refrigerators, item 661.35, all of the foregoing articles discussed in other summaries in this volume; welding machines and apparatus, items 674.80 (in volume 6:9) and 683.90 (in volume 6:10).

U.S. tariff treatment

The column 1 (trade-agreement) rates of duty (see general headnote 3 in the TSUSA-1969) applicable to equipment for treating materials by a process involving a change in temperature (item 661.70) are shown below:

	<u>Rate of duty</u>
Prior rate (before the Kennedy Round)-----	12.5% ad val.
Concessions granted by the United States in the 1964-67 trade conference (Kennedy Round):	
Second stage, effective Jan. 1, 1969----	10% ad val.
Fifth and final stage, effective Jan. 1, 1972-----	6% ad val.

The prior rate of 12.5 percent ad valorem for item 661.70 had remained unchanged under the TSUS from August 31, 1963, through 1967. As the result of a concession granted by the United States in the sixth (Kennedy) round of trade negotiations concluded on June 30, 1967, the prior rate is being reduced to 6 percent ad valorem in five annual stages (see the TSUSA-1969 for all of the staged rates).

For the period from August 31, 1963, through December 6, 1965, importations of certain shoe machinery were provided for under TSUS item 661.70. With the enactment of the Technical Amendments Act of 1965 (Public Law 89-241), the superior heading of the TSUS article description was amended effective December 7, 1965, to exclude "shoe machinery" (note item 678.10).

U.S. consumption

U.S. consumption of machinery and equipment for treating materials by a process involving a change in temperature has probably increased annually in recent years. No separate data on domestic consumption of the articles covered by this summary are available; it is believed, however, that the value of annual aggregate consumption of such articles was within the range of \$500 million to \$1 billion during 1963-68.

The outlook appears favorable for increased consumption of machinery and equipment for treating materials by a process involving a change in temperature. The demand for this merchandise is greatly influenced by technological changes and general economic activity. Contributing to the favorable outlook is the trend toward increased use of the articles considered here in the production of industrial gases (e.g., oxygen for use in steel mills), in the freeze-drying of food, in water desalinization plants, and in generating facilities for nuclear power.

U.S. producers and producers' shipments

More than 100 U.S. establishments produced machinery and equipment for treating materials by a change in temperature in 1963; these establishments were situated principally in the Middle Atlantic and North Central States. The output of the concerns that make the articles considered here is generally highly diversified. Some of the producers make such articles as steam boilers and related equipment; a number produce industrial gases; and others make furnaces and air-conditioning and refrigeration equipment.

It is estimated by the staff of the U.S. Tariff Commission that producers' shipments of machinery and equipment used to treat materials by a process involving a change in temperature as covered by this summary increased annually during 1963-68 and that such shipments ranged between \$500 million and \$1 billion.

U.S. exports

The value of U.S. exports of machinery and equipment for treating materials by a process involving a change in temperature increased irregularly from \$80.9 million in 1965 to \$109.2 million in 1968. Exports in recent years have consisted primarily of industrial processing vessels (nonmixing types), heat exchangers, and machines and parts not elsewhere classified (table 1). During 1965-68 these three classes of products accounted for 14, 16, and 36 percent of the total value of U.S. exports of the articles considered here.

Canada has been the principal export market for the articles considered here (table 2), receiving 25 percent of such exports during the 1965-68 period. Other important export markets include Mexico, Venezuela, and the United Kingdom.

U.S. imports

The value of U.S. imports of machinery and equipment used to treat materials by a process involving a change in temperature increased from \$11.2 million in 1964 to \$28.7 million in 1967, and then dropped to \$23.2 million in 1968 (table 3). Imports have consisted principally of gas liquefaction equipment, heat exchangers, vulcanizers, autoclaves, and distillation units. West Germany, Canada, the United Kingdom, and Italy supplied the bulk of the imports entered under item 661.70 during 1964-68.

Table 1.--Machinery and equipment for treating materials by a process involving a change in temperature: U.S. exports of domestic merchandise, by types, 1956-68

(In millions of dollars)

Type	1965	1966	1967	1968
Machines for treating--				
Dairy and milk products-----	3.5	3.0	4.7	4.3
Industrial food products <u>1/</u> -----	4.2	6.7	8.2	8.7
Paper <u>1/</u> -----	1.4	.7	1.3	.6
Chemicals <u>1/</u> -----	7.1	6.6	4.2	3.8
Plastics <u>1/</u> -----	1.7	2.1	1.9	2.2
Rubber <u>1/</u> -----	4.2	4.7	2.6	5.3
Sterilizers and autoclaves and parts (dental, medical, hospital, and laboratory types)-----	4.2	4.5	4.8	6.0
Condensers <u>2/</u> -----	2.8	3.0	3.2	3.6
Heat exchangers <u>3/</u> -----	7.7	16.2	19.0	20.3
Industrial processing vessels, nonmixing types, and parts-----	11.1	17.3	11.0	16.0
Machines and parts, other than domestic use types, not elsewhere classified----	33.0	34.3	31.9	38.4
Total-----	80.9	99.1	92.8	109.2

1/ Includes parts.

2/ Does not include compressor-condenser units, condensers for household refrigerators, or condensers for use with steam-generating power boilers.

3/ Does not include heat exchangers which are for central-heating apparatus or accessories for power-generating boilers.

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

Note.--No separate data on U.S. producers' shipments or U.S. consumption of the equipment covered by this summary are available; it is estimated by the staff of the U.S. Tariff Commission that the value of annual U.S. producers' shipments during 1963-68 ranged from \$500 million to \$1,000 million. In 1968, U.S. imports were valued at \$23 million.

Table 2.--Machinery and equipment for treating materials by a process involving a change in temperature: U.S. exports of domestic merchandise, by principal markets, 1965-68

(In millions of dollars)

Market	1965	1966	1967	1968
Canada-----	22.1	25.4	20.9	27.9
Mexico-----	6.8	5.2	11.5	9.7
Libya-----	.3	.7	1.2	5.4
Saudi Arabia-----	.3	.9	2.2	5.2
Venezuela-----	2.7	2.7	2.3	4.1
Japan-----	2.8	2.2	3.8	3.1
United Kingdom-----	4.3	3.1	2.2	3.1
Iran-----	1.2	2.0	2.4	3.0
Brazil-----	.2	.8	1.1	2.8
Kuwait-----	.5	2.0	5.3	2.6
Australia-----	2.3	1.8	2.4	2.5
Netherlands-----	1.0	1.8	1.5	1.9
France-----	1.9	1.8	2.5	1.8
West Germany-----	2.6	1.9	3.3	1.6
Chile-----	.6	1.4	2.0	1.4
All other-----	31.3	45.4	28.2	33.1
Total-----	80.9	99.1	92.8	109.2

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

Table 3.--Machinery and equipment for treating materials by a process involving a change in temperature: U.S. imports for consumption, by principal sources, 1964-68

(In thousands of dollars)

Source	1964	1965	1966	1967	1968
West Germany-----	1,159	9,457	7,313	6,996	6,678
Canada-----	3,383	3,501	4,577	6,016	3,511
United Kingdom-----	1,851	2,445	2,568	3,037	3,032
France-----	81	807	829	1,165	2,355
Netherlands-----	360	628	2,161	655	1,746
Italy-----	1,132	2,300	1,226	2,979	1,442
Switzerland-----	1,032	907	1,161	1,250	1,296
Japan-----	363	216	683	3,456	1,274
Sweden-----	1,104	1,589	864	1,551	952
All other-----	776	888	1,420	1,566	871
Total-----	11,241	22,738	22,802	28,671	23,157

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

<u>Commodity</u>	<u>TSUS item</u>
Cream separators, other centrifuges, and filtering and purifying machinery, and apparatus and parts-----	661.75,
-.80, -.85, -.90, -.92, -.93, -.95, -.96	

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1969).

U.S. trade position

The estimated value of U.S. consumption of centrifuges and filtering and purifying machinery and apparatus increased from \$230 million in 1965 to \$335 million in 1967, or by 46 percent. U.S. imports accounted for less than 3 percent of the estimated value of apparent U.S. consumption of this machinery in 1967, whereas exports accounted for about 20 percent of the value of U.S. producers' shipments in that year.

Description and uses

Included in this summary are machines which by the use of centrifugal force completely or partly separate substances according to their different specific gravities, or which remove the moisture from wet substances. Most centrifuges consist essentially of a perforated plate, drum, basket, or bowl revolving at great speed in a stationary collector that is usually cylindrical; expelled materials are projected against the walls by centrifugal force. Centrifuges are used rather extensively in laboratories, food-processing plants, laundries, mineral processing plants, and chemical manufacturing plants.

Also covered by this summary are filtering and purifying machinery and apparatus for liquids or gases, other than filter funnels, milk strainers, and similar articles which are simply equipped with metallic gauze or other straining material. Filtering and purifying machinery and apparatus and parts include such articles as industrial absorption towers; dust extractors; water, air, and oil filtering and purifying machinery and apparatus; water softeners; and filtering and purifying tanks. Such machinery and apparatus encompass many diverse types of equipment which often operate on chemical, magnetic, or electrostatic principles. Many of the articles included here are for industrial use; however, many items, such as water-softening equipment, are used in the home.

Related articles not considered in this summary but discussed elsewhere in this volume are soot removers (item 660.15), gas generators

with purifiers (items 660.20 and 660.22), and milk strainers (item 660.00). Neither does this summary include the usual type of oil pressure filters used in automobiles, other internal combustion engines and certain other engines, in accordance with the practice of the U.S. Bureau of Customs, based on administrative determinations classifying such merchandise as parts of the engines with which they are chiefly used. (The Brussels Nomenclature, after which the pertinent U.S. tariff provisions here were patterned, classified these oil filters as "filtering and purifying machinery and apparatus.")

U.S. tariff treatment

The column 1 (trade-agreement) rates of duty applicable to imports (see general headnote 3 in the TSUSA-1969) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	U.S. concessions granted in 1964-67 trade confer- ence (Kennedy Round)	
			Second stage, effective Jan. 1, 1969	Final stage, effective Jan. 1, 1972
	:Centrifuges; filtering and purifying machinery and apparatus (other than filter funnels, milk strainers, and similar articles), for liquids or gases; all the fore- going and parts: Centrifuges and parts: Cream separators:			
661.75:	Valued not over \$50 each.	Free	<u>1/</u>	<u>1/</u>
661.80:	Valued over \$50 but not over \$100 each.	4% ad	2% ad val.	Free
661.85:	Valued over \$100 each.	10.5% ad. val.	8% ad val.	5% ad val.
661.90:	Other centrifuges and parts.	11.5% ad val.	9% ad val.	5.5% ad val.

See footnote at end of table.

TSUS item	Commodity	Rate prior to Jan. 1, 1968	U.S. concessions granted in 1964-67 trade confer- ence (Kennedy Round)	
			Second stage, effective Jan. 1, 1969	Final stage, effective Jan. 1, 1972
	Centrifuges; filtering and purifying machinery and apparatus, etc.--Con.			
	Other:			
661.92:	Cast-iron (except mal- leable cast-iron) parts, not alloyed and not advanced beyond cleaning, and machined only for the removal of fins, gates, sprues, and risers or to permit loca- tion in finishing machinery.	3% ad val.	2% ad val.	1.5% ad val.
661.93:	If Canadian article and original motor- vehicle equipment.	Free	<u>1/</u>	<u>1/</u>
661.95:	Other than cast-iron parts above.	11.5% ad val.	9% ad val.	5.5% ad val.
661.96:	If Canadian article and original motor- vehicle equipment.	Free	<u>1/</u>	<u>1/</u>

1/ Duty-free status not affected by the trade conference.

The tabulation above shows the column 1 rates of duty in effect prior to January 1, 1968, and modifications therein as a result of concessions granted by the United States in the sixth (Kennedy) round of trade negotiations under the General Agreement on Tariffs and Trade. Only the second and final stages of the five annual rate modifications are shown above (see the TSUSA-1969 for all of the staged rates).

The prior rates of duty for items 661.80, 661.85, 661.90, and 661.95 had remained unchanged under the TSUS from August 31, 1963, through 1967.

Item 661.92, covering certain cast-iron parts of the articles considered here became effective on December 7, 1965, as a result of the

enactment of the Tariff Schedules Technical Amendments Act of 1965 (Public Law 89-241). This act restored the pre-TSUS rate to these castings, which during the period from August 31, 1963, through December 6, 1965, were dutiable under item 661.95 at the rate of 11.5 percent ad valorem.

Items 661.93 and 661.96 provide for the duty-free entry of Canadian articles that are original motor-vehicle equipment (see general headnote 3 of the TSUS). These provisions were established pursuant to the enactment of the Automotive Products Trade Act of 1965 (see Presidential Proclamation 3682 of October 21, 1965), which provided for duty-free entry retroactive to January 18, 1965. From the effective date of the TSUS, August 31, 1963, through January 17, 1965, these articles were classifiable under items 661.92 and 661.95, respectively. The duty-free status of the Canadian articles was not affected by the recent trade conference.

U.S. consumption

The estimated value of U.S. consumption of centrifuges and filtering and purifying machinery increased from \$230 million in 1965 to \$335 million in 1967 (table 1).

With the passage of laws regulating the emission of wastes into air and water, additional pollution control equipment and machinery will be required. Therefore, it is likely that consumption of the machinery and apparatus considered here will increase at an accelerated rate as the more stringent regulations are imposed.

U.S. producers

The 1967 edition of the Thomas Register of American Manufacturers listed 77 U.S. firms as producers of centrifuges. These producers were situated primarily in the Middle Atlantic States. Cream separators, which are a specialized type of centrifuge, are produced mainly in New York State.

It is estimated that filtering and purifying machinery and apparatus are produced by several hundred domestic establishments. Producing establishments are concentrated in California, Illinois, and New Jersey, although there are some in all regions of the United States. Water-purifying machinery and apparatus are usually manufactured in establishments which produce other types of water-treatment equipment, such as water softeners; likewise, air-purifying machinery is often produced in establishments which also produce such articles as blowers, fans, and filters.

U.S. producers' shipments

The value of annual U.S. producers' shipments of centrifuges and filtering and purifying machinery and apparatus ranged from \$233 million to an estimated \$410 million during 1963-67. Emphasis on the control of water and air pollution in recent years has stimulated the output of machinery and apparatus to handle these particular problems. Production of cream separators at present consists mostly of models with a high output capacity for use on dairy farms and in milk-processing plants. Cream separators selling for less than \$100 each have a low output capacity; shipments of these separators have almost ceased in recent years with the sharp decline in the number of small farms being operated in the United States.

Annual shipments during 1963-66 of the two principal statistical product classes considered here were as follows (in millions of dollars):

<u>Class</u>	<u>1963</u>	<u>1964</u>	<u>1965</u>	<u>1966</u>
Centrifuges, separators, filters, and strainers-----	138	<u>1/140</u>	<u>1/158</u>	<u>1/194</u>
Dust collectors, air-purification equipment, and air washers-----	<u>95</u>	<u>105</u>	<u>137</u>	<u>156</u>
Total-----	<u>233</u>	<u>245</u>	<u>295</u>	<u>350</u>

1/ Estimated by the staff of the U.S. Tariff Commission.

U.S. exports

The value of U.S. exports of centrifuges and filtering and purifying machinery increased from about \$71 million in 1965 to \$102 million in 1968 (table 1). Centrifuges, water-purifying machinery, and other purifying and filtering equipment are the principal items involved in export trade. During 1965-68 the value of exports of the machinery and apparatus considered here was as follows (in thousands of dollars):

<u>Type</u>	<u>1965</u>	<u>1966</u>	<u>1967</u>	<u>1968</u>
Cream separating (estimated)--	708	824	945	988
Other centrifuges-----	21,708	19,646	19,117	21,632
Filtering-----	5,686	8,171	5,968	7,174
Water-purifying-----	11,869	14,794	16,478	18,817
Filtering and purifying, not elsewhere covered-----	<u>30,941</u>	<u>37,146</u>	<u>42,417</u>	<u>53,538</u>
Total-----	<u>70,912</u>	<u>80,581</u>	<u>84,925</u>	<u>102,149</u>

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During 1965-68 Canada was the principal market for exports of the articles considered here, receiving 25 percent of such U.S. exports during this period. Other important export markets included the United Kingdom, Libya, and Mexico (table 2).

U.S. imports

The value of U.S. imports of centrifuges and of filtering and purifying machinery and apparatus increased annually, from \$3.5 million in 1963 to \$9.4 million in 1968 (table 1). In 1967, imports represented about 2.3 percent of the value of apparent consumption.

The distribution of imports, by types, during 1964-68 was as follows (in thousands of dollars):

<u>Type</u>	<u>1964</u>	<u>1965</u>	<u>1966</u>	<u>1967</u>	<u>1968</u>
Cream separators:					
Valued not over \$50 each--	9	4	2	-	-
Valued over \$50 but not over \$100 each-----	35	9	15	27	7
Valued over \$100 each-----	673	749	543	658	694
Centrifuges and parts, in- cluding parts of cream separators-----	2,924	3,430	5,199	4,986	5,376
Filtering and purifying ma- chinery and parts-----	<u>1,138</u>	<u>1,893</u>	<u>1,727</u>	<u>2,192</u>	<u>3,332</u>
Total-----	4,779	6,085	7,486	7,863	9,409

Imports of centrifuges other than cream separators have consisted of clarifier-standardizers, honey extractors, and various types of separators. Imports of filtering and purifying articles have consisted of dust collectors, strainers, filters, purifiers, water conditioners, and sieve baskets. In 1968 centrifuges other than cream separators accounted for more than half of the value of the imports considered here.

West Germany and Sweden were the principal sources of imports of centrifuges and filtering and purifying machinery and apparatus during 1964-68. Other important sources in those years included the United Kingdom and Canada (table 3).

Table 1.--Centrifuges and filtering and purifying machinery, and apparatus and parts: U.S. producers' shipments, imports for consumption, exports of domestic merchandise, and apparent consumption, 1963-68

Year	U.S. producers' shipments	Imports	Exports	Apparent consumption	Ratio of imports to consumption
	<u>1,000 dollars</u>	<u>1,000 dollars</u>	<u>1,000 dollars</u>	<u>1,000 dollars</u>	<u>Percent</u>
1963-----	232,740	3,451	1/	1/	1/
1964-----	<u>2/</u> 245,000	4,779	1/	1/	1/
1965-----	<u>2/</u> 295,000	6,085	70,912	<u>2/</u> 230,000	2.6
1966-----	<u>2/</u> 350,000	7,486	80,581	<u>2/</u> 275,000	2.7
1967-----	<u>2/</u> 410,000	7,863	84,925	<u>2/</u> 335,000	2.3
1968-----	<u>1/</u>	9,409	102,149	<u>1/</u>	<u>1/</u>

1/ Not available.

2/ Estimated by the staff of the U.S. Tariff Commission.

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

Note.--Data shown for U.S. producers' shipments and exports are not fully comparable with those shown for imports because of variations in the coverage of the statistical classifications used in compiling and reporting U.S. producers' shipments, imports, and exports of the articles considered in this summary.

Table 2.--Centrifuges and filtering and purifying machinery and apparatus, and parts: U.S. exports of domestic merchandise, by principal markets, 1965-68

(In thousands of dollars)

Market	1965	1966	1967	1968
Canada-----	15,076	21,632	23,029	24,934
United Kingdom-----	2,920	2,784	3,324	6,809
Libya-----	2,933	3,467	3,064	5,980
Mexico-----	5,104	3,371	4,614	5,409
Japan-----	2,824	2,990	4,875	4,679
West Germany-----	2,325	2,849	3,624	3,686
France-----	2,232	2,548	3,373	3,261
Belgium and Luxembourg-----	1,801	2,535	2,638	3,069
Netherlands-----	1,200	1,549	2,644	2,997
Venezuela-----	3,947	2,772	2,563	2,681
Jamaica-----	545	468	1,049	1,921
Australia-----	2,226	1,874	1,626	1,898
Iran-----	802	1,001	1,231	1,849
Arabia-----	1,777	482	166	1,452
India-----	1,980	1,805	817	1,270
All other-----	23,220	28,454	26,288	30,254
Total-----	70,912	80,581	84,925	102,149

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

Table 3.--Centrifuges and filtering and purifying machinery and apparatus and parts: U.S. imports for consumption, by principal sources, 1964-68

(In thousands of dollars)

Source	1964	1965	1966	1967	1968
West Germany-----	2,309	2,595	3,309	3,305	4,489
Sweden-----	978	1,097	1,737	1,531	1,189
United Kingdom-----	256	420	303	622	1,166
Canada-----	478	990	810	975	1,034
Netherlands-----	354	343	607	458	418
All other-----	404	640	720	972	1,113
Total-----	4,779	6,085	7,486	7,863	9,409

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

<u>Commodity</u>	<u>TSUS item</u>
Candy and tobacco wrapping and packaging	
machines and parts-----	662.10
Can sealing machines and parts-----	662.15
Cast-iron parts, not alloyed and not advanced---	662.18
Other wrapping and packaging machines; bottle and other container cleaning machines; con- tainer (not can) sealing and labeling ma- chines; dishwashers; and parts-----	662.20

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1969).

U.S. trade position

The estimated value of U.S. consumption of wrapping and packaging machinery and the related machines covered by this summary increased from \$407 million in 1965 to \$484 million in 1967. The value of imports in 1968 exceeded \$18 million; that of exports in the same year was \$95 million.

Description and uses

This summary covers a variety of machines with many different functions; these machines are used to perform such packaging operations as forming the container, filling, sealing, labeling, and capsuling. Other machines considered here are used to aerate beverages (bottle-filling machines that add carbon dioxide and a liquid simultaneously) and to clean and dry bottles and other containers. Both household and commercial types of dishwashers, with or without a drying mechanism, are considered here.

Important types of wrapping and packaging machines are those used for bubble or blister packaging, capsuling of drug products, bagging of dry goods, sealing of canned fruits and vegetables, sealing of vacuum cans, and capping of bottles. Wrapping and packaging machinery is used to prepare such commodities as food, drugs, chemicals, tobacco, and cosmetics in various size containers for sale, transport, or storage. These machines package goods in containers made of metal, wood, cloth, glass, plastics, and various other materials. Illustrative of the variety of machines covered in this summary are such items as stapling machines used for packaging--other than types used in the home or office, machines for the filling of packages with preset weights of material or other products, and machines for affixing straps or wires on wooden boxes or crates.

Related articles not considered here but discussed in other summaries in this volume are agricultural balers (item 666.00), paper bag and carton-making machines (item 668.02 and 668.07), and food and drink preparation machinery (item 666.25).

U.S. tariff treatment

The column 1 (trade-agreement) rates of duty applicable to imports (see general headnote 3 of the TSUSA-1969) are as follows:

TSUS item	Commodity	Rate		U.S. concessions granted	
		to Jan. 1, 1968	prior to Jan. 1, 1968	Second stage, effective Jan. 1, 1969	Final stage, effective Jan. 1, 1972
	Machinery for cleaning or drying bottles or other containers; machinery for filling, closing, sealing, capsuling, or labeling bottles, cans, boxes, bags, or other containers; other pack- ing or wrapping ma- chinery; machinery for aerating beverages; dishwashing machines; all the foregoing and parts:				
662.10:	Machines for packaging pipe tobacco; machines for wrapping candy; machines for wrapping cigarette packages; and combination candy cutting and wrapping machines; all the fore- going and parts.	8% ad val.		6.5% ad val.	5% ad val.
662.15:	Can-sealing machines, and parts.	15% ad val.		12% ad val.	7.5% ad val.

TSUS item	Commodity	Rate prior to Jan. 1, 1968	U.S. concessions granted in 1964-67 trade conference (Kennedy Round)	Second stage, effective Jan. 1, 1969	Final stage, effective Jan. 1, 1972
	Machinery for cleaning or drying bottles--Con.				
	Other:				
662.18: 1/	Cast-iron (except malleable cast-iron parts, not alloyed and not advanced beyond cleaning, and machined only for the removal of fins, gates, sprues, and risers, or to permit location in finishing machinery.	11.5% ad val.	2% ad val.	1.5% ad val.	
662.20:	Other-----	11.5% ad val.	9% ad val.	5.5% ad val.	

1/ See following text discussion.

The tabulation above shows the column 1 rates of duty in effect prior to January 1, 1968, and modifications therein as a result of concessions granted by the United States in the sixth (Kennedy) round of trade negotiations under the General Agreement on Tariffs and Trade. Only the second and final stages of the five annual rate modifications are shown above (see the TSUSA-1969 for all of the staged rates). The prior rates of duty for items 662.15 and 662.20 had remained unchanged under the TSUS from August 31, 1963, through 1967. The prior rate of duty for item 662.10, tobacco and candy wrapping and packaging machinery, had remained unchanged from January 1, 1964, through 1967; from the effective date of the TSUS, August 31, 1963, through December 31, 1963, the rate of duty was 9 percent ad valorem. Item 662.18, covering certain unfinished cast-iron parts of the machinery considered in this summary, was established by Public Law 90-638, effective October 25, 1968. This act restored the pre-TSUS rate to these cast-iron parts, and provided for staged rate reductions beginning January 1, 1968.

U.S. consumption

The estimated value of apparent U.S. consumption of the wrapping, packaging, and related machinery discussed in this summary increased annually from \$407 million in 1965 to \$484 million in 1967 (table 1). Continued expansion of the general economy is largely responsible for the increased consumption of this machinery. Imports accounted for about 3 percent of consumption during each of the years 1965-67.

U.S. producers

According to the 1963 Census of Manufactures, more than 400 U.S. establishments produce wrapping, packaging, and related machinery in the United States. About 25 of these establishments produce dishwashers. Most of the larger firms make several types of wrapping and packaging machines, whereas some of the smaller companies produce only a specialized line of machines for a particular type of operation. Establishments in the East North Central and Middle Atlantic States account for the bulk of domestic output.

Production

The value of U.S. manufacturers' shipments of wrapping, packaging, and related machinery increased from about \$430 million in 1964 to \$560 million in 1967. The relative importance of the various types of articles produced is indicated by the following data, reported in the 1963 Census of Manufactures:

<u>Type</u>	<u>Shipments</u> (1,000 dollars)	<u>Percent of</u> <u>total</u>
Dairy: Bottling and packag- ing machines-----	26,546	7
Bakery: Wrapping machinery----	4,568	1
Fruit and vegetable: Pack- aging machines-----	12,224	3
Packaging and wrapping: Other machinery-----	207,648	52
Dishwashers: Commercial-----	27,875	7
Dishwashers: Household-----	121,799	30
Total-----	400,660	100

U.S. exports

The value of U.S. exports of the machinery considered here increased from \$80.4 million in 1965 to \$94.7 million in 1968. Data on exports of this machinery for 1965-68 are shown, by types, in table 2. During 1965-67, exports accounted for about 17 percent of the aggregate value of U.S. producers' shipments of wrapping and packaging machinery and related machines.

Canada has been the principal market for U.S. exports of wrapping and packaging, accounting for nearly 30 percent of the total value of such exports in 1968. Mexico and the United Kingdom are other important export markets (table 3).

U.S. imports

The value of U.S. imports of wrapping, packaging, and related machinery increased from about \$10 million in 1964 to \$18 million in 1968 (table 1). Although imports increased annually during 1964-68, they accounted for only about 3 percent of the value of apparent consumption in each of the years 1965-67. Data on imports of the machinery considered here are shown, by types, for 1964-68 in table 4.

Imports have consisted of machinery used for wrapping and packaging such food and beverage items as candy, sugar, dairy products, tea, lettuce, canned goods, coffee, yeast, and peanuts. Machinery for packaging nonfood articles include those for packaging tobacco, soap, wood shavings, table flatware, chemicals, screws, bus tokens, and powder. Dishwashers, bottle washers, and unscramblers are among the related machines imported. Imports of dish washers are virtually insignificant. Some imports compete directly with domestically produced articles, although some imported machinery has specialized features that are not available in U.S.-manufactured machines. A large part of the imports have consisted of special types of machinery not produced in the United States.

West Germany, Canada, and the United Kingdom are the principal sources supplying U.S. imports of wrapping and packaging machinery (table 5).

Table 1.--Wrapping and packaging, cleaning, dishwashing, and other related machinery, and parts: U.S. producers' shipments, imports for consumption, exports of domestic merchandise, and apparent consumption, 1964-68

Year	U.S. producers' shipments <u>1/</u>	Imports	Exports	Apparent consumption <u>1/</u>	Ratio of imports to consumption <u>1/</u>
	<u>1,000 dollars</u>	<u>1,000 dollars</u>	<u>1,000 dollars</u>	<u>1,000 dollars</u>	<u>Percent</u>
1964-----	430,000	9,559	2/	2/	2/
1965-----	475,000	11,123	80,422	407,000	2.7
1966-----	530,000	14,251	92,259	450,000	3.2
1967-----	560,000	15,516	91,487	484,000	3.2
1968-----	2/	18,449	94,686	2/	2/

1/ Estimated by the staff of the U.S. Tariff Commission.

2/ Not available.

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

Note.--The data shown for U.S. producers' shipments and exports are not fully comparable with the data shown for imports because of variations in the coverage of the statistical classifications used in compiling and reporting U.S. producers' shipments, imports, and exports of the articles considered in this summary.

Table 2.--Wrapping and packaging, cleaning, dishwashing, and other related machinery, and parts: U.S. exports of domestic merchandise, by types, 1965-68

(In thousands of dollars)

Type	1965	1966	1967	1968
Food and beverage bottling, washing, filling, closing, and labeling machines-----	19,780	21,330	22,823	24,022
Food canning, wrapping, packaging, and sealing machines and parts--	27,579	33,815	31,112	31,291
Bakery, tobacco, and other wrapping and packaging machines and parts-----	21,753	23,857	24,902	27,383
Dishwashing machines and parts----	11,310	13,257	12,650	11,990
Total-----	80,422	92,259	91,487	94,686

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

Table 3.--Wrapping and packaging, cleaning, dishwashing, and other related machinery, and parts: U.S. exports of domestic merchandise, by principal markets, 1965-68

(In thousands of dollars)

Market	1965	1966	1967	1968
Canada-----	21,013	25,899	23,243	28,332
Mexico-----	7,868	8,253	7,531	11,811
United Kingdom-----	4,390	5,500	5,549	5,961
Japan-----	2,478	1,980	3,213	4,007
Venezuela-----	3,004	4,687	3,381	3,568
West Germany-----	3,452	4,171	3,295	3,433
Australia-----	2,687	3,884	3,615	3,423
Sweden-----	3,650	3,207	3,410	3,263
France-----	2,688	2,493	2,687	2,337
Republic of South Africa-----	2,424	2,054	2,685	1,800
Netherlands-----	2,191	2,731	2,331	1,794
Philippines-----	3,115	1,835	1,951	1,288
All other-----	21,462	25,565	28,596	23,669
Total-----	80,422	92,259	91,487	94,686

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

Table 4.--Wrapping and packaging, cleaning, dishwashing, and other related machinery, and parts: U.S. imports for consumption, by types, 1964-68

(In thousands of dollars)					
Type	1964	1965	1966	1967	1968
Machines for packaging					
candy and pipe tobacco					
and wrapping cigarette					
packages, and parts-----	1,587	1,515	1,387	1,858	1,890
Can-sealing machines and					
parts-----	61	59	286	692	854
Other wrapping and packag-					
ing, bottle- and con-					
tainer-cleaning, dish-					
washing, and related					
machines, and parts-----	7,911	9,549	12,578	12,966	15,705
Total-----	9,559	11,123	14,251	15,516	18,449

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

Table 5.--Wrapping and packaging, cleaning, dishwashing, and related machinery, and parts: U.S. imports for consumption, by principal sources, 1964-68

(In thousands of dollars)

Source	1964	1965	1966	1967	1968
West Germany-----	3,429	4,816	4,451	5,535	6,450
Canada-----	1,862	2,108	4,201	2,897	3,514
United Kingdom-----	2,025	1,713	2,136	2,257	2,502
Switzerland-----	273	376	457	404	1,270
Italy-----	410	468	999	1,509	1,219
Belgium-----	23	30	283	619	1,029
All other-----	1,537	1,612	1,724	2,295	2,465
Total-----	9,559	11,123	14,251	15,516	18,449

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

<u>Commodity</u>	<u>TSUS</u> <u>item</u>
Weighing machinery and scales (except balances of a sensitivity of 5 centigrams or better) and parts-----	662.25, -.26, -.30

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1969).

U.S. trade position

The value of U.S. consumption of the weighing machinery covered by this summary increased annually during 1964-68, reaching an estimated \$164 million in 1968. Imports accounted for about 2 percent of the value of apparent domestic consumption during 1964-68; exports represented an average of about 10 percent of the annual value of U.S. producers' shipments during the same period.

Description and uses

This summary covers weighing machinery and scales (except for balances of a sensitivity of 5 centigrams 1/ or better provided for under items 711.04 and 711.08, which are discussed in a separate summary in volume 7:2), weight-operated counting and checking machines, and weighing-machine weights other than those provided for under items 711.04 and 711.08. This summary also includes parts for weighing machinery. A wide variety of weighing machinery is covered by this summary, such as the following: Machinery and appliances for the direct determination of the weight of objects, whether by balancing the object against exchangeable weights, by manipulation of movable (cursor) weights on a calibrated beam (steelyard and other) or by automatic recording on a scale or indicator in machines operating hydraulically or by means of springs, levers, and counterweights; appliances working on a weight determination principle but recording automatically in other units (e.g., units of volume, number, price, or length) having a direct relation to weight; and predetermined weight machines for checking the uniformity of, or indicating defects in, products by reference to weight, or for dispensing fixed weights of goods ready for packing. Parts for weighing machinery include these, among others: Scale beams, calibrated or not; scale pans and platforms; baseplates, supports, and casings; and knife edges and pivots.

1/ 1 centigram equals 1/100 of a gram.

Scales specially designed to weigh bagasse (a residue obtained when sugarcane is pressed through crushing rollers to extract sugar juice) immediately after the crushing operation are weighing machinery for use in the manufacture of sugar (item 662.25) (C.I.E. 1/ 273/67). Electronic belt weighers, designed for continuous weighing of a load on a moving belt conveyor and providing accurate weight data at all times, are classifiable under item 662.26 or 662.30, depending on the degree of accuracy of the weighing system (C.I.E. 1941/66). The belt weigher consists of three basic elements: the detection subsystem the computation subsystem, and the display subsystem. A system for industrial weighing consisting of load cells hooked up to an indicating or recording device is classifiable under the provision for weighing machinery in item 662.26 or 662.30, depending on the degree of accuracy. The load cells, which are basically special steel billets with strain gages (wires cemented to the billet which stretch with the deformation of the billet when a load is placed thereon and which change in electrical resistance when stretched, the change being picked up by suitable electrical or electronic equipment), are classifiable under item 662.30, which includes parts of weighing machinery (C.I.E. 800/66). Numbering devices which are chiefly used to stamp numbers on weigh tickets and which constitute integral, constituent component parts of weighing machines are also provided for under item 662.30 (C.I.E. 37/66).

A few of the many types of weighing machines considered here are computing scales which indicate not only the weight of the goods but the particular value of the said weight corresponding to a large number of different unitary prices, such as the scales used at the checkout counter in grocery stores; letter and parcel scales used in the post offices; scales for weighing persons, platform scales or weighbridges used in checking the payload of trucks and railroad cars; weight-operated counting scales for determining the number of pieces per pound; and scales for discharging a predetermined weight of material into a bag or container in packaging plants.

Related articles provided for elsewhere in the TSUS include electric weight recorders and weigh data systems, which in effect are data-processing or office record-keeping machines, provided for under item 676.30 (see summary in volume 6:9), and separate stamping devices--with watch or clock movements or synchronous motors (even though for use with and chiefly used with weighing machinery)--which impress the hour, day, month, and year on weigh tickets are provided for under items 715.45 to 715.53 (see summary in volume 7:2).

1/ Customs Information Exchange.

U.S. tariff treatment

The column 1 (trade-agreement) rates of duty applicable to imports (see general headnote 3 in the TSUSA-1969) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	U.S. concessions granted in 1964-67 trade confer- ence (Kennedy Round)	
			Second stage, effective Jan. 1, 1969	Final stage, effective Jan. 1, 1972
	Weighing machinery and scales (except balanc- es of a sensitivity of 5 centigrams or better provided for in part 2D of schedule 7), includ- ing weight-operated counting and checking machines, and parts; weighing machine weights, not provided for in part 2D of schedule 7:			
662.25:	Weighing machinery for use in the manufacture of sugar.	Free	<u>1/</u>	<u>1/</u>
662.26:	Fully automatic weighing machinery requiring no manual operations for weight determinations, and accurate to 1/20 of 1 percent or better of the maximum weighing capacity, on weight tests within the weigh- ing range of the scale.	10% ad val.	8% ad val.	5% ad val.
662.30:	Other-----	18% ad val.	14% ad val.	9% ad val.

1/ Duty-free status not affected by the trade conference.

WEIGHING MACHINERY

The tabulation above shows the column 1 rates of duty in effect prior to January 1, 1968, and modifications therein as a result of concessions granted by the United States in the sixth (Kennedy) round of trade negotiations under the General Agreement on Tariffs and Trade. Only the second and final stages of the five annual rate modifications are shown above (see the TSUSA-1969 for all of the staged rates). The prior rates shown in the preceding tabulation had remained unchanged under the TSUS from August 31, 1963, through 1967. Weighing machinery for use in the manufacture of sugar (item 662.25) continues to be free of duty, as originally provided for in the Tariff Act of 1930; this was the only item covered by this summary that was not considered in the trade conference.

U.S. consumption and U.S. producers' shipments

The value of apparent U.S. consumption of weighing machinery and scales increased annually from about \$81 million in 1964 to an estimated \$164 million in 1968 (table 1). The value of U.S. producers' shipments of such equipment paralleled that of consumption, increasing from \$92 million in 1964 to an estimated \$175 million in 1968. In 1967, U.S. producers' shipments 1/ of weighing machinery and scales, by types, were valued as follows:

<u>Type</u>	<u>Million dollars</u>
Scales and balances, except laboratory:	
Railroad track and motortruck scales---	18.7
Industrial scales-----	55.0
Retail and commercial scales-----	19.6
Household and person-weighing scales---	15.6
Mailing and parcel post scales-----	3.2
Other scales and balances-----	8.3
Parts-----	<u>11.0</u>
Total-----	131.4

1/ The scope of the data on U.S. producers' shipments may not fully coincide with the scope of this summary.

Separate data on the distribution of shipments by types are not available for the years 1964-68. It is known, however, that there has been a large increase in recent years in U.S. producers' shipments of railroad track and motortruck scales, and of industrial scales. The value of shipments of railroad track and motortruck scales increased from \$6 million in 1958 to \$18 million in 1967; during the same period, the value of shipments of industrial scales increased from \$29 million to \$55 million; and these same rates of increase probably continued during 1968-69.

According to representatives of domestic scale producers, there is a definite trend toward increased use of highly complicated weighing and batching systems that are integrated with electronic computer controls.

U.S. producers

In 1967 the U.S. weighing machinery and scale industry was composed of 76 establishments, with 6,500 employees. Only 34 of the producing establishments had 20 or more employees. The principal producing States, which account for more than 60 percent of the value of total production are New York, Ohio, and Illinois. Most establishments that produce the equipment considered here are highly specialized and dependent on such production for nine-tenths or more of the value of their total shipments. Some of the domestic producers have controlling interests in foreign concerns manufacturing weighing machines and scales.

U.S. exports

The value of annual U.S. exports of weighing machinery and scales increased from about \$13.0 million in 1965 to \$14.1 million in 1967, and then declined to \$12.8 million in 1968 (table 2). Industrial scales have been the principal class of scales exported, accounting for 46 percent of the total value of exports of weighing machinery during 1965-68. Canada was the principal market for U.S. exports of weighing machinery and scales during that period, when it accounted for about 30 percent of the value of total exports (table 3). Other countries that have received significant shares of U.S. exports include Mexico, Venezuela, and France.

U.S. imports

The aggregate value of imports of weighing machinery and scales increased annually from \$1.5 million in 1964 to \$2.4 million in 1966, and then declined to about \$1.8 million in 1968 (table 4). West Ger-

many and Switzerland were the principal sources of imports of these articles during 1964-68; together they accounted for about 62 percent of the total value of imports during that period (table 5).

U.S. imports of weighing machinery for use in the manufacture of sugar (item 662.25) were negligible in 1964-68, increasing in value from about \$9,000 in 1964 and 1965 to \$45,000 in 1967, and then declining to \$11,000 in 1968.

The value of imports of automatic weighing machinery (item 662.26) increased from \$722,000 in 1964 to \$1,129,000 in 1966, and then declined to \$971,000 in 1968. West Germany accounted for 40 percent of the total value of such imports during 1964-68.

The value of U.S. imports of all other types of weighing machinery and scales (item 662.30) increased from \$760,000 in 1964 to \$1,267,000 in 1966, but declined to about \$781,000 in 1968. Switzerland supplied 50 percent of the total value of imports of this class during 1964-68.

The inconvenience and expense that foreign producers encounter in obtaining type approval of scales used in commerce from the bureau of weights and measures (or its counterpart agency) in each of the 50 United States has restricted the volume of imports of scales. Obtaining type approval of scales used in commerce is less of a problem for domestic firms because over a period of years they have developed close working relationships with the State bureaus. The fact that some domestic manufacturers of scales maintain trained servicing personnel in many cities in the United States is also a deterrent to imports because foreign producers find the cost of providing comparable servicing prohibitive.

Some of the other types of weighing machinery and scales (under item 662.30) that are imported are mail, household, and person-weighing scales, beam scales, and semiautomatic counter scales.

Table 1.--Weighing machinery and scales: U.S. producers' shipments, imports for consumption, exports of domestic merchandise, and apparent consumption, 1963-68

Year	U.S. producers' shipments	Imports	Exports	Apparent consumption	Ratio of imports to consumption
	<u>1,000</u> dollars	<u>1,000</u> dollars	<u>1,000</u> dollars	<u>1,000</u> dollars	Percent
1963-----	89,979	<u>1/</u>	11,165	<u>1/</u>	<u>1/</u>
1964-----	91,790	1,491	12,626	80,700	1.8
1965-----	107,550	2,112	12,983	96,700	2.2
1966-----	133,818	2,438	13,683	122,600	2.0
1967-----	131,400	2,180	14,147	119,433	1.8
1968-----	<u>2/</u> 175,000	1,763	12,819	<u>2/</u> 164,000	1.1

1/ Not available.

2/ Estimated by the staff of the U.S. Tariff Commission.

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

Note.--The ratios of imports to consumption are based on the foreign market value of imports and U.S. factory value of shipments. If the ratios were computed on the basis of the foreign value of imports plus U.S. import duties and costs of transportation, insurance, and other handling to deliver the merchandise to the United States, they would be higher. The data shown for U.S. producers' shipments and for exports are not fully comparable with those shown for imports, owing to variations in the coverage of the statistical classifications used in compiling and reporting U.S. producers' shipments, imports, and exports of the articles considered in this summary.

WEIGHING MACHINERY

Table 2.--Weighing machinery and scales: U.S. exports of domestic merchandise, by types, 1965-68

(In thousands of dollars)

Type	1965	1966	1967	1968
Railroad track and motortruck scales-----	526	503	557	807
Industrial scales-----	5,901	6,410	6,540	5,854
Retail, commercial, mailing, and parcel post scales-----	1,494	1,756	1,496	1,652
Household and person-weighing scales-----	1,895	1,381	1,279	1,051
Parts for scales-----	3,167	3,633	4,275	3,455
Total-----	12,983	13,683	14,147	12,819

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

Table 3.--Weighing machinery and scales: U.S. imports of domestic merchandise, by principal markets, 1965-68

(In thousands of dollars)

Market	1965	1966	1967	1968
Canada-----	3,477	4,529	4,510	3,672
Venezuela-----	739	717	617	835
Mexico-----	974	820	1,478	733
France-----	600	579	678	673
Australia-----	339	484	508	473
United Kingdom-----	432	284	263	471
Philippines-----	422	241	524	423
Switzerland-----	447	470	289	299
West Germany-----	346	307	316	276
Argentina-----	-	30	53	226
Republic of South Africa-----	242	258	251	210
All other-----	4,965	4,964	4,660	4,528
Total-----	12,983	13,683	14,147	12,819

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

Table 4.--Weighing machinery and scales: U.S. imports for consumption, by types, 1964-68

(In thousands of dollars)

Type	1964	1965	1966	1967	1968
Weighing machinery for use in: the manufacture of sugar---	9	9	42	45	11
Fully automatic weighing machinery-----	722	1,091	1,129	1,011	971
Other weighing machinery and scales-----	760	1,012	1,267	1,124	781
Total-----	1,491	2,112	2,438	2,180	1,763

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

Table 5.--Weighing machinery and scales: U.S. imports for consumption, by principal sources, 1964-68

(In thousands of dollars)

Source	1964	1965	1966	1967	1968
West Germany-----	312	561	887	734	737
Switzerland-----	496	707	825	704	231
Canada-----	168	165	123	150	164
United Kingdom-----	52	163	173	128	146
Japan-----	43	16	23	85	141
Netherlands-----	42	45	47	80	87
Belgium and Luxembourg-----	250	286	177	53	84
Sweden-----	80	72	84	136	77
Italy-----	34	51	70	83	62
Ireland-----	-	4	10	15	12
All other-----	14	42	19	12	22
Total-----	1,491	2,112	2,438	2,180	1,763

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

APPLIANCES FOR SPRAYING OR DISPERSING LIQUIDS,
POWDERS, OR GRANULES

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<u>Commodity</u>	<u>TSUS</u> <u>item</u>
Mechanical appliances, whether or not hand operated, for projecting, dispersing, or spraying liquids, powers, or granules; self-contained fire extinguishers-----	662.35, -.36, -.40, -.45, -.50, -.51

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1969).

U.S. trade position

The value of U.S. imports of appliances for spraying or dispersing liquids or powders is small in relation to exports. In 1968, exports were valued at about \$52.0 million and imports at \$5.0 million. Complete data on domestic production of appliances for spraying or dispersing liquids or powders are not available; however, it is known that the value of annual production of such articles increased significantly during 1963-68.

Description and uses

Mechanical appliances for spraying or dispersing liquids or powders or projecting granules consist of a wide variety of articles having many diverse uses. In addition to the appliances themselves, this summary includes parts thereof. The appliances include the following: Spray-and powder-dispensing articles used in dispersing insecticides and fungicides in agriculture, horticulture, or the home; antifrost machines, emitting an artificial cloud; liquid manure sprayers, sprinklers for lawns and orchards; mistblowers and dusters; hydraulic (water) guns used for dislodging minerals (placer mining); spraying booms for mounting on trucks used for spraying roadsides for weed and brush control; mechanical showers used on paper machines; self-contained fire extinguishers; paint spray guns and paint spray equipment units; spray car-washing machines; steam cleaning machines; mouth sprayers for dental spray cleaning and massage of the gums; pump devices operated by finger pressure for attachment to the tops of bottles and used for spraying liquids; sandblasting machines used for cleaning, finishing, or etching surfaces (in the cleaning of metal castings and other metal products and pottery, and in the etching of tools, jewelry, and glass); and jet projecting machines (item 662.50), propelling sand, metal, shot, or other abrasives such as grit, for blast-cleaning, descaling, deflashing, deburring, and shot peening.

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APPLIANCES FOR SPRAYING OR DISPERSING LIQUIDS,
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Related articles not covered in this summary include these: Hand-pump metal oil cans and hand-operated grease guns and parts thereof, which are classified under items 651.47 and 651.55 (both of these articles are discussed in volume 6:6); hose nozzles of brass that must be threaded or unthreaded to control the flow of liquids passing through the hose, which are classified under item 657.35 and discussed in volume 6:7 (see Treasury Decision 56089 (62)); and automatic vending machines and parts thereof, which are classified in item 678.40 and discussed in volume 6:10.

U.S. tariff treatment

The column 1 (trade-agreement) rates of duty applicable to imports (see general headnote 3 in the TSUSA-1969) are as follows:

TSUS item :	Commodity :	Rate prior to Jan. 1, 1968 :	U.S. concessions granted in 1964-67 trade confer- ence (Kennedy Round) ----- :Second stage, :Final stage, : effective : effective :Jan. 1, 1969 :Jan. 1, 1972	
662.35:	Mechanical appliances, whether or not hand operated, for project- ing, dispersing, or spraying liquids or powders; fire extin- guishers, whether or not charged; spray guns and similar ap- pliances; steam- or sandblasting machines and similar jet pro- jecting machines; all the foregoing (except automatic vending ma- chines) and parts:	19% ad val.	15% ad val.	9.5% ad val.
662.36:	If Canadian article and original motor- vehicle equipment (see headnote 2, part 6B, schedule 6):	Free	<u>1/</u>	<u>1/</u>

See footnote at end of table.

APPLIANCES FOR SPRAYING OR DISPERSING LIQUIDS,
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TSUS item	Commodity	Rate prior to Jan. 1, 1968	U.S. concessions granted in 1964-67 trade confer- ence (Kennedy Round)	Second stage, effective Jan. 1, 1969	Final stage, effective Jan. 1, 1972
	Mechanical appliances, whether or not hand operated, etc. (Con.):				
662.40:	Sand-blasting machines, and parts thereof.	Free	<u>1/</u>	<u>1/</u>	
662.45:	Sprayers (except spray- ers, self-contained, having a capacity not over 5 gallons) suit- able for agricultural or horticultural use.	Free	<u>1/</u>	<u>1/</u>	
662.50:	Other-----	10% ad val.	8% ad val.	5% ad val.	
662.51:	If Canadian article and original motor- vehicle equipment (see headnote 2, part 6B, schedule 6).	Free	<u>1/</u>	<u>1/</u>	

1/ Duty-free status not affected by the trade conference.

The tabulation above shows the column 1 rates of duty in effect prior to January 1, 1968, and modifications therein as a result of concessions granted by the United States in the sixth (Kennedy) round of trade negotiations under the General Agreement on Tariffs and Trade. Only the second and final stages of the five annual rate modifications are shown above (see the TSUSA-1969 for all of the staged rates). The prior rates shown in the preceding tabulation had remained unchanged under the TSUS from August 31, 1963, through 1967. Concessions amounting to a reduction of about 50 percent in the duties on items 662.35 and 662.50 were granted by the United States in the trade conference.

Items 662.36 and 662.51 provide for the duty-free entry of Canadian articles that are original motor-vehicle equipment (see general headnote 3 of the TSUSA). These provisions were established pursuant to the enactment of the Automotive Products Trade Act of 1965 (see Presidential Proclamation 3682 of October 21, 1965), which provided for duty-free entry retroactive to January 18, 1965. From the effective date of the TSUS, August 31, 1963, through January 17, 1965, these articles were classifiable under items 662.35 (pt.) and 662.50 (pt.), respectively.

Sandblasting machines (item 662.40) and certain sprayers (items 662.45) are free of duty as originally provided for in the Tariff Act of 1930. The duty-free status of the aforementioned articles was not affected by the recent trade conference.

U.S. consumption and U.S. producers' shipments

U.S. consumption of the heterogeneous group of products covered by this summary is believed to have increased during recent years and to have expanded at a rate closely paralleling the rate of growth in the gross national product. This sustained growth is due primarily to the fact that the articles covered here, being used for numerous diversified applications in industry, on farms, and at home, are not dependent on any one segment of the economy for their growth.

No data are available regarding the value of U.S. production of the aforementioned articles during 1964-68; also, no separate data are available regarding the value of production during any recent year of certain articles considered here. It is believed, however, that the value of U.S. producers' shipments of all appliances covered by this summary exceeded \$300 million in 1968. Some of the articles considered here for which the value of U.S. producers' shipments in 1963 are known are chemical types of fire extinguishing equipment and parts (\$52.3 million), industrial spraying equipment (\$54.2 million), and farm types of sprayers and dusters (\$49.3 million).

U.S. producers

It is estimated that more than 150 U.S. establishments produce mechanical appliances for projecting, dispersing, or spraying liquids or powders. These establishments are situated principally in the East North Central and Middle Atlantic States. Many of the producing establishments are highly specialized and make only one line of products; others are diversified to the extent that the production of articles included in this summary may represent only a small part of their total output.

U.S. exports

The value of U.S. exports of appliances for spraying and dispersing liquids or powders increased from about \$41.6 million in 1965 to \$52.0 million in 1968. Data on U.S. exports of the appliances considered here are shown, by types, in table 1.

During 1965-68, Canada was the principal market for U.S. exports of appliances for spraying or dispersing liquids or powders (table 2); about 30 percent of the value of total exports in those years was accounted for by that country. Other countries that have received significant shares of U.S. exports include Mexico, West Germany, and the United Kingdom.

U.S. imports

Annual U.S. imports of appliances for spraying or dispersing liquids or powders are small in relation to U.S. production and consumption.

The aggregate value of imports of the articles covered by this summary increased annually from \$1.8 million in 1964 to about \$5.0 million in 1968 (table 3). Canada was the principal source of such imports (table 4), supplying 36 percent of their total value in the 1964-68 period. West Germany was also an important supplier.

The value of U.S. imports of simple piston pump sprays and parts (item 662.35 and 662.36) increased irregularly from about \$71,000 in 1964 to \$86,000 in 1968. Japan supplied 46 percent of the total value of imports of this equipment during 1964-68. The value of imports of sprayers for agricultural and horticultural use, other than self-contained units under 5 gallons capacity (item 662.45), increased substantially from \$364,000 in 1964 to about \$1.1 million in 1968. Canada supplied 57 percent of the total value of imports of these sprayers during 1964-68. Imports of mechanical appliances for dispersing liquids or powders (item 662.50 and 662.51), which constituted the great bulk of all the imports considered here, increased in value annually from \$1.3 million in 1964 to about \$3.8 million in 1968. Canada and West Germany supplied 29 percent and 24 percent, respectively, of the total value of such appliances during 1964-68. Imports of these mechanical appliances included, among others, fire extinguishers, paint sprayers, rotary hand dusters, metallizing hand spray guns, and borehole loaders and cleaners.

APPLIANCES FOR SPRAYING OR DISPERSING LIQUIDS,
POWDERS, OR GRANULES

Table 1.--Appliances for spraying or dispersing liquids, powders, or granules, and parts of such appliances: U.S. exports of domestic merchandise, by types, 1965-68

(In thousands of dollars)

Type	1965	1966	1967	1968
Sprayers and dusters, agricultural and pesticidal, power-operated---	4,947	4,492	4,687	5,161
Sprayers and dusters, agricultural and pesticidal, hand-operated----	2,439	2,014	2,713	2,803
Parts for agricultural and pesticidal sprayers and dusters-----	3,256	3,975	4,118	4,452
Foundry blast cleaning machines and parts-----	3,840	3,807	4,190	3,756
Metal cleaning machines and parts--	4,041	3,430	3,292	3,887
Other sprayers and spraying equipment and parts-----	16,055	18,440	21,506	22,200
Fire extinguishers, chemical, and parts-----	4,936	5,392	5,662	6,393
Fire sprinkler systems, automatic, and parts-----	2,055	2,512	3,243	3,313
Total-----	41,569	44,062	49,411	51,965

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

Note.--No data on the value of U.S. producers' shipments of appliances for spraying or dispersing liquids, powders, or granules, are available for 1964-68. It is believed, however, that the value of producers' shipments of such appliances exceeded \$300 million in 1968. The data shown for U.S. producers' shipments and exports are not fully comparable with the data shown for imports, owing to variations in the coverage of the statistical classifications used in compiling and reporting U.S. producers' shipments, imports, and exports of the articles considered in this summary.

APPLIANCES FOR SPRAYING OR DISPERSING LIQUIDS,
POWDERS, OR GRANULES

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Table 2.--Appliances for spraying or dispersing liquids, powders, or granules, and parts: U.S. exports of domestic merchandise, by principal markets, 1965-68

(In thousands of dollars)

Market	1965	1966	1967	1968
Canada-----	12,642	13,690	15,326	14,449
Mexico-----	2,597	2,411	2,420	3,085
West Germany-----	2,338	2,307	2,061	2,607
United Kingdom-----	1,609	1,999	2,381	2,615
France-----	1,189	1,687	1,764	2,129
Belgium and Luxembourg----	1,048	1,464	1,252	1,482
Japan-----	839	1,267	2,564	3,132
Sweden-----	1,184	964	1,189	1,192
All other-----	1/ 18,123	2/ 18,273	3/ 20,454	4/ 21,274
Total-----	41,569	44,062	49,411	51,965

1/ Includes exports to India valued at 969 thousand dollars.

2/ Includes exports to Italy and the Netherlands valued at 1,075 thousand dollars and 825 thousand dollars, respectively.

3/ Includes exports to the Republic of South Africa and Italy valued at 1,578 thousand dollars and 1,516 thousand dollars, respectively.

4/ Includes exports to Venezuela, the Republic of South Africa, and Italy valued at 2,134 thousand dollars, 1,474 thousand dollars, and 1,254 thousand dollars, respectively.

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

APPLIANCES FOR SPRAYING OR DISPERSING LIQUIDS,
POWDERS, OR GRANULES

Table 3.--Appliances for spraying or dispersing liquids, powders, or granules, and parts: U.S. imports for consumption, by types, 1964-68

(In thousands of dollars)

Type	1964	1965	1966	1967	1968
Simple piston pump sprays and parts-----	71	65	77	61	85
Canadian article-----	-	-	5	-	1
Sandblasting machines and parts-----	6	6	16	13	22
Sprayers for agricultural or horticultural use, except self-contained under 5 gallons capacity-----	364	390	708	752	1,083
Other mechanical appliances for dispersing liquids or powders-----	1,332	1,500	1,632	2,863	3,406
Canadian article-----	-	3	30	120	369
Total-----	1,773	1,964	2,468	3,809	4,966

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

APPLIANCES FOR SPRAYING OR DISPERSING LIQUIDS,
POWDERS, OR GRANULES

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Table 4.--Appliances for spraying or dispersing liquids, powders, or granules, and parts: U.S. imports for consumption, by principal sources, 1964-68

(In thousands of dollars)

Source	1964	1965	1966	1967	1968
Canada ^{1/} -----	364	509	725	1,792	2,010
West Germany-----	433	409	388	545	940
United Kingdom-----	383	416	384	342	492
Japan-----	243	234	273	376	459'
Netherlands-----	96	80	76	129	330
Denmark-----	76	175	228	186	252
Israel-----	6	8	107	121	173
All other-----	172	133	287	318	310
Total-----	1,773	1,964	2,458	3,809	4,966

^{1/} Data include imports in 1965 valued at 3 thousand dollars, in 1966 valued at 35 thousand dollars, in 1967 valued at 120 thousand dollars, and in 1968 valued at 370 thousand dollars, which were entered free of duty under the provisions of the Automotive Products Trade Act of 1965.

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

<u>Commodity</u>	<u>TSUS item</u>
Excavating, mining, and related machinery, including pile drivers and snowplows; and parts-----	664.05

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1969).

U.S. trade position

U.S. producers and their foreign-based subsidiaries and affiliates have accounted for more than half of the total value of free world production of excavating, mining, and related machinery in recent years. The value of U.S. producers' shipments of this equipment increased annually during 1964-68, reaching an estimated \$3.1 billion in 1968. Imports accounted for about 1 percent of apparent U.S. consumption in 1965-68, whereas exports represented about 26 percent of producers' shipments during the same period.

Description and uses

This summary covers machinery, other than agricultural machinery, for extracting or moving of earth, minerals, or ore (consisting of mechanical shovels, coal cutters, excavators, backhoes, scrapers, bulldozers, tractor-shovel loaders, ditchers, trenchers, graders, rollers, rock drills, post-hole diggers, well-drilling machinery, and other excavating, leveling, boring, and extracting machinery). It also includes pile-drivers, non-self-propelled snowplows, and parts for all of the machinery covered by this summary. The machinery may be stationary or mobile; however, machines mounted on transport equipment, such as trucks, railroad cars, vessels or other floating structures, are excluded. Under ordinary circumstances the propelling base and the other portion of the self-propelled machinery considered here form an integral unit.

Many of the machinery parts considered here are subject to severe wear conditions, therefore requiring frequent replacement. These parts include such items as tracks for tracklaying machinery, drills and bits for coal-mining and oil-well-drilling machines, bulldozer blades, and scoops for shovel loaders.

The aforementioned equipment is used for such purposes as highway, airport, and dam construction; highway maintenance (including snow removal); preparing sites for the construction of buildings; mining;

dredging; tunneling; drilling for water, oil, and gas; and driving piles for buildings, bridges, and piers.

Related articles not included in this summary are the following: oil well casings (items 610.39 to 610.43), discussed in volume 6:4; hand-directed or hand-controlled pneumatic tools, such as rock drills, pavement breakers, and tampers (item 674.70), discussed in volume 6:6; rock-drilling bits (items 649.43, 649.47, and 649.49), discussed in volume 6:7; machinery for soil preparation and cultivation (item 666.00), hoists and conveyors other than those used, for example, in mining (item 664.10), and snowblowers (item 661.10), all discussed in this volume; and wheel and tracklaying types of tractors (items 692.30 and 692.35), cranes mounted on motor-vehicles (item 692.16), and offshore drilling rigs mounted on floating structures (item 696.60), all discussed in volume 6:11.

U.S. tariff treatment

The column 1 (trade-agreement) rates of duty (see general head-note 3 in the TSUSA-1969) applicable to imports of excavating, mining, and related machinery (item 664.05) are shown below:

	<u>Rate of duty</u>
Rate prior to Jan. 1, 1968-----	10% ad val.
Concessions granted by the United States in the 1964-67 trade conference (Kennedy Round):	
Second stage, effective Jan. 1, 1969-----	8% ad val.
Fifth and final stage, effective Jan. 1, 1972-----	5% ad val.

The prior rate of 10 percent ad valorem had remained unchanged under the TSUS from August 31, 1963, through 1967. As a result of a concession granted by the United States in the sixth (Kennedy) round of trade negotiations under the General Agreement on Tariffs and Trade, the rate is being reduced to 5 percent ad valorem in five annual stages; the second stage, a reduction to 8 percent, became effective January 1, 1969 (see the TSUSA-1969 for all of the staged rates).

U.S. consumption

The estimated value of apparent U.S. consumption of excavating, mining, and related machinery increased from \$2.0 billion in 1965 to \$2.3 billion in 1968 (table 1). Factors contributing to the upward trend in consumption were the continuing high level of construction activity (particularly in the areas of commercial and industrial build-

ings, highways, airports, dams, and irrigation and land reclamation projects); an increasing demand for coal and other minerals; increased military requirements for earth-moving and related machinery resulting from the war in Viet-Nam; and the continuing development of more versatile, larger capacity, and higher priced equipment.

U.S. producers

Approximately 1,400 U.S. establishments are engaged in the production of excavating, mining, and related machinery. None of the producers of this machinery make all of the diverse lines of products considered here, and many of the smaller producers make only a single product line. Many of the large producers also manufacture other articles, such as wheel and tracklaying tractors, off-highway haulers, rock crushers, and ball and rod mills. Furthermore, these large concerns frequently produce excavating, mining, and related machinery in foreign countries through subsidiary or affiliated companies.

Establishments for producing excavating and other types of construction machinery are situated principally in the East North Central States; those producing mining machinery are concentrated in the coal-producing States of Pennsylvania, West Virginia, and Ohio; and those producing oil-drilling and oil-extracting machinery are situated principally in Texas, Oklahoma, and California.

U.S. producers' shipments

The estimated value of U.S. producers' shipments of the excavating, mining, and related machinery covered by this summary increased from \$2.4 billion in 1964 to \$3.1 billion in 1968 (table 1). Annual shipments during 1964-66 of certain types of equipment for which data are separately reported were as follows (in millions of dollars):

	<u>1964</u>	<u>1965</u>	<u>1966</u>
Power cranes, draglines, shovels, and parts-----	543	607	687
Integral tractor-shovel loaders-----	391	406	422
Ditchers, trenchers, scrapers, rollers, and compactors-----	154	172	191
Motor graders and light maintainers--	102	108	121
Dozers for mounting on tractors-----	43	52	55
Backhoes for mounting on tractors---	44	63	70
Mine conveyors-----	16	17	16
Mining drills-----	28	30	32
Underground-mining machinery-----	34	40	44

Excavating, mining, and related machinery are subject to rigorous operating conditions; consequently, shipments of spare parts represent a significant share of the total shipments of concerns which produce these products.

Changing technology and the availability of improved materials have resulted in the production of machines of increased versatility, horsepower, and capacities. Examples of very large machines which are now operational include a power shovel with a 215-foot boom and a bucket capacity of 180 cubic yards and a dragline with a 310-foot boom and a bucket capacity of 220 cubic yards. The trend throughout the industry is toward larger machinery which is capable of greater production and conservation of manpower.

The value of U.S. producers' shipments of oilfield machinery increased annually during 1964-68, although the number of wells completed and the total footage drilled a year declined significantly during the period. The increase in shipments was attributable largely to the fact that the search for oil has shifted to less accessible land areas and to offshore areas which require more sophisticated exploratory equipment and more complex drilling and extracting equipment.

U.S. exports

The aggregate value of U.S. exports of excavating, mining, and related machinery increased from \$698 million in 1965 to \$841 million in 1968. Exports represented about 26 percent of U.S. producers' total shipments during 1965-68. In 1968, exports of integral tractor-shovel loaders, including parts and attachments, accounted for 27 percent of the total exports considered here; well-drilling machines, including parts, accessories, and attachments, accounted for 16 percent; and power cranes, draglines, shovels, and backhoes, including parts, accessories, and attachments, accounted for 14 percent, as indicated in table 2.

Canada was the principal export market for excavating, mining, and related equipment during 1965-68, receiving about 20 percent of total U.S. exports of such equipment. Other important markets included Brazil, Venezuela, Mexico, the United Kingdom, France, West Germany, and Australia.

In addition to supplying foreign markets from U.S. production, U.S. firms also manufacture many of the articles considered here in the plants of their foreign subsidiaries. Although these subsidiaries compete with domestic concerns in export markets, they also make a significant contribution to the expansion of U.S. exports because they incorporate many U.S.-produced parts, including subassemblies, in machines which they manufacture.

U.S. imports

The value of imports of excavating, mining, and related machinery increased from \$13.9 million in 1964 to \$34.9 million in 1968 (table 3), or by 150 percent. Although imports increased rapidly during the period, they represented only 1.5 percent of the value of apparent domestic consumption in 1968.

Articles entered under item 664.05 have included mechanical shovels, scrapers, excavators, bulldozers, non-self-propelled snowplows, pile-drivers, rock drills, and parts of machines, such as drill bit bodies, drill rods, track shoes and pins for the tracklaying equipment included in this summary, and buckets for mechanical shovels.

During 1964-68 Canada and West Germany accounted for about 30 percent and 23 percent, respectively, of the total value of imports of the articles considered here; other important sources of imports were France, the United Kingdom, Italy, and Sweden. A significant share of the imports from Canada consisted of articles produced by Canadian subsidiaries of U.S. firms.

EXCAVATING, MINING, AND RELATED MACHINERY

Table 1.--Excavating, mining, and related machinery, including parts: U.S. producers' shipments, imports for consumption, exports of domestic merchandise, and apparent consumption, 1964-68

Year	U.S. producers' shipments 1/	Imports	Exports	Apparent consumption 1/	Ratio of imports to consumption 1/
	<u>Million dollars</u>	<u>Million dollars</u>	<u>Million dollars</u>	<u>Million dollars</u>	<u>Percent</u>
1964-----	2,400	13.9	2/	2/	2/
1965-----	2,700	12.0	698.4	2,010	0.6
1966-----	2,900	15.0	713.0	2,200	.7
1967-----	3,000	20.8	773.8	2,250	.9
1968-----	3,100	34.9	840.8	2,290	1.5

1/ Estimated by the staff of the U.S. Tariff Commission.

2/ Not available.

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

Note.--The data shown above for imports and exports are not fully comparable, owing to variations in the statistical classification systems used in compiling import and export statistics (see footnote 1 to table 2).

Table 2.--Excavating, mining, and related machinery: U.S. exports of domestic merchandise, by types, 1965-68 1/

(In millions of dollars)

Type	1965	1966	1967	1968
Power cranes, draglines, shovels, and backhoes, excavator types-----	60.9	55.3	80.0	66.3
Parts, accessories, and attachments, not elsewhere classified, for excavator types of power cranes, draglines, shovels, and backhoes-----	44.3	46.7	50.9	47.5
Scrapers, dig-carry-haul-----	24.7	24.5	31.2	30.2
Motor graders and light maintainers----	33.1	32.9	39.5	49.3
Ditchers and trenchers, self-propelled-	3.3	4.2	4.8	4.6
Road rollers and compactors-----	12.6	11.8	11.7	14.0
Dredging machines, piledrivers, and railway maintenance-of-way equipment-	5.2	4.3	5.5	6.1
Construction, maintenance, and excavating machines, n.e.c-----	16.2	23.3	19.4	22.0
Backhoes for mounting on wheel tractors-----	5.6	5.9	3.3	2.0
Dozers for mounting on tractors-----	19.7	19.2	15.5	20.3
Rippers and rooters for mounting on tractors, trucks, or locomotives-----	9.0	9.2	7.6	9.5
Attachments, n.e.c., for mounting on tractors or trucks-----	20.0	16.6	14.6	15.8
Parts and accessories, n.e.c., for construction, maintenance, excavating, and leveling machines, n.e.c----	68.2	66.1	65.0	67.7
Coal-cutting machines and continuous-mining machines-----	8.6	6.5	5.4	10.6
Boring and drilling machines, n.e.c., for mining and construction-----	11.1	16.0	16.2	23.7
Mining machines, n.e.c-----	6.2	5.0	2.6	2.9
Parts and attachments, n.e.c. for mining machines-----	20.5	22.9	28.5	38.3
Well-drilling machines (rotary and other types)-----	23.1	21.5	32.8	37.9
Parts, accessories, and attachments, n.e.c., for well-drilling machines---	71.8	73.4	79.2	96.5
Oil- and gas-field derricks, rod-lifting and other oil- and gas-field lifting machines and parts-----	40.4	47.2	50.6	39.8
Integral tractor-shovel loaders, wheel and tracklaying types-----	133.0	132.3	136.8	148.8

See footnote at end of table.

EXCAVATING, MINING, AND RELATED MACHINERY

Table 2.--Excavating, mining, and related machinery: U.S. exports of domestic merchandise, by types, 1965-68 1/--Continued

(In millions of dollars)

Type	1965	1966	1967	1968
Parts and attachments for integral shovel loaders-----	51.2	60.7	65.2	76.8
Underground loaders for mining, including parts and attachments, n.e.c., and underground mine conveyors-----	9.7	7.5	7.5	10.2
Total-----	698.4	713.0	773.8	840.8

1/ The export classes above include certain articles which do not fall within the scope of this summary (e.g., accessories and attachments are not dutiable under item 664.05 unless they are parts of the machinery considered here or are imported with the machines as an entirety). Likewise export classes which include some items that would be properly dutiable under item 664.05 are not included in this table. It is believed that these omissions and overstatements have little net effect on the validity of the totals reported.

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

Table 3.--Excavating, mining, and related machinery: U.S. imports for consumption, by principal sources, 1964-68

(In thousands of dollars)

Source	1964	1965	1966	1967	1968
Canada-----	4,477	3,378	4,146	6,747	11,172
West Germany-----	3,410	3,050	3,795	4,670	7,358
France-----	982	1,011	1,227	2,574	5,872
United Kingdom-----	2,776	1,172	2,043	2,119	2,847
Italy-----	128	378	820	729	2,472
Sweden-----	1,864	2,396	2,214	1,899	2,314
Japan-----	79	74	351	942	1,475
All other-----	210	576	375	1,081	1,391
Total-----	13,926	12,035	14,971	20,761	34,901

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

<u>Commodity</u>	<u>TSUS item</u>
Elevators, conveyors, cranes, and other lifting, handling, loading, or un- loading machinery, and parts-----	644.10, -.11

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1969).

U.S. trade position

The value of U.S. producers' shipments of elevators, conveyors, cranes, and related machinery increased annually during 1964-68, reaching an estimated \$1.5 billion in 1968. The value of annual U.S. imports of this machinery more than tripled in 1964-68; imports represented about 3.8 percent of the value of apparent domestic consumption in 1968. Exports accounted for about 8.5 percent of U.S. producers' total shipments during 1965-68.

Description and uses

This summary covers a heterogeneous group of machines, including freight and passenger elevators, escalators, ski lifts, sky rides, hoists, winches, cranes, jacks, automobile lifts, pulley tackle, conveyors, stackers, and other lifting, handling, loading, or unloading machinery, and parts of all of the foregoing articles. This machinery is used for lifting, handling, loading, or unloading materials in and around industrial plants, airports, bus and rail terminals, warehouses, docks, garages, post offices, and other establishments. It is also used in the bulk handling of such commodities as grain, sand and gravel, coal, and ores, or for lifting and--to some extent--for transporting people.

The machinery considered here, if imported unassembled in a complete shipment, is classified as an entirety under item 664.10 or 664.11; however, if the components of such machinery are imported separately and are more specifically provided for elsewhere in the tariff schedules, they are classified in accordance with General Headnote 10 (ij) of the TSUS. Thus the various components of an aerial tramway which includes cars, cables, steel towers, electric motors, gasoline engines, and so forth, if imported as an entirety are classifiable under item 664.10; however, these same components if imported separately would be dutiable under other provisions if they are more specifically provided for elsewhere.

Item 664.11, covering Canadian articles which are original motor-vehicle equipment, does not provide for machinery for specially equipped or constructed vehicles such as auto-wrecker tow trucks since the term "motor vehicle" as defined in headnote 2(b), part 6B, schedule 6, does not include such vehicles.

Related articles not included in this summary are cranes, mechanical shovels, excavators, hoists, and conveyors which are used in earth-moving and mining operations (item 664.05) and elevators and hoists which are chiefly used on farms (item 666.00); these articles are considered in other summaries in this volume. Cranes and certain other materials-handling machinery mounted on motor vehicles (items 692.14 and 692.16) and self-propelled forklift trucks, platform trucks, and other self-propelled work trucks (item 692.40) are discussed in summaries in volume 6:11.

U.S. tariff treatment

The column 1 (trade-agreement) rates of duty applicable to imports (see general headnote 3 in the TSUSA-1969) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	U.S. concessions granted in 1964-67 trade confer- ence (Kennedy Round)	
			Second stage, effective Jan. 1, 1969	Final stage, effective Jan. 1, 1972
664.10:	Elevators, hoists, winches,	10.5%	8% ad val.	5% ad val.
:	cranes, jacks, pulley	ad val.	:	:
:	tackle, belt conveyors,	:	:	:
:	and other lifting,	:	:	:
:	handling, loading, or	:	:	:
:	unloading machinery,	:	:	:
:	and conveyors, all the	:	:	:
:	foregoing and parts	:	:	:
:	thereof not provided	:	:	:
:	for in item 664.05.	:	:	:
664.11:	If Canadian article and	Free	<u>1/</u>	<u>1/</u>
:	original motor-vehicle	:	:	:
:	equipment.	:	:	:
:	:	:	:	:

1/ Duty-free status not affected by the trade conference.

The tabulation above shows the column 1 rates of duty in effect prior to January 1, 1968, and modifications therein as a result of concessions granted by the United States in the sixth (Kennedy) round

of trade negotiations under the General Agreement on Tariffs and Trade. Only the second and final stages of the five annual rate modifications are shown above (see the TSUSA-1969 for all of the staged rates).

The prior rate of duty of 10.5 percent ad valorem for item 664.10 had remained unchanged under the TSUS from August 31, 1963, through 1967. Item 664.11 provides for duty-free entry of Canadian articles that are original motor-vehicle equipment (see general headnote 3 of the TSUS). This provision was established pursuant to the enactment of the Automotive Products Trade Act of 1965 (see Presidential Proclamation 3682 of October 21, 1965), which provided for duty-free entry retroactive to January 18, 1965. From the effective date of the TSUS, August 31, 1963, to January 17, 1965, these articles were classified under item 664.10. The duty-free status of the Canadian articles was not affected by the recent trade conference.

U.S. consumption

The estimated value of apparent U.S. consumption of elevators, conveyors, cranes, and related machinery increased from about \$1.1 billion in 1965 to \$1.4 billion in 1968 (table 1). The upward trend in consumption is due in part to the strong emphasis that is being placed on automation and labor-saving devices in new plant construction and in the modernization and expansion of existing facilities. This trend is likely to continue because the managers of industrial firms recognize that the use of modern, efficient materials-handling equipment reduces the costs of manufacturing, warehousing, order filling, and internal plant transportation.

U.S. producers

About 800 U.S. establishments that employ more than 50,000 workers are involved in the production of elevators, conveyors, cranes, and the related machinery covered by this summary. Manufacturing facilities are situated in all sections of the United States; however, nearly half of the producing establishments are in the East North Central and Middle Atlantic States.

U.S. producers' shipments

The estimated value of U.S. producers' shipments of the articles covered by this summary increased from about \$1.1 billion in 1964 to \$1.5 billion in 1968 (table 1). Annual shipments during 1964-66 of

the principal product classes considered here were as follows (in millions of dollars):

	<u>1964</u>	<u>1965</u>	<u>1966</u>
Elevators and moving stairways-----	267	290	316
Conveyors-----	430	463	537
Hoists, cranes, and monorails-----	249	265	286
Other handling machinery (includes in part jacks, non-self-propelled pallet trucks, stackers, and winches)-----	<u>1/140</u>	<u>1/165</u>	<u>1/190</u>

1/ Estimated.

The continued high rate of construction of office buildings, apartment houses, hotels, and other high-rise buildings accounts for the growth in shipments of elevators and moving stairways. The emphasis placed on automation of manufacturing and warehousing operations, combined with a strong demand for new production and storage facilities, has had a similar effect on shipments of conveyors, cranes, hoists, and monorails.

U.S. exports

The total value of U.S. exports of elevators, conveyors, cranes, and related machinery increased from \$97 million in 1965 to \$118 million in 1967, and then declined to \$117 million in 1968 (table 2). Exports accounted for about 8.5 percent of the value of U.S. producers' shipments during 1965-68 and consisted principally of conveyors, non-excavating types of cranes, hoists, and winches, and parts for the foregoing articles. Canada has been the principal market during 1965-68 receiving about 30 percent of the total exports considered here. Other important export markets have been Mexico, Belgium, France, West Germany, the United Kingdom, the Philippines, Australia, and Brazil.

U.S. exports of materials-handling equipment are frequently at a competitive disadvantage because of the high level of engineering involved in the design and installation of two of the principal product classes considered here--elevators and moving stairways and conveyor systems. Since virtually every installation of these products must be custom engineered, it is difficult for U.S. manufacturers to compete with local producers in foreign markets. Exports have also been affected by the fact that U.S. producers have been supplying an increasing share of the foreign demand for materials-handling equipment from their foreign subsidiaries and affiliates.

U.S. imports

The aggregate value of U.S. imports of elevators, conveyors, cranes, and related machinery increased annually, from \$16.6 million in 1964 to \$53.6 million in 1968, or by more than 200 percent.

The value of imports of passenger elevators and moving stairways and parts increased from \$0.7 million in 1964 to \$3.8 million in 1968 (table 3). A significant share of these imports have consisted of parts of elevators which were produced by foreign subsidiaries of a large U.S. concern. Imports of conveyors and parts and those of hoists, winches, and overhead traveling cranes and parts increased in value from \$1.3 million and \$5.0 million in 1964 to \$7.9 and \$15.2 million, respectively, in 1968, and accounted in 1964-68 for 12 and 31 percent, respectively, of the total imports considered here.

Imports of other lifting and handling machinery and parts entered under item 664.10 during 1964-68 included a wide variety of articles such as non-self-propelled pallet trucks, hydraulic and mechanical jacks, hydraulically operated aircraft passenger-loading steps, tower cranes, sky rides, ski tows and lifts, and aerial tramway components. Some of the imports of these articles are of a unique construction and consequently are not directly competitive with U.S.-produced articles.

Canada was the principal source of imports of materials-handling equipment during 1964-68 (table 4), accounting for about 37 percent of such imports; other important sources were West Germany, Sweden, the United Kingdom, and France.

Table 1.--Elevators, conveyors, cranes, and related machinery: U.S. producers' shipments, imports for consumption, exports of domestic merchandise, and apparent consumption, 1964-68

Year	U.S. producers' shipments <u>1/</u>	Imports	Exports	Apparent consumption <u>1/</u>	Ratio of imports to consumption <u>1/</u>
	Million dollars	Million dollars	Million dollars	Million dollars	Percent
1964-----	1,085	16.6	<u>2/</u>	<u>2/</u>	<u>2/</u>
1965-----	1,185	22.9	96.7	1,110	2.1
1966-----	1,330	33.3	112.5	1,250	2.7
1967-----	1,390	37.0	117.6	1,310	2.8
1968-----	1,460	53.6	116.6	1,395	3.8

1/ Estimated by the staff of the U.S. Tariff Commission.

2/ Not available.

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

Note.--The data shown above for imports and exports are not fully comparable, owing to variations in the statistical classification systems used in compiling import and export statistics. (see footnote 1 to table 2).

Table 2.--Elevators, conveyors, cranes, and related machinery:
U.S. exports of domestic merchandise, by types, 1965-68 ^{1/}

(In millions of dollars)

Type	1965	1966	1967	1968
Overhead traveling cranes, and monorails--	5.6	6.7	3.8	2.8
Power cranes, other than excavator types and other than crawler mounted or rubber tire mounted-----	5.6	7.4	16.3	19.8
Parts and attachments for cranes, other than excavator types or rubber tire mounted-----	7.7	10.9	10.0	8.7
Front-end loaders, for mounting on tractors-----	2.4	3.7	4.6	3.0
Hoists, including parts and attachments---	12.4	14.7	14.1	12.7
Derricks, except oil- and gas-field, and not truck mounted-----	1.1	0.8	0.4	1.0
Winches, other than truck mounted-----	10.4	11.5	11.4	10.7
Automobile lifts-----	1.1	1.6	1.4	1.3
Elevators and moving stairways-----	1.8	2.3	2.1	2.5
Parts for elevators, moving stairways, and automobile lifts-----	5.4	4.9	4.3	5.5
Conveyors, other than underground mine conveyors, and parts and attachments---	35.7	40.3	36.6	35.8
Jacks and parts-----	7.5	7.7	7.1	7.5
Lifting, loading, and handling machines and equipment, not elsewhere classified, and parts-----	<u>2/</u>	<u>2/</u>	5.5	5.3
Total-----	96.7	112.5	117.6	116.6

^{1/} The export classes shown above include certain articles which do not fall within the scope of this summary (e.g., accessories and attachments are not dutiable under the provisions considered here unless they are parts of the machinery covered or are imported with a machine as an entirety. Likewise export classes which include some articles that would be properly dutiable under items 664.10 and 664.11 are not included in this table. It is believed that these omissions and overstatements have little net effect on the validity of the totals reported.

^{2/} Not separately reported in the official statistics.

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

Table 3.--Elevators, conveyors, cranes, and related machinery:
U.S. imports for consumption, by types, 1964-68

(In thousands of dollars)

Type	1964	1965	1966	1967	1968
Passenger elevators and moving stairways and parts-----	698	1,051	930	1,888	3,770
Belt conveyors and parts--	409	703	563	319	1,115
Other conveyors and parts-	900	1,804	2,472	4,447	6,794
Hoists, winches, and overhead traveling cranes and parts-----	5,044	7,565	11,373	11,567	15,185
Other lifting and handling machinery and parts-----	9,578	11,741	17,965	18,783	26,553
Canadian article and original motor-vehicle equipment-----	<u>1/</u>	<u>1/</u>	-	31	139
Total-----	16,629	22,864	33,303	37,035	53,556

1/ Data not separately reported prior to Dec. 20, 1965.

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

Table 4.--Elevators, conveyors, cranes, and related machinery:
U.S. imports for consumption, by principal sources, 1964-68

(In thousands of dollars)

Source	1964	1965	1966	1967	1968
Canada-----	5,874	8,621	12,724	14,262	18,371
West Germany-----	1,811	2,095	5,438	5,382	8,110
Sweden-----	2,720	3,531	4,470	4,057	5,996
United Kingdom-----	1,114	1,796	2,212	2,988	5,299
France-----	878	1,640	2,563	2,309	3,876
Japan-----	622	1,064	1,739	1,137	2,964
Belgium-----	398	213	374	751	1,533
Italy-----	821	342	565	1,574	1,467
Ireland-----	663	465	202	864	1,442
Switzerland-----	705	1,696	1,678	1,346	1,403
Australia-----	3	23	51	189	1,108
Denmark-----	660	813	457	999	817
All other-----	360	565	830	1,177	1,170
Total-----	16,629	22,864	33,303	37,035	53,556

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

<u>Commodity</u>	<u>TSUS</u> <u>item</u>
Agricultural and horticultural machinery, equipment, and implements-----	666.00

Note. --For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1969).

U.S. trade position

The United States is the world's largest producer and consumer of agricultural and horticultural machinery, equipment, and implements. The value of U.S. consumption of the machines and parts covered by this summary increased from \$1.7 billion in 1964 to an estimated \$2.4 billion in 1967. Imports in 1967 accounted for about 9 percent of the value of apparent consumption; exports in the same year accounted for about 10 percent of U.S. producers' shipments.

Description and uses

This summary covers five basic groups of machinery, equipment, and implements for farm use, namely, (1) machines for soil preparation, (2) machines used for seeding and planting, (3) harvesting machines, (4) haying machines, and (5) other agricultural and horticultural machines, equipment, and implements. Also included are poultry laying cages, cow boots, dehorner, sheep drenchers, pelt-drying boards, maple-sap spigots, orchard machines, and bird-scare cannons. Parts of these articles are included here unless specially provided for elsewhere in the TSUS.

Potting machines that are used to prepare nursery plants for sale have been classified as wrapping and packaging machinery instead of horticultural machinery. Small hand tools, cream separators, and industrial machinery for preparing food or drink are separately provided for in the TSUSA.

Included in the basic group of machines, implements, and equipment for soil preparation are plows, harrows, terracers, soil pulverizers, listers, and rollers. The planting and seeding group includes seed drills, planters, transplanters, fertilizer distributors, and manure spreaders. The third group of machines are those used for harvesting crops, and include such articles as grain combines, cotton pickers, and beet, peanut, potato, ensilage, and forage harvesters. Haying machines include mowers, rakes, hay conditioners, and balers. Other agricultural and horticultural machines, equipment, and implements include incubators, farm elevators, crop driers, feed grinders,

milking machines, farm wagons, bulk fruit and other picking bins, bulk handling containers, tobacco-holding clips, and other machines and implements used in the production of food, fiber, and tobacco.

The U.S. Customs Court stated in Customs Decision 2002 that an agricultural implement is one which is employed in farming or husbandry and which plays a direct role in the production of food or clothing and is chiefly used for that purpose.

Many items used on farms are excluded from the category covered by this summary since they are specifically provided for elsewhere in the TSUSA. Such items include metal containers, wire, fencing, screen, bale ties, fasteners (nails, nuts, bolts, rivets, cotter pins), tools, knives, chain, tubing, metal fence posts, cooking ware, solder, cars, trucks, aircraft and boats. Specific articles not included in this summary are hand tools such as forks, hoes, rakes, and shovels (items 648.55, 648.61, and 651.39), which are discussed in volume 6:6; piston-type internal combustion engines (item 660.40), cream separators (items 661.75 to 661.85), and lawnmowers (item 666.10), which are discussed in other summaries in this volume; tobacco-processing machines (item 678.45), discussed in volume 6:10; and tractors (items 692.30 and 692.35), discussed in volume 6:11. Headnote 1, subpart C, part 4, schedule 6, of the TSUSA gives the particular articles and tariff provisions not included in this summary.

U.S. tariff treatment

Imports of agricultural and horticultural machinery and parts thereof are entered free of duty under TSUS item 666.00. The duty-free treatment of these articles was also provided for under paragraph 1604 of the Tariff Act of 1930 as originally enacted. It was bound by a concession granted by the United States under the General Agreement on Tariffs and Trade, effective January 1, 1948.

U.S. consumption

The value of apparent U.S. consumption of agricultural and horticultural machinery, equipment, and implements increased annually from \$1.7 billion in 1964 to an estimated \$2.4 billion in 1967. Because of the continuing growth in population and the concurrent growth in demand for food and fibers, the outlook appears favorable for increased consumption of agricultural and horticultural machinery, equipment, and implements. As domestic farm sizes and the need for automation increase, more or larger capacity machines will be used in agricultural activities, especially in harvesting certain fruits and vegetables. Where suitable machines have been developed, mechanized operations are replacing manual labor in this area.

The trend toward larger, more versatile agricultural machinery is reflected in newly introduced equipment. Examples of such equipment are multipurpose planters, which plow, prepare the seedbed, and plant the seed in one operation; narrow row equipment, which makes it possible to grow twice as many plants in the same space; and attachments for grain combines which permit six rows or more of corn to be harvested at once.

U.S. producers

About 1,500 U.S. establishments produced agricultural machinery, equipment, and implements in 1964, the latest year for which statistics are available. Production of this equipment is centered in the North Central States. More than 75 percent of the value of shipments of agricultural and horticultural machinery, equipment, and implements in 1964 was accounted for by establishments in these States.

In recent years there have been only minor changes in the number of establishments producing agricultural and horticultural machinery, equipment, and implements. Slight declines have occurred in the number of establishments producing haying and soil preparation machinery. Producers of harvesting machinery constitute a stable group whose shipments have steadily increased in value in recent years.

Certain large U.S. producers of agricultural and horticultural machinery, equipment, and implements also make construction equipment, motor vehicles, and special industrial equipment; however, most producers are dependent on the sale of farm machinery and agricultural types of tractors for the great bulk of their total income.

U.S. production

The value of U.S. producers' shipments of agricultural and horticultural machinery, equipment, and implements increased from \$1.8 billion in 1964 to an estimated \$2.5 billion in 1967 (table 1). The value of shipments, by principal types, for 1964-66 is shown in table 2. The percentage distribution of domestic producers' shipments of agricultural and horticultural machinery, equipment, and implements by types, in 1966 was as follows:

<u>Type</u>	<u>Percent</u>
Soil preparation-----	12
Planting, seeding, and fertilizing-----	7
Harvesting-----	26
Haying-----	8
Other-----	47
Total-----	100

The value of harvesting machinery has increased in recent years, owing in part to increased production of forage harvesters and in part to increased use of machines for harvesting such crops as fruits and vegetables which had previously been harvested by hand.

U.S. exports

The value of U.S. exports of agricultural and horticultural machinery, equipment, and implements increased from \$216 million in 1964 to \$234 million in 1967, and then declined to \$213 million in 1968 (table 1). During 1965-68, exports represented about 10 percent of the value of U.S. producers' shipments. Data on exports, by types, are shown for those years in table 3.

In recent years Canada has been the principal U.S. export market for agricultural and horticultural machinery, equipment, and implements, receiving more than 60 percent, by value, of U.S. exports during 1965-68. Mexico has also been an important export market.

U.S. imports

The value of U.S. imports of agricultural and horticultural machinery, equipment, and implements rose from \$145 million in 1964 to \$218 million in 1967, and then declined to \$190 million in 1968. Data on imports, by types, are shown in table 4. Harvesting machinery and parts thereof accounted for more than half of the total value of imports during each of the years 1964-68. The ratio of imports to apparent consumption in 1967 on a value basis was estimated at about 9 percent.

Canada accounted for more than 92 percent of the value of U.S. imports of agricultural machinery, equipment, and implements during 1964-68. (see value figures in table 5). A significant part of these imports were produced by Canadian subsidiaries of U.S. companies. A large single market for agricultural machinery has developed between the United States and Canada, since both countries permit duty-free entry of such machinery. Belgium and Luxembourg, West Germany, and the United Kingdom also supply small quantities of imported machines. Imports from Belgium and Luxembourg consist principally of harvesting machines; those from West Germany are mainly specialized machines, such as rock pickers; and those from the United Kingdom are mainly soil preparation machines.

Table 1.--Agricultural and horticultural machinery, equipment, implements, and parts: U.S. producers' shipments, imports for consumption, exports of domestic merchandise, and apparent consumption, 1964-68

Year	U.S. producers' shipments	Imports	Exports	Apparent consumption	Ratio of imports to consumption
	Million dollars	Million dollars	Million dollars	Million dollars	Percent
1964-----	1,783	145	216	1,712	8
1965-----	1,908	157	219	1,846	8
1966-----	2,293	193	231	2,255	9
1967-----	<u>1/</u> 2,450	218	234	<u>1/</u> 2,434	9
1968-----	<u>2/</u>	190	213	<u>2/</u>	<u>2/</u>

1/ Estimated by the staff of the U.S. Tariff Commission.

2/ Not available.

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

AGRICULTURAL AND HORTICULTURAL MACHINERY

Table 2.--Agricultural and horticultural machinery, equipment, implements, and parts: U.S. producers' shipments, by principal types, 1964-66

(In thousands of dollars)

Type	1964	1965	1966
Soil preparation machines-----	220,731	232,354	275,683
Planting, seeding, and fertiliz- ing machinery-----	131,029	137,300	155,634
Harvesting machines-----	439,645	513,341	607,043
Haying machinery-----	139,415	155,926	176,275
Other machines-----	852,617	868,582	1,078,014
Total-----	1,783,437	1,907,503	2,292,649

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

Table 3.--Agricultural and horticultural machinery, equipment, implements, and parts: U.S. exports of domestic merchandise, by types, 1965-68

(In thousands of dollars)

Type	1965	1966	1967	1968
Soil preparation machines-----	32,937	33,265	36,595	33,248
Planting, seeding, and fertilizing machinery-----	18,056	18,246	22,344	23,104
Harvesting machines-----	92,499	97,161	92,974	77,487
Haying machinery-----	24,823	25,819	26,310	23,929
Other machines and equipment--	50,464	56,101	56,062	55,608
Total-----	218,779	230,592	234,285	213,376

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

AGRICULTURAL AND HORTICULTURAL MACHINERY

Table 4.--Agricultural and horticultural machinery, equipment, implements, and parts: U.S. imports for consumption, by types, 1964-68

(In thousands of dollars)

Type	1964	1965	1966	1967	1968
Soil preparation machines-----	16,472	20,292	24,409	30,808	19,379
Planting, seeding, and fertilizing machinery-----	8,700	8,993	11,542	12,477	8,255
Harvesting machines-----	77,209	86,564	106,413	109,352	100,996
Haying machinery-----	16,091	17,032	13,419	13,191	8,774
Other machines and equipment-----	26,572	23,810	37,339	52,210	52,926
Total-----	145,044	156,691	193,122	218,038	190,330

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

Table 5.--Agricultural and horticultural machinery, equipment, implements, and parts: U.S. imports for consumption, by principal sources, 1964-68

(In thousands of dollars)

Source	1964	1965	1966	1967	1968
Canada-----	140,382	148,869	181,781	202,801	162,403
Belgium and Luxembourg-----	155	1,740	3,375	5,402	11,803
West Germany-----	579	689	1,720	3,061	7,786
United Kingdom-----	1,636	2,841	3,144	3,743	3,751
Japan-----	24	59	298	555	1,023
Netherlands-----	659	1,165	1,145	904	1,008
All other-----	1,609	1,328	1,659	1,572	2,556
Total-----	145,044	156,691	193,122	218,038	190,330

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

<u>Commodity</u>	<u>TSUS item</u>
Lawnmowers and parts thereof-----	666.10

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1969).

U.S. trade position

The value of U.S. consumption of lawnmowers and parts increased from \$262 million in 1963 to an estimated \$457 million in 1968. Imports in 1968 were valued at \$0.8 million, whereas exports in the same year were valued at \$13.6 million, about 3 percent of the value of domestic producers' shipments.

Description and uses

Lawnmowers covered by this summary consist of three basic types: Reel, rotary and, sickle bar. The reel type of mower shears the grass between revolving spiral blades and a stationary blade. The rotary type of mower uses rapidly rotating blades to cut the grass. Sickle bar mowers cut the grass by means of a reciprocating blade mounted in a serrated bar. Rotary and sickle bar types are power operated, whereas the reel type is either power operated or hand operated. Rotary and sickle bar mowers are better adapted for cutting tall grass than are reel types. Several lawnmowers that are combined to operate as one unit are generally known as gang mowers. These units are usually of the reel type and are often powered by a tractor.

Lawnmowers are used for cutting grass around residences and other buildings. They are also used in the maintenance of golf courses, parks, cemeteries, and other grass-covered areas maintained either for appearance or for use such as in ball parks. Related articles not considered here are grass mowers used for agricultural purposes (item 666.00), which are discussed in another summary in this volume.

U.S. tariff treatment

The column 1 (trade-agreement) rates of duty (see general headnote 3 in the TSUSA-1969) applicable to lawnmowers and parts thereof are shown below:

	<u>Rate of duty</u>
Rate prior to Jan. 1, 1968-----	20% ad val.
Concession granted by the United States in the 1964-67 trade conference (Kennedy Round):	
Second stage, effective Jan. 1, 1969-----	16% ad val.
Final stage, effective Jan. 1, 1972-----	10% ad val.

The prior rate of 20 percent ad valorem had remained unchanged under the TSUS from August 31, 1963, through 1967. As a result of a concession granted by the United States in the sixth (Kennedy) round of trade negotiations under the General Agreement on Tariffs and Trade, the duty is being reduced by 50 percent in five annual stages; only the second and final stages are shown above (see the TSUSA-1969 for all of the staged rates).

U.S. consumption

The value of apparent U.S. consumption of lawnmowers increased from \$262 million in 1963 to an estimated \$457 million in 1968 (table 1). The outlook for future consumption of lawnmowers is favorable in view of the large market represented by replacement sales plus the additional stimulus created by the ever expanding suburban home, apartment, and industrial areas.

The use of hand mowers has declined drastically since World War II, largely because of the reduced cost of power mowers. The application of mass production techniques to small gasoline engines has contributed to lower unit costs for power mowers. This reduction in unit costs, together with the growth in population and the movement of people to suburban areas, contributed to the rapid growth in domestic consumption of power lawnmowers during 1963-68.

U.S. producers

The U.S. lawnmower industry is situated principally in the East North Central States; manufacturing establishments are concentrated in Ohio, Illinois, and Indiana. About 80 companies produce lawnmowers as their primary product, and these companies account for the bulk of the domestic output. A smaller number of companies produce mowers as secondary products. Approximately a dozen manufacturers make hand mowers, and fewer than five concerns produce hand mowers exclusively.

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The number of establishments that produce lawnmowers has declined since 1963, although U.S. production of lawnmowers increased substantially during 1963-68. The decline in the number of producers was caused in part by the inability of some manufacturers to compete and in part by mergers and consolidations of some producing firms.

U.S. production

The value of U.S. producers' shipments of lawnmowers and parts increased from \$267 million in 1963 to an estimated \$470 million in 1968. In 1963, the most recent year for which data on shipments of lawnmowers, by type, are available in the official statistics, approximately 78 percent of the lawnmowers shipped by U.S. producers were of the rotary type (see actual numbers in table 2). This represented a decline from 1958, when rotary mowers accounted for 83 percent of U.S. production. The share of the value of U.S. producers' total shipments accounted for by hand-operated reel mowers increased from 9 percent in 1958 to 11 percent in 1963. Unit values of U.S. producers' shipments of hand-operated and power-operated reel mowers declined from \$13.65 and \$77.46, respectively, in 1958 to \$12.91 and \$66.71, respectively, in 1963. During this same period, the unit values of rotary mowers increased from \$50.73 to \$53.15.

U.S. exports

U.S. exports of lawnmowers are small in relation to U.S. production but several times as large as U.S. imports. During 1963-68, exports accounted for approximately 3 percent per year of the value of U.S. producers' shipments. The value of U.S. exports of lawnmowers rose from \$4.7 million in 1963 to \$13.6 million in 1968 (table 1). Unit values of lawnmowers indicate that export sales consist predominantly of power mowers (table 3).

Canada, the largest U.S. export market for lawnmowers accounted for about 28 percent of total exports during 1963-68. West Germany, France, and Switzerland have also been important export markets.

U.S. imports

The value of U.S. imports of lawnmowers and parts rose from \$259,000 in 1963 to \$765,000 in 1968 (table 4). Imports have accounted for less than 0.5 percent of the value of U.S. production and consumption of lawnmowers in recent years. The United Kingdom accounted for about 63 percent of the value of U.S. imports during 1963-68. Canada and West Germany were other important sources of lawnmower imports.

LAWNMOWERS

Table 1.--Lawnmowers and parts: U.S. producers' shipments, imports for consumption, exports of domestic merchandise, and apparent consumption, 1963-68

(In thousands of dollars)

Year	U.S. producers' shipments	Imports	Exports	Apparent consumption
1963-----	266,517	259	<u>1/</u> 4,737	262,039
1964-----	285,976	334	<u>1/</u> 5,889	280,421
1965-----	294,933	497	10,516	284,914
1966-----	375,103	638	13,178	362,563
1967-----	<u>2/</u> 425,000	485	14,229	<u>2/</u> 410,000
1968-----	<u>2/</u> 470,000	765	13,637	<u>2/</u> 457,000

1/ Does not include parts and therefore is not fully comparable with data on U.S. producers' shipments and imports.

2/ Estimated by the staff of the U.S. Tariff Commission.

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

Table 2.--Lawnmowers: U.S. producers' shipments,
by principal types, 1958 and 1963

Type	1958	1963
	Quantity (number)	
Hand-operated reel-----	391,412	447,183
Power reel-----	324,226	433,942
Power rotary-----	3,507,782	3,205,153
Other-----	<u>1/</u>	<u>1/</u>
	Value (1,000 dollars)	
Hand-operated reel-----	5,341	5,774
Power reel-----	25,116	28,948
Power rotary-----	177,950	170,351
Other-----	15,727	40,409

1/ Not available.

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

Table 3.--Lawnmowers: U.S. exports of domestic merchandise, by principal markets, 1963-68 ^{1/}

Market	1963	1964	1965	1966	1967	1968
Quantity (thousands)						
Canada-----	23.2	22.7	25.1	39.8	31.3	25.5
West Germany-----	7.0	8.7	23.0	28.1	29.5	18.0
Belgium and Luxembourg-----	5.5	11.2	13.3	8.3	8.5	6.2
Switzerland-----	3.4	5.7	9.5	9.3	9.3	7.2
France-----	5.2	7.5	14.6	13.6	15.9	15.8
Netherlands-----	1.4	4.5	4.5	5.6	2.9	3.2
Sweden-----	3.2	3.2	4.5	4.6	3.4	4.0
All other-----	15.6	21.0	21.7	27.9	32.9	30.4
Total-----	64.5	84.5	116.2	137.2	133.7	110.3
Value (1,000 dollars)						
Canada-----	1,729	1,597	1,906	2,574	2,543	2,309
West Germany-----	618	904	1,496	1,867	2,214	1,791
Belgium and Luxembourg-----	289	508	618	441	470	402
Switzerland-----	332	465	608	700	804	679
France-----	295	454	857	845	1,040	1,146
Netherlands-----	174	403	403	389	410	563
Sweden-----	254	301	344	379	356	502
All other-----	1,046	1,257	1,418	1,889	2,326	2,458
Total-----	4,737	5,889	7,650	9,084	10,163	9,850
Unit value (each)						
Canada-----	\$74.48	\$70.48	\$75.79	\$64.74	\$81.36	\$90.55
West Germany-----	88.52	103.98	65.01	66.38	74.93	99.50
Belgium and Luxembourg-----	52.66	45.56	46.34	53.27	55.51	64.84
Switzerland-----	98.24	81.21	64.39	74.86	86.04	94.31
France-----	56.27	60.89	58.52	61.99	65.52	72.53
Netherlands-----	128.19	89.13	89.05	68.90	141.81	175.94
Sweden-----	78.83	94.67	75.68	82.44	103.52	125.50
All other-----	66.84	59.38	65.74	67.90	70.70	80.86
Average-----	73.40	69.65	65.82	66.21	76.00	89.30

^{1/} This table does not include exports of lawnmower parts and attachments in 1965 valued at 2,865 thousand dollars, in 1966 valued at 4,094 thousand dollars, in 1967 valued at 4,065 thousand dollars, and in 1968 valued at 3,787 thousand dollars. Attachments as distinguished from parts are not articles covered by this summary.

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

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Table 4.--Lawnmowers and parts: U.S. imports for consumption,
by principal sources, 1963-68

(In thousands of dollars)

Source	1963	1964	1965	1966	1967	1968
United Kingdom---	241	252	287	324	265	519
Canada-----	11	53	176	265	176	211
West Germany----	1	25	33	32	23	17
Japan-----	3	<u>1/</u>	-	6	6	4
All other-----	3	4	1	11	15	14
Total-----	259	334	497	638	485	765

1/ Less than \$500.

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

<u>Commodity</u>	<u>TSUS item</u>
Industrial machinery for preparing and manufacturing food or drink, and parts-----	666.20, -.25

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1969).

U.S. trade position

The value of U.S. consumption of machines and parts covered by this summary increased from \$328 million in 1965 to an estimated \$400 million in 1967. Imports in 1967 accounted for about 4 percent of the value of consumption, whereas exports in the same year accounted for about 14 percent of domestic producers' shipments.

Description and uses

The articles covered in this summary include a heterogeneous group of industrial machinery used for preparing and manufacturing food or drink. The more important types of articles are sugar-mill machinery, bakery machinery, chocolate and confectionery machinery, fruit and vegetable processing and preparation machinery, and parts of the foregoing. The different types of machinery are used to crush, cut, grind, chop, shape, churn, press, roll, crumble, peel, shell, hull, clean, sort, grade, polish, screen, strain, mix, knead, and ferment; to make sandwiches; and to perform innumerable other processes in the preparation and manufacture of food or drink. This industrial machinery is ordinarily power operated and includes machinery whether electrical, gas powered, or otherwise. The machinery for the manufacture of sugar (item 666.20) has been held administratively by the U.S. Bureau of Customs to cover a variety of machinery, including sugar process analyzers and maple draw-off machinery, while the Court of Customs and Patent Appeals has even held that cranes of a type used exclusively in moving sugarcane from stockpiles at the mills to the crushing rollers are included (C.A.D. 957). In recent years the machinery considered here has become more complex as new machines capable of performing multiple functions have become available.

Related articles not considered here are cream separators (items 661.75 to 661.95); machinery used in treating materials by a change in temperature (item 661.70), wrapping and packaging machinery (items 662.10 to 662.20), nonelectric ovens (item 661.30), and industrial electric ovens (item 683.95)--all discussed in other summaries in this volume; and food grinders, mixers, juice extractors, and other electro-mechanical household appliances (item 683.32)--discussed in a summary in volume 6:10.

U.S. tariff treatment

The column 1 (trade-agreement) rates of duty applicable to imports (see general headnote 3 of the TSUSA-1969) are as follows:

TSUS item	Commodity	U.S. concessions granted		
		Rate prior to: Jan. 1, 1968	in 1964-67 trade confer- ence (Kennedy Round) Second stage, effective Jan. 1, 1969	Final stage, effective Jan. 1, 1972
666.20	Industrial machinery for preparing and manufacturing food or drink, and parts: Machinery for use in the manufacture of sugar, and parts.	Free	1/	1/
666.25	Other-----	11.5% ad val.	9% ad val.	5.5% ad val.

1/ Duty-free status not affected by the trade conference.

The tabulation above shows the column 1 rates of duty in effect prior to January 1, 1968, and modifications therein as a result of concessions granted by the United States in the sixth (Kennedy) round of trade negotiations under the General Agreement on Tariffs and Trade. Only the second and final stages of the five annual rate modifications are shown above (see the TSUSA-1969 for all of the staged rates). The prior rate of duty for item 666.25 had remained unchanged under the TSUS from August 31, 1963, through 1967. The duty-free status of item 666.20 (machinery for use in the manufacture of sugar) was not affected by the recent trade conference.

U.S. consumption

The value of apparent domestic consumption of food and drink preparation machinery increased annually from \$328 million in 1965 to an estimated \$400 million in 1967 (table 1). The upward trend in consumption is attributable in part to changes in the extent to which the food and drink sold in the United States has been processed. Housewives are spending an increasing share of their food budgets on highly processed convenience foods which can be quickly prepared and served. Population growth and technological changes in methods of preparing food and drink have also contributed to increased consumption of the machinery considered here.

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U.S. producers

According to the Census of Manufactures, 682 U.S. establishments produced food products machinery in 1963. Establishments in the East North Central and Middle Atlantic States account for approximately 60 percent of the total value of U.S. producers' shipments of industrial machinery for preparing food and drink. Secondary products produced by establishments that manufacture the machinery considered here include metal-forming machine tools, conveying equipment, fabricated platework and paper industries machinery.

U.S. production

The estimated value of U.S. manufacturers' shipments of food preparation machinery increased from \$345 million in 1964 to \$450 million in 1967 (table 1). The most important types of machinery considered here with respect to the value of U.S. producers' shipments are meat- and poultry-processing machinery, flour and grain mill machinery, fruit- and vegetable-processing machinery, sugar plant machinery, bakery machinery, and dairy products machinery.

U.S. exports

The value of U.S. exports of food preparation machinery increased from \$57 million in 1965 to \$66 million in 1968 (table 1). The value of exports, by types, in 1965-68 is shown in table 2. Commercial food products cutting machines and cleaning, grading, and sorting machinery were the principal items involved in export trade. Many new items of machinery developed as a result of the changing technology in the food industry are contributing significantly to the growth in exports of the articles considered here.

Canada has been the principal export market for food-processing machinery, accounting for 22 percent of U.S. exports during 1968. Other important export markets are Mexico and Venezuela (table 3).

U.S. imports

The value of annual U.S. imports of food and drink preparation machinery remained relatively stable at about \$15 million a year during the 1964-68 period. The value of industrial food and drink preparation and manufacturing machinery imports, by types, for the years 1964-68 is shown in table 4.

West Germany accounted for more than 45 percent of the value of total U.S. imports of industrial machinery for preparing food and drink in the 1964-68 period (see money figures in table 5). Other countries which have furnished sizable imports are the United Kingdom, the Netherlands, Switzerland, and Italy. It is believed that some of the imported food preparation machinery has specialized features not found in domestic equipment. Imports from West Germany have consisted principally of sugar-mill machinery, meat and poultry preparation machinery, and chocolate and confectionery machinery; imports from Switzerland and the Netherlands have consisted principally of bakery machinery; and imports from Italy are principally chocolate and confectionery equipment.

Table 1.--Industrial machinery for preparing food and drink, and parts:
U.S. producers' shipments, imports for consumption, exports of
domestic merchandise, and apparent consumption, 1964-68

Year	U.S. producers' shipments	Imports	Exports	Apparent consump- tion	Ratio of imports to con- sumption
	<u>1,000</u> dollars	<u>1,000</u> dollars	<u>1,000</u> dollars	<u>1,000</u> dollars	Percent
1964-----	345,000	14,749	<u>1/</u>	<u>1/</u>	<u>1/</u>
1965-----	370,000	14,777	56,782	328,000	4
1966-----	410,000	18,331	61,868	366,000	5
1967-----	<u>2/</u> 450,000	14,542	62,532	<u>2/</u> 400,000	4
1968-----	<u>1/</u>	17,836	66,143	<u>1/</u>	<u>1/</u>

1/ Not available.

2/ Estimated by the staff of the U.S. Tariff Commission.

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

Note.--The data shown for U.S. producers' shipments and exports are not fully comparable with the data shown for imports, owing to variations in the coverage of the statistical classifications used in compiling and reporting U.S. producers' shipments, imports, and exports of the articles considered in this summary.

INDUSTRIAL MACHINERY FOR PREPARING FOOD OR DRINK

Table 2.--Industrial machinery for preparing food and drink, and parts:
U.S. exports of domestic merchandise, by types, 1965-68

(In thousands of dollars)

Type	1965	1966	1967	1968
Cleaning, grading, and sorting machinery and parts-----	4,906	4,478	6,134	7,556
Industrial dairy machines and parts-----	2,226	2,806	2,674	3,056
Fruit presses and crushers and parts-----	823	388	546	586
Grain milling industry machines and parts-----	3,878	4,195	4,752	4,291
Commercial food products cutting machines and parts-----	5,570	6,787	6,953	7,588
Bakery machines and equipment-----	4,667	6,393	6,018	6,402
Sugar-plant machines and equipment-----	8,208	8,467	8,157	5,955
Brewing machines and equipment-----	3,227	3,437	2,362	3,969
Meat- and poultry-processing machines and equipment-----	3,250	3,557	4,631	5,862
Fruit- and vegetable-processing machines and parts-----	2,310	2,115	2,621	2,471
Food-processing machines and equipment, not elsewhere classified-----	11,838	12,177	10,595	10,175
Vegetable oil mill machines and parts-----	5,879	7,068	7,089	8,232
Total-----	56,782	61,868	62,532	66,143

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

Table 3.--Industrial machinery for preparing food and drink, and parts:
U.S. exports of domestic merchandise, by principal markets, 1965-68

(In thousands of dollars)

Market	1965	1966	1967	1968
Canada-----	12,223	13,687	12,156	14,470
Mexico-----	5,798	6,695	5,496	6,332
Venezuela-----	2,566	4,030	3,734	4,856
Japan-----	881	2,161	1,654	2,929
United Kingdom-----	2,088	3,059	3,209	2,581
West Germany-----	1,504	1,250	1,550	2,443
Netherlands-----	1,188	1,277	1,921	1,875
Australia-----	1,766	1,669	2,342	1,849
Philippines-----	1,852	1,444	1,775	1,797
Guatemala-----	1,086	590	668	1,762
Italy-----	781	671	1,462	1,608
Peru-----	2,029	1,093	2,227	1,483
Switzerland-----	231	454	306	1,129
France-----	1,188	1,046	1,025	1,081
All other-----	21,601	22,742	23,007	19,948
Total-----	56,782	61,868	62,532	66,143

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

Table 4.--Industrial machinery for preparing food and drink, and parts:
U.S. imports for consumption, by types, 1964-68

(In thousands of dollars)

Type	1964	1965	1966	1967	1968
Sugar manufacturing machinery and parts	2,520	1,625	5,202	1,730	3,394
Meat- and poultry-packing plant machinery and parts	1,875	1,846	1,709	2,006	2,681
Flour and grain mill machines and parts	1,273	1,709	1,108	1,346	1,640
Bakery machinery and parts	2,116	2,343	2,527	2,563	2,837
Fruit and vegetable preparing and processing machinery and parts	492	626	1,431	1,138	909
Chocolate and confectionery machinery and parts	3,105	2,672	2,462	2,413	2,658
Other industrial machinery for the preparation and manufacture of food or drink, and parts	3,368	3,956	3,892	3,346	3,717
Total	14,749	14,777	18,331	14,542	17,836

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

Table 5.--Industrial machinery for preparing food and drink, and parts:
U.S. imports for consumption, by principal sources, 1964-68

(In thousands of dollars)

Source	1964	1965	1966	1967	1968
West Germany-----	6,757	5,798	9,961	5,879	8,351
United Kingdom-----	1,984	1,955	1,226	1,864	1,275
Netherlands-----	991	1,478	866	963	1,171
Switzerland-----	767	1,108	1,187	1,068	990
Italy-----	833	1,504	1,520	1,191	947
Denmark-----	462	517	726	389	922
Norway-----	422	770	373	475	805
Japan-----	374	298	401	456	739
Canada-----	549	271	823	598	618
All other-----	1,610	1,078	1,248	1,659	2,018
Total-----	14,749	14,777	18,331	14,542	17,836

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

<u>Commodity</u>	<u>TSUS item</u>
Machines for making or processing cellulosic pulp, paper, and paperboard; machines for converting such products into articles; and parts-----	668.00, -.02, -.04, -.06, -.07

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1969).

U.S. trade position

The value of U.S. consumption of machines and parts covered in this summary increased from \$383 million in 1965 to an estimated \$520 million in 1968. Imports in 1968 accounted for about 7 percent of the value of consumption, whereas exports in that year accounted for about 14 percent of domestic producers' shipments.

Description and uses

The machines covered by this summary comprise three basic groups, namely, machines used in the production of cellulosic pulp, machines used in producing paper and paperboard from cellulosic pulp, and machines used in the processing of paper and paperboard and in the converting of pulp, paper, or paperboard into finished articles. Parts of these machines are covered here but not included are Fourdriniers and cylinder wire, items 642.25, 642.27, and 642.30 (discussed in a summary in volume 6:5); calenders, items 661.40, 661.45, and 661.55; and dryers for pulp and paper, item 661.70 (both calenders and dryers are discussed in other summaries in this volume).

Included in the group of machines that produce cellulosic pulp are, among others, chippers, beaters, pulpers, grinders, refiners, deckers, and pulp-drying equipment.

Machines for producing paper and paperboard are of two basic types, namely Fourdrinier paper machines and cylinder paper machines. Also included in this group are machines for producing cellulosic building boards, such as insulating board and hardboard.

Pulp and papermaking machinery, which generally is custom built to meet individual specifications, may require several years to build. A modern pulp and paper mill costs tens of millions of dollars. Pulp-producing equipment differs substantially according to the pulping processes used (such as chemical, semichemical, or mechanical pulping methods) to convert wood or other cellulosic materials to papermaking

fibers. Papermaking consists basically of two major operations: the production of pulp from raw materials and the conversion of pulp into paper or paperboard. Mechanical pulping utilizes high-speed grinders and refiners which convert logs and wood chips, respectively, to pulp. The mechanical method yields a high percentage of pulp without removing the lignin from the wood; newsprint, ground-wood papers, building boards and some specialty papers and boards are made from this type of pulp. In chemical processing, the wood is cut into small pieces by a chipper, then cooked in a digester, with chemicals, under pressure. This process removes the lignin and produces a stronger pulp with considerably lower yield than mechanically produced pulp. Paper is formed either on Fourdrinier machines, which have endless woven wire belts for shaping the slurry into a thin, continuous sheet, or on cylinder machines, which pick up the stock on a wire-covered cylinder mold and then transfer it to a felt that carries it to the next cylinder mold. This process is repeated until a desired web thickness is obtained. In both types, water drains through wires and is further removed from the paper web by passing the web through press rollers and over drying cylinders before it reaches the machine calender and winding reels.

The third group of machines considered here are those used in processing paper and paperboard by such methods as cutting, slitting, rewinding, coating, and laminating and machines that produce from pulp, paper, or paperboard, such finished articles as egg cartons, paperboard boxes, paper bags, sacks, and envelopes.

U.S. tariff treatment

The column 1 (trade-agreement) rates of duty applicable to imports (see general headnote 3 of the TSUSA-1969) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	U.S. concessions granted in 1964-67 trade confer- ence (Kennedy Round)	
			Second stage, effective Jan. 1, 1969	Final stage, effective Jan. 1, 1972
	Machines for making cellu- losic pulp, paper, or paperboard; machines for processing or finishing pulp, paper, or paperboard, or making them up into articles:			
668.00	Machines for making cellulosic pulp, paper; or paperboard.	7% ad val.	5.5% ad val.	3.5% ad val.
668.02	Other-----	10% ad val.	8% ad val.	5% ad val.
	Parts of the foregoing machines:			
668.04	Bed plates, roll bars, and other stock- treating parts for pulp or paper machines: Other:	10% ad val.	<u>1/</u>	<u>1/</u>
668.06	Parts of machines for making cellulosic pulp, paper, or paperboard.	7% ad val.	5.5% ad val.	3.5% ad val.
668.07	Other-----	10% ad val.	8% ad val.	5% ad val.

1/ Duty status not affected by the trade conference.

The tabulation above shows the column 1 rates of duty in effect prior to January 1, 1968, and modifications therein as a result of concessions granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade. Only the second and final stages of the five annual rate modifications are shown above (see the TSUSA-1969 for all of the staged rates). The prior rates of duty for items 668.00 to 668.07 had remained unchanged under the TSUS from August 31, 1963 through 1967. The duty status for

item 688.04 (stock-treating parts for pulp or paper machines) was not affected by the recent trade conference.

U.S. consumption

The value of apparent consumption of machines (including certain parts thereof) for making and processing pulp and paper increased from nearly \$383 million in 1965 to an estimated \$410 million in 1968 (table 1). The increased consumption of pulp and paper machinery reflects the general increase in U.S. production of pulp and paper products.

Several technological breakthroughs which have taken place in paper production and conversion during recent years have stimulated the sale of new types of machinery for manufacturing and processing pulp, paper, and paperboard. Among the most important types of machinery relating to new processes are the following:

(1) Continuous pulp digesters (Kamyr digesters), which provide for continuous pulp making, in contrast to the conventional batch type of digesters.

(2) The inverform paper machine, which is a modified Fourdrinier type of paper machine with several Fourdrinier wires; machines of this type are mostly used for the production of paperboard with each Fourdrinier wire providing for an individual paper web and the webs, which are of different raw materials then being pressed together into a homogeneous product. This type of machine produces an end product with a high-grade surface and middle layers of less expensive raw materials.

(3) A wide variety of converting machines for coating paper with plastic substances and for laminating paper with foil and films.

To increase production of a paper machine, an increase of the productive capacity is often met by accelerating the operating speed; this requires many modifications, primarily the enlarging of the machines' drying section. Such gains in machine output are restricted, however, to existing machine widths; new machines are required to accommodate wider paper widths.

U.S. producers and production

According to the 1967 Census of Manufactures there were 218 establishments engaged in the manufacture of machinery for the pulp and paper industry. No one manufacturer makes all types of machines required by the paper industry. Only a few firms actually engage in contracting for construction of entire pulp and paper plants; such contracts often include complete installation and production startups. Production of pulp and paper machinery is concentrated in the Middle

Atlantic and East North Central States.

The value of domestic producers' shipments of machinery and parts for the pulp and paper industries increased from \$348 million in 1963 to an estimated \$560 million in 1968 (table 1). Separate data on U.S. producers' shipments of all types of machinery covered by this summary were last reported in the 1967 Census of Manufactures. In that year, the value of shipments by type of machinery was as follows:

	<u>Million dollars</u>
Pulp mill and wood preparation machines-----	61
Paper mill and stock preparation machines-----	180
Paper and paperboard converting machinery-----	135
Rebuilt pulp and paper machines-----	46
Parts, attachments, and unidentified machines--	93
Total-----	<u>515</u>

U.S. exports

The value of U.S. exports of the machinery considered here increased from \$64 million in 1965 to \$74 million in 1968 (table 1). During this 4-year period, exports represented 15 percent of the value of U.S. producers' total shipments of machines for making and processing pulp, paper, and paperboard. The value of exports, by types, for the years 1965-68 was as follows (in millions of dollars):

<u>Type</u>	<u>1965</u>	<u>1966</u>	<u>1967</u>	<u>1968</u>
Pulp and paper mill machines and parts--	38	32	40	47
Paper-converting machines-----	18	20	20	16
Parts, not elsewhere covered, for paper converting machines-----	<u>8</u>	<u>8</u>	<u>10</u>	<u>11</u>
Total-----	64	60	70	74

Canada was the leading market for U.S. exports, accounting for about 26 percent of the total value of exports in 1968. Mexico, the United Kingdom, and Sweden were other important export markets in 1965-68 (table 2).

U.S. imports

The value of U.S. imports of pulp and paper machinery increased from \$17 million in 1964 to \$34 million in 1968, or by 100 percent. Imports accounted for about 8 percent of the value of apparent consumption in 1968.

The most important classes of pulp and paper machinery imports in 1968 were (1) machines for making containers, (2) parts of pulp and paper machinery, (3) and paper-converting machines (see table 3). These three classes accounted for 89 percent of total imports in 1968. Parts of pulp and paper machinery accounted for almost one-third of the imports in 1968; this is due to the fact that much of the equipment considered here is large and bulky and consequently is imported in separate shipments and is assembled after delivery to the plant site.

Imports of the machinery covered in this summary have included a wide variety of equipment, such as chippers, pulpers, deflakers, pulp vibrating chip screens, stock agitators, refiners, paper- and paperboard-making machines, slitter-scorers, folder-glueers, machines for making paper bags and coin wrappers, paper guillotine cutters, coating equipment, and paper shredders.

West Germany, Switzerland, and Canada were the principal sources of imports of pulp and paper machinery during 1964-68. Other important sources, in recent years, have included Sweden and the United Kingdom (table 4).

Table 1.--Machines for making and processing cellulosic pulp, paper, and paperboard, and machines for making them up into articles, and parts of the foregoing machines: U.S. producers' shipments, imports for consumption, exports of domestic merchandise, and apparent consumption, 1963-68

Year	U.S. producers' shipments	Imports ^{1/}	Exports	Apparent consumption	Ratio of imports to consumption
	<u>1,000 dollars</u>	<u>1,000 dollars</u>	<u>1,000 dollars</u>	<u>1,000 dollars</u>	<u>Percent</u>
1963---	347,552	<u>2/</u>	<u>2/</u>	<u>2/</u>	<u>2/</u>
1964---	377,636	<u>17,295</u>	<u>2/</u>	<u>2/</u>	<u>2/</u>
1965---	423,989	22,431	63,867	382,553	6
1966---	439,677	28,614	60,210	408,081	7
1967---	515,000	41,403	70,126	486,277	9
1968---	<u>3/</u> 560,000	34,069	74,472	<u>3/</u> 520,000	<u>3/</u> 7

^{1/} Data on imports exclude calendering machines and are therefore understated in relation to exports and producers' shipments.

^{2/} Not available.

^{3/} Estimated by the staff of the U.S. Tariff Commission.

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

Table 2.--Machines for making and processing cellulosic pulp, paper, and paperboard, and machines for making them up into articles, and parts of the foregoing machines: U.S. exports of domestic merchandise, by principal markets, 1965-68

(In thousands of dollars)

Market	1965	1966	1967	1968
Canada-----	18,318	20,548	18,761	19,534
Thailand-----	94	16	667	12,820
Mexico-----	5,827	4,029	5,198	7,793
United Kingdom-----	3,764	3,978	5,622	3,706
Ethiopia-----	1	9	284	2,676
Japan-----	2,303	1,146	1,713	2,541
West Germany-----	3,225	1,845	1,744	1,883
France-----	1,663	2,108	1,573	1,873
Venezuela-----	3,163	2,283	2,422	1,609
Netherlands-----	1,073	1,645	1,270	1,371
Australia-----	2,009	1,349	1,578	1,265
Italy-----	1,750	1,730	1,489	1,238
Republic of South Africa-----	1,448	1,074	1,353	1,166
Sweden-----	1,486	3,915	6,406	1,155
Singapore-----	-	8	180	1,080
India-----	651	728	2,703	1,017
Finland-----	1,230	761	1,317	773
All other-----	15,862	13,038	15,846	10,972
Total-----	63,867	60,210	70,126	74,472

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

Table 3.--Machines for making and processing cellulosic pulp, paper, and paperboard, and machines for making them up into articles, and parts of the foregoing: U.S. imports for consumption, by types, 1964-68

(In thousands of dollars)						
Type	1964	1965	1966	1967	1968	
Pulp mill machines-----	1,652	1,485	1,317	2,283	595	
Paper mill and paper-						
board machines-----	970	1,353	2,647	2,669	2,973	
Machines for making						
containers-----	5,530	6,473	7,094	9,210	11,227	
Paper-converting						
machines-----	3,982	5,464	6,948	8,345	9,426	
Parts of above						
machines-----	5,161	7,656	10,608	18,896	9,848	
Total-----	17,295	22,431	28,614	41,403	34,069	

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

MACHINES FOR MAKING AND PROCESSING PULP AND PAPER

Table 4.--Machines for making and processing cellulosic pulp, paper, and paperboard, and machines for making them up into articles, and parts of the foregoing machines: U.S. imports for consumption, by principal sources, 1964-68

(In thousands of dollars)					
Source	1964	1965	1966	1967	1968
West Germany-----	6,750	8,261	6,556	8,173	8,552
Switzerland-----	2,378	4,001	5,775	7,342	6,330
Canada-----	3,921	4,556	6,112	9,882	6,204
Japan-----	256	218	679	1,529	3,094
United Kingdom-----	863	1,091	1,684	1,536	2,755
Sweden-----	1,380	2,049	2,197	3,163	1,686
Netherlands-----	418	168	301	362	1,279
Italy-----	360	546	1,372	1,806	1,156
France-----	196	604	800	371	1,155
Norway-----	471	600	892	1,047	808
Finland-----	43	125	1,862	5,121	696
All other-----	259	212	384	1,071	354
Total-----	17,295	22,431	28,614	41,403	34,069

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

<u>Commodity</u>	<u>TSUS item</u>
Bookbinding machinery, including book-sewing machines, and parts thereof-----	668.10

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1969).

U.S. trade position

The value of U.S. apparent consumption of bookbinding machinery and parts in 1968 is estimated at about \$43 million--about 19 percent of it accounted for by imports. In recent years about one-fourth of domestic production has been exported.

Description and uses

The bookbinding machinery discussed in this summary includes a variety of machines, among which are casemakers (for making book covers), casing-in machines (for inserting a sewn book into its cover), drills, joggers, liners, papercutters, perfect binders, punches, stamping presses, trimmers, wire stitchers, and collating, folding, gathering, gluing, heat-sealing, round-corner, backing, sewing, gold-stamping, sanding, headband, and lineup (for reinforcing backbones before casing in) machines.

There are many ways to bind a book, but the most common methods are edition binding, perfect binding, and mechanical binding.

The edition binding method has been in use for many years. It starts with the folding of printed sheets into 16- or 32-page assemblies (technically referred to as signatures). Four-page endleaves are pasted on the outside of the first and last signatures. The signatures are then collated by machine and sewn together by special sewing machines designed for this purpose. After they are sewn, the books are trimmed at the top, front, and bottom, and the sewn edges are coated with glue. Each book is passed through a rounding machine which rolls the backbone. The rounded back is characteristic of this type of binding, and gives the book the correct shape to allow the cover to open and close properly. After rounding, a strip of gauze is glued to the backbone in such a manner that the cloth extends outward from both sides of the backbone. At the same time the books are being bound, the covers (cases) are prepared on a casemaking machine. Most covers are stamped with some design and the title of the book. This is done in a heavy-duty platen press using special dies and metallic foils. When the cover is finished, the book is

automatically put into its case on a casing-in machine, which applies paste to the endleaves and fits the cover into place. The finished books are then dried in special presses. Finally, they are inspected, wrapped in paper jackets, and packed for shipment. Hardback books are bound in this manner.

Perfect binding--a binding method by machine during which a gathered book is fed into the binder and automatically clamped; the back folds are cut off and the cut leaf edges are roughened; cloth or paper is applied with glue to the roughened leaf edges, and the book is ready for trimming. This process is usually used on magazines and paperbacks.

Mechanical binding is a method used for manuals and notebooks. Here the sheets are punched with a series of round or slotted holes, then wire or plastic coils or rings are inserted through the holes.

U.S. tariff treatment

The column 1 (trade-agreement) rates of duty applicable to imports (see general headnote 3 of the TSUSA-1969) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	U.S. concessions granted in 1964-67 trade confer- ence (Kennedy Round)	
			Second stage, effective Jan. 1, 1969	Final stage, effective Jan. 1, 1972
668.10	Bookbinding machinery, including book-sewing machines, and parts thereof.	10.5% ad val.	8% ad val.	5% ad val.

The tabulation above shows the column 1 rate of duty in effect prior to January 1, 1968, and modifications therein as a result of a concession granted by the United States in the sixth (Kennedy) round of trade negotiations under the General Agreement on Tariffs and Trade. Only the second and the final stages of the five annual rate modifications are shown above (see the TSUSA-1969 for all of the staged rates).

The prior rate shown in the tabulation above had remained unchanged under the TSUS from August 31, 1963, through 1967. A concession amounting to a reduction of about 50 percent in the duty for this item was granted by the United States in the trade conference.

U.S. consumption

The apparent U.S. consumption of bookbinding machinery and parts probably more than doubled during 1958-68 (table 1). Although official statistics on shipments are not available for 1964-68, it is estimated that consumption in 1968 amounted to about \$43 million. Imports of bookbinding machinery accounted for 4 percent of the value of U.S. apparent consumption in 1958 and 7 percent in 1963; they were equivalent to about 19 percent of estimated consumption in 1968.

U.S. producers and production

U.S. producers of binding machinery and parts are concentrated in the New England, Middle Atlantic, and East North Central States. Bookbinding machinery represents a small but significant part of the total output of the large concerns, most of which are engaged in the production of a full line of machinery and equipment for the printing and publishing trade.

The value of U.S. producers' shipments of bookbinding machinery and parts increased from about \$20 million in 1958 to \$29 million in 1963, the last year for which official statistics are available (table 1). It is estimated that shipments increased during subsequent years and probably amounted to about \$45 million in 1968.

U.S. exports and imports

U.S. exports of bookbinding machinery exhibited a significant upward trend during the 1958-68 period (table 1); they increased in value from about \$3.5 million in 1958 to \$10.6 million in 1968, or by almost 200 percent. During 1964-68 Canada and the United Kingdom were the leading markets for U.S. exports of bookbinding machinery (table 2). In this period these two countries accounted for 40 to 45 percent of total annual U.S. exports of items covered in this summary. In 1968 the United States exported bookbinding machinery and parts to more than 35 foreign markets.

Annual U.S. imports of bookbinding machinery increased manyfold during 1958-68 (table 1). Imports increased steadily in value from \$685,000 in 1958 to about \$4.3 million in 1967; they increased abruptly in 1968, when they amounted to about \$8.3 million. In recent years West Germany and Switzerland have been the principal foreign suppliers of bookbinding machinery (table 3). In 1964 West Germany supplied about 57 percent of the total quantity of imports (28 percent of the total value), and in 1968, about 33 percent of the total quantity (about 35 percent of the total value). Switzerland supplied about 16 percent of the total quantity and about 54 percent of the

total value of imports in 1964; in 1968 these percentages were 40 and 33 percent, respectively. During recent years the imports of parts for bookbinding machinery amounted to 6 to 10 percent of the value of total imports of items covered by this summary (see money figures in table 4). Canada, Switzerland, and West Germany were major suppliers of parts.

Table 1.--Bookbinding machinery and parts: U.S. producers' shipments, imports for consumption, exports of domestic merchandise, and apparent consumption, 1958 and 1963-68

Year	U.S. producers' shipments	Imports	Exports	Apparent consump- tion	Ratio of imports to con- sumption
	<u>1,000</u> dollars	<u>1,000</u> dollars	<u>1,000</u> dollars	<u>1,000</u> dollars	Percent
1958-----	19,912	685	3,545	17,052	4.0
1963-----	29,468	1,659	7,453	23,674	7.0
1964-----	$\frac{1}{2}$ / 32,000	2,384	7,203	27,200	8.8
1965-----	$\frac{1}{1}$ / 35,000	2,482	9,112	28,400	8.7
1966-----	$\frac{1}{1}$ / 38,000	3,129	9,408	31,700	9.9
1967-----	$\frac{1}{1}$ / 41,000	4,273	9,097	36,200	11.8
1968-----	$\frac{1}{1}$ / 45,000	8,292	10,593	42,700	19.4

$\frac{1}{1}$ / Estimated on the basis of shipments of a more inclusive group of products.

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

BOOKBINDING MACHINERY

Table 2.--Bookbinding machinery and parts: U.S. exports of domestic merchandise, by principal markets, 1964-68

(In thousands of dollars)

Market	1964	1965	1966	1967	1968
Canada-----	1,434	2,407	2,602	2,733	2,575
United Kingdom-----	1,504	1,669	1,722	1,165	1,521
Japan-----	586	475	645	653	1,108
West Germany-----	680	719	746	603	668
Australia-----	188	343	576	340	550
Mexico-----	268	346	373	691	433
France-----	453	566	222	328	346
Netherlands-----	348	238	343	316	267
All other-----	1,742	2,349	2,179	2,268	3,125
Total-----	7,203	9,112	9,408	9,097	10,593

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

Table 3.--Bookbinding machinery: U.S. imports for consumption, by principal sources, 1964-68

Source	1964	1965	1966	1967	1968
Quantity (number)					
West Germany-----	337	375	307	253	569
Switzerland-----	92	84	81	369	696
United Kingdom-----	89	46	87	123	142
Italy-----	1	4	9	18	24
All other-----	73	25	27	34	302
Total-----	592	534	511	797	1,733
Value (1,000 dollars)					
West Germany-----	597	728	1,314	1,534	2,622
Switzerland-----	1,148	1,047	991	1,373	2,452
United Kingdom-----	305	119	320	510	1,625
Italy-----	6	23	122	83	194
All other-----	89	142	54	222	608
Total-----	2,145	2,059	2,801	3,722	7,501
Average unit value ^{1/}					
West Germany-----	\$1,771	\$1,941	\$4,281	\$6,064	\$4,608
Switzerland-----	12,474	12,465	12,235	3,721	3,523
United Kingdom-----	3,426	2,577	3,674	4,148	11,444
Italy-----	5,500	5,860	13,580	4,587	8,097
All other-----	1,232	5,692	1,992	6,527	2,011
Average-----	3,623	3,856	5,481	4,670	4,328

^{1/} Data calculated from the unrounded figures.

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

BOOKBINDING MACHINERY

Table 4.--Bookbinding machinery and parts: U.S. imports for consumption of complete machines and of parts, 1964-68

Year	Quantity		Value		
	of complete machines	Number	Complete machines <u>1,000</u> dollars	Parts <u>1,000</u> dollars	Total <u>1,000</u> dollars
1964-----	592		2,145	239	2,384
1965-----	534		2,059	423	2,482
1966-----	511		2,801	328	3,129
1967-----	797		3,722	551	4,273
1968-----	1,733		7,501	791	8,292

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

<u>Commodity</u>	<u>TSUS item</u>
Duplicating machines-----	668.20 (pt.)
Parts of duplicating machines-----	668.50 (pt.)

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1969).

U.S. trade position

The value of apparent U.S. consumption of duplicating machines and parts in 1968 probably amounted to about \$50 million--about 10 percent of it accounted for by imports. In recent years about one-fourth of domestic production has been exported. Imports were significantly smaller than the exports.

Description and uses

This summary deals with duplicating machines weighing less than 3,500 pounds, and parts of such machines. The principal types of duplicators are the offset, spirit, stencil, and gelatin.

In the offset process, ink is applied by roller to the printed matter on a master plate (specially coated paper, thin sheet metal, or other material); the ink is then transferred to a rubber-covered roller or "blanket", which in turn comes in contact with the paper on which the printed impression is made. Offset duplicators are used for small printing jobs--either small in quantity or small in size. Their use has grown substantially in recent years. Because of their low cost, facility of operation, speed, versatility, and minimum use of floor space, these duplicators are used widely by industry, business, schools, and government. Industry sources estimate that there are at least 175,000 of these machines now in use, with about 12,000 ideally suited for printing office forms, bulletins, sales letters, and the like. Offset duplicators are versatile in that they can be used for printing on onionskin or on other stock up to 1/16 inch cardboard at speeds up to 9,000 copies per hour. Although the standard machines use paper in sizes 8-1/2 by 11 inches and 8-1/2 by 14 inches, some will accommodate paper sizes up to 17-1/2 by 22 inches.

Spirit duplicators transfer ink directly from a master copy to the sheet of paper to be printed. The master copy is made in reverse by means of a special carbon sheet, and may be made by typing, writing, or drawing upon it. The master sheet is then clamped to the cylinder of the machine and moistened with a special duplicating fluid which is fed to the cylinder from a reservoir. The moistened

sheet dissolves a small quantity of the ink preparation on the master copy. The ink then sticks to the paper which is fed into the machine, reproducing the typing, writing, or drawing. Special absorbent paper is used in spirit duplicators because regular hard-finished papers do not absorb duplicating ink and hence cause the master copy to become blurred. Spirit duplication is advantageous for quick, easy runs. The master sheets can be reused without preparation.

Stencil duplicators (mimeographs) were invented by A. B. Dick in 1884. Such duplicators reproduce typewritten and illustrated material through a stencil which has been cut or otherwise prepared by a typist or illustrator. The principal part of the machine is a perforated revolving cylinder or drum having an inking device inside. A felt ink pad on the outside of the cylinder transfers the ink to the stencil; ink penetrates the stencil where it has been "cut" thus leaving a printed impression on paper with which it comes in contact. Duplicators of the stencil type are generally used with rough-finished, absorbent paper. The stencil itself consists of specially coated or impregnated paper pasted along one edge to heavier paper having perforations at the top so that it may be attached to the drum of the duplicator. Stencils are classified for customs purposes as parts of duplicating machines (item 668.50).

The gelatin duplicating method is based on the process known as the hectograph, by which anything written with a special type of aniline ink, after being transferred to a sheet of gelatin, may again be transferred from the gelatin to sheets of blank paper. There are flatbed gelatin duplicators and rotary gelatin duplicators. The flatbed gelatin duplicator (hectograph) uses a method in which the typed master copy is impressed into a gelatin composition, the gelatin is inked, and the original is reproduced on copy sheets. The rotary gelatin duplicators use a prepared flatbed gelatin film, which is attached to a rotating cylinder that delivers the impression sheet automatically.

U.S. tariff treatment

The column 1 (trade-agreement) rates of duty applicable to imports (see general headnote 3 of the TSUSA-1969) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	U.S. concessions granted in 1964-67 trade conference (Kennedy Round) Second stage, effective Jan. 1, 1969	Final stage, effective Jan. 1, 1972
668.20(pt.)	Duplicating machines weighing less than 3,500 pounds and using stencils or masters or plates.	12.5% ad val.	10% ad val.	6% ad val.
668.50(pt.)	Parts of duplicating machines.	The rate for the article of which they are parts.	<u>1/</u>	<u>1/</u>

1/ Article rate applies; no concession granted on this item.

The tabulation above shows the column 1 rates of duty in effect under the TSUS from August 31, 1963, through 1967, and modifications therein as a result of a concession granted by the United States in the sixth (Kennedy) round of trade negotiations under the General Agreement on Tariffs and Trade. The concession amounting to a reduction of 50 percent in the duty applicable to duplicating machines is being put into effect in five annual stages--the final reduction going into effect on January 1, 1972. Only the second and final stages of the rate modifications are shown above (see the TSUSA-1969 for all of the staged rates).

U.S. consumption

Annual apparent consumption of duplicating machines and parts has increased significantly during the last decade (table 1). U.S. consumption amounted to about \$31 million in 1958 and reached about \$50 million in 1967. During 1958-67 imports supplied from 6.7 to 11.6 percent of annual apparent consumption.

U.S. producers and production

About 30 U.S. producers manufacture one or more of the duplicating machines covered in this summary. About a dozen firms (six of them large firms) produce offset duplicators; about six produce the gelatin or hectograph type of duplicating machines; six manufacture the spirit type and six the stencil type of duplicators. Several of the U.S. producers have subsidiaries in one or more European countries.

U.S. producers' shipments of duplicating machines and parts almost doubled during 1958-67. The value of shipments, about \$34 million in 1958, increased to about \$65 million in 1966, showing an average annual increase of 8.3 percent, but declined to about \$62 million in 1967 (table 1).

The number of duplicating machines (not including gelatin duplicators) produced in the United States rose steadily from more than 84,000 in 1963 to 102,000 in 1966, then declined to 90,000 in 1967. During 1963-67, duplicators of the stencil type were the most significant item, based on quantity, and offset duplicators, the most significant item, based on value (table 2).

U.S. exports

The value of annual U.S. exports of duplicating machines and parts increased to more than threefold during 1958-64 and reached \$17.5 million in the latter year. Thereafter exports fluctuated between \$12.3 million in 1965 and \$18.2 million in 1968 (table 1). Exports of complete machines, which amounted to 65,445 units, valued at \$13.7 million, in 1964, declined substantially in 1965, when they numbered 29,382 units, valued at \$8.2 million. Although the value of exports of complete machines increased in each of the years 1966-68, the number of exports declined in 1968 (table 3). The average (per unit) value of exported machines varied widely during 1964-68. The value of exports of duplicating machine parts has generally increased in recent years (table 4).

The United States exports duplicating machines to a great number of markets. Canada, France, the Netherlands, West Germany, and the United Kingdom have together accounted for about half of the value of U.S. exports during recent years. Although the value of Canada's share of U.S. exports of complete machines declined sharply during 1964-68 (from \$7.2 million in 1964 to \$1.9 million in 1968), that of exports to the United Kingdom has more than trebled. Significant increases were also noted in exports to France, the Netherlands, and West Germany. Exports of parts for duplicating machines during recent years have also been significant; they increased in value from about \$3.8 million in 1964 to \$6.3 million in 1968 (table 4).

U.S. imports

The value of U.S. imports for consumption of duplicating machines and parts almost trebled during 1958-68 (table 1). While the value of U.S. imports during 1964-68 remained rather stable, the quantity fluctuated between a high of 46,661 units in 1967 and a low of 20,484 units in 1965 (table 5). Duplicating machines of the stencil type were the most important single item, in terms of both quantity and value, during 1964-68 (table 6) and in 1968 accounted for 61 percent of the total value of U.S. imports of complete duplicating machines.

During 1964-68 the United Kingdom was the major supplier of duplicating machines in terms of both quantity and value, accounting for 44 to 54 percent of the quantity and for 50 to 59 percent of the value of annual imports. Denmark was the second most important source. The average unit value of imported duplicating machines in 1968 ranged between \$108 and \$11,183, depending on the country of origin; machines supplied by Switzerland were highest in value.

In recent years the United Kingdom and Austria have been the major suppliers of parts for duplicating machines (table 7). The value of imports of parts for duplicating machines was equivalent to about one-fourth to one-third of the value of imports of complete machines during 1964-68 (table 7).

DUPLICATING MACHINES

Table 1.--Duplicating machines and parts: U.S. production, imports for consumption, exports of domestic merchandise, and apparent consumption, 1958 and 1963-68

Year	Production	Imports	Exports	Apparent consumption	Ratio of imports to consumption
	<u>1,000</u> dollars	<u>1,000</u> dollars	<u>1,000</u> dollars	<u>1,000</u> dollars	Percent
1958-----	33,977	2,084	5,064	30,997	6.7
1963-----	46,824	4,041	15,451	35,414	11.4
1964-----	49,466	4,219	17,532	36,153	11.6
1965-----	54,793	4,169	12,340	46,622	8.9
1966-----	64,514	5,314	13,848	55,980	9.5
1967-----	62,118	4,471	17,408	49,181	9.1
1968-----	<u>1/</u>	5,575	18,176	<u>1/</u>	<u>1/</u>

1/ Not available.

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

Table 2.--Duplicating machines and parts: U.S. production, by types, 1963-67

Type	1963	1964	1965	1966	1967
Quantity (number)					
Spirit machines:					
Hand-----	21,756	21,178	22,278	24,137	20,540
Electric-----	14,062	15,695	20,447) ^{1/} 40,944) ^{1/} 38,739
Offset-----	11,815	12,966	11,706))
Stencil-----	36,800	35,192	33,509	36,559	30,742
Total of above---	<u>84,433</u>	<u>85,031</u>	<u>87,940</u>	<u>101,640</u>	<u>90,021</u>
Value (1,000 dollars)					
Spirit machines:					
Hand-----	2,721	2,562	2,867	3,142	2,539
Electric-----	3,997	4,515	5,105) ^{1/} 40,048) ^{1/} 37,102
Offset-----	23,405	26,057	29,441))
Stencil-----	5,617	5,447	5,785	6,792	6,545
Total of above---	<u>35,740</u>	<u>38,581</u>	<u>43,198</u>	<u>49,982</u>	<u>46,186</u>
Other machines and parts ^{2/} -----	11,084	10,885	11,595	14,532	15,932

^{1/} Not separately reported.

^{2/} Data for parts not strictly comparable from year to year owing to changes in classification.

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

DUPLICATING MACHINES

Table 3.--Duplicating machines (complete): U.S. exports of domestic merchandise, by principal markets, 1964-68

Market	1964	1965	1966	1967	1968
	Quantity (number)				
Canada-----	43,612	5,355	11,141	20,666	9,272
France-----	2,663	1,485	598	722	1,479
Netherlands-----	454	578	832	826	2,836
West Germany-----	317	1,136	711	727	1,455
United Kingdom-----	428	10,357	641	1,231	1,120
Japan-----	515	655	911	626	346
Australia-----	1,528	961	741	550	426
All other-----	15,928	8,855	6,977	7,209	8,033
Total-----	65,445	29,382	22,552	32,557	24,967
	Value (1,000 dollars)				
Canada-----	7,206	1,461	1,811	2,723	1,948
France-----	533	457	448	619	1,167
Netherlands-----	418	591	566	897	1,088
West Germany-----	405	764	526	618	911
United Kingdom-----	253	506	427	541	847
Japan-----	414	336	606	511	584
Australia-----	381	417	407	381	425
All other-----	4,109	3,645	3,820	4,221	4,941
Total-----	13,719	8,177	8,611	10,511	11,911
	Unit value				
Canada-----	\$165	\$273	\$163	\$132	\$210
France-----	200	308	750	857	789
Netherlands-----	920	1,022	681	1,086	384
West Germany-----	1,277	672	740	851	626
United Kingdom-----	592	49	666	439	756
Japan-----	803	512	665	817	1,689
Australia-----	249	434	549	693	998
All other-----	258	412	548	586	615
Average-----	210	278	382	323	477

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

Table 4.--Duplicating machine parts: U.S. exports of domestic merchandise, by principal markets, 1964-68

(In thousands of dollars)

Market	1964	1965	1966	1967	1968
Canada-----	971	1,102	1,256	1,194	1,397
United Kingdom-----	518	850	1,022	1,933	956
West Germany-----	421	402	519	603	730
Netherlands-----	96	94	196	434	552
Japan-----	285	119	248	674	438
France-----	136	250	290	345	318
Australia-----	336	224	156	249	215
All other-----	1,050	1,122	1,549	1,464	1,658
Total-----	3,813	4,163	5,236	6,896	6,264

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

DUPLICATING MACHINES

Table 5.--Duplicating machines (complete): U.S. imports for consumption, by principal sources, 1964-68

Source	1964	1965	1966	1967	1968
Quantity (number)					
United Kingdom-----	11,511	10,124	15,294	24,970	12,025
Denmark-----	10,178	9,236	11,535	9,938	8,554
West Germany-----	1,634	578	15,045	772	2,690
Switzerland-----	19	7	-	1	18
Italy-----	1,391	442	426	374	155
All other-----	1,402	97	210	^{1/} 10,606	680
Total-----	26,135	20,484	42,510	46,661	24,122
Value (1,000 dollars)					
United Kingdom-----	1,617	1,620	2,486	2,049	2,397
Denmark-----	959	890	1,180	1,043	926
West Germany-----	161	260	513	247	532
Switzerland-----	189	67	-	17	201
Italy-----	206	39	26	30	85
All other-----	112	166	97	^{1/} 105	191
Total-----	3,244	3,042	4,302	3,491	4,332
Unit value					
United Kingdom-----	\$140	\$160	\$163	\$82	\$199
Denmark-----	94	96	102	105	108
West Germany-----	98	449	34	320	198
Switzerland-----	9,963	9,535	-	17,204	11,183
Italy-----	148	87	60	79	548
All other-----	80	1,712	459	^{1/} 10	281
Average-----	124	148	101	75	180

^{1/} Includes imports from Canada of 10,508 units, valued at 37 thousand dollars, with a unit value of \$3.51.

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

Table 6.--Duplicating machines and parts: U.S. imports for consumption, by TSUS item number, 1964-68

Year	Stencil type of duplica- tors (668.2005)	Spirit type of duplica- tors (668.2010)	Offset type of duplica- tors (668.2015)	Other types of duplica- tors (668.2020)	Parts of duplica- tors (668.5040)	Total
Quantity (number)						
1964----	12,569	1,660	1,694	10,212	1/	26,135
1965----	10,717	379	93	9,295	1/	20,484
1966----	20,782	3,829	104	17,795	1/	42,510
1967----	19,067	3,987	<u>2/</u> 12,250	11,357	1/	46,661
1968----	18,458	3,473	272	1,919	1/	24,122
Value (1,000 dollars)						
1964----	1,795	129	326	984	975	4,219
1965----	1,711	20	402	909	1,127	4,169
1966----	3,188	299	330	485	1,012	5,314
1967----	2,801	329	<u>2/</u> 183	178	980	4,471
1968----	2,640	312	1,192	188	1,243	5,575

1/ Not available.

2/ Includes imports from Canada of 10,501 units, valued at 3 thousand dollars.

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

DUPLICATING MACHINES

Table 7.--Parts of duplicating machines: U.S. imports for consumption, by principal sources, 1964-68

(In thousands of dollars)

Source	1964	1965	1966	1967	1968
United Kingdom-----	614	675	578	580	516
Denmark-----	116	138	167	155	164
Austria-----	154	150	180	186	149
West Germany-----	45	38	44	35	123
Canada-----	31	116	33	17	18
All other-----	15	10	10	7	273
Total-----	975	1,127	1,012	980	1,243

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

CommodityTSUS
item

Linotype and typesetting machines and parts----- 668.25

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1969).

U.S. trade position

The value of apparent U.S. consumption of linotype and typesetting machines and parts in 1968 is estimated at about \$43 million--about 14 percent of which was accounted for by imports. In recent years about one-third of domestic production has been exported.

Description and uses

There are several typesetting methods in common use; the more important ones are hand typesetting, Linotype and Intertype, Monotype, Ludlow, photo typesetting, computer typesetting, and cold typesetting.

Hand typesetting, as contrasted with the machine typesetting of this summary, has been used since Gutenberg's invention of movable type in the 15th century. In this method the printer holds a composing stick in one hand while with the other he selects individual type characters from a type case and places them in the stick until a full line is set. This process is repeated until a full page has been assembled. From this it can be seen that the hand method is slow and is practical only for small amounts of type, primarily the larger sizes for headings (see summary on printing types elsewhere in this volume).

Linotype and Intertype machines cast a one-piece line of type. The operator uses a keyboard similar to that of a typewriter. At the touch of a key, a matrix or die (a shallow mold in which the face of a type or slug is cast) is released from a magazine (storage case). Once a line of matrices is assembled, it is automatically justified (spaced), and moved into a casting mechanism, where molten metal is poured. The molten metal solidifies quickly, forming a casting of the line of type (slug). After the first line has been cast and the slug ejected from the mold, the matrices are returned to the magazine, ready for use in a subsequent line. Recently, tape-controlled line-casting machines have been equipped for automatic linecasting using perforated tape. Tape can be made in the print shop on special perforators or can be received over wire services, making it desirable in newspaper work. The use of perforated tape greatly increases the output of linecasting.

The Monotype method of typesetting is similar to that of Linotype, except that when the Monotype operator presses the keys he produces a perforated ribbon that is run through the caster, which molds single characters, as opposed to Linotype, wherein a whole line is cast at once. One advantage of Monotype is that most corrections can be made by hand rather than by machine. Monotype is widely used for setting complex tables and charts.

The Ludlow system is a semiautomatic method combining hand and machine operation. The Ludlow method makes a new slug for each line of type, giving an unlimited supply of type from one set of matrices. This method is especially suitable for large headings and tabular work.

Photo typesetting represents modifications of the already existing methods, providing a fast, low-cost method of typesetting. In this method the melting pot and mold are replaced by a photographic unit. Newer types of photo typesetting systems are tape-controlled. The necessity of making proofs, required by metal linecasting machinery, is eliminated. The reproduction is generally of very high quality. Photo-typesetting methods are used for business forms, book printing, and classified sections of newspapers.

Typesetting methods are being revolutionized by the recent introduction of computers for typesetting. Their main task is to convert rough perforated tape into a justified tape suitable for operation in a linecasting or photo-typesetting machine. Necessary spacing and hyphenations are made electronically. Computers greatly increase production and are finding use by large-circulation newspapers.

Cold typesetting is normally produced by direct impression of a typewriter mechanism.

U.S. tariff treatment

Imports of linotype and typesetting machines and parts are entered free of duty under item 668.25 of the TSUS. The duty-free treatment of these articles, which was also provided for under paragraph 1643 of the Tariff Act of 1930 as originally enacted, was bound, effective January 1, 1948, pursuant to a concession granted by the United States in the General Agreement on Tariffs and Trade. The item was not negotiated during the 1964-67 trade conference.

U.S. consumption

During the last decade apparent annual consumption of Linotype and typesetting machines and parts increased by about 80 percent, from \$24 million in 1958 to an estimated \$43 million in 1968 (table 1).

Imports, which supplied about 0.3 percent of U.S. consumption in 1958, provided about 14 percent of consumption in 1968.

U.S. producers and production

The U.S. producers of Linotype and typesetting machines and parts, of which there were about 15 in 1964, are concentrated in the north-eastern quadrant of the United States, with some manufacturers situated in California. Some of the producers manufacture other machinery related to the printing industry.

U.S. producers' shipments of items covered by this summary amounted to about \$34 million in 1958. In 1963, the last year for which official statistics are available, shipments amounted to about \$43 million. It is believed that shipments have continued to increase during subsequent years and probably amounted to about \$52 million in 1968.

U.S. exports

U.S. exports of Linotype and typesetting machines and parts generally increased during 1958-66. The aggregate value of exports of complete machines and parts during this period increased from more than \$10 million to an estimated \$18 million, or by about 75 percent (table 2). Exports declined in 1967 and again in 1968, when they amounted to \$15 million. During 1964-68, the value of annual exports of complete machines varied between about \$7 and \$11 million. The value of exports of parts during the same period varied between about \$7 million and an estimated \$9 million.

The United States exports complete Linotype and typesetting machines to a large number of countries; France and Canada have been the principal markets during recent years (table 3).

U.S. imports

U.S. imports for consumption of Linotype and typesetting machines and parts, although much smaller than exports, have increased at a much greater rate than exports. During 1958-68, the value of aggregate annual imports rose from \$83,000 in 1958 to \$6 million in 1968 (table 4). The value of imports of complete machines increased from \$315,000 in 1965 to \$1.8 million in 1968. The value of imports of parts of Linotype and typesetting machines has been significantly larger than that of the imports of complete machines. Imports of parts, which included keyboard assemblies, justifying scales, matrices and matrix holders, perforators, distributor beams and other repair

parts and components, increased threefold during 1964-68 and amounted to \$4.1 million in 1968.

The United Kingdom, West Germany, and Japan accounted for about 90 percent of the total value of U.S. imports of complete machines during 1964-67. During 1968, however, France was the leading source of U.S. imports, exporting 180 machines, valued at \$867,000, and accounting for almost half of total imports of complete machines (table 5). The United Kingdom and West Germany have been the principal foreign suppliers of parts in all recent years (table 6).

Table 1.--Linotype and typesetting machines and parts: U.S. producers' shipments, imports for consumption, exports of domestic merchandise, and apparent consumption, 1958 and 1963-68

Year	U.S. producers' shipments	Imports	Exports	Apparent consumption	Ratio of imports to consumption
	<u>1,000 dollars</u>	<u>1,000 dollars</u>	<u>1,000 dollars</u>	<u>1,000 dollars</u>	<u>Percent</u>
1958-----	34,368	83	10,399	24,052	0.3
1963-----	42,506	797	14,661	28,642	2.8
1964-----	<u>1/</u> 44,000	1,567	16,807	28,800	5.4
1965-----	<u>1/</u> 46,000	1,764	<u>2/</u> 16,102	30,700	5.6
1966-----	<u>1/</u> 48,000	2,865	<u>2/</u> 18,169	32,700	8.8
1967-----	<u>1/</u> 50,000	5,435	<u>2/</u> 17,270	38,200	14.2
1968-----	<u>1/</u> 52,000	5,996	<u>2/</u> 15,305	42,700	14.0

1/ Estimated on the basis of shipments of a more inclusive group of articles.

2/ Includes estimates for exports of parts.

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

Note.--Exports of parts for typesetting machines are not reported separately in official statistics beginning in 1965.

LINOTYPE AND TYPESETTING MACHINES

Table 2.--Linotype and typesetting machines and parts: U.S. exports of domestic merchandise, 1958-68

Year	Quantity of	Complete	Value	
	complete machines	machines	Parts	Total
	Number	<u>1,000</u> dollars	<u>1,000</u> dollars	<u>1,000</u> dollars
1958-----	730	5,797	4,602	10,399
1959-----	851	5,815	4,801	10,616
1960-----	1,065	7,484	5,278	12,762
1961-----	920	10,135	4,578	14,713
1962-----	900	10,155	4,784	14,939
1963-----	1,109	9,057	5,604	14,661
1964-----	1,094	10,147	6,660	16,807
1965-----	1,061	9,023	<u>1/</u> 7,079	16,102
1966-----	1,278	10,644	<u>1/</u> 7,525	18,169
1967-----	1,884	9,271	<u>1/</u> 7,999	17,270
1968-----	769	6,802	<u>1/</u> 8,503	15,305

1/ Estimated on basis of 1958-64 exports of parts.

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

Table 3.--Linotype and typesetting machines: U.S. exports of domestic merchandise, by principal markets, 1964-68

Market	1964	1965	1966	1967	1968
Quantity (number)					
Canada-----	209	124	138	158	142
France-----	53	82	107	335	62
Sweden-----	32	45	78	100	63
Netherlands-----	85	87	100	53	32
United Kingdom-----	59	56	51	252	22
West Germany-----	22	28	33	97	12
Italy-----	48	36	29	70	10
All other-----	586	603	742	819	426
Total-----	1,094	1,061	1,278	1,884	769
Value (1,000 dollars)					
Canada-----	1,570	797	1,157	1,086	1,006
France-----	699	785	1,233	1,202	802
Sweden-----	359	481	713	444	463
Netherlands-----	798	897	753	405	255
United Kingdom-----	464	238	321	656	165
West Germany-----	172	277	357	573	96
Italy-----	221	192	327	440	80
All other-----	5,864	5,356	5,783	4,470	3,938
Total-----	10,147	9,023	10,644	9,271	6,802

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

LINOTYPE AND TYPESETTING MACHINES

Table 4.--Linotype and typesetting machines and parts: U.S. imports for consumption, 1958-68

Year	Quantity of	Complete	Value	
	complete	machines	Parts	Total
	machines		1,000	1,000
	Number	dollars	dollars	dollars
1958-----	1/	2/	2/	83
1959-----	1/	2/	2/	191
1960-----	1/	2/	2/	249
1961-----	1/	2/	2/	588
1962 <u>3/</u> -----	59	71	636	707
1963-----	35	140	657	797
1964-----	163	530	1,037	1,567
1965-----	168	315	1,449	1,764
1966-----	139	321	2,544	2,865
1967-----	185	754	4,681	5,435
1968-----	447	1,848	4,148	5,996

1/ Not available.

2/ Not separately reported in official statistics.

3/ Data partly estimated. Distribution of value of imports between complete units and parts for January-June 1963 estimated by applying the ratio of the value of parts imported during July-December 1962 to the value of imports of complete units in that year to the total reported value of imports of complete units plus parts during July-December 1962.

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

Table 5.--Linotype and typesetting machines: U.S. imports for consumption, by principal sources, 1964-68

Source	1964	1965	1966	1967	1968
Quantity (number)					
United Kingdom-----	79	39	30	64	93
Japan-----	52	86	90	93	139
West Germany-----	26	37	15	12	27
All other-----	6	6	4	16	<u>1/</u> 188
Total-----	163	168	139	185	447
Value (1,000 dollars)					
United Kingdom-----	415	168	111	348	573
Japan-----	74	112	105	134	222
West Germany-----	20	13	78	194	152
All other-----	21	22	27	78	<u>1/</u> 901
Total-----	530	315	321	754	1,848
Unit value (each)					
United Kingdom-----	\$5,249	\$4,314	\$3,702	\$5,442	\$6,156
Japan-----	1,418	1,298	1,161	1,439	1,597
West Germany-----	752	362	5,207	16,157	5,643
All other-----	3,683	3,648	6,832	4,884	<u>1/</u> 4,795
Average-----	3,252	1,876	2,309	4,077	4,135

1/ Includes 180 machines, valued at 867 thousand dollars, imported from France, with a unit value of \$4,817.

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

LINOTYPE AND TYPESETTING MACHINES

Table 6.--Linotype and typesetting machine parts: U.S. imports for consumption, by principal sources, 1964-68

(In thousands of dollars)

Source	1964	1965	1966	1967	1968
United Kingdom-----	411	508	1,020	1,858	1,639
West Germany-----	360	549	822	2,035	1,170
Italy-----	171	293	480	491	659
All other-----	95	99	222	297	<u>1/</u> 680
Total-----	1,037	1,449	2,544	4,681	4,148

1/ Includes imports valued at 259 thousand dollars from France.

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

<u>Commodity</u>	<u>TSUS</u> <u>item</u>
Print blocks and print rollers, used for printing, stamping, or cutting designs:	
Print rollers with raised patterns of brass or brass and felt-----	668.32
Other-----	668.34

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1969).

U.S. trade position

U.S. trade in print rollers with raised patterns of brass or brass and felt is believed to be insignificant. Imports of other print blocks and print rollers are relatively small in comparison with domestic production. Exports are probably significantly larger than imports.

Description and uses

This summary deals with print blocks and print rollers used for stamping, printing, or cutting designs. Not discussed in this summary are blank rolls or blocks, which do not perform these functions (see summary on printing machinery other than for textiles, elsewhere in this volume).

Print blocks are usually made of wood, the surface of which has been carved to leave a raised pattern or picture; the pattern may also be engraved in linoleum, which may or may not be backed with wood. They are used primarily for printing art prints, greeting cards, and textiles. Modern printing techniques have, to a considerable extent, displaced the wooden print block. Used print blocks have become collectors' and decorators' items and are frequently used as wall plaques. They are classified for tariff purposes as wood carvings under item 207.00 if so declared upon importation and if damaged or dried out to the point that they would no longer be useful as print blocks (see summary in volume 2:2).

Print rollers of the type covered by item 668.32 have a wood case or roll into brass strips or brass strips and felt are hammered and wedged to form a design; these rollers are used mostly for printing wallpaper. The production of such print rollers requires much skill and hand labor; many used rollers of this type have been converted to lamp bases and other decorative objects. Mechanically

PRINT BLOCKS AND PRINT ROLLERS

engraved aluminum print rollers are much easier and cheaper to make and are being used to an increasing extent for printing wallpaper. Among other print rollers are those made of copper, copper alloys, or steel. Rollers made of copper and copper alloys are commonly used for printing textiles. The designs on such rollers are engraved by mechanical or chemical means. Print rollers made of steel, which are somewhat more durable, are desirable for extended and repeated use. They are engraved by a photochemical method. Print rollers are generally custom made and sold in sets--one roller for each color to be printed.

Print blocks and print rollers are ordinarily used in a machine; however, hobbyists often carve their own print blocks for hand reproduction of personal greeting cards.

U.S. tariff treatment

The column 1 (trade-agreement) rates of duty applicable to imports (see general headnote 3 of the TSUSA-1969) are as follows:

TSUS item	Commodity	Rate		
		U.S. concessions granted in 1964-67 trade confer- ence (Kennedy Round)	Second stage, effective	Final stage, effective
		to Jan. 1, 1968	Jan. 1, 1969	Jan. 1, 1972
	:Print blocks and print : rollers, used for print- : ing, stamping, or cutting: : designs:	:	:	:
668.32	: Print rollers with raised : patterns of brass or : brass and felt.	:\$4 each + : + 40% : : ad val.:	:\$3.20 each + : 32% ad val. : : ad val.:	:\$2 each + : 20% ad : val.:
668.34	: Other-----	:40% ad : val. :	: 32% ad val. : : ad val. :	:20% ad val. : : ad val. :

The tabulation above shows the column 1 rates of duty in effect under the TSUS from August 31, 1963, through 1967, and modifications therein as a result of concessions granted by the United States in the sixth (Kennedy) round of trade negotiations under the General Agreement on Tariffs and Trade. Concessions amounting to a reduction of 50 percent in duties were granted by the United States on both items; the concessions are being put into effect in five annual stages--the final reductions going into effect on January 1, 1972. Only the second and final stages of the rate modifications are shown above (see the TSUSA-1969 for all of the staged rates). On the 1966 imports of print rollers with raised patterns of brass or brass and felt (item 668.32),

the latest year during which imports entered, the ad valorem equivalent was 59.0 percent.

U.S. consumption

U.S. consumption of print rollers with raised patterns of brass or brass and felt (item 668.32) was estimated by trade sources to have been about 700 to 800 rollers in 1963. Later data are not available, but it is believed that the annual domestic consumption of such rollers has declined, principally because of the declining use of wallpaper during the last several years and the increasing use of machine-made aluminum rollers.

The value of consumption of print rollers and blocks other than those covered by item 668.32 was estimated to have been about \$10 million in 1963, and is presumed to have increased substantially since then.

U.S. producers and production

According to industry sources there were about 50 producers of print rollers in the United States in 1968, some of them large concerns. Domestic manufacturers do not limit their production to print rollers alone--they produce numerous other articles for the printing industry. The number of domestic manufacturers producing print rollers with raised patterns of brass or brass and felt is declining and probably numbers fewer than 10; all are relatively small firms.

It is believed that domestic production of print rollers with raised patterns of brass or brass and felt is small and declining. Production of other print rollers (including aluminum rollers) and blocks is much more significant. Although no official data are available, it is believed that, despite the declining production of the handmade brass rollers, total production of print rollers has increased with the significant growth of the printing industry in recent years.

U.S. exports and imports

U.S. exports of print blocks and print rollers are not reported separately in official statistics. However, exports of print rollers with raised patterns of brass or brass and felt are probably nil or negligible. Exports of other rollers and print blocks are probably larger than imports.

The value of annual U.S. imports of print blocks and print rollers during 1958-68 fluctuated between \$19,000 in 1964 and \$153,000 in 1961 (table 1). Imports of print rollers with raised patterns of brass or

brass and felt were relatively small and sporadic. The imports of other rollers were also irregular but have been of much greater significance. Japan and the Netherlands were the leading sources of U.S. imports during 1964-68; Canada and West Germany also supplied a significant share of the imports in that period, especially since 1964 (table 2).

Table 1.--Print blocks and print rollers: U.S. imports for consumption, by TSUS item number, 1958-68

Year	Print rollers with raised patterns of brass or brass and felt (item 668.32)		Other print blocks and rollers (item 668.34)	
	Quantity	Value	Quantity	Value
	Number		Number	
1958-----	56	\$6,465	1,013	\$21,611
1959-----	7	1,254	5,205	126,132
1960-----	9	990	2,809	87,719
1961-----	-	-	5,851	153,101
1962-----	6	2,775	4,209	107,070
1963-----	505	1,499	1,422	50,210
1964-----	36	185	2,456	18,356
1965-----	1	5,737	12,381	66,613
1966-----	106	2,239	10,731	35,154
1967-----	-	-	1,500	84,733
1968-----	-	-	18,108	107,957

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

Note.--Official data on U.S. production and segregated data on exports of print blocks and print rollers are not available. It is estimated that annual U.S. production of print rollers with raised patterns of brass or brass and felt is very small; U.S. production of other print rollers, however, is much larger (probably valued at about \$10 million in 1963) and supplies the bulk of domestic consumption.

PRINT BLOCKS AND PRINT ROLLERS

Table 2.--Print blocks and print rollers: U.S. imports for consumption, by principal sources, 1958 and 1964-68

Source	1958	1964	1965	1966	1967	1968
Japan-----	\$1,475	\$609	\$46,033	\$951	\$48,518	\$52,501
Netherlands-----	22,966	8,133	8,750	15,434	15,503	16,083
Canada-----	-	300	8,909	5,713	8,828	13,561
India-----	-	283	3,409	629	-	6,453
West Germany----	1,170	315	3,576	7,554	8,196	5,607
United Kingdom--	2,033	4,975	1,673	3,122	2,717	2,325
All other-----	432	^{1/} 3,926	-	^{2/} 3,990	971	^{3/} 11,427
Total-----	28,076	18,541	72,350	37,393	84,733	107,957

^{1/} Includes imports from Belgium and Luxembourg valued at \$2,925.

^{2/} Includes imports from France valued at \$2,543.

^{3/} Includes imports from Italy valued at \$11,129.

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

<u>Commodity</u>	<u>TSUS</u> <u>item</u>
Printing types-----	668.36

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1969).

U.S. trade position

Annual U.S. requirements for printing types are supplied to a large extent by domestic producers. Imports are believed to have amounted to about 20 percent of domestic shipments in recent years. Exports are smaller than imports.

Description and uses

This summary covers printing types made of any material. Type is a piece of metal or small block of wood bearing on its upper surface, usually in relief, a letter or character for use in printing. Most printing type is made of lead- or zinc-base alloys, aluminum, brass or bronze. Common printing type is made by casting and is called foundry type. Such type is usually cast in a commercial type foundry for the printing trade, as distinguished from type cast in the printing office on type-casting machines. Foundry type is harder than other type, is usually of better quality, and is suitable for very long runs. It is generally made of a lead-antimony-tin alloy, sometimes containing a small quantity of copper.

Printing type is also made from plastics, felt, rubber, and other materials. Such type is usually used for stamping by hand.

U.S. tariff treatment

The column 1 (trade-agreement) rates of duty (see general head-note 3 in the TSUSA-1969) applicable to printing types (item 668.36) are shown below:

	<u>Rate of duty</u>
Rate prior to Jan. 1, 1968-----	10% ad val.
Concession granted by the United States in the 1964-67 trade conference (Kennedy Round):	
Second stage, effective Jan. 1, 1969- -----	8% ad val.
Final stage, effective Jan. 1, 1972-----	5% ad val.

The prior rate of 10 percent ad valorem had remained unchanged under the TSUS from August 31, 1963, through 1967. As a result of a concession granted by the United States in the sixth (Kennedy) round of trade negotiations under the General Agreement on Tariffs and Trade, the duty is being reduced by 50 percent in five annual stages; only the second and final stages are shown above (see the TSUSA-1969 for all of the staged rates).

U.S. consumption

U.S. consumption of foundry type, which amounted to about \$5 million both in 1958 and in 1963, was estimated by industry sources at about \$6 million in 1967. Consumption of other type is believed to be larger than that of foundry type. Most of the domestic printing establishments make their own type. The rather slow growth of consumption of foundry type is attributable in part to the growing use of photographic techniques in printing.

U.S. producers and production

In 1963, the last year for which information is available, there were 30 U.S. manufacturers of foundry type and other printing type for use by other printing establishments. Some of the domestic type manufacturers employ more than 100 persons. The majority of the type producers are situated in or close to large printing centers throughout the United States.

Annual data on U.S. production comparable with those on imports are not separately reported in official statistics. Shipments of foundry type by domestic producers amounted to about \$4.5 million during each of the years 1958 and 1963. Industry sources estimate the value of production of foundry type in 1967 at about \$5 million. Shipments of other type were at least as great in value as those of foundry type. Although the whole of the printing industry has shown significant growth during recent years, it is estimated that the domestic production of printing type has increased less rapidly. Production of the type-making industry is mainly for replacement of wornout type.

U.S. exports and imports

U.S. exports of domestic merchandise are not reported separately in official statistics. It is believed, however, that exports are smaller than imports. Foreign-made types are somewhat larger in size than the standard U.S. types, and special tooling would be required to make the standard domestic type suitable for export.

The value of U.S. imports for consumption of printing type increased from about \$691,000 in 1964 to more than \$1 million in 1966, then declined to \$785,000 in 1968 (see accompanying table). The recent decline in imports may be due in part to the trend to photographic printing methods. West Germany was the major supplier of printing types during 1958 and 1964-68 (see table) and has accounted for as much as 57 percent of the quantity of annual imports during recent years. Other important sources of imports were France, Italy, and the United Kingdom, which together supply about one-third of the quantity of U.S. imports of printing types.

<u>Commodity</u>	<u>TSUS item</u>
Printing plates-----	668.38

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1969).

U.S. trade position

The value of U.S. consumption of printing plates in 1967 is estimated at about \$637 million. In recent years imports were insignificant, and exports, although significantly larger than imports, were small compared with consumption.

Description and uses

This summary deals with steel plates, lithographic plates, stereotype plates, electrotype plates, halftone plates, photogravure plates, photoengraved plates, and plates of plastic, rubber, and the like, engraved or otherwise prepared for printing. Unfinished plates or plates that have been finished but have not been engraved or otherwise prepared for printing are not covered by this summary (see summary relating to printing machinery other than for textiles, not elsewhere enumerated, also in this volume).

Steel plates are engraved with letters, designs, or characters and are used for printing. Lithographic plates for commercial printing are usually made of thin flexible metal, bimetal, or multimetals (multimetals plates such as those with a zinc or steel base, first plated with copper, and finally plated with chromium). The bimetal or multimetals plates are effective for larger press runs such as those of more than a million impressions. Lithographic plates made of stone, though once quite common, are rarely used now because of their weight and the special care and handling they require. Stereotype plates are made by taking a mold of composed type or the like, in paper mache or other material, and then taking from this mold a casting in type metal. Stereotype plates, the oldest and least expensive kind of printing plates, are used primarily for newspaper work.

Electrotype plates are the most expensive of the various printing plates and also the finest in quality. They are produced by an electrolytic process. The original plates are molded in a sheet of mineral wax, sheet lead, or plastic. The mold is sprayed with a silver nitrate solution and then placed in an electroplating bath where a thin layer of copper is deposited. The shell is removed from the mold and is packed with lead. A recent development is the lightweight, plastic-backed, curved electrotype plates. They are 80 percent lighter than

the conventional plates. Very long runs (more than 7 million impressions) can be made. Electrotpe plates are widely used by printers of large-circulation magazines.

A halftone plate is a reproduction of a photograph, drawing, print, or other object having a graduation of tones. The surface of the plate, usually of copper but sometimes of zinc, consists of uniformly placed dots of various sizes, capable of rendering highlights, shadows, and the graduations between them on the printed copper halftone printing plates are usually produced by a photoengraving process (etching of the plate), in which a screen is placed between the camera lens and the film. Best results are obtained by the use of two sheets of glass (screen), each of which contains fine straight lines (usually from 50 to 133 lines to the inch) which are placed at right angles to each other; the number of lines to the inch determines the degree of clarity and detail in the resulting reproduction.

Photogravure plates (commonly copper), which are made by using a photomechanical process (including etching), are used for short runs of art subjects, portraits, book illustrations, and the like. Such plates are often used for printing private editions; the impressions are made by hand, one at a time. When gravure plates are chromium plated, they are serviceable for press runs of a million or more and are used widely for printing on transparent and flexible films and on foils, for packaging and labeling purposes.

Photoengraving is a process for producing a design on a sensitized metal plate by placement of a transparent negative between the plate and a source of light. The areas not rendered water soluble by light are worked and etched with acid solutions.

Plastic and rubber plates are made by molding with heat and pressure. Such plates are used for short runs.

U.S. tariff treatment

The column 1 (trade-agreement) rates of duty (see general head-note 3 in the TSUSA-1969) applicable to printing plates (item 668.38) are shown below:

	<u>Rate of duty</u>
Rate prior to January 1, 1968-----	10.5% ad val.
Concession granted by the United States in the 1964-67 trade conference (Kennedy Round):	
Second stage, effective January 1, 1969-----	8% ad val.
Final stage, effective January 1, 1972-----	5% ad val.

The prior rate of 10.5 percent ad valorem had remained unchanged under the TSUS from August 31, 1963, through 1967. As a result of a concession granted by the United States in the sixth (Kennedy) round of trade negotiations under the General Agreement on Tariffs and Trade, the duty is being reduced by about 50 percent in five annual stages; only the second and final stages are shown above (see the TSUSA-1969 for all of the staged rates).

U.S. consumption

The value of apparent annual U.S. consumption of printing plates consumed by others than the producer increased significantly during 1958-67 from \$383 million in 1958 to \$453 million in 1963 and to an estimated \$637 million in 1967 (table 1). The ratio of imports to domestic consumption has never been significant.

According to trade sources, the consumption of printing plates by printing plants making their own plates is much greater than consumption of plates by others. For example, virtually all daily newspapers consume plates that they themselves made. Such consumption is not included in the data shown in table 1 or discussed above.

U.S. producers and production

A total of about 1,500 domestic plants produced printing plates for sale to others in 1963, the last year for which such data are available. These plants are situated throughout the United States; however, the majority of them are in New York, Massachusetts, New Jersey, Pennsylvania, Ohio, and Illinois.

U.S. production (producers' shipments) of printing plates supplies more than 99.5 percent of domestic consumption and showed a significant growth during 1958-67 (table 1), increasing in value from \$385 million in 1958 to \$456 million in 1963 and to an estimated \$639 million in 1967. Lithographic plates have shown the most significant increase in value of shipments during recent years, from \$68 million in 1958 to \$130 million in 1963 (table 2) and to an estimated \$203 million in 1966. On the other hand, the value of electrotyping and stereotyping plates declined from \$81 million in 1958 to \$72 million in 1963; however, it is believed that annual production of such plates have increased somewhat since 1963. The value of production of photo-engraving plates has changed but little, increasing from \$209 million in 1958 to \$215 million in 1963. It is believed that production of gravure plates and plates of rubber, wood, plastic, and the like has, in the aggregate, almost doubled during recent years.

U.S. exports

The value of U.S. exports of printing plates declined from \$4.1 million in 1964 to \$2.2 million in 1968 (table 3). Export data for the years 1965-68 include exports of printing blocks; hence exports of plates were somewhat less than those indicated in the table. The United States exports printing plates to a great number of countries throughout the world; however, most countries afford rather small markets. Canada has been by far the principal foreign market for U.S. exports of printing plates for a number of years, taking between 33 and 43 percent of annual exports in recent years. Other important markets for U.S.-made printing plates have been Mexico, West Germany, and the United Kingdom; together with Canada, these countries accounted for about 58 percent of total U.S. exports of printing plates in 1968.

U.S. imports

U.S. imports of printing plates vary widely as to type and are insignificant in comparison with domestic consumption. During 1964-68, reported imports varied widely in terms of quantity, value, and unit value (table 4). The quantity of imports increased from 30,811 plates in 1966 to 62,662 plates in 1968; however, the value of imports declined from \$923,000 in 1966 to \$688,000 in 1968. In the latter year the unit value of imported plates for the countries shown in table 4 ranged between \$5.01 for those from West Germany and \$233.50 for those from Mexico. Canada, the United Kingdom, Austria, and West Germany have been the principal sources of imports in recent years.

Table 1.--Printing plates: U.S. producers' shipments, imports for consumption, exports of domestic merchandise, and apparent consumption, 1958 and 1963-68

(In thousands of dollars)				
Year	Producers' shipments	Imports	Exports	Apparent consumption
1958-----	385,066	446	2,062	383,450
1963-----	456,208	476	3,578	453,106
1964-----	<u>1/</u> 476,000	511	4,116	472,400
1965-----	<u>1/</u> 515,000	514	<u>2/</u> 3,211	512,300
1966-----	<u>1/</u> 587,000	923	<u>2/</u> 3,539	584,400
1967-----	<u>3/</u> 639,000	834	<u>2/</u> 2,491	637,000
1968-----	<u>4/</u>	688	<u>2/</u> 2,165	<u>4/</u>

1/ Includes estimates for shipments of gravure plates and plates of rubber, plastic, and other material; such estimates amount to about 10 percent of the total shown.

2/ Includes exports of printing blocks and is thus not strictly comparable with data on shipments and imports.

3/ Estimated.

4/ Not available.

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

Note.--In none of the years shown did imports amount to more than 0.2 percent of consumption.

PRINTING PLATES

Table 2.--Printing plates: U.S. producers' shipments, by type, 1958 and 1963

(In thousands of dollars)

Description	1958	1963
Lithographic plates made for others-----	67,952	129,502
Photoengraving plates made for others-----	208,510	214,748
Electrotyping and stereotyping plates-----	81,479	71,914
Gravure plates-----	12,947	18,647
Rubber, plastic, and other plates-----	14,177	21,397
Total-----	385,066	456,208

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

Table 3.--Printing plates: U.S. exports of domestic merchandise, by principal markets, 1964-68 ^{1/}

(In thousands of dollars)

Market	1964	1965	1966	1967	1968
Canada-----	1,752	1,235	1,163	981	838
Mexico-----	145	274	206	351	210
Netherlands-----	27	79	94	26	142
West Germany-----	220	247	183	43	114
Venezuela-----	80	74	81	74	90
United Kingdom-----	238	194	241	127	88
France-----	199	115	167	49	46
Panama-----	53	42	29	51	30
Sweden-----	127	135	180	153	17
Italy-----	103	39	74	47	16
Brazil-----	32	12	18	78	15
All other-----	1,140	765	1,103	511	559
Total-----	4,116	3,211	3,539	2,491	2,165

^{1/} Data for 1965-68 include exports of print blocks; such exports are believed to be small.

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

Table 4.--Printing plates: U.S. imports for consumption, by principal sources, 1964-68

Source	1964	1965	1966	1967	1968
Quantity (number)					
Canada-----	1,923	3,624	11,128	12,102	18,938
United Kingdom--	31,207	6,756	3,519	17,554	16,320
Austria-----	2,678	2,039	2,611	2,191	726
West Germany---	8,802	1,308	8,876	948	15,314
Switzerland----	598	473	314	30	859
Mexico-----	34	74	3,419	1,658	6
All other-----	2,606	<u>1/</u> 1,036	944	3,237	<u>2/</u> 10,499
Total-----	47,848	15,310	30,811	37,720	62,662
Value (1,000 dollars)					
Canada-----	143	209	472	436	297
United Kingdom--	75	84	96	155	168
Austria-----	157	121	188	149	96
West Germany---	44	17	30	25	77
Switzerland----	48	28	15	4	13
Mexico-----	<u>3/</u>	1	50	22	1
All other-----	44	<u>1/</u> 54	72	43	<u>2/</u> 36
Total-----	511	514	923	834	688
Unit value					
Canada-----	\$74.48	\$57.67	\$42.41	\$35.99	\$15.67
United Kingdom--	2.40	12.44	27.28	8.82	10.31
Austria-----	58.61	59.48	71.89	67.87	132.02
West Germany---	4.97	13.21	3.35	26.65	5.01
Switzerland----	80.77	60.07	46.47	122.53	15.28
Mexico-----	8.47	20.22	14.72	13.31	233.50
All other-----	16.58	<u>1/</u> 51.00	76.86	13.69	<u>2/</u> 3.43
Average----	10.67	33.60	29.95	22.12	10.98

1/ Includes 269 units, valued at 17 thousand dollars, with a unit value of \$63.33, imported from the Netherlands.

2/ Includes 3,559 units, valued at 15 thousand dollars, with a unit value of \$4.14, imported from France.

3/ Less than \$500.

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

PRINTING MACHINERY OTHER THAN FOR TEXTILES,
NOT ELSEWHERE ENUMERATED

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<u>Commodity</u>	<u>TSUS item</u>
Printing machinery other than for textiles---	668.20 (pt.)
Parts for printing machinery-----	668.50 (pt.)

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1969).

U.S. trade position

The value of apparent annual U.S. consumption of printing machines has more than doubled during the past decade and probably amounted to \$430 million in 1967. Imports supplied about 7 percent of consumption in 1965 and 1966 and about 9 percent in 1967. Exports were significantly larger than imports.

Description and uses

This summary deals with printing presses, other printing machinery, and parts, other than for printing textiles. It also deals with stereotyping, electrotyping, and photoengraving machinery used for making printing plates. Related products, all of which are covered in other summaries in this volume, include duplicating machines (item 668.20 (pt.)) and parts (item 668.50 (pt.)), linotype and typesetting machines (item 668.25), print blocks and rollers (items 668.32 and 668.34), printing types (item 668.36), and printing plates (item 668.38).

The three principal types of printing presses are the letter press, the offset or lithographic press, and the gravure press. The oldest and most common type of printing press is the letter press. In this type of press, the ink is applied to a raised surface and transferred directly to the paper by applying pressure. The areas to be printed are raised above nonprinting areas. Letter presses can be categorized as either platen, flatbed cylinder, or rotary presses. The platen press carries both the paper and the type form on flat surfaces, known as the bed and the platen. Platen presses are well suited for printing circulars and stationery at speeds up to 4,000 impressions an hour. Flatbed cylinder presses can be of various sizes and differ in construction; however, the operating principle is the same: a flat bed holds the form, and a rotating impression cylinder provides the pressure. Such presses are used for printing booklets, catalogs, and labels, using most types of paper. The rotary presses are the most efficient of the three types of letter presses and best

PRINTING MACHINERY OTHER THAN FOR TEXTILES,
NOT ELSEWHERE ENUMERATED

suiting for longrun work. On rotary presses both the impression and printing surfaces are cylindrical. The rotary presses can be sheet-fed or web-fed, i.e., using a continuous roll of paper (web). Many models of rotary presses are used today for all types of printing, from newspaper printing to the finest color printing in magazines.

Offset presses, either sheet- or roll-fed, are used in lithographic printing, which prints by an indirect method. The ink is transferred from a curved plate to a rubber blanket, which in turn transfers the impression to paper by means of an impression cylinder. Offset lithography is the newest of the printing processes and the fastest growing. Photographic negatives and positives are used to make the plates, one printing plate for each color. Electronic color scanners were introduced recently to be used with this type of printing. They have a built-in computer that calculates the necessary color corrections of the three filtered negatives used in color printing. There are numerous models of offset presses used today. Such presses are fast, and are used for single color or multicolor work for small- and medium-run newspapers, books, and magazines.

Gravure presses are made both for sheets (sheet-fed gravure) and rolls (rotogravure) of paper. Also included in this type of printing are photogravure, offset gravure, copper and steel engraving, and etching. Gravure printing is considered to be the finest method for reproducing pictures; however, it is expensive. Gravure presses can be used for printing vinyl floor coverings, vinyl upholstery materials, and the like.

Among other printing presses are flexographic presses (formerly known as aniline presses), which use flexible rubber plates, and screen-process presses, which are still operated by hand and are used for very small runs.

The U.S. Bureau of Customs has held that item 668.20 covers such products as a small, hand-held, self-inking printing machine (C.I.E. 1/ 1114/64); electrically motivated printing apparatus for marking ampoules or other cylindrical articles (C.I.E. 1872/65); hand-operated marking machines used to print numbers, weights, sizes, and prices on tags (C.I.E. 1934/65); machines for printing, at regular intervals and on most types of insulated wire and plastic pipe or tubing, information relating to the origin, capacity, size, etc., of the product (C.I.E. 2397/65); etching presses (C.I.E. 282/67); and screen-printing machines adapted for printing on materials such as leather (C.I.E. 288/68).

1/ Customs Information Exchange.

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The Bureau of Customs has also held that item 668.50 covers such articles as printing plates that have not been engraved or otherwise prepared for printing (C.I.E. 1048/64 and C.I.E. 175/69), and covered impression rollers for "Rotogravure" presses (C.I.E. 584/65).

U.S. tariff treatment

The column 1 (trade-agreement) rates of duty applicable to imports (see general headnote 3 of the TSUSA-1969) are as follows:

TSUS item	Commodity	U.S. concessions granted		
		Rate prior to: Jan. 1, 1968	in 1964-67 trade confer- ence (Kennedy Round) Second stage, effective Jan. 1, 1969	Final stage, effective Jan. 1, 1972
668.20 (pt.)	Printing machinery, ex- cept textile printing machinery and dupli- cating machines.	12.5% ad val.	10% ad val.	6% ad val.
668.50 (pt.)	Parts for printing machinery covered above.	The rate: for the: article: of which they are parts.	<u>1/</u>	<u>1/</u>

1/ Article rate applies; concession not granted on this item.

The tabulation above shows the column 1 rates of duty in effect under the TSUS from August 31, 1963, through 1967, and modifications therein as a result of a concession granted by the United States in the sixth (Kennedy) round of trade negotiations under the General Agreement on Tariffs and Trade. A concession amounting to a reduction of 50 percent in duty was granted by the United States on item 668.20; the concession is being put into effect in five annual stages--the final reduction going into effect on January 1, 1972. Only the second and final stages of the annual rate modifications are shown (see the TSUSA-1969 for all of the staged rates).

PRINTING MACHINERY OTHER THAN FOR TEXTILES,
NOT ELSEWHERE ENUMERATEDU.S. consumption

Apparent annual U.S. consumption of printing machinery other than for printing textiles has increased with the growth in population, rise in the level of education, and increase in the number of publications. The value of annual consumption more than doubled during 1958-67, increasing from \$204 million in 1958 to \$276 million in 1963 and to an estimated \$430 million in 1967 (table 1). The bulk of the domestic consumption of printing machinery discussed in this summary and parts therefor was supplied by domestic producers, with imports accounting for 5.7 to 9.2 percent during 1958-67.

U.S. producers and production

There are more than a hundred establishments producing printing presses and parts in the United States. Several of them are large concerns having subsidiaries in one or more foreign countries. Domestic producers of printing machinery are largely concentrated in the New England, Mid-Atlantic and North Central States. Some of the domestic manufacturers, in addition to producing printing presses and parts, make a variety of related equipment for the printing industry.

The value of U.S. producers' shipments of the printing machinery and equipment discussed in this summary increased from \$214 million in 1958 to \$307 million in 1963 and to an estimated \$450 million in 1967 (table 1). In 1958, domestic producers shipped complete printing presses valued at \$94 million, of which \$33 million (about 35 percent) was accounted for by offset presses. In 1963, total shipments of printing presses were valued at \$138 million, of which \$80 million (58 percent) represented offset presses; such presses were about evenly divided between the sheet-fed and roll-fed types. Were detailed data available for 1967, it is likely that they would show a continued increase in the predominance of offset presses.

U.S. exports

The United States exports printing machinery to a great number of markets and to every continent. During recent years U.S. exports of such machinery have been equivalent to as much as 17 percent of domestic shipments. Exports increased steadily in value during 1965-68, and reached \$71 million in 1968 (table 1). Export data for years prior to 1965 included textile printing machines and therefore are not comparable with the data for 1965-68.

In recent years Canada has been the major foreign market for U.S.-made printing machinery. Exports to Canada of the items covered

by this summary were valued at about \$13 million in 1965 and amounted to about \$19 million in 1968 (table 2). Canada alone accounted for more than a fourth of U.S. exports of printing machinery and parts during 1965-68. Mexico, Japan, and the United Kingdom were other significant markets.

In terms of value, offset presses were the most important of these export items during 1965-68 (table 3). Although the number of offset presses exported remained fairly stable during recent years, the export value of such presses rose from about \$12 million in 1965 to about \$26 million in 1968.

U.S. imports

The value of annual U.S. imports for consumption of printing machinery and parts increased significantly during 1958-68 both absolutely and in relation to U.S. production and consumption. Imports increased from about \$12 million in 1958 to about \$51 million in 1968; most of the increase has taken place since 1965 (table 1). The value of imports from West Germany, by far the largest source during recent years, increased from \$13 million in 1964 to about \$24 million in 1968, or by about 80 percent (table 4). Other important sources of recent U.S. imports of printing machinery were Sweden, Italy, and the United Kingdom.

The imports of offset presses, including both the sheet-fed and the roll-fed types, were the most significant single item in terms of value during 1964-68 (table 5). In 1968, aggregate imports of offset presses amounted to about \$22 million and consisted of 849 sheet-fed offset presses, valued at \$12.3 million, and 299 roll-fed offset presses, valued at \$9.7 million. The number of sheet-fed letter presses imported in 1964-68 was also significant, but the value of such imports was small compared with the value of sheet-fed offset presses. The value of imports of parts of printing presses and parts of other printing machinery and equipment increased from \$2.9 million (14 percent of the total value of imports) in 1964 to \$12.9 million (25 percent of the total) in 1968.

PRINTING MACHINERY OTHER THAN FOR TEXTILES,
NOT ELSEWHERE ENUMERATED

Table 1.--Printing machinery other than for textiles, not elsewhere enumerated, and parts: U.S. producers' shipments, imports for consumption, exports of domestic merchandise, and apparent consumption, 1958 and 1963-68

Year	Producers' shipments	Imports	Exports	Apparent consump- tion	Ratio of imports to con- sumption
	<u>1,000</u> dollars	<u>1,000</u> dollars	<u>1,000</u> dollars	<u>1,000</u> dollars	Percent
1958-----	214,397	11,642	<u>1/</u> 21,743	204,296	5.7
1963-----	307,099	16,404	<u>1/</u> 47,213	276,290	5.9
1964-----	<u>2/</u> 341,000	20,674	<u>1/</u> 58,865	303,000	6.8
1965-----	<u>2/</u> 367,000	26,051	42,079	351,000	7.4
1966-----	<u>2/</u> 410,000	28,629	48,770	390,000	7.3
1967-----	<u>2/</u> 450,000	39,732	59,510	430,000	9.2
1968-----	<u>3/</u>	50,631	71,492	<u>3/</u>	<u>3/</u>

1/ Because exports in 1958, 1963, and 1964 include textile printing machinery, values of which are unknown, they are not strictly comparable with the exports in 1965-67.

2/ Partly estimated.

3/ Not available.

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

PRINTING MACHINERY OTHER THAN FOR TEXTILES,
NOT ELSEWHERE ENUMERATED

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Table 2.--Printing machinery other than for textiles, not elsewhere enumerated, and parts: U.S. exports of domestic merchandise, by principal markets, 1965-68

(In thousands of dollars)

Market	1965	1966	1967	1968
Canada-----	12,586	15,452	16,512	18,572
Mexico-----	4,468	5,947	4,990	7,414
Japan-----	1,037	1,210	2,529	3,424
Australia-----	1,461	1,603	1,929	3,285
West Germany-----	1,102	1,614	3,199	3,122
United Kingdom-----	2,919	2,778	3,276	3,103
France-----	1,747	2,126	2,266	2,785
Venezuela-----	1,490	1,062	906	2,575
Sweden-----	981	780	2,216	1,541
Switzerland-----	471	592	1,441	1,478
Netherlands-----	1,022	802	1,143	1,366
Italy-----	762	806	1,124	1,202
Argentina-----	562	1,064	1,479	1,151
Finland-----	993	832	1,703	1,010
All other-----	10,478	12,102	14,797	19,464
Total-----	42,079	48,770	59,510	71,492

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

PRINTING MACHINERY OTHER THAN FOR TEXTILES,
NOT ELSEWHERE ENUMERATED

Table 3.--Printing machinery other than for textiles, not elsewhere enumerated, and parts: U.S. exports of domestic merchandise, by types, 1965-68

Type of machinery	1965	1966	1967	1968
	Quantity (number)			
Electrotyping, stereotyping, and photoengraving equipment-----	1,873	2,997	3,576	2,721
Letterpresses-----	892	669	1,198	827
Offset presses-----	816	674	794	727
Gravure presses-----	67	103	166	107
Other printing presses-----	803	949	657	682
Printing machines-----	7,324	9,040	10,297	43,226
Total-----	<u>11,775</u>	<u>14,432</u>	<u>16,688</u>	<u>48,290</u>
	Value (1,000 dollars)			
Electrotyping, stereotyping, and photoengraving equipment-----	2,392	4,233	5,141	4,011
Letterpresses-----	3,293	3,614	5,457	5,565
Offset presses-----	12,295	15,401	19,631	26,235
Gravure presses-----	542	560	971	1,648
Other printing presses-----	5,262	5,348	4,625	5,913
Printing machines-----	3,788	4,597	5,641	5,949
Total-----	<u>27,572</u>	<u>33,753</u>	<u>41,466</u>	<u>49,321</u>
Parts for printing machines and printing presses-----	12,515	12,668	13,377	15,710
Printing blocks, plates, etc., prepared for engraving and impressing-----	1,992	2,349	4,667	6,461
Grand total-----	<u>42,079</u>	<u>48,770</u>	<u>59,510</u>	<u>71,492</u>

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

PRINTING MACHINERY OTHER THAN FOR TEXTILES,
NOT ELSEWHERE ENUMERATED

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Table 4.--Printing machinery other than for textiles, not elsewhere enumerated, and parts: U.S. imports for consumption, by principal sources, 1964-68

(In thousands of dollars)

Source	1964	1965	1966	1967	1968
West Germany-----	13,056	17,188	15,092	20,385	23,523
Sweden-----	1,700	1,791	1,981	5,418	8,131
Italy-----	619	903	2,305	4,072	5,643
United Kingdom-----	1,952	2,197	3,543	2,527	5,546
Canada-----	1,406	1,769	2,006	2,693	2,526
Switzerland-----	774	685	862	1,117	1,395
France-----	432	567	1,391	1,366	1,213
All other-----	735	951	1,449	2,154	2,654
Total-----	20,674	26,051	28,629	39,732	50,631

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

PRINTING MACHINERY OTHER THAN FOR TEXTILES,
NOT ELSEWHERE ENUMERATED

Table 5.--Printing machinery other than for textiles, not elsewhere enumerated, and parts: U.S. imports for consumption, by type, 1964-68

Description	1964	1965	1966	1967	1968
	Quantity (number)				
Letterpresses:					
Sheet-fed type-----	592	575	587	886	948
Roll-fed type-----	17	57	29	66	51
Offset presses:					
Sheet-fed type-----	453	770	554	596	849
Roll-fed type-----	237	386	213	258	299
Other presses-----	1,412	1,038	1,236	1,087	1,015
Total-----	<u>2,711</u>	<u>2,826</u>	<u>2,619</u>	<u>2,893</u>	<u>3,162</u>
	Value (1,000 dollars)				
Letterpresses:					
Sheet-fed type-----	3,044	3,876	4,470	5,001	6,204
Roll-fed type-----	650	567	350	1,523	855
Offset presses:					
Sheet-fed type-----	7,475	10,525	9,142	11,909	12,324
Roll-fed type-----	3,150	3,634	4,165	6,085	9,710
Other presses-----	2,264	3,158	4,624	3,582	5,967
Total-----	<u>16,583</u>	<u>21,760</u>	<u>22,751</u>	<u>28,100</u>	<u>35,060</u>
Other printing machinery-----	1,190	1,117	2,402	2,512	2,698
Parts of printing presses-----	2,562	2,675	2,879	7,915	11,071
Parts of other printing machinery (not duplicating machines)-----	339	499	597	1,205	1,802
Total-----	<u>4,091</u>	<u>4,291</u>	<u>5,878</u>	<u>11,732</u>	<u>15,571</u>
Grand total-----	<u>20,674</u>	<u>26,051</u>	<u>28,629</u>	<u>39,632</u>	<u>50,631</u>

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 (1969):
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.

TARIFF SCHEDULES OF THE UNITED STATES ANNOTATED (1969)

GENERAL HEADNOTES AND RULES OF INTERPRETATION

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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.

(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

^{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".

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General Headnotes and Rules of Interpretation

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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. 2/ 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.

2/ The purpose of headnote 3(g) was to provide for an effective date for the rates of duty initially contained in the Tariff Schedules of the United States. By Presidential Proclamation 3548 of August 21, 1963, these rates of duty, except as noted in subparagraphs (i), (ii), and (iii) of headnote 3(g), became effective on August 31, 1963.

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.

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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.

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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 unloading;

(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.

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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 (1969)

HISTORICAL NOTES

Notes p. 1
General
Headnotes

Amendments and Modifications

PROVISIONS

Gen Hdnte--Language "Except as provided in headnote 6 of 3(a)(i) 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.

PROVISIONS

Gen Hdnte--Headnotes 3(d), (e), and (f) redesignated as 3(d), (e), headnotes 3(e), (f), and (g), respectively, (f) and (g) 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--Language "and containers of usual types ordinarily sold at retail with their contents," 6(b)(i) added. Pub. L. 89-241, Secs. 2(a), 4, Oct. 7, 1965, 79 Stat. 933, 934, effective date Dec. 7, 1965.

SCHEDULE 6. - METALS AND METAL PRODUCTS

SCHEDULE 6. - METALS AND METAL PRODUCTS

<p>Part 1 - Metals, Coatings, Casts and Other Metal-Bearing Materials</p> <p>Part 2 - Metals, Their Alloys, and Their Waste Scrap and Slag</p> <p>A. Ferrous Metals</p> <p>B. Special Steels</p> <p>C. Casts</p> <p>D. Aluminum</p> <p>E. Nickel</p> <p>F. Tin</p> <p>G. Lead</p> <p>H. Zinc</p> <p>I. Titanium</p> <p>J. Ferric Chloride, Columbian, Germanium, Indium, Inertium, Magnesium, Molybdenum, Selenium, Tellurium, Vanadium, Zirconium, Zirconium and Zirconium</p> <p>K. Other Base Metals</p> <p>Part 3 - Metal Products</p> <p>A. Metallic Containers</p> <p>B. Wire Ropes, Wire Cables, Netting and Twisting, and Ties</p> <p>C. Metal Lath and Bar, Castings</p> <p>D. Bolts, Screws, Nuts, and Other Fasteners; Locks, Builders' Hardware, Furniture, Latches, and Similar Hardware</p> <p>E. Metal Plates, Sheets, and Strips</p>	<p>Section 1 - General</p> <p>Section 2 - Ferrous Metals</p> <p>Section 3 - Aluminum</p> <p>Section 4 - Titanium</p> <p>Section 5 - Other Base Metals</p> <p>Section 6 - Metal Products</p> <p>Section 7 - Machinery and Mechanical Equipment</p> <p>Section 8 - Electrical Machinery and Equipment</p> <p>Section 9 - Transportation Equipment</p>
<p>Part 4 - Machinery and Mechanical Equipment</p> <p>A. Boilers, Non-Electric Motors and Engines, and Other General-Purpose Machinery</p> <p>B. Elevators, Winches, Cranes, and Related Machinery; Earth-Moving and Mining Machinery</p> <p>C. Agricultural and Horticultural Machinery; Machinery for Preparing Food and Drink</p> <p>D. Pulp and Paper Machinery; Bookbinding Machinery; Printing Machinery</p> <p>E. Textile Machinery; Laundry and Dry-Cleaning Machines; Sewing Machines</p> <p>F. Machines for Working Metal, Hand, and Other Materials</p> <p>G. Lathes; Machines</p> <p>H. Other Machines</p> <p>I. Tools of Machinery</p> <p>Part 5 - Electrical Machinery and Equipment</p> <p>Part 6 - Transportation Equipment</p> <p>A. Rail Locomotives and Rolling Stock</p> <p>B. Motor Vehicles</p> <p>C. Aircraft and Spacecraft</p> <p>D. Ships, Boats, and Other Vessels</p>	<p>Section 10 - Miscellaneous</p> <p>Section 11 - Miscellaneous</p> <p>Section 12 - Miscellaneous</p> <p>Section 13 - Miscellaneous</p> <p>Section 14 - Miscellaneous</p> <p>Section 15 - Miscellaneous</p> <p>Section 16 - Miscellaneous</p> <p>Section 17 - Miscellaneous</p> <p>Section 18 - Miscellaneous</p> <p>Section 19 - Miscellaneous</p> <p>Section 20 - Miscellaneous</p>

TARIFF SCHEDULES OF THE UNITED STATES ANNOTATED (1969)

SCHEDULE 6. - METALS AND METAL PRODUCTS

Part 4. - Machinery and Mechanical Equipment

Item	Stat. Suffix	Articles	Units of Quantity	Rates of Duty	
				1	2
		<p>PART 4. - MACHINERY AND MECHANICAL EQUIPMENT</p> <p><u>Part 4 headnotes:</u></p> <p>1. This part does not cover -- (i) bobbins, spools, cops, tubes, and similar holders; (ii) belts and belting; (iii) machine clothing, other than card clothing provided for in items 670.52 and 670.54; (iv) articles of textile materials; articles of stone, of ceramic ware, of glass, or of other materials provided for in schedule 5; or articles of leather or of fur on the skin; or (v) articles and parts of articles specifically provided for elsewhere in the schedules.</p> <p>2. Unless the context requires otherwise, and subject to headnote 1 to subpart A of this part, a multi-purpose machine is classifiable according to its principal purpose, but if such a machine is not described in a superior tariff heading as to its principal purpose, or if it has no one principal purpose, it is classifiable in subpart H of this part as a machine not specially provided for.</p> <p>3. An electric motor or other power unit imported with a machine is classifiable with such machine as an entirety if fitted thereto when imported, or, if the machine or its framework is designed to receive the power unit, or if the shipment includes a common base designed to receive both the power unit and the machine.</p>			
		<p>Subpart A. - Boilers, Non-Electric Motors and Engines, and Other General Purpose Machinery</p> <p><u>Subpart A headnote:</u></p> <p>1. A machine or appliance which is described in this subpart and also is described elsewhere in this part is classifiable in this subpart.</p>			
660.10	00	Steam and other vapor generating boilers (except central heating hot water boilers capable also of producing low pressure steam), and parts thereof.....	X.....	10.5% ad val.	45% ad val.
660.15	00	Economizers, superheaters, soot removers, gas recoverers, and auxiliary plants for use with steam and other vapor generating boilers; condensers for vapor engines and power units; all of the foregoing and parts thereof.....	X.....	11% ad val.	45% ad val.

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SCHEDULE 6. - METALS AND METAL PRODUCTS
Part 4. - Machinery and Mechanical Equipment

6 - 4 - A
660.20 - 660.55

Item	Stat. Suffix	Articles	Units of Quantity	Rates of Duty	
				1	2
660.20	00	Producer gas and water gas generators, with or without purifiers; acetylene gas generators (water process) and other gas generators, with or without purifiers; all the foregoing and parts thereof: Apparatus for the generation of acetylene gas from calcium carbide, and parts thereof.....	X.....	6% ad val.	20% ad val.
660.22	00	Other.....	X.....	10.5% ad val.	45% ad val.
660.25	00	Steam engines, steam turbines, and other vapor power units, and parts thereof: Steam engines and parts thereof.....	X.....	6% ad val.	15% ad val.
660.30	00	Steam turbines and parts thereof.....	X.....	12% ad val.	20% ad val.
	20	Steam turbines.....	No.		
	40	Parts.....	X		
660.35	00	Other.....	X.....	7% ad val.	27.5% ad val.
660.40	00	Internal combustion engines and parts thereof: Piston-type engines: To be installed in tractors of a type provided for in item 692.30 or in agricultural or horticultural machinery or implements provided for in item 666.00.....	No.....	Free	Free
660.42	00	Other: Compression-ignition engines.....	No.....	8% ad val.	35% ad val.
660.43	00	If Canadian article and original motor-vehicle equipment (see headnote 2, part 6B, schedule 6)..	No.....	Free	
660.44	00	Engines other than compression-ignition engines.....		6.5% ad val.	35% ad val.
	15	Specially designed for: Aircraft.....	No.		
	30	Automobile (including truck and bus).....	No.		
	40	Other: Outboard motors for marine craft.....	No.		
660.45	00	Other.....	No.		
660.46	00	If Canadian article and original motor-vehicle equipment (see headnote 2, part 6B, schedule 6)..	No.....	Free	
660.46	00	Non-piston type engines.....		8% ad val.	35% ad val.
	20	Aircraft: Turbo-jet and gas turbine, new.....	No.		
	40	Other.....	No.		
660.47	00	Other.....	No.		
660.47	00	If Canadian article and original motor-vehicle equipment (see headnote 2, part 6B, schedule 6).....	No.....	Free	
660.50	00	Parts: Cast-iron (except malleable cast-iron) parts, not alloyed and not advanced beyond cleaning, and machined only for the removal of fins, gates, sprues, and risers or to permit location in finishing machinery.....	Lb.....	1.5% ad val.	10% ad val.
660.51	00	If Canadian article and original motor-vehicle equipment (see headnote 2, part 6B, schedule 6).....	Lb.....	Free	
660.52	00	Other parts: Parts of piston-type engines other than compression-ignition engines.....	X.....	6.5% ad val.	35% ad val.
660.53	00	If Canadian article and original motor-vehicle equipment (see headnote 2, part 6B, schedule 6)..	X.....	Free	
660.54	00	Other.....	X.....	8% ad val.	35% ad val.
660.55	00	If Canadian article and original motor-vehicle equipment (see headnote 2, part 6B, schedule 6)..	X.....	Free	

TARIFF SCHEDULES OF THE UNITED STATES ANNOTATED (1969)

SCHEDULE 6. - METALS AND METAL PRODUCTS
Part 4. - Machinery and Mechanical Equipment

Item	Stat. Suffix	Articles	Units of Quantity	Rates of Duty	
				1	2
660.65	00	Water wheels, water turbines, and other water engines, and parts including governors therefor: Governors.....	No.....	\$1.80 each + 28% ad val.	\$4.50 each + 65% ad val.
660.70	20	Other.....		12% ad val.	27.5% ad val.
	40	<i>Water wheels, water turbines, and other water engines</i>	No.		
		<i>Parts</i>	X		
		Non-electric engines and motors not specially provided for, and parts thereof:			
660.75	00	Hydrojet engines for motor boats, and parts thereof.....	X.....	9.5% ad val.	30% ad val.
660.80	00	Spring-operated and weight-operated motors.....	No.....	16% ad val.	35% ad val.
660.85	00	Other.....	X.....	7% ad val.	27.5% ad val.
660.86	00	If Canadian article and original motor-vehicle equipment (see headnote 2, part 6B, schedule 6).....	X.....	Free	
		Pumps for liquids, whether or not fitted with measuring devices; liquid elevators of bucket, chain, screw, band, and similar types; all the foregoing whether operated by hand or by any kind of power unit, and parts thereof:			
660.92	00	Fuel injection pumps for compression-ignition engines, and parts thereof.....	X.....	4.5% ad val.	35% ad val.
660.93	00	If Canadian article and original motor-vehicle equipment (see headnote 2, part 6B, schedule 6).....	X.....	Free	
660.94	20	Other.....		8% ad val.	35% ad val.
	40	<i>Submersible pumps</i>	No.		
	60	<i>Other (except parts)</i>	No.		
	60	<i>Parts</i>	X		
660.95	00	If Canadian article and original motor-vehicle equipment (see headnote 2, part 6B, schedule 6).....	X.....	Free	
		Air pumps, vacuum pumps and air or gas compressors (including free-piston compressors for gas turbines); fans and blowers; all the foregoing, whether operated by hand or by any kind of power unit, and parts thereof:			
		Fans and blowers, and parts thereof:			
661.09	00	Blowers for pipe organs.....	No.....	8% ad val.	35% ad val.
661.10	00	Other.....	X.....	11% ad val.	35% ad val.
661.11	00	If Canadian article and original motor-vehicle equipment (see headnote 2, part 6B, schedule 6).....	X.....	Free	
661.12	20	Compressors, and parts thereof.....		7.5% ad val.	35% ad val.
	40	<i>Refrigeration and air-conditioning</i>	No.		
	60	<i>Other, except parts</i>	No.		
	60	<i>Parts</i>	X		
661.13	00	If Canadian article and original motor-vehicle equipment (see headnote 2, part 6B, schedule 6).....	X.....	Free	
661.15	00	Other.....	X.....	8% ad val.	35% ad val.
661.16	00	If Canadian article and original motor-vehicle equipment (see headnote 2, part 6B, schedule 6).....	X.....	Free	
661.20	20	Air-conditioning machines, comprising a motor-driven fan and elements for changing the temperature and humidity of air, and parts thereof.....		8.5% ad val.	35% ad val.
	40	<i>Machines</i>	No.		
	40	<i>Parts</i>	X		
661.21	00	If Canadian article and original motor-vehicle equipment (see headnote 2, part 6B, schedule 6).....	X.....	Free	

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SCHEDULE 6. - METALS AND METAL PRODUCTS
Part 4. - Machinery and Mechanical Equipment

6 - 4 - A
661.25 - 661.96

Item	Stat. Suf-fix	Articles	Units of Quantity	Rates of Duty	
				1	2
661.25	00	Furnace burners for liquid fuel (atomizers), for pulverized solid fuel or for gas; mechanical stokers, mechanical grates, mechanical ash dischargers and similar appliances; and parts thereof.....	X.....	7% ad val.	27.5% ad val.
661.30	00	Industrial and laboratory furnaces and ovens, non-electric, and parts thereof.....	X.....	15% ad val.	45% ad val.
661.35		Refrigerators and refrigerating equipment, whether or not electric, and parts thereof.....		8% ad val.	35% ad val.
	25	Compression type (excluding parts).....	No.		
	45	Other (excluding parts).....	No.		
	50	Parts.....	X		
661.36	00	If Canadian article and original motor-vehicle equipment (see headnote 2, part 6B, schedule 6).....	X.....	Free	
661.40	00	Calendering and similar rolling machines (except metal-working and metal-rolling machines and glass-working machines), and parts thereof: Calender bowls or rolls of textile fibers, husk, paper, or mixtures thereof, compressed between and held together by iron or steel heads or washers fastened to iron or steel cores or mandrels, for calendering, embossing, mangling, or pressing operations.....	No.....	22% ad val.	35% ad val.
661.45	00	Embossing rollers of metal.....	No.....	8% ad val.	30% ad val.
661.55	00	Other.....	X.....	8% ad val.	35% ad val.
		Industrial machinery, plant, and similar laboratory equipment, whether or not electrically heated, for the treatment of materials by a process involving a change of temperature, such as heating, cooking, roasting, distilling, rectifying, sterilizing, pasteurizing, steaming, drying, evaporating, vaporizing, condensing, or cooling; instantaneous or storage water heaters, non-electrical; all the foregoing (except agricultural implements, sugar machinery, shoe machinery, and machinery or equipment for the heat-treatment of textile yarns, fabrics, or made-up textile articles) and parts thereof:			
661.70	00	Other.....	X.....	10% ad val.	35% ad val.
		Centrifuges; filtering and purifying machinery and apparatus (other than filter funnels, milk strainers, and similar articles), for liquids or gases; all the foregoing and parts thereof: Centrifuges and parts thereof: Cream separators: Valued not over \$50 each.....	No.....	Free	Free
661.75	00	Valued over \$50 but not over \$100 each...	No.....	2% ad val.	25% ad val.
661.80	00	Valued over \$100 each.....	No.....	8% ad val.	25% ad val.
661.85	00	Other.....	X.....	9% ad val.	25% ad val.
661.90	00	Other: Cast-iron (except malleable cast-iron) parts, not alloyed and not advanced beyond cleaning, and machined only for the removal of fins, gates, sprues, and risers or to permit location in finishing machinery.....	Lb.....	2% ad val.	10% ad val.
661.92	00	If Canadian article and original motor-vehicle equipment (see headnote 2, part 6B, schedule 6).....	Lb.....	Free	
661.93	00	Other.....	X.....	9% ad val.	35% ad val.
661.95	00	If Canadian article and original motor-vehicle equipment (see headnote 2, part 6B, schedule 6).....	X.....	Free	
661.96	00				

TARIFF SCHEDULES OF THE UNITED STATES ANNOTATED (1969)

SCHEDULE 6. - METALS AND METAL PRODUCTS
Part 4. - Machinery and Mechanical Equipment

Item	Stat. Suf-fix	Articles	Units of Quantity	Rates of Duty	
				1	2
662.10		Machinery for cleaning or drying bottles or other containers; machinery for filling, closing, sealing, capsuling, or labelling bottles, cans, boxes, bags, or other containers; other packing or wrapping machinery; machinery for aerating beverages; dish washing machines; all the foregoing and parts thereof:			
		Machines for packaging pipe tobacco; machines for wrapping candy; machines for wrapping cigarette packages; and combination candy cutting and wrapping machines; all the foregoing and parts thereof.....	No.	6.5% ad val.	35% ad val.
	20	<i>Machines for wrapping candy</i>	No.		
	40	<i>Other machines</i>	No.,		
	60	<i>Parts of the foregoing</i>	X		
662.15	00	Can-sealing machines, and parts thereof.....	X.....	12% ad val.	30% ad val.
662.18	00	Other: Cast iron (except malleable cast iron) parts, not alloyed and not advanced beyond cleaning, and machined only for the removal of fins, gates, sprues, and risers, or to permit location in finishing machinery.....	X.....	2% ad val.	10% ad val.
662.20		Other.....		9% ad val.	35% ad val.
	25	<i>Wrapping and packaging machines, and parts</i>	X		
	65	<i>Other</i>	X		
		Weighing machinery and scales (except balances of a sensitivity of 5 centigrams or better provided for in part 2D of schedule 7), including weight-operated counting and checking machines, and parts thereof; weighing machine weights not provided for in part 2D of schedule 7:			
662.25	00	Weighing machinery for use in the manufacture of sugar.....	X.....	Free	Free
662.26	00	Fully automatic weighing machinery requiring no manual operations for weight determinations, and accurate to 1/20 of 1 percent or better of the maximum weighing capacity, on weight tests within the weighing range of the scale.....	X.....	8% ad val.	35% ad val.
662.30	00	Other.....	X.....	14% ad val.	45% ad val.
		Mechanical appliances, whether or not hand operated, for projecting, dispersing, or spraying liquids or powders; fire extinguishers, whether or not charged; spray guns and similar appliances; steam- or sand-blasting machines and similar jet projecting machines; all the foregoing (except automatic vending machines) and parts thereof:			
662.35	00	Simple piston pump sprays, powder bellows, all the foregoing and parts thereof.....	X.....	15% ad val.	45% ad val.
662.36	00	If Canadian article and original motor-vehicle equipment (see headnote 2, part 6B, schedule 6).....	X.....	Free	Free
662.40	00	Sand-blasting machines, and parts thereof.....	X.....	Free	Free
662.45	00	Sprayers (except sprayers, self-contained, having a capacity not over 5 gallons) suitable for agricultural or horticultural use.....	X.....	Free	Free
662.50	00	Other.....	X.....	8% ad val.	35% ad val.
662.51	00	If Canadian article and original motor-vehicle equipment (see headnote 2, part 6B, schedule 6).....	X.....	Free	Free

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SCHEDULE 6. - METALS AND METAL PRODUCTS
Part 4. - Machinery and Mechanical Equipment

6 - 4 - B
664.05 - 664.11

Item	Stat. Suffix	Articles	Units of Quantity	Rates of Duty	
				1	2
		<p>Subpart B. - Elevators, Winches, Cranes, and Related Machinery; Earth-Moving and Mining Machinery</p> <p><u>Subpart B headnote:</u></p> <p>1. This subpart does not cover -- (i) cranes or other machines mounted on vehicles, on vessels or other floating structures, or on other transport equipment (see part 6 of this schedule); or (ii) agricultural implements (see subpart C of this part).</p>			
664.05		<p>Mechanical shovels, coal-cutters, excavators, scrapers, bulldozers, and other excavating, levelling, boring, and extracting machinery, all the foregoing, whether stationary or mobile, for earth, minerals, or ores; pile drivers; snow plows, not self-propelled; all the foregoing and parts thereof.....</p>		8% ad val.	35% ad val.
	20	<i>Mechanical shovels.....</i>	No.		
	65	<i>Other, including parts of the foregoing.....</i>	X		
664.10		<p>Elevators, hoists, winches, cranes, jacks, pulley tackle, belt conveyors, and other lifting, handling, loading, or unloading machinery, and conveyors, all the foregoing and parts thereof not provided for in item 664.05.....</p>		8% ad val.	35% ad val.
	10	<i>Passenger elevators, moving stairways, and parts thereof.....</i>	X		
	20	<i>Conveyors:</i>			
	30	<i>Belt, and parts.....</i>	X		
	35	<i>Other, and parts.....</i>	X		
	45	<i>Hoists and winches, and parts thereof.....</i>	X		
	50	<i>Overhead traveling cranes and parts thereof.....</i>	X		
	50	<i>Other.....</i>	X		
664.11	00	<p>If Canadian article and original motor-vehicle equipment (see headnote 2, part 6B, schedule 6).....</p>	X.....	Free	

TARIFF SCHEDULES OF THE UNITED STATES ANNOTATED (1969)

SCHEDULE 6. - METALS AND METAL PRODUCTS
Part 4. - Machinery and Mechanical Equipment

Item	Stat. Suffix	Articles	Units of Quantity	Rates of Duty	
				1	2
		<p>Subpart C. - Agricultural and Horticultural Machinery; Machinery for Preparing Food and Drink</p> <p><u>Subpart C headnote:</u></p> <p>1. The provisions of Item 666.00 for "agricultural and horticultural implements not specially provided for" do not apply to any of the articles provided for in schedule 6, part 2, part 3 (subparts A through F, inclusive), part 5 (except item 688.40), or part 6, or to any of the articles specially provided for elsewhere in the tariff schedules, but interchangeable agricultural and horticultural implements are classifiable in item 666.00 even if mounted at the time of importation on a tractor provided for in part 6B of this schedule.</p>			
666.00		<p>Machinery for soil preparation and cultivation, agricultural drills and planters, fertilizer spreaders, harvesting and threshing machinery, hay or grass mowers (except lawn-mowers), farm wagons and carts, milking machines, on-farm equipment for the handling or drying of agricultural or horticultural products, and agricultural and horticultural implements not specially provided for, and parts of any of the foregoing.....</p> <p>05 <i>Plows and listers</i>..... No.</p> <p>10 <i>Cultivators and weeders</i>..... No.</p> <p>15 <i>Parts of plows, listers, cultivators and weeders</i>... X</p> <p>20 <i>Harrows, rollers, stalk cutters and soil pulverizers</i>..... No.</p> <p>25 <i>Planting, seeding, and fertilizing machines</i>..... No.</p> <p><i>Harvesting machines:</i></p> <p>30 <i>Haying machines other than mowers</i>..... No.</p> <p>35 <i>Mowers</i>..... No.</p> <p>40 <i>Other</i>..... No.</p> <p>45 <i>Farm wagons and carts</i>..... No.</p> <p>50 <i>Other machinery and implements</i>..... X</p> <p>55 <i>Other parts</i>..... X</p>		Free	Free
666.10	00	Lawn mowers and parts thereof.....	X.....	16% ad val.	30% ad val.
		Industrial machinery for preparing and manufacturing food or drink, and parts thereof:			
666.20	00	Machinery for use in the manufacture of sugar, and parts thereof.....	X.....	Free	Free
666.25		Other.....		9% ad val.	35% ad val.
	10	<i>Meat- and poultry-packing plant machinery and equipment, and parts</i>	X		
	20	<i>Flour mill and grain mill machines</i>	No.		
	30	<i>Parts for flour mill and grain mill machines</i> ..	X		
	40	<i>Bakery machinery, and parts</i>	X		
	50	<i>Machinery for preparing and processing fruits and vegetables, and parts</i>	X		
	60	<i>Chocolate and confectionery machinery, and parts</i>	X		
	70	<i>Other machinery, and parts</i>	X		

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SCHEDULE 6. - METALS AND METAL PRODUCTS
Part 4. - Machinery and Mechanical Equipment

6 - 4 - D
668.00 - 668.20

Item	Stat. Suf-fix	Articles	Units of Quantity	Rates of Duty	
				1	2
Subpart D. - Pulp and Paper Machinery; Bookbinding Machinery; Printing Machinery					
<i>Subpart D statistical headnote:</i>					
1. For the purposes of this subpart the weight of duplicating machines and offset presses shall be determined in their condition when fully assembled.					

668.00		Machines for making cellulosic pulp, paper, or paperboard; machines for processing or finishing pulp, paper, or paperboard, or making them up into articles:			
	20	Machines for making cellulosic pulp, paper, or paperboard.....	No.	5.5% ad val.	35% ad val.
	40	Machines for making cellulose pulp.....	No.		
668.02		Machines for making paper and paperboard.....	No.		
	20	Other.....	No.	8% ad val.	35% ad val.
	40	Machines for making boxes, cartons, tubes, drums, and similar rigid containers.....	No.		
	40	Machines for making bags, sacks, envelopes, and similar non-rigid containers.....	No.		
	60	Other.....	No.		
668.04	00	Parts of the foregoing machines: Bed plates, roll bars, and other stock-treating parts for pulp or paper machines.....	X.....	13% ad val.	20% ad val.
668.06	00	Other: Parts of machines for making cellulosic pulp, paper or paperboard.....	X.....	5.5% ad val.	35% ad val.
668.07	00	Other.....	X.....	8% ad val.	35% ad val.
668.10		Bookbinding machinery, including book-sewing machines, and parts thereof.....		8% ad val.	25% ad val.
	20	Machines.....	No.		
	40	Parts.....	X		
Printing machinery:					
668.20		Other, including printing presses, offset duplicating machines, and stencil copy machines.....		10% ad val.	25% ad val.
		Duplicating machines weighing less than 3,500 pounds and using stencils or masters or plates: 1/			
	05	Stencil type.....	No.		
	10	Spirit type.....	No.		
	15	Offset type.....	No.		
	20	Other.....	No.		
		Other:			
		Printing presses:			
		Letter presses:			
	25	Sheet-fed type.....	No.		
	30	Roll-fed type.....	No.		
		Offset presses weighing 3,500 pounds or more:			
	35	Sheet-fed type.....	No.		
	40	Roll-fed type.....	No.		
	45	Other.....	No.		
	50	Other printing machinery.....	X		
1/ See Subpart D statistical headnote 1.					

TARIFF SCHEDULES OF THE UNITED STATES ANNOTATED (1969)

STAGED RATES AND HISTORICAL NOTES

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Staged Rates

Modifications of column 1 rates of duty by Pres. Proc. 3694 (Canadian Compensation), Dec. 27, 1965, 3 CFR, 1965 Supp., p. 85, as modified by Pres. Proc. 3818, Nov. 6, 1967, 32 F.R. 15487:

TSUS item	Prior rate	Rate of duty, effective with respect to articles entered on and after January 1 --				
		1966	1967	1968	1969	1970
660.10	13.75% ad val.	13% ad val.	13% ad val.	1/10	1/10	1/10
660.22	14% ad val.	13% ad val.	13% ad val.	1/10	1/10	1/10
661.20	11.5% ad val.	11% ad val.	11% ad val.	1/10	1/10	1/10
668.04	15.5% ad val.	12% ad val.	11% ad val.	10% ad val.	8% ad val.	7% ad val.
667.22	22% ad val.	22% ad val.	13% ad val.	10% ad val.	10% ad val.	11% ad val.
667.04	18% ad val.	17% ad val.	14% ad val.	11% ad val.	11% ad val.	11% ad val.
667.11	14% ad val.	17% ad val.	11% ad val.	11% ad val.	11% ad val.	11% ad val.

1/ See Kennedy Round staged rates, infra.

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
660.10	13% ad val.	11.5% ad val.	10.5% ad val.	9% ad val.	8% ad val.	6.5% ad val.
660.15	14% ad val.	12.5% ad val.	11% ad val.	9.5% ad val.	8% ad val.	7% ad val.
660.20	8% ad val.	7% ad val.	6% ad val.	5.5% ad val.	4.5% ad val.	4% ad val.
660.22	13% ad val.	11.5% ad val.	10.5% ad val.	9% ad val.	8% ad val.	7% ad val.
660.25	8% ad val.	7% ad val.	6% ad val.	5.5% ad val.	4.5% ad val.	4% ad val.
660.30	15% ad val.	13% ad val.	12% ad val.	10% ad val.	9% ad val.	7.5% ad val.
660.35	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.	4.5% ad val.
660.42	10% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
660.44	8.5% ad val.	7.5% ad val.	6.5% ad val.	5.5% ad val.	5% ad val.	4% ad val.
660.46	10% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
660.50	3% ad val.	2% ad val.	1.5% ad val.	1% ad val.	0.5% ad val.	Free
660.52	8.5% ad val.	7.5% ad val.	6.5% ad val.	5.5% ad val.	5% ad val.	4% ad val.
660.54	10% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
660.65	\$2.25 each + 35% ad val.	\$2.02 each + 31.5% ad val.	\$1.80 each + 28% ad val.	\$1.57 each + 24.5% ad val.	\$1.35 each + 21% ad val.	\$1.12 each + 17.5% ad val.
660.70	15% ad val.	13% ad val.	12% ad val.	10% ad val.	9% ad val.	7.5% ad val.
660.75	12% ad val.	10.5% ad val.	9.5% ad val.	8% ad val.	7% ad val.	6% ad val.
660.80	20% ad val.	18% ad val.	16% ad val.	14% ad val.	12% ad val.	10% ad val.
660.85	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.	4.5% ad val.
660.92	6% ad val.	5% ad val.	4.5% ad val.	4% ad val.	3.5% ad val.	3% ad val.
660.94	10% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
661.09	10% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
661.10	14% ad val.	12.5% ad val.	11% ad val.	9.5% ad val.	8% ad val.	7% ad val.
661.12	9.5% ad val.	8.5% ad val.	7.5% ad val.	6.5% ad val.	5.5% ad val.	4.5% ad val.
661.15	10.5% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
661.20	11% ad val.	9.5% ad val.	8.5% ad val.	7.5% ad val.	6.5% ad val.	5.5% ad val.
661.25	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.	4.5% ad val.
661.30	19% ad val.	17% ad val.	15% ad val.	13% ad val.	11% ad val.	9.5% ad val.
661.35	10.5% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
661.40	28% ad val.	25% ad val.	22% ad val.	19.5% ad val.	16.5% ad val.	14% ad val.
661.45	10% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
661.55	10% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
661.70	12.5% ad val.	11% ad val.	10% ad val.	8.5% ad val.	7% ad val.	6% ad val.
661.80	4% ad val.	3% ad val.	2% ad val.	1.5% ad val.	0.5% ad val.	Free

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STAGED RATES AND HISTORICAL NOTES

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Staged Rates

Modifications of column 1 rates of duty by Pres. Proc. 3822 (Kennedy Round), Dec. 16, 1967, 32 F.R. 19002 1/ (con.):

TSUS item	Prior rate	Rate of duty, effective with respect to articles entered on and after January 1 --				
		1968	1969	1970	1971	1972
661.85	10.5% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
661.90	11.5% ad val.	10% ad val.	9% ad val.	8% ad val.	6.5% ad val.	5.5% ad val.
661.92	3% ad val.	2.5% ad val.	2% ad val.	2% ad val.	1.5% ad val.	1.5% ad val.
661.95	11.5% ad val.	10% ad val.	9% ad val.	8% ad val.	6.5% ad val.	5.5% ad val.
662.10	8% ad val.	7% ad val.	6.5% ad val.	6% ad val.	5.5% ad val.	5% ad val.
662.15	15% ad val.	13% ad val.	12% ad val.	10% ad val.	9% ad val.	7.5% ad val.
662.18 1/	11.5% ad val.	2.5% ad val.	2% ad val.	2% ad val.	1.5% ad val.	1.5% ad val.
662.20	11.5% ad val.	10% ad val.	9% ad val.	8% ad val.	6.5% ad val.	5.5% ad val.
662.26	10% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
662.30	18% ad val.	16% ad val.	14% ad val.	12.5% ad val.	10.5% ad val.	9% ad val.
662.35	19% ad val.	17% ad val.	15% ad val.	13% ad val.	11% ad val.	9.5% ad val.
662.50	10% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
664.05	10% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
664.10	10.5% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
666.10	20% ad val.	18% ad val.	16% ad val.	14% ad val.	12% ad val.	10% ad val.
666.25	11.5% ad val.	10% ad val.	9% ad val.	8% ad val.	6.5% ad val.	5.5% ad val.
668.00	7% ad val.	6% ad val.	5.5% ad val.	4.5% ad val.	4% ad val.	3.5% ad val.
668.02	10% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
668.06	7% ad val.	6% ad val.	5.5% ad val.	4.5% ad val.	4% ad val.	3.5% ad val.
668.07	10% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
668.10	10.5% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
668.20	12.5% ad val.	11% ad val.	10% ad val.	8.5% ad val.	7% ad val.	6% ad val.
668.32	\$4 each + 40% ad val.	\$3.60 each + 36% ad val.	\$3.20 each + 32% ad val.	\$2.80 each + 28% ad val.	\$2.40 each + 24% ad val.	\$2 each + 20% ad val.
668.34	40% ad val.	36% ad val.	32% ad val.	28% ad val.	24% ad val.	20% ad val.
668.36	10% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
668.38	10.5% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.

1/ The staged rates for item 662.18 were not proclaimed by Pres. Proc. 3822. These rates were established by Pub. L. 90-638, effective date Oct. 25, 1968, which provides that they shall be treated as having been proclaimed by the President as being required or appropriate to carry out foreign trade agreements to which the United States is a party.

TARIFF SCHEDULES OF THE UNITED STATES ANNOTATED (1969)

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TARIFF CLASSIFICATION	DESCRIPTION	Rates of duty, effective with respect to articles imported on and after January 1, 1965				
		1965	1966	1970	1975	1981
660.91	...	11% ad val.	10% ad val.	5% ad val.	5% ad val.	5% ad val.
660.92	...	12% ad val.	11% ad val.	6% ad val.	6% ad val.	6% ad val.
660.93	...	13% ad val.	12% ad val.	7% ad val.	7% ad val.	7% ad val.
660.94	...	14% ad val.	13% ad val.	8% ad val.	8% ad val.	8% ad val.
660.95	...	15% ad val.	14% ad val.	9% ad val.	9% ad val.	9% ad val.
660.96	...	16% ad val.	15% ad val.	10% ad val.	10% ad val.	10% ad val.
660.97	...	17% ad val.	16% ad val.	11% ad val.	11% ad val.	11% ad val.
660.98	...	18% ad val.	17% ad val.	12% ad val.	12% ad val.	12% ad val.
660.99	...	19% ad val.	18% ad val.	13% ad val.	13% ad val.	13% ad val.
661.00	...	20% ad val.	19% ad val.	14% ad val.	14% ad val.	14% ad val.
661.01	...	21% ad val.	20% ad val.	15% ad val.	15% ad val.	15% ad val.
661.02	...	22% ad val.	21% ad val.	16% ad val.	16% ad val.	16% ad val.
661.03	...	23% ad val.	22% ad val.	17% ad val.	17% ad val.	17% ad val.
661.04	...	24% ad val.	23% ad val.	18% ad val.	18% ad val.	18% ad val.
661.05	...	25% ad val.	24% ad val.	19% ad val.	19% ad val.	19% ad val.
661.06	...	26% ad val.	25% ad val.	20% ad val.	20% ad val.	20% ad val.
661.07	...	27% ad val.	26% ad val.	21% ad val.	21% ad val.	21% ad val.
661.08	...	28% ad val.	27% ad val.	22% ad val.	22% ad val.	22% ad val.
661.09	...	29% ad val.	28% ad val.	23% ad val.	23% ad val.	23% ad val.
661.10	...	30% ad val.	29% ad val.	24% ad val.	24% ad val.	24% ad val.
661.11	...	31% ad val.	30% ad val.	25% ad val.	25% ad val.	25% ad val.
661.12	...	32% ad val.	31% ad val.	26% ad val.	26% ad val.	26% ad val.
661.13	...	33% ad val.	32% ad val.	27% ad val.	27% ad val.	27% ad val.
661.14	...	34% ad val.	33% ad val.	28% ad val.	28% ad val.	28% ad val.
661.15	...	35% ad val.	34% ad val.	29% ad val.	29% ad val.	29% ad val.
661.16	...	36% ad val.	35% ad val.	30% ad val.	30% ad val.	30% ad val.
661.17	...	37% ad val.	36% ad val.	31% ad val.	31% ad val.	31% ad val.
661.18	...	38% ad val.	37% ad val.	32% ad val.	32% ad val.	32% ad val.
661.19	...	39% ad val.	38% ad val.	33% ad val.	33% ad val.	33% ad val.
661.20	...	40% ad val.	39% ad val.	34% ad val.	34% ad val.	34% ad val.
661.21	...	41% ad val.	40% ad val.	35% ad val.	35% ad val.	35% ad val.
661.22	...	42% ad val.	41% ad val.	36% ad val.	36% ad val.	36% ad val.
661.23	...	43% ad val.	42% ad val.	37% ad val.	37% ad val.	37% ad val.
661.24	...	44% ad val.	43% ad val.	38% ad val.	38% ad val.	38% ad val.
661.25	...	45% ad val.	44% ad val.	39% ad val.	39% ad val.	39% ad val.
661.26	...	46% ad val.	45% ad val.	40% ad val.	40% ad val.	40% ad val.
661.27	...	47% ad val.	46% ad val.	41% ad val.	41% ad val.	41% ad val.
661.28	...	48% ad val.	47% ad val.	42% ad val.	42% ad val.	42% ad val.
661.29	...	49% ad val.	48% ad val.	43% ad val.	43% ad val.	43% ad val.
661.30	...	50% ad val.	49% ad val.	44% ad val.	44% ad val.	44% ad val.
661.31	...	51% ad val.	50% ad val.	45% ad val.	45% ad val.	45% ad val.
661.32	...	52% ad val.	51% ad val.	46% ad val.	46% ad val.	46% ad val.
661.33	...	53% ad val.	52% ad val.	47% ad val.	47% ad val.	47% ad val.
661.34	...	54% ad val.	53% ad val.	48% ad val.	48% ad val.	48% ad val.
661.35	...	55% ad val.	54% ad val.	49% ad val.	49% ad val.	49% ad val.
661.36	...	56% ad val.	55% ad val.	50% ad val.	50% ad val.	50% ad val.
661.37	...	57% ad val.	56% ad val.	51% ad val.	51% ad val.	51% ad val.
661.38	...	58% ad val.	57% ad val.	52% ad val.	52% ad val.	52% ad val.
661.39	...	59% ad val.	58% ad val.	53% ad val.	53% ad val.	53% ad val.
661.40	...	60% ad val.	59% ad val.	54% ad val.	54% ad val.	54% ad val.
661.41	...	61% ad val.	60% ad val.	55% ad val.	55% ad val.	55% ad val.
661.42	...	62% ad val.	61% ad val.	56% ad val.	56% ad val.	56% ad val.
661.43	...	63% ad val.	62% ad val.	57% ad val.	57% ad val.	57% ad val.
661.44	...	64% ad val.	63% ad val.	58% ad val.	58% ad val.	58% ad val.
661.45	...	65% ad val.	64% ad val.	59% ad val.	59% ad val.	59% ad val.
661.46	...	66% ad val.	65% ad val.	60% ad val.	60% ad val.	60% ad val.
661.47	...	67% ad val.	66% ad val.	61% ad val.	61% ad val.	61% ad val.
661.48	...	68% ad val.	67% ad val.	62% ad val.	62% ad val.	62% ad val.
661.49	...	69% ad val.	68% ad val.	63% ad val.	63% ad val.	63% ad val.
661.50	...	70% ad val.	69% ad val.	64% ad val.	64% ad val.	64% ad val.
661.51	...	71% ad val.	70% ad val.	65% ad val.	65% ad val.	65% ad val.
661.52	...	72% ad val.	71% ad val.	66% ad val.	66% ad val.	66% ad val.
661.53	...	73% ad val.	72% ad val.	67% ad val.	67% ad val.	67% ad val.
661.54	...	74% ad val.	73% ad val.	68% ad val.	68% ad val.	68% ad val.
661.55	...	75% ad val.	74% ad val.	69% ad val.	69% ad val.	69% ad val.
661.56	...	76% ad val.	75% ad val.	70% ad val.	70% ad val.	70% ad val.
661.57	...	77% ad val.	76% ad val.	71% ad val.	71% ad val.	71% ad val.
661.58	...	78% ad val.	77% ad val.	72% ad val.	72% ad val.	72% ad val.
661.59	...	79% ad val.	78% ad val.	73% ad val.	73% ad val.	73% ad val.
661.60	...	80% ad val.	79% ad val.	74% ad val.	74% ad val.	74% ad val.
661.61	...	81% ad val.	80% ad val.	75% ad val.	75% ad val.	75% ad val.
661.62	...	82% ad val.	81% ad val.	76% ad val.	76% ad val.	76% ad val.
661.63	...	83% ad val.	82% ad val.	77% ad val.	77% ad val.	77% ad val.
661.64	...	84% ad val.	83% ad val.	78% ad val.	78% ad val.	78% ad val.
661.65	...	85% ad val.	84% ad val.	79% ad val.	79% ad val.	79% ad val.
661.66	...	86% ad val.	85% ad val.	80% ad val.	80% ad val.	80% ad val.
661.67	...	87% ad val.	86% ad val.	81% ad val.	81% ad val.	81% ad val.
661.68	...	88% ad val.	87% ad val.	82% ad val.	82% ad val.	82% ad val.
661.69	...	89% ad val.	88% ad val.	83% ad val.	83% ad val.	83% ad val.
661.70	...	90% ad val.	89% ad val.	84% ad val.	84% ad val.	84% ad val.
661.71	...	91% ad val.	90% ad val.	85% ad val.	85% ad val.	85% ad val.
661.72	...	92% ad val.	91% ad val.	86% ad val.	86% ad val.	86% ad val.
661.73	...	93% ad val.	92% ad val.	87% ad val.	87% ad val.	87% ad val.
661.74	...	94% ad val.	93% ad val.	88% ad val.	88% ad val.	88% ad val.
661.75	...	95% ad val.	94% ad val.	89% ad val.	89% ad val.	89% ad val.
661.76	...	96% ad val.	95% ad val.	90% ad val.	90% ad val.	90% ad val.
661.77	...	97% ad val.	96% ad val.	91% ad val.	91% ad val.	91% ad val.
661.78	...	98% ad val.	97% ad val.	92% ad val.	92% ad val.	92% ad val.
661.79	...	99% ad val.	98% ad val.	93% ad val.	93% ad val.	93% ad val.
661.80	...	100% ad val.	99% ad val.	94% ad val.	94% ad val.	94% ad val.

Other Amendments and Modifications

PROVISION

Part 4--Language "other than card clothing provided for in headnote 1 items 670.52 and 670.54" added. Pub. L. 89-241, (iii) Secs. 2(c), 46, Oct. 7, 1965, 79 Stat. 933, 943, effective date Dec. 7, 1965.

Part 4--headnote 1(iv) ("jacquard cards") deleted and headnotes notes 1(v) and 1(vi) redesignated as headnotes 1(iv), 1(iv) and 1(v), respectively. Pub. L. 89-241, 1(v), Secs. 2(a), 50(a), Oct. 7, 1965, 79 Stat. 933, and 1(vi) 943, effective date Dec. 7, 1965.

660.40--Language "or in agricultural or horticultural machinery or implements provided for in item 660.00" added to article description. Pub. L. 89-241, Secs. 2(a), 49(c), Oct. 7, 1965, 79 Stat. 933, 943, effective date Dec. 7, 1965.

660.43--Items 660.43, 660.45, 660.47, 660.51, 660.53, 660.55, 660.45 and 660.86 added. Pub. L. 89-283, Secs. 401(a), 660.47 405(d), Oct. 21, 1965, 79 Stat. 1021, 1025; entered into force Dec. 20, 1965, by Pres. Proc. 3682, Oct. 21, 1965, 3 CFR, 1965 Supp., p. 68; effective with respect to articles entered on and after Jan. 18, 1965.

PROVISION

660.90--Item 660.90 (column 1 rate--12% ad val.; column 2 rate--35% ad val.) deleted and items 660.92 and 660.94 660.94 and heading immediately preceding item 660.92 added in lieu thereof. Pub. L. 89-241, Secs. 2(a), 36(c), Oct. 7, 1965, 79 Stat. 933, 940, effective date Dec. 7, 1965.

660.93--Items 660.93 and 660.95 added. Pub. L. 89-283, 660.95 Secs. 401(a), 405(d), Oct. 21, 1965, 79 Stat. 1021, 1025; entered into force Dec. 20, 1965, by Pres. Proc. 3682, Oct. 21, 1965, 3 CFR, 1965 Supp., p. 68; effective with respect to articles entered on and after Jan. 18, 1965.

661.09--Item 661.10 (column 1 rate--14% ad val.; column 2 rate--35% ad val.) deleted and item 661.09 and heading immediately preceding item 661.09 added in lieu thereof. Pub. L. 89-241, Secs. 2(a), 47, Oct. 7, 1965, 79 Stat. 932, 943, effective date Dec. 7, 1965.

TARIFF SCHEDULES OF THE UNITED STATES ANNOTATED (1969)

STAGED RATES AND HISTORICAL NOTES

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Other Amendments and Modifications--(con.)

PROVISION

661.11--Items 661.11, 661.13, 661.16, 661.21, and 661.36 added.
661.13 Pub. L. 89-283, Secs. 401(a), 405(d), Oct. 21, 1965,
661.16 79 Stat. 1021, 1025; entered into force Dec. 20,
661.21 1965, by Pres. Proc. 3682, Oct. 21, 1965, 3 CFR, 1965
661.36 Supp., p. 68; effective with respect to articles
entered on and after Jan. 18, 1965.

661.65--Language "shoe machinery," added to heading immediately
661.70 preceding item 661.65. Pub. L. 89-241, Secs. 2(a),
45(b), Oct. 7, 1965, 79 Stat. 933, 942, effective date
Dec. 7, 1965.

661.92--Item 661.95 (column 1 rate--11.5% ad val.; column 2
661.95 rate--35% ad val.) deleted and new items 661.92 and
661.95 and heading immediately preceding item 661.92
added in lieu thereof. Pub. L. 89-241, Secs. 2(a),
48(a), Oct. 7, 1965, 79 Stat. 933, 943, effective date
Dec. 7, 1965.

661.93--Items 661.93 and 661.96 added. Pub. L. 89-283,
661.96 Secs. 401(a), 405(d), Oct. 21, 1965, 79 Stat. 1021,
1025; entered into force Dec. 20, 1965, by Pres. Proc.
3682, Oct. 21, 1965, 3 CFR, 1965 Supp., p. 68; effective
with respect to articles entered on and after
Jan. 18, 1965.

662.10--Column 1 rate of duty of 9% ad val. reduced to 8% ad val.
on Jan. 1, 1964. General headnote 3(g).

662.18--Item 662.20 (column 1 rate--10% ad val.; column 2 rate--
662.20 35% ad val.) deleted and new items 662.18 and 662.20
and heading immediately preceding item 662.18 added
in lieu thereof. Pub. L. 90-638, Secs. 1(a), (b),
Oct. 24, 1968, 82 Stat. 1359, effective date
Oct. 25, 1968.

662.36--Item 662.36 added. Pub. L. 89-283, Secs. 401(a), 405(d),
Oct. 21, 1965, 79 Stat. 1021, 1025; entered into force
Dec. 20, 1965, by Pres. Proc. 3682, Oct. 21, 1965,
3 CFR, 1965 Supp., p. 68; effective with respect to
articles entered on and after Jan. 18, 1965.

662.45--Language ", self-contained, having a capacity over 5
gallons," deleted from article description and
language "(except sprayers, self-contained, having
a capacity not over 5 gallons)" inserted in lieu
thereof. Pub. L. 89-241, Secs. 2(a), 10(b), Oct. 7,
1965, 79 Stat. 933, 935, effective date Dec. 7, 1965.

662.51--Items 662.51 and 664.11 added. Pub. L. 89-283, Secs.
664.11 401(a), 405(d), Oct. 21, 1965, 79 Stat. 1021, 1025;
entered into force Dec. 20, 1965, by Pres. Proc. 3682,
Oct. 21, 1965, 3 CFR, 1965 Supp., p. 68; effective
with respect to articles entered on and after Jan. 18,
1965.

Subpt C--Language "(except item 688.40)" added. Pub. L. 89-241,
hdntc 1 Secs. 2(a), 49(a), Oct. 7, 1965, 79 Stat. 933,
943, effective date Dec. 7, 1965.

666.00--Language "milkng machines, on-farm equipment for the
handling or drying of agricultural or horticultural
products," added to article description. Pub. L.
89-241, Secs. 2(a), 49(b), Oct. 7, 1965, 79 Stat.
933, 943, effective date Dec. 7, 1965.

666.01--Language ", and parts thereof (except needles)" added
to article description. Pub. L. 89-241, Secs. 2(a),
49(c), Oct. 7, 1965, 79 Stat. 933, 943, effective date
Dec. 7, 1965.

666.02--Item 666.02 added. Pub. L. 89-283, Secs. 401(a),
405(d), Oct. 21, 1965, 79 Stat. 1021, 1025; entered
into force Dec. 20, 1965, by Pres. Proc. 3682, Oct. 21,
1965, 3 CFR, 1965 Supp., p. 68; effective with respect
to articles entered on and after Jan. 18, 1965.

666.03--Item 666.03 (column 1 rate--11.5% ad val.; column 2
666.03 rate--35% ad val.) deleted and new items 666.03 and
666.04 and heading immediately preceding item
666.03 added in lieu thereof. Pub. L. 89-241,
Secs. 2(a), 49(c), Oct. 7, 1965, 79 Stat. 933,
943, effective date Dec. 7, 1965.

666.05--Language ", and parts thereof" added to heading im-
666.05 mediately preceding item 666.05. Pub. L. 89-241,
Secs. 2(a), 49(c), Oct. 7, 1965, 79 Stat. 933,
943, effective date Dec. 7, 1965.

666.06--Items 666.06, 666.07, 666.08, and 666.09 added.
666.06 Pub. L. 89-241, Secs. 401(a), 405(d), Oct. 21,
666.07 1965, 79 Stat. 1021, 1025; entered into force
666.08 Dec. 20, 1965, by Pres. Proc. 3682, Oct. 21, 1965,
666.09 3 CFR, 1965 Supp., p. 68; effective with respect
to articles entered on and after Jan. 18, 1965.

666.10--Item 666.10 (column 1 rate--3.4% ad val.; column 2
666.10 rate--10% ad val.) deleted and new items 666.10 and 666.11 and head-
ing immediately preceding item 666.10 added in
lieu thereof. Pub. L. 89-241, Secs. 2(a), 36(b),
Oct. 7, 1965, 79 Stat. 933, 943, effective date
Dec. 7, 1965.

666.12--Item 666.12 redesignated as item 666.13 and new item
666.12 added in lieu thereof. Pub. L. 89-241, Secs.
666.13 401(a), 405(d), Oct. 21, 1965, 79 Stat. 1021, 1025;
entered into force Dec. 20, 1965, by Pres. Proc.
3682, Oct. 21, 1965, 3 CFR, 1965 Supp., p. 68; ef-
fective with respect to articles entered on and
after Jan. 18, 1965.

666.14--Language "all the foregoing and parts thereof (ex-
666.14 cept parts of motor vehicles, aircraft, and
666.15 aircraft)" inserted from heading immediately preceding item
666.14 and language "all the foregoing (except
666.16 parts of agricultural, horticultural, machinery
666.17 and implements provided for in item 666.06 and
666.18 parts of motor vehicles, aircraft, and bicycles)
and parts thereof" inserted in lieu thereof.
Pub. L. 89-241, Secs. 2(a), 49(d), Oct. 7, 1965,
79 Stat. 933, 943, effective date Dec. 7, 1965.

666.19--Language "multiple and variable ratio speed changers
and ratio of which is selected by manual manipu-
666.19 lation" added to article description. Pub. L.
89-241, Secs. 2(a), 49(e), Oct. 7, 1965, 79 Stat. 933,
943, effective date Dec. 7, 1965.

666.20--New item 666.20 added. Pub. L. 89-241, Secs. 401(a),
405(d), Oct. 21, 1965, 79 Stat. 1021, 1025; entered
into force Dec. 20, 1965, by Pres. Proc. 3682,
Oct. 21, 1965, 3 CFR, 1965 Supp., p. 68; effective
with respect to articles entered on and after
Jan. 18, 1965.

666.21--Added as original item 666.21. Pub. L. 89-241, Secs.
666.21 401(a), 405(d), Oct. 7, 1965, 79 Stat. 933, 943; ef-
fective date Dec. 7, 1965.
Redesignated as new item 666.22. Pub. L. 89-241,
Secs. 401(a), 405(d), Oct. 7, 1965, 79 Stat.
933, 943; entered into force Dec. 20, 1965, by
Pres. Proc. 3682, Oct. 21, 1965, 3 CFR, 1965 Supp.,
p. 68; effective with respect to articles entered
on and after Jan. 18, 1965.

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Other Amendments and Modifications--(cont.)

PROVISION

660.72--Added as item 660.72, Pub. L. 89-211, Sec. 701, 10 Stat. Dec. 7, 1965, 78 Stat. 241, 242, effective date Jan. 1, 1966.
Redesignated as item 660.70, Pub. L. 89-223, Secs. 401(a), 401(b), Oct. 21, 1965, 79 Stat. 1111, 1025, entered into force Dec. 20, 1965, by Pres. Proc. 3487, Oct. 21, 1965, 3 CFR, 1965 Supp., p. 64, effective with respect to articles entered on and after Jan. 18, 1965.

PROVISION

660.70--Original item 660.60 redesignated as item 660.60, Pub. L. 89-223, Secs. 401(a), 401(b), Oct. 21, 1965, 79 Stat. 1021, 1025, entered into force Dec. 20, 1965, by Pres. Proc. 3487, Oct. 21, 1965, 3 CFR, 1965 Supp., p. 61, effective with respect to articles entered on and after Jan. 18, 1965.

660.71--Item 660.71 added, Pub. L. 89-223, Secs. 401(a), 401(b), Oct. 21, 1965, 79 Stat. 1021, 1025, entered into force Dec. 20, 1965, by Pres. Proc. 3487, Oct. 21, 1965, 3 CFR, 1965 Supp., p. 64, effective with respect to articles entered on and after Jan. 18, 1965.

Statistical Notes

PROVISION	Effective date	PROVISION	Effective date
660.40--See Other Amendments and Modifications 00--Piston-type engines to be installed in agricultural or horticultural machinery transferred from 660.4200 and 660.4450...	Dec. 7, 1965	660.54-- 00--Articles subject to AFTA transferred to 660.5600.....	Dec. 20, 1965
660.43--See Other Amendments and Modifications 00--Estab. (transferred from 660.4200pt).....	Dec. 20, 1965	660.55--See Other Amendments and Modifications 00--Estab. (transferred from 660.5400pt).....	Dec. 20, 1965
660.44-- 10--Disc. (transferred to 660.4415).....	Jan. 1, 1966	660.56--See Other Amendments and Modifications 00--Estab. (transferred from 660.8500pt).....	Dec. 20, 1965
15--Estab. (transferred from 660.4410 & 20)....	do	660.59--See Other Amendments and Modifications 20--Disc. (transferred to 660.9440).....	Dec. 7, 1965
20--Disc. (transferred to 660.4415).....	do	40--Disc. (transferred to 660.9420).....	do
30--Articles subject to Automotive Products Trade Act (APTA) transferred to 660.4500.....	Dec. 20, 1965	60--Disc. (transferred to 660.9200 & 660.9440).....	do
660.45--See Other Amendments and Modifications 00--Estab. (transferred from 660.4430pt).....	Dec. 20, 1965	80--Disc. (transferred to 660.9200, 660.9460 & 660.7000).....	do
660.46-- 60--Articles subject to AFTA transferred to 660.4700.....	Dec. 20, 1965	660.92--See Other Amendments and Modifications 00--Estab. (transferred from 660.9080pt & 80pt).....	Dec. 7, 1965
660.47--See Other Amendments and Modifications 00--Estab. (transferred from 660.4680pt).....	Dec. 20, 1965	Articles subject to AFTA transferred to 660.8500.....	Dec. 20, 1965
660.50-- 00--Unit of quantity changed from "x" to "lb.".....	Dec. 7, 1965	660.93--See Other Amendments and Modifications 00--Estab. (transferred from 660.9200pt).....	Dec. 20, 1965
Articles subject to AFTA transferred to 660.5100.....	Dec. 20, 1965	660.94--See Other Amendments and Modifications 20--Estab. (transferred from 660.9040pt).....	Dec. 7, 1965
660.51--See Other Amendments and Modifications 00--Estab. (transferred from 660.5000pt).....	Dec. 20, 1965	Articles subject to AFTA transferred to 660.9500.....	Dec. 20, 1965
660.52-- 00--Certain articles transferred to 660.7000.....	Dec. 20, 1965	40--Estab. (transferred from 660.8920pt & 80pt).....	Dec. 7, 1965
Articles subject to AFTA transferred to 660.5300.....	do	Articles subject to AFTA transferred to 660.9600.....	Dec. 20, 1965
660.53--See Other Amendments and Modifications 00--Estab. (transferred from 660.5200pt).....	Dec. 20, 1965	60--Estab. (transferred from 660.9080pt).....	Dec. 7, 1965
		Articles subject to AFTA transferred to 660.9500.....	Dec. 20, 1965
		660.96--See Other Amendments and Modifications 00--Estab. (transferred from 660.9420pt, 40pt & 60pt).....	Dec. 20, 1965
		661.09--See Other Amendments and Modifications 00--Estab. (transferred from 661.1000pt).....	Dec. 7, 1965

TARIFF SCHEDULES OF THE UNITED STATES ANNOTATED (1969)

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Notes p. 7
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Statistical Notes--(con.)

PROVISION	Effective date	PROVISION	Effective date
661.10--See Other Amendments and Modifications		662.50--	
00--Blowers for pipe organs transferred to		00--Estab. (transferred from 662.5020 & 40).....	Jan. 1, 1966
661.0900.....	Dec. 7, 1965	20--Disc. (transferred to 662.5000).....	do
Articles subject to APTA transferred to		40--Disc. do	do
661.1100.....	Dec. 20, 1965		
661.11--See Other Amendments and Modifications		662.51--See Other Amendments and Modifications	
00--Estab. (transferred from 661.1000pt).....	Dec. 20, 1965	00--Estab. (transferred from 662.5040pt).....	Dec. 20, 1965
661.13--See Other Amendments and Modifications		664.05--	
00--Estab. (transferred from 661.1220pt,		40--Disc. (transferred to 664.0565).....	Jan. 1, 1966
40pt & 60pt).....	Dec. 20, 1965	60--Disc. do	do
661.16--See Other Amendments and Modifications		65--Estab. (transferred from 664.0540 & 60)....	do
00--Estab. (transferred from 661.1500pt).....	Dec. 20, 1965		
661.20--		664.10--	
20--Articles subject to APTA transferred to		35--Estab. (transferred from 664.1040pt).....	Jan. 1, 1966
661.2100.....	Dec. 20, 1965	40--Disc. (transferred to 664.1035 & 45).....	do
40-- do do	do	45--Estab. (transferred from 664.1040pt).....	do
661.21--See Other Amendments and Modifications		664.11--See Other Amendments and Modifications	
00--Estab. (transferred from 661.2020pt &		00--Estab. (transferred from 664.1040pt &	
40pt).....	Dec. 20, 1965	50pt).....	Dec. 20, 1965
661.35--		666.00--See Other Amendments and Modifications	
10--Disc. (transferred to 661.3525).....	Jan. 1, 1966		
20--Disc. do	do		
25--Estab. (transferred from 661.3510 & 20)....	do		
30--Disc. (transferred to 661.3545).....	do		
40--Disc. do	do		
45--Estab. (transferred from 661.3530 & 40)....	do		
661.36--See Other Amendments and Modifications			
00--Estab. (transferred from 661.3510pt-50pt).....	Dec. 20, 1965		
661.70--See Other Amendments and Modifications			
661.92--See Other Amendments and Modifications			
00--Estab. (transferred from 661.9500pt).....	Dec. 7, 1965		
661.93--See Other Amendments and Modifications			
00--Estab. (transferred from 661.9200pt).....	Dec. 20, 1965		
661.95--See Other Amendments and Modifications			
00--Cast-iron parts, not advanced, for			
filtering and purifying machinery			
transferred to 661.9200.....	Dec. 7, 1965		
661.96--See Other Amendments and Modifications			
00--Estab. (transferred from 661.9500pt).....	Dec. 20, 1965		
662.10--See Other Amendments and Modifications			
662.10--See Other Amendments and Modifications			
00--Estab. (transferred from 662.2020pt &			
70pt).....	Oct. 25, 1966		
662.20--See Other Amendments and Modifications			
20--Disc. (transferred to 662.1800 &			
662.2025).....	Oct. 25, 1966		
25--Estab. (transferred from 662.2020).....	do		
40--Disc. (transferred to 662.2070).....	Jan. 1, 1966		
60--Disc. do	do		
65--Estab. (transferred from 662.2070).....	Oct. 25, 1966		
70--Estab. (transferred from 662.2040 & 60)....	Jan. 1, 1966		
Disc. (transferred to 662.1800 &			
662.2065).....	Oct. 25, 1966		
662.36--See Other Amendments and Modifications			
00--Estab. (transferred from 662.3500pt).....	Dec. 20, 1965		
662.45--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, 1968.

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, 1968

(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)

Summary title and page; TSUS item	All countries		First supplier		Second supplier		Third supplier	
	Amount in 1968	Per-cent change from 1967	Country	Value	Country	Value	Country	Value
Vapor-generating boilers and auxiliary equipment (p. 3)								
660.10	2,265	+16	Canada	1,101	Netherlands	498	Japan	308
660.15	138	-68	Canada	94	U. K.	16	W. Germany	16
Gas generators (p.13)								
660.20	1	-73	Canada	1	-	-	-	-
660.22	112	-29	Canada	70	W. Germany	24	Switzerland	17
Steam engines and turbines (p. 19)								
660.25	16	-93	W. Germany	14	U. K.	2	Spain	1/
660.30	12,389	+93	Japan	3,188	Switzerland	2,663	Norway	1,872
660.35	713	+15	France	399	Netherlands	189	Canada	92
Internal combustion engines (p. 31)								
660.40	30,792	+1	U. K.	27,705	W. Germany	2,759	Canada	321
660.42	21,296	+24	U. K.	11,321	W. Germany	7,053	Italy	1,105
660.43	121	+178	Canada	121	-	-	-	-
660.44	32,166	+21	W. Germany	17,611	Canada	6,487	U. K.	2,023
660.45	184,764	+61	Canada	184,764	-	-	-	-
660.46	50,049	+27	U. K.	24,376	Canada	20,518	Japan	3,407
660.47	-	2/	-	-	-	-	-	-
660.50	570	+46	W. Germany	291	Mexico	171	Canada	104
660.51	8,276	+51	Canada	8,276	-	-	-	-
660.52	66,786	+31	Canada	38,749	W. Germany	14,427	Japan	5,638
660.53	26,977	+43	Canada	26,977	-	-	-	-
660.54	72,444	+19	U. K.	32,282	Canada	26,923	Japan	4,156
660.55	229	+28	Canada	229	-	-	-	-
Water engines (p. 47)								
660.65	9	+852	W. Germany	9	-	-	-	-
660.70	3,839	-17	Japan	2,520	W. Germany	1,146	U. K.	67
Nonelectric engines and motors, not elsewhere enumerated (p. 59)								
660.75	38	+6,598	Sweden	35	W. Germany	2	Canada	1
660.80	149	+553	Japan	96	Switzerland	47	Belg. & Lux.	6
660.85	2,017	+32	U. K.	1,200	W. Germany	408	Canada	144
660.86	-	-	-	-	-	-	-	-
Pumps and compressors (p. 67)								
660.92	4,530	+14	W. Germany	2,162	Italy	1,410	U. K.	410
660.93	11	-46	Canada	11	-	-	-	-
660.94	15,407	+15	U. K.	4,238	Canada	3,861	W. Germany	3,395
660.95	4,507	+98	Canada	4,507	-	-	-	-
661.12	22,586	+12	Canada	6,458	W. Germany	4,043	U. K.	3,671
661.13	182	+553	Canada	182	-	-	-	-
661.15	5,311	+50	Japan	2,246	U. K.	809	W. Germany	710
661.16	133	+70	Canada	133	-	-	-	-
Fans and blowers (p. 81)								
661.09	83	+28	Switzerland	56	W. Germany	15	U. K.	11
661.10	2,996	+17	W. Germany	901	Canada	844	Japan	836
661.11	2,206	+226	Canada	2,206	-	-	-	-

See footnotes at end of table.

APPENDIX B

B-4

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, 1968

(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)

Summary title and page; TSUS item	All countries		First supplier		Second supplier		Third supplier	
	Amount in 1968	Per-cent change from 1967	Country	Value	Country	Value	Country	Value
Air conditioning and refrigerating equipment (p. 89)								
661.20	7,657	+113	Canada	6,284	U. K.	625	France	556
661.21	1,133	+41	Canada	1,133	-	-	-	-
661.35	35,903	+68	Italy	15,115	Sweden	9,777	U. K.	3,871
661.36	-	-	-	-	-	-	-	-
Furnace burners and nonelectric industrial furnaces and ovens (p. 101)								
661.25	529	+184	Canada	227	Japan	144	Sweden	82
661.30	1,115	-28	Canada	513	W. Germany	233	U. K.	209
Calendering and similar rolling machines (p. 111)								
661.40	78	+2,321	Italy	44	Canada	30	W. Germany	4
661.45	253	+23	U. K.	145	W. Germany	80	Japan	16
661.55	198	-7	W. Germany	75	Japan	44	Canada	43
Equipment for treating materials by changing temperature (p. 119)								
661.70	23,157	-19	W. Germany	6,678	Canada	5,511	U. K.	3,052
Centrifuges and filtering and purifying machinery (p. 127)								
661.75	-	-	-	-	-	-	-	-
661.80	7	-72	Sweden	7	-	-	-	-
661.85	694	+5	W. Germany	665	Italy	17	Canada	10
661.90	5,376	+8	W. Germany	2,677	Sweden	1,142	U. K.	636
661.92	235	-36	Canada	233	-	-	-	-
661.93	-	-	-	-	-	-	-	-
661.95	3,097	+70	W. Germany	1,147	Canada	684	U. K.	529
661.96	1	-19	Canada	1	-	-	-	-
Wrapping and packaging machinery, and related machines (p. 137)								
662.10	1,891	+2	W. Germany	640	U. K.	536	Italy	276
662.15	854	+24	Belg. & Lux.	737	Canada	77	France	19
662.18	-	2/	-	-	-	-	-	-
662.20	15,705	+21	W. Germany	5,799	Canada	3,423	U. K.	1,964
Weighing machinery (p. 147)								
662.25	11	-75	W. Germany	6	Japan	5	-	-
662.26	970	-4	W. Germany	422	Switzerland	166	U. K.	100
662.30	781	-31	W. Germany	309	Canada	152	Japan	135
Appliances for spraying or dispersing liquids, or powders, or granules (p. 159)								
662.35	85	+40	Japan	47	W. Germany	18	Hong Kong	12
662.36	1	3/	Canada	1	-	-	-	-
662.40	22	+63	France	13	U. K.	7	Sweden	1
662.45	1,083	+44	Canada	555	Netherlands	226	Denmark	148
662.50	3,406	+19	Canada	1,084	W. Germany	916	Japan	410
662.51	369	+208	Canada	369	-	-	-	-
Excavating, mining, and related machines (p. 169)								
664.05	34,901	+59	Canada	11,117	W. Germany	7,358	France	5,872
Elevators, conveyors, cranes, and related machinery (p. 179)								
664.10	55,417	+42	Canada	18,233	W. Germany	8,110	Sweden	5,996
664.11	139	+345	Canada	139	-	-	-	-

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, 1968

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)

Summary title and page; TSUS item	All countries		First supplier		Second supplier		Third supplier	
	Amount in 1968	Per-cent change from 1967	Country	Value	Country	Value	Country	Value
Agricultural and horticultural machinery (p. 189)								
666.00	190,330	-13	Canada	162,403	Belg.& Lux.	11,803	W. Germany	7,786
Lawnmowers (p. 199)								
666.10	765	+58	U. K.	519	Canada	211	W. Germany	17
Industrial machinery for preparing food or drink (p. 207)								
666.20	3,394	+96	W. Germany	1,933	Norway	796	Belg.& Lux.	246
666.25	14,441	+13	W. Germany	6,417	U. K.	1,201	Switzerland	990
Machines for making and processing pulp and paper (p. 217)								
668.00	3,568	-28	Japan	1,429	Norway	581	Canada	556
668.02	20,653	+18	W. Germany	7,008	Switzerland	5,734	Canada	1,866
668.04	830	+1	Canada	516	W. Germany	124	Sweden	100
668.06	5,483	-63	Canada	2,741	U. K.	654	Japan	634
668.07	3,535	+5	W. Germany	801	Switzerland	581	Canada	525
Bookbinding machinery (p. 227)								
668.10	8,292	+94	W. Germany	2,911	Switzerland	2,665	U. K.	1,645
Duplicating machines (p. 235)								
668.2005	2,640	-6	U. K.	1,847	Denmark	670	W. Germany	113
668.2010	312	-5	Denmark	204	Japan	64	W. Germany	37
668.2015	1,192	+549	U. K.	524	W. Germany	272	Switzerland	201
668.2020	188	+6	W. Germany	109	Japan	43	U. K.	25
668.5040	1,243	+27	U. K.	516	Japan	261	Denmark	164
Linotype and typesetting machines (p. 247)								
668.25	5,996	+10	U. K.	2,212	W. Germany	1,322	France	1,126
Print blocks and print rollers (p. 257)								
668.32	-	-	-	-	-	-	-	-
668.34	108	+27	Japan	53	Netherlands	16	Canada	14
Printing types (p. 263)								
668.36	785	-15	W. Germany	376	France	91	Switzerland	76
Printing plates (p. 267)								
668.38	688	-18	Canada	297	U. K.	168	Austria	96
Printing machinery other than for textiles, not elsewhere enumerated (p. 275)								
668.2025	6,203	+24	W. Germany	6,110	Switzerland	38	Spain	17
668.2030	855	-44	U. K.	323	W. Germany	291	Italy	226
668.2035	12,324	+4	W. Germany	7,279	Sweden	2,053	Italy	1,042
668.2040	9,710	+60	W. Germany	3,624	Italy	1,906	Canada	1,395
668.2045	5,967	+67	W. Germany	2,193	U. K.	1,396	Italy	1,352
668.2050	2,698	+7	W. Germany	960	U. K.	530	Switzerland	250
668.5060	11,071	+40	Sweden	5,455	W. Germany	2,280	U. K.	1,031
668.5080	1,802	+50	W. Germany	786	Canada	423	U. K.	303

1/ Less than \$500.

2/ No imports in 1968.

3/ No imports in 1967.

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

OTHER AVAILABLE VOLUMES OF THE SUMMARIES SERIES

<i>Schedule</i>	<i>Volume</i>	<i>Title</i>
1	1	Animals and Meats
1	2	Fish: Fresh, Chilled, Frozen, or Cured
1	3	Fish Products, Shellfish, and Shellfish Products
1	4	Dairy Products and Birds' Eggs
1	5	Live Plants and Seeds
1	6	Cereal Grains, Malts, Starches, and Animal Feeds
1	7	Vegetables and Edible Nuts
1	8	Edible Fruit
1	9	Sugar, Cocoa, Confectionery, Coffee, Tea and Spices
1	11	Tobacco and Tobacco Products
1	12	Animal and Vegetable Fats and Oils
1	13	Hides, Skins, Leather, Feathers, and Miscellaneous Articles of Animal Origin
1	14	Edible Preparations, Natural Resins, and Miscellaneous Articles of Vegetable Origin
2	1	Wood and Related Products I
2	2	Wood and Related Products II
2	3	Paper and Related Products I
2	4	Paper and Related Products II
3	2	Fibers, Yarns, Waste, and Intermediate Products of Silk, Manmade Fiber, Metalized, Paper, Certain Hair, and Yarns, N. S. P. F.
3	4	Felts, Batting, Nonwoven Fabrics, Fish Nets, Machinery Belts and Clothing, Hose, Coated Fabrics, and Other Fabrics for Special Purposes
3	5	Textile Furnishings and Apparel
3	6	Cordage, Braids, Elastic Yarns and Fabrics, Trimmings, Packing, Polishing Cloths, Sacks, Labels, Lacings, Rags, and Other Miscellaneous Textile Products
4	2	Inorganic Chemicals I
4	3	Inorganic Chemicals II
4	4	Inorganic Chemicals III
4	6	Organic Chemicals II
4	9	Glue, Gelatin, Aromatic Substances, Toilet Preparations, Surface-Active Agents, Soaps, Dyes, and Tannins
4	10	Pigments, Inks, Paints, and Related Products
4	12	Fatty Substances, Waxes, and Miscellaneous Chemical Products