

71st Congress }  
1st Session }

SENATE COMMITTEE PRINT

# WINDOW GLASS

---

REPORT  
OF  
THE UNITED STATES TARIFF COMMISSION  
TO  
THE PRESIDENT OF THE UNITED STATES

---

DIFFERENCES IN COSTS OF PRODUCTION OF WINDOW GLASS  
IN THE UNITED STATES AND IN THE PRINCIPAL COM-  
PETING COUNTRY, AS ASCERTAINED PURSUANT  
TO THE PROVISIONS OF SECTION 315 OF  
TITLE III OF THE TARIFF ACT OF 1922



Printed for the use of the Committee on Finance

UNITED STATES  
GOVERNMENT PRINTING OFFICE  
WASHINGTON : 1929

## COMMITTEE ON FINANCE

### UNITED STATES SENATE

REED SMOOT, Utah, *Chairman*

JAMES E. WATSON, Indiana.

DAVID A. REED, Pennsylvania.

SAMUEL M. SHORTRIDGE, California.

WALTER E. EDGE, New Jersey.

JAMES COUZENS, Michigan.

FRANK L. ORENE, Vermont.

CHARLES S. DENEEN, Illinois.

HENRY W. KEYES, New Hampshire.

HIRAM BINGHAM, Connecticut.

FREDERIC M. SACKETT, Kentucky.

FURNIFOLD McL. SIMMONS, North Carolina.

PAT HARRISON, Mississippi.

WILLIAM H. KING, Utah.

WALTER F. GEORGE, Georgia.

DAVID I. WALSH, Massachusetts.

ALBEN W. BARKLEY, Kentucky.

ELMER THOMAS, Oklahoma.

TOM CONNALLY, Texas.

ISAAC M. STEWART, *Clerk*

# CONTENTS

## I. TEXT

	Page
Introduction:	
Reference to files .....	1
Rates of duty .....	1
History of the investigation .....	2
Description and uses of window glass .....	2
Information obtained in the commission's investigation:	
Processes of manufacture—	
Cylinder glass—	
The hand-blown cylinder process .....	3
The machine-blown cylinder process .....	4
Sheet glass .....	4
The Libbey-Owens process .....	5
The Fourcault process .....	5
The window-glass industry of the United States .....	5
The window-glass industry of Europe—	
Belgium .....	8
Organization of the Comptoir Fourcault .....	10
Patents and royalties (Fourcault process) .....	11
Trend in methods of production .....	13
United States foreign trade in window glass—	
Imports .....	13
Principal competing country .....	15
Exports .....	17
Domestic consumption .....	17
Prices—	
United States .....	17
Belgium .....	19
Costs of production—	
Scope of the investigation and cost period in the United States .....	21
Cost periods of individual domestic companies .....	21
Scope of the investigation and cost period in Belgium .....	21
Conversion of Belgian francs into United States dollars .....	21
Elements of costs—United States and Belgium .....	22
Treatment of costs—United States and Belgium .....	23
Wage rates and relative productivity in the United States and Belgium .....	25
Raw-material prices .....	26
Costs—	
United States .....	26
Belgium .....	28
Costs f. o. b. plant, United States and Belgium .....	28
Marketing—	
Methods of selling Belgian window glass .....	29
Methods of selling domestic product .....	30
Localization of markets and competition .....	30
Transportation—	
Charges on imported window glass from plants in Belgium .....	33
Charges borne by domestic window glass .....	35
Final cost comparisons .....	39
Summary:	
Cost including transportation .....	40
Application of cost difference to seven rates of duty .....	40
Rates of duty necessary to equalize cost difference .....	41

## II. TABLES

No.		
1.—	Window glass: Total production in the United States, 1914-1927 .....	7
2.—	Window glass: Production by processes and thicknesses in the United States, 1926 and 1927 .....	7
3.—	Window glass: Production in Belgium for specified years .....	10
4.—	Window glass: Belgian exports to principal countries for specified years .....	12

No.	Page
5.—Window glass: United States imports for consumption, 1910-1928.....	14
6.—Window glass: Imports for consumption, by tariff classification for specified years.....	14
7.—Window glass: Imports for consumption, by tariff classification, according to weight for 1927 and 1928.....	15
8.—Window glass: United States general imports by countries, 1924-1928.....	16
9.—Window glass: United States production, imports, exports, and consumption, together with the relation of imports to domestic consumption for specified years, 1914-1928.....	17
10.—Window glass: United States wholesale prices (f. o. b. plant and exclusive of boxing charges) for single and double strength, A and B quality, of the 25 unit inches bracket, 1913-1927.....	18
11.—Window glass: United States wholesale prices (f. o. b. plant) for all sizes in single and double strength, A and B quality, 1926.....	18
12.—Window glass: Belgian, wholesale prices f. o. b. Antwerp quoted for export to the United States, for various sizes in single and double strength, A and B qualities, 1926.....	19
13.—Window glass: United States and Belgian prices compared, with existing specific and equivalent ad valorem rates of duty, by specified sizes, single strength, B (third) quality, 1926.....	20
14.—Window glass: United States and Belgian prices compared, with existing specific and equivalent ad valorem rates of duty, by specified sizes, double strength, and B (third) quality, 1926.....	20
15.—Monthly average exchange rates for Belgian francs with annual averages for fiscal years and calendar years, 1925-1927.....	22
16.—Window glass: Comparison of production for companies investigated in the United States and Belgium, by strengths, together with the equivalent production in single-strength boxes and in pounds.....	24
17.—Window glass: United States and Belgium. Comparison of production per man-day, 1926-27.....	26
18.—Window glass: United States and Belgium. Comparison of raw material delivered prices, 1926.....	26
19.—Window glass: Weighted average cost of production in United States, by processes of manufacture, for the year 1926.....	27
20.—Window glass: Weighted average cost of production in United States according to geographical location of plants for the year 1926.....	27
21.—Window glass: Weighted average cost of production in Belgium for 1926 for plants grouped according to process of manufacture in francs and cents per pound.....	28
22.—Window glass: United States and Belgium. Comparison of the weighted average costs of production per pound by items of expense, 1926.....	28
23.—Window glass: United States and Belgium. Comparison of the weighted average costs of production per pound for plants using the sheet-drawing process, 1926.....	29
24.—Window glass: Distribution of the domestic product from the plants collectively to the leading markets in the United States, 1926.....	32
25.—Window glass: Imports from Belgium, by principal ports of entry of the United States, grouped geographically, 1926.....	33
26.—Window glass: Transportation and other charges from Antwerp to the principal seaboard ports of entry in the United States, 1926.....	34
27.—Window glass: Freight rates from Antwerp and from principal American ports to certain interior centers of consumption in the United States, 1926.....	34
28.—Window glass: Freight rates from the various plants to certain seaboard ports and Chicago, 1926.....	36
29.—Window glass: United States: Movements and transportation charges for the domestic product from each producing district to principal markets, 1926.....	37
30.—Window glass: Comparison of United States and Belgian costs f. o. b. plants, including imputed interest and transportation costs from plants in the United States and Belgium for the year 1926.....	40

## III. CHARTS

No.	Page
1.—Window glass: Location of United States plants, 1926.....	8
2.—Window glass: Location of Belgian plants, 1926.....	9
3.—Distribution of domestic window glass, by States, 1926.....	31

# WINDOW GLASS

UNITED STATES TARIFF COMMISSION,  
Washington, March 19, 1929.

To the PRESIDENT:

The United States Tariff Commission respectfully submits the following report on the differences in costs of production, and other advantages and disadvantages in competition, of window glass in the United States and in the principal competing country for the purposes of section 315 of Title III of the tariff act of 1922.

## INTRODUCTION

*Reference to files.*—The documentary and statistical material upon which this report is based is in the files of the commission and available to the President. It comprises the original cost schedules and other basic data, the papers and reports on different stages of the investigation, and a transcript of the public hearing. Included in the basic material are matters of a confidential nature, the disclosure of which is forbidden by section 708 of the revenue act of 1916, the pertinent provisions of which are as follows:

SEC. 708. It shall be unlawful for any member of the United States Tariff Commission, or for any employee, agent, or clerk of said commission, or any other officer or employee of the United States, to divulge, or to make known in any manner whatever not provided for by law, to any person, the trade secrets or processes, of any person, firm, copartnership, corporation, or association embraced in any examination or investigation conducted by said commission, or by order of said commission, or by order of any member thereof.

*Rates of duty.*—Cylinder, crown, and sheet glass (mainly common window glass) unpolished, has been dutiable under the last three general tariff acts at the rates shown in the following table.

[Cents per pound]

Cylinder, crown, and sheet glass (common window glass) unpolished	Act of 1922 (par. 219)	Act of 1913 (par. 85)	Act of 1907 (par. 92)
Not exceeding 150 square inches	1½	1½	1½
Valued not more than 1½ cents per pound			1½
Do			1½
Above 150, and not exceeding 384 square inches	1¾	1	1¾
Valued not more than 1¾ cents per pound			1¾
Do			1¾
Above 384 and not exceeding 720 square inches	1¾	1½	2¼
Valued not more than 2¼ cents per pound			2¼
Do			2¼
Above 720 and not exceeding 864 square inches	1¾	1½	2¼
Above 864 and not exceeding 1,200 square inches	2	1½	3¼
Above 1,200 and not exceeding 2,400 square inches	2¼	1¾	3¾
Above 2,400 square inches	2½	2	4¼

<sup>1</sup> *Provided*, That cylinder, crown, and sheet glass (common window glass) unpolished, imported in boxes, shall contain fifty square feet, as nearly as sizes will permit, and the duty shall be computed thereon according to the actual weight of glass.

*History of the investigation.*—An application requesting an investigation for purposes of section 315 of the tariff act of 1922 looking toward an increase in the duty on window glass was filed April 7, 1927, by representatives of American window-glass manufacturers.

The commission instituted an investigation May 26, 1927. During July, August, and September, 1927, representatives of the Tariff Commission (four accountants and one commodity expert) obtained in the field domestic cost data for the year 1926 from 25 plants, producing approximately 92 per cent of the total window glass manufactured in the United States. During the winter 1927-28 the same commodity expert and one of the four accountants employed in the domestic field work, obtained cost data for the year 1926 from 13 Belgian plants, the output of which amounted to about 50 per cent of the total Belgian production for 1926.

Public notice of the institution of the investigation was given in the usual form by posting in the Washington and New York offices of the commission and by publication in Treasury Decisions and Commerce Reports.

After public notice had been given as prescribed by law and a preliminary statement of information obtained in the investigation had been distributed, a public hearing was held at the office of the commission in Washington, the sessions of which were on September 11, 12, 13, and 14, 1928. At the hearing all parties interested were given reasonable opportunity to be present, to produce evidence, and to be heard with regard to differences in cost of production and all other advantages and disadvantages in competition with respect to window glass.

Subsequent to this hearing briefs were filed by counsel for the Belgian and Czechoslovakian window-glass manufacturers and for the American window-glass manufacturers. The information obtained in the investigation and at the public hearing is incorporated in this report.

#### DESCRIPTION AND USES OF WINDOW GLASS

Window glass is glass drawn into sheets (commonly thinner than plate glass) or blown into a cylinder by hand or by machine and afterwards flattened into sheets, annealed, and cut into desired commercial sizes. It has a glossy fire finish and a plain smooth surface, unless viewed at an acute angle or in reflected light, when a characteristic waviness is noticeable. In this latter respect window glass differs chiefly from polished plate glass, the surfaces of which are parallel planes free from waves or irregularities which cause a distorted vision.

Window glass is made in several different qualities and in varying thicknesses. Single-strength glass, representing approximately 70 per cent of the total domestic production, measures 12 sheets to the inch and weighs approximately 18½ ounces per square foot. Double-strength glass, representing over 27 per cent of the total domestic production, measures 9 sheets to the inch and weighs approximately 24½ ounces per square foot. Window glass is produced in the United States and in Belgium in small quantity in thicknesses heavier than double strength. This extra heavy glass, according to its thickness, is classified as 26-ounce glass, 29-ounce glass, 34-ounce glass, 30-ounce, or ¼-inch, and ½-inch glass. Some of this heavier glass, known in

the trade as crystal sheet glass and as vitrea crystal glass, possesses a brilliant surface and more uniform thickness than other kinds. With respect to the quality of window glass several grades are recognized, the two which are the ordinary standard grades being known and marketed as A or second quality and B or third quality. A superior grade of window glass is known as AA or first quality and sold for special purposes in limited quantity. It has an even surface, is well flattened, and is free from the more perceptible defects in the glass itself—such as air bubbles, blown specks, cords, and strings. The entire output of this particular grade of glass does not exceed 3 per cent of the total window glass produced. There is also a limited production of window glass in grades which are inferior to the B quality. The Belgian "first" and "second" qualities of window glass, very little of which is imported, are comparable with the AA and A qualities produced in the United States. The "third" and "fourth" qualities of Belgian window glass are chiefly imported; these are comparable with the B quality and fourth quality produced in the United States.

Common window glass of the usual qualities and thicknesses is used principally for glazing the windows and doors of dwelling houses, hotbeds and cold frames, in skylights, conservatories, greenhouses, and as tops for fancy boxes. Extra thin window glass of specially selected quality, dutiable at the same rate as common window glass, is used in the manufacture of photographic plates, and still other thin glass is used for making cheap mirrors (shop mirrors). Crystal sheet and vitrea glass is used in residences, hotels, and public buildings and for other uses where, for reasons of economy, it is preferred to polished plate glass. Only a small amount of crystal sheet and photographic glass is produced in the United States at the present time.

## INFORMATION OBTAINED IN THE COMMISSION'S INVESTIGATION

### PROCESSES OF MANUFACTURE

Common window glass is made by various processes in this country and abroad. Cylinder glass is produced by both hand and machine-blown processes, and sheet glass, by drawing as contrasted with blowing. The crown method of production, a hand-blown operation, is practically in disuse everywhere at the present time.

#### **Cylinder glass.**

*The hand-blown cylinder process.*—The hand-blown cylinder process for making window glass came into general use in the United States and elsewhere in the early part of the nineteenth century and was the principal method until 1903. This method produces in the first instance a cylinder, when of single-strength glass, of approximately 5 feet in length and from 12 to 15 inches in diameter. Nine such cylinders per hour, or 1,400 cylinders per month, is the rate of output per man engaged in blowing.

Both in this country and abroad the hand-cylinder method of making window glass was the accepted method for many years, but at the present time, though still used, is rapidly being abandoned because of the development of mechanical methods. In the United States, in 1920, less than 2 per cent of the total production of window glass was made by the hand-cylinder method.

*The machine-blown cylinder process.*—In the machine-blown cylinder process, the machine accomplishes the same immediate results as those obtained by the individual glass blower. The molten glass in a large tank is ladled from the refining end of the tank into a series of pots, each holding enough glass to make a cylinder of the desired size and thickness and maintained at a temperature sufficiently high to keep the glass in a semiplastic state. A separate machine is operated for each of these pots into which is lowered a pipe or tube, having at its extremity a mushroom-shaped cap to which the glass quickly adheres. The tube is then slowly raised while compressed air controlled by the operator is blown through it to the inside of the hollow globe of glass which is attached both to the glass in the pot and to the cap of the tube of the machine. This globe appears to stretch into an increasingly elongated cylinder as the tube of the machine continues to rise and more and more air is admitted.

When the cylinder has reached a height of approximately 50 feet, the motion of the machine is stopped and the cylinder, broken loose from the cap and from the pot, is lowered by mechanical means to a rack which receives it. Here it is cut into sections and each section split lengthwise by means of red-hot wires, and from the cutting rack the sections are transferred to flattening ovens in which a suitable temperature softens the glass. In these ovens the cylindrical-shaped sheets assume a semiflattened shape under the wilting effects of the heat and are further flattened by means of wooden hoes thrust into the oven and used with an ironing motion. Next the sheets of glass pass through an annealing oven, after which they are ready for inspection, are cut into the exact sizes desired, and packed in boxes. The same processes of cutting cylinders into sections, flattening or ironing, and annealing are followed in the production of finished plates of glass whether the initial process is the hand-blowing or machine-blowing of the cylinders.

That the machine-blown process is, from the point of view of labor saving, a great advance upon the hand-blown process is evident from the description given. The 50-foot-length cylinder (30 inches in diameter) produced by a machine is many times larger than one produced by a hand blower and is produced in considerably less time. One workman, seated at control levers, can operate several of these cylinder-forming machines simultaneously. In 1926 about 60 per cent of the window glass produced in the United States was made by the machine-cylinder process and over half of this by one company. Most of the remainder was also produced by mechanical means—by processes that fall under the general designation of sheet glass as contrasted with cylinder glass.

#### **Sheet glass.**

The production of window glass initially drawn in the form of sheets, instead of blown in the form of cylinders subsequently flattened, is of importance because of the greater range attainable with respect to thickness.

At present, two processes of making window glass by first drawing into sheets are in use. These two processes, employed successfully since the war, in this country and abroad, are the Libbey-Owens process (patented in 1906-1912 by Colburn, an American) and the Fourcault process (patented in 1901 by a Belgian of that name). Both of these processes have in common the supplying of molten glass



for drawing by a continuous method. The glass passes from the melting end to the refining end of a large melting furnace or tank, with a capacity of from 600 to 1,200 tons, and from this is admitted without interruption to the shallow drawing furnace from which the sheets are extracted. From this point, with respect to the actual drawing of the sheets and the subsequent annealing, the Libbey-Owens and Fourcault processes differ radically.

*The Libbey-Owens process.*—In this process the drawing of the sheets is accomplished by first placing the machine in reverse motion, which allows a so-called bait made of iron and about 3 inches wide and 6 feet long to be introduced into the molten mass of glass. The machine is then placed in forward motion and the plastic glass adhering to the bait is pulled or drawn upward about 2 or 3 feet, after which the direction changes to a horizontal one which carries the drawn ribbon of glass over a flattening table and then into an annealing oven. As the strip of glass, from 6 to 8 feet wide, emerges from the cold end of the oven it is cut into large sheets which are afterwards cut again into small sheets of commercial sizes. The thickness of the glass mechanically produced by this process depends upon the temperature of the glass and upon the rate of speed of the drawing operation. If the sheet is drawn at a speed of from 40 to 60 inches per minute, the usual window glass thicknesses (single and double strength) are obtained. To secure a thickness of one-fourth of an inch, the machine is made to operate at approximately 23 inches per minute. It is possible to produce with the Libbey-Owens machine different thicknesses up to seven-sixteenths of an inch.

*The Fourcault process.*—By the Fourcault method a slotted block of refractory material having less density than glass is lowered into the drawing tank of molten glass. When pressure is applied to this block, which would otherwise float, the molten glass flows upward through the slot, from the peculiarly shaped lips of which it is continuously removed by the drawing apparatus. This consists in a series of asbestos-covered steel rollers, placed in pairs directly above the drawing block. These rollers lift or pull the glass by friction, being in contact with the glass across the entire width of the sheet. The whole series of rollers, with the exception of the four upper pairs, are inclosed in a structure of steel plates which retains the heat and thus serves as an annealing lehr (tempering oven). While the ascending sheet of glass is being drawn, it cools slowly and uniformly (that is, is annealed) and emerges from the top of the machine in condition for immediate cutting.

The thickness of the finished sheets is determined by the temperature of the molten glass and by the speed of the lifting rollers. As in the Libbey-Owens process, the faster the rollers revolve the thinner will be the sheet of drawn glass. To obtain sheets of glass thicker than those ordinarily desired, the machine is operated at less than its maximum rate of speed.

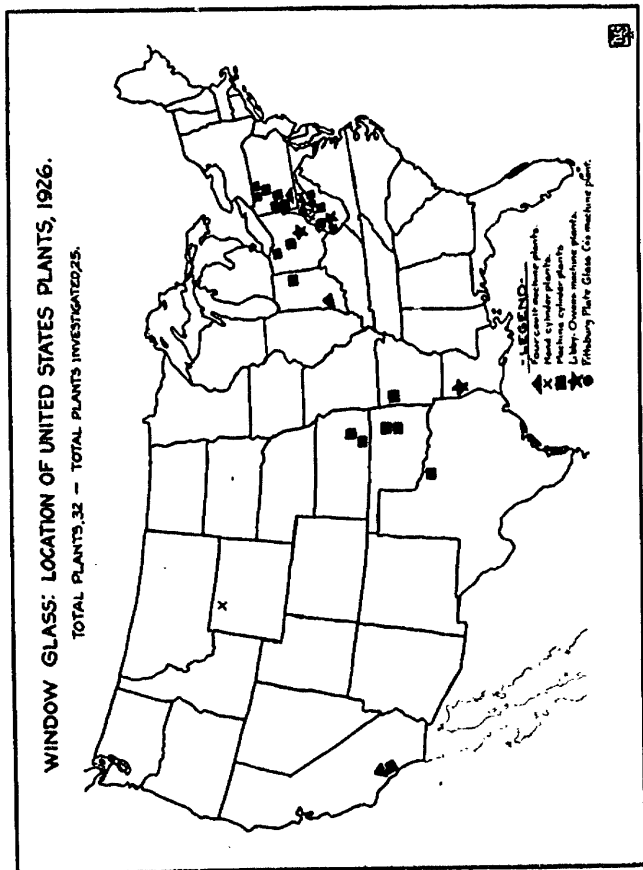
#### THE WINDOW-GLASS INDUSTRY OF THE UNITED STATES

In 1926 there were 24 window-glass companies in the United States, operating 32 plants located as follows:

West Virginia.....	10
Pennsylvania.....	7
Ohio.....	3
Indiana.....	2

Kansas.....	.....
Oklahoma.....	.....
California.....	.....
Arkansas.....	.....
Louisiana.....	.....
Texas.....	.....
Wyoming.....	.....

2  
2  
1  
1  
1  
1



West Virginia ranked first in amount of production, Pennsylvania second, Indiana third, and Louisiana fourth. Twelve companies, using the cylinder-machine process, produced in 19 plants 59 per cent of the total domestic production in 1926; three companies, using the Libbey-Owens process, produced in three plants 29 per cent of the total; six companies, using the Fourcault process in six plants, produced 10 per cent; and three companies, using the hand-cylinder

process, produced in four plants the remaining 2 per cent. Some of the plants operating in 1926 have since that year ceased to operate.

Table 1 gives total production of window glass in the United States for specified years.

TABLE 1.—*Window glass: Total production in the United States, 1914-1927*

[Source: 1914-1925, Census of Manufactures; 1926-27, obtained by the Tariff Commission from the records of domestic manufacturers]

Year	Quantity	Value	Average unit value
	<i>Square feet</i>		
1914.....	400,995,893	\$17,495,956	\$40.043
1919.....	368,912,209	41,100,724	.111
1921.....	290,065,080	24,026,366	.082
1923.....	510,214,838	42,623,203	.084
1925.....	567,150,590	37,524,738	.066
1926.....	530,000,000	36,040,000	.068
1927.....	481,021,350	26,813,567	.055

The great and continuous expansion of the domestic window-glass industry between 1921 and 1925 is directly attributable to the activity in building which created an unprecedented demand for building glass of all types. Almost simultaneous with the increased demand for window glass came the application of the new continuous methods of production (the Libbey-Owens and the Fourcault), which increased productive capacities and stimulated a general movement toward mass production. In 1925 more window glass was produced in the United States than in any previous year. Since 1925 there has been a decline in production, notwithstanding the increased productive capacity of the industry. The production of window glass in the United States for 1926 and 1927 by processes and by thicknesses is shown in Table 2. It will be noted that the newer mechanical processes are supplying a rapidly increasing proportion of the total output of the industry.

TABLE 2.—*Window glass: Production by processes and thicknesses in the United States, 1926 and 1927*

[Source: Data obtained by the Tariff Commission from the records of domestic manufacturers]

Process	Single strength		Double strength		Triple strength		Total	
	Amount	Per cent of total	Amount	Per cent of total	Amount	Per cent of total	Amount	Per cent of total
	<i>Square feet</i>		<i>Square feet</i>		<i>Square feet</i>		<i>Square feet</i>	
<b>1926</b>								
Machine cylinder.....	232,772,000	75	73,670,950	23	7,414,750	2	313,857,700	100
Libbey-Owens.....	94,096,350	62	49,787,250	23	8,025,450	5	151,912,050	100
Fourcault.....	30,116,900	70	12,283,700	29	403,950	1	42,804,550	100
Hand cylinder.....	8,285,800	79	2,176,000	20.8	18,700	.02	10,480,500	100
Other processes.....	6,900,300	64	3,981,900	36			10,885,200	
By all processes.....	372,234,350	70	141,902,800	27	15,862,850	3	530,000,000	100
<b>1927</b>								
Machine cylinder.....	170,281,508	72.3	62,026,175	26.7			232,307,773	100
Libbey-Owens.....	124,840,433	64.4	61,450,958	31.7	7,560,213	3.9	193,851,604	100
Fourcault.....	37,799,899	68.9	16,403,730	29.9	658,344	1.2	54,861,973	100
Hand cylinder.....								
Other processes.....								
By all processes.....	332,921,900	60.1	139,880,863	29.2	8,218,557	1.7	481,021,350	100

<sup>1</sup>No production.

## THE WINDOW-GLASS INDUSTRY OF EUROPE

Window glass is produced in continental Europe by three processes, the hand-blown cylinder, the Libbey-Owens, and the Fourcault. The hand-blown cylinder process, which until the war was the only process used in Europe, is being rapidly replaced on the continent by the more modern mechanical methods introduced by Libbey-Owens and Fourcault. The mechanization of the European window-glass industry has been, until recently, slower than in America, and hand-blown glass is still produced in considerable quantity. The expansion in mechanical production which has recently taken place in Europe is indicated by the number of Libbey-Owens and Fourcault machines introduced in the principal European window-glass producing countries since the signing of the armistice. A list of these countries and the number of machines installed during the postwar period follows.

Country	Number of machines		Country	Number of machines	
	Fourcault	Libbey-Owens		Fourcault	Libbey-Owens
Belgium.....	146	12	Poland.....	8	4
France.....	40	6	Italy.....	6	1
Czechoslovakia.....	49		Spain.....	6	
Russia.....	50		Greece.....	6	
Germany.....	30	4	Switzerland.....		1
England.....	14		Total.....	356	28
Holland.....	10				

The potential producing capacity of these machines is said to be approximately one and one-half billion square feet of single-strength glass annually. The total European production by all methods, as estimated authoritatively for 1926, was 1,180,000,000 square feet, of which over one-half was produced by the Libbey-Owens and Fourcault processes. The estimated production of the various European countries for 1926 is as follows:

*Estimated production of window glass in European countries, 1926 (square feet)*

Belgium.....	550,000,000
Germany.....	180,000,000
France.....	125,000,000
Czechoslovakia.....	110,000,000
Italy.....	100,000,000
England.....	80,000,000
Spain.....	25,000,000
Switzerland.....	10,000,000
Total.....	1,180,000,000

## BELGIUM

In Belgium, which is the principal source of imports into the United States, the manufacture of window glass is one of the main industries, with 33 plants operating in 1927. Their location is shown on the map of Belgium, page 9.

During the war the industry became inactive, but by 1924 production was back to the pre-war level, and in 1926 was even 23 per cent above the production for 1913. This advance was due mainly

to the introduction, largely since 1922, of mechanical processes of production.

The production of window glass in Belgium by the Fourcault process has been a postwar development. In 1913 only 1 plant operated by this method; in 1927 there were 11. Some of these were entirely new plants, but the majority were transformed mouth-blowing factories.

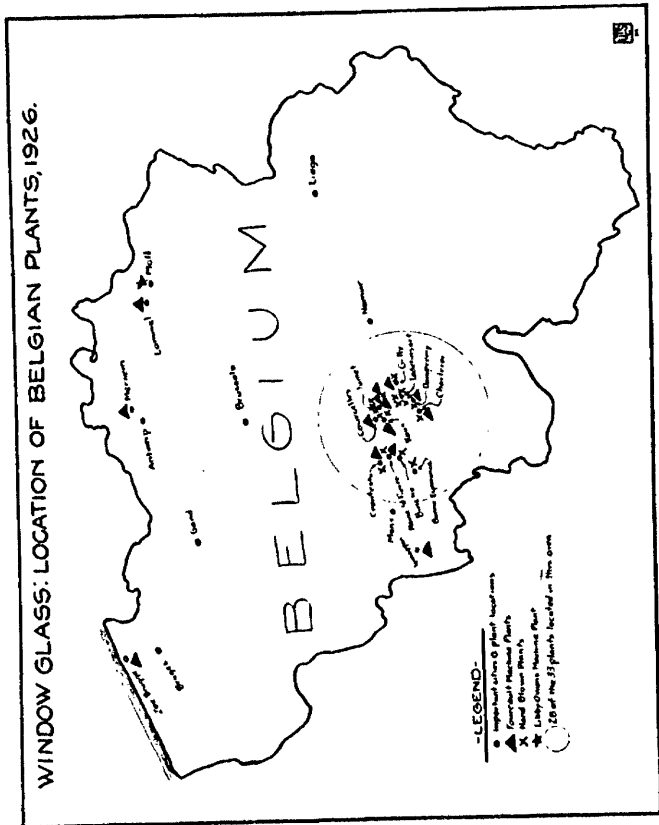


Table 3 shows the Belgian output of window glass for a number of years by both the mouth-blown and the mechanical process plants (Fourcault and Libbey-Owens).

The figures for mechanically produced glass include not only the Fourcault plants but also the plant of the Libbey-Owens Co. which was put in operation in 1923. The combined output of the mechanical plants in 1927, 399,091,000 square feet, was equivalent to

7,981,820 boxes of 50 square feet. The total Belgian production before the war (1913) was equivalent to approximately nine million 50-foot boxes.

TABLE 3.—*Window glass: Production in Belgium for specified years (square feet)*

Year	Month-blown <sup>1</sup>	Mechanically produced	Total, all processes	Per cent of total mechanically produced
1913.....	448,947,000	13,674,000	462,621,000	3
1922.....	330,507,000	17,324,000	347,831,000	5
1923.....	349,254,000	62,965,000	412,219,000	15
1924.....	335,137,000	118,187,000	453,324,000	25
1925.....	298,854,000	164,718,000	463,572,000	35
1926.....	281,277,000	222,510,000	503,787,000	51
1927.....	167,277,000	399,091,000	566,368,000	70

<sup>1</sup> Not including 2 plants not members of the Association des Verrieres Belges.

The revolution in the Belgian window-glass industry is still in progress and will probably not be completed until all of the factories have been mechanized. Preparations are now (1920) being made for the transformation of several of them by the installation of Fourcault machines.

Among the causes of the transition from hand to mechanical methods, the most important was the scarcity of labor after the war. There had been a depression in the window-glass industry in 1921 and 1922 but at the end of 1923 better conditions were apparent. The progressive depreciation in the Belgian currency from 1921 to the latter part of 1926 encouraged exports; but the scarcity of skilled labor made it impossible to rapidly expand the production of mouth-blown glass. In this situation attention was naturally directed to the installation of machinery. The experience of the Fourcault plants already in operation had shown that it required about one-third less labor to produce the same quantity of glass by this mechanical means than by the old fashioned process.

#### Organization of the Comptoir Fourcault.

The rapid installation of new Fourcault machines, especially after November, 1924, as well as the increasing output of the new Libbey-Owens plant, caused a significant increase in the total production of Belgian window glass. As long as the Belgian currency continued to depreciate little difficulty was found in marketing the glass abroad, but after the stabilization of October, 1926, the artificial stimulus to exports was removed. Although the exports of Belgian window glass in 1926 were greater than in 1925, the increase was much less than the increase in production. While exports gained 8.6 per cent, output increased 24 per cent. Export prices, which had shown a falling tendency (measured both in paper and in gold) up to the middle of 1926, thereafter stiffened when it was apparent that stabilization was imminent. This was the situation which led in June, 1927, to the formation of a central sales bureau of certain Belgian window-glass companies, known as the Comptoir Fourcault.

The Comptoir, whose official title is "Comptoir General Belge pour la Vente des Verres Mecaniques Fourcault," is a limited liability company. Its capital is owned by 10 factories producing window glass by the Fourcault process. The production of the members of the Comptoir in 1926-27 was 3,540,418 boxes. The new plan went

into operation January 1, 1928, and 10 companies which are members are now selling all their Fourcault window glass through the central sales office. The trade-marks formerly used by the individual factories have been abolished and a single trade-mark of the Comptoir has been substituted.

This plan of centralized control of exported glass puts the matters of price, terms, and quality—in dealings with outside customers—beyond the influence of the producing companies who participate in the arrangement. In forming the "Comptoir Fourcault" the stated objects were: (1) to establish more uniform prices at which exported Belgian glass is sold; (2) to avoid price cutting and other forms of harmful competition among the companies affiliated; (3) to adjust production in accordance with the demand; (4) to effect economies in selling expense; (5) to act as a clearing house for information, affording a better understanding of conditions in the industry; and (6) to assure the maintenance of standards with respect to quality. The activities of the "Comptoir Fourcault" are similar to those of the "Union" selling organization which handles exports for the Belgian plate-glass industry.

This Comptoir buys the glass from each of the affiliated companies at a prearranged nominal price, thereby acquiring title and control, and sells it at the best price obtainable in the markets of the world. The difference between the selling price and the nominal purchase price with respect to the glass of any particular producer is, after deduction of selling expenses, paid to that producer.

Prior to January 1, 1928, all exported Belgian window glass was sold through dealers located in Belgium, who purchased from producers at basic prices, which varied with the quality, strength, and size of the glass, and were subject to discounts according to the amounts purchased. These dealers sold to importers and jobbers throughout the world, at the basic prices quoted by the producers plus a commission, which usually amounted to 5 per cent.

#### **Patents and royalties (Fourcault process).**

The patent rights for the Fourcault process are owned by the Société Anonyme des Brevets Fourcault, founded in 1905. This company not only issues licenses for the use of Fourcault machines but it also aids in installing the machines and putting them in successful operation. The royalty is collected on the basis of glass packed.

The Fourcault patents expired in all countries except Belgium in 1927, and in Belgium they expire in 1931. Until that time the company owning them, by refusing to grant more licenses, can control the further expansion of the production of Fourcault glass in Belgium. Moreover, in all the licenses granted in Belgium for the manufacture of glass by the Fourcault process, there is an important restriction which limits the thickness of the glass thus produced to 4 millimeters or less. This restriction is the result of a contract made in 1905 between the Société Anonyme des Brevets Fourcault and a group of Belgian and German plate-glass companies. In consideration of the payment of a certain sum of money the plate-glass manufacturers acquired exclusive rights for Belgium to produce by the Fourcault process thick window glass; i. e., glass of 4 millimeters and above. None of the so-called demiglass, or "Vitrea," such as is produced in Czechoslovakia by the Fourcault process, has been produced in Belgium.

The Compagnie Internationale pour la Fabrication Mecanique du Verre, using the Libbey-Owens patented drawing-machine process, was established in 1922 by the Libbey-Owens Sheet Glass Co., of Toledo, Ohio, in conjunction with a group of Belgian financiers and was given the sole right to exploit in Europe the Libbey-Owens patented drawing process. Its plant, built in 1923 and located at Moll in the northern part of Belgium, is probably one of the most modernly equipped plants in Europe and of its kind in the world. Since 1922 a number of companies subsidiary to the Internationale have been organized and plants erected by them in France, Germany, Italy, Spain, and Switzerland with a view to supplying the European market while the main company in Belgium supplies the export market with the exception of the United States. By an agreement with the American Libbey-Owens Co., neither the main Belgian company nor its subsidiary companies using the Libbey-Owens process is permitted to export to the United States window glass produced by its drawing machines.

Table 4 shows the distribution by principal countries of Belgian exports of window glass for 1913 and for the years 1922 to 1927, inclusive.

TABLE 4.—*Window glass: Belgian exports to principal countries for specified years, listed in the order of their relative importance in 1926*

(Metric tons (2,204 pounds))

Exports to—	1913		1922		1923		1924	
	Amount	Per cent of total	Amount	Per cent of total	Amount	Per cent of total	Amount	Per cent of total
Great Britain.....	47,242	23.0	39,655	18.6	22,479	15.5	34,144	16.9
Netherlands.....	16,452	8.0	14,323	8.8	11,090	6.1	24,630	12.2
United States.....	8,669	4.2	25,041	15.5	22,831	12.5	12,230	6.0
Canada.....	15,633	7.6	10,225	6.3	10,471	5.7	12,776	6.3
British India.....	7,304	3.6	7,893	4.9	6,585	3.6	9,977	4.9
Argentina.....	10,157	5.0	6,783	4.2	9,977	5.4	9,081	4.5
Denmark.....	2,820	1.4	4,307	2.7	4,576	2.5	5,655	2.8
Australia.....	10,069	4.9	5,366	3.3	6,242	3.4	6,042	3.4
China.....	13,277	6.4	10,494	6.5	20,355	11.1	19,291	9.5
Brazil.....	5,518	2.7	3,251	2.0	3,622	2.0	5,644	2.8
Japan.....	20,890	10.1	5,744	3.5	19,769	10.8	14,851	7.4
All other countries.....	47,510	23.1	38,419	23.7	39,137	21.4	47,117	23.3
Total.....	203,562	100.0	161,904	100.0	177,125	100.0	202,308	100.0

Exports to—	1925		1926		1927	
	Amount	Per cent of total	Amount	Per cent of total	Amount	Per cent of total
Great Britain.....	43,367	20.4	49,893	19.6	51,315	19.6
Netherlands.....	29,956	14.1	35,919	14.1	39,747	13.9
United States.....	17,616	8.3	29,036	11.4	31,121	11.8
Canada.....	16,269	7.7	20,638	8.1	23,408	8.8
British India.....	8,842	4.2	10,746	4.2	9,209	3.5
Argentina.....	10,926	5.1	10,722	4.2	10,455	3.9
Denmark.....	5,809	2.7	10,013	4.0	6,907	2.6
Australia.....	7,559	3.6	10,013	4.0	7,230	2.8
China.....	12,870	6.1	8,101	3.2	(1)	.....
Brazil.....	5,690	2.7	6,323	2.5	(1)	.....
Japan.....	4,276	2.0	5,177	2.0	(1)	.....
All other countries.....	49,065	23.1	57,735	22.7	87,594	33.1
Total.....	212,275	100.0	254,316	100.0	264,646	100.0

<sup>1</sup> Not listed separately; included in "all other."



## TREND IN METHODS OF PRODUCTION

Since 1926, the period for which cost data were obtained, changes in the methods of manufacturing window glass have occurred both in the United States and in Belgium. The transition from hand to mechanical processes, particularly to Libbey-Owens and Fourcault, beginning shortly after the war, is still in progress. Production by the hand-cylinder process has been since 1926 completely discontinued in the United States, whereas in Belgium it has declined from 51.8 per cent of the total production in 1926 to 24.3 per cent of the total in 1928. Production by the machine cylinder process—employed only in the United States—has declined from 59.2 per cent of the total production in 1926 to 38.8 per cent in 1928. On the other hand, the production by the more modern sheet-drawing processes, Libbey-Owens and Fourcault, has increased decidedly in both the United States and Belgium since 1926. In the United States production by these two processes in 1926 amounted to 38.8 per cent of the total. In 1928 it amounted to 61.2 per cent. In Belgium the production by these processes increased from 48.2 per cent of the total in 1926 to 75.7 per cent of the total in 1928. The production (by all processes) in both the United States and Belgium, however, was less in 1928 than in 1926.

This trend toward the use of the mechanical sheet-drawing processes in the production of window glass is indicated in the following tabulation which shows the percentages of the total output in the United States and in Belgium represented by the various processes in 1926 and 1928.

Item	United States		Belgium	
	1926	1928	1926	1928
Production (square feet).....	530,000,000	480,000,000	607,000,000	500,000,000
Process:	<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>
Hand cylinder.....	2.0	None.	51.8	24.3
Machine cylinder.....	59.2	38.8	None.	None.
Sheet drawing—				
Fourcault.....	10.1	30.9	36.0	53.3
Libbey-Owens.....	28.7	30.3	12.2	22.4
	100.0	100.0	100.0	100.0

## UNITED STATES FOREIGN TRADE IN WINDOW GLASS

## IMPORTS

The United States imports of common window glass are known to consist mainly of single strength and "third" quality glass—the foreign "third" quality closely corresponding to the domestic "B" quality. The statistics of imports apply to all unpolished flat glass dutiable under paragraph 219 of the tariff act of 1922, whatever the thickness and the quality. The bulk of the imports, but not the whole of them, may be directly compared with the bulk of the production in the United States. The value per pound of particular imports will vary with thickness, and more especially according to quality.

Table 5 shows the quantity and value of total imports of flat glass, mostly common window glass, since 1910. It will be observed

that of recent years, since the beginning of the great activity of building in the United States, the average annual imports have been almost double in quantity what they were before the war. The considerable increase of imports in the years 1921 and 1922, in particular, was due to the domestic industry not being prepared in those years to meet the greatly enlarged demand.

TABLE 5.—Window glass: United States imports for consumption, 1910-1928

Year	Quantity	Value		Specific duties collected		Equivalent ad valorem rate of duty
		Total	Per pound	Total	Per pound	
<b>Fiscal:</b>	<i>Pounds</i>					<i>Per cent</i>
1910.....	25,690,426	\$711,741	\$0.028	\$125,300	\$0.016554	59.75
1911.....	29,098,311	825,381	.028	515,180	.027347	62.42
1912.....	23,426,151	827,868	.035	383,947	.016389	46.39
1913.....	29,458,970	864,731	.039	330,768	.016167	41.10
1914.....	31,197,531	1,212,536	.039	338,544	.010851	27.92
1915.....	16,532,210	679,239	.041	179,372	.010849	26.41
1916.....	1,401,572	140,262	.100	13,222	.009443	9.43
1917.....	2,394,979	277,222	.107	23,486	.009650	8.47
1918.....	572,634	84,018	.147	5,317	.009337	6.36
<b>Calendar:</b>						
1918.....	392,461	33,634	.111	2,897	.009178	8.52
1919.....	635,501	73,636	.116	6,134	.009652	8.33
1920.....	5,319,080	513,579	.097	52,763	.009919	10.27
1921.....	47,065,139	2,524,082	.054	561,197	.011923	22.23
1922.....	52,414,111	2,527,382	.048	671,755	.012816	26.58
1923.....	16,243,164	2,102,410	.045	723,845	.017782	31.71
1924.....	30,799,664	1,768,793	.057	488,124	.015781	27.43
1925.....	45,585,770	2,305,168	.052	758,692	.016342	42.24
1926.....	80,884,601	3,129,075	.039	1,321,844	.016099	16.34
1927.....	83,204,229	2,888,616	.035	1,348,636	.016238	14.16
1928.....	67,870,133	2,491,075	.037	1,100,061		

Source: Commerce and Navigation of the United States.

TABLE 6.—Window glass: Imports for consumption by tariff classifications for specified years

Square inches	1924		1925		1926		1927		1928	
	Pounds	Per cent of total	Pounds	Per cent of total	Pounds	Per cent of total	Pounds	Per cent of total	Pounds	Per cent of total
Not exceeding 150.....	9,139,571	29.67	11,433,787	25.08	20,075,094	24.82	18,245,210	21.93	15,927,574	23.47
Above 150 and not exceeding 384.....	6,732,184	21.89	8,199,764	17.98	15,402,421	19.01	18,405,380	22.12	14,002,160	20.63
Above 384 and not exceeding 720.....	7,617,235	24.73	11,402,409	25.01	21,310,805	26.38	24,200,244	29.02	21,809,981	32.13
Above 720 and not exceeding 864.....	1,849,159	6.00	2,886,739	6.33	7,057,138	8.72	7,105,701	8.54	4,140,966	6.10
Above 864 and not exceeding 1,200.....	1,997,230	6.48	2,184,387	4.70	5,198,714	6.43	5,604,218	6.73	3,105,215	4.58
Above 1,200 and not exceeding 2,400.....	1,750,485	5.68	3,389,305	7.44	4,160,259	5.11	5,311,033	6.38	3,836,701	5.65
Above 2,400.....	1,713,809	5.56	6,092,379	13.37	7,630,170	9.47	4,332,323	5.21	5,047,536	7.44
Total.....	30,799,664	100.00	45,585,770	100.00	80,884,601	100.00	83,204,229	100.00	67,870,133	100.00

Source: Commerce and Navigation of the United States.

The specific duties provided in paragraph 210 of the existing tariff are graduated, irrespective of thickness and quality, according to size brackets. In Table 6, given below, total imports for a series of years are analyzed upon the basis of the tariff classification by sizes.

It will be noted that the bulk of the imports fall within the first three tariff brackets or groups of sizes. In Table 7 the analysis of imports for the years 1927 and 1928 is partly upon the basis of size and partly upon the basis of thickness. Window glass weighing less than 80 pounds net per box of 50 square feet consists of single and double strength glass; whereas glass thicker than single or double strength weighs more than 80 pounds net per box of 50 square feet. It will be observed in Table 7 that for the third, sixth, and seventh brackets the thicker glass weighing over 80 pounds per case or box of 50 square feet predominates.

TABLE 7.—Window glass: Imports for consumption, by tariff classifications, according to weight, for 1927 and 1928

Square inches	Weighting less than 80 pounds net, per case	Weighting 80 pounds net and over per case	Total
1927			
Not exceeding 150.....	<i>Pounds</i> 12,050,044	<i>Pounds</i> 6,193,196	<i>Pounds</i> 18,243,240
Above 150 and not exceeding 384.....	12,360,612	6,044,768	18,405,380
Above 384 and not exceeding 720.....	11,079,241	12,221,003	23,300,244
Above 720 and not exceeding 864.....	4,689,076	2,435,715	7,124,791
Above 864 and not exceeding 1,200.....	3,274,201	2,436,047	5,710,248
Above 1,200 and not exceeding 2,400.....	1,350,724	3,980,369	5,331,093
Above 2,400.....	378,111	3,974,212	4,352,323
Total.....	46,033,060	37,171,230	83,204,290
1928			
Not exceeding 150.....	12,467,804	3,479,770	15,947,574
Above 150 and not exceeding 384.....	9,831,254	4,170,906	14,002,160
Above 384 and not exceeding 720.....	7,954,653	13,879,328	21,833,981
Above 720 and not exceeding 864.....	2,914,010	1,285,356	4,199,366
Above 864 and not exceeding 1,200.....	2,148,453	956,762	3,105,215
Above 1,200 and not exceeding 2,400.....	1,099,574	2,827,127	3,926,701
Above 2,400.....	840,583	4,266,953	5,047,536
Total.....	37,142,941	50,727,202	87,870,143

Source: Commerce and Navigation of the United States.

#### PRINCIPAL COMPETING COUNTRY

Belgium is now and has been for many years the principal country of origin of United States imports of common window glass. Prior to the World War 85 per cent of total imports came from Belgium and most of the remainder from England. Since 1924 the imports of flat glass from Czechoslovakia, produced in considerable quantity by mechanical process in that country, have markedly increased. For the years 1925, 1926, 1927, and 1928 the imports from that country have constituted by quantity over 23 per cent of the total imports, and by value about 37 per cent. The greater value per unit of the imports from Czechoslovakia, as compared with those from Belgium and other countries, is accounted for by the fact that they consist largely not of window glass of the common thicknesses and qualities, but of extra heavy glass (with some other physical character besides thickness), imported and consumed here under the trade name of "Vitrea." This glass is similar to the heavy drawn sheet glass made in the United States by the Libbey-Owens and Fourcalt process, and to the lesser amount of crystal sheet glass made in this country by the machine-cylinder process. In Table 8 is shown the imports of recent years, both by quantity and value, from all the principal countries of origin of imports.

TABLE 8.—Window glass: United States general imports, by countries, 1924-1928

Country of origin	1924				1925				1926			
	Quantity	Value	Per cent of total		Quantity	Value	Per cent of total		Quantity	Value	Per cent of total	
			By quantity	By value			By quantity	By value			By quantity	By value
	<i>Pounds</i>				<i>Pounds</i>				<i>Pounds</i>			
Belgium.....	23,789,413	\$1,167,082	77.24	65.98	29,707,370	\$1,228,845	65.17	51.30	59,153,261	\$1,741,607	73.09	53.63
Czechoslovakia.....	2,959,453	284,079	9.68	16.06	12,697,443	919,888	27.85	30.66	17,989,346	1,175,899	22.24	37.55
Germany.....	2,485,936	186,969	8.06	10.56	2,657,873	134,784	4.51	5.63	1,651,393	105,401	2.04	3.37
United Kingdom.....	624,853	67,087	2.02	3.79	650,835	58,215	1.43	2.43	579,518	31,235	.72	1.00
All other.....	940,909	63,677	3.00	3.61	472,239	23,336	1.04	.98	1,548,502	76,789	1.91	2.45
<b>Total.....</b>	<b>30,799,664</b>	<b>1,768,793</b>	<b>100.00</b>	<b>100.00</b>	<b>45,585,770</b>	<b>2,395,168</b>	<b>100.00</b>	<b>100.00</b>	<b>80,902,020</b>	<b>3,130,922</b>	<b>100.00</b>	<b>100.00</b>

Country of origin	1927				1928			
	Quantity	Value	Per cent of total		Quantity	Value	Per cent of total	
			By quantity	By value			By quantity	By value
	<i>Pounds</i>				<i>Pounds</i>			
Belgium.....	61,408,745	\$1,713,822	77.91	59.89	40,209,233	\$1,151,260	59.38	46.21
Czechoslovakia.....	13,905,830	865,974	16.81	30.26	19,202,001	936,583	28.29	37.59
Germany.....	2,212,182	105,966	2.67	3.70	1,913,521	137,917	2.86	5.54
United Kingdom.....	621,076	119,331	.75	4.19	506,874	90,665	.75	3.64
All other.....	1,536,677	56,078	1.86	1.96	5,918,506	174,650	8.72	7.02
<b>Total.....</b>	<b>82,747,510</b>	<b>2,861,771</b>	<b>100.00</b>	<b>100.00</b>	<b>67,870,135</b>	<b>2,491,075</b>	<b>100.00</b>	<b>100.00</b>

Source: Commerce and Navigation of the United States.

## EXPORTS

The United States exports of window glass have always been, except during the World War, inconsiderable as compared either with imports or with domestic production. The cessation of production in the principal producing countries of Europe during the war put the United States temporarily in the position of the principal source of supply for the world market. In 1919 exports were 13 per cent of the domestic production. Ordinarily they have amounted to less than 1 per cent. The exceptional exports of 1919 were chiefly to South America, Canada, and Cuba.

## DOMESTIC CONSUMPTION

Window glass is used principally in buildings and consequently its consumption depends largely upon the extent of building operations throughout the country. The unusual building activities during the last few years have been reflected in an increased consumption of window glass in the United States, particularly noticeable in the centers of greatest population, and this in turn has stimulated both domestic production and imports. Table 9 shows domestic production, imports, exports, and consumption of window glass for the United States for specified years.

TABLE 9.—*Window glass: United States production, imports, exports, and consumption, together with the relation of imports to domestic consumption for the specified years, 1914-1928*

[Square feet]

Year	Domestic production	Imports <sup>1</sup>	Domestic exports	Domestic consumption	Ratio of imports to domestic consumption
					<i>Per cent</i>
1911.....	493,954,803	24,000,000	12,000,000	426,954,803	6.6
1919.....	368,942,269	540,000	48,298,500	321,183,769	.2
1921.....	293,955,080	40,000,000	2,879,850	257,185,230	13.5
1923.....	510,214,838	38,000,000	2,534,100	545,688,738	7.0
1925.....	567,150,500	38,000,000	1,256,550	603,894,040	6.3
1926.....	1,530,000,000	67,500,000	1,548,800	595,951,200	11.3
1927.....	481,021,350	69,500,000	1,058,200	549,263,150	12.6
1928 (6 months).....	1,223,774,600	26,300,000	452,450	252,601,150	11.6

<sup>1</sup> Statistics from Commerce and Navigation in pounds; conversion from pounds to square feet at 1.2 pounds to the square foot.

<sup>2</sup> Estimated on the basis of sales value of exports.

<sup>3</sup> Information obtained by Tariff Commission from records of domestic manufacturers.

## PRICES

## United States.

In the United States window glass is sold in wholesale quantities at price discounts based upon an official list of prices dated October, 1912, which basic prices and discounts vary with the size, thickness, and quality of the glass, as well as with the size of the order and terms of sale. Special discounts are often quoted to buyers in certain sections of the country where there is occasion to meet exceptional conditions of competition. This is especially true of the Pacific coast. Table 10 shows, with respect to a representative size, the trend of domestic wholesale prices for the principal thicknesses and qualities of window glass for a series of years, together with index numbers based on the prices of 1913 taken as 100.

TABLE 10.—*Window glass: United States wholesale prices (f. o. b. plant and exclusive of boxing charge) for single and double strength, A and B quality, of the 25 unit inches bracket*

[Source: Data obtained by the Tariff Commission from the records of domestic manufacturers]

[Per box containing 50 square feet]

Grade	1913	1922	1923	1924	1925	1926	1927	Index numbers of glass prices, 1927 (1913=100)
Single strength:								
A quality.....	\$1.60	\$2.60	\$2.65	\$2.28	\$2.09	\$2.60	\$2.28	142.5
B quality.....	1.52	2.28	2.41	2.17	1.99	2.05	1.94	127.6
Double strength:								
A quality.....	2.17	3.12	4.48	3.64	3.36	4.37	3.45	159.0
B quality.....	2.05	3.18	3.45	3.18	2.92	3.02	2.96	144.4

Table 11 gives, with respect to all sizes, the domestic wholesale prices (f. o. b. plant) in effect during 1926, for the leading thicknesses (strengths) and qualities. Over 70 per cent of domestic sales are of single strength and B quality, and in sizes less than 720 square inches or 60 unit inches. It will be noted that the classification by size used by the trade is more differentiated than the one embodied in paragraph 210 of the tariff act of 1922.

TABLE 11.—*Window glass: United States wholesale prices<sup>1</sup> (f. o. b. plant) for all sizes in single and double strength, and A and B quality, 1926*

[Per box containing 50 square feet]

Size of glass		A or 2d quality		B or 3d quality	
Tariff classification	Trade classification (unit inches, length plus width)	Single strength	Double strength	Single strength	Double strength
		Not exceeding 150 square inches.....	29 \$2.60	4.37	\$2.05
150 to 384 square inches.....	34	3.19	4.83	2.47	3.31
	40	3.42	5.30	2.59	3.53
	50	4.04	5.77	3.10	3.93
384 to 720 square inches.....	54	4.15	5.93	3.17	3.99
	60	4.42	6.08	3.49	4.52
	70	4.89	6.55	3.79	4.84
720 to 864 square inches.....	80	5.65	7.18	4.31	5.29
	84	6.03	7.33	4.69	5.41
	90	.....	7.80	.....	5.86
1,200 to 2,400 square inches.....	94	.....	7.96	.....	5.99
	98	.....	.....	.....	.....
	100	.....	9.36	.....	7.14

<sup>1</sup> Based on price list of Oct. 15, 1912, and discounts in effect during 1926. Additional boxing charges for single and double strength glass are as follows: First 3 bracket sizes, 21 cents per 50-foot box; above sizes, 42 cents per 50-foot box. An additional discount of 3 per cent is allowed to qualified buyers (buyers who purchase not less than 5,000 boxes per annum). Above prices apply to all sections of the United States except the Pacific coast. Wholesale prices quoted for Pacific coast markets are slightly lower than the above prices. Terms 30 days net, or 1 per cent cash if paid within 10 days from date of invoice. Freight equalized with Pittsburgh, Columbus, and Kansas City.

**Belgium.**

As already stated, Belgian window glass was sold prior to 1928 in wholesale quantities to importers and jobbers in the United States through dealers located exclusively in Belgium, whose prices varied with the size, thickness, and quality of the glass, and also with the amount of the order, the factory from which purchased, and with the particular market to which the glass was consigned. Since the beginning of the operations of the "Comptoir Fourcault" in January, 1928, a large part of the window glass produced in Belgium by the Fourcault process has been sold by this centralized selling organization rather than by independent dealers. These independent dealers, however, continue to sell for export the Belgian glass produced in the hand-blown factories, a declining but still considerable proportion of the total exports.

Representative prices for Belgian window glass for 1926 quoted by one of the leading dealers in Belgium for export to the United States are shown for the various sizes, qualities, and strengths in Table 12.

TABLE 12.—*Window glass: Belgian wholesale prices f. o. b. Antwerp quoted for export to the United States, for various sizes in single and double strength, A and B qualities, 1926*

[Per box containing 50 square feet]

Size of glass		A (or second) quality		B (or third) quality	
Tariff classification	Trade classification (unit inches—length plus width)	Single strength	Double strength	Single strength	Double strength
Not exceeding 150 square inches.....	25	\$1.15	\$1.75	\$1.00	\$1.50
150 to 384 square inches.....	34	1.40	2.10	1.25	1.85
	40	1.40	2.10	1.25	1.85
384 to 720 square inches.....	50	1.60	2.40	1.40	2.10
	54	1.60	2.45	1.43	2.20
720 to 864 square inches.....	60	1.90	2.85	1.45	2.20
864 to 1,200 square inches.....	70	2.15	3.25	1.55	2.30
	80	2.45	3.70	1.70	2.55
	84	2.75	4.15	1.85	2.75
1,200 to 2,400 square inches.....	90	3.10	4.60	2.00	3.00
	94	3.55	5.30	2.15	3.25
	100	4.00	6.00	2.30	3.45

Terms, cash without discount. Additional boxing charge: 12 cents per box of sizes up to 40 inches; 18 cents per box of sizes 41 to 50 inches; 24 cents per box of sizes 51 to 60 inches. Above 60 inches, boxing charges increase by 6 cents for each trade bracket.

Table 13 presents a comparison for the year 1926 of Belgian export prices with United States prices for a considerable range of sizes in single strength and B quality. It also shows with respect to each size of the imported Belgian glass of this strength and quality, the existing specific duty and the equivalent ad valorem rate of duty calculated from the price (value) of the Belgian glass.

TABLE 13.—Window glass: United States and Belgian prices compared, with existing specific and equivalent ad valorem rates of duty, by specified sizes, single strength and B (third) quality, 1926.

[Per box containing 50 square feet]

Size of glass		Price		Amount United States price exceeds Belgian price	Specific duty <sup>1</sup> (act of 1922)	Equivalent ad valorem rate on Belgian price
Tariff classification	Trade classification (unit inches—length plus width)	In the United States <sup>1</sup>	In Belgium <sup>2</sup>			
Not exceeding 150						<i>Per cent</i>
.....square inches..	25	\$2.05	\$1.00	\$1.05	\$0.72	72.00
150 to 384.....do.....	34	2.47	1.25	1.22	.79	63.20
	40	2.59	1.25	1.34	.93	74.40
384 to 720.....do.....	50	3.10	1.40	1.70	.93	66.43
	54	3.17	1.45	1.72	.93	61.14
720 to 864.....do.....	60	3.49	1.45	2.04	1.00	68.96
864 to 1,200.....do.....	70	3.79	1.55	2.24	1.15	74.20
	80	4.31	1.70	2.61	1.29	75.88
1,200 to 2,400.....do.....	84	4.69	1.85	2.84	1.29	69.73

<sup>1</sup> Wholesale prices f. o. b. factory.

<sup>2</sup> Wholesale prices f. o. b. Antwerp.

<sup>3</sup> Specific duties in the tariff act of 1922, par. 219, are expressed in cents per pound. These rates of duty have been converted into cents per box for this thickness of glass on the basis of 55 pounds to the box containing 50 square feet.

In Table 14 the same kind of comparison is made between Belgian export prices and United States prices as in Table 13, except that it is for double-strength glass.

TABLE 14.—Window glass: United States and Belgian prices compared, with existing specific and equivalent ad valorem rates of duty, by specified sizes, double strength and B (third) quality, 1926

[Per box containing 50 square feet]

Size of glass		Price		Amount United States price exceeds Belgian price	Specific duty <sup>1</sup> (act of 1922)	Equivalent ad valorem rate on Belgian price
Tariff classification	Trade classification (unit inches—length plus width)	In the United States <sup>1</sup>	In Belgium <sup>2</sup>			
Not exceeding 150						<i>Per cent</i>
.....square inches..	25	\$3.02	\$1.50	\$1.52	\$0.94	62.67
150 to 384.....do.....	34	3.31	1.85	1.46	1.03	55.68
	40	3.56	1.85	1.71	1.21	65.40
384 to 720.....do.....	50	3.93	2.10	1.83	1.21	57.62
	54	3.99	2.20	1.79	1.21	55.00
720 to 864.....do.....	60	4.52	2.20	2.32	1.31	59.55
864 to 1,200.....do.....	70	4.84	2.30	2.54	1.50	65.22
	80	5.29	2.55	2.74	1.69	66.28
	84	5.41	2.75	2.66	1.69	61.45
	90	5.86	3.25	2.61	1.69	66.33
1,200 to 2,400.....do.....	94	5.99	3.00	2.99	1.69	52.31
	100	7.13	3.45	3.68	1.69	49.00

<sup>1</sup> Wholesale prices f. o. b. factory.

<sup>2</sup> Wholesale prices f. o. b. Antwerp.

<sup>3</sup> Specific duties in the tariff act of 1922 are expressed in cents per pound. These rates of duty have been converted into cents per box for this thickness of glass on the basis of 75 pounds to the box containing 50 square feet.



## COSTS OF PRODUCTION

**Scope of the investigation and cost period in the United States.**

During 1927 representatives of the commission obtained cost data for the year 1926 for 25 United States window-glass companies which produced over 90 per cent of the total domestic production for that year. These cost data apply to plants now and old, operating under varying conditions in all sections of the country where window glass was produced in 1926.

**Cost periods of individual domestic companies.**

Owing to differences in the accounting practice of particular manufacturers, costs could not be secured uniformly for one and the same period of time. They were secured, however, for most of the 25 companies studied for an accounting period of a full year, either calendar or fiscal. In the other instances they were secured for an operating period of less than a full year.

The separate cost periods covered by the investigation in the United States are shown below, with the number of companies having the same period:

Number of companies	Cost periods	Number of companies	Cost periods
1	Apr. 1, 1925-Mar. 31, 1926	1	Oct. 1, 1925-Sept. 30, 1926
1	July 1, 1925-June 30, 1926	4	Dec. 25, 1925-Dec. 31, 1926
1	Aug. 1, 1925-July 31, 1926	7	Jan. 1, 1926-Dec. 31, 1926
5	Aug. 28, 1925-Aug. 27, 1926	1	Apr. 1, 1926-Mar. 31, 1927
1	Aug. 31, 1925-Aug. 30, 1926	1	May 22, 1926-Dec. 31, 1926
1	Sept. 1, 1925-Aug. 31, 1926	1	Oct. 15, 1926-June 30, 1927

**Scope of the investigation and cost period in Belgium.**

In the fall of 1927 and the spring of 1928 the commission obtained from cost records and other sources of information complete detailed cost data for 13 companies manufacturing window glass in Belgium in 1926. Three companies used the mouth-blowing process and produced approximately 40 per cent of the total mouth-blown glass, and 23.3 per cent of all the glass for which costs were obtained.

The cost periods covered by the investigation in Belgium are shown below:

Number of companies	Cost periods	Number of companies	Cost periods
2	Nov. 1, 1925-Oct. 30, 1926	3	July 1, 1926-June 30, 1927
5	Jan. 1, 1926-Dec. 31, 1926	2	Aug. 1, 1926-July 31, 1927
1	Apr. 1, 1926-Mar. 31, 1927		

**Conversion of Belgian francs into United States dollars.**

Belgian costs, as secured for 1926 and 1927, were costs expressed in francs, and such costs must be converted into costs expressed in United States money before they can be compared with domestic costs. Furthermore, the value of the paper franc, as measured by the current rates of exchange, was unstable for the greater part of the period investigated.

The conversion of Belgian unit costs as obtained in francs into United States money for direct comparison with domestic unit costs, has been made at the average rate of exchange of the franc for each period for which Belgian costs for individual plants were obtained. The course of exchange for a series of years, including the whole period covered by the investigation of costs in Belgium, is shown in the table which follows:

TABLE 15.—Monthly average exchange rates for Belgian francs with annual averages for fiscal years and calendar years, 1925-1927<sup>1</sup>

[Cents per franc (par = 19.30)]

[Source: Federal Reserve Board]

	1925	1926	1927
January.....	5.06	4.54	2.78
February.....	5.07	4.54	2.78
March.....	5.06	4.23	2.78
April.....	5.05	3.67	2.78
May.....	5.02	3.12	2.78
June.....	4.70	2.96	2.78
July.....	4.62	2.42	2.78
August.....	4.53	2.75	2.78
September.....	4.40	2.72	2.78
October.....	4.82	2.78	2.70
November.....	4.53	2.78	2.70
December.....	4.53	2.78	2.80
Average for fiscal year ending—			
June 30.....	4.92	4.18	2.74
July 31.....		4.00	2.77
March 31.....		4.60	2.88
October 31.....	4.76	3.57	2.78
Average for calendar year.....		3.27	2.78

<sup>1</sup> Monthly averages of noon buying rates for cable transfers in New York.

### Elements of cost—United States and Belgium

1. *Labor*.—This item includes all direct labor engaged in the processes of mixing, melting, blowing, drawing, flattening, cleaning, cutting, sorting, packing, warehousing, and shipping window glass. The cost of indirect labor, such as is required in the refractory department, power and heat department, and for repairs and maintenance, is combined with the other costs of these departments, and eventually included in the overhead costs of the glass produced.

2. *Power and heat*.—Power and heat costs include departmental charges for labor, the coal used in the production of gas for the melting furnaces, drawing furnaces, blow room, and flattening ovens, natural gas (used in the United States only), and purchased electricity. Repairs and maintenance and a share of general plant and office overhead is charged to power and heat in the United States costs, while in the Belgian costs these items are not allocated, but are shown under the general captions of repairs and maintenance, general plant overhead, and general office overhead.

3. *Raw materials*.—This item includes the delivered cost at the plant of the ingredients of window glass; melting sand, soda, salt cake, lime, arsenic, charcoal, and cullet (cullet is the broken glass used for remelting).

4. *Manufacturing materials and supplies*.—The principal charges under this heading are the cost of packing cases and packing supplies. The cost of refractories and of miscellaneous supplies used throughout the plant is also included.

5. *Repairs and maintenance.*—This charge covers the cost of labor and materials used for repairs and maintenance of furnaces, drawing machines, blowing machines, and general plant.

6. *General plant overhead.*—General plant overhead includes salaries for plant superintendents; indirect labor; watchmen, guards and ground maintenance; royalties; depreciation; insurance and taxes, and other miscellaneous plant expenses.

7. *General office overhead.*—This item includes officers' and general office salaries, supplies, and expense.

8. *Imputed interest.*—Imputed interest for United States and Belgium was calculated at 6 per cent of the value of fixed assets as at the end of the period costed. The interest charge for Belgium is based on the average interest charge for six Belgian plants, covering 48 per cent of the total boxes produced.

It was impossible to use the balance sheets of the Belgian window-glass companies in the form in which they were submitted to determine the value of their invested capital. The balance sheets were kept in paper francs. Successive additions to capital had been entered without consideration of the varying value of the franc in terms of gold. The investment upon which the interest charge for Belgium was calculated was, therefore, based upon the data obtained from their balance sheets calculated on a gold basis (that is, reduced to gold francs at a par value of 19.3 cents).

9. *Transportation in Belgium to Antwerp.*—This item includes the cost of transporting the glass from the plants to Antwerp, and the cost of loading on board the steamer.

The records of the factories did not separate the charges paid on glass shipped to Antwerp destined for the United States from charges paid on all other shipments.

Nine of the ten sheet-drawing process plants studied are situated at distances varying from 100–130 kilometers from Antwerp. In order to determine the usual quantities shipped in each lot an examination was made of 237 invoices consulated at Brussels in the months of January, May, and October, 1926. They showed that 90 per cent of the glass was shipped in lots of 15,000 kilograms or over. A further difficulty in determining the freight charge for 1926 is found in the rate increases which took place in August and October. From the consular records it was found that 55 per cent of the glass invoiced in 1926 was shipped in the months of January and July, 14 per cent in August, and 31 per cent in October and December.

Selecting as typical the distance of 100–130 kilometers, and the typical quantity as 15,000 kilos, the weighted average rate applying to shipments to Antwerp for export to the United States in 1926 was 2.29 cents per box. The average charge for loading on steamer at Antwerp was 0.51 cents per box.

10. *Selling expense.*—The main items included under selling expense are salesmen's salaries, commission, traveling expense, advertising, bad debts, and that proportion of general office overhead applicable to selling.

#### **Treatment of costs—United States and Belgium.**

The long established cost-accounting practice in the window-glass industry, both domestic and foreign, has been to arrive at the specific costs of particular strengths by calculation. An average cost per box

for all the strengths of glass produced during any costing period is first determined through reducing the quantity of all strengths to a common strength (single strength), which conventional quantity of total production is divided into the aggregate costs incurred for all strengths collectively. The fixed ratios employed in reducing the quantity of double-strength and triple-strength glass actually produced and recorded to a conventional quantity of single-strength glass are based on experience and are considered to represent approximately the actual, usual differences in costs as between the different strengths. By this method the calculated average cost per box for single-strength glass is finally converted into specific costs for each strength for any costing period, by employing the same ratios by means of which the average cost was determined.

The cost ratios used in the United States for converting the single-strength costs to double and triple strength costs vary with the different processes of manufacture and with different companies; the average for all plants in 1926 was 1 to 1.472 between single and double and 1 to 2.68 between single and triple strengths. For Belgium the cost ratios were the same for all companies, that is, 1 to 1.5 between single and double, and 1 to 2 between single and triple. The contrast between the Belgian and the average American sets of ratios is partly accounted for by the fact that the different strengths of glass in the two countries do not exactly correspond.

The relative amounts of the different strengths in the two countries are approximately the same, as shown in Table 16.

TABLE 16.—*Window glass: Comparison of production for companies investigated in the United States and Belgium, by strengths, together with the equivalent production in single-strength boxes and in pounds*

Thickness	United States		Belgium	
	Boxes (50 square feet)	Per cent of total	Boxes (50 square feet)	Per cent of total
1926				
Single strength.....	6,980,496	71.65	3,680,240	74.00
Double strength.....	2,578,822	26.47	1,212,883	24.40
Heavy.....	153,747	1.88	176,982	3.60
Total.....	9,713,072	100.00	4,970,105	100.00
Total as single, in boxes.....	10,867,171		5,633,532	
Total weight, in pounds.....	634,543,934		304,827,448	

† Three-sixteenths inch or 5-millimeter glass.

‡ 4-millimeter glass.

In the following tables costs for the United States and Belgium are shown per pound. The weights used in converting the production as recorded in boxes to pounds are those furnished by the various companies. A box of window glass contains almost uniformly 50 square feet—the weight of the box varies with the thickness. The average weight of 50 square feet of single-strength glass in 1926 was 58.64 pounds in the United States and 53.92 pounds in Belgium.

Included in the production for which costs were obtained in the United States was 22,422,524 pounds of glass thicker than double strength—that is, glass  $\frac{3}{8}$  inch in thickness. No glass of that thickness is produced in Belgium. The exclusion of such glass has little

effect upon the result as regards the domestic average costs for all strengths, because of the obtaining of the costs upon a single-strength basis through the use of the ratios described above. Even if the sales tax which was in effect from September 20, 1926, to March 19, 1927, were included in Belgian costs it would not affect the results of this investigation.

The extra cost of marking Belgian glass shipped to the United States since 1926 has amounted to an average of 0.6 centimes per square foot. This item has not been included in the Belgian cost as obtained for 1926.

#### Wage rates and relative productivity in the United States and Belgium.

Skilled workers in the window-glass industry of the United States received in 1926 from \$6 to \$8 per day of eight hours; semiskilled workers from \$4.50 to \$6 and unskilled workers from \$3 to \$4 per day. Available information indicates that there has been no appreciable change in the wages of window-glass workers in the United States since 1926. The wage rates in the Belgian factories are lower than those in the United States.

Wages in Belgium were increased four times in 1926. In January, 1926, the average wage in paper francs was 26.95 francs per employe (which, when converted into American dollars on the basis of exchange is \$1.22, and on the basis of cost of living, \$1.68). Wages were increased on June 1, 1926, in practically all Belgian window-glass plants; the increase amounting to 7.14 per cent. A second increase was made in July, 1926, a third in October, 1926, a fourth in November, 1926, a fifth in September, 1928, and a sixth in December, 1928. From information supplied the commission by the Comptoir General pour la Vente des Verres Fourcault it appears that the foregoing increases in wages amounted to 30.6 per cent from June, 1926, to December, 1928.

The wages paid in a representative plant in Belgium in 1928, converted into United States dollars, are given below:

	Francs per day (8 hours)	Converted into United States dollars on basis of—	
		Rate of exchange †	Cost of living index ‡
Average wage paid.....	31.90	\$0.97	\$1.99
Wages of boys.....	9.00-16.35	.25- .45	.51- .92
Wages of women.....	12.10	.31	.70
Highest wage paid, foreman.....	39.15	1.09	2.23

† Rate of exchange April, 1928, 1 franc=27½ cents.

‡ Cost of living index, April, 1928=205, based on 1921=100.

The workers in the Belgian window-glass plants are organized in four crafts unions. In all except one of the Fourcault plants the unions are recognized by their employers, wages being determined by collective bargaining. Although the employers are not formally organized in labor matters, informal understandings result in uniformity in wage rates and working conditions throughout the industry.

From data obtained in the commission's cost of production investigation the relative productivity of workmen in the United States and Belgian factories may be calculated.

Table 17 shows the number of days operated, the average number of employees, production in boxes, and the average production in boxes per man-day for the cost period 1926-27.

TABLE 17.—*Window glass: United States and Belgium—Comparison of production per man-day, 1926-27*

	Total days operated	Average number of employees per plant	Total man-days	Production in boxes (50 square feet)	Average production per man-day in boxes (50 square feet)
United States <sup>1</sup> .....	6,295	331	2,102,611	10,867,171	5.17
Belgium <sup>2</sup> .....	2,200	372.3	852,767	3,020,421	3.54

<sup>1</sup> Includes 25 plants.

<sup>2</sup> Includes 8 plants.

### Raw material prices.

The rapid depreciation of Belgian currency beginning in March, 1926, was reflected at once in the prices of raw materials used in the manufacture of window glass. This rise was not immediately checked with the stabilization of the franc in October. Materials such as coal, the price of which in Belgium is determined by the prices of imports, responded first to the inflation and such prices reached their peak in January, 1927. Other materials such as soda, cullet, salt cake, lime, and sand, which are of Belgian production and priced in Belgium, responded more slowly; but their increase continued for six months or more after the currency depreciation had ended. In general the tendency of material prices has been downward since the middle of 1927. Table 18 gives a comparison between United States and Belgian raw materials prices (delivered at plant).

TABLE 18.—*Window glass: United States and Belgium—Comparison of raw-material delivered prices, 1926*

[Per short ton]

Raw material	United States	Belgium
Sand.....	\$3.81	\$0.66
Soda.....	20.99	15.57
Salt cake.....	22.84	11.08
Lime.....	7.18	1.09

### Costs.

*United States.*—The specific items of cost taken from monthly and yearly cost sheets, as submitted by each company, were verified by the commission's agents by examination of the companies' books. From these cost data and the production data a total unit cost per box (50 square feet) and per pound was computed.

Table 19 shows the weighted average cost of production in cents per pound for the costed plants grouped according to processes of manufacture, and the weighted average cost for all plants combined. The costs for the two-hand cylinder-process plants are included in the cylinder-process group. Of the total production for all plants investigated 34.2 per cent was produced by the 3 plants using the Libbey-Owens sheet-drawing process, 6.7 per cent by the 3 plants using the Fourcault sheet-drawing process, 58 per cent by the 16 plants using the machine-cylinder process, and 1.1 per cent by the two plants using the hand-cylinder process.

TABLE 19.—*Window glass: Weighted average cost of production in United States by processes of manufacture, for the year 1926*

[Cents per pound]

Item	Sheet-drawing process plants <sup>1</sup>	Cylinder-process plants <sup>1</sup>	Weighted average for all plants
Direct labor.....	0.90	1.61	1.34
Power and heat.....	.435	.65	.59
Raw materials.....	.655	.54	.59
Manufacturing materials and supplies.....	.39	.46	.43
Repairs and maintenance.....	.245	.19	.21
General plant overhead.....	.74	.64	.69
General office overhead.....	.14	.12	.13
Total cost f. o. b. plant.....	3.565	4.21	3.98
Imputed interest at 6 per cent on fixed assets.....	.295	.25	.26
Total cost f. o. b. plant including imputed interest.....	3.86	4.46	4.24
Selling expense.....	.07	.10	.09
Total cost f. o. b. plant including imputed interest and selling expense.....	3.93	4.56	4.33
Number of plants.....	6	18	24
Production in pounds.....	290, 112, 124	375, 513, 304	635, 627, 427

<sup>1</sup> Includes 3 plants operated by the Fourcault sheet-drawing process and 3 plants operated by the Libbey-Owens sheet-drawing process.

<sup>2</sup> Includes 16 plants operated by the machine-cylinder process and 2 plants operated by the hand-cylinder process. The inclusion of the costs for the two hand-cylinder plants has but a slight effect upon the average for the cylinder process group.

Table 20 shows the weighted average cost of production in cents per pound for plants grouped according to their location east or west of the Mississippi River, and the weighted average cost for all plants combined. Of the total production, 76.4 per cent was produced in the 17 plants located east of the Mississippi River and 23.6 per cent in the 7 plants located west of the Mississippi River.

TABLE 20.—*Window glass: Weighted average cost of production in United States according to geographical location of plants, for the year 1926*

[Cents per pound]

Item	Plants east of the Mississippi River <sup>1</sup>	Plants west of the Mississippi River <sup>2</sup>	Weighted average for all plants
Direct labor.....	1.37	1.29	1.34
Power and heat.....	.61	.51	.59
Raw material.....	.76	.68	.59
Manufacturing material and supplies.....	.41	.42	.43
Repairs and maintenance.....	.22	.19	.21
General plant overhead.....	.64	.84	.69
General office overhead.....	.14	.10	.13
Total cost f. o. b. plant.....	3.96	4.01	3.98
Imputed interest at 6 per cent on fixed assets.....	.27	.24	.26
Total cost f. o. b. plants including imputed interest.....	4.23	4.25	4.24
Selling expense.....	.09	.09	.09
Total cost f. o. b. plant including imputed interest and selling expense.....	4.32	4.34	4.33
Number of plants.....	17	7	24
Production in pounds.....	488, 946, 171	149, 681, 256	635, 627, 427

<sup>1</sup> Includes 3 plants operated by the Fourcault sheet-drawing process, 21 plants operated by the Libbey-Owens sheet-drawing process, 2 plants operated by the hand-cylinder process, and 10 plants operated by the machine-cylinder process.

<sup>2</sup> Includes 1 plant operated by the Libbey-Owens sheet-drawing process and 6 plants operated by the machine-cylinder process.

*Belgium.*—The same form of schedule as that used in obtaining United States costs was used in obtaining Belgian costs. The specific items of cost shown on this schedule were verified by the commission's agents by examination of the company's books, and from these detailed items of cost and the amounts of production a total cost per box (50 square feet) of window glass for each company and a weighted average cost per box and per pound for all companies were computed.

Table 21 shows the Belgian unit costs in francs and in cents per pound for plants grouped according to processes of manufacture and the weighted average cost for all plants combined.

TABLE 21.—*Window glass: Weighted average cost of production in Belgium for 1926 for plants grouped according to process of manufacture in francs and cents per pound* [Per pound]

Item	Sheet-blowing process plants		Cylinder-process plants		Weighted average for all plants	
	Francs	Cents	Francs	Cents	Francs	Cents
Direct labor.....	0.1185	0.36	0.2893	1.00	0.1581	0.51
Power and heat.....	.1326	.49	.1818	.62	.1418	.45
Raw material.....	.0691	.30	.0617	.21	.0906	.28
Manufacturing material and supplies.....	.1210	.38	.0724	.31	.1178	.37
Repairs and maintenance.....	.0478	.14	.0191	.06	.0395	.13
General plant overhead.....	.0956	.19	.0321	.11	.0677	.17
General office overhead.....	.0130	.04	.0109	.04	.0134	.04
Total cost f. o. b. plant.....	.5965	1.81	.6951	2.38	.6222	1.95
Imputed interest at 6 per cent on fixed assets.....	.0900	.09	.0267	.09	.0292	.09
Total cost f. o. b. plant including imputed interest.....	.6265	1.90	.7218	2.47	.6514	2.04
Transportation in Belgium to Antwerp.....	.0167	.05	.0167	.05	.0167	.05
Total cost including transportation in Belgium.....	.6462	1.95	.7385	2.52	.6681	2.09
Selling expense.....	.0030	.01	.0024	.00	.0024	.01
Total cost f. o. b. plant including imputed interest, transportation in Belgium, and selling expense.....	.6492	1.96	.7409	2.52	.6705	2.10
Number of plants.....	10		13		13	
Production in pounds.....	233,588,385		71,233,093		304,827,448	

### Costs f. o. b. plant, United States and Belgium.

Tables 22 and 23 show comparisons of the weighted average costs of production of window glass for the United States and for Belgium for the year 1926.

TABLE 22.—*Window glass: United States and Belgium. Comparison of the weighted average costs of production per pound, by items of expense, 1926* [Cents per pound]

Item	United States <sup>1</sup>	Belgium <sup>2</sup>
Direct labor.....	1.31	0.51
Power and heat.....	.50	.45
Raw materials.....	.50	.28
Manufacturing materials and supplies.....	.43	.37
Repairs and maintenance.....	.21	.13
General plant overhead.....	.69	.17
General office overhead.....	.13	.04
Total cost f. o. b. plants.....	3.98	1.95
Imputed interest.....	.26	.09
Total cost with imputed interest.....	4.24	2.04
Selling expense.....	.09	.01
Total with selling expense.....	4.33	2.05

<sup>1</sup> Includes 24 plants, the production of which amounted in 1926 to 635,627,427 pounds.

<sup>2</sup> Includes 13 plants, the production of which amounted in 1926 to 304,827,448 pounds.



TABLE 23.—Window glass: United States and Belgium. Comparison of the weighted average costs of production per pound for plants using the sheet-drawing processes, 1926

[Cents per pound]

Item	United States <sup>1</sup>	Belgium <sup>2</sup>
Direct labor.....	0.90	0.36
Power and heat.....	.495	.40
Raw materials.....	.635	.30
Manufacturing materials and supplies.....	.39	.38
Repairs and maintenance.....	.245	.14
General plant overhead.....	.74	.19
General office overhead.....	.14	.04
Total cost f. o. b. plant.....	3.565	1.81
Imputed interest.....	.295	.09
Total cost with imputed interest.....	3.86	1.90
Selling expense.....	.07	.01
Total with selling expense.....	3.93	1.91

<sup>1</sup> Includes 3 plants operated by the Fourcault sheet-drawing process and 3 plants operated by the Libbey-Owens sheet-drawing process. Production 260,112,123 pounds.

<sup>2</sup> Includes 10 plants operated by the Fourcault sheet-drawing process. Production 233,588,385 pounds.

The cost of production of window glass for the "Compagnie Internationale pour la Fabrication Mecanique du Verre," the company using the Libbey-Owens sheet-drawing process in Belgium, which is understood to be lower than the cost of production for the companies using the Fourcault process, was not secured by the commission. This company by an agreement with the American Libbey-Owens company is prohibited from exporting to the United States window glass produced by its drawing machines. The production of window glass by the Libbey-Owens process in Belgium, in 1926, amounted to 12.2 per cent of the total Belgian production for that year.

## MARKETING

*Methods of selling Belgian window glass.*—Since January 1, 1928, window glass produced by mechanical process in Belgium has been distributed to foreign markets largely through a central selling organization, the previously described Comptoir Fourcault. This organization, including 12 of the 14 Belgian Fourcault companies, has a sales agent in New York who receives credit for all of the sales of the Comptoir in the United States. The remaining Belgian companies that export to the United States—those producing glass by the hand-blown method and the two Fourcault companies not affiliated with the Comptoir—sell their exports to the United States through dealers in Belgium. The Libbey-Owens process concern located in Belgium does not export to the United States.

Belgian window glass exported to the United States through dealers in Belgium is handled after arrival in this country by American importing brokers and jobbers. The importing brokers, although they serve in the capacity of middlemen buying the glass from dealers in Belgium and selling to United States wholesale dealers and large consumers in contract lots, do not, as a rule, carry a stock of glass in warehouses. The prices at which they buy are usually quoted f. o. b. Antwerp, and the prices at which they sell are prices delivered to the nearest American port or to the point of final destination. The

American jobbers who handle both imported and domestic glass are located in the principal cities on the Atlantic and Pacific coasts and in some of the larger interior cities. These jobbers have warehouses in the cities where their headquarters are established and sometimes in other cities. They usually buy in large quantities from the Belgian dealers, direct at prices f. o. b. Antwerp, or c. i. f. American port, and sell to sash and door manufacturers, contractors, and retailers making delivery from stock on hand at their nearest warehouse.

*Methods of selling domestic product.*—The larger portion of window glass produced in the United States is sold by traveling salesmen representing the manufacturers and jobbers, principally to sash and door manufacturers, contractors, and jobbers, the last named often serving as exclusive distributing agents for a particular company's product in a certain territory. Some of the larger producers, who cover the entire United States through their sales organization, maintain offices in the principal cities to facilitate getting contracts, and also warehouses to facilitate deliveries. Window glass is usually sold in carload lots (500-700 boxes); often as many as 150,000 boxes are ordered at a time by a large consumer. Prices are quoted f. o. b. factory with freight equalized with Pittsburgh, Columbus, or Kansas City—whichever is nearest to destination. Some of the domestic producers of window glass have more than one factory, and shipments from each to the various areas of consumption are usually controlled by considerations of economy in freight rates. Varying conditions of operation and of demand in different territories, kinds of specifications, financial affiliations with consumers, and other considerations often influence the distribution of shipments from particular plants.

*Localization of markets and competition.*—Inasmuch as window glass is used wherever there are dwelling houses, no distinctive centers of consumption exist in the United States other than certain places where important sash and door factories are located. For the most part distribution corresponds with density of population, and the principal markets are merely the larger cities. Based on 1926 figures of domestic sales, approximately 37 per cent of the total analyzed shipments of domestic window glass in 1926 (covering over 92 per cent of the total domestic production of that year) were consigned to markets within a radius of 325 miles of Indianapolis. Approximately 74 per cent of the analyzed domestic sales were to markets east of the Mississippi. Of individual cities, Chicago was first with 9 per cent, and New York second with 7.6 per cent. About 35 per cent of the total domestic shipments were received by New York and cities within 325 miles of New York. The distribution of domestic window glass by individual States and cities is shown in Chart III on page 31 and in Table 24 on page 32. The Pacific coast group of States takes  $7\frac{1}{2}$  per cent of the total, the Atlantic coast and Gulf group  $45\frac{1}{2}$  per cent, and the remaining States making up the interior of the country, 47 per cent.

As regards the distribution of sales and of consumption of Belgian imports of window glass within the United States, available information is less complete and conclusive because it is based upon statistics of shipments to customs districts and ports of entry, coastal and interior, and some Belgian glass is sold and consumed in States and cities other than those at which it is entered. Most of it, however finds a market not far distant from the places of customs entry.

# DISTRIBUTION OF DOMESTIC WINDOW GLASS, BY STATES

1926  
POUNDS (gross weight)

Note- Total shipments 678,208,723 or over 92 per cent of total sales of all domestic companies.

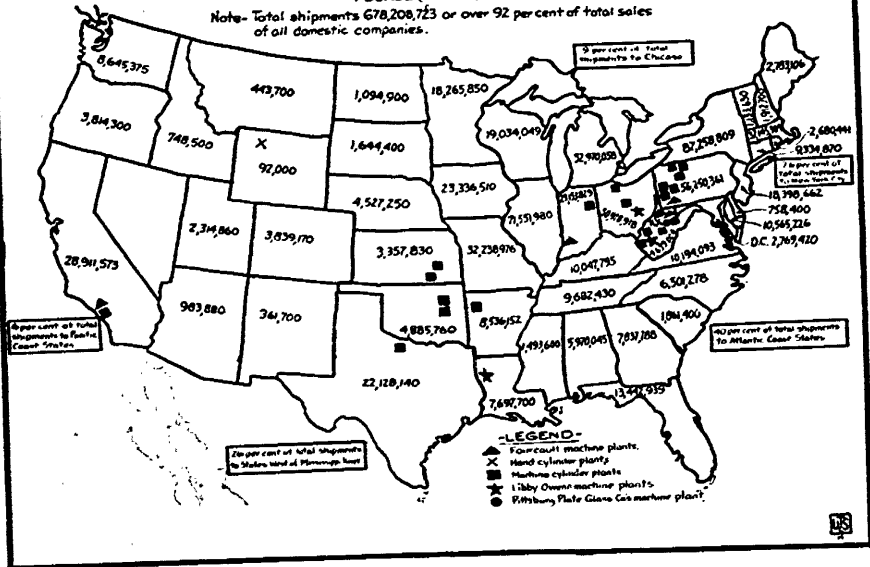


TABLE 24.—Window glass: Distribution of the domestic product from the plants collectively to the leading markets in the United States, 1928<sup>1</sup>

[Source: Shipment records of domestic producers. Shipments given in the following table represent shipments from plants producing over 92 per cent of the domestic window glass production]

Market	Shipments of domestic companies	
	Pounds	Per cent of total
New York.....	51,699,981	7.62
Boston.....	31,592,780	4.66
Philadelphia.....	23,967,308	3.53
Baltimore.....	8,591,880	1.27
Newark.....	5,038,410	.74
Richmond.....	4,528,250	.67
Jacksonville.....	4,411,910	.65
Others.....	52,212,973	7.70
Atlantic seaboard.....	182,041,590	26.84
New Orleans.....	4,933,100	.73
Houston.....	3,000,740	.45
Tampa.....	2,942,778	.43
Others.....	8,037,225	1.19
Gulf seaboard.....	18,933,843	2.80
Los Angeles.....	16,627,763	2.45
San Francisco.....	8,532,230	1.26
Seattle.....	5,017,365	.74
Portland.....	3,759,900	.55
Others.....	7,433,970	1.10
Pacific seaboard.....	41,371,248	6.10
Chicago.....	60,811,030	8.96
Detroit.....	21,800,513	3.22
Buffalo.....	11,776,600	1.74
Milwaukee.....	10,806,649	1.59
Cleveland.....	10,529,900	1.55
Toledo.....	9,766,130	1.44
Others.....	31,786,690	4.69
Great Lakes.....	137,277,532	23.19
St. Louis.....	21,606,000	3.17
Pittsburgh.....	14,869,280	2.15
Cincinnati.....	13,461,745	1.98
Indianapolis.....	12,222,225	1.80
Minneapolis.....	12,119,350	1.79
Louisville.....	9,204,770	1.36
Kansas City.....	8,788,600	1.30
Others.....	186,712,540	27.52
Interior.....	278,584,510	41.07
Total.....	678,208,723	100.00

The existing markets for Belgian window glass in the United States are far more localized than are the markets for the domestic product. Eight cities, four on the North Atlantic coast and four on the Pacific coast, received 84 per cent of the total imports from Belgium in 1926. All the other ports of entry, exclusive of Rochester and St. Louis (where the imports are mostly not common window glass but a special flat glass used for photographic plates), received that year 3 per cent of the total Belgian imports. In contrast, in those States where these scattering Belgian sales amounted to 3 per cent of the total, the domestic sales in 1926 were 69 per cent of the total.

Table 25 shows imports of Belgian window glass, by principal ports of entry in the United States, grouped geographically:

TABLE 25.—*Window glass: Imports from Belgium by principal ports of entry of the United States, grouped geographically, 1926*<sup>1</sup>

Port of entry	Quantity entered	
	Pounds (net)	Per cent of total
New York.....	22,973,538	38.82
Boston.....	4,103,922	6.93
Philadelphia.....	1,825,207	3.07
Baltimore.....	514,815	.92
Galveston.....	61,707	.10
New Orleans.....	40,043	.07
Others.....	202,397	.37
Atlantic and Gulf coast.....	29,758,599	50.28
San Francisco.....	10,245,844	17.31
Los Angeles.....	5,077,309	8.23
Portland, Oreg.....	2,140,233	3.67
Seattle.....	2,076,523	3.55
Pacific coast.....	19,609,809	33.79
Rochester <sup>2</sup> .....	5,165,213	8.72
St. Louis <sup>2</sup> .....	3,097,993	5.22
Chicago.....	362,538	.60
Detroit.....	507,684	.82
Others.....	526,538	.87
Interior places.....	9,459,068	15.93
Total.....	59,188,376	100.00

<sup>1</sup> Commerce and Navigation of the United States.

<sup>2</sup> Imports entered at Rochester and St. Louis consist principally of thin window glass used in the manufacture of photographic plates.

## TRANSPORTATION

*Charges on imported window glass from plants in Belgium.*—Belgian window glass exported to the United States is concentrated for export at the port of Antwerp. The weighted average freight charges from the plants to Antwerp, together with the loading charges at Antwerp, have been included (both in francs and converted into American money) in the Belgian costs of production as set up f. o. b. Antwerp. From Antwerp shipments move to the Atlantic, Gulf, and Pacific ports at varying ocean rates. The total charges incurred in moving window glass from Antwerp to the principal seaboard ports of entry in the United States are given in Table 26. Through rates and charges from Antwerp, including inland rates from the American ports of importation to interior centers of consumption, are shown in Table 27.

## WINDOW GLASS

TABLE 26.—*Window glass: Transportation and other charges from Antwerp to the principal seaboard ports of entry in the United States, 1926*

(Cents per 100 pounds net)

To—	Ocean freight	Marine insurance	Wharfage charge at pier	Customs entry fee and consular invoice	Total
Boston.....	26.0	0.5	1.7	1.0	29.2
New York.....	26.0	.5	8.0	1.0	35.5
Philadelphia.....	29.0	.5	1.7	1.0	32.2
Baltimore.....	29.0	.5	1.7	1.0	32.2
Average, North Atlantic ports.....	27.5	.5	3.28	1.0	32.3
Galveston.....	26.65	1.0	1.7	1.0	30.35
New Orleans.....	26.65	1.0	1.7	1.0	30.35
Average, Gulf ports.....	26.65	1.0	1.7	1.0	30.35
Los Angeles.....	37.0	1.5	16.25	1.0	55.75
San Francisco.....	37.0	1.5	1.0	1.0	40.50
Portland.....	37.0	1.5	3.25	1.0	42.75
Seattle.....	37.0	1.5	3.25	1.0	42.75
Average, Pacific coast ports.....	37.0	1.5	5.94	1.0	45.44
Average, all ports.....	31.13	1.0	4.02	1.0	37.15

<sup>1</sup> On shipments for Los Angeles there is a wharfage charge of 7.15 per 100 pounds at the Wilmington dock and a handling charge of 9.1 per 100 pounds from this dock to Los Angeles.

<sup>2</sup> There is no wharfage charge at San Francisco but a State toll of 1 cent per 100 pounds is charged at this port.

TABLE 27.—*Window glass: Freight rates from Antwerp and from principal American ports to certain interior centers of consumption in the United States, 1926*

(Cents per 100 pounds)

To—	From—				
	Antwerp	New York <sup>1</sup>	Baltimore <sup>1</sup>	New Orleans <sup>1</sup>	San Francisco
Rochester.....	163.55	37.05	37.05	148.2	.....
Pittsburgh.....	166.80	44.2	40.3	115.7	.....
Cleveland.....	174.60	52.0	48.1	115.7	.....
Detroit.....	179.8	57.2	53.3	115.7	.....
Chicago.....	196.05	73.45	69.55	110.5	.....
Indianapolis.....	190.85	68.25	64.35	108.55	.....
St. Louis.....	186.75	85.8	81.9	94.25	265.2
Omaha.....	195.9	125.45	121.55	131.3	233.35
Denver.....	154.9	.....	190.8	127.75	140.4

<sup>1</sup> All rail.<sup>2</sup> Ocean and rail.<sup>3</sup> Ocean, Mississippi River and rail.<sup>4</sup> Mississippi River and rail.<sup>5</sup> Mississippi River.

The total ocean transportation charges, Antwerp to New York, of 35.5 cents per 100 pounds including landing charges at New York, apply to approximately 39 per cent of the total United States imports of window glass from Belgium. Total ocean transportation charges, including landing charges, Antwerp to Boston, Philadelphia, and Baltimore cover approximately 11 per cent of total imports. Total transportation charges by sea including port of importation landing charges at Seattle, Portland, San Francisco, and Los Angeles, apply to about 34 per cent of the total imports. Shipments from Antwerp to all other ports of importation in the United States, such as New Orleans and Galveston, are small, amounting to only a little more than 100,000 pounds in 1926.

*Charges borne by domestic window glass.*—The statements made above with respect to the localization of markets for domestic glass, applied to the distribution of the product of the domestic industry as a whole. The industry is made up of different plants and different producing areas, or districts, and the actual transportation charges incurred per hundred pounds of product, are the rates from those shipping points, or groups of shipping points, to certain particular markets supplied by them. The freight rates from individual plants within a producing area to any particular market are usually the same; and often two competitive producing areas are given a common, commodity rate, as it is called, to a certain important market. In a general way the amount of railroad freight charges corresponds with distance, but only in a general way. Rates are sometimes blanketed not only with respect to points of origin, but also with respect to points of destination, a number of them being treated as one transportation terminus. Such rates create a common market, so far as transportation is concerned for a large section of the country.

Thus, three of the more important shipping points in the Pennsylvania producing district and three in the West Virginia district have a common rate, regardless of varying distances, of 47.4 cents per 100 pounds (net) to the market of Boston; the same six places have a common rate of 44.2 cents to New York, and a common rate of 55.0 cents to St. Louis. All the shipping points in the West Virginia producing district and three in Pennsylvania have a common commodity rate on window glass to Chicago of 44.2 cents; and all the shipping points in the Pennsylvania district and three in West Virginia have a common rate of 93.6 cents for a combined rail and water haul to Los Angeles, San Francisco, Seattle, and Portland, Oreg. The total cost incurred in reaching individual Pacific coast cities, however, varies somewhat because of differences in landing charges; those at Los Angeles, as already brought out, being much higher than those at the other Pacific ports. Table 28 gives the freight rates from individual domestic plants to seaboard markets in the United States.

TABLE 28.—Window glass: Freight rates from the various plants to certain sea-board ports and Chicago, 1926 (carload shipments)

[Source: Interstate Commerce Commission, United States Shipping Board, Conference Tariffs of the Intercoastal Steamship Companies]

[Cents per 100 pounds, net]

	To—					
	New York <sup>1</sup>	Baltim-ore <sup>1</sup>	Jackson-ville <sup>1</sup>	New Orleans <sup>1</sup>	San Fran-cisco <sup>1</sup>	Chicago <sup>1</sup>
From plants east of the Mississippi River:						
Arnold, Pa.....	44.2	40.3	169.6	85.2	93.6	44.2
Jeannette, Pa.....	44.2	40.3	169.6	78.0	93.6	44.2
Kane, Pa.....	41.6	40.3	185.2	97.5	93.6	51.4
Monongahela, Pa.....	44.2	40.3	191.6	78.0	93.6	44.2
Mt. Jewett, Pa.....	41.6	40.3	85.2	97.5	93.6	51.4
Weston, W. Va.....	41.2	40.3	91.6	85.2	93.6	44.2
Dunbar, W. Va.....	54.6	50.7	64.4	78.0	104.0	44.2
Clarksburg, W. Va.....	44.2	40.3	91.6	85.2	93.6	44.2
Charleston, W. Va.....	54.6	50.7	64.4	78.0	98.2	44.2
Sistersville, W. Va.....	51.4	47.4	91.6	78.0	100.8	44.2
Salem, W. Va.....	44.2	40.3	91.6	85.2	93.6	44.2
Lancaster, Ohio.....	57.2	53.3	91.6	76.0	106.6	39.6
Hartford City, Ind.....	66.3	62.4	91.6	74.8	115.7	31.2
Vincennes, Ind.....	73.4	69.6	85.8	63.0	109.2	34.4
Unweighted average rate.....	50.4	46.9	83.2	81.4	98.8	43.3
From plants west of the Mississippi River:						
Okmulgee, Okla.....	102.0	123.5	94.9	50.0	102.7	54.0
Ft. Smith, Ark.....	102.0	123.5	81.2	50.0	102.7	54.0
Wichita Falls, Tex.....	102.0	128.0	100.1	76.0	100.8	83.2
Fredonia, Kans.....	128.0	123.5	113.1	76.0	117.0	54.0
Shreveport, La.....	72.2	95.6	81.2	124.0	77.4	63.7
Torrance, Calif.....	65.0	85.0	65.0	165.0	37.7	133.9
Santa Ana, Calif.....	78.6	78.6	78.6	78.0	150.7	147.6
Unweighted average rate.....	92.8	105.4	87.8	60.7	84.1	84.4
Unweighted average from all plants.....	64.6	66.4	84.8	74.5	93.0	56.9

<sup>1</sup> All rail.<sup>2</sup> Average of all rail and rail and water rates.<sup>3</sup> Rail and water. Includes marine insurance, Intercoastal 1 cent, coastwise ¼ cent per 100 pounds.

Note.—To the rates given above for San Francisco via rail and water (Panama Canal route) a State toll of 1 cent per 100 pounds is incurred.

Practically all the domestic window glass shipped to the eastern markets, such as New York, Boston, and Philadelphia was shipped from the nearest groups of plants located in the eastern part of the United States, in Pennsylvania and West Virginia. On the other hand certain other markets were supplied largely from groups of plants which enjoy little or no advantage over other groups in their location and the resulting freight rates to those markets. Chicago, for instance, was supplied principally from West Virginia, although the freight rates are not less than those from Pennsylvania. Pacific coast markets, in contrast, received a considerable portion of their supply of window glass from the Pennsylvania district, and none from West Virginia, although the rates from a number of West Virginia plants to the Pacific coast are the same as from the Pennsylvania plants.

Table 29 shows shipments and transportation charges from the different producing districts to 16 important markets of the United States, covering practically all geographic sections and representing over 50 per cent of the total domestic shipments for 1926.



TABLE 29.—Window glass: United States: Movements and transportation charge for the domestic product from each producing district to principal markets, 1926

Producing district	West Virginia <sup>1</sup>	Pennsylvania <sup>2</sup>	South-western <sup>3</sup>	Ohio-Indiana <sup>4</sup>	Pacific coast <sup>5</sup>	All districts
Shipments to all markets, in pounds.....	181,477,923	176,899,702	96,663,504	57,826,546	8,801,043	521,699,018
CHICAGO						
Shipments to this market, in pounds.....	21,000,045	9,759,344	7,814,503	8,201,636	.....	46,777,728
Shipments to this market, per cent of total.....	12.0	5.5	8.1	14.2	.....	9.1
Receipts in this market originating in above producing district—per cent.....	44.9	20.9	16.7	17.5	.....	100.0
Weighted average transportation cost from plants in producing district to this market (cents per 100 pounds).....	44.2	47.7	54.6	33.7	.....	44.7
NEW YORK						
Shipments to this market, in pounds.....	26,761,466	12,542,120	.....	465,613	.....	39,769,207
Shipments to this market, per cent of total.....	12.0	7.1	.....	0.8	.....	7.6
Receipts in this market originating in above producing district—per cent.....	67.3	31.5	.....	1.2	.....	100.0
Weighted average transportation cost from plants in producing district to this market (cents per 100 pounds).....	51.6	43.0	.....	57.2	.....	49.0
BOSTON						
Shipments to this market, in pounds.....	3,045,449	20,433,617	.....	.....	.....	24,379,066
Shipments to this market, per cent of total.....	2.0	11.0	.....	.....	.....	4.68
Receipts in this market originating in above producing district—per cent.....	16.0	84.0	.....	.....	.....	100.0
Weighted average transportation cost from plants in producing district to this market (cents per 100 pounds).....	56.4	46.8	.....	.....	.....	48.4
LOS ANGELES AND SAN FRANCISCO						
Shipments to this market, in pounds.....	.....	6,637,228	4,450,355	129,731,700	8,510	19,353,854
Shipments to this market, per cent of total.....	.....	3.9	4.65	0.23	88.7	3.72
Receipts in this market originating in above producing district—per cent.....	.....	35.8	23.2	0.67	40.33	100.0
Weighted average transportation cost from plants in producing district to this market (cents per 100 pounds).....	.....	100.3	189.1	131.9	20.6	65.96
PHILADELPHIA						
Shipments to this market, in pounds.....	6,748,837	11,687,541	.....	.....	.....	18,436,378
Shipments to this market, per cent of total.....	3.7	6.7	.....	.....	.....	3.54
Receipts in this market originating in above producing district—per cent.....	36.6	63.4	.....	.....	.....	100.0
Weighted average transportation cost from plants in producing district to this market (cents per 100 pounds).....	48.36	41.6	.....	.....	.....	44.07
DETROIT						
Shipments to this market, in pounds.....	9,511,431	3,806,691	.....	3,436,117	.....	16,754,239
Shipments to this market, per cent of total.....	5.3	2.2	.....	6.2	.....	3.2
Receipts in this market originating in above producing district—per cent.....	56.8	22.7	.....	20.5	.....	100.0
Weighted average transportation cost from plants in producing district to this market (cents per 100 pounds).....	39.5	38.48	.....	33.8	.....	38.09
ST. LOUIS						
Shipments to this market, in pounds.....	1,955,151	5,886,324	4,746,523	2,955,078	.....	16,543,076
Shipments to this market, per cent of total.....	1.6	3.3	4.9	5.1	.....	3.2
Receipts in this market originating in above producing district—per cent.....	17.8	35.6	28.8	17.8	.....	100.0
Weighted average transportation cost from plants in producing district to this market (cents per 100 pounds).....	50.57	53.69	47.58	35.62	.....	49.01

See footnotes at end of table.

TABLE 29.—*Window glass: United States. Movements and transportation charge for the domestic product from each producing district to principal markets, 1926—Continued*

Producing district	West Virginia <sup>1</sup>	Pennsylvania <sup>1</sup>	South-western <sup>1</sup>	Ohio-Indiana <sup>1</sup>	Pacific coast <sup>2</sup>	All districts
Shipments to all markets, in pounds <sup>1</sup> .....	181,477,923	176,899,702	96,693,804	57,824,516	8,801,043	521,699,018
<b>PITTSBURGH</b>						
Shipments to this market, in pounds.....	8,060,615	6,114,956		30,709		11,204,370
Shipments to this market, per cent of total.....	2.79	3.46		0.05		2.16
Receipts in this market originating in above producing district—per cent.....	45.15	54.57		0.28		100.0
Weighted average transportation cost from plants in producing district to this market (cents per 100 pounds).....	35.4	18.0		33.15		26.43
<b>MINNEAPOLIS</b>						
Shipments to this market, in pounds.....	2,053,000	2,798,385	3,706,616	2,669,347		11,227,348
Shipments to this market, per cent of total.....	1.13	1.59	3.83	4.62		2.16
Receipts in this market originating in above producing district—per cent.....	18.3	24.9	33.0	21.8		100.0
Weighted average transportation cost from plants in producing district to this market (cents per 100 pounds).....	78.0	78.7	82.5	61.3		67.99
<b>CINCINNATI</b>						
Shipments to this market, in pounds.....	4,700,497	3,974,276		2,240,673		10,915,446
Shipments to this market, per cent of total.....	2.59	2.19		3.88		1.98
Receipts in this market originating in above producing district—per cent.....	43.6	36.4		20.0		100.0
Weighted average transportation cost from plants in producing district to this market (cents per 100 pounds).....	26.6	38.6		22.4		30.11
<b>INDIANAPOLIS</b>						
Shipments to this market, in pounds.....	6,027,807	553,385		2,820,520		9,401,712
Shipments to this market, per cent of total.....	3.0	0.3		4.9		1.82
Receipts in this market originating in above producing district—per cent.....	64.1	5.9		30.0		100.0
Weighted average transportation cost from plants in producing district to this market (cents per 100 pounds).....	34.71	41.85		24.57		33.81
<b>BUFFALO</b>						
Shipments to this market, in pounds.....	314,531	8,713,469		923		9,058,923
Shipments to this market, per cent of total.....	0.19	4.93				1.74
Receipts in this market originating in above producing district—per cent.....	3.8	96.2				100.0
Weighted average transportation cost from plants in producing district to this market (cents per 100 pounds).....	38.70	26.04		46.8		26.52
<b>MILWAUKEE</b>						
Shipments to this market, in pounds.....	5,688,639	961,384	595,231	1,068,424		8,313,578
Shipments to this market, per cent of total.....	3.13	0.54	0.62	1.85		1.69
Receipts in this market originating in above producing district—per cent.....	68.4	11.56	7.14	12.9		100.0
Weighted average transportation cost from plants in producing district to this market (cents per 100 pounds).....	48.1	48.3	72.14	33.2		48.57
<b>CLEVELAND</b>						
Shipments to this market, in pounds.....	5,607,576	2,211,499		280,846		8,099,921
Shipments to this market, per cent of total.....	7.6	1.3		0.5		1.2
Receipts in this market originating in above producing district—per cent.....	69.2	27.3		3.6		100.0
Weighted average transportation cost from plants in producing district to this market (cents per 100 pounds).....	35.88	29.38		34.45		34.06

See footnotes at end of table.

TABLE 29.—*Window glass: United States. Movements and transportation charge for the domestic product from each producing district to principal markets, 1926—Continued*

Producing district	West Virginia <sup>1</sup>	Pennsylvania <sup>1</sup>	South-western <sup>1</sup>	Ohio-Iadiana <sup>1</sup>	Pacific coast <sup>1</sup>	All districts
Shipments to all markets, in pounds <sup>1</sup> .....	181, 477, 923	176, 699, 702	96, 693, 504	57, 826, 546	8, 801, 043	521, 699, 018
TOLEDO						
Shipments to this market, in pounds.....	5, 773, 212	358, 846	613, 923	766, 461	.....	7, 512, 442
Shipments to this market, per cent of total.....	3.18	0.20	0.633	1.33	.....	1.41
Receipts in this market originating in above producing district—per cent.....	76.78	4.77	8.17	10.28	.....	100.0
Weighted average transportation cost from plants in producing district to this market (cents per 100 pounds).....	36.00	35.10	91.65	30.40	.....	40.59
LOUISVILLE						
Shipments to this market, in pounds.....	4, 067, 209	698, 307	97, 077	2, 218, 000	.....	7, 080, 693
Shipments to this market, per cent of total.....	2.24	0.395	0.10	3.84	.....	1.35
Receipts in this market originating in above producing district—per cent.....	67.44	9.86	1.37	31.33	.....	100.0
Weighted average transportation cost from plants in producing district to this market (cents per 100 pounds).....	37.99	42.00	74.83	29.98	.....	36.46

<sup>1</sup> Not weight.

<sup>2</sup> Includes plants at Clarksville, Weston, Salem, Sistersville, Charleston, and Dunbar.

<sup>3</sup> Includes plants at Kane, Mount Jewell, Arnold, Jeannette, and Monongahela.

<sup>4</sup> Includes plants at Shreveport, La., Wichita Falls, Tex., Okmulgee, Okla., Fort Smith, Ark., and Fredonia, Kans.

<sup>5</sup> Includes plants at Lancaster, Ohio, Hartford City, Ind., and Vincennes, Ind.

<sup>6</sup> Includes plants at Torrence and Santa Ana, Calif.

<sup>7</sup> Includes: On shipments to Los Angeles a charge of 17.75 cents per 100 pounds (marine insurance 1.5 cents, wharfage charge 7.15 cents, and freight from the port of Wilmington to Los Angeles proper 9.1 cents per 100 pounds); and on shipments to San Francisco marine insurance of 1.5 cents and a State toll charge of 1 cent per 100 pounds.

### FINAL COST COMPARISONS

Table 30 given below shows comparison between the United States and Belgian costs on the basis of costs of production, plus transportation costs to New York City for the year 1926.

The transportation costs shown in this table with respect to Belgian glass include the average freight charge from plants in Belgium to Antwerp, the ocean rate from Antwerp to New York, marine insurance, consular and customs fees, and wharfage charge at New York. The average transportation charge in Belgium from plants to Antwerp in 1926 amounted to 0.05 cent per pound (see p. 23). The transportation and other charges from Antwerp to New York in 1926 amounted to 0.355 cent per pound, making a total transportation charge from Belgian plants to New York City of 0.405 cent per pound. (Details of these charges are shown in Table 26, p. 34).

The transportation costs with respect to domestic glass are given in Table 30 in two ways, A and B:

(A) The weighted average freight charge incurred on actual shipments of window glass from domestic plants to New York City in 1926. This amounted to 0.49 cent per pound (see Table 29).

(B) The weighted average freight rate for transporting the entire production of window glass in 1926 of the plants east of the Mississippi River to New York City, regardless of actual shipments. This amounted to 0.51 cent per pound.

TABLE 30.—*Window glass: Comparison of United States and Belgian costs f. o. b. plants, including imputed interest and transportation costs from plants in United States and Belgium for the year 1926.*

[Cents per pound]

Item	United States	Belgium
Cost of production, f. o. b. plant including interest (see Table 22, p. —)	4.24	2.04
Transportation from plants to New York:		
Weighted by shipments from plants	.49	.405
Weighted by production of United States plants east of Mississippi River	.51	
Total cost of production including transportation from plants to New York:	4.73	2.445
Weighted by shipments from plants		
Weighted by production of United States plants east of Mississippi River	4.75	
Amount by which United States cost exceeds Belgian cost:		2.285
Weighted by shipments from plants		2.305
Weighted by production of United States plants east of Mississippi River		1.509
Weighted average duty collected on 1926 imports from Belgium		2.264
Maximum average duty permissible under sec. 315		

### SUMMARY

Findings of fact to the following effect are, in the judgment of the United States Tariff Commission, warranted by the evidence collected in the investigation and summarized in the commission's report.

1. Belgium is the principal competing country.

2. The present rates of duty on cylinder, crown, and sheet glass, unpolished, do not equalize the difference in the weighted average costs of production of cylinder, crown, and sheet glass, unpolished, in the United States and in the principal competing country.

3. *Costs including transportation.*—The weighted average costs of production of cylinder, crown, and sheet glass, unpolished, including transportation to New York City, are for the United States: (a) On the basis of transportation charge weighted by shipments, 4.73 cents per pound; and (b) on the basis of transportation charge weighted by production of plants east of the Mississippi River, 4.75 cents per pound; and for Belgium 2.445 cents per pound. Such costs for the United States exceed the costs for Belgium by: (a) 2.285 cents per pound, and (b) 2.305 cents per pound.

4. *Application of cost difference to seven rates of duty.*—The tariff act imposes seven rates of duty upon cylinder, crown, and sheet glass, unpolished, graduated according to size. The books of the manufacturers, both domestic and foreign, were kept in such a form that it was impossible to ascertain costs of production for the respective sizes included within the different duty brackets. The costs obtained therefore, were weighted average costs for producing all sizes of cylinder, crown, and sheet glass, unpolished, both in the United States and Belgium.

The weighted average rate of duty collected upon Belgian imports under the seven specific rates of duty upon cylinder, crown, and sheet glass, unpolished, during 1926 was 1.509 cents per pound. The weighted average difference in costs of production between the United States and Belgium, including transportation to New York City (transportation charge on domestic glass weighted by shipments) is 2.285 cents per pound, and (transportation charge on domestic glass weighted by production of plants east of the Mississippi

River) 2.305 cents per pound. Such differences in weighted average costs exceed the weighted average rate of duty collected during 1926 by 0.776 cent per pound and 0.796 cent per pound, or 51.4 per cent and 52.7 per cent, respectively.

Within the limitations of section 315 of the tariff act of 1922, the percentage of increase indicated by the difference in the average costs of production in the United States and in Belgium was applied to each of the rates specified in the act of 1922.

5. *Rates of duty necessary to equalize cost difference.*—The rates of duty necessary to equalize the difference in cost of production in the United States and in said principal competing country (within the limits specified in section 315 of the tariff act of 1922) are, on cylinder, crown, and sheet glass, unpolished:

	Cents per pound
Not exceeding 150 square inches.....	1. 8750
Above 150 and not exceeding 384 square inches.....	2. 0625
Above 384 and not exceeding 720 square inches.....	2. 4375
Above 720 and not exceeding 864 square inches.....	2. 6250
Above 864 and not exceeding 1,200 square inches.....	3. 0000
Above 1,200 and not exceeding 2,400 square inches.....	3. 3750
Above 2,400 square inches.....	3. 7500

Respectfully submitted.

THOMAS O. MARVIN,  
*Chairman.*  
ALFRED P. DENNIS,  
*Vice Chairman.*  
EDGAR B. BROSSARD,  
SHERMAN J. LOWELL,  
LINCOLN DIXON,  
FRANK CLARK,  
*Commissioners.*

