

# CENSUS BULLETIN.

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## AGRICULTURE.

### FLORIDA.

Hon. WILLIAM R. MERRIAM,

*Director of the Census.*

SIR: I have the honor to transmit herewith, for publication in bulletin form, the statistics of agriculture in the state of Florida, taken in accordance with the provisions of section 7 of the act of March 3, 1899. This section requires that—

The schedules relating to agriculture shall comprehend the following topics: Name of occupant of each farm, color of occupant, tenure, acreage, value of farm and improvements, acreage of different products, quantity and value of products, and number and value of live stock. All questions as to quantity and value of crops shall relate to the year ending December thirty-first next preceding the enumeration.

A "farm," as defined by the Twelfth Census, includes all the land, under one management, used for raising crops and pasturing live stock, with the wood lots, swamps, meadows, etc., connected therewith. It also includes the house in which the farmer resides, and all other buildings used by him in connection with his farming operations.

The farms of Florida, June 1, 1900, numbered 40,814, and had a value of \$40,799,838. Of this amount \$9,976,822, or 24.5 per cent, represents the value of buildings, and \$30,823,016, or 75.5 per cent, the value of land and improvements other than buildings. On the same date the value of farm implements and machinery was \$1,963,210, and that of live stock was \$11,166,016. These values, added to that of farms, give \$53,929,064, the "total value of farm property."

The products derived from domestic animals, poultry, and bees, including animals sold or slaughtered on farms, are referred to in this bulletin as "animal products." The total value of all such products, together with the value of all

crops, is termed "total value of farm products." This value for 1899 was \$18,309,104, of which amount \$4,810,524, or 26.3 per cent, represents the value of animal products, and \$13,498,580, or 73.7 per cent, the value of crops, including forest products cut or produced on farms. The total value of farm products for 1899 exceeds that reported for 1889 by \$6,222,774, or 51.5 per cent. A large part of this apparent increase doubtless is due to a more detailed enumeration in 1900 than in 1890.

The "gross farm income" is obtained by deducting from the "total value of farm products" the value of the products fed to live stock on the farms of the producers. In 1899 the reported value of products fed was \$2,118,630, leaving \$16,190,474 as the gross farm income for that year. The percentage which this amount is of the "total value of farm property" is referred to in the text of the bulletin as the "percentage of gross income upon investment." For Florida in 1899 it was 30.0 per cent. As no reports of expenditures for taxes, interest, insurance, feed for stock, and similar items have been obtained by any census, no statement of net farm income can be given.

The statistics presented in this bulletin will be treated in greater detail in the final report on agriculture in the United States, which will be published about June 1, 1902. The present publication is designed to present a summarized advance statement for Florida.

Very respectfully,

*L. G. Powers.*

*Chief Statistician for Agriculture.*

# AGRICULTURE IN FLORIDA.

## GENERAL STATISTICS.

Florida has a total land surface of 54,240 square miles, or 34,713,600 acres, of which 4,363,891 acres, or 12.6 per cent, are included in farms.

The surface of the state is level, nowhere reaching an altitude of 500 feet except at a few places along the central ridge of the peninsula. The lands of the state may, in general, be classified as hammock, high-pine, flatwood, and swamp. The hammock land is the most fertile, but is found only in small detached areas. The high-pine land is favored for horticulture, but requires heavy fertilization to insure good crops, while the flatwoods, as a rule, are suitable only for grazing purposes. The swamp land, though generally covered with valuable timber, has a very fertile, alluvial soil, and, when diked, is especially adapted to the production of rice and sugar.

In the last decade destructive frosts were a severe check to the development of agriculture in Florida, and account for the decrease since 1890 in total farm wealth shown in the tables.

### NUMBER AND SIZE OF FARMS.

The following table gives, by decades since 1850, the number of farms, the total and average acreage, and the per cent of farm land improved.

TABLE I.—FARMS AND FARM ACREAGE: 1850 TO 1900.

YEAR.	Number of farms.	NUMBER OF ACRES IN FARMS.				Per cent of farm land improved.
		Total.	Improved.	Unimproved.	Average.	
1900.....	40,814	4,863,891	1,511,653	2,852,238	106.9	34.6
1890.....	34,228	3,674,486	1,145,693	2,528,793	107.4	31.2
1880.....	23,438	3,297,324	947,640	2,349,684	146.7	28.7
1870.....	16,241	2,373,541	736,172	1,637,369	231.3	31.0
1860.....	6,563	2,320,228	654,213	2,266,015	444.6	22.4
1850.....	4,304	1,563,289	349,049	1,246,240	370.7	21.9

The number of farms in Florida has increased in every decade for the last fifty years, and so rapidly that in 1900 there were over nine times as many farms as there were in 1850 and 19.2 per cent more than there were in 1890. Except in the decade 1860 to 1870, the total acreage of farm land has also increased, but, on the whole, less rapidly than the number of farms, so that the average size of farms has decreased, being in 1900 less than one-fourth as great as in 1860. The area of improved farm land has increased in every decade since 1850, even in the decade 1880 to 1870 when the total farm acreage showed a decrease. This increase has been far more rapid in certain decades than in others, but in all decades except from 1870 to 1880, it has outstripped the increase in unimproved

land. Consequently the percentage of farm land improved has shown a considerable increase since 1850, constituting about one-third of the total farm acreage in 1900, as compared with about one-fifth in 1850.

### FARM PROPERTY AND PRODUCTS.

Table 2 presents a summary of the principal statistics relating to farm property and products for each census year, beginning with 1850.

TABLE 2.—VALUES OF SPECIFIED CLASSES OF FARM PROPERTY, AND OF FARM PRODUCTS: 1850 TO 1900.

YEAR.	Total value of farm property.	Land, improvements, and buildings.	Implements and machinery.	Live stock.	Farm products. <sup>1</sup>
1900.....	\$53,929,064	\$40,799,838	\$1,963,210	\$11,166,016	\$18,309,104
1890.....	31,046,200	72,745,180	1,158,040	7,142,980	12,086,330
1880.....	26,340,481	20,291,835	689,666	5,358,980	7,439,892
1870 <sup>2</sup> .....	15,665,151	9,947,920	505,074	5,212,157	8,909,746
1860.....	22,889,752	16,435,727	900,669	5,553,356	-----
1850.....	9,861,962	6,823,109	658,795	2,880,058	-----

<sup>1</sup> For year preceding that designated.

<sup>2</sup> Values for 1870 were reported in depreciated currency. To reduce to specie basis of other figures, they must be diminished one-fifth.

<sup>3</sup> Includes betterments and additions to live stock.

The most significant features of the change in agricultural conditions reflected in the above table are the rapid development in the decade from 1850 to 1860; the disastrous effects of the Civil War, from which the state did not recover entirely until the decade 1880 to 1890; the remarkable progress shown for the decade 1880 to 1890; and the marked decrease in the value of land, improvements, and buildings in the last decade.

This decrease in the total value of farm property in the last decade is due entirely to a depreciation in the value of land, improvements, and buildings, resulting from the effects of the destructive frosts of 1894-95 upon the fruit-growing industry of the state. All other classes of farm property show a considerable increase in value. In the case of live stock the increase, 56.3 per cent, is simply another result of the causes just mentioned. Abandoned fruit lands were utilized for grazing purposes, with a consequent development of cattle raising, that contributed towards offsetting the losses in fruit production. A part of the increase of 69.5 per cent in the value of implements and machinery, and of 51.5 per cent in the value of products, is doubtless due to a more detailed enumeration in 1900 than in previous census years.

### COUNTY STATISTICS.

Table 3 gives an exhibit of general agricultural statistics by counties.

TABLE 3.—NUMBER AND ACREAGE OF FARMS, AND VALUES OF SPECIFIED CLASSES OF FARM PROPERTY, JUNE 1, 1900, WITH VALUE OF PRODUCTS OF 1899 NOT FED TO LIVE STOCK, AND EXPENDITURES IN 1899 FOR LABOR AND FERTILIZERS, BY COUNTIES.

COUNTIES.	NUMBER OF FARMS.		ACRES IN FARMS.		VALUES OF FARM PROPERTY.				Value of products not fed to live stock.	EXPENDITURES.	
	Total.	With build-ings.	Total.	Improved.	Land and improve-ments (ex-cept build-ings).	Buildings.	Imple-ments and machinery.	Live stock.		Labor.	Fertil-izers.
The State -----	40,814	39,265	4,363,891	1,511,653	\$30,823,016	\$9,976,822	\$1,963,210	\$11,166,016	\$16,190,474	\$1,468,290	\$753,120
Alachua -----	2,953	2,766	278,675	101,594	1,605,180	543,810	154,000	637,574	1,366,390	88,210	51,640
Baker -----	393	395	33,200	13,836	214,429	83,860	16,600	116,474	280,213	20,870	16,900
Bradford -----	1,291	1,225	116,836	39,773	524,830	229,250	41,890	274,375	504,295	24,150	27,620
Brevard -----	615	572	88,113	7,290	1,649,170	483,590	26,440	160,625	207,942	69,000	38,290
Calhoun -----	315	312	49,901	19,566	138,500	82,450	20,030	110,224	143,098	4,330	8,540
Citrus -----	802	296	29,078	7,346	367,210	130,160	17,570	105,770	187,581	8,460	970
Clay -----	991	992	48,075	7,173	159,870	100,380	17,030	139,460	162,921	4,390	2,230
Columbia -----	1,596	1,548	205,557	94,037	783,370	316,930	58,560	342,317	663,861	66,750	16,460
Dade -----	398	341	39,231	4,726	915,570	172,030	24,590	29,198	301,310	72,510	56,800
De Soto -----	658	636	59,576	10,203	2,048,630	210,070	35,440	475,485	475,664	18,060	28,070
Duval -----	771	761	66,795	9,609	1,051,830	324,130	39,260	226,653	325,789	29,610	9,040
Escambia -----	463	467	43,456	7,977	261,350	204,960	29,030	133,796	181,140	10,080	12,960
Franklin -----	45	45	12,389	2,585	17,010	2,440	2,440	15,496	15,496	860	190
Gadsden -----	1,539	1,526	212,022	79,135	1,120,710	434,910	250,090	238,145	749,868	47,623	41,770
Hamilton -----	1,085	1,022	182,781	74,026	672,560	197,840	50,760	252,170	528,262	40,330	21,190
Hernando -----	363	358	25,453	8,040	156,540	94,410	13,070	98,610	101,689	5,300	590
Hillsboro -----	1,449	1,411	103,561	22,346	2,590,070	588,970	75,450	364,743	667,678	52,960	50,940
Holmes -----	375	364	120,291	29,414	214,050	117,280	21,670	110,830	226,630	5,630	10,180
Jackson -----	3,092	3,068	324,269	144,871	846,819	437,851	122,400	497,872	963,984	67,390	47,080
Jefferson -----	2,258	2,217	174,142	101,570	712,185	209,495	66,580	230,367	752,728	42,110	8,880
Lafayette -----	580	575	92,031	25,594	222,010	94,100	22,380	288,963	216,761	7,940	690
Lake -----	848	816	88,099	22,171	1,181,410	400,610	46,840	176,259	227,451	59,110	14,550
Lee -----	238	224	24,021	3,387	799,630	116,560	23,930	193,859	236,130	54,140	17,400
Leon -----	2,428	2,400	207,307	118,930	1,102,067	352,118	92,340	371,684	725,485	53,620	2,140
Levy -----	795	776	90,467	28,534	278,300	124,380	23,670	287,577	285,621	19,070	620
Liberty -----	170	170	50,227	10,098	58,510	33,870	8,810	60,218	70,156	4,800	2,020
Madison -----	2,100	2,065	226,942	119,885	857,935	258,598	80,230	342,013	794,068	72,200	31,370
Manatee -----	212	195	20,346	4,252	1,466,440	134,420	17,340	110,311	260,653	87,560	30,380
Marion -----	2,620	2,247	201,472	72,755	1,216,630	704,230	112,030	519,861	947,789	126,610	31,600
Monroe -----	118	118	12,266	2,129	181,960	48,360	2,530	48,360	246,343	19,530	850
Nassau -----	361	353	35,315	7,100	123,700	74,370	11,630	113,861	124,586	5,710	2,450
Orange -----	1,218	1,050	85,509	20,790	2,168,830	659,570	71,530	362,053	355,891	100,430	60,250
Osceola -----	354	247	55,126	5,251	423,120	69,130	11,030	783,030	229,068	4,930	2,710
Pasco -----	537	572	45,271	13,669	403,700	131,420	30,540	214,751	257,695	27,430	8,530
Polk -----	829	806	75,184	17,836	1,013,080	252,300	40,890	452,676	292,282	20,460	25,000
Putnam -----	799	773	69,934	14,466	437,800	260,910	26,330	203,104	228,296	19,300	6,750
St. John -----	238	229	20,869	3,737	137,970	84,570	16,480	105,390	106,122	12,470	4,890
Santa Rosa -----	343	341	51,957	9,385	152,630	113,340	17,230	154,977	138,861	5,100	7,950
Sumter -----	744	712	81,294	20,525	504,350	152,120	43,390	251,855	239,748	29,360	17,690
Suwanee -----	1,679	1,656	220,779	102,336	593,990	236,080	62,880	326,302	610,044	34,180	16,200
Taylor -----	538	528	63,286	21,913	133,560	63,710	13,900	153,568	138,267	6,510	3,530
Volusia -----	430	421	46,763	10,741	10,741	316,640	32,330	220,568	178,869	49,100	9,290
Wakulla -----	375	373	72,935	22,710	105,490	54,890	16,020	102,669	112,723	4,420	820
Walton -----	649	641	36,839	13,502	256,210	114,430	22,120	130,946	206,964	6,670	8,660
Washington -----	803	755	93,316	29,340	229,590	109,620	23,330	131,913	203,767	8,570	8,740

The number of farms in the state, June 1, 1900, was 6,586 greater than in 1890, the largest relative gains being shown for Monroe, Osceola, Liberty, Lee, and De Soto counties, where the rates of increase were 1,211.1 per cent, 359.7 per cent, 314.6 per cent, 296.7 per cent, and 295.8 per cent, respectively. The percentages of decrease for the counties which report fewer farms than in 1890 are as follows: Volusia, 61.8; St. John, 53.3; Orange, 42.0; Lake, 37.7; Pasco, 31.8; Sumter, 30.0; Putnam, 28.7; Santa Rosa, 12.9; and Polk, 11.5. All of these counties, except Santa Rosa and five others in the central part of the state, show decreases in total farm acreage. The counties showing increases of over 100 per cent are: Monroe, Osceola, Calhoun, Franklin, Walton, Liberty, Taylor, De Soto, Lee, and Brevard. Liberty, Dade, Calhoun, Monroe, and Franklin counties report improved acreages in 1900 from four to twelve times as great as they had in 1890.

The value of farms increased in the southern and western parts of the state, but decreased in most of the

central counties. Decreases in the value of land and buildings are shown in all counties of the northern half of the peninsula, the losses being greatest in those counties which suffered most severely from the frosts of 1894, 1895, and 1899.

All counties except Lafayette, Lake, Levy, Orange, Putnam, and Volusia reported a greater value for implements and machinery in 1900 than in 1890. In 1900 the average value per farm was \$48.10, and in 1890 it was \$33.83. The highest average value was reported by Gadsden county, \$162.50, and the lowest by Monroe county, \$21.44.

The total value of live stock has increased 56.3 per cent, Manatee, Santa Rosa, St. John, and Volusia being the only counties in which decreases are reported. The largest gains are shown for Osceola, De Soto, and Alachua counties.

The average expenditure per farm for labor, including value of board furnished, varied from \$10 in Walton county, to \$227 in Lee county, and for the state it was \$36. For fertilizers, the average expenditure per farm

was \$18 in 1899, and \$25 in 1889. Levy county expended an average of only \$0.78 per farm. The highest average, \$143, was for Manatee county.

#### INCREASE IN THE NUMBER OF FARMERS IN FLORIDA.

In this bulletin those individuals who, as owners, salaried managers, or tenants, operate farms with or without the assistance of members of their household or of hired laborers, are designated as "farmers." All those working on farms for wages are spoken of as "farm laborers." The number of farmers at any given time corresponds closely to the number of farms.

For every ten years, excepting from 1850 to 1860, and from 1890 to 1900, in which latter decade the agricultural development was temporarily checked by the frosts which so seriously damaged the orchards of the state, the rate of gain in the number of farms, and consequently in the number of farmers, has exceeded that in population. Taking the period since 1850 as a whole, the population of Florida has increased from 87,445 to 528,542, or a little more than sixfold, while the number of farms has advanced from 4,304 to 40,814, an increase of almost tenfold.

These facts, and those contained in Tables 4, 4a, and 5, which follow, to be seen in their true relation to the social and economic conditions and changes on Florida farms, must be studied in connection with the occupation tables of the censuses. Those tables are available for 1880 and 1890, but not as yet for 1900. In 1880 the total number of males engaged in agriculture was 47,465, while in 1890 it was 53,558. In 1880, 22,279 of the total number were farm laborers, working for wages, and 1,748 worked for wages at special occupations, such as gardening, fruit growing, etc. In 1890 the number of farm laborers was but 16,783, and the number working at special occupations, 2,547.

These figures show that in 1880 there were on each 1,000 farms in Florida 2,025 males employed in some capacity. Of this number approximately 691 operated farms as owners and 309 as tenants, while 1,025 worked for wages. Ten years later, for each 1,000 farms, 1,565 males were employed, of whom 764 operated farms as owners and 236 as tenants, while 565 worked for wages.

As showing the relative changes in these three classes of farming population, the following comparative statement is presented: For every 1,000 males engaged in agriculture in 1880 there were approximately 341 who operated farms as owners; 153, as tenants; and 506 who worked for wages. In 1890 there were 488 owners, 151 tenants, and 361 wage laborers. It is seen that farm owners and wage laborers practically changed places in relative importance between the two census periods, while the tenant class remained about stationary as compared with the total farming population. As the Eleventh Census, however, in its statistics of farms and homes reported more farm-tenant families than the agricultural division of that census reported tenant-operated farms, it is possible that more exact figures would show a slight

increase in the relative number of tenants compared with the total number of males engaged in agriculture in the decade from 1880 to 1890, instead of the decrease given above.

During the decade under consideration the number of males engaged in agriculture increased 12.8 per cent. It may safely be assumed that the total agricultural population increased in about the same proportion. The number of farm owners in the meantime increased 61.4 per cent, the number of tenants 11.7 per cent, while the number of farm laborers decreased 24.7 per cent.

The changes that took place in the relative numbers of these three classes indicate a distinct elevation in the general social and economic level of the total farming population. Whether caused by the rise of the farm wage laborer to farm ownership, as appears probable from the figures reviewed, or by additions to the classes of owners and tenants from other occupations, or through immigration, this elevation is a beneficent change in all its aspects.

The occupation tables for 1900 are not yet prepared, but if the changes in rural population are reliable indices of the changes in the farming population proper, the movements in the decade from 1880 to 1890 were continued with but slight modifications in the last decade; and the average status of the people toiling on Florida farms has been raised even more than is shown by the foregoing comparisons for the preceding decade.

#### FARM TENURE.

In connection with the changes noted above, attention is called to the specific changes in farm tenure shown in Tables 4, 4a, and 5. Table 4 gives a comparative exhibit of the number of farms operated by owners, cash tenants, and share tenants, for 1880, 1890, and 1900. Table 4a presents, for the two decades covered by Table 4, the per cent of increase in rural population, in the total number of farms, and in the number of farms of specified tenures. In Table 5 the tenure of farms for 1900 is given by race of farmer, and the farms operated by owners are subdivided into groups designated as farms operated by "owners," "part owners," "owners and tenants," and "managers." These groups comprise respectively: (1) Farms operated by individuals who own all the land they cultivate; (2) farms operated by individuals who own a part of the land and rent the remainder from others; (3) farms operated under the joint direction and by the united labor of two or more individuals, one owning the farm or a part of it, and the other, or others, owning no part, but receiving for supervision or labor a share of the products; and (4) farms operated by individuals who receive for their supervision and other services a fixed salary from the owners.

The farms operated by tenants are divided into groups designated as farms operated by "cash tenants" and "share tenants." These groups comprise, respectively: (1) Farms operated by individuals who pay a cash rental or a stated amount of labor or farm produce; (2) farms operated by individuals who pay as rental a share of the products.

TABLE 4.—NUMBER AND PER CENT OF FARMS OF SPECIFIED TENURES: 1880 TO 1900.

YEAR.	Total number of farms.	NUMBER OF FARMS OPERATED BY—			PER CENT OF FARMS OPERATED BY—		
		Owners. <sup>1</sup>	Cash tenants.	Share tenants.	Owners. <sup>1</sup>	Cash tenants.	Share tenants.
1900	40,814	29,994	7,889	2,931	73.5	19.3	7.2
1890	34,238	26,140	3,936	4,152	76.4	11.5	12.1
1880	23,438	16,198	3,548	3,692	69.1	15.1	15.8

<sup>1</sup> Including "part owners," "owners and tenants," and "managers."

TABLE 4a.—PER CENT OF INCREASE IN RURAL POPULATION, IN THE TOTAL NUMBER OF FARMS, AND IN THE NUMBER OF FARMS OF SPECIFIED TENURES, FOR THE DECADES, 1880 TO 1890 AND 1890 TO 1900, AND FOR THE TWENTY-YEAR PERIOD, 1880 TO 1900.

PERIODS.	PER CENT OF INCREASE IN—					
	Rural population.	Total number of farms.	Number of farms operated by—			
			All owners.	All tenants.	Cash tenants.	Share tenants.
1890-1900	29.8	19.2	14.7	33.8	100.4	129.4
1880-1890	34.1	46.0	61.4	11.7	10.9	12.5
1880-1900	74.0	74.1	85.2	49.4	122.4	120.6

<sup>1</sup> Decrease.

TABLE 5.—NUMBER AND PER CENT OF FARMS OF SPECIFIED TENURES, JUNE 1, 1900, CLASSIFIED BY RACE OF FARMER.

PART 1.—NUMBER OF FARMS OF SPECIFIED TENURES.

RACE.	Total number of farms.	Owners.	Part owners.	Owners and tenants.	Managers.	Cash tenants.	Share tenants.
The State..	40,814	26,423	2,281	280	1,010	7,889	2,931
White	27,288	20,816	1,480	186	917	2,392	1,547
Colored <sup>1</sup>	13,526	5,607	851	94	93	5,497	1,384

PART 2.—PER CENT OF FARMS OF SPECIFIED TENURES.

The State..	100.0	64.7	5.6	0.7	2.5	19.3	7.2
White	100.0	76.3	5.2	0.7	3.3	8.8	5.7
Colored <sup>1</sup>	100.0	41.5	6.3	0.7	0.7	40.6	10.2

<sup>1</sup> Including 5 Indians.

Of the farms of the state, 66.9 per cent are operated by white farmers and 33.1 per cent by colored farmers. Of the white farmers, 82.2 per cent own a part or all of the farms they operate, and 17.8 per cent operate farms owned by others. For colored farmers, the corresponding percentages are 48.5 and 51.5.

The relative number of farms rented for cash or for a share of the products is determined largely by local conditions. In counties where diversified farming or stock raising prevails, and where most of the farmers are white, share tenants outnumber cash tenants, but in the leading cotton-growing counties, where colored farmers are the

more numerous, the greater number of tenants pay a cash rental. In these latter counties, however, it is difficult to draw the distinguishing line very closely between the two forms of tenancy, since the contract is commonly of such a character as to make the lessee in part a share tenant, and in part a cash tenant. In Florida, as in other southern states, the greater number of these cases of indeterminate tenure were reported as share tenants.

No previous census has reported the number of farms operated by "part owners," "owners and tenants," or "managers," but it is believed that the number of farms conducted by the last-named class is constantly increasing.

PROGRESS OF COLORED FARMERS.

In 1850 the number of colored farmers in Florida was practically a negligible quantity. In 1900 it was 13,526, indicating the rise of substantially that number from the status of slaves or wage laborers to that of farmers.

The Eleventh Census, in its report on "Farms and Homes," gives valuable statistics relating to the number of colored farmers owning and renting farms, the only statistics of the kind which can be used, in connection with Table 5, to throw light upon the changes in the last decade in the average status of negro farmers. Those statistics are not, however, strictly comparable with the statistics of farm tenure collected by the division of agriculture. After making due allowance for variations, a careful comparison indicates that in the last decade the number of colored owners and tenants increased faster than the total negro farming population. The average status of the colored farming population of Florida has been materially advanced since emancipation, and the statistics at present available indicate more rapid progress since 1890 than in any preceding decade.

FARMS CLASSIFIED BY RACE OF FARMER AND BY TENURE.

Tables 6 and 7 present the principal statistics for farms classified by race of farmer and by tenure.

TABLE 6.—NUMBER AND ACREAGE OF FARMS, AND VALUE OF FARM PROPERTY, JUNE 1, 1900, CLASSIFIED BY RACE OF FARMER AND BY TENURE, WITH PERCENTAGES.

RACE OF FARMER, AND TENURE.	Number of farms.	NUMBER OF ACRES IN FARMS.			VALUE OF FARM PROPERTY.	
		Average.	Total.	Per cent.	Total.	Per cent.
The State.....	40,814	106.9	4,363,891	100.0	\$58,929,064	100.0
White farmers.....	27,288	133.6	3,648,691	83.6	47,457,291	88.0
Colored farmers <sup>1</sup> .....	13,526	53.0	717,200	16.4	6,471,773	12.0
Owners.....	26,423	121.8	3,217,923	73.7	38,137,000	70.7
Part owners.....	2,281	116.4	265,569	6.1	2,321,117	5.2
Owners and tenants.....	280	112.4	31,458	0.7	339,151	0.6
Managers.....	1,010	206.6	208,680	4.8	5,926,081	11.0
Cash tenants.....	7,889	55.7	439,042	10.1	4,775,113	8.9
Share tenants.....	2,931	68.7	201,219	4.6	1,980,597	3.6

<sup>1</sup> Including 5 Indians.

TABLE 7.—AVERAGE VALUES OF SPECIFIED CLASSES OF FARM PROPERTY, AND AVERAGE GROSS INCOME PER FARM, WITH PER CENT OF GROSS INCOME ON TOTAL INVESTMENT IN FARM PROPERTY, CLASSIFIED BY RACE OF FARMER AND BY TENURE.

RACE OF FARMER, AND TENURE.	AVERAGE VALUES PER FARM OF—					Per cent of gross income on total investment in farm property.
	Farm property, June 1, 1900.				Gross income (products of 1899 not fed to live stock).	
	Land and im- prove- ments (except build- ings).	Build- ings.	Imple- ments and ma- chinery.	Live stock.		
The State.....	\$765	\$244	\$48	\$274	\$397	30.0
White farmers.....	994	324	61	860	476	27.4
Colored farmers <sup>1</sup> .....	275	84	22	99	236	49.3
Owners.....	782	270	49	842	440	30.5
Part owners.....	788	242	49	213	418	33.8
Owners and tenants.....	699	261	41	210	412	34.0
Managers.....	4,199	1,129	271	268	687	10.9
Cash tenants.....	371	95	26	113	256	42.3
Share tenants.....	887	111	22	139	283	42.9

<sup>1</sup> Including 5 Indians.

Approximately one-third of the farms of the state, comprising about one-sixth of the total farm acreage, are operated by colored farmers. The value of their farm property, however, constitutes less than one-eighth of the value of all farm property in the state. This is, of course, due in part to the fact that the holdings of colored farmers are small, the average size of their farms being but 53.0 acres as compared with 133.6 acres for white farmers. The average value per acre of their farm property, June 1, 1900, was but \$9, while for white farmers it was \$13. The average values per farm of their land, buildings, implements and machinery, and live stock, also, are relatively low. On the other hand, it appears from Table 7 that they obtained in 1899 a higher per cent of gross income on their investment in farm property than did white farmers.

This apparent anomaly is traceable, in general, to certain distinguishing racial characteristics, and, in particular, to the peculiarities of the contract system under which nearly all colored tenants lease their lands. The first point relates to the recognized tendency on the part of the more progressive white farmer to constantly improve his property, especially his buildings and fences, thus adding to its market value, although not materially increasing its producing capacity per acre. The colored farmer, on the other hand, adds comparatively little to his fixed capital in the way of improvements and his income per acre naturally represents a higher percentage of the capital invested than in the case of the white farmer. In addition, under the prevailing contract system, the white landlord commonly owns the greater portion of the working animals and most of the implements and machinery used by his colored tenants. These being kept for the most part on the farm where the landlord resides, were reported as part of his property, while the products obtained through their use were reported under the names of the tenants.

The farms conducted by cash tenants have the smallest

average area, 55.7 acres, and those under managers, the largest, 206.6 acres. Farms of managers have the highest average value, but on account of the high valuation of their land and buildings and the fact that not all of these farms are cultivated primarily for profit, the percentage of income on investment is lower than for any other group.

Of the 5 Indian farmers, 1 was an owner, 2 were managers, and 2 were tenants. The value of their property was \$5,286, and of their products, \$1,329.

Of the 278 farms, each containing 1,000 acres or over, 200 are operated by owners, 38 by managers, 16 by part owners, 15 by cash tenants, 8 by share tenants, and 1 by an owner and tenant.

#### FARMS CLASSIFIED BY AREA.

Tables 8 and 9 present the principal statistics for farms classified by area.

TABLE 8.—NUMBER AND ACREAGE OF FARMS, AND VALUE OF FARM PROPERTY, JUNE 1, 1900, CLASSIFIED BY AREA, WITH PERCENTAGES.

AREA.	Number of farms.	NUMBER OF ACRES IN FARMS.			VALUE OF FARM PROPERTY.	
		Average.	Total.	Per cent.	Total.	Per cent.
The State.....	40,814	106.9	4,363,891	100.0	\$53,929,064	100.0
Under 3 acres.....	584	1.6	908	(1)	809,310	1.5
3 to 9 acres.....	2,292	6.0	13,783	0.3	1,717,062	3.2
10 to 19 acres.....	8,488	13.2	46,008	1.1	2,845,919	5.3
20 to 49 acres.....	13,646	34.2	467,062	10.7	10,116,941	18.8
50 to 99 acres.....	7,874	78.9	581,503	13.3	9,030,653	16.7
100 to 174 acres.....	7,940	141.2	1,120,791	25.7	11,178,228	20.7
175 to 259 acres.....	2,259	209.3	472,792	10.8	4,856,002	9.0
260 to 499 acres.....	1,844	338.7	624,554	14.3	6,370,337	11.8
500 to 999 acres.....	609	689.4	407,684	9.4	3,247,954	6.0
1,000 acres and over.....	278	2,261.9	628,806	14.4	3,756,658	7.0

<sup>1</sup> Less than one-tenth of 1 per cent.

TABLE 9.—AVERAGE VALUES OF SPECIFIED CLASSES OF FARM PROPERTY, AND AVERAGE GROSS INCOME PER FARM, WITH PER CENT OF GROSS INCOME ON TOTAL INVESTMENT IN FARM PROPERTY, CLASSIFIED BY AREA.

AREA.	AVERAGE VALUES PER FARM OF—					Per cent of gross income on total investment in farm property.
	Farm property, June 1, 1900.				Gross income (products of 1899 not fed to live stock).	
	Land and im- prove- ments (except build- ings).	Build- ings.	Imple- ments and ma- chinery.	Live stock.		
The State.....	\$755	\$244	\$48	\$274	\$307	30.0
Under 3 acres.....	328	239	18	801	387	27.9
3 to 9 acres.....	420	218	28	88	194	25.9
10 to 19 acres.....	469	208	28	116	225	27.6
20 to 49 acres.....	409	144	27	161	274	37.0
50 to 99 acres.....	645	207	40	255	379	33.0
100 to 174 acres.....	812	245	47	304	460	32.7
175 to 259 acres.....	1,188	393	71	498	683	29.7
260 to 499 acres.....	2,194	536	106	619	814	23.6
500 to 999 acres.....	3,131	887	198	1,117	1,135	21.3
1,000 acres and over.....	3,235	2,434	975	1,869	2,714	19.3

The greatest number of farms are in the group containing from 20 to 49 acres each, but the farms containing from 100 to 174 acres each comprise the largest percentage of the total acreage.

The relatively high values of land and buildings for the first three groups are due to the fact that they include most of the city dairies and florists' establishments and many fruit farms under highly intensive cultivation. The high average value of live stock on farms of the first group is due to the fact that among them are some farms the operators of which use large ranges on the public domain, but actually own or rent less than 3 acres of land.

The average gross incomes per acre for the various groups are as follows: Farms under 3 acres, \$248.74; 3 to 9 acres, \$32.29; 10 to 19 acres, \$17.02; 20 to 49 acres, \$8.01; 50 to 99 acres, \$5.13; 100 to 174 acres, \$3.26; 175 to 259 acres, \$3.05; 260 to 499 acres, \$2.40; 500 to 999 acres, \$1.70; 1,000 acres and over, \$1.16. In considering the high gross income per acre for farms of less than 3 acres, it should be borne in mind that the incomes of florists' establishments, nurseries, and city dairies, of which this group is largely composed, are determined not so much by the acreage of land used as by the amount of capital invested in buildings, implements, and live stock, and by the amounts expended for labor and fertilizers.

#### FARMS CLASSIFIED BY PRINCIPAL SOURCE OF INCOME.

In Tables 10 and 11 the farms are classified by principal source of income. If the value of the hay and grain raised on any farm exceeds that of any other crop and constitutes at least 40 per cent of the total value of products not fed to live stock, the farm is classified as a "hay and grain" farm. If vegetables are the leading crop, constituting 40 per cent of the value of the products, it is a "vegetable" farm. The farms of the other groups are classified in accordance with the same general principle. "Miscellaneous" farms are those whose operators do not derive 40 per cent of their income from any one class of farm products. Farms with no income in 1899 are classified according to the agricultural operations upon other farms in the same locality.

TABLE 10.—NUMBER AND ACREAGE OF FARMS, AND VALUE OF FARM PROPERTY, JUNE 1, 1900, CLASSIFIED BY PRINCIPAL SOURCE OF INCOME, WITH PERCENTAGES.

PRINCIPAL SOURCE OF INCOME.	Number of farms.	NUMBER OF ACRES IN FARMS.			VALUE OF FARM PROPERTY.	
		Average.	Total.	Per cent.	Total.	Per cent.
The State.....	40,814	106.9	4,363,891	100.0	\$53,929,064	100.0
Hay and grain.....	1,722	111.1	191,256	4.4	1,560,260	2.9
Vegetables.....	4,613	79.1	365,117	8.4	6,589,684	12.2
Fruits.....	2,760	85.2	235,120	5.4	11,503,696	21.3
Live stock.....	5,150	131.9	679,423	15.6	9,013,889	16.7
Dairy produce.....	1,853	98.8	183,046	4.2	2,889,560	5.4
Tobacco.....	171	261.3	44,680	1.0	1,001,300	1.8
Cotton.....	9,191	91.3	839,205	19.2	5,756,996	10.7
Rice.....	65	147.9	9,615	0.2	68,985	0.1
Sugar.....	66	89.5	5,906	0.1	100,768	0.2
Flowers and plants.....	15	12.1	182	( <sup>1</sup> )	55,362	0.1
Nursery products.....	30	76.9	2,807	0.1	246,020	0.5
Miscellaneous.....	15,178	119.1	1,808,034	41.4	15,142,545	28.1

<sup>1</sup> Less than one-tenth of 1 per cent.

TABLE 11.—AVERAGE VALUES OF SPECIFIED CLASSES OF FARM PROPERTY, AND AVERAGE GROSS INCOME PER FARM, WITH PER CENT OF GROSS INCOME ON TOTAL INVESTMENT IN FARM PROPERTY, CLASSIFIED BY PRINCIPAL SOURCE OF INCOME.

PRINCIPAL SOURCE OF INCOME.	AVERAGE VALUES PER FARM OF—					Per cent of gross income on total investment in farm property.
	Farm property, June 1, 1900.				Gross income (products of 1899 not fed to live stock).	
	Land and improvements (except buildings).	Buildings.	Implements and machinery.	Live stock.		
The State.....	\$755	\$244	\$48	\$274	\$397	30.0
Hay and grain.....	570	194	35	107	195	21.5
Vegetables.....	893	291	53	192	535	37.5
Fruits.....	3,240	662	59	207	536	12.9
Live stock.....	681	250	48	771	409	23.3
Dairy produce.....	744	359	52	404	362	23.2
Tobacco.....	2,379	2,153	965	359	1,581	27.0
Cotton.....	345	101	33	147	355	55.7
Rice.....	659	205	39	158	242	22.7
Sugar.....	1,056	202	70	219	349	22.9
Flowers and plants.....	2,537	87	186	51	2,049	55.5
Nursery products.....	5,937	1,389	204	171	4,577	55.6
Miscellaneous.....	526	206	44	222	355	35.6

With the exception of nurseries, which are few in number, fruit farms show the highest value of land and improvements per farm. They occupy but 5.4 per cent of the total farm area, but constitute 21.3 per cent of the total value of farm property. The percentage of gross income on total investment in farm property, however, is much lower for fruit farms than for the farms of any other group. This is due to the fact that a large number of newly planted orchards having high valuations, but which yielded little or no income in 1899, were classed as fruit farms, thus materially reducing the average gross income per farm for the group.

For the several classes of farms the average values per acre of the products not fed to live stock are: Flowers and plants, \$168.84; nursery products, \$59.27; vegetables, \$6.76; fruit, \$6.30; tobacco, \$6.05; sugar, \$3.90; cotton, \$3.89; dairy produce, \$3.66; live stock, \$3.10; miscellaneous, \$2.98; and hay and grain, \$1.75.

The wide variations shown in the averages and percentages of gross income are largely due to the fact that in computing gross income no deductions are made for expenses involved in operation. For florists' establishments, nurseries, and market gardens, the average expenditure for such items as labor and fertilizers represents a far larger percentage of the gross income than in the case of "hay and grain," "live-stock," or "miscellaneous" farms. If it were possible to present the average net income, the variations shown would be comparatively slight.

#### FARMS CLASSIFIED BY REPORTED VALUE OF PRODUCTS NOT FED TO LIVE STOCK.

Tables 12 and 13 present data relating to farms classified by the reported value of products not fed to live stock.

TABLE 12.—NUMBER AND ACREAGE OF FARMS, AND VALUE OF FARM PROPERTY, JUNE 1, 1900, CLASSIFIED BY REPORTED VALUE OF PRODUCTS NOT FED TO LIVE STOCK, WITH PERCENTAGES.

VALUE OF PRODUCTS NOT FED TO LIVE STOCK.	Number of farms.	NUMBER OF ACRES IN FARMS.			VALUE OF FARM PROPERTY.	
		Average.	Total.	Per cent.	Total.	Per cent.
The State.....	40,814	106.9	4,363,891	100.0	\$53,929,064	100.0
\$0.....	989	62.5	61,789	1.4	1,572,840	2.9
\$1 to \$49.....	2,696	47.5	128,185	3.0	1,915,250	3.6
\$50 to \$99.....	4,171	52.6	219,463	5.0	2,544,180	4.7
\$100 to \$249.....	12,920	71.0	917,470	21.0	9,077,880	16.8
\$250 to \$499.....	11,616	101.2	1,175,290	26.9	12,144,440	22.5
\$500 to \$999.....	6,031	168.2	1,014,162	23.3	11,707,426	21.7
\$1,000 to \$2,499.....	1,966	286.7	563,704	12.9	8,412,700	15.6
\$2,500 and over.....	425	667.9	233,878	6.5	6,554,348	12.2

TABLE 13.—AVERAGE VALUES OF SPECIFIED CLASSES OF FARM PROPERTY, AND AVERAGE GROSS INCOME PER FARM, WITH PER CENT OF GROSS INCOME ON TOTAL INVESTMENT IN FARM PROPERTY, CLASSIFIED BY REPORTED VALUE OF PRODUCTS NOT FED TO LIVE STOCK.

VALUE OF PRODUCTS NOT FED TO LIVE STOCK.	AVERAGE VALUES PER FARM OF—					Per cent of gross income on total investment in farm property.
	Farm property, June 1, 1900.				Gross income (products of 1899 not fed to live stock).	
	Land and improvements (except buildings).	Buildings.	Implements and machinery.	Live stock.		
The State.....	\$755	\$244	\$48	\$274	\$397	30.0
\$0.....	1,166	332	23	69	27	3.9
\$1 to \$49.....	476	146	17	71	78	12.7
\$50 to \$99.....	372	186	21	81	175	24.9
\$100 to \$249.....	392	143	26	137	357	34.1
\$250 to \$499.....	558	213	89	235	685	35.3
\$500 to \$999.....	1,066	346	72	457	1,445	33.8
\$1,000 to \$2,499.....	2,565	637	133	944	5,654	36.9
\$2,500 and over.....	8,999	2,257	754	3,412		

Nearly all of the 989 farms reporting no income in 1899 were fruit farms which had been partially abandoned or on which the trees were too young to bear. The high average values of the land and buildings of these farms indicate that some of them were country homes or estates held for pleasure and not for profit. For some of them it was impossible to secure complete reports, as changes in ownership or tenancy had occurred shortly prior to enumeration, and the persons in charge June 1, 1900, could not give definite information concerning the products of the preceding year. The same statements are true concerning some of the farms which reported incomes of less than \$100. To this extent the reports fall short of giving a complete exhibit of farm income in 1899.

#### LIVE STOCK.

At the request of the various live-stock associations of the country, a new classification of domestic animals was adopted for the Twelfth Census. The age grouping for neat cattle was determined by their present and prospective relations to the dairy industry and to the supply of meat products. Horses and mules are classified by age, and

neat cattle and sheep by age and sex. The new classification permits a very close comparison with the figures published in previous census reports.

Table 14 presents a summary of live-stock statistics.

TABLE 14.—NUMBER OF DOMESTIC ANIMALS, FOWLS, AND BEES ON FARMS, JUNE 1, 1900, WITH TOTAL AND AVERAGE VALUES, AND NUMBER OF DOMESTIC ANIMALS NOT ON FARMS.

LIVE STOCK.	Age in years.	ON FARMS.			NOT ON FARMS.
		Number.	Value.	Average value.	
Calves.....	Under 1.....	133,393	\$586,919	\$4.24	3,186
Steers.....	1 and under 2.....	67,292	405,590	6.03	798
Steers.....	2 and under 3.....	46,731	404,300	8.65	532
Steers.....	3 and over.....	44,516	556,313	12.50	1,257
Bulls.....	1 and over.....	19,342	198,998	10.29	172
Heifers.....	1 and under 2.....	70,445	458,458	6.51	917
Cows kept for milk.....	2 and over.....	78,830	1,048,849	13.31	5,444
Cows and heifers not kept for milk.....	2 and over.....	285,712	2,684,922	9.40	1,996
Colts.....	Under 1.....	2,239	42,156	18.83	86
Horses.....	1 and under 2.....	2,185	75,232	34.43	56
Horses.....	2 and over.....	38,387	2,172,751	56.60	7,448
Mule colts.....	Under 1.....	102	3,312	32.47	4
Mules.....	1 and under 2.....	377	22,102	58.63	15
Mules.....	2 and over.....	13,135	1,049,558	79.60	3,239
Asses and burros.....	All ages.....	98	3,445	35.15	69
Lambs.....	Under 1.....	21,811	32,493	1.49	168
Sheep (ewes).....	1 and over.....	55,881	109,136	1.95	850
Sheep (rams and wethers).....	1 and over.....	46,828	97,692	2.09	368
Swine.....	All ages.....	464,277	702,827	1.51	15,622
Goats.....	All ages.....	43,705	32,639	0.75	1,348
Fowls: <sup>1</sup>					
Chickens <sup>2</sup> .....		1,107,816			
Turkeys.....		32,869			
Geese.....		36,658			
Ducks.....		6,877			
Bees (swarms of).....		39,753	83,827	2.11	
Value of all livestock.....			11,166,016		

<sup>1</sup>The number reported is of fowls over 3 months old. The value is of all, old and young.

<sup>2</sup>Including Guinea fowls.

The total value of all live stock on farms, June 1, 1900, was \$11,166,016. Of this amount 9.4 per cent represents the value of dairy cows; 47.4 per cent, that of other neat cattle; 20.5 per cent, that of horses; 9.6 per cent, that of mules; 6.3 per cent, that of swine; 2.2 per cent, that of sheep; and 4.6 per cent that of all other live stock.

No reports were secured concerning the value of live stock not on farms, but it is probable that such animals have higher average values than those on farms. Allowing the same averages, however, the total value of all live stock in the state, exclusive of the poultry and bees not on farms, would be \$12,015,700.

#### CHANGES IN LIVE STOCK ON FARMS.

The following table shows the changes since 1850 in the number of the most important domestic animals.

TABLE 15.—NUMBER OF SPECIFIED DOMESTIC ANIMALS ON FARMS: 1850 TO 1900.

YEAR.	Dairy cows.	Other neat cattle.	Horses.	Mules and asses.	Sheep. <sup>1</sup>	Swine.
1900.....	78,830	672,431	42,811	13,762	102,709	464,277
1890.....	113,388	370,176	31,807	9,755	98,275	374,241
1880.....	42,174	425,196	22,636	9,606	56,681	287,051
1870.....	61,922	328,993	11,902	8,895	28,599	158,908
1860.....	92,974	295,086	13,446	10,810	30,158	271,742
1850.....	72,376	188,209	10,848	5,002	23,311	209,453

<sup>1</sup>Lambs not included.

The number of dairy cows shown in the table for 1900 is 30.5 per cent less than for 1890. It is probable, however, that this decrease is more apparent than real, and that many of the 285,712 "cows and heifers, 2 and over, not kept for milk," were milch cows dry at the time of enumeration or were excluded by a stricter definition of the term "dairy cow" than was used by previous censuses. Many of them were doubtless milked for a part of the year, although not kept primarily for milk. The increase of 90.6 per cent in the production of milk sustains this view.

The number of other neat cattle given for 1900 includes 138,393 calves. It is uncertain whether or not calves were included in previous reports. If not, they should be deducted from the 1900 figures before making comparisons with the reports of previous censuses. Even if this is done an increase would still be shown for the last decade, indicating a marked development of the live-stock industry in recent years.

The remaining classes of live stock reported in the table show steady increases since 1850, except for the Civil War period. The rates of increase since 1890 are as follows: Mules and asses, 41.1 per cent; horses, 34.6 per cent; swine, 24.1 per cent; and sheep, 4.5 per cent.

In comparing the poultry report for 1900 (see Table 14) with that for 1890, it should be borne in mind that in 1900 the enumerators were instructed not to report fowls less than three months old, while in 1890 no such limitation was made. This fact explains the decreases shown in the number of all kinds of fowls except chickens, and the small increase shown for those fowls. Compared with the figures for 1890, the present census shows decreases in the number of fowls as follows: Turkeys, 4.5 per cent; ducks, 27.5 per cent; geese, 2.3 per cent. The number of chickens increased 20.5 per cent.

#### ANIMAL PRODUCTS.

Table 16 is a summarized exhibit of the products of the animal industry.

TABLE 16.—QUANTITIES AND VALUES OF SPECIFIED ANIMAL PRODUCTS, AND VALUES OF POULTRY RAISED, ANIMALS SOLD, AND ANIMALS SLAUGHTERED ON FARMS IN 1899.

PRODUCTS.	Unit of measure.	Quantity.	Value.
Wool	Pounds	388,898	\$66,881
Mohair and goat hair	Pounds	20	8
Milk	Gallons	19,640,434	1,468,603
Butter	Pounds	1,886,445	
Cheese	Pounds	3,751	558,524
Eggs	Dozens	4,214,186	
Poultry			574,708
Honey	Pounds	677,540	58,500
Wax	Pounds	32,290	
Animals sold			890,657
Animals slaughtered			1,257,648
Total			4,810,524

<sup>1</sup> Includes all milk produced.

The animal products of the state were valued at \$4,810,524, or 26.3 per cent of the value of all farm products, and 29.7 per cent of the gross farm income. Of the above amount, 43.4 per cent represents the value of animals sold and of animals slaughtered on farms; 30.5 per cent, that of dairy products; 23.5 per cent, that of poultry and eggs; and 2.6 per cent, that of wool, mohair, honey, and wax.

#### DAIRY PRODUCTS.

The quantity of milk produced increased 90.6 per cent in the last decade; that of butter, 59.9 per cent; and that of cheese, 116.7 per cent.

Of the \$1,468,603, given in Table 16, as the value of all dairy products in 1899, \$1,121,787, or 76.4 per cent, represents the value of such products consumed on the farms of the producers, and \$346,816, or 23.6 per cent, the amount realized from sales. Of the latter sum, \$262,670 was derived from the sale of 1,003,918 gallons of milk; \$1,497, from 1,427 gallons of cream; \$82,390, from 339,503 pounds of butter; and \$259 from 2,912 pounds of cheese.

#### POULTRY AND EGGS.

Of the total value of the products of the poultry business in 1899, 50.9 per cent represents the value of fowls raised, and 49.1 per cent, that of eggs produced. The number of dozens of eggs reported in 1900 was 51.1 per cent greater than that reported in 1890.

#### WOOL.

With the exception of the ten years from 1860 to 1870, the production of wool has increased with each decade for half a century. The gain for the last decade was 50.4 per cent. The Tenth Census, which was the first to report the number of fleeces shorn, showed 56,681, having a total weight of 162,810 pounds. In 1899 the number of fleeces shorn was 109,821, and the aggregate weight, 333,898 pounds. The average weight of fleeces was practically the same in 1879 and 1899, being approximately 3 pounds. Wool was reported in all counties except Brevard, Dade, and Lee.

#### HONEY AND WAX.

The quantity of honey reported in 1900 exceeded that reported in 1890 by 114,554 pounds, or 20.3 per cent. The amount of wax produced increased 19.2 per cent.

#### HORSES AND DAIRY COWS ON SPECIFIED CLASSES OF FARMS.

Table 17 presents, for the leading groups of farms, the number of farms reporting horses and dairy cows, the total number for each group, and the average number per farm. In computing the averages presented, only those farms which report the kind of stock under consideration are included.

TABLE 17.—HORSES AND DAIRY COWS ON SPECIFIED CLASSES OF FARMS, JUNE 1, 1900.

CLASSES.	HORSES.			DAIRY COWS.		
	Farms report- ing.	Num- ber.	Average per farm.	Farms report- ing.	Num- ber.	Average per farm.
Total	26, 972	42, 811	1. 6	21, 104	78, 830	3. 7
White farmers	19, 536	32, 858	1. 7	15, 987	67, 031	4. 2
Colored farmers	7, 436	9, 953	1. 3	5, 117	11, 799	2. 3
Owners <sup>1</sup>	21, 004	34, 833	1. 7	16, 964	61, 555	3. 6
Managers	880	724	1. 9	263	1, 912	7. 3
Cash tenants	4, 186	5, 306	1. 3	3, 015	8, 102	2. 7
Share tenants	1, 452	1, 948	1. 3	862	4, 261	4. 9
Under 20 acres	2, 956	3, 890	1. 3	2, 114	8, 251	3. 9
20 to 99 acres	14, 101	19, 929	1. 4	10, 207	31, 145	3. 1
100 to 174 acres	5, 957	9, 985	1. 7	4, 966	15, 127	3. 0
175 to 259 acres	1, 767	3, 586	2. 0	1, 637	7, 995	4. 9
260 acres and over	2, 191	5, 412	2. 5	2, 180	16, 312	7. 5
Hay and grain	899	1, 192	1. 3	397	1, 132	2. 9
Vegetable	3, 017	4, 630	1. 6	1, 765	4, 349	2. 5
Fruit	1, 413	2, 217	1. 6	780	2, 381	3. 1
Live stock	4, 002	7, 643	1. 9	3, 023	14, 402	4. 8
Dairy	1, 377	2, 873	1. 7	1, 853	15, 919	8. 6
Tobacco	124	267	2. 2	105	305	2. 9
Cotton	5, 251	7, 413	1. 4	3, 567	9, 513	2. 7
Rice	47	64	1. 4	18	53	3. 2
Sugar	41	71	1. 7	27	95	3. 5
Florist	5	6	1. 2	4	9	2. 2
Nursery	12	17	1. 4	11	32	2. 9
Miscellaneous	10, 784	16, 858	1. 6	9, 554	30, 635	3. 2

<sup>1</sup>Including "part owners" and "owners and tenants."

#### CROPS.

The following table gives statistics concerning the principal crops grown in 1899.

TABLE 18.—ACREAGES, QUANTITIES, AND VALUES OF THE PRINCIPAL FARM CROPS IN 1899.

CROPS.	Acres.	Unit of measure.	Quantity.	Value.
Corn	569, 567	Bushels	5, 311, 050	\$2, 669, 509
Wheat	85	Bushels	800	601
Oats	31, 467	Bushels	297, 430	143, 028
Barley	27	Bushels	320	318
Rye	764	Bushels	4, 840	5, 514
Buckwheat	2	Bushels	80	80
Rice	5, 410	Pounds	2, 254, 492	87, 332
Grass seed		Bushels	37	37
Hay and forage	21, 994	Tons	37, 187	485, 297
Cotton (upland)	99, 036	Bales <sup>1</sup>	30, 283	926, 558
Cotton (sea island)	122, 793	Bales <sup>1</sup>	81, 573	1, 065, 238
Cottonseed (upland)		Tons	14, 702	163, 360
Cottonseed (sea island)		Tons	12, 211	149, 774
Broom corn	34	Pounds	8, 390	174
Tobacco	2, 056	Pounds	1, 125, 600	254, 211
Dry beans	9, 189	Bushels	176, 304	139, 349
Dry pease	17, 875	Bushels	159, 814	171, 702
Peanuts	69, 452	Bushels	967, 927	699, 713
Potatoes	3, 752	Bushels	232, 212	187, 274
Sweet potatoes	22, 791	Bushels	2, 049, 784	898, 282
Onions	159	Bushels	18, 793	18, 827
Cassava	755			22, 562
Cassava seed				1, 729
Miscellaneous vegetables	25, 848			1, 911, 634
Sugar cane	12, 800	Tons	21, 157	5, 194
Sugar cane kept for seed		Tons	55, 200	193, 200
Sugar		Pounds	284, 300	12, 744
Sirup		Gallons	1, 687, 452	512, 038
Small fruits	1, 343	Quarts	1, 770, 980	189, 867
Grapes	535	Centals	16, 847	456, 420
Orchard fruits	2, 038	Bushels	228, 453	192, 893
Tropical fruits	39, 014			945, 607
Nuts				8, 453
Forest products				648, 412
Flowers and plants	45			41, 417
Seeds	21			3, 622
Nursery products	663			122, 140
Miscellaneous				24, 470
Total	1, 059, 515			13, 498, 580

<sup>1</sup>Commercial bales.

<sup>2</sup>Sold as cane.

<sup>3</sup>Estimated from the number of vines or trees.

<sup>4</sup>Including value of wine, raisins, etc.

<sup>5</sup>Including value of cider, vinegar, etc.

Of the total value of crops, vegetables, including potatoes, sweet potatoes, and onions, contributed 22.3 per

cent; cereals, 21.5 per cent; cotton, 21.5 per cent; fruits and nuts, 10.3 per cent; peanuts, 5.2 per cent; forest products, 4.8 per cent; sugar cane and its products, 5.4 per cent; hay and forage, 3.2 per cent; tobacco, 1.9 per cent; and all other products, 3.9 per cent.

The average gross values per acre of the various crops are as follows: Tobacco, \$123.64; vegetables, \$57.39; sugar cane and its products, \$56.50; fruits and nuts, \$32.45; hay and forage, \$19.79; cotton, \$13.05; peanuts, \$10.07; cereals, \$4.79.

#### VEGETABLES.

The value of all vegetables grown in the state in 1899, including potatoes, sweet potatoes, and onions, was \$3,016,067, which amount constitutes 16.5 per cent of the total value of farm products. Of the total value of vegetables, 29.8 per cent represents the value of sweet potatoes, and 6.2 per cent that of Irish potatoes. The largest quantities of sweet potatoes were raised in Alachua, Marion, and Leon counties, which reported 24.9 per cent of the total acreage. Since 1889 a gain of 17.2 per cent is shown in the production of sweet potatoes, and of 213.4 per cent in the production of Irish potatoes.

Aside from the land devoted to potatoes, sweet potatoes, and onions, 25,848 acres were used in the growing of miscellaneous vegetables. The products of 4,933 acres of this area were not reported in detail. Of the remaining area, 8,728 acres were devoted to watermelons; 4,401, to tomatoes; 2,437, to beans; 2,087, to muskmelons; 1,103, to cucumbers; 981, to cabbage; 548, to lettuce; and 630, to other vegetables.

#### CEREALS.

The following table is an exhibit of the changes in cereal production since 1849.

TABLE 19.—ACREAGE AND PRODUCTION OF CEREALS: 1849 TO 1899.

##### PART 1.—ACREAGE.

YEAR. <sup>1</sup>	Barley.	Corn.	Oats.	Rice.	Rye.	Wheat.
1899	27	569, 567	31, 467	5, 410	764	85
1889	9	378, 908	42, 003	1, 787	853	32
1879	21	360, 294	47, 962	2, 551	601	31

<sup>1</sup>No statistics of acreage were secured prior to 1879.

##### PART 2.—BUSHELS PRODUCED.<sup>2</sup>

YEAR.	Barley.	Corn.	Oats.	Rice.	Rye.	Wheat.
1899	320	5, 311, 050	297, 430	2, 254, 492	4, 840	800
1889	128	3, 701, 264	391, 321	1, 011, 805	18, 389	290
1879	210	3, 174, 234	468, 112	1, 294, 677	2, 965	422
1869	12	2, 225, 056	114, 204	401, 687	545	
1859	8, 369	2, 834, 391	46, 899	228, 704	21, 306	2, 308
1849		1, 996, 309	66, 586	1, 075, 090	1, 152	1, 027

<sup>2</sup>Rice reported in pounds.

In 1899 the total area devoted to cereals, including rice, was 607,322 acres; in 1889 it was 423,590 acres; and in 1879, 411,510 acres. The gain in twenty years amounts to 47.6 per cent, of which 30.3 per cent took place in the last decade.

The principal cereal grown is corn, and each decade shows an increased acreage, the gain for the last decade amounting to 50.3 per cent. In 1900 the extreme northern

counties—Columbia, Hamilton, Madison, Jefferson, Leon, Gadsden, and Jackson—reported 51.3 per cent of the acreage and 51.9 per cent of the product of that crop for the state.

Of the total acreage in oats, 56.0 per cent was reported by Madison, Marion, Leon, Columbia, Alachua, and Jackson counties, each having over 2,000 acres and ranking in the order named. A decrease of 25.1 per cent is shown for the state.

All counties except Dade and Monroe reported rice in 1899. The largest acreage was in Hillsboro county, which reported 592 acres with a yield of 455,542 pounds. Marion county reported the next largest area, 492 acres, with a yield of 168,298 pounds.

In addition to the cereals shown in Table 19, 2 acres of buckwheat, with a product of 30 bushels, were reported.

## COTTON.

Table 20 is an exhibit of the changes in cotton production since 1849.

TABLE 20.—ACREAGE AND PRODUCTION OF COTTON: 1849 TO 1899.

YEAR. <sup>1</sup>	ACREAGE.		PRODUCTION.		
	Total.	Per cent of decrease.	Commercial bales.	Pounds.	Per cent of increase.
1899	221,829	2.4	61,856	26,996,884	22.3
1889	227,370	7.4	57,928	27,631,656	10.9
1879	245,595		54,997	24,913,641	44.3
1869			39,789	17,268,426	40.4
1859			65,153	28,993,085	60.6
1849			45,131	18,052,400	

<sup>1</sup>No statistics of acreage were secured prior to 1880.  
<sup>2</sup>Decrease.

The total area devoted to the cultivation of cotton in 1899 was 221,829 acres. The total production was 61,856 commercial bales, or 26,996,884 pounds, an average of 0.279 bale or 121.7 pounds per acre. In 1889 the total area was 227,370 acres, and the total product was 57,928 commercial bales, or 27,631,656 pounds, an average of 0.255 bale or 121.5 pounds per acre. There were decreases of 2.4 per cent and 2.3 per cent, respectively, in the last decade in acreage and production. For the decade from 1880 to 1890, there was an increase of 10.9 per cent in production, although the acreage decreased 7.4 per cent.

Of the total acreage in 1899, 99,036 acres, or 44.6 per cent, were devoted to the cultivation of upland cotton, while 122,793 acres, or 55.4 per cent, were used for sea-island cotton. Of the total product, upland cotton comprised 30,283 bales, or 14,940,617 pounds, and sea-island cotton, 31,573 bales or 12,056,267 pounds.

No cotton whatever was reported by any county lying wholly south of the twenty-eighth parallel, and only 65 bales were grown in counties lying south of the twenty-ninth parallel. The eight counties of Jackson, Jefferson, Leon, Madison, Columbia, Alachua, Suwanee, and Hamilton reported 82.9 per cent of the total acreage and 82.6 per cent of the total number of bales produced in the state. The largest area in cotton for any single county—29,508

acres—was reported by Jackson county. In 1889 this county reported 25,272 acres. In 1889 Jefferson county had the largest area, 30,356 acres, while in 1899 the area grown was 27,761 acres, a loss for the decade of 8.5 per cent.

The total value of the cotton produced represents 17.9 per cent of the gross farm income. Of the total number of acres of improved land in the state, 14.7 per cent were used in the cultivation of cotton.

## SUGAR CANE AND ITS PRODUCTS.

Table 21 presents a comparative exhibit of the acreage of cane and the production of sugar and sirup, 1849 to 1899.

TABLE 21.—ACREAGE OF CANE, AND PRODUCTION OF SUGAR AND SIRUP: 1849 TO 1899.

YEAR. <sup>1</sup>	Acreage in cane.	SUGAR.		SIRUP.	
		Production in pounds.	Average yield per acre in pounds.	Production in gallons.	Average yield per acre in gallons.
1899	12,800	284,800	22.2	1,687,452	131.8
1889	9,345	1,692,015	181.1	1,441,744	154.3
1879	7,938	1,527,600	192.4	1,029,868	129.7
1869		1,142,400		844,389	
1859		2,002,800		436,357	
1849		8,300,000			

<sup>1</sup>No statistics of acreage were secured prior to 1879.

In comparing the sugar statistics of 1900 with those of previous censuses it should be considered that about 60.0 per cent of the crop of 1899 was destroyed by frost. The area devoted to sugar cane increased from 9,345 acres in 1889 to 12,800 acres in 1899, a gain for the decade of 37.0 per cent. Accepting the estimate of a 60.0 per cent loss as approximately correct, a normal year would have given to Florida a total of 710,750 pounds of sugar and 4,218,630 gallons of sirup as a product for the acreage reported.

Each decade shows an increase in the quantity of sirup manufactured, while the production of sugar is rapidly declining, indicating that the planters find sirup the more profitable product. The manufacture of sugar and sirup in Florida is carried on entirely by the "open-kettle" process. The sirup produced by this method is of superior quality and commands a good price, while the sugar is of the brown variety and is rated low commercially.

The largest production of sugar, 25,300 pounds, was reported by Duval county, and the largest quantity of sirup, 166,956 gallons, was made in Gadsden county. The latter county also leads in total value of product, the value reported in 1900 being \$43,264. Alachua county ranks second with a production of 112,945 gallons of sirup, valued at \$36,066. The total value of the sugar and sirup produced in the state represents 3.2 per cent of the gross farm income.

## SEMITROPICAL FRUITS.

The changes in production of semitropical fruits since 1889 are shown in the following table.

TABLE 22.—SEMITROPICAL TREES AND FRUITS: 1890 AND 1900.

FRUIT.	NUMBER OF TREES.		QUANTITIES OF FRUIT.		
	1900.	1890.	Unit of measure.	1899.	1889.
Figs	9,433	20,109	Pounds	66,680	(1)
Guavas	106,025	21,448	Pounds	1,645,795	(1)
Kaki	8,271	38,729	Pounds	75,110	(1)
Lemons	22,691	85,052	Boxes	2,859	282,948
Limes	41,741	17,089	Boxes	22,714	46,294
Oranges	2,552,542	2,725,272	Boxes	273,295	3,146,740
Pineapples	<sup>2</sup> 14,578,597	<sup>2</sup> 21,605,000	Number	2,868,140	10,462,499
Pomeloes	117,386	3,135	Boxes	12,366	910,080
Olives	8,186		Pounds	12,250	
Miscellaneous	34,731		Pounds	112,670	

<sup>1</sup> No product reported in 1890.

<sup>2</sup> Plants.  
<sup>3</sup> Barrels.

The value of semitropical fruits grown in Florida in 1889 was \$5,930,787. For 1899 the corresponding value was \$945,607, a loss in ten years of 84.1 per cent. The cold wave of the winter of 1894-95, and the severe frost in February of 1899, resulted in the destruction of about three-quarters of the orange trees of the state. The orange groves of Columbia, Bradford, and St. John counties were almost entirely destroyed, and the counties of Alachua, Marion, Putnam, and Sumter lost about nine-tenths of their trees. In this region, Lake was the only county that escaped with as small a loss as 40.0 per cent of its groves. Although much farther south, the losses in Polk county amounted to about 70.0 per cent, and the gulf counties, Levy, Citrus, Hernando, and Pasco, lost about 90.0 per cent of their trees. Baker, Dade, Lafayette, Lee, Manatee, and Monroe counties each show a slight increase since 1889 in the number of orange trees.

In 1889 the four counties of De Soto, Hillsboro, Lee, and Manatee comprised but 6.3 per cent of the orange-growing area of the state, and their production was commercially insignificant. In 1899 these four counties contained 20.9 per cent of all the orange trees, and produced 245,454 boxes of oranges or 89.8 per cent of the total production for the state.

The pineapple industry still centers in Brevard and Dade counties as it did in the preceding census year, 81.1 per cent of the entire number of plants grown in the state in 1899 being reported by these two counties. Since 1890 there has been an increase in the number of plants amounting to 55.3 per cent in Brevard county, and to 61.4 per cent in Dade county. A decrease is shown in the total number of plants, however, owing to the exaggerated number reported from Monroe county in 1890.

Olive trees are grown in Florida for ornamental or experimental purposes only. The 250 pounds of olives shown in the tables were reported by two farmers in Osceola county. In addition to the trees shown in Table 22, unclassified semitropical fruit trees to the number of 84,731 were reported, with a yield of 112,670 pounds of fruit.

#### ORCHARD FRUITS.

The following table shows the changes in orchard fruits since 1890.

TABLE 23.—ORCHARD TREES AND FRUITS: 1890 AND 1900.

FRUITS.	NUMBER OF TREES.		BUSHELS OF FRUIT.	
	1900.	1890.	1899.	1889.
Apples	8,219	7,025	1,866	2,610
Apricots	524	1,448	68	15
Cherries	1,495	333	112	12
Peaches	351,208	235,936	92,113	230,290
Pears	208,145	49,295	83,584	84,255
Plums and prunes	107,720	36,688	47,840	13,356

Among temperate orchard fruits some interesting changes are to be noted. The entire number of trees has a little more than doubled within the past ten years, rising from about one-ninth of the number of orange trees in 1890 to more than one-fourth in 1900.

In this class peach trees are far the most important. They constituted about 71.0 per cent of all orchard trees in 1890, but only 50.2 per cent in 1900. This change is the result of the greater relative increases in other fruits, especially in pear and plum trees, which increased from 49,295 and 36,688, respectively, in 1890, to 208,145 and 107,720 in 1900, thus coming into the same general grade of importance with peach trees. Apples, cherries, and apricots are of minor importance. Increases were reported in the number of trees of all kinds, except apricots, as follows: Apples, 17.0 per cent; cherries, 348.9 per cent; peaches, 50.1 per cent; pears, 322.2 per cent; plums and prunes, 193.6 per cent. The rate of decrease in the number of apricot trees is 63.8 per cent.

The counties that report more than 10,000 peach trees each are Alachua, Clay, Duval, Escambia, Gadsden, Hillsboro, Jackson, Lake, Marion, Polk, Putnam, Santa Rosa, Taylor, and Walton, in the northern and central parts of the state. The large increases in the number of pear and plum trees indicate that farmers are realizing that the soil and climate of Florida are well adapted to the culture of these fruits. The largest number of pear trees, 16.3 per cent of the total number, was reported by Leon county. Marion county reported 13.5 per cent of all the plum and prune trees. Gadsden, Jackson, and Santa Rosa counties reported almost one-half of all the apple trees. In addition to the trees shown in Table 23, unclassified fruit trees to the number of 3,769 were reported, with a yield of 2,870 bushels of fruit.

The value of orchard products, given in Table 18, includes the value of 708 barrels of cider, 298 barrels of vinegar, and 4,870 pounds of dried and evaporated fruits.

#### SMALL FRUITS.

The total area used in the cultivation of small fruits in 1899 was 1,343 acres, distributed among 1,669 farms. The value of the fruits grown was \$189,867, an average of \$113.76 per farm reporting.

Of the total area in small fruits all but 30 acres were devoted to strawberries, the yield being 1,731,730 quarts. Bradford county, near the northern border of the state, and Hillsboro, Polk, and Pasco counties, in the east central portion, contained 74.3 per cent of the total acreage devoted to this fruit, and reported 75.6 per cent of the total

product. Of the remaining 30 acres, 5 were used for raspberries, and 25 for other small fruits.

#### TOBACCO.

Tobacco was grown for the market in Florida as early as 1840, and in the decade from 1850 to 1860 its culture became an important industry in certain sections of the state. The Florida "speckled-leaf," differing from the Connecticut "seed-leaf" or "broad-leaf" chiefly in its spotted appearance, was the principal variety grown. After 1860 the industry declined rapidly, and, largely on account of the competition of Sumatra tobacco and the difficulty in controlling labor, was soon practically abandoned.

Since 1885 the introduction of Cuban and Sumatran seed and careful experimentation have revived the industry. In 1889, 1,190 acres were devoted to the crop and 470,443 pounds of tobacco were gathered. In 1899, 998 farmers devoted 2,056 acres to tobacco and gathered a crop of 1,125,600 pounds. The acreage increased 72.8 per cent in the decade and the production more than doubled. Gadsden is the leading county in tobacco culture, having reported in 1900, 84.5 per cent of the total acreage and 90.3 per cent of the total product.

#### PEANUTS.

In 1899, 967,927 bushels of peanuts, valued at \$699,713, were grown on 69,452 acres of land. In 1889, 359,555 bushels were obtained from 26,166 acres, the average yield per acre in both years being approximately 14 bushels. Jackson county had the largest acreage in both years, having reported in 1889, 3,224 acres and a yield of 29,050 bushels, and in 1899, 12,003 acres and a yield of 130,619 bushels. Suwanee county ranked second in 1899 in both acreage and production, having reported 5,779 acres and 90,519 bushels. Ten years before Alachua county ranked second and Suwanee county, sixth. In the present census Alachua county ranks third in acreage.

#### FLORICULTURE.

The total value of plants and flowers grown by the operators of the 44 farms from whom reports on this industry were received was \$41,417. Only 15 of the 44 were commercial florists, the others having raised flowers or plants incidentally in connection with their farming operations. In 1899 the income derived by these 15 establishments from the sale of flowers and plants was \$27,309, and that from other products was \$3,429. The total capital invested by them in land was \$38,350; in buildings, \$13,450; in implements, \$2,790; and in live stock, \$772.

Of the total area of 74,960 square feet of land under glass, reported by the operators of 31 farms, 59,962 square feet, equivalent to 79,950 square feet of glass surface, were used by the 15 commercial florists.

#### NURSERIES.

The 30 nurseries in the state yielded, in 1899, a gross income of \$136,726, of which \$118,622 was derived from the sale of trees, shrubs, and vines, and \$18,104 from other

products. The acreage reported by nurserymen was 2,307, making the average income per acre \$59.27.

#### LABOR AND FERTILIZERS.

The total expenditure for labor on farms in 1899, including the value of board furnished, was \$1,468,290, an average of \$36 per farm. The average was highest on the most intensively cultivated farms, being \$922 for nurseries, \$601 for florists' establishments, \$441 for tobacco farms, \$108 for fruit farms, \$81 for sugar plantations, \$58 for market gardens, \$27 for rice farms, and \$24 for cotton farms. Managers expended, on an average, \$290; owners, \$33; cash tenants, \$16; and share tenants, \$15. White farmers expended \$49 per farm, and colored farmers, \$10.

Fertilizers purchased in 1899 cost \$753,120, an average of \$18 per farm, and a decrease since 1890 of 12.2 per cent. The average expenditure was greatest for nurseries, and least for hay and grain farms. For nurseries the average was \$280; for tobacco farms, \$123; for florists' establishments, \$113; for fruit farms, \$63; for market gardens, \$45; and for cotton plantations, \$12.

#### IRRIGATION STATISTICS.

Irrigation occupies a position of growing importance in the agricultural economy of Florida. It is a comparatively recent innovation, having been first resorted to in 1888 by the orange growers. The results were apparently so satisfactory that the number of irrigators has increased from year to year.

Until the disastrous "freeze" of 1894-95, irrigation was confined almost entirely to orange groves, but with the destruction of thousands of orange trees, many of the irrigation systems were thrown out of use, and the attention of irrigators was turned to the industry of truck farming. In this industry the need of irrigation was quickly felt, as the products of truck farms are of large commercial value, and even a partial loss of crops is very costly. The cultivation of fruits and vegetables has proved most profitable, and the development of these branches of agriculture has been very rapid, giving a great impetus to the use of irrigation. At the present time by far the greater number of irrigation plants in the state are used by truck farmers and growers of small fruits.

Although it has a heavy mean annual rainfall, Florida is subject to severe droughts, especially during the growing period between February and June. In the sections where irrigation is reported, the soil is naturally nonretentive of moisture, and, owing to the great heat, evaporation is excessive.

The state appears to be underlaid by artesian waters at depths varying from 25 to 500 feet below the surface. Where these waters have been tapped the supply is found to be ample, many of the wells flowing with considerable pressure and great volume. In most cases no cost of pumping is entailed in irrigation, and the expense of maintaining the plant is very slight. The usual cost of one well, including drilling, casing, cement pipes, and everything required to complete a plant capable of irrigating 10 acres, is about \$500.

The system employed on the leading farms is as follows: Continuous underground cement pipes are laid from the wells to hydrants, plugs, or standpipes, from which the water is distributed in small furrows between rows. These pipes are made and laid at the same time by a machine, in trenches previously prepared, and extend without break to any desired part of the field. The pipe itself is composed of two parts sand and one part cement, with a usual inside measurement of 3 inches, and an outside measurement of 6 inches, and costs about 10 cents per foot. In a few sections the water is pumped by windmills into tanks, whence it is distributed over the land through iron pipes or wooden troughs. Gasoline engines and rotary pumps are sometimes used instead of windmills. A well, with its equipment of gasoline engine, rotary pump, and iron pipe sufficient to irrigate 3 acres, costs about \$500. Using gasoline, at 14½ cents per gallon, as a fuel, such a plant will deliver 2,000 gallons per hour, at an average cost of 4 cents per hour.

The most extensive irrigation systems in the state are located in Gadsden county, and belong to two companies engaged in the cultivation of Sumatra tobacco. The cost of constructing these plants, which irrigate 250 acres of tobacco, was \$36,250. In 1899 the value of the tobacco grown was \$91,000. The water for these plants is pumped by steam from several small creeks into reservoirs, from which it is distributed through ditches by gravity. One of the companies has perfected an elaborate plan of distribution through troughs and overhead sprays, the water being supplied in a manner very similar to that of natural rainfall.

Among the humid states where irrigation was practiced in 1899, in growing general crops, Florida ranked first in the area irrigated, in cost of plants, and in value of irrigated crops. In that year there were 180 irrigated farms, 166 of which reported irrigated products. On 14 farms 53 acres of nonbearing orange trees and pineapples were irrigated. Forty-three irrigation systems, representing an aggregate cost of \$78,525, and covering 751 acres, were not operated in 1899. The value of the products of the 1,485 acres irrigated was \$302,870, or an average of \$203.95 per acre. The total cost of the pumping systems, ditches, and wells was \$232,388, or an average of \$101.52 per acre. The following table presents statistics of irrigation for a number of the leading counties in the state.

## IRRIGATION STATISTICS.

COUNTIES.	Number of farms irrigated.	Number of acres irrigated.	Cost of systems.	IRRIGATED PRODUCTS.		
				Acres.	Value.	Average value per acre.
The State -----	180	1,538	\$232,388	1,485	\$302,870	\$204
Alachua -----	8	34	7,850	84	10,876	820
Brevard -----	22	111	17,800	103	6,730	65
Dade -----	7	57	13,200	57	652	11
De Soto -----	8	62	7,060	62	6,388	103
Gadsden -----	3	252	36,600	252	91,176	862
Hillsboro -----	15	80	8,775	75	14,999	200
Lake -----	4	21	10,250	21	640	30
Lee -----	6	82	10,300	76	10,373	136
Manatee -----	57	666	42,973	641	107,602	168
Orange -----	18	56	54,315	53	15,611	295
Polk -----	5	42	5,650	42	4,850	115
All other counties -----	27	75	17,615	69	32,973	478

Twelfth Census of the United States.

# CENSUS BULLETIN.

No. 166.

WASHINGTON, D. C.

May 5, 1902.

## MANUFACTURES.

### SHIPBUILDING.

HON. WILLIAM R. MERRIAM,

*Director of the Census.*

SIR: I transmit herewith, for publication in bulletin form, a report on shipbuilding and repairing, prepared under my direction by Mr. Alexander R. Smith, of New York, acting in the capacity of an expert special agent of the division of manufactures of the Census Office.

The statistics for the shipbuilding industry were reported at the census of 1890 under four subdivisions, that is: Iron and steel vessels; wooden vessels; boats, masts, and spars; and repairs of vessels. In 1900 it was decided to assign the reports for the industry to the two groups, iron and steel vessels, including their repairing, and wooden vessels, boats, oars, masts, and spars, including repairing. The statistical tables embodied in this report include only such data as relate to ship construction and repairs, and the equipment of vessels, without reference to the trade in which the vessels constructed might be engaged, whether foreign or domestic. Reference has been made, however, in the discussion of the data, to the Treasury Department statistics, giving separately the tonnage of American vessels engaged in foreign and domestic trade. These statistics seem to show that however gratifying in other respects the increase in shipbuilding in the United States may be (and the addition to the merchant marine was considerable during the census year), the addition to the tonnage in foreign trade by new construction was insufficient to make up for the loss of such tonnage from natural and common causes, and that the decline in American shipbuilding for foreign trade, which has been so marked for half a century, has not been arrested.

It has been found impossible to separate the statistics relating to merchant and naval vessels when both are constructed in private shipyards. The tonnage of the latter is, however, of large proportions, and should be taken into account in any consideration of the statistics from the standpoint of the uses in which the new ships are employed. During the decade the relative positions of the two branches of the industry—wooden shipbuilding and iron and steel shipbuilding—have been reversed, the latter for the first time occupying the leading position in the tonnage and value of vessels constructed. In this connection the tonnage of barges is not considered.

The statistics of this industry are presented in 23 tables: Table 1 showing comparative figures for the industry at the several censuses; Table 2 showing totals for all establishments divided between iron and steel shipbuilding, wooden shipbuilding, governmental establishments, and establishments with a product of less than \$500, which latter class was not reported at previous censuses; Tables 3, 4, and 5, comparative statistics of governmental establishments, iron and steel shipbuilding, and wooden shipbuilding, respectively, for 1890 and 1900; Table 6, comparative statistics of both branches of the industry combined, by states, for 1890 and 1900; Tables 7 and 8, detailed statistics of materials and products for iron and steel and for wooden shipbuilding establishments, respectively; Tables 9, 10, 11, and 12, summaries of shipbuilding on the Great Lakes, presenting, respectively, statistics of both branches of the industry combined, of iron and steel shipbuilding, of wooden shipbuilding, and of iron and steel shipbuilding in 1900 and 1890; Table 13, statistics of wooden

ship and boat building in cities of 20,000 population and over; Table 14, capital invested; Table 15, percentages that the several items for each branch of the industry form of the corresponding totals for the entire industry; Table 16, cost of the several materials used and percentage of total cost; Table 17, number of establishments engaged exclusively in small boat construction and repair, with capital and value of products, by states; Table 18, number of establishments engaged exclusively in repair work, with capital and value of products, by states; Table 19, statistics of transportation companies engaged in construction and repair of their floating equipment, by states; Table 20, number and value of small boats constructed, by states; Tables 21, 22, and 23, detailed statistics, by states, for iron and steel shipbuilding, wooden shipbuilding, and shipbuilding by governmental establishments, respectively.

In drafting the schedules of inquiry for the census of 1900 care was taken to preserve the basis of comparison with prior censuses. Comparison may be made safely with respect to all the general heads of the inquiry, except those relating to capital, salaried officials, clerks, etc., and their salaries, the average number of employees, and the total amount of wages paid. Live capital, that is, cash on hand, bills receivable, unsettled ledger accounts, raw materials, stock in process of manufacture, finished products on hand, and other sundries, was first called for at the census of 1890. No definite attempt was made, prior to the census of 1890, to secure a return of live capital invested.

Changes were made in the inquiries relating to employees and wages in order to eliminate defects found to exist on the form of inquiry adopted in 1890. At the census of 1890 the average number of persons employed during the entire year was called for, and also the average number employed at stated weekly rates of pay, and the average number was computed for the actual time the establishments were reported as being in operation. At the census of 1900 the greatest and least numbers of employees were reported, and also the average number employed during each month of the year. The average number of wage-earners (men, women, and children) employed during the entire year was ascertained by using 12, the number of calendar months, as a divisor into the total of the average numbers reported for each month. This difference in the method of ascertaining the average number of wage-earners during the entire year may have resulted in a variation in the number, and should be considered in making comparisons.

At the census of 1890 the number and salaries of proprietors and firm members actively engaged in the business or in supervision were reported, combined with clerks and other officials. In cases where proprietors and firm members were reported without salaries,

the amount that would ordinarily be paid for similar services was estimated. At the census of 1900 only the number of proprietors and firm members actively engaged in the industry or in supervision was ascertained, and no salaries were reported for this class. It is therefore impossible to compare the number and salaries of salaried officials of any character for the two censuses.

Furthermore, the schedules for 1890 included in the wage-earning class, overseers, foremen, and superintendents (not general superintendents or managers), while the census of 1900 separates from the wage-earning class such salaried employees as general superintendents, clerks, and salesmen. It is possible and probable that this change in the form of the question has resulted in eliminating from the wage-earners, as reported by the present census, many high-salaried employees included in that group for the census of 1890. With the exception of these and several other changes in the special features of the schedules, which do not affect the value of the statistics for comparative purposes, the investigation has been conducted along the lines followed at the census of 1890.

In some instances the number of proprietors and firm members, shown in the accompanying tables, falls short of the number of establishments reported. This is accounted for by the fact that no proprietors or firm members are reported for corporations.

The reports show a capital of \$77,362,701 invested in the 1,116 establishments reporting for the industry. This sum represents the value of land, buildings, machinery, tools, and implements, and the live capital utilized, but does not include the capital stock of any of the corporations. The value of the products is returned at \$74,578,158, to produce which involved an outlay of \$2,008,537 for salaries of officials, clerks, etc.; \$24,839,163 for wages; \$3,685,661 for miscellaneous expenses, including rent, taxes, etc.; and \$33,486,772 for materials used, mill supplies, freight, and fuel. It is not to be assumed, however, that the difference between the aggregate of these sums and the value of the products is, in any sense, indicative of the profits in the manufacture of the products during the census year. The census schedule takes no cognizance of the cost of selling, or of interest on capital invested, or of the mercantile losses incurred in the business, or of depreciation in plant. This statement is necessary in order to avoid erroneous conclusions from the figures presented.

Very respectfully,



*Chief Statistician for Manufactures.*

# SHIPBUILDING.

By ALEXANDER R. SMITH, *Expert Special Agent.*

The growth of the shipbuilding industry in the United States during the past ten years, as shown by the census reports, exceeds that of any preceding decade, and the tonnage constructed during the census year ending May 31, 1900, was greater than during any preceding year in the history of the United States, with the possible exceptions of 1854 and 1855. Although in other countries iron and steel long ago largely superseded wood as the chief material used in the construction of ships, the census statistics show that it was not until the last decade that metal shipbuilding attained proportions greater than wooden in the private shipyards of the United States.

This substitution of iron and steel for wood has wrought a revolution in the shipbuilding industry in the United States. The zenith of American shipbuilding, judged by the tonnage annually added to the merchant marine, was reached during the decade between 1850 and 1860. At that time the superiority of ships built in the United States for endurance, speed, and safety was conceded. It was the era of the American clipper. This class of wooden sailing ships commanded higher freight rates, even in Liverpool and London, than British ships, and insurance rates on American vessels and their cargoes were lower than on foreign ships. These advantages placed the United States in the very front rank in international trade-carrying competition. This prestige had been increasing ever since the successes achieved by the United States in the carrying trade during the Napoleonic wars. The easy convertibility of the wooden vessels of that time into ships of war gave a distinct naval strength and solidity to the nation. The passing of wooden shipbuilding, therefore, as the dominant branch of the shipbuilding industry in the United States, has an historical significance.

One remarkable feature of the growth of the industry during the past decade is the fact that the product of merchant vessels has been so largely absorbed and employed in the domestic commerce of the country. Up to the time of the Civil War the tonnage of vessels constructed in American shipyards for the foreign trade compared favorably with that for the domestic trade; and, indeed, the progress and prosperity of the industry rested largely upon the demands for vessels

for foreign commerce. This is no longer true. Comparatively few vessels for foreign trade are now built in American shipyards. But in the meantime the enormous growth of internal commerce, together with the opportunities afforded by the extensive coast line of the United States, the Great Lakes, and the navigable rivers, which in many cases have been so deepened, at an expense reaching into hundreds of millions of dollars, as to accommodate the passage of the largest vessels, has greatly developed the demand for vessels in the domestic trade. This has not only kept alive our shipbuilding industry, but constitutes also, in large part, the foundation upon which it has expanded. Another important element in the growth of the industry has been the demand of the Government for a new Navy constructed in home shipyards.

During the last four decades, therefore, the stability of the industry in the United States has rested almost wholly upon the domestic or coastwise trade, the vessels constructed for foreign trade representing but a small proportion of the entire output of the shipyards. Whether or not this is due to the fact that the domestic water-borne trade of the United States has by law been restricted to vessels built in the United States, need not here be discussed. These restrictions have existed since the foundation of the Government, at first by statutory discriminations in favor of home vessels that practically excluded foreign tonnage, and, ever since the early part of the Nineteenth century, by statutory prohibition. Under such restrictions shipbuilding for the internal commerce of the United States has grown and prospered. On the other hand, in the foreign trade, to which foreign vessels for many years have been admitted upon terms of perfect equality with those of the United States, the foreign tonnage has maintained an almost constant increase, while the domestic tonnage has steadily diminished.

The completeness of the decline of American shipping in the foreign trade may be briefly illustrated by quotations from the statistical history of the growth of the foreign commerce of the United States, showing the share in its carriage taken by American ships in the earlier years compared with the present time. In 1826 American vessels carried 92.5 per cent of the foreign

commerce of the United States, the value of which was \$150,331,636, while in 1900 they carried 9.3 per cent, the value of which was \$195,083,155, an increase in value of only 29.5 per cent in seventy-four years. In 1826 foreign vessels carried 7.5 per cent of our foreign commerce, valued at \$12,238,163, while in 1900 they carried 90.7 per cent, valued at \$1,894,445,461, an increase of 15,379.8 per cent in seventy-four years.<sup>1</sup>

While the census returns do not indicate the particular trade in which the vessels built are to engage, other official records are at hand which in part supply the information. For instance, no vessel is permitted to engage in foreign trade unless provided with a register, a document issued by the Government through its custom houses. Hence the American shipping under register accurately shows the total tonnage of the United States engaged in the foreign trade. The returns for the Twelfth Census show that the vessels of all kinds—sail and steam, steel and wood, including barges and canal boats—constructed in the shipyards of the United States in 1900 numbered 2,087, with a gross tonnage of 687,681 tons. The report of the Commissioner of Navigation for 1900<sup>2</sup> shows that 88 American-built vessels, with a total of 29,069 gross tons, were registered for the foreign trade. This tonnage constitutes only 4.2 per cent of the total product turned out by American shipyards in 1900, hardly equivalent to half a month's construction. Reports of the Commissioner of Navigation show further that during the ten years ending with 1900, 206,771 tons of vessels built in the United States were registered for the foreign trade, a total that is equal to only 30.1 per cent of the tonnage constructed in shipyards of the United States for all purposes in the year 1900; that is to say, in less than four months of 1900 as much tonnage was built in American shipyards for all trades as was built in those shipyards for foreign trade during the entire ten years ending with 1900.

Although the actual tonnage of different vessels, foreign and domestic, engaged in the foreign trade of the United States is not precisely known, estimates have been made by different commissioners of navigation which may serve as a basis for comparison. In the report of the Commissioner of Navigation for 1900 the tonnage necessary for the foreign carrying trade in 1899 is estimated at 3,571,284 gross tons of steam and 1,000,000 tons of sail, a total of 4,571,284 tons.<sup>3</sup> This is the lowest official estimate that has been made. The Commissioner of Navigation stated in 1890 that 6,500,000 tons would be required to carry 83 per cent of the foreign commerce of the United States at that time.<sup>4</sup> That would make the tonnage required for carrying the entire foreign commerce of the United States 7,831,325 tons. Since that time the value of our foreign commerce has

increased 36 per cent. In view of these expert official estimates, it would be conservative to state that fully 5,000,000 tons of shipping are now required for the carriage of the entire foreign commerce. Toward supplying that need home shipyards, as we have seen, contributed only 29,069 tons during the census year of 1900, and only 206,771 tons during the entire ten years ending with 1900. At the rate of construction in 1900 one hundred and seventy-two years would elapse before enough tonnage would be built for the present needs of our foreign trade. The average life of a ship is commonly computed at ten years, taking into account losses, accidents, and deterioration. But allowing twenty years as the average life of a modern steel steamship, at the present rate of construction for foreign trade over eight years would elapse before enough ships would be constructed to provide for the average losses of one year. In Great Britain, in 1899, steel steamships to the number of 567 were constructed, the tonnage of which aggregated 1,341,425, while in the United States 123 steel steam vessels, aggregating 237,379 gross tons, were constructed for all kinds of trade, inland, coastwise, and foreign. As a matter of fact only one steel steam vessel, of 1,771 tons, was built in the United States during 1900 for the foreign trade.<sup>5</sup> On the Great Lakes alone vessels aggregating 111,241 gross tons were built in 1900, or 16.2 per cent of the total tonnage built during that year in the United States, while the tonnage built under register, as previously stated, constituted but 4.2 per cent of the total tonnage, or 26.1 per cent of that constructed for the traffic of the Great Lakes. In number of tons, the merchandise moved annually upon the Great Lakes approximates very closely to the merchandise annually imported into and exported from the United States, but the distance it is carried is very much less. For this reason the commerce of the Great Lakes can be carried by use of a tonnage approximately one-third as large as is necessary for the carriage of our foreign commerce. And yet, notwithstanding the smaller requirements of the traffic on the Great Lakes, the tonnage built for that traffic in 1900 was nearly four times that built for foreign trade.

While in general our laws deny American registry to foreign-built vessels, there are exceptions provided by which such vessels may be registered if owned by citizens of the United States. For instance, a foreign-built vessel wrecked in American waters and purchased and repaired by a citizen of the United States may be registered "if it shall be proved to the satisfaction of the Commissioner [of Navigation] that the repairs put upon such vessel are equal to three-fourths of the cost of the vessel when so repaired."<sup>6</sup> Congress also, by special enactment, admits foreign vessels to American registry from time to time, under exceptional circumstances. During the past ten years vessels of foreign

<sup>1</sup> Report Commissioner of Navigation, 1901, pages 560-563.

<sup>2</sup> *Ibid.*, 1900, page 382.

<sup>3</sup> *Ibid.*, page 24.

<sup>4</sup> *Ibid.*, 1890, page 132.

<sup>5</sup> Report Commissioner of Navigation, 1900, pages 25-27.

<sup>6</sup> Navigation Laws of the United States, 1899, page 16.

construction, including Hawaiian tonnage and vessels captured from Spain, aggregating 134,859 tons, were admitted to American registry, a total equal to 65.2 per cent of the tonnage constructed in domestic shipyards for the foreign trade during the same period.<sup>1</sup>

In 1890 the American tonnage under register, in our foreign trade, amounted to 946,695 tons, since which time 206,771 tons have been built in the United States and documented under register, and 134,859 tons of foreign-built vessels have been granted American registry. This would have made a total of 1,288,325 tons in 1900, had none gone out of existence. But in 1900 the tonnage under American registry was only 826,694, showing a loss of 461,631 tons during the ten years. This shrinkage is more than twice as much as the total new registered tonnage built in the United States during the decade. This indicates how hopeless, under present conditions, are the prospects of the shipyards of the United States maintaining even the present tonnage in the foreign carrying trade, to say nothing of providing the additional tonnage made necessary by the growth in volume of foreign commerce. An idea of the extent of this growth may be obtained from a study of the statistics of tonnage of foreign commerce entering at and clearing from the seaports of the United States in 1890 and 1900. In 1890 the tonnage of American and foreign vessels entering the seaports of the United States from foreign ports was 15,365,604 tons; in 1900 it was 23,533,597 tons, an increase of 8,167,993 tons, or 53.2 per cent, in ten years. The tonnage of clearances in foreign trade is approximately that of entries, and consequently shows about the same percentage of increase.<sup>2</sup>

The domestic water-borne traffic of the United States is confined to vessels constructed and owned in the United States, and the growth of shipping in the domestic trade seems to be all that can be desired. The improvement of rivers and harbors has, during the last decade especially, proceeded upon an enormous scale, with promise of continuance. These improvements make possible the use of craft of constantly increasing size; and freight rates being gradually decreased, the effect is inevitably stimulating upon the growth of domestic water-borne commerce. This growth assures to shipbuilders of the United States a steady demand for vessels adapted to the needs of domestic traffic.

The recent territorial acquisitions of the United States, extending to the West Indies and the islands of the Pacific, our trade with which must be confined to vessels built in the United States, holds promise to shipbuilders of a demand for ocean-going vessels adapted to the trade requirements and harbor facilities of the ports of these possessions. Moreover, it is likely that the future growth of the Navy will afford employment for many shipyards. Its growth during

the past twenty years accounts, in very large degree, for the establishment of new and entirely up-to-date plants and the reequipment of old plants with the modern facilities required for the construction of high-class naval vessels. These establishments are also prepared to enter upon the construction of vessels of any size or type for any trade; and the grade of work and fineness of finish demanded by the specifications for our war ships, and insured by the thorough inspection under which they are built, are likewise evinced in the improvements shown in the constructions for our merchant service. The demand for yachts, steam and sail, of the finest and largest type, the finish and elegance of which are so notable, gives employment to men of the greatest efficiency in a number of our shipyards in different parts of the country.

These are the varied demands upon our shipbuilders that form the broad underlying foundation of their present prosperous condition. But the constructions for the foreign trade of the United States, which afford, in other countries, investment for a capital probably twice as large as is at present invested in the United States, furnishing employment to thousands of skilled workmen and providing an enormous market for materials, assume very small proportions in the shipyards of our own country. The demand for vessels in the foreign trade is so great that if it were supplied by American shipyards the average annual construction of these yards would be increased fully one-third in tonnage and probably doubled in value. The types of vessels engaged in the foreign trade are much more costly than those employed in domestic trade. Summing up the present situation, the paradox exists of a substantial number of establishments, equipped with every essential for the construction of ocean-going ships of every type, being limited to the construction of war ships and of vessels for our domestic trade, except for the infrequent and spasmodic requirements of a few courageous shipowners who persist in operating American-built ships in foreign trade. The very infrequency and uncertainty of this demand largely account for the fact that the cost of construction per ton is higher in the United States than in other countries, notably Great Britain, which probably builds four-fifths of the world's ocean-going tonnage, although less than three-fifths of it is under the flag of that nation. This anomalous condition of American shipyards, in respect of equipment for and output of ocean-going shipping, has attracted widespread attention and provoked world-wide comment. Precisely what should be done to increase United States shipping in foreign trade is the much discussed and still unsolved American maritime problem.

As previously stated, 206,771 tons of ships for foreign trade were built in the United States during the past decade. During the same period 12,077,359 tons of steel steamships were built in the world's shipyards,

<sup>1</sup> Reports of the Commissioner of Navigation, 1891 to 1900, inclusive; table giving "Balance sheets of tonnage accounts."

<sup>2</sup> Statistical Abstract of the United States, 1900, pages 441-442.

of which Great Britain built 9,793,426 tons, or 81.1 per cent. In the United States only 742,830 tons of steel vessels were built during the past ten years, 450,089 tons of which were constructed upon the Great Lakes. The remainder, 292,741 tons, or 39.4 per cent of the total, represents the constructions of the Atlantic and Pacific shipyards for the coastwise and ocean traffic.<sup>1</sup> It should be stated in this connection that during the last three years of the decade 80,687 tons of American vessels were sold to the Government, as compared with a total of 4,254 tons sold during the intervening years succeeding the Civil War. This, naturally, created an abnormal demand for new tonnage, which is shown by the fact that of the 275,550 tons of steel vessels built on the Atlantic coast of the United States during the past decade, 138,888 tons, or more than one-half, were constructed in the last three years of that period, and 70,548, or more than one-fourth, in the year 1900. Since, however, 8,258 tons were bought back, the net purchases amounted to 72,429 tons.<sup>2</sup> It is very easy to see, in the light of these large purchases, comprising in most cases vessels of the largest and most serviceable type for the needs of the Government, what an abnormal demand for construction has arisen, leading to an unparalleled degree of activity in our shipyards. The acquirement of Porto Rico and Hawaii, and the restriction of that trade to American-built vessels, has also added to the demand for large vessels, in the construction of which a few of our shipyards are now engaged. The total documented tonnage annually lost, abandoned, sold, and exempted is quite large, the amount in the year 1900 being 156,862 tons. During the last decade

1,897,488 tons have been so withdrawn, an annual average of 189,748 tons. The documented tonnage of the United States in 1900 constituted only 57.3 per cent of the tonnage constructed in the shipyards of the United States during that year, as disclosed by the census returns. The undocumented tonnage consists of a class of shipping which is much lighter, more frail, and more short-lived, so that it is reasonable to believe that the annual loss in this tonnage fully equals that in the documented. Therefore, there is an annual demand, merely to make good average losses, for new tonnage aggregating between 300,000 and 350,000 tons, so that losses alone in our national shipping create a steady demand for what may be regarded as a substantial annual total of new tonnage—more than one-half, probably, of the tonnage constructed during the year 1900.

Although iron ships were constructed in American shipyards previous to the inauguration of the new Navy, which were almost wholly employed in domestic trade, modern steel shipbuilding is contemporaneous with the growth of the new Navy, the first vessels for which were launched about sixteen years ago. These initial constructions led to the equipment of a few of the shipbuilding establishments in operation at that time with plants adequate for the production of modern ships of war, and these plants, with others that have been established since, are equally capable of producing steel merchant vessels of the highest type, a limited number of which, in every way a credit to the skill of the shipbuilders, have been turned out during the last decade.

Table 1 shows the statistics for the entire industry, exclusive of establishments owned by the Government, as returned at the censuses of 1850 to 1900, inclusive, with the percentage of increase for each decade.

<sup>1</sup> Report Commissioner of Navigation, 1900, page 24.

<sup>2</sup> Ibid., page 439.

TABLE 1.—COMPARATIVE SUMMARY, 1850 TO 1900, WITH PER CENT OF INCREASE FOR EACH DECADE.

	DATE OF CENSUS.						PER CENT OF INCREASE.				
	1900	1890	1880	1870	1860	1850	1890 to 1900	1880 to 1890	1870 to 1880	1860 to 1870	1850 to 1860
Number of establishments.....	1,116	1,006	2,188	964	675	953	10.9	154.0	127.0	42.8	129.2
Capital.....	\$77,362,701	\$27,262,892	\$20,979,874	\$11,468,076	\$5,952,665	\$5,373,139	133.8	29.9	83.0	92.6	10.8
Salaries of officials, clerks, etc., number.....	1,407	21,123	( <sup>3</sup> )	( <sup>3</sup> )	( <sup>3</sup> )	( <sup>3</sup> )	25.3	( <sup>3</sup> )	( <sup>3</sup> )	( <sup>3</sup> )	( <sup>3</sup> )
Salaries.....	\$2,008,587	\$1,194,870	( <sup>3</sup> )	( <sup>3</sup> )	( <sup>3</sup> )	( <sup>3</sup> )	68.1	( <sup>3</sup> )	( <sup>3</sup> )	( <sup>3</sup> )	( <sup>3</sup> )
Wage-earners, average number.....	46,781	22,143	21,345	13,915	10,071	12,976	111.3	3.7	58.4	38.2	122.3
Total wages.....	\$24,839,168	\$18,083,949	\$12,713,813	\$7,073,400	\$4,539,313	\$6,055,884	89.9	2.9	79.7	55.8	125.0
Men, 16 years and over.....	45,744	21,990	21,338	13,814	10,070	12,962	108.3	2.9	54.5	37.2	115.3
Wages.....	\$24,636,612	\$13,055,083	( <sup>3</sup> )	( <sup>3</sup> )	( <sup>3</sup> )	( <sup>3</sup> )	88.7	( <sup>3</sup> )	( <sup>3</sup> )	( <sup>3</sup> )	( <sup>3</sup> )
Women, 16 years and over.....	34	9	( <sup>3</sup> )	6	1	14	277.8	( <sup>3</sup> )	1100.0	600.0	192.9
Wages.....	\$11,424	\$2,522	( <sup>3</sup> )	( <sup>3</sup> )	( <sup>3</sup> )	( <sup>3</sup> )	353.0	( <sup>3</sup> )	( <sup>3</sup> )	( <sup>3</sup> )	( <sup>3</sup> )
Children, under 16 years.....	1,003	174	7	95	( <sup>3</sup> )	( <sup>3</sup> )	476.4	2,385.7	192.6	( <sup>3</sup> )	( <sup>3</sup> )
Wages.....	\$191,127	\$26,844	( <sup>3</sup> )	( <sup>3</sup> )	( <sup>3</sup> )	( <sup>3</sup> )	625.5	( <sup>3</sup> )	( <sup>3</sup> )	( <sup>3</sup> )	( <sup>3</sup> )
Miscellaneous expenses.....	\$3,685,661	\$1,392,551	( <sup>4</sup> )	( <sup>4</sup> )	( <sup>4</sup> )	( <sup>4</sup> )	164.7	( <sup>4</sup> )	( <sup>4</sup> )	( <sup>4</sup> )	( <sup>4</sup> )
Cost of materials used.....	\$33,486,772	\$16,521,246	\$19,736,358	\$9,379,980	\$5,788,676	\$7,420,496	102.7	116.3	110.4	62.0	122.0
Value of products, including repairing.....	\$74,678,158	\$38,065,410	\$30,800,827	\$21,483,967	\$13,424,037	\$16,937,525	95.9	3.4	71.3	60.0	120.7

<sup>1</sup> Decrease.

<sup>2</sup> Includes proprietors and firm members, with their salaries; number only reported in 1900. (See Tables 21 and 22.)

<sup>3</sup> Not reported separately.

<sup>4</sup> Not reported.

Table 1 includes returns from a large number of small establishments engaged in the building or repairing of canal boats, ships' boats, fishing boats, pleasure boats, and other small craft, as well as in the construction of masts and spars. It is possible that the canvass for the collection of returns for these small establish-

ments has been more thorough at some censuses than at others.

In some of the great shipbuilding establishments the manufactures of a character different from shipbuilding are too important to be included as by-products of that industry. In such cases the method was adopted of

treating each of the establishments as two separate plants, including in the tables presented in this report the operations in shipbuilding, with value of products and cost of labor and materials, and assigning to this branch of the work a certain proportion of the officers, clerks, etc., employed in the establishment. All other products of the establishments, with the materials, wages, and salaries chargeable thereto, were included under their proper classified industries. There are 3 such establishments in Delaware, 1 in Maryland, and 1 in Washington.

On the other hand a certain amount of vessel construction and repair work is carried on in the United States by establishments which, so far as their main business is concerned, are not shipbuilding plants. The construction of stationary engines, machinery, and steel work of a general character so largely predominates in their output that it is not practicable to include them in the shipbuilding tables. Of the more important establishments of this class, one is located in Pennsylvania, classified under "foundries and machine shops," whose total product in marine construction during 1900 was \$54,990. This value included a wooden steam vessel of 200 gross tons, valued at \$25,675. An establishment in Michigan, similarly classified, built 4 wooden steam vessels aggregating 202 gross tons measurement and \$23,100 in value. An establishment in Maryland did general marine repair work valued at \$15,000.

The report on shipbuilding at the census of 1890 contained the following statement: "Returns too imperfect for tabulation were received from a few shipbuilders. It is believed that the omission of reports from the delinquent establishments has but slight effect on the totals for the United States. The principal omissions occur in the state of Pennsylvania." In the light of the information at that time in the possession of those tabulating the returns for shipbuilding for the Eleventh Census, the statement seemed to adequately qualify the statistical results. Certain not wholly explainable omissions of considerable magnitude, however, indicate that the deficiencies may have been more serious than was supposed, and that caution must be exercised in making comparisons between the census returns of 1890 and those of 1900. Taking the governmental establishments as an illustration, 9 were reported in 1900, while but 4 were reported in 1890, and yet the fact is that 7 of the establishments reported in 1900 were in existence in 1890. It is possible that the omission of 3 of these establishments from the 1890 report was due to the small amount of repairing on ships, which led to their inclusion in the foundry and machine shop classification. Moreover, but 18 private iron and steel shipbuilding establishments were reported at the census of 1890, although the schedules for 1900 show that of the 44 iron and steel shipbuilding establishments then reporting, all but 6, according to the statements of the officers or proprietors, had been established before 1890. These seeming omissions may, in part, be explained upon the theory that establishments engaged

in building wooden vessels at the census of 1890 have since entered upon the construction of iron and steel vessels, as the schedules show only the date that the establishments commenced operations, no information in regard to the change in the character of its products being required.

Table 1 shows that the number of establishments engaged in the building and repairing of vessels, boats, masts, and spars increased from 953 in 1850 to 1,116 in 1900, or 17.1 per cent, while the capital invested increased from \$5,373,139 to \$77,362,701, or 1,339.8 per cent. This is an increase in the average capital per establishment invested in the industry, from \$5,638 in 1850 to \$69,321 in 1900, or 1,129.5 per cent. During the same period the average number of wage-earners increased from 12,976 to 46,781, or 260.5 per cent. The total value of constructions and repairs increased from \$16,937,525 to \$74,578,158, or 340.3 per cent. Of the latter sum a large part represents work done for the Navy and War Departments. It was found impracticable to secure any statement from these departments covering the census year ending May 31; but it appears that during the year ending June 30, 1900, the sum of \$8,554,862 was disbursed in the Navy Department to private shipbuilding establishments for construction and repairs, and the sum of \$5,493,556 in the War Department, the total being \$14,048,438, or 18.8 per cent of the total value of products reported by private shipyards for the census year. Of the amount disbursed in the War Department, \$1,291,581 was for "fitting up chartered transports," the remainder being expended "for refitting and repairs of vessels owned by the War Department."

Table 1 shows that the capital invested in shipbuilding in 1850 and 1860 was less than \$6,000,000, a sum insufficient to replace any one of several existing iron and steel establishments. The value of the products in 1850 was more than three times greater than the capital invested, and in 1860 was more than twice as great. In 1900, for the first time in the census history of the industry, the value of products was less than the capital invested. The ratio of capital to product has steadily increased from 1850 to the present time. In 1850 the wages paid to labor exceeded the capital, but in 1900 was less than one-third the amount invested.

Table 2 presents the statistics for the industry by establishments manufacturing a product exceeding \$500 in value, separated into those of iron and steel shipbuilding and wooden shipbuilding, by governmental establishments, and by establishments with a product of less than \$500. These two latter classes of establishments are omitted from all the other tables, except Tables 3 and 22, which present comparative and detailed statistics, respectively, for governmental establishments. In addition to the 1,229 active establishments in the industry during the census year, with a capital of \$131,736,843, shown in Table 2, there were 3 idle iron and steel shipbuilding establishments, with a total capital of \$2,688,940.

TABLE 2.—SUMMARY FOR ALL ESTABLISHMENTS.

CLASSES.	Number of establishments.	Capital.	Proprietors and firm members.	WAGE-EARNERS.		Miscellaneous expenses.	COST OF MATERIALS USED.			Value of products, including repairing.
				Average number.	Total wages.		Total.	Principal materials.	Fuel, freight, etc.	
Total .....	1,229	\$131,736,843	1,366	54,477	\$31,063,176	\$3,718,836	\$37,303,618	\$35,743,907	\$1,559,651	\$85,642,540
Iron and steel shipbuilding .....	44	59,839,555	16	30,906	16,231,311	2,642,690	23,535,549	22,447,481	1,138,068	50,367,739
Wooden ship and boat building .....	1,072	17,523,146	1,239	15,875	8,607,852	1,042,971	9,901,223	9,638,159	263,064	24,210,419
Governmental establishments .....	9	54,291,011	.....	7,690	6,222,263	29,064	3,805,326	3,647,155	158,171	11,034,312
Establishments with a product of less than \$500 .....	104	33,131	111	6	1,750	4,111	11,520	11,172	348	30,070

Table 3 presents a comparative summary of the statistics reported by governmental establishments at the censuses of 1890 and 1900, with the percentages of increase for the decade.

TABLE 3.—COMPARATIVE SUMMARY, GOVERNMENTAL ESTABLISHMENTS, 1890 AND 1900, WITH PER CENT OF INCREASE.

	1900	1890	Per cent of increase.
Number of establishments .....	9	4	125.0
Capital .....	\$54,291,011	\$26,130,182	107.8
Salaries, clerks, etc., number .....	540	.....	.....
Salaries .....	\$466,497	.....	.....
Wage-earners, average number .....	7,690	2,668	188.2
Total wages .....	\$6,222,263	\$1,750,028	255.5
Men, 16 years and over .....	7,664	(1)	.....
Wages .....	\$6,202,882	(1)	.....
Women, 16 years and over .....	25	(1)	.....
Wages .....	\$19,281	(1)	.....
Children, under 16 years .....	1	(1)	.....
Wages .....	\$100	(1)	.....
Miscellaneous expenses .....	\$29,064	.....	.....
Cost of materials used .....	\$3,805,326	\$403,863	842.2
Value of products, including repairing ..	\$11,034,312	\$2,276,705	384.7
Vessels:			
Number .....	.....	13	.....
Tonnage .....	.....	24,956	.....
Value .....	.....	\$1,705,857	.....
Boats:			
Number .....	2,679	50	1,258.0
Value .....	\$115,322	\$50,000	130.6
Masts and spars:			
Value .....	(1)	\$20,000	.....
Repairs:			
Value .....	\$6,470,238	\$500,848	1,191.9

<sup>1</sup> Not reported separately. <sup>2</sup> Includes 2 barges, valued at \$1,200.

Table 3 shows a large increase in the statistics of governmental establishments engaged in shipbuilding and repairs. In this connection, the fact that several establishments which are included for 1900 were probably entered under some other classification in 1890 should be taken into account. As previously stated, 7 of the yards reported as governmental shipyards were in existence and engaged in similar work in 1890, although 4 only appear in the report for that year. The establishments whose reports compose Table 3 are the governmental navy-yards located at Kittery, Me., Boston (Charlestown), Mass., Brooklyn, N. Y., Philadelphia (League Island), Pa., Norfolk, Va., Port Royal, S. C., Vallejo (Mare Island), Cal., and Brémerton (Pugét Sound), Wash., and an establishment under the supervision of the state of Illinois, engaged in the repair of canal boats, locks, gates, etc., at Lockport, Ill. Table 3 includes the reports of all United States navy-yards, except that at Washington, D. C., at which yard a very large proportion of the work done was the manufacture

of ordnance, and the report was classified accordingly, and the naval station at Pensacola, Fla., where a small amount of repair work was done, a return of which was not received.

The work performed at several of the navy-yards consisted of the repair of naval vessels and the manufacture of ships' boats, small boats, barges, etc.; the building and repair of machinery, and the ordnance and other equipment of the vessels. It was impossible to make separate reports of each class of work. The figures presented in Table 2 include, therefore, statistics that do not pertain strictly to shipbuilding or repairing. The table shows that in 1890 there were constructed 13 vessels, valued at \$1,705,857, with a total tonnage of 24,956. The reports show no work of this character in 1900. There were 50 boats made in 1890, valued at \$50,000, as compared with 679 in 1900, valued at \$115,322. The figures for 1900 include 2 barges, valued at \$1,200, made at the Port Royal, S. C., yard, the only new constructional work reported, with the exception of boat building. The figures for 1900 show that almost the entire work consisted of repairing, equipment, etc. In 1890, 74.9 per cent of the value of the work was new construction, while in 1900, of the \$11,034,312 reported as the value of the products, \$10,916,990, or 98.9 per cent, was the value of repair work and equipment. In 1890 the tonnage of new vessels built in Government yards was 24,956, valued at \$1,705,857, an average of \$68 per ton, which precludes the possibility of such tonnage being warships. The value of the product as reported by governmental establishments for 1899 was \$8,061,093, which was an increase of 254.1 per cent over 1890. The increase indicated by the figures for 1900 over 1899 was 36.9 per cent.

The large capital invested in governmental shipbuilding establishments indicates the costliness of such modern equipment, and explains, in a measure, the enormous investment necessary in private yards to enable them to successfully engage in the construction of modern ships of war. The average capital invested in the 8 navy-yards is \$6,735,064. This exceeds the total capital invested in shipbuilding in the United States in 1850 by \$1,411,925.

Table 4 presents the comparative statistics for iron and steel shipbuilding for 1890 and 1900.

TABLE 4.—COMPARATIVE SUMMARY, IRON AND STEEL SHIPBUILDING, 1890 AND 1900, WITH PER CENT OF INCREASE.

	1900	1890	Per cent of increase.
Number of establishments .....	44	18	144.4
Capital .....	\$59,839,655	\$10,712,023	458.6
Salaried officials, clerks, etc., number .....	857	1,138	521.0
Salaries .....	\$1,411,863	\$291,105	485.0
Wage-earners, average number .....	30,906	8,165	278.5
Total wages .....	\$16,231,311	\$4,883,665	232.4
Men, 16 years and over .....	29,940	(2)	.....
Wages .....	\$16,045,494	(2)	.....
Women, 16 years and over .....	17	(2)	.....
Wages .....	\$4,908	(2)	.....
Children, under 16 years .....	949	(2)	.....
Wages .....	\$180,909	(2)	.....
Miscellaneous expenses .....	\$2,642,690	\$546,135	383.9
Cost of materials used .....	\$23,585,549	\$6,254,905	277.0
Value of products, including repairing ..	\$50,307,739	\$13,012,266	287.1
Vessels:			
Number .....	134	88	52.3
Tonnage—			
Gross .....	262,516	123,973	111.8
Net .....	186,509	.....	.....
Value .....	\$25,451,943	\$11,550,846	120.4

<sup>1</sup> Includes proprietors and firm members, with their salaries; number only reported in 1900. (See Table 21.)

<sup>2</sup> Not reported separately.

<sup>3</sup> Kind of tonnage not specified in 1890.

Table 4 discloses a remarkable growth in the number of establishments, capital invested, wage-earners employed, wages paid, cost of materials, and value of products. The statistics indicate not only that this branch of the industry increased largely in all the essential items of information, but that the individual establishments have enlarged their productive capacity by investments in improved machinery equipment, and by extensions of their plants. The capital per establishment in 1890 averaged \$595,112, and in 1900, \$1,359,990, an increase of 128.5 per cent. The average number of wage-earners to each establishment in 1890 was 454; in 1900 it was 702, an increase of 54.6 per cent. The average value of product per establishment in 1890 was \$722,904; in 1900 it was \$1,144,721, an increase in value per establishment of 58.4 per cent. The value of the new iron and steel vessels constructed in 1890 was 88.8 per cent of the total value of the products; in 1900 only 50.5 per cent of the product was represented in new construction. The increase in the value of the products in this branch of the industry in 1900 over 1890 was 287.1 per cent, yet the number of vessels constructed increased only from 88 to 134, or 52.3 per cent. The value of the new construction was 120.4 per cent greater in 1900 than in 1890.

The new tonnage constructed in the iron and steel branch of the industry in 1890 was 123,973, but whether gross or net is unknown. In view of this uncertainty, but little value can be attached to any comparative deductions as to the value of iron and steel vessels per ton in 1900 as compared with 1890. Assuming that the tonnage statistics for the census of 1890 were for gross measurement, the value per ton was \$93.17, while it is shown that the value in 1900 was \$96.97 per gross ton of the iron and steel vessels constructed. In view of the great reduction in the cost of iron and steel during

the past ten years, it is not reasonable to suppose that there has been an actual increase in the cost per ton of vessels constructed from these materials; on the contrary, there has been a substantial decline. It is believed that in some cases gross and in others net tonnage was reported in 1890, without any distinction.

The increase in capital invested in the iron and steel branch of the industry, for the decade ending with 1900, was \$49,127,532, or 458.6 per cent. The capital in the whole industry increased only \$50,099,809, or 183.8 per cent, which indicates what an insignificant increase was made in this respect in the wooden-shipbuilding branch. The increase in the value of shipbuilding products in both branches of the industry from 1890 to 1900 was \$36,512,748, or 95.9 per cent. The increase in the value of iron and steel shipbuilding products alone was \$37,355,473. Wooden shipbuilding, therefore, suffered an actual decrease.

Table 5 presents the comparative statistics for wooden shipbuilding for 1890 and 1900.

TABLE 5.—COMPARATIVE SUMMARY, WOODEN SHIP AND BOAT BUILDING, 1890 AND 1900, WITH PER CENT OF INCREASE.

	1900	1890	Per cent of increase.
Number of establishments .....	1,072	988	8.5
Capital .....	\$17,523,146	\$10,550,869	5.9
Salaried officials, clerks, etc., number .....	550	1,985	244.2
Salaries .....	\$396,074	\$903,766	234.0
Wage-earners, average number .....	15,875	14,116	12.4
Total wages .....	\$8,607,852	\$8,491,389	1.4
Men, 16 years and over .....	15,804	(3)	.....
Wages .....	\$8,591,118	(3)	.....
Women, 16 years and over .....	17	(3)	.....
Wages .....	\$6,516	(3)	.....
Children, under 16 years .....	54	(3)	.....
Wages .....	\$10,213	(3)	.....
Miscellaneous expenses .....	\$1,042,971	\$846,410	23.2
Cost of materials used .....	\$9,901,228	\$10,264,341	23.5
Value of products, including repairing ..	\$24,210,419	\$25,053,144	23.4
Vessels:			
Number .....	1,953	1,265	54.3
Tonnage—			
Gross .....	425,165	4300,667	17.9
Net .....	356,830	.....	.....
Value .....	\$10,300,971	\$12,938,149	220.4
Small boats:			
Number .....	15,448	18,680	217.3
Value .....	\$1,972,825	\$1,392,084	14.2

<sup>1</sup> Includes proprietors and firm members, with their salaries; number only reported in 1900. (See Table 22.)

<sup>2</sup> Decrease.

<sup>3</sup> Not reported separately.

<sup>4</sup> Kind of tonnage not specified in 1890.

The statistics presented in Table 5 include not only wooden shipbuilding and repairing, but also the manufacture of boats, oars, masts, and spars. Subsidiary tables, presented elsewhere in this report, will show what part these minor or auxiliary industries form of the whole.

Several items in the foregoing table show a decrease. While there has been an increase during the decade of 8.5 per cent in the number of establishments and 5.9 per cent in the capital, there has been a decrease of 435, or 44.2 per cent, in the number of salaried officials, clerks, etc., and of \$307,091, or 33.9 per cent, in the salaries paid, with comparatively slight increases in the number

of wage-earners and in wages paid. The decrease in cost of materials was \$363,118, or 3.5 per cent, and in value of products it was \$842,725, or 3.4 per cent. While the number of vessels built increased 687, or 54.3 per cent, their value decreased \$2,632,178, or 20.4 per cent, showing that the use of wood in shipbuilding is being restricted to smaller vessels than formerly. It is impracticable, however, to make reliable comparisons between the tonnage of wooden vessels built in 1900 and in 1890, for the same reason as in the iron and steel

branch of the industry, that the tonnage at the former census was reported in one item, no distinction being made between gross and net. Assuming, however, that gross tonnage was reported, the average tonnage per vessel was 285 in 1890, compared with 218 in 1900. In the latter year the value of wooden construction was \$24.23 per gross ton or \$28.91 per net ton.

Table 6 is a comparative summary by states of the totals for the shipbuilding industry in the census years 1890 and 1900.

TABLE 6.—COMPARATIVE SUMMARY, BY STATES: 1890 AND 1900.

STATES.	Year.	Number of establishments.	Capital.	SALARIED OFFICIALS, CLERKS, ETC.		WAGE-EARNERS.		Miscellaneous expenses.	Cost of materials used.	Value of products, including repairing.
				Number.	Salaries.	Average number.	Total wages.			
United States.....	1900 1890	1,116 1,000	\$77,362,701 27,262,892	1,407 11,123	\$2,008,537 11,194,870	46,781 22,143	\$24,839,163 13,088,949	\$3,685,661 1,392,551	\$33,486,772 16,521,246	\$74,578,158 38,005,410
Alabama.....	1900 1890	6 5	146,946 37,750	3 8	4,800 750	293 82	101,526 24,324	6,022 1,085	76,767 9,493	240,242 38,701
California.....	1900 1890	41 32	5,776,518 1,958,198	97 15	147,948 60,146	3,549 1,467	2,239,694 1,153,843	518,200 878,104	3,234,804 1,212,671	6,736,636 3,148,636
Connecticut.....	1900 1890	35 29	601,871 564,941	12 28	14,012 27,904	915 624	451,086 348,218	13,529 20,463	680,213 535,093	1,227,120 1,053,301
Delaware.....	1900 1890	11 11	2,226,811 1,745,218	97 43	124,010 98,174	2,031 1,759	992,449 800,977	122,267 69,819	1,594,918 836,979	3,004,366 2,044,318
District of Columbia.....	1900 1890	3 4	14,465 15,575	..... .....	..... .....	17 14	11,480 8,410	154 654	6,989 9,940	24,980 28,755
Florida.....	1900 1890	16 16	284,159 93,156	14 7	15,250 3,740	327 69	125,509 29,881	16,385 2,083	167,461 21,702	409,991 68,020
Georgia.....	1900 1890	4 4	15,170 156,100	2 6	1,400 6,080	19 112	5,156 55,054	680 9,384	12,650 45,716	23,500 126,300
Illinois.....	1900 1890	18 10	1,972,220 638,439	33 16	33,559 15,155	1,359 315	670,658 171,866	53,751 11,728	952,960 148,127	2,331,659 421,815
Indiana.....	1900 1890	15 11	430,907 371,860	18 8	58,620 6,794	403 543	189,179 246,939	42,461 7,722	296,143 204,229	675,207 551,640
Iowa.....	1900 1890	11 5	69,996 38,850	12 3	11,900 1,825	214 45	79,460 25,101	55,417 3,997	60,578 22,820	291,025 73,144
Kentucky.....	1900 1890	10 29	60,377 53,511	6 26	3,785 15,612	104 62	48,090 25,965	7,804 3,157	20,775 31,675	97,492 95,545
Louisiana.....	1900 1890	15 13	212,643 368,218	23 17	15,232 15,104	247 175	105,196 104,451	9,732 13,227	71,621 71,259	250,307 229,645
Maine.....	1900 1890	117 85	2,819,053 1,027,756	54 89	57,938 65,721	2,216 1,450	1,219,657 777,994	109,572 109,032	2,022,557 1,423,175	3,777,059 2,518,565
Maryland.....	1900 1890	47 34	4,446,023 1,815,262	95 32	105,442 28,859	2,615 1,048	1,517,705 620,483	141,505 92,677	1,798,564 737,457	4,161,525 1,737,674
Massachusetts.....	1900 1890	125 147	2,149,291 1,239,993	80 112	79,046 96,961	1,606 1,076	1,035,993 768,967	231,769 71,604	1,357,405 890,405	3,057,454 2,248,647
Michigan.....	1900 1890	64 62	3,893,019 3,266,472	73 93	76,398 81,901	2,916 2,191	1,343,887 1,185,201	209,555 97,786	2,197,883 2,300,299	4,432,101 4,710,108
Minnesota.....	1900 1890	25 20	161,967 521,373	7 11	7,580 9,924	137 308	74,317 168,684	11,401 2,570	84,962 322,412	223,971 542,440
Mississippi.....	1900 1890	13 9	54,885 8,554	5 2	4,500 764	73 45	46,452 14,978	1,829 157	46,376 7,495	115,744 26,425
Missouri.....	1900 1890	10 5	25,930 125,625	3 11	3,070 11,381	66 346	45,909 147,813	6,342 18,067	31,914 145,707	93,867 417,286
New Hampshire.....	1900 1890	6 .....	10,585 .....	..... .....	..... .....	5 .....	3,600 .....	368 .....	2,625 .....	9,793 .....
New Jersey.....	1900 1890	68 62	3,686,332 2,165,104	123 70	158,027 73,499	2,874 1,116	1,792,209 817,290	368,027 89,200	1,949,519 1,140,452	4,310,470 2,592,420
New York.....	1900 1890	227 216	9,675,080 4,281,884	197 235	265,349 278,245	5,572 3,303	3,131,959 2,337,511	309,415 166,442	3,115,997 2,267,391	8,647,371 6,154,488
North Carolina.....	1900 1890	14 16	73,760 76,978	2 12	1,200 8,496	73 126	34,782 41,988	2,504 8,428	21,253 30,396	77,528 101,515
Ohio.....	1900 1890	33 44	5,155,440 2,950,811	68 143	125,545 128,967	3,117 2,679	1,650,775 1,392,245	218,305 86,986	1,236,450 1,750,939	3,614,714 3,304,338
Oregon.....	1900 1890	17 14	592,564 305,220	28 9	39,590 7,597	687 199	361,357 127,626	46,641 9,508	623,139 119,036	1,287,385 320,715

<sup>1</sup> Includes proprietors and firm members, with their salaries; number only reported in 1900. (See Tables 21 and 22.)

TABLE 6.—COMPARATIVE SUMMARY, BY STATES: 1890 AND 1900—Continued.

STATES.	Year.	Number of establishments.	Capital.	SALARIED OFFICIALS, CLERKS, ETC.		WAGE-EARNERS.		Miscellaneous expenses.	Cost of materials used.	Value of products, including repairing.
				Number.	Salaries.	Average number.	Total wages.			
Pennsylvania .....	1900	38	\$14,141,482	161	\$253,901	7,077	\$8,544,945	\$680,163	\$7,173,201	\$14,493,158
	1890	32	2,443,063	47	76,096	1,975	1,139,780	82,941	1,769,582	3,239,770
Rhode Island .....	1900	21	700,847	28	45,534	762	441,858	189,217	470,163	1,234,333
	1890	15	316,665	16	15,980	184	117,473	5,271	68,900	239,626
South Carolina .....	1900	8	128,020	7	6,360	76	40,926	11,554	46,762	186,130
	1890	8	128,020	7	6,360	76	40,926	11,554	46,762	186,130
Tennessee .....	1900	3	1,020			11	2,560	39	3,710	8,097
	1890	3	1,020			11	2,560	39	3,710	8,097
Texas .....	1900	7	10,930			33	19,815	1,150	90,845	126,446
	1890	9	9,619	2	918	29	10,870	425	12,808	29,777
Vermont .....	1900	3	8,950	2	312	12	4,260	153	2,859	8,239
	1890	3	8,950	2	312	12	4,260	153	2,859	8,239
Virginia .....	1900	29	14,824,884	93	228,261	5,569	2,525,121	224,144	2,943,317	6,162,962
	1890	17	310,726	15	9,988	194	89,706	4,436	83,694	297,000
Washington .....	1900	37	766,909	33	38,014	842	568,985	51,763	802,529	1,723,476
	1890	17	165,020	15	12,711	171	84,505	5,037	68,885	188,685
West Virginia .....	1900	4	46,455	4	1,575	53	20,204	1,780	19,354	51,170
	1890	4	21,303	2	700	55	16,850	2,307	8,262	38,980
Wisconsin .....	1900	30	2,273,952	36	37,561	935	360,380	83,012	307,699	1,091,372
	1890	16	544,828	26	28,206	285	176,799	11,157	178,351	463,120
All other states .....	1900	6	40,210			64	27,710	698	11,441	66,137
	1890	2	2,250			13	6,942	450	6,205	19,000

<sup>1</sup> Included in "all other states."

<sup>2</sup> Includes states having less than 3 establishments, distributed as follows: Arkansas, 1; Idaho, 1; South Carolina, 2; Vermont, 2.

<sup>3</sup> Includes states having less than 3 establishments, distributed as follows: Arkansas, 1; Tennessee, 1.

Table 6 shows the totals for the industry for 1900 in 33 states, of which the following 17 reported either a capital or products of more than \$1,000,000 each: California, Connecticut, Delaware, Illinois, Maine, Maryland, Massachusetts, Michigan, New Jersey, New York, Ohio, Oregon, Pennsylvania, Rhode Island, Virginia, Washington, and Wisconsin. Of these states, 3 are located on the Pacific coast, 4 on the Great Lakes, and 10 on the Atlantic, although both New York and Pennsylvania have ports on the Great Lakes. All of the above states show gratifying increases, with the exception of Michigan and Ohio, which show decreases in cost of materials and value of products. The percentages of increase or decrease during the decade for the foregoing states, in capital, wages paid, cost of materials used, and value of products, are shown in the following statement:

STATES.	PERCENTAGE OF INCREASE.			
	Capital.	Wages.	Cost of materials used.	Value of products.
California .....	195.8	94.1	166.7	114.0
Connecticut .....	6.5	29.5	27.1	16.5
Delaware .....	27.6	28.9	90.5	47.0
Illinois .....	208.9	290.2	543.3	452.8
Maine .....	174.3	56.8	42.1	34.0
Maryland .....	298.0	144.6	148.9	139.5
Massachusetts .....	73.3	31.7	52.4	36.0
Michigan .....	19.2	13.4	14.5	15.9
New Jersey .....	70.3	119.3	70.9	85.6
New York .....	126.0	36.1	37.4	40.5
Ohio .....	74.7	18.6	129.4	15.0
Oregon .....	94.1	133.1	423.5	301.4
Pennsylvania .....	478.8	211.0	307.7	347.4
Rhode Island .....	121.3	275.7	562.4	415.2
Virginia .....	4,671.0	2,715.0	3,416.8	1,975.1
Washington .....	392.8	573.3	1,065.1	313.4
Wisconsin .....	317.4	108.3	72.5	135.7

<sup>1</sup> Decrease.

Of the states included in the above statement, notable advances have been made in Virginia, Pennsylvania, Illinois, Maryland, California, Washington, Oregon, and New Jersey.

During the last decade Virginia has advanced from a position of comparatively small importance to a place among the leading shipbuilding states. In 1900 this state was first in the amount of capital invested, third in the number of wage-earners and in wages paid, and fourth in the value of products. Its capital invested in shipbuilding has increased from less than a third of a million in 1890 to nearly fifteen millions in 1900, and is two and one-third times as great as the entire capital invested in the industry in New England, more than double the entire capital so invested on the Pacific coast, and almost equal to the entire amount of capital invested in shipbuilding on the Great Lakes. When the prolific development in the shipbuilding industry upon the Great Lakes—a development that has challenged the attention of the entire shipbuilding world for more than a decade—is taken into consideration, this comparison seems to indicate the future development and importance of Virginia as a great shipbuilding center.

The amount of capital invested in shipbuilding in Illinois was 208.9 per cent greater in 1900 than in 1890, the number of wage-earners increased 331.4 per cent, and the wages 290.2 per cent; the increase in the cost of materials used was 543.3 per cent and in the value of products 452.8 per cent.

In California the capital increased 195.8 per cent in 1900 over 1890, the number of wage-earners 141.9 per cent, the total amount of wages paid 94.1 per cent, the

cost of materials used 166.7 per cent, and the value of products 114 per cent.

In Delaware the capital showed an increase for 1900 over 1890 of 27.6 per cent, number of wage-earners 15.5 per cent, wages paid 23.9 per cent, cost of materials used 90.5 per cent, and value of products 47 per cent.

In Maine the capital increased during the decade 174.3 per cent, the number of wage-earners 52.8 per cent, wages paid 56.8 per cent, cost of materials used 42.1 per cent, and value of products 34 per cent.

In Maryland the capital increased 238 per cent, the number of wage-earners 150.7 per cent, wages paid 144.6 per cent, cost of materials used 143.9 per cent, and value of products 139.5 per cent.

In Massachusetts the capital increased 73.3 per cent, the number of wage-earners 49.3 per cent, wages paid 34.7 per cent, cost of materials used 52.4 per cent, and value of products 36 per cent.

In Michigan the capital increased 19.2 per cent, the number of wage-earners 33.1 per cent, and wages paid 13.4 per cent; the cost of materials used and value of products decreased 4.5 per cent and 5.9 per cent, respectively.

In New Jersey the capital invested increased 70.3 per cent, the number of wage-earners 157.5 per cent, wages paid 119.3 per cent, cost of materials used 70.9 per cent, and value of products 85.6 per cent.

In New York there was an increase of 126 per cent in capital invested, 68.7 per cent in the number of wage-earners, 36.1 per cent in wages paid, 37.4 per cent in cost of materials, and 40.5 per cent in value of products. New York ranks third in the amount of capital invested in shipbuilding, second in the number of wage-earners and amount of wages paid, third in the cost of materials used, and second in the value of products. There were employed in this state only three more wage-earners than, during the same year, in Virginia. The amount of wages paid, however, in the former state exceeded that in the latter by \$656,838.

In Ohio the capital increased 74.7 per cent, number of wage-earners 16.3 per cent, and wages paid 18.6 per cent; the cost of materials used and value of products decreased 29.4 per cent and 5 per cent, respectively. It is a singular fact that there should be so large an increase in the amount of capital invested in shipbuilding in this state coincident with a decrease in the value of the products between 1890 and 1900.

In Pennsylvania there was an increase of 478.8 per cent in capital invested, 258.3 per cent in the number of wage-earners, 211 per cent in wages, 307.7 per cent in the cost of materials used, and 347.4 per cent in the value of products.

In Virginia there was an increase of 4,671 per cent in the capital invested in 1900 over 1890, 2,770.6 per cent in the number of wage-earners, 2,715 per cent in wages paid, 3,416.8 per cent in the cost of materials used, and 1,975.1 per cent in the value of products.

For the reason previously pointed out, that an omission of considerable importance occurred in the statistics for Pennsylvania at the census of 1890, any comparison between the figures for the two censuses will be of little value. According to the figures for 1900, Pennsylvania is second in the amount of capital invested in shipbuilding, and first in the number of wage-earners and wages paid and in the value of products. Notwithstanding the omissions from the figures for 1890 it can be stated with certainty that the growth of the industry in this state has been considerable. Table 6 shows also that California, Washington, Oregon, Illinois, Maryland, New Jersey, and Wisconsin have made considerable increases. On the Pacific coast Washington and Oregon have shared with California the expansion in the shipbuilding industry, their percentages of increase being as follows: Washington, capital invested, 392.8; wages paid, 573.3; cost of materials, 1,065.1; value of products, 813.4; Oregon, capital invested, 94.1; wages paid, 183.1; cost of materials, 423.5; value of products, 301.4. The remarkable growth of the industry in the Pacific states is due in part to their large forests of the finest shipbuilding timber. Decreases, both in capital invested and in value of products, are shown in the District of Columbia, Georgia, Minnesota, Missouri, North Carolina, South Carolina, and Vermont. In Michigan the capital increased 19.2 per cent, while the value of products decreased 5.9 per cent, and in Ohio the capital increased 74.7 per cent, while the value of products decreased 5 per cent.

The rank, with respect to the principal items of information at the censuses of 1890 and 1900, of states reporting either capital or products in shipbuilding to the value of more than \$1,000,000 in 1900, is given in the following statement, the number indicating the rank:

STATES.	Capital.		WAGE-EARNERS.				Cost of materials used.		Value of products.	
			Average number.		Total wages.					
	1900	1890	1900	1890	1900	1890	1900	1890	1900	1890
California .....	4	6	4	6	4	4	2	6	3	5
Connecticut .....	16	12	14	11	14	11	14	11	16	11
Delaware .....	11	7	10	5	11	7	9	9	11	9
Illinois .....	13	11	12	14	12	14	12	15	12	15
Maine .....	9	10	9	7	9	8	6	5	8	6
Maryland .....	6	8	8	10	7	10	8	10	7	10
Massachusetts .....	12	9	11	9	10	9	10	8	10	8
Michigan .....	7	2	6	3	8	3	5	8	10	2
New Jersey .....	8	5	7	8	5	7	7	7	6	7
New York .....	8	1	2	1	2	1	3	2	5	1
Ohio .....	5	3	5	2	6	2	11	4	2	3
Oregon .....	17	19	17	17	16	17	15	17	14	17
Pennsylvania .....	2	4	1	4	1	5	1	3	1	4
Rhode Island .....	15	17	16	19	15	18	16	20	15	19
Virginia .....	1	18	3	18	3	20	4	18	4	18
Washington .....	14	21	15	21	13	21	13	21	13	21
Wisconsin .....	10	13	13	16	17	13	17	14	17	14

It is probable that the contest for primacy in shipbuilding during the next decade will be between the Delaware River and the Chesapeake Bay districts. The capital invested in shipbuilding on the Delaware River in 1900 was \$16,756,690, and the value of the prod-

ucts \$18,013,279. On Chesapeake Bay the capital was \$19,262,193, and the value of the products \$10,263,345. The figures for the Delaware River district do not include a new shipbuilding plant of large proportions, the capital invested in which runs into the millions, but which was not in operation during the census year. The value of the shipbuilding products of the Great Lakes was almost double that of Virginia, and considerably larger than that of the Chesapeake Bay district as a whole. It was, however, less than two-thirds of that of the Delaware River district. The capital invested in shipbuilding on the shores of the Delaware River and of Chesapeake Bay is nearly one-half of the capital invested in the industry in the United States, and the value of the products of these districts is more than three-eighths that of the whole country. There can be no doubt, in view of the above facts, that these two sections possess attractions and advantages which may in time materially help in advancing the United States to a leading position among shipbuilding nations.

Table 7 presents for the United States the quantity and cost of the principal materials used, the cost of all other materials, and the number and value of steam and sailing vessels and barges built, the value of all other products, and the amount received for repair work; also the number of establishments reporting for 1899 and 1900, with the value of products for both years, for iron and steel shipbuilding.

TABLE 7.—MATERIALS AND PRODUCTS, IRON AND STEEL SHIPBUILDING: 1900.

MATERIALS USED.		PRODUCTS.	
Total cost.....	\$23,585,549	Total value.....	\$50,367,739
Lumber, all kinds, including logs, timber, and knees, thousand feet B. M. ....	207,953	Vessels:	
Cost.....	\$1,341,113	Steam, number.....	123
Pig and scrap iron, tons ..	22,639	Gross tonnage....	237,379
Cost.....	\$395,091	Net tonnage.....	164,313
Iron and steel plates, beams, angles, forgings, bolts, spikes, rivets, girders, castings, etc., pounds.....	375,383,913	Value.....	\$24,311,343
Cost.....	\$11,878,297	Sailing, number....	6
Anchor and chains purchased.....	\$168,726	Gross tonnage....	21,085
Wire, feet.....	633,175	Net tonnage.....	18,848
Cost.....	\$72,791	Value.....	\$962,600
Manila and hemp, pounds.....	973,283	Barges, number....	5
Cost.....	\$142,138	Gross tonnage....	4,052
All other materials.....	\$9,587,393	Net tonnage.....	3,848
		Value.....	\$181,000
		All other products ..	\$12,609,836
		Amount received for repair work.....	\$12,302,960
		Comparison of products:	
		Number of establishments reporting for	
		both years.....	41
		Value for census year.....	\$46,262,750
		Value for preceding business year.....	\$25,222,512

Table 7 shows that the value of the products of iron and steel shipbuilding establishments was \$50,367,739, of which \$24,311,343 represents the value of steam vessels, \$962,600 that of sailing vessels, and \$181,000 that of barges. The production of sailing vessels is almost equally divided between two states, one on the Great Lakes and the other on the Atlantic coast. The steam vessels, including steam launches, numbered 123, aggregating 237,379 gross and 164,313 net tons. The sailing vessels numbered 6, having a total of 21,085 gross

and 18,348 net tons, and the barges 5, with a total of 4,052 gross and 3,848 net tons. More than one-half of the value of products was the value of new construction; about one-fourth, or \$12,302,960, the value of repairs; and the remainder, \$12,609,836, the value of unfinished construction and repairs.

Reference to Table 21 shows that of the 6 states separately reported, Michigan shows the minimum value per gross ton of construction, the average per gross ton being \$61.34, and the maximum average of size, 4,291 tons for the 8 iron and steel vessels built. In Massachusetts and New Jersey, where the maximum value per gross ton is shown, the average tonnage per vessel was smallest. In Massachusetts the value averaged \$255 per gross ton, the 3 vessels averaging 533 gross tons. In New Jersey the average value per gross ton was \$242.27, the 10 vessels averaging 343 gross tons. In these 2 states the construction of river steamboats, yachts, and Government torpedo boats may account for the higher average value per gross ton. In New York, where the size of the vessels built closely approximates to that of those built in Massachusetts, the value per gross ton was not one-half that in the latter state. In Pennsylvania, where several large warships were built, the value per gross ton averaged only \$104.48, and the size 3,850 gross tons, for the 22 vessels built.

In New Jersey and New York steel barges were built—1 in the former and 3 in the latter. That in New Jersey, of 500 gross tons, shows a value of \$80 per gross ton, while those in New York, averaging 1,167 gross tons, were valued at \$38.55 per gross ton.

In view of these wide variations in the value of vessels similar in size or type, deductions as to average value per gross ton for the United States possess no significance.

The following is a statement of the number and value of iron and steel vessels built in each state:

STATE.	Num-ber.	Value.	STATE.	Num-ber.	Value.
United States..	134	\$25,454,943	Massachusetts.....	3	\$408,000
California.....	4	1,450,000	Michigan.....	8	2,105,500
Delaware.....	13	1,908,399	New Jersey.....	11	870,000
Florida.....	1	38,000	New York.....	17	995,650
Illinois.....	5	918,478	Ohio.....	8	1,649,000
Indiana.....	4	136,000	Oregon.....	2	879,000
Iowa.....	5	228,300	Pennsylvania.....	22	8,849,029
Maine.....	4	724,000	Washington.....	2	93,000
Maryland.....	14	1,789,542	Wisconsin.....	1	268,500
			Virginia.....	10	2,644,885

The above statement presents, by states, items of chief importance not in all cases disclosed in Table 21, which shows the detailed statistics for the industry. Inasmuch as the construction of iron and steel vessels has, during the census year, for the first time exceeded in value that of wooden vessels, the data shown in the statement will afford opportunities for comparisons in future censuses of the growth, by states, in this, the more important branch of the industry.

For 41 of the 44 establishments the value of products was reported for both 1899 and 1900. For the latter

year this was \$46,262,750, or 91.8 per cent of the total value of products of all the 44 establishments. In the preceding year the value of products of these 41 establishments was \$25,222,512. In every state except Wisconsin there was an increase in the value of products in 1900 over 1899, the aggregate increase for these 41 establishments being 83.4 per cent. Upon this basis the value of products in 1899 increased 111.2 per cent over 1890, while the value of the products in 1900 increased 287.1 per cent over 1890. It can be stated, therefore, that while the value of the products of the iron and steel branch of the industry little more than doubled in the nine years preceding the census year, it nearly doubled again in 1900, although there seems to have been but 1 iron and steel shipbuilding plant established in the latter year. This seems to indicate that the establishments were only operated at about one-half their capacity in 1899 and that the great expansion in iron and steel shipbuilding has but just commenced.

Of the \$23,585,549 expended for materials in iron and steel shipbuilding, \$11,878,297 was for 375,383,913 pounds of iron and steel plates, beams, angles, forgings, bolts, spikes, rivets, girders, castings, etc.; \$1,341,113 for lumber of all kinds, including logs, timbers, and knees, the lumber measuring 267,953,000 feet, board measure; and \$395,091 for 22,639 tons of pig and scrap iron.

Table 21 comprehends the entire iron and steel shipbuilding industry, as conducted in private establishments. The number of such establishments was 44, of which 26 were located in six states—Maryland, Massachusetts, Michigan, New Jersey, New York, and Pennsylvania—the remaining 18 being located in California, Delaware, Florida, Illinois, Indiana, Iowa, Maine, Ohio, Oregon, Rhode Island, Virginia, Washington, and Wisconsin. The statistics for this latter group of states are not separately reported, for the reason that there are less than three establishments in each state.

Of the total number of establishments, 4 are owned by individuals, 5 by firms and limited partnerships, and 35 by incorporated companies. Six of these establishments commenced operations during the last decade, and one during the census year.

Of the capital, amounting to \$59,839,555, invested in the iron and steel shipbuilding industry, \$32,624,784 represents the value of the plants, consisting of land, \$9,614,552; buildings, \$10,925,216; machinery, tools, and implements, \$12,085,016; and cash on hand, bills receivable, unsettled ledger accounts, raw materials, stock in process of manufacture, finished products on hand, and other sundries, \$27,214,771.

Table 21 also shows the number of proprietors and firm members, and officers of corporations, and general superintendents, managers, clerks, and salesmen with their salaries, and wage-earners by sex, with the amounts paid in wages.

The average number of wage earners employed during each month is stated, there being comparatively

small variations in the several months, although in a few cases, in certain states, the variations are greater than in others, the changes being apparently due rather to the demands of the industry than to climatic or other unusual causes.

It is also shown that in this branch of the industry no materials are purchased in the raw state. Separate items are given showing the amounts paid for fuel, rent of power and heat, mill supplies, all other materials, and freight. Other miscellaneous expenses, such as rent of works, taxes not including internal revenue, rent of offices, insurance, interest, internal-revenue tax and stamps, ordinary repairs of buildings and machinery, advertising, and other sundries are not reported under the head of materials; in addition the different kinds of materials used are separately stated with the quantities, when possible, and cost.

Table 8 presents for the United States the quantity and cost of the principal materials used, the cost of all other materials, and the number and value of steam and sailing vessels, barges, canal boats, and small boats, the value of all other products, and the amount received for repair work; also the number of establishments reporting for 1899 and 1900, with the value of products for both years, for wooden shipbuilding.

TABLE 8.—MATERIALS AND PRODUCTS, WOODEN SHIP AND BOAT BUILDING: 1900.

MATERIALS USED.		PRODUCTS.	
Total cost .....	\$9,901,223	Total value .....	\$24,210,419
Lumber, all kinds, including logs, timber, and knees, thousand feet		Wooden vessels:	
B. M. ....	257,338	Steam, number .....	396
Cost .....	\$4,890,728	Gross tonnage....	48,932
Iron and steel plates, beams, angles, forgings, bolts, spikes, rivets, girders, castings, etc., pounds.....	36,277,031	Net tonnage .....	32,845
Cost .....	\$1,519,450	Value .....	\$2,994,358
Anchors and chains purchased .....	\$152,830	Sailing, number .....	646
Cordage:		Gross tonnage....	59,291
Wire, feet.....	914,656	Net tonnage .....	51,847
Cost .....	\$93,301	Value .....	\$3,251,069
Manila and hemp, pounds.....	1,486,929	Barges, number.....	839
Cost .....	\$223,686	Gross tonnage....	295,508
All other materials.....	\$3,021,228	Net tonnage .....	251,689
		Value .....	\$3,828,170
		Canal boats, number.....	72
		Gross tonnage....	21,484
		Net tonnage .....	19,949
		Value .....	\$227,374
		Small boats, launches and ships, fishing, pleasure, life, and row boats, etc., number .....	15,448
		Value .....	\$1,972,825
		All other products .....	\$1,070,297
		Amount received for repair work.....	\$10,866,326
		Comparison of products:	
		Number of establishments reporting for both years .....	898
		Value for census year.....	\$21,643,485
		Value for preceding business year .....	\$17,386,228

Of the materials used in wooden shipbuilding, Table 8 shows that \$4,890,728 was expended for lumber of all kinds, including logs, timber, and knees, measuring 257,338,000 feet, board measure; and \$1,519,450 for iron and steel materials, weighing 36,277,031 pounds.

Of the value of products, amounting to \$24,210,419, the sum of \$2,994,358 represented the value of 396 steam vessels of 48,932 gross and 32,845 net tons; \$3,251,069, that of 646 sailing vessels of 59,291 gross

and 51,847 net tons; \$3,828,170, that of 839 barges of 295,508 gross and 251,689 net tons; \$227,374, that of 72 canal boats of 21,434 gross and 19,949 net tons; \$1,972,825, that of 15,448 small boats; \$1,070,297, that of all other products, consisting of unfinished new vessels and small boats, and unfinished repairs; and \$10,866,326, that of repair work.

The average value per gross ton of wooden steam vessels is \$61.19, of sailing vessels \$54.83, of barges \$12.95, and of canal boats \$10.61. There is a wide variation in different parts of the country in the average value per gross ton of steam vessels.

Reference to Table 22 shows that in Indiana 20 vessels of a total of 10,159 gross tons averaged \$27.28 per gross ton; in Connecticut 25 vessels of a total of 1,102 gross tons averaged \$37.59; in Wisconsin 12 vessels of a total of 382 gross tons averaged \$134.58; in New York 87 vessels of 4,817 gross tons averaged \$111.12; in Michigan 17 vessels of a total of 4,710 gross tons averaged \$63.99; in Ohio 15 vessels of a total of 1,262 gross tons averaged \$60.36; in California 28 vessels of a total of 3,922 gross tons averaged \$71.52; in Washington 21 vessels of a total of 6,298 gross tons averaged \$57.67; and in Oregon 16 vessels of a total of 4,899 gross tons averaged \$54.36.

In wooden sailing vessels the variations are nearly as wide. In Massachusetts 128 vessels of a total of 3,889 gross tons averaged \$98.74; in New York 85 vessels of a total of 1,400 gross tons averaged \$99.78; in California 22 vessels of a total of 8,256 gross tons averaged \$67.93; in Washington 30 vessels of a total of 8,963 gross tons averaged \$55.27; in Maine 73 vessels of a total of 26,683 gross tons averaged \$40.76; and in Delaware 3 vessels of a total of 1,600 gross tons averaged \$29.38.

The variation is greatest in the values per ton of barges. In Pennsylvania, 174 barges, averaging 378.6 gross tons, had a value of only \$1.90 per gross ton. In this state, large numbers of roughly built barges are constructed near Pittsburg for carrying coal down the Ohio and Mississippi rivers to New Orleans. In Minnesota 5 barges of a total of 664 gross tons averaged \$48.84; and in Michigan 2 barges of a total of 1,225 gross tons averaged \$49.43. In the two states last named, the vessels were built to withstand the storms of the Great Lakes. In Maine 34 barges of a total of 25,286 gross tons averaged \$30.25; in New York 172 barges of a total of 62,100 gross tons averaged \$14.07; in New Jersey 40 barges of a total of 42,487 gross tons averaged \$8.16; in Connecticut 31 barges of a total of 18,746 gross tons averaged \$28.52; and in Delaware 22 barges of a total of 10,125 gross tons averaged \$18.81. In New Jersey and New York the barges were largely of the type used in conveying coal around the harbor of New York and in inland waters; in Maine, Connecticut, and Delaware they were of a heavier type, in some cases adapted to coast navigation. In California 35 barges of a total of 6,726 gross tons had an average value of

\$21.07; and in Washington 116 barges of a total of 2,478 gross tons had an average value of \$30.63.

Reference to Table 22 shows that in 1900 there were 1,072 private establishments engaged in wooden shipbuilding, and in the construction of boats, masts, and spars, and in the repairing of wooden vessels. Of these establishments, 400 commenced operations during the decade, 51 of which were established during the census year. This by no means indicates that the wooden shipbuilding industry is becoming extinct, although it has been largely superseded by steel constructions. As compared with the statistics for wooden shipbuilding for 1890 there is an increase of 84 establishments, which would indicate, considering the commencement of 400 new ones during the decade, that no less than 316 of those in existence in 1890 had ceased to exist in 1900, at least as wooden shipbuilding establishments. This shows that quite a change was going on in the industry. From 1890 to 1900 there was a gain in Alabama of 1 establishment, in California of 8, in Connecticut of 6, in the District of Columbia of 1, in Idaho of 1, in Illinois of 7, in Indiana of 3, in Iowa of 5, in Louisiana of 2, in Maine of 30, in Maryland of 10, in Minnesota of 6, in Mississippi of 4, in Missouri of 5, in New Hampshire of 6, in New Jersey of 3, in New York of 5, in Oregon of 2, in Pennsylvania of 5, in Rhode Island of 6, in Tennessee of 2, in Virginia of 10, in Washington of 20, in West Virginia of 4, and in Wisconsin of 13. There was a loss in Florida of 1, in Kentucky of 19, in Massachusetts of 25, in Michigan of 10, in North Carolina of 2, and in Ohio of 9.

Not in all cases, however, has a decrease in number of establishments been accompanied with a loss of capital or of value of products, and not in every case of increase in number of establishments has there been a corresponding increase in capital invested and in value of products. In California, while there was an increase of 8 establishments, there was a decrease of \$67,791, or 18.5 per cent, in capital, but an increase of \$682,001, or 70.2 per cent, in the value of products. In Connecticut there was an increase of 6 in number of establishments, of \$36,930, or 6.5 per cent, in capital invested, and \$173,819, or 16.5 per cent, in the value of products. In Florida there was a loss of 1 establishment, but an increase of \$56,003, or 60.1 per cent, in the capital, and of \$186,971, or 274.9 per cent, in the value of products. In Maine there was an increase of 30 establishments and of \$288,064, or 28 per cent, in capital, but a decrease of \$326,800, or 11.6 per cent, in value of products. In Massachusetts there was a decrease of 25 establishments, of \$101,168, or 8.2 per cent, in capital, and of \$488,073, or 21.7 per cent, in value of products. In no other state was the decrease so great as in Michigan, the decrease being 10 in number of establishments, \$2,140,617, or 72.7 per cent, in capital, and \$2,117,210, or 60.1 per cent, in value of products. In New Jersey there was an increase of 3 in number of establishments,

\$290,865, or 21.1 per cent, in capital, but a decrease of \$254,379, or 11.5 per cent, in value of products. In New York there was an increase of 5 in number of establishments, with an increase of \$2,597,496, or 73.3 per cent, in capital, a larger gain in capital than is shown for any other state in wooden shipbuilding, but there was a decrease of \$25,841 in the value of products. In Ohio there was a decrease of 9 in number of establishments, of \$559,471, or 66.3 per cent, in capital, and of \$617,857, or 56 per cent, in value of products. In Oregon, with an increase of 2 in number of establishments, there was a decrease of \$178,375, or 58.4 per cent, in capital, and an increase of \$333,670, or 104 per cent, in value of products. In Washington there was an increase of 20 in number of establishments, of \$494,164, or 916.5 per cent, in capital, and of \$1,378,164, or 1,081 per cent, in value of products. The percentage of increase in Washington in wooden shipbuilding is remarkable, being next to that of Virginia in steel shipbuilding. As in Virginia, so it is in Washington. The proximity of the coast to the almost inexhaustible supply of shipbuilding materials is an explanation of the great growth recorded. In Wisconsin there was an increase of 13 in number of establishments, of \$287,397, or 52.8 per cent, in capital, and of \$244,835, or 52.9 per cent, in value of products. In Virginia there was an increase of 10 in number of establishments and of \$10,256, or 3.3 per cent, in capital, with a decrease of \$33,198, or 11.2 per cent, in value of products.

From such conditions as have been shown but very little intelligible deduction is possible. On the Great Lakes, with the exception of Wisconsin, the wooden shipbuilding industry is evidently declining. On the Atlantic it holds its own, while on the Pacific coast it has advanced, owing to large forests of the finest shipbuilding timber.

The amount of capital invested in wooden shipbuilding was \$17,523,146, of which \$9,944,225 was invested in plant, divided into \$3,868,999 for land, \$2,182,156 for buildings, and \$3,893,070 for machinery, tools, and implements, leaving the sum of \$7,578,921 in cash on hand, bills receivable, unsettled ledger accounts, raw materials, stock in process of manufacture, finished products on hand, and other sundries.

Establishments reporting in 1900 products valued at \$21,643,485, or 89.4 per cent of the total of \$24,210,419, reported also the value of their products for 1899—\$17,386,228. In every state reported separately in Table 22, except Indiana, Minnesota, and Tennessee, there was an increase in the value of the products in 1900 over 1899, the aggregate increase being 24.5 per cent. For certain states the increases from 1899 to 1900 in the value of the products of establishments reporting for both years were as follows: California, 18.3 per cent; Connecticut, 39.1 per cent; Maine, 46.6 per cent; Massachusetts, 33.2 per cent; New Jersey,

24.5 per cent; New York, 18.5 per cent; and Washington, 45.3 per cent. At the close of the census year nearly all the large shipyards in both branches of the industry were engaged in the construction of vessels which could not be reported as finished. Careful estimates of the approximate value of such uncompleted work, based on the labor and materials employed, were made by the builders. The valuations thus reached are included in Tables 7, 8, 21, and 22, under "all other products." Thus a large proportion of the total under that heading represents the value of important steel shipbuilding operations, while nearly all of the products so classified are for maritime use and are properly included in the shipbuilding of the country. The total value of the unfinished vessels in the large shipyards of the country at the close of the census year was closely estimated by the builders, and the aggregate value was \$9,336,897. Reports of this character were received from 14 establishments, located in the following states: Connecticut, 1; Delaware, 1; Illinois, 1; Maine, 2; Maryland, 1; Michigan, 2; New Jersey, 1; New York, 2; Ohio, 1; Pennsylvania, 1; Virginia, 1.

Summarizing the new construction of vessels of all kinds—steam, sailing, barges, and canal boats, both iron and steel and wooden—there were constructed in American shipyards during the year ending May 31, 1900, 2,087 vessels of a total of 687,681 gross tons. Of these, 519, of a total of 286,311 gross tons, were steam; 652, of a total of 80,376 gross tons, were sailing vessels; 844, of a total of 299,560 gross tons, were barges; and 72, of a total of 21,434 gross tons, were canal boats. Of the 2,087 vessels built, 134, of a total of 262,516 gross tons, were of iron and steel, divided as follows: 123 steam vessels of a total of 237,379 gross tons, 6 sailing vessels of a total of 21,085 gross tons, and 5 canal boats of a total of 4,052 gross tons. The wooden vessels numbered 1,953, of a total of 425,165 gross tons, divided as follows: 396 steam vessels of a total of 48,932 gross tons, 646 sailing vessels of a total of 59,291 gross tons, 839 barges of a total of 295,508 gross tons, and 72 canal boats of a total of 21,434 gross tons.

Tables 9, 10, 11, and 12 present statistics of shipbuilding on the Great Lakes, as follows: Table 9, a summary of all shipbuilding for 1900; Tables 10 and 11, summaries of iron and steel shipbuilding and wooden shipbuilding, respectively, for 1900; Table 12, a comparative summary of iron and steel shipbuilding for 1890 and 1900, with the percentages of increase.

TABLE 9.—SUMMARY OF SHIPBUILDING ON THE GREAT LAKES, WOODEN AND IRON AND STEEL: 1900.

Number of establishments .....	122
Capital .....	\$15,185,178
Salaries .....	\$806,987
Wage-earners, average number .....	8,517
Total wages .....	\$4,331,065
Miscellaneous expenses .....	\$556,466
Cost of materials used .....	\$4,966,250
Value of products, including repairing .....	\$11,953,854

TABLE 10.—IRON AND STEEL SHIPBUILDING ON THE GREAT LAKES: 1900.

Number of establishments	18
Capital	\$12,509,788
Salaried officials, clerks, etc., number	140
Salaries	\$230,330
Wage-earners, average number	6,388
Total wages	\$3,130,005
Miscellaneous expenses	\$405,446
Cost of materials used	\$4,003,854
Value of products:	
Total	\$9,247,305
Steam vessels:	
Number	21
Gross tonnage	81,211
Net tonnage	60,228
Value	\$4,633,628
Sailing vessels:	
Number	3
Gross tonnage	15,117
Net tonnage	14,001
Value	\$550,000
All other products	\$2,035,038
Repair work	\$2,028,639

TABLE 11.—WOODEN SHIPBUILDING ON THE GREAT LAKES: 1900.

Number of establishments	2114
Capital	\$2,675,385
Salaried officials, clerks, etc., number	77
Salaries	\$76,657
Wage-earners, average number	2,129
Total wages	\$1,201,060
Miscellaneous expenses	\$151,020
Cost of materials used	\$902,396
Value of products:	
Total	\$2,706,519
Steam vessels:	
Number	57
Gross tonnage	5,872
Net tonnage	4,808
Value	\$380,450
Sailing vessels:	
Number	27
Gross tonnage	3,044
Net tonnage	2,928
Value	\$184,000
Barges:	
Number	8
Gross tonnage	3,083
Net tonnage	2,813
Value	\$131,754
Canal boats:	
Number	12
Gross tonnage	2,914
Net tonnage	2,164
Value	\$33,600
Small boats:	
Number	2,096
Value	\$333,034
All other products	\$76,404
Repair work	\$1,617,307

<sup>1</sup> Distributed as follows: On Lake Superior—Wisconsin, 1; on Lake Michigan—Illinois, 1; on Lake Huron—Michigan, 1; on Lake Erie—Ohio, 2, and New York, 1; on St. Clair River—Michigan, 1; on Detroit River—Michigan, 1.

<sup>2</sup> Distributed as follows: On Lake Superior—Minnesota, 5; Wisconsin, 3; Michigan, 2; on Lake Michigan—Michigan, 10; Wisconsin, 9; Illinois, 8; on Lake Huron—Michigan, 9; on Lake Erie—Ohio, 11; Pennsylvania, 1; New York, 8; on Lake Ontario—New York, 20; on St. Marys River—Michigan, 1; on St. Clair River—Michigan, 8; on Lake St. Clair—Michigan, 3; on Detroit River—Michigan, 12; on Niagara River—New York, 4.

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TABLE 12.—COMPARATIVE SUMMARY, IRON AND STEEL SHIPBUILDING ON THE GREAT LAKES: 1890 AND 1900.

	1900	1890	Per cent of increase.
Number of establishments	8	8	.....
Capital	\$12,509,788	\$3,034,580	312.2
Salaried officials, clerks, etc., number	140	146	204.3
Salaries	\$230,330	<sup>1</sup> \$90,160	155.5
Wage-earners, average number	6,388	2,544	151.1
Total wages	\$3,130,005	\$1,298,789	141.0
Miscellaneous expenses	\$405,446	\$69,826	480.7
Cost of materials used	\$4,003,854	\$1,767,922	126.5
Value of products	\$9,247,305	\$4,321,400	114.0
Iron and steel vessels:			
Number	24	33	227.3
Gross tonnage	96,328	<sup>3</sup> 36,728	162.3
Value	\$5,183,628	\$4,128,000	25.6
All other products, including amount received for repair work	\$4,063,677	\$193,400	2,001.2

<sup>1</sup> Includes proprietors and firm members, with their salaries; number only reported in 1900.

<sup>2</sup> Decrease.

<sup>3</sup> Kind of tonnage not reported in 1890.

Comparison of Table 9 with the totals for the industry in the United States shows that while only 10.9 per cent of the total number of shipbuilding establishments were located on the Great Lakes, the capital invested there was 19.6 per cent of the total capital, the number of wage-earners employed, 18.2 per cent of the total number; the wages paid, 17.4 per cent of the total wages; and the value of products, consisting of iron and steel and wooden vessels, boats, masts, spars, and oars, and repairing, constituted 16 per cent of the total value of products.

Table 10 shows that only 8 establishments on the Great Lakes constructed iron and steel vessels during the census year, but their capital, averaging \$1,563,723 per establishment, and the value of their products constituted 82.4 and 77.3 per cent, respectively, of the corresponding totals for all shipbuilding establishments on the Great Lakes. There were 114 establishments engaged in the construction of wooden vessels, small boats, masts, and spars, and repairing, but their capital investment amounted to only \$2,675,385, an average of \$23,468. Of the total gross tonnage of wooden vessels constructed in the United States in 1900, Table 11 shows that only 3.5 per cent, with a value constituting 6.6 per cent of the total, was turned out by the Great Lakes shipyards. Of the total gross tonnage of iron and steel vessels, 36.7 per cent was built there, with a value constituting 20.4 per cent of the total value.

As shown by Table 12, the number of iron and steel shipbuilding establishments on the Great Lakes was the same at the censuses of 1890 and 1900. Very large increases are shown, however, in the items of capital, wage-earners, wages, cost of materials used, and value of products. The number of vessels constructed decreased from 33 to 24, but they were of considerably

larger tonnage. Assuming that the tonnage reported in 1890 was gross, the average gross tonnage of vessels was 4,014 in 1900, compared with 1,113 in 1890.

In the Southern states, during the last decade, the growth in shipbuilding was probably greater than in any other geographical division of the United States. This was due in a large measure to the remarkable increase made in Virginia. The capital invested increased from \$1,467,860 in 1890 to \$22,476,618 in 1900, or 403.1 per cent. In 1890 it constituted 16.4 per cent of shipbuilding capital in the United States, and in 1900, 29.1 per cent. The increase in the capital invested in ship-

building in the United States during the past decade amounted to \$50,099,809, of which \$18,008,758, or 35.9 per cent, was placed in Southern shipbuilding establishments.

In 1890 the value of the products of shipbuilding in the South was \$5,485,116, or 14.4 per cent of the total for the United States; in 1900 it was \$14,905,422, or 20 per cent of the total, showing an increase of 171.7 per cent.

Table 13 presents statistics for wooden ship and boat building and repairing in cities of 20,000 population and over for 1900.

TABLE 13.—SHIP AND BOAT BUILDING, WOODEN, BY CITIES: 1900.

CITIES.	Number of establishments.	Capital.	SALARIED OFFICIALS, CLERKS, ETC.		WAGE-EARNERS.		Miscellaneous expenses.	Cost of materials used.	Value of products, including repairing.
			Number.	Salaries.	Average number.	Total wages.			
Total.....	422	\$10,317,854	337	\$370,024	8,393	\$4,722,895	\$680,935	\$4,276,185	\$12,449,833
Baltimore, Md.....	14	469,015	17	16,716	413	233,532	25,445	164,437	555,852
Bangor, Me.....	4	7,900	.....	.....	14	8,683	652	4,837	20,638
Bay City, Mich.....	4	9,125	1	1,500	63	36,500	611	21,290	132,909
Bayonne, N. J.....	3	77,400	8	4,183	23	8,292	1,167	17,275	42,000
Boston, Mass.....	30	643,760	26	20,510	653	415,417	102,144	451,779	1,120,763
Bridgeport, Conn.....	3	10,601	.....	.....	24	17,685	2,020	6,434	32,871
Buffalo, N. Y.....	8	574,826	9	10,991	162	86,547	22,867	65,922	216,486
Camden, N. J.....	9	219,712	12	8,594	266	177,218	21,452	142,778	409,500
Chester, Pa.....	3	13,550	.....	.....	10	6,450	617	6,175	17,775
Chicago, Ill.....	7	284,072	9	13,010	100	86,469	8,396	55,114	187,083
Cincinnati, Ohio.....	4	59,800	4	3,760	103	32,899	15,047	24,254	98,114
Cleveland, Ohio.....	3	9,625	.....	.....	42	21,400	1,603	13,209	49,950
Detroit, Mich.....	10	75,021	8	5,558	91	47,836	9,426	35,083	123,635
Duluth, Minn.....	5	80,482	7	7,580	71	41,760	8,055	30,990	102,516
Gloucester, Mass.....	24	145,172	6	6,860	102	62,800	12,100	74,531	201,448
Jacksonville, Fla.....	3	4,625	.....	.....	12	3,864	712	2,582	11,154
Jersey City, N. J.....	5	151,400	7	12,200	212	116,693	19,324	70,204	259,000
Kingston, N. Y.....	4	90,000	1	1,500	146	93,476	4,004	88,560	207,201
Minneapolis, Minn.....	3	1,365	.....	.....	1	420	99	743	2,395
Mobile, Ala.....	4	146,026	3	4,300	291	100,816	6,013	75,218	236,142
New Bedford, Mass.....	11	13,650	.....	.....	22	12,760	1,699	6,073	27,925
New Haven, Conn.....	5	17,400	.....	.....	11	7,190	808	6,925	19,685
New Orleans, La.....	6	171,847	19	11,032	137	57,402	8,953	25,773	132,771
New York, N. Y.....	83	3,974,116	77	117,576	2,484	1,493,448	144,872	1,267,853	3,919,804
Norfolk, Va.....	6	184,650	8	7,900	104	50,920	4,071	32,164	129,148
Oshkosh, Wis.....	4	39,641	1	468	33	15,342	1,134	17,913	56,310
Philadelphia, Pa.....	10	51,955	.....	.....	69	33,184	4,143	21,342	91,957
Portland, Me.....	6	5,275	.....	.....	14	10,016	643	1,750	22,350
Portland, Oreg.....	9	97,020	6	8,060	261	120,044	6,187	186,890	399,717
Providence, R. I.....	3	81,701	2	2,500	51	37,240	2,867	20,650	80,904
Quincy, Mass.....	3	38,805	2	2,500	18	10,360	806	10,925	16,150
Rochester, N. Y.....	7	30,552	.....	.....	6	3,010	1,181	8,507	20,109
St. Louis, Mo.....	4	23,592	3	3,070	58	41,696	6,000	23,187	77,326
St. Paul, Minn.....	3	13,125	.....	.....	5	2,428	190	6,492	10,275
Salem, Mass.....	3	5,400	.....	.....	8	6,250	393	3,215	13,200
San Francisco, Cal.....	21	112,290	11	10,000	334	201,706	69,296	287,047	646,084
Seattle, Wash.....	12	287,925	9	6,842	184	130,081	13,170	159,081	429,641
Tacoma, Wash.....	3	117,584	7	11,280	169	95,602	8,855	115,965	209,750
Toledo, Ohio.....	4	64,605	.....	.....	53	25,694	494	24,742	65,950
Waltham, Mass.....	3	21,655	1	260	9	5,500	2,494	4,003	18,900
Washington, D. C.....	3	14,465	.....	.....	17	11,480	154	6,989	24,980
Wilmington, Del.....	4	182,225	7	8,936	176	94,114	6,212	123,282	301,018
All other cities <sup>1</sup> .....	59	1,745,638	66	64,240	1,251	653,565	134,194	563,061	1,714,697

<sup>1</sup> Includes establishments distributed as follows: Akron, Ohio, 2; Albany, N. Y., 2; Allegheny, Pa., 2; Burlington, Iowa, 2; Cambridge, Mass., 2; Charleston, S. C., 1; Chattanooga, Tenn., 1; Chelsea, Mass., 2; Clinton, Iowa, 1; Covington, Ky., 1; Dubuque, Iowa, 2; Elizabeth, N. J., 1; Elmira, N. Y., 1; Erie, Pa., 1; Fall River, Mass., 1; Galveston, Tex., 1; Grand Rapids, Mich., 2; Hartford, Conn., 1; Hoboken, N. J., 2; Indianapolis, Ind., 1; Jamestown, N. Y., 2; Kalamazoo, Mich., 1; Knoxville, Tenn., 1; La Crosse, Wis., 1; Lawrence, Mass., 1; McKeesport, Pa., 1; Milwaukee, Wis., 1; Memphis, Tenn., 1; New Brunswick, N. J., 1; Newton, Mass., 1; Oakland, Cal., 2; Oswego, N. Y., 1; Paterson, N. J., 1; Pittsburg, Pa., 2; Poughkeepsie, N. Y., 1; Quincy, Ill., 1; Racine, Wis., 1; Sacramento, Cal., 1; Saginaw, Mich., 1; San Jose, Cal., 1; Superior, Wis., 1; Taunton, Mass., 1; Trenton, N. J., 1; Troy, N. Y., 1; Wilkesbarre, Pa., 1; Wilmington, N. C., 1; Yonkers, N. Y., 1.

Table 13 shows that of the 1,072 wooden ship and boat building establishments in the United States, 422, or 39.4 per cent, are located in cities with a population of 20,000 and over. The value of the products of these establishments was \$12,449,833, which was 51.4 per cent of the total for the United States. The statistics

shown do not represent the entire shipbuilding operations of the several cities included in the above table. It was impossible to present the combined statistics for iron and steel and wooden shipbuilding in this manner without danger of disclosing individual operations in the industry. There were one or more iron and steel

shipbuilding establishments located in each of the following cities: Baltimore, Md., 3; Boston, Mass., 2; Buffalo, N. Y., 1; Camden, N. J., 1; Chester, Pa., 1; Chicago, Ill., 1; Cleveland, Ohio, 1; Detroit, Mich., 1; Dubuque, Iowa, 1; Elizabeth, N. J., 1; Hoboken, N. J., 2; Jacksonville, Fla., 1; Newburg, N. Y., 1; New York, N. Y., 7; Philadelphia, Pa., 2; Portland, Oreg., 1; Richmond, Va., 1; San Francisco, Cal., 2; Seattle, Wash., 1; Superior, Wis., 1; Toledo, Ohio, 1; Wilmington, Del., 2. The statistics of iron and steel shipbuilding in several of the foregoing cities greatly exceed those of wooden shipbuilding. This is notably the case in Philadelphia, Pa., San Francisco, Cal., Cleveland, Ohio, Wilmington, Del., Chicago, Ill., Detroit, Mich., Chester, Pa., Elizabeth, N. J., Baltimore, Md., and Hoboken, N. J., which are the ten leading cities in the value of products, ranked in the order in which they are given.

Table 14 presents the detailed items of capital invested in the shipbuilding industry in the United States, with the percentage that each forms of the total.

TABLE 14.—ITEMS OF CAPITAL INVESTED IN SHIPBUILDING AND PERCENTAGE THAT EACH FORMS OF THE TOTAL: 1900.

	Capital.	Per cent of total.
Total capital .....	\$77,362,701	100.0
Total value of plant .....	42,569,009	55.0
Land .....	13,483,551	17.4
Buildings .....	13,107,372	17.0
Machinery, tools, and implements.....	15,978,086	20.6
Cash and sundries.....	34,793,692	45.0

Table 15 shows the percentages that the items reported for each branch of the industry, iron and steel shipbuilding and wooden shipbuilding, under the general heads of this inquiry, form of the corresponding totals for the entire industry.

TABLE 15.—PERCENTAGES THAT THE SEVERAL ITEMS FOR EACH BRANCH OF SHIPBUILDING FORM OF THE TOTAL FOR THAT ITEM FOR THE ENTIRE INDUSTRY: 1900.

	Iron and steel.	Wooden. <sup>1</sup>
Capital .....	77.3	22.7
Salaries, officials, clerks, etc., number .....	60.9	39.1
Salaries.....	70.3	29.7
Wage-earners, average number.....	66.1	33.9
Total wages .....	65.3	34.7
Miscellaneous expenses .....	71.7	28.3
Cost of materials used .....	70.4	29.6
Value of products, including repairing.....	67.5	32.5

<sup>1</sup>Including small boats, spar making, rigging, and repairing.

Table 16 shows the sums expended for the different materials used in shipbuilding and the percentage that each is of the total cost of materials.

TABLE 16.—COST OF DIFFERENT MATERIALS USED IN SHIPBUILDING AND THE PERCENTAGE THAT EACH FORMS OF THE TOTAL: 1900.

	Cost.	Per cent of total.
Total cost of materials.....	\$33,486,772	100.0
Lumber, all kinds, including logs, timber, and knees..	6,231,841	18.6
Iron and steel plates, beams, angles, forgings, bolts, spikes, rivets, girders, castings, pig and scrap iron, etc.	13,792,838	41.2
Anchor and chains purchased .....	321,556	1.0
Cordage:		
Wire .....	166,092	0.5
Manila and hemp.....	365,824	1.1
Duck.....	177,866	0.5
Paints, oils, etc .....	721,865	2.2
Oakum and pitch .....	275,652	0.8
Masts and spars purchased.....	223,601	0.7
Blocks purchased .....	85,262	0.2
Machinery and boilers purchased .....	3,082,977	9.2
Fittings and furniture purchased.....	808,516	2.4
All other materials, including fuel, rent of power and heat, mill supplies, freight, etc .....	7,232,882	21.6

Table 16, compared with a similar table appearing in the report on shipbuilding at the Eleventh Census, shows that the cost of lumber used has increased but slightly. In 1890 it was \$5,995,894 and in 1900 it was \$6,231,841, an increase of \$235,947, or only 3.9 per cent. The cost of metal used increased from \$4,872,074 in 1890 to \$13,792,838 in 1900, an increase of \$8,920,764, or 183.1 per cent. The cost of machinery and boilers purchased in 1890 was \$2,913,856 and in 1900, \$3,082,977, an increase of \$169,121, or 5.8 per cent. In view of the large increase in the number and tonnage of steam vessels, the small increase in the amount expended by shipbuilders, for boilers and machinery purchased, indicates that the equipment of their plants had been sufficiently increased to enable a large proportion of them to manufacture the machinery and boiler equipment of the vessels built, without recourse to specialists in these lines of manufacturing industry. It should be stated at this point that the tables presenting the cost of materials in detail in 1890 included governmental establishments, and it has been found impossible to separate the detailed items reported by such establishments; to some extent, therefore, the value of the statistics is impaired for comparative purposes, as such data are not included in Table 16. The total cost of materials reported by governmental establishments in 1890 was \$403,863.

So large a number of the establishments reporting were exclusively engaged in the building of small boats, in repair work, or in other distinct branches of the industry, that tables are here presented giving separately the number of such establishments by states, with their capital and value of products, in order that by deduction from the general tables the totals for shipbuilding proper may be ascertained, and computations based thereon rendered more accurate and valuable. The most numerous among such establishments are those devoted exclusively to the construction of small boats, as shown in Table 17.

Table 17 shows, by states, the number of establish-

ments, capital invested, and value of products of establishments engaged exclusively in the manufacture and repair of small boats, including power launches, ships' boats, lifeboats and life rafts, rowboats, and sailboats under 5 tons measurement.

TABLE 17.—ESTABLISHMENTS ENGAGED IN THE CONSTRUCTION AND REPAIR OF SMALL BOATS, WITH CAPITAL AND VALUE OF PRODUCTS, BY STATES: 1900.

STATES.	Number of establishments.	Capital.	Value of products, including repairing.
United States.....	363	\$2,596,887	\$2,830,229
California.....	10	23,700	71,475
Connecticut.....	17	47,491	110,565
Delaware.....	4	27,254	28,818
Florida.....	7	6,107	13,626
Illinois.....	4	2,272	15,158
Indiana.....	9	37,565	53,560
Iowa.....	5	3,975	6,054
Maine.....	46	78,652	95,711
Maryland.....	10	30,755	45,919
Massachusetts.....	45	208,559	271,114
Michigan.....	27	85,727	158,069
Minnesota.....	12	17,710	26,630
Missouri.....	3	11,215	12,210
New Jersey.....	21	89,490	59,799
New York.....	71	1,707,010	1,046,698
North Carolina.....	4	7,435	6,593
Ohio.....	9	24,765	52,665
Pennsylvania.....	7	33,430	42,926
Rhode Island.....	10	26,245	26,405
Virginia.....	6	7,225	11,854
Washington.....	9	9,250	16,317
Wisconsin.....	16	91,895	133,625
All other States <sup>1</sup> .....	11	19,160	24,438

<sup>1</sup> Includes establishments distributed as follows: District of Columbia, 1; Idaho, 1; Kentucky, 2; Louisiana, 2; Tennessee, 1; Texas, 2; Vermont, 2.

Table 17 includes a certain number of establishments that were engaged solely in the construction and repair of small boats during the census year, although equipped for the building of larger vessels and occasionally so occupied. No establishments were included, however, whose reports showed repair work on small boats alone and no new construction. In this connection it should be stated that the statistics presented in Table 17 differ from those applying to small boats shown in Tables 20 and 22, in that the latter show the total construction of such vessels in the United States, many being the output of establishments engaged principally in the more important branches of the industry.

It is important to state that, in order to carry out the general plan of showing separately the statistics for iron and steel and for wooden shipbuilding in the United States, it was necessary, in the case of 2 establishments largely engaged in each class of construction, to consider each establishment as 2 separate plants, and to treat them as such in the tabulations, including under iron and steel shipbuilding the output in that class and the materials used in it, with an equitable proportion of the investment values, wages, etc. The same course was followed under wooden construction. In the case of one of these establishments the output under wooden shipbuilding, so segregated, was small-boat construction. As its inclusion in Table 17 adds more to the total than any other plant, it is proper to state that steel-shipbuilding operations of an impor-

tant character were carried on by this firm during the census year. Its inclusion, however, is justified, not only by the large output, but by the fact that to all intents and purposes of the present census the establishment is considered as 2 separate and distinct plants.

Table 18 shows, by states, the number of establishments, capital invested, and value of products of establishments engaged exclusively in repairing. Plants maintained by transportation companies for the repair of their own vessels are not included.

TABLE 18.—ESTABLISHMENTS ENGAGED DURING THE CENSUS YEAR IN REPAIR WORK EXCLUSIVELY, WITH CAPITAL AND VALUE OF WORK DONE, BY STATES: 1900.

STATES.	Number of establishments.	Capital.	Value of work done.
United States.....	215	\$7,154,552	\$7,418,489
Alabama.....	3	49,800	131,116
Connecticut.....	7	82,050	161,227
Florida.....	3	13,894	11,194
Illinois.....	9	345,830	253,208
Louisiana.....	5	149,100	80,791
Maine.....	15	127,318	166,262
Maryland.....	12	116,971	141,939
Massachusetts.....	16	920,707	1,042,690
Michigan.....	15	278,525	325,800
New Jersey.....	16	627,313	628,660
New York.....	48	2,060,711	2,557,262
North Carolina.....	6	48,560	50,016
Ohio.....	9	61,490	117,764
Pennsylvania.....	9	142,833	103,939
Rhode Island.....	4	242,676	749,810
Virginia.....	15	218,942	194,648
Washington.....	3	113,484	183,000
West Virginia.....	3	34,465	26,495
All other states <sup>1</sup> .....	18	619,293	502,669

<sup>1</sup> Includes establishments distributed as follows: California, 2; Delaware, 1; District of Columbia, 1; Iowa, 2; Kentucky, 2; Minnesota, 2; Mississippi, 1; New Hampshire, 2; Oregon, 1; South Carolina, 1; Texas, 1; Wisconsin, 2.

In point of capital invested and value of products, Table 18 shows, in comparison with the statistics presented in Table 17, that the establishments engaged exclusively in repairing formed the most important group of the subsidiary branches of the shipbuilding industry. A large part of the repair work throughout the country is carried on by plants also engaged in construction work, and is, therefore, shown in Tables 21 and 22; but the establishments included in Table 18 did no other work than repairing during the census year, although many are equipped for building new vessels and are at times so employed.

In addition to the branches of the industry covered by Tables 17 and 18, there are also included in the general tables a number of contributory industries carried on as separate trades, such as rigging, spar making, and calking. Almost all of the work reported by such establishments was a part of the construction of new vessels during the census year, and has, accordingly, been included with shipbuilding proper; a large proportion of the work was done by contract, in the shipyard, and would otherwise have been done by the builders themselves. It is important that this should be taken into consideration in basing computations on the general totals, and the total investment and the

value of the work done by such establishments are given here in order that they may be deducted from shipbuilding proper.

Reports were received from 32 establishments in the United States engaged in spar making, calking, and ship fitting, showing an aggregate capital of \$208,633, and products valued at \$405,323. They were located as follows: California, 2; Connecticut, 2; Maine, 5; Massachusetts, 12; New Jersey, 2; New York, 6; Oregon, 2; Pennsylvania, 1. Reports were received from 30 ships' riggers, showing an aggregate capital of \$94,575, and products valued at \$253,015. They were located as follows: California, 1; Maine, 5; Massachusetts, 13; New York, 5; Ohio, 1; Pennsylvania, 5. Reports were received from 7 establishments engaged exclusively on ship-joiner work, their capital aggregating \$108,158, and the value of their products \$209,310. They were located as follows: Maryland, 2; Massachusetts, 3; New York, 2. Other minor contributory industries are included in the general report for manufactures of the Twelfth Census, sailmaking being classified under "awnings, tents, and sails."

Table 19 shows the number of establishments, capital, and value of work done at plants maintained by trans-

portation companies for the construction and repair of their own vessels exclusively, no work being performed on contract. The table also includes plants operated by railroad companies for the exclusive repair of their floating equipment.

TABLE 19.—TRANSPORTATION COMPANIES ENGAGED IN THE CONSTRUCTION AND REPAIR OF VESSELS, WITH CAPITAL AND VALUE OF PRODUCTS, BY STATES: 1900.

STATES.	Number of establishments.	Capital.	Value of products, including repairing.
United States .....	20	\$1,112,068	\$2,428,395
California.....	4	75,800	779,264
Connecticut.....	3	73,000	167,279
Massachusetts.....	2	80,500	120,200
New Jersey.....	3	542,250	376,127
New York.....	3	81,000	131,664
Ohio.....	1	5,000	20,000
Pennsylvania.....	2	14,000	68,108
Rhode Island.....	1	160,000	678,506
Wisconsin.....	1	81,018	87,000

Table 20 shows the total small-boat construction of the United States, by states, giving the number and value of each class, and supplements by its greater detail the data relating to small-boat construction presented in other tables.

TABLE 20.—SMALL BOATS, BY STATES: 1900.

STATES.	SMALL BOATS.									
	Steam launches. <sup>1</sup>				Power launches other than steam—electric, gasoline, naphtha, alcohol, vapor, etc.		Sailboats under 5 tons—pleasure and fishing.		Rowboats—pleasure, fishing, life, racing, ships', hunting, and canvas canoes.	
	Number.	Gross tonnage.	Net tonnage.	Value.	Number.	Value.	Number.	Value.	Number.	Value.
United States.....	96	848	458	\$143,660	1,689	\$1,060,365	4,817	\$473,307	9,442	\$439,153
California.....	11	50	28	9,600	14	9,800	263	58,810	320	81,405
Connecticut.....	22	189	104	13,050	159	56,855	77	12,202	82	3,050
Delaware.....					3	1,450	7	1,500	285	26,192
District of Columbia.....							7	500		
Florida.....	2	18	9	900	1	1,000	37	18,030	59	1,641
Illinois.....	9	48	28	8,800	5	5,950	80	4,848	276	10,100
Indiana.....	2	51	29	1,550	81	40,400	8	840	485	5,900
Iowa.....					2	1,404	8	880	30	1,965
Kentucky.....									45	800
Louisiana.....							5	875	38	1,060
Maine.....	3	3	3	335	8	5,895	353	85,388	1,539	52,288
Maryland.....					17	12,500	97	10,780	160	12,074
Massachusetts.....	7	61	35	28,860	41	49,383	2,099	98,242	1,661	61,339
Michigan.....	12	79	44	16,400	327	171,405	215	51,393	454	13,212
Minnesota.....					37	17,485	17	3,740	471	12,750
Mississippi.....							4	517		
Missouri.....					5	6,500	12	2,180	123	3,385
New Hampshire.....	1	10	5	900			13	1,610	50	1,333
New Jersey.....	6	34	21	6,000	82	48,857	115	18,140	104	2,780
New York.....	15	248	121	56,975	552	454,643	337	74,189	1,756	125,870
North Carolina.....					1	313	6	680	2	30
Ohio.....					78	34,400	24	4,450	268	8,855
Oregon.....	2	15	9	1,400	4	6,040	12	985	26	2,000
Pennsylvania.....					15	11,000	91	13,176	289	22,860
Rhode Island.....	2	22	12	2,200	2	3,000	58	15,435	73	3,469
Tennessee.....									52	820
Texas.....	2	15	10	1,700			13	1,036		
Virginia.....					1	4,000	44	3,837	32	2,550
Washington.....					10	26,900	185	21,134	199	13,205
Wisconsin.....					241	89,780	108	17,160	531	10,861
All other states <sup>2</sup> .....					3	1,400	22	650	87	2,850

<sup>1</sup> Included under "steam vessels" in Tables 8 and 22.

<sup>2</sup> Includes Arkansas, Idaho, and Vermont.

Table 20 presents the number, gross and net tonnage, and value of steam launches, and the number and value of other power launches, small sailboats under 5 tons, and rowboats of all types. Gasoline engines were employed as a motive power in all but a small proportion of the launches using power other than steam. Both these and the steam launches varied widely in value. The average value of steam launches is shown to be considerably higher than the actual value of the greater proportion of those constructed. The same is true of boats propelled by oars, the average value being raised by the inclusion in this class of racing shells valued as high as \$2,000, of metal lifeboats averaging \$200 in value, and of a large number of hunting boats of expensive construction.

The detailed statistics for the industry as reported are shown in Tables 21, 22, and 23, Table 21 presenting statistics of iron and steel shipbuilding; Table 22, of wooden ship and boat building; and Table 23, of governmental establishments. These tables present separate totals for each state in which there were 3 or more establishments, and group the statistics for other

states so as not to disclose the operations of individual establishments, except in Table 23, which shows separately the data reported by each establishment. The establishments are classified according to the character of the ownership, which shows that in iron and steel shipbuilding 4 were owned by individuals, 5 by partnerships, and 35 by corporations; and in wooden shipbuilding 744 were owned by individuals, 212 by partnerships, and 116 by corporations. The employees are classified so as to show for salaried officials, clerks, etc., and for wage-earners separately the number and salaries or wages of men, women, and children, respectively, and also the average number of wage-earners employed during each month of the year. Separate totals are shown for the different materials, presenting quantities when possible; and the kind, number, and value of the several types of vessels constructed, the amount received for repairing, and the value of all other products, are given. The number of engines, water wheels, electric motors, and other forms of power in use, with their horsepower, are shown. The establishments are grouped in the tables according to the number of employees in each.

TABLE 21.—SHIPBUILDING, IRON AND STEEL, BY STATES: 1900.

	United States.	Maryland.	Massachusetts.	Michigan.	New Jersey.	New York.	Pennsylvania.	All other states. <sup>1</sup>
Number of establishments	44	4	3	3	4	9	3	18
Character of organization:								
Individual	4			1	2	2		1
Firm and limited partnership	6	1	1			2		
Incorporated company	35	3	2	3	2	6	3	17
Established during the decade	6	1		3				2
Established during the census year	1			1				
Capital:								
Total	\$59,839,555	\$3,822,588	\$1,010,461	\$3,087,164	\$2,015,368	\$3,536,165	\$13,858,081	\$32,509,733
Land	\$9,614,562	\$103,000	\$122,500	\$709,115	\$557,000	\$1,273,068	\$2,505,514	\$4,350,357
Buildings	\$10,925,216	\$250,000	\$187,388	\$729,017	\$139,500	\$401,862	\$4,551,882	\$4,635,467
Machinery, tools, and implements	\$12,085,016	\$945,000	\$445,898	\$309,408	\$414,436	\$642,870	\$2,042,882	\$6,791,027
Cash and sundries	\$27,214,771	\$2,524,588	\$274,675	\$851,629	\$854,427	\$1,218,867	\$4,767,708	\$16,732,882
Proprietors and firm members	16	3	2		1	7		3
Salaried officials, clerks, etc.:								
Total number	857	70	29	41	54	74	148	441
Total salaries	\$1,411,863	\$85,122	\$40,944	\$50,020	\$82,168	\$110,673	\$245,221	\$797,715
Officers of corporations:								
Number	78	8	4	7	2	5	10	42
Salaries	\$380,323	\$27,400	\$12,700	\$19,000	\$8,000	\$22,020	\$68,186	\$228,017
General superintendents, managers, clerks, and salesmen:								
Total number	779	62	25	34	52	69	138	399
Total salaries	\$1,031,540	\$57,722	\$25,244	\$31,020	\$74,168	\$88,653	\$182,035	\$569,698
Men:								
Number	758	62	21	34	51	68	138	384
Salaries	\$1,020,794	\$57,722	\$26,594	\$31,020	\$73,768	\$88,138	\$182,035	\$561,522
Women:								
Number	21		4		1	1		15
Salaries	\$10,746		\$1,650		\$400	\$520		\$8,176
Wage-earners, including pieceworkers, and total wages:								
Greatest number employed at any one time during the year	41,228	2,795	886	2,934	1,877	3,261	8,836	20,637
Least number employed at any one time during the year	23,059	1,351	361	988	1,134	1,889	5,477	12,409
Average number	30,906	1,939	563	1,796	1,458	2,103	6,820	16,222
Wages	\$16,231,311	\$1,185,832	\$399,307	\$369,366	\$1,014,106	\$1,167,171	\$3,425,226	\$8,170,303
Men, 16 years and over:								
Average number	29,940	1,904	563	1,796	1,429	2,100	6,347	15,801
Wages	\$16,045,494	\$1,178,297	\$399,307	\$369,366	\$1,005,106	\$1,164,415	\$3,323,216	\$8,105,737
Women, 16 years and over:								
Average number	17	1				2		14
Wages	\$4,908	\$482				\$986		\$3,490
Children, under 16 years:								
Average number	949	34			29	6	473	407
Wages	\$180,909	\$7,053			\$9,000	\$1,820	\$102,010	\$61,026
Average number of wage-earners, including pieceworkers, employed during each month: <sup>2</sup>								
Men, 16 years and over:								
January	29,842	1,795	409	1,677	1,469	2,080	6,293	16,119
February	30,163	1,869	443	1,824	1,546	2,041	6,664	15,766
March	31,470	2,402	570	2,108	1,505	1,953	7,039	15,893
April	33,209	2,441	608	2,396	1,519	2,693	7,631	16,921

<sup>1</sup>Includes establishments distributed as follows: California, 2; Delaware, 2; Florida, 1; Illinois, 1; Indiana, 1; Iowa, 1; Maine, 2; Ohio, 2; Oregon, 1; Rhode Island, 1; Virginia, 2; Washington, 1; Wisconsin, 1.

<sup>2</sup>The average number of women, 16 years and over, and children, under 16 years, employed during each month are not included in the table, because of the small number reported.

TABLE 21.—SHIPBUILDING, IRON AND STEEL, BY STATES: 1900—Continued.

	United States.	Maryland.	Massachu- setts.	Michigan	New Jersey.	New York	Pennsyl- vania	All other states. <sup>1</sup>
Average number of wage-earners, including piece- workers, employed during each month—Cont'd. <sup>2</sup> Men, 16 years and over—Continued:								
May	30,346	2,049	495	2,309	1,574	2,270	5,833	15,815
June	80,592	2,130	522	2,015	1,632	2,298	5,943	16,052
July	28,789	1,884	559	1,857	1,551	2,119	6,323	14,946
August	28,884	1,891	583	1,391	1,291	2,280	6,513	14,935
September	28,877	1,852	582	1,591	1,037	1,998	6,192	15,685
October	28,646	1,725	589	1,483	1,348	1,835	5,715	15,951
November	28,802	1,529	662	1,677	1,820	1,754	5,897	15,973
December	29,711	1,276	785	1,708	1,360	1,882	6,133	16,557
Miscellaneous expenses:								
Total	\$2,612,690	\$110,916	\$97,982	\$109,687	\$251,092	\$98,970	\$591,535	\$1,382,508
Rent of works	\$93,990	\$27,875	-----	\$1,275	\$29,520	\$15,400	\$2,500	\$17,420
Taxes, not including internal revenue	\$145,284	\$12,716	\$7,904	\$15,699	\$9,151	\$23,934	\$23,925	\$51,955
Rent of offices, insurance, interest, and all sundry expenses not hitherto included	\$1,287,554	\$67,325	\$82,828	\$92,713	\$87,421	\$34,636	\$286,774	\$636,357
Contract work	\$1,115,862	\$3,000	\$7,750	-----	\$125,000	\$25,000	\$278,336	\$676,776
Materials used:								
Total cost	\$23,555,549	\$1,497,554	\$652,966	\$1,654,348	\$1,282,927	\$1,283,335	\$6,996,703	\$10,317,713
Lumber, all kinds, including logs, timber, and knees, thousand feet, B. M.	267,953	3,520	554	220,286	2,544	2,934	15,843	22,266
Cost	\$1,841,118	\$95,616	\$14,884	\$46,853	\$78,781	\$89,412	\$393,042	\$625,525
Pig and scrap iron, tons	22,639	405	-----	1,035	300	312	6,715	14,472
Cost	\$395,091	\$6,500	-----	\$20,692	\$5,400	\$5,000	\$100,742	\$256,767
Iron and steel plates, beams, angles, forg- ings, bolts, spikes, rivets, girders, castings, etc., pounds	375,883,913	30,480,153	13,800,900	42,042,000	9,520,119	24,818,241	66,106,421	188,616,079
Cost	\$11,878,297	\$874,803	\$482,866	\$1,100,402	\$511,122	\$728,085	\$3,442,416	\$4,738,543
Anchors and chains purchased	\$168,726	-----	\$25,465	\$21,326	\$3,247	\$11,751	\$30,511	\$76,426
Cordage:								
Wire, feet	633,175	39,406	2,700	32,365	115,281	19,148	75,962	348,363
Cost	\$72,791	\$5,294	\$400	\$4,968	\$10,599	\$1,458	\$11,314	\$33,323
Manila and hemp, pounds	973,283	24,804	1,800	54,775	109,864	51,893	94,169	635,983
Cost	\$142,138	\$3,382	\$300	\$6,977	\$12,743	\$6,074	\$15,729	\$97,533
Duck	\$41,363	\$2,271	\$215	\$740	\$1,939	\$3,350	\$3,537	\$20,311
Paints, oils, etc.	\$381,423	\$19,404	\$1,565	\$7,035	\$34,551	\$23,864	\$109,040	\$189,994
Oakum and pitch	\$33,697	\$1,277	\$160	\$2,027	\$1,709	\$6,475	\$1,866	\$20,153
Masts and spars purchased	\$40,018	\$1,768	\$60	-----	\$5,353	\$16,370	\$5,809	\$10,078
Blocks purchased	\$32,527	\$3,549	\$30	-----	\$2,605	\$1,224	\$10,769	\$14,351
Machinery and boilers purchased	\$2,315,161	\$94,528	\$93,566	\$146,843	\$207,520	\$98,249	\$590,139	\$1,084,316
Fittings and furniture purchased	\$694,024	\$31,132	\$7,569	\$26,346	\$170,463	\$18,348	\$15,108	\$430,010
Fuel	\$568,320	\$33,161	\$11,700	\$25,701	\$24,525	\$16,965	\$93,282	\$358,008
Rent of power and heat	\$16,156	-----	-----	-----	\$4,820	\$2,248	\$11,336	\$54,260
Mill supplies	\$198,205	\$3,205	\$3,365	\$5,480	\$4,643	\$2,448	\$120,065	\$64,260
All other materials	\$4,712,846	\$286,049	\$33,751	\$233,276	\$196,371	\$204,615	\$2,031,045	\$1,787,289
Freight	\$653,592	\$100	\$2,535	\$5,622	\$20,376	-----	\$29,912	\$494,547
Products:								
Total value	\$50,367,739	\$3,299,491	\$1,296,880	\$3,029,203	\$2,857,429	\$3,223,654	\$14,085,395	\$22,576,687
Steel and iron vessels:								
Steam, number	123	14	3	8	10	14	22	52
Gross tonnage	237,379	15,173	1,600	34,327	3,426	7,592	84,698	90,573
Net tonnage	164,313	10,789	950	25,551	2,358	5,527	56,447	62,691
Value	\$24,311,343	\$1,789,542	\$408,000	\$2,105,500	\$390,000	\$800,650	\$3,849,029	\$9,435,622
Sailing, number	6	-----	-----	-----	-----	-----	-----	6
Gross tonnage	21,085	-----	-----	-----	-----	-----	-----	21,085
Net tonnage	18,348	-----	-----	-----	-----	-----	-----	18,348
Value	\$962,600	-----	-----	-----	-----	-----	-----	\$962,600
Barges, number	5	-----	-----	-----	1	3	-----	1
Gross tonnage	4,052	-----	-----	-----	500	3,502	-----	50
Net tonnage	3,848	-----	-----	-----	450	3,348	-----	50
Value	\$181,000	-----	-----	-----	\$40,000	\$135,000	-----	\$6,000
All other products	\$12,609,836	\$875,293	\$93,000	\$479,203	\$1,139,112	\$352,335	\$2,680,782	\$6,985,111
Amount received for repair work	\$12,302,960	\$634,656	\$793,880	\$444,500	\$848,317	\$1,875,699	\$2,555,684	\$5,150,354
Comparison of products:								
Number of establishments reporting for both years	41	4	3	2	4	9	3	16
Value for census year	\$46,262,750	\$3,299,491	\$1,296,880	\$2,429,203	\$2,857,429	\$3,223,654	\$14,085,395	\$19,070,693
Value for preceding business year	\$25,222,512	\$1,256,091	\$761,555	\$577,000	\$1,675,437	\$2,249,402	\$8,905,763	\$9,897,274
Power:								
Number of establishments reporting	43	4	3	3	4	8	3	13
Total horsepower	44,096	1,933	505	1,697	769	3,130	20,187	15,876
Owned:								
Engines:								
Steam, number	308	20	8	32	15	18	53	162
Horsepower	85,902	1,075	375	1,500	637	2,500	18,173	11,637
Gas or gasoline, number	3	-----	-----	-----	-----	-----	-----	2
Horsepower	28	-----	-----	12	-----	-----	-----	16
Electric motors, number	395	37	10	3	31	4	73	287
Horsepower	5,234	363	130	80	82	200	1,039	3,340
Other power, horsepower	2,220	495	-----	105	50	-----	970	600
Rented:								
Electric, horsepower	52	-----	-----	-----	-----	-----	-----	52
Other kind, horsepower	660	-----	-----	-----	-----	430	-----	230
Establishments classified by number of persons em- ployed, not including proprietors and firm mem- bers:								
Total number of establishments	44	4	3	3	4	9	3	18
51 to 100	2	-----	-----	-----	-----	1	-----	1
101 to 250	5	1	1	-----	-----	2	-----	1
251 to 500	15	1	1	-----	2	4	-----	7
501 to 1,000	13	1	1	2	2	2	-----	4
Over 1,000	9	1	-----	1	-----	-----	2	6

<sup>1</sup> Includes establishments distributed as follows: California, 2; Delaware, 2; Florida, 1; Illinois, 1; Indiana, 1; Iowa, 1; Maine, 2; Ohio, 2; Oregon, 1; Rhode Island, 1; Virginia, 2; Washington, 1; Wisconsin, 1.

<sup>2</sup> The average number of women, 16 years and over, and children, under 16 years, employed during each month, are not included in the table, because of the small number reported.

TABLE 22.—SHIP AND BOAT BUILDING,

	United States.	Alabama.	California.	Connecticut.	Delaware.	District of Columbia.
1 Number of establishments.....	1,072	6	39	35	9	3
2 Character of organization:						
3 Individual.....	744	2	23	24	6	1
4 Firm and limited partnership.....	212	1	10	6	1	2
5 Incorporated company.....	116	3	6	5	2	
6 Established during the decade.....	400	3	17	10	3	
7 Established during the census year.....	51		3		2	
8 Capital:						
9 Total.....	\$17,523,146	\$146,946	\$298,990	\$601,871	\$224,726	\$14,465
10 Land.....	\$3,868,999	\$24,750	\$30,950	\$121,900	\$40,900	\$11,500
11 Buildings.....	\$2,182,156	\$2,600	\$98,170	\$118,730	\$14,350	\$1,400
12 Machinery, tools, and implements.....	\$3,898,070	\$31,820	\$92,360	\$80,939	\$36,850	\$515
13 Cash and sundries.....	\$7,578,921	\$87,776	\$137,510	\$280,302	\$132,626	\$1,050
14 Proprietors and firm members.....	1,239	4	51	37	9	5
15 Salaried officials, clerks, etc.:						
16 Total number.....	550	3	21	12	7	
17 Total salaries.....	\$596,074	\$4,800	\$23,348	\$14,012	\$8,936	
18 Officers of corporations:						
19 Number.....	104	1	5	3	4	
20 Salaries.....	\$183,707	\$2,000	\$7,200	\$2,212	\$5,500	
21 General superintendents, managots, clerks, and salesmen:						
22 Total number.....	446	2	16	9	3	
23 Total salaries.....	\$412,967	\$2,300	\$16,148	\$11,800	\$3,436	
24 Men:						
25 Number.....	413	2	16	9	3	
26 Salaries.....	\$397,656	\$2,300	\$16,148	\$11,800	\$3,436	
27 Women:						
28 Number.....	33					
29 Salaries.....	\$15,311					
30 Wage-earners, including pieceworkers, and total wages:						
31 Greatest number employed at any one time during the year.....	28,591	642	1,666	1,187	321	27
32 Least number employed at any one time during the year.....	9,668	52	448	697	144	10
33 Average number.....	15,875	293	885	915	207	17
34 Wages.....	\$8,607,852	\$101,526	\$538,694	\$451,086	\$110,504	\$11,480
35 Men, 16 years and over:						
36 Average number.....	15,804	293	880	915	201	17
37 Wages.....	\$8,591,118	\$101,526	\$537,060	\$451,086	\$109,464	\$11,480
38 Women, 16 years and over:						
39 Average number.....	17					
40 Wages.....	\$6,510					
41 Children, under 16 years:						
42 Average number.....	54		5		6	
43 Wages.....	\$10,218		\$1,634		\$1,040	
44 Average number of wage-earners, including pieceworkers, employed during each month: <sup>1</sup>						
45 Men, 16 years and over:						
46 January.....	13,283	132	832	841	179	12
47 February.....	13,808	118	915	881	224	12
48 March.....	15,967	139	812	1,017	227	15
49 April.....	17,459	307	853	929	148	19
50 May.....	18,579	428	869	1,003	186	20
51 June.....	17,560	409	921	1,016	214	21
52 July.....	16,807	313	919	932	219	18
53 August.....	16,632	445	963	924	220	20
54 September.....	16,329	539	1,002	922	197	20
55 October.....	15,106	380	765	804	201	18
56 November.....	14,122	129	759	821	200	16
57 December.....	14,049	177	948	888	201	11
58 Miscellaneous expenses:						
59 Total.....	\$1,042,971	\$6,022	\$39,025	\$13,529	\$7,791	\$154
60 Rent of works.....	\$199,488	\$2,850	\$9,761	\$8,227	\$869	
61 Taxes, not including internal revenue.....	\$92,184	\$1,538	\$1,548	\$1,885	\$557	\$29
62 Rent of offices, insurance, interest, and all sundry expenses not hitherto included.....	\$508,944	\$2,134	\$7,226	\$7,547	\$6,007	\$126
63 Contract work.....	\$242,360		\$10,500	\$870	\$358	
64 Materials used:						
65 Total cost.....	\$9,901,228	\$76,767	\$702,319	\$680,213	\$153,861	\$6,989
66 Lumber, all kinds, including logs, timber, and knees, thousand feet, B. M.:	257,398	1,745	14,328	14,628	3,222	164
67 Cost.....	\$4,890,728	\$33,579	\$352,559	\$354,073	\$98,065	\$5,335
68 Iron and steel plates, beams, angles, forgings, bolts, spikes, rivets, girders, castings, etc., pounds:	\$6,277,031	285,973	1,468,486	3,062,140	912,130	20,200
69 Cost.....	\$1,519,450	\$8,897	\$94,266	\$78,351	\$23,641	\$1,308
70 Anchors and chains purchased.....	\$152,830	\$317	\$17,625	\$11,302	\$1,985	\$40
71 Cordage:						
72 Wire, feet.....	914,656	340	46,489	17,695	9,250	
73 Cost.....	\$93,301	\$38	\$4,534	\$2,910	\$860	
74 Manila and hemp, pounds.....	1,438,929	16,480	115,996	167,128	12,770	200
75 Cost.....	\$223,686	\$2,890	\$18,076	\$27,910	\$1,598	\$24
76 Duck.....	\$188,503	\$88	\$19,030	\$1,860	\$1,931	
77 Paints, oils, etc.....	\$940,442	\$4,282	\$13,946	\$23,099	\$3,810	
78 Oakum and pitch.....	\$241,955	\$2,602	\$12,274	\$8,891	\$2,860	\$148
79 Masts and spars purchased.....	\$188,583	\$842	\$9,144	\$14,964	\$5,145	
80 Blocks purchased.....	\$52,735	\$32	\$2,784	\$3,416	\$975	
81 Machinery and boilers purchased.....	\$767,816	\$18,091	\$69,580	\$70,629	\$20	
82 Fittings and furniture purchased.....	\$114,492	\$375	\$6,614	\$6,671	\$260	
83 Fuel.....	\$121,171	\$185	\$4,692	\$5,783	\$2,499	
84 Rent of power and heat.....	\$16,011	\$100	\$450	\$522	\$75	
85 Mill supplies.....	\$27,562	\$75	\$1,384	\$1,549	\$392	
86 All other materials.....	\$393,076	\$4,865	\$69,438	\$62,745	\$8,055	\$134
87 Freight.....	\$125,882	\$579	\$5,928	\$6,038		

<sup>1</sup>The average number of women, 16 years and over, and children, under 16 years, employed during each month, are not included in the table, because of the small number reported.



TABLE 22.—SHIP AND BOAT BUILDING,

	Minnesota.	Mississippi.	Missouri.	New Hampshire.	New Jersey.	New York.	North Carolina.
1 Number of establishments .....	25	13	10	6	64	218	14
2 Character of organization:							
3 Individual .....	19	11	6	6	42	160	12
4 Firm and limited partnership .....	4	1	2	.....	8	44	2
5 Incorporated company .....	2	1	2	.....	14	14	.....
6 Established during the decade .....	10	7	8	1	23	76	8
7 Established during the census year .....	1	.....	2	.....	5	11	.....
8 Capital:							
9 Total .....	\$161,967	\$54,885	\$25,930	\$10,585	\$1,670,909	\$6,138,915	\$78,760
10 Land .....	\$24,050	\$4,850	\$1,901	\$1,500	\$178,054	\$1,674,472	\$21,600
11 Buildings .....	\$29,975	\$11,850	\$2,625	\$2,000	\$210,227	\$646,203	\$2,700
Machinery, tools, and implements .....	\$44,782	\$16,705	\$7,627	\$1,725	\$616,894	\$1,373,636	\$22,185
Cash and sundries .....	\$63,210	\$21,480	\$13,777	\$5,360	\$665,794	\$2,444,604	\$27,275
12 Proprietors and firm members .....	28	13	12	6	60	268	17
13 Salaried officials, clerks, etc.:							
14 Total number .....	7	5	3	.....	69	123	2
15 Total salaries .....	\$7,580	\$4,500	\$3,070	.....	\$75,859	\$154,676	\$1,200
16 Officers of corporations:							
Number .....	.....	3	.....	.....	16	12	.....
Salaries .....	.....	\$2,000	.....	.....	\$30,350	\$37,508	.....
General superintendents, managers, clerks, and salesmen:							
17 Total number .....	7	2	3	.....	53	111	2
18 Total salaries .....	\$7,580	\$2,500	\$3,070	.....	\$45,509	\$117,168	\$1,200
Men:							
19 Number .....	7	2	2	.....	49	104	2
20 Salaries .....	\$7,580	\$2,500	\$2,650	.....	\$44,095	\$113,109	\$1,200
Women:							
21 Number .....	.....	.....	1	.....	4	7	.....
22 Salaries .....	.....	.....	\$390	.....	\$1,414	\$4,059	.....
23 Wage earners, including pieceworkers, and total wages:							
24 Greatest number employed at any one time during the year .....	358	162	129	9	2,043	6,539	178
25 Least number employed at any one time during the year .....	87	40	43	5	837	2,242	44
26 Average number .....	137	73	61	5	1,416	3,464	73
27 Wages .....	\$74,317	\$46,452	\$45,906	\$3,600	\$778,103	\$2,014,788	\$34,782
Men, 16 years and over:							
28 Average number .....	137	73	66	5	1,416	3,426	73
29 Wages .....	\$74,317	\$46,452	\$45,909	\$3,600	\$778,103	\$2,006,374	\$34,782
Women, 16 years and over:							
30 Average number .....	.....	.....	.....	.....	.....	9	.....
31 Wages .....	.....	.....	.....	.....	.....	\$4,136	.....
Children, under 16 years:							
32 Average number .....	.....	.....	.....	.....	.....	29	.....
Wages .....	.....	.....	.....	.....	.....	\$4,278	.....
Average number of wage-earners, including pieceworkers, employed during each month:							
Men, 16 years and over:							
33 January .....	102	56	52	4	1,130	3,114	65
34 February .....	107	60	41	5	1,137	3,298	74
35 March .....	188	65	91	6	1,316	3,727	87
36 April .....	268	82	82	7	1,401	4,250	89
37 May .....	200	84	77	8	1,575	4,274	81
38 June .....	163	75	61	6	1,474	3,948	79
39 July .....	125	65	92	5	1,503	3,520	85
40 August .....	102	79	79	5	1,482	3,264	82
41 September .....	92	68	63	5	1,518	3,113	82
42 October .....	106	91	71	4	1,594	2,983	56
43 November .....	96	88	49	4	1,548	2,776	53
44 December .....	93	74	32	4	1,314	2,842	43
45 Miscellaneous expenses:							
46 Total .....	\$11,401	\$1,829	\$6,342	\$368	\$116,935	\$210,445	\$2,504
47 Rent of works .....	\$2,485	\$319	\$2,880	\$110	\$39,040	\$70,095	\$1,520
48 Taxes, not including internal revenue .....	\$1,529	\$260	\$82	\$41	\$6,144	\$23,043	\$454
49 Rent of offices, insurance, interest, and all sundry expenses not hitherto included .....	\$2,572	\$840	\$3,230	\$217	\$69,564	\$101,752	\$530
50 Contract work .....	\$4,815	\$410	\$150	.....	\$11,187	\$15,555	.....
51 Materials used:							
Total cost .....	\$84,962	\$46,376	\$31,914	\$2,625	\$716,592	\$1,882,659	\$21,253
Lumber, all kinds, including logs, timber, and knees, thousand feet, B. M.:							
52 Cost .....	1,195	950	441	44	12,238	73,356	399
53 Cost .....	\$31,006	\$25,252	\$16,576	\$1,420	\$352,717	\$976,362	\$12,737
54 Iron and steel plates, beams, angles, forgings, bolts, spikes, rivets, girders, castings, etc., pounds:							
55 Cost .....	219,847	118,950	106,360	3,650	3,504,712	7,621,589	59,495
56 Cost .....	\$13,996	\$4,988	\$4,293	\$300	\$107,286	\$331,441	\$3,927
57 Anchors and chains purchased .....	\$430	\$464	\$26	\$15	\$4,319	\$5,106	\$328
58 Cordage:							
Wire, feet .....	7,075	2,475	280	.....	20,115	191,985	420
59 Cost .....	\$1,046	\$185	\$26	.....	\$1,823	\$14,111	\$26
60 Manila and hemp, pounds .....	6,106	4,080	950	540	32,006	140,496	1,375
61 Cost .....	\$1,006	\$718	\$130	\$90	\$4,747	\$21,591	\$224
62 Duck .....	\$526	\$1,138	\$118	.....	\$8,342	\$13,378	\$253
63 Paints, oils, etc. .....	\$2,688	\$1,111	\$656	\$250	\$49,954	\$80,147	\$1,397
64 Oakum and pitch .....	\$1,794	\$1,698	\$1,237	\$18	\$25,574	\$54,244	\$1,000
65 Masts and spars purchased .....	\$153	\$914	\$12	\$40	\$7,386	\$40,155	\$515
66 Blocks purchased .....	\$203	\$168	\$20	\$20	\$2,557	\$5,577	\$124
67 Machinery and boilers purchased .....	\$16,990	\$1,400	\$3,375	.....	\$30,160	\$66,684	.....
68 Fittings and furniture purchased .....	\$2,453	\$90	\$195	\$20	\$6,590	\$17,473	.....
69 Fuel .....	\$2,076	\$1,294	\$330	\$150	\$10,641	\$28,514	\$350
70 Rent of power and heat .....	\$590	.....	.....	.....	\$1,023	\$6,209	.....
71 Mill supplies .....	\$332	\$264	\$65	\$10	\$2,286	\$6,288	\$85
All other materials .....	\$7,498	\$6,839	\$4,205	\$237	\$96,795	\$194,952	\$295
72 Freight .....	\$2,175	\$883	\$120	\$55	\$9,292	\$20,387	.....

WOODEN, BY STATES: 1900—Continued.

Ohio.	Oregon.	Pennsylvania.	Rhode Island.	Tennessee.	Texas.	Virginia.	Washington.	West Virginia.	Wisconsin.	All other states. <sup>1</sup>	
31	16	35	20	3	7	27	36	4	29	6	1
18	10	23	15	3	4	18	23	1	20	4	2
9	3	8	2	2	3	8	7	1	6	2	3
4	3	4	3	3	1	1	6	2	3	3	4
11	11	7	6	2	3	12	23	2	11	2	5
1	2	1	1	1	1	1	7	1	1	1	6
\$283,940	\$126,845	\$288,401	\$540,847	\$1,020	\$10,980	\$320,982	\$548,084	\$46,455	\$332,225	\$40,210	7
\$90,050	\$23,750	\$58,550	\$50,850	.....	\$270	\$131,270	\$106,660	\$2,000	\$259,700	\$7,500	8
\$35,880	\$6,200	\$59,450	\$98,917	.....	\$2,850	\$27,240	\$80,200	\$4,000	\$111,000	\$8,800	9
\$52,785	\$39,770	\$44,790	\$104,507	\$320	\$2,335	\$121,150	\$110,375	\$19,200	\$250,670	\$16,010	10
\$105,225	\$57,125	\$120,011	\$226,513	\$700	\$5,475	\$41,322	\$250,849	\$21,255	\$210,855	\$7,900	11
37	15	41	19	3	10	35	39	4	31	8	12
14	8	13	8	.....	.....	10	22	4	20	.....	13
\$9,445	\$10,400	\$3,680	\$20,440	.....	.....	\$10,100	\$27,572	\$1,575	\$19,968	.....	14
2	3	.....	6	.....	.....	.....	8	4	4	.....	15
\$1,800	\$3,600	.....	\$18,840	.....	.....	.....	\$6,000	\$1,575	\$3,800	.....	16
12	5	13	2	.....	.....	10	19	.....	16	.....	17
\$7,645	\$6,860	\$3,680	\$1,600	.....	.....	\$10,100	\$21,572	.....	\$11,168	.....	18
11	5	12	2	.....	.....	10	19	.....	12	.....	19
\$7,420	\$6,860	\$3,560	\$1,600	.....	.....	\$10,100	\$21,572	.....	\$9,968	.....	20
1	.....	1	.....	.....	.....	.....	.....	.....	4	.....	21
\$225	.....	\$120	.....	.....	.....	.....	.....	.....	\$1,200	.....	22
743	662	527	430	65	68	362	1,926	102	927	95	23
148	212	231	204	65	16	83	336	27	351	11	24
368	338	257	299	11	33	187	741	53	562	64	25
\$161,123	\$187,357	\$119,719	\$210,009	\$2,560	\$19,315	\$97,681	\$510,301	\$20,204	\$282,667	\$27,710	26
368	338	252	299	11	33	187	732	53	559	64	27
\$161,123	\$187,357	\$118,619	\$210,009	\$2,560	\$19,315	\$97,681	\$503,051	\$20,204	\$281,667	\$27,710	28
.....	.....	1	.....	.....	.....	.....	.....	.....	3	.....	29
.....	.....	\$250	.....	.....	.....	.....	.....	.....	\$900	.....	30
.....	.....	4	.....	.....	.....	.....	9	.....	.....	.....	31
.....	.....	\$850	.....	.....	.....	.....	\$2,250	.....	.....	.....	32
211	306	186	209	65	61	124	399	32	584	42	38
251	310	166	235	65	42	125	519	25	601	42	34
360	356	224	299	.....	43	153	1,014	28	642	60	35
396	279	240	368	.....	44	179	900	40	655	69	36
388	346	255	358	.....	47	232	1,011	49	750	76	37
342	330	347	350	.....	25	266	743	62	591	76	38
425	326	332	334	.....	24	224	780	70	519	76	39
458	355	332	327	.....	17	230	902	86	486	87	40
455	423	340	293	.....	11	241	643	89	414	75	41
415	316	219	265	.....	22	166	592	81	464	66	42
366	313	191	273	.....	20	165	627	46	449	46	43
362	394	186	278	.....	40	143	651	33	557	60	44
\$23,908	\$3,351	\$38,628	\$7,821	\$339	\$1,150	\$10,582	\$32,415	\$1,780	\$42,110	\$698	45
\$3,360	\$1,865	\$3,223	\$2,225	\$14	\$841	\$942	\$1,379	\$593	\$1,653	\$65	46
\$1,704	\$1,652	\$2,251	\$1,421	.....	59	.....	\$2,317	\$288	\$5,787	\$413	47
\$6,994	\$3,503	\$3,537	\$3,874	\$25	.....	\$8,421	\$20,265	\$399	\$24,674	\$120	48
\$11,850	\$1,331	\$29,617	\$300	.....	\$300	.....	\$5,454	.....	\$10,005	\$100	49
\$202,516	\$306,579	\$176,498	\$229,496	\$3,710	\$90,845	\$72,418	\$735,050	\$19,354	\$212,680	\$11,441	50
3,994	6,142	4,608	3,066	83	345	912	12,636	539	3,529	299	51
\$147,879	\$127,113	\$116,138	\$90,085	\$1,270	\$42,959	\$21,758	\$266,285	\$13,423	\$94,024	\$7,460	52
629,387	882,462	802,525	464,700	2,700	63,150	750,385	2,591,075	39,500	1,381,915	10,070	53
\$21,376	\$43,868	\$27,265	\$40,554	\$150	\$1,473	\$20,546	\$158,153	\$2,722	\$46,108	\$625	54
\$179	\$5,872	\$197	\$2,468	\$300	\$55	\$2,300	\$17,448	.....	\$323	\$150	55
4,850	18,892	15,050	68,600	110	.....	1,370	85,455	575	800	.....	56
\$599	\$2,666	\$1,565	\$3,359	\$13	.....	\$175	\$10,027	\$60	\$100	.....	57
13,850	42,216	53,070	23,825	400	7,200	4,560	100,319	300	7,500	.....	58
\$2,303	\$7,021	\$8,965	\$3,584	\$45	\$1,240	\$733	\$16,787	\$50	\$1,200	.....	59
\$1,874	\$3,824	\$400	\$16,538	\$67	\$35	\$450	\$9,532	\$5	\$4,810	.....	60
\$3,980	\$11,151	\$3,297	\$9,725	\$250	\$703	\$5,999	\$11,517	\$109	\$6,009	\$733	61
\$6,471	\$8,516	\$6,808	\$451	\$60	\$565	\$3,649	\$16,121	\$2,025	\$9,855	\$650	62
\$30	\$2,810	\$220	\$7,079	.....	\$70	\$3,245	\$7,622	.....	\$754	.....	63
\$63	\$1,606	\$179	\$4,231	.....	\$165	\$213	\$4,677	.....	\$374	.....	64
\$3,694	\$51,400	\$300	\$1,000	\$1,400	\$40,000	\$2,500	\$71,728	.....	\$12,735	\$30	65
\$1,656	\$11,318	\$1,300	\$645	\$25	\$1,000	\$775	\$7,878	.....	\$2,720	\$150	66
\$2,334	\$1,430	\$2,204	\$4,760	.....	\$50	\$4,702	\$6,286	\$170	\$10,759	\$110	67
\$203	\$95	\$168	.....	.....	.....	.....	\$90	.....	\$20	.....	68
\$718	\$382	\$431	\$750	.....	.....	\$543	\$656	.....	\$1,291	\$33	69
\$5,086	\$26,447	\$5,786	\$37,609	\$100	\$2,530	\$3,620	\$126,016	\$581	\$15,403	\$1,050	70
\$3,671	\$1,120	\$1,276	\$1,698	\$30	.....	\$1,210	\$4,227	\$181	\$5,455	\$100	71

TABLE 22.—SHIP AND BOAT BUILDING,

	United States.	Alabama.	California.	Connecticut.	Delaware.	District of Columbia.	
72	Products:						
	Total value.....	\$24,210,419	\$240,242	\$1,654,108	\$1,227,120	\$360,117	\$24,980
	Wooden vessels:						
73	Steam, number.....	396	3	28	25	3	
74	Gross tonnage.....	48,932	326	3,922	1,102	443	
75	Net tonnage.....	32,845	220	2,632	980	233	
76	Value.....	\$2,994,358	\$28,600	\$280,486	\$41,425	\$23,008	
77	Sailing, number.....	646	1	22	14	3	
78	Gross tonnage.....	59,291	6	8,256	188	1,600	
79	Net tonnage.....	51,847	6	7,530	180	1,143	
80	Value.....	\$3,251,069	\$700	\$500,860	\$18,500	\$47,000	
81	Barges, number.....	839	4	35	31	22	3
82	Gross tonnage.....	295,508	3,669	6,726	18,746	10,125	360
83	Net tonnage.....	261,689	1,859	5,890	17,089	9,457	300
84	Value.....	\$3,828,170	\$66,250	\$141,750	\$534,600	\$190,456	\$7,980
85	Canal boats, number.....	72			4		
86	Gross tonnage.....	21,434			3,240		
87	Net tonnage.....	19,949			3,240		
88	Value.....	\$227,374			\$64,000		
89	Small boats, launches and ships; fishing, pleasure, life, and row boats, etc., number.....	15,448		597	318	295	7
90	Value.....	\$1,972,825		\$100,015	\$72,107	\$29,142	\$500
91	All other products.....	\$1,070,297		\$87,930	\$185,872	\$4,961	
92	Amount received for repair work.....	\$10,866,326	\$144,692	\$483,017	\$310,616	\$65,550	\$16,500
93	Comparison of products:						
	Number of establishments reporting for both years.....	898	4	35	32	8	2
94	Value for census year.....	\$21,643,485	\$161,066	\$1,627,728	\$1,196,070	\$358,467	\$26,980
95	Value for preceding business year.....	\$17,386,228	\$129,275	\$1,375,347	\$859,997	\$235,922	\$28,000
96	Power:						
	Number of establishments reporting.....	382	3	16	15	6	
97	Total horsepower.....	28,908	156	918	814	176	
	Owned:						
	Engines:						
98	Steam, number.....	496	3	11	25	8	
99	Horsepower.....	19,997	146	458	720	170	
100	Gas or gasoline, number.....	45		9	3		
101	Horsepower.....	617		312	12		
102	Water wheels, number.....	10			2		
103	Horsepower.....	1,799			16		
104	Electric motors, number.....	33			2		
105	Horsepower.....	968			26		
106	Other power, horsepower.....	55		3			
	Rented:						
107	Electric, horsepower.....	149		20	40		
108	Other kind, horsepower.....	417	10	123		6	
109	Horsepower furnished to other establishments.....	127		10			
	Establishments classified by number of persons employed, not including proprietors and firm members:						
110	Total number of establishments.....	1,072	6	39	35	9	3
111	Number of employees.....	198		4	4		
112	Under 5.....	211	1	6	11	3	1
113	5 to 20.....	361	1	15	10	2	2
114	21 to 50.....	152	1	6	7	2	
115	51 to 100.....	81	2	3	1	1	
116	101 to 250.....	51		4	1	1	
117	251 to 500.....	14	1	1			
118	501 to 1,000.....	4			1		

WOODEN, BY STATES: 1900—Continued.

Florida.	Georgia.	Illinois.	Indiana.	Iowa.	Kentucky.	Louisiana.	Maine.	Maryland.	Massachusetts.	Michigan.	
\$254,991	\$23,500	\$322,446	\$465,207	\$42,665	\$97,492	\$250,307	\$2,491,765	\$862,034	\$1,760,574	\$1,402,898	72
8	3	11	20	6	4	7	14	9	16	17	73
68	525	198	10,159	454	242	1,040	1,212	1,701	1,474	4,710	74
39	405	124	5,723	277	242	747	946	582	864	4,039	75
\$10,900	\$22,300	\$12,800	\$277,123	\$16,650	\$10,223	\$17,582	\$85,340	\$69,775	\$158,275	\$301,400	76
6	1	8			5	1	73	24	128	13	77
522	15	40			220	15	26,683	456	3,889	2,884	78
394	12	36			194	10	23,753	295	2,910	2,793	79
\$42,685	\$600	\$8,600			\$3,450	\$275	\$1,087,701	\$23,891	\$384,000	\$117,250	80
26	1	2	41	3	2	20	34	29	9	2	81
1,888	100	60	21,500	193	560	3,210	25,286	12,027	2,030	1,225	82
1,708	100	52	10,388	171	500	2,686	22,751	10,911	798	1,015	83
\$41,751	\$600	\$250	\$97,056	\$900	\$2,800	\$56,425	\$764,875	\$169,820	\$36,800	\$60,550	84
		1						6			85
		100						920			86
		75						920			87
		\$1,000						\$68,800			88
		361	524	40	45	38	1,000	274	3,801	996	89
\$20,671		\$20,898	\$47,140	\$4,249	\$800	\$1,935	\$93,571	\$35,354	\$208,964	\$241,010	90
\$5,000		\$6,700			\$987	\$10,921	\$37,974	\$17,780	\$162,699	\$99,265	91
\$133,984		\$271,598	\$43,888	\$20,966	\$79,232	\$163,169	\$422,304	\$538,614	\$809,836	\$588,423	92
14	1	15	6	9	5	13	102	35	116	40	93
\$253,815	\$600	\$305,996	\$415,707	\$41,740	\$69,727	\$225,557	\$2,311,313	\$784,493	\$1,657,349	\$1,180,455	94
\$138,205	\$500	\$285,488	\$523,762	\$37,874	\$42,310	\$186,863	\$1,576,250	\$635,520	\$1,244,006	\$949,083	95
2		5	5	6	2	7	22	17	40	21	96
845		221	338	116	206	427	612	600	736	1,855	97
12		6	11	4	2	13	19	24	34	25	98
845		215	242	96	200	427	466	562	619	1,741	99
		1	1	2	1	1	1	3	2	3	100
		6	6	20	6		16	38	36	34	101
		1	1							1	102
		80								65	103
		1								2	104
		10								6	105
										15	106
											107
							122			74	108
										1	109
										85	
15	4	17	14	10	10	15	115	48	122	51	110
4	1	3	3	1	1		43	3	28	10	111
6		4	5	5	3	1	17	5	20	13	112
4	2	3	2	2	4	7	30	22	54	10	113
1	1	4	2	1	1	4	11	6	11	8	114
			1	1		2	7	5	7	6	115
1		3	1		1		5	2	1	2	116
			1				1		1	1	117
							1			1	118

TABLE 22.—SHIP AND BOAT BUILDING.

	Minnesota.	Mississippi.	Missouri.	New Hampshire.	New Jersey.	New York.	North Carolina.	
72	Products:							
	Total value.....	\$223,971	\$115,744	\$93,367	\$9,798	\$1,958,041	\$5,423,717	\$77,528
	Wooden vessels:							
73	Steam, number.....	11	25	2	1	10	87	2
74	Gross tonnage.....	627	534	84	10	581	4,817	214
75	Net tonnage.....	448	308	53	5	405	2,874	133
76	Value.....	\$41,760	\$31,700	\$6,210	\$900	\$55,605	\$535,252	\$4,200
77	Sailing, number.....	15	14	2		80	85	9
78	Gross tonnage.....	176	193	48		857	1,400	142
79	Net tonnage.....	158	140	48		240	1,150	109
80	Value.....	\$11,085	\$12,800	\$500		\$25,695	\$139,657	\$6,225
81	Barges, number.....	5	8	8		40		
82	Gross tonnage.....	604	1,160	956		42,487	62,100	
83	Net tonnage.....	659	946	852		37,328	47,848	
84	Value.....	\$32,429	\$22,310	\$9,632		\$346,606	\$873,664	
86	Canal boats, number.....					24		
87	Gross tonnage.....					9,815	6,909	
88	Net tonnage.....					9,805	5,499	
89	Value.....					\$67,674	\$82,850	
	Small boats, launches and ships', fishing, pleasure, life, and row boats, etc., number.....	525	4	140	63	301	2,645	9
90	Value.....	\$33,975	\$517	\$12,065	\$2,943	\$69,777	\$654,702	\$1,028
91	All other products.....	\$20,135	\$6,000	\$503	\$150	\$5,520	\$155,305	\$140
92	Amount received for repair work.....	\$78,597	\$42,417	\$64,457	\$5,800	\$1,381,164	\$2,982,247	\$65,935
	Comparison of products:							
93	Number of establishments reporting for both years.....	21	11	6	5	53	190	11
94	Value for census year.....	\$214,186	\$88,944	\$74,752	\$8,750	\$1,834,081	\$4,821,975	\$75,703
95	Value for preceding business year.....	\$268,235	\$49,875	\$73,817	\$8,176	\$1,473,395	\$4,068,740	\$55,336
	Power:							
96	Number of establishments reporting.....	11	6	2	1	28	82	4
97	Total horsepower.....	180	197	142	15	2,152	7,444	156
	Owned:							
	Engines:							
98	Steam, number.....	10	6	3	1	63	98	5
99	Horsepower.....	138	132	142	15	2,094	5,714	156
100	Gas or gasoline, number.....	2	1			3	8	
101	Horsepower.....	18	15			24	6	
102	Water wheels, number.....						45	
103	Horsepower.....						1,539	
104	Electric motors, number.....	2						
105	Horsepower.....	4						
106	Other power, horsepower.....						52	
	Rented:							
107	Electric, horsepower.....							
108	Other kind, horsepower.....	20				34	94	
109	Horsepower furnished to other establishments.....	2				20	60	
	Establishments classified by number of persons employed, not including proprietors and firm members:							
110	Total number of establishments.....	25	13	10	6	64	218	14
111	Number of employees.....	5		2	2	11	45	
112	Under 5.....	7	2	2	4	14	36	4
113	5 to 20.....	8	9	4		20	71	8
114	21 to 50.....	3	2	1		3	33	2
115	51 to 100.....	1		1		10	18	
116	101 to 250.....	1				5	12	
117	251 to 500.....					1	2	
118	501 to 1,000.....						1	

WOODEN, BY STATES: 1900—Continued.

Ohio.	Oregon.	Pennsylvania.	Rhode Island.	Tennessee.	Texas.	Virginia.	Washington.	West Virginia.	Wisconsin.	All other states. <sup>1</sup>	
\$485,581	\$654,885	\$407,763	\$555,827	\$8,097	\$126,446	\$263,802	\$1,505,649	\$51,170	\$707,965	\$66,137	72
15	16	5	10	2	4	2	21	1	12	1	73
1,262	4,899	876	98	114	325	104	6,298	78	382	59	74
893	3,293	522	56	76	268	63	4,953	58	293	38	75
\$76,177	\$266,328	\$41,950	\$40,700	\$7,052	\$105,200	\$4,400	\$363,137	\$4,200	\$51,410	\$2,250	76
2	1	9	35	.....	2	61	30	.....	.....	.....	77
50	1,443	76	414	.....	17	1,220	8,983	.....	.....	.....	78
34	1,353	58	374	.....	16	920	7,975	.....	.....	.....	79
\$1,750	\$50,000	\$15,850	\$191,650	.....	\$1,100	\$3,290	\$495,425	.....	.....	\$580	80
36	5	174	.....	.....	2	4	116	.....	.....	.....	81
9,640	517	65,880	.....	.....	450	400	2,478	.....	.....	.....	82
8,610	486	65,328	.....	.....	490	360	2,183	.....	.....	.....	83
\$120,000	\$5,290	\$125,060	.....	.....	\$12,000	\$4,000	\$75,916	\$1,300	\$26,300	\$800	84
2	.....	8	.....	.....	.....	.....	.....	.....	.....	.....	85
150	.....	300	.....	.....	.....	.....	.....	.....	.....	.....	86
150	.....	260	.....	.....	.....	.....	.....	.....	.....	.....	87
\$2,200	.....	\$2,250	.....	.....	.....	.....	.....	.....	.....	.....	88
370	42	395	133	52	13	77	394	.....	860	112	89
\$47,205	\$9,025	\$47,036	\$21,904	\$820	\$1,086	\$10,337	\$61,289	.....	\$117,801	\$4,909	90
\$11,200	\$15,080	\$14,992	\$106,014	.....	\$1,400	\$15,000	\$79,900	.....	\$11,819	.....	91
\$227,049	\$308,662	\$160,625	\$195,559	\$225	\$5,660	\$226,815	\$429,932	\$45,670	\$500,625	\$57,698	92
25	11	30	19	1	5	23	17	4	23	6	93
\$417,631	\$478,928	\$367,349	\$655,193	\$1,000	\$125,250	\$255,502	\$908,677	\$51,170	\$685,794	\$66,537	94
\$391,284	\$364,623	\$304,867	\$435,077	\$1,000	\$70,950	\$212,635	\$625,227	\$45,518	\$594,182	\$57,700	95
15	2	10	9	.....	.....	14	14	2	13	2	96
553	90	218	437	.....	.....	1,579	1,408	72	1,170	70	97
19	1	11	15	.....	.....	19	18	3	25	2	98
543	75	209	437	.....	.....	734	1,371	72	1,138	70	99
1	.....	2	.....	.....	.....	.....	1	.....	1	.....	100
10	.....	9	.....	.....	.....	.....	2	.....	8	.....	101
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	102
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	103
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	104
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	105
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	106
.....	15	.....	.....	.....	.....	.....	.....	.....	.....	.....	107
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	108
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	109
81	16	35	20	3	7	27	36	4	29	6	110
5	.....	5	2	2	1	.....	7	.....	4	2	111
5	1	6	5	.....	3	.....	4	.....	10	1	112
10	.....	15	9	.....	2	.....	6	.....	7	2	113
6	.....	8	2	.....	1	.....	9	.....	3	.....	114
4	.....	1	1	1	.....	.....	4	.....	.....	.....	115
1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	116
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	117
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	118

<sup>1</sup>Includes establishments distributed as follows: Arkansas, 1; Idaho, 1; South Carolina, 2; Vermont, 2.

TABLE 23.—SHIPBUILDING, GOVERNMENTAL ESTABLISHMENTS, BY STATES: 1900.

	United States.	California.	Illinois. <sup>1</sup>	Maine.	Massachusetts.	New York.	Pennsylvania.	South Carolina.	Virginia.	Washington.
Number of establishments	9	1	1	1	1	1	1	1	1	1
Established during the decade	1									
Capital:										
Total	\$64,291,011	\$5,347,090	\$10,500	\$6,082,965	\$13,273,708	\$18,299,276	\$3,198,451	\$899,603	\$6,380,867	\$798,551
Land	\$30,412,074	\$1,156,387	\$2,500	\$1,583,200	\$8,143,882	\$14,345,875	\$1,760,440	\$118,792	\$2,900,998	\$400,000
Buildings	\$11,515,795	\$1,804,213	\$5,000	\$1,016,135	\$3,120,390	\$3,089,489	\$883,645	\$138,505	\$1,291,444	\$166,974
Machinery, tools, and implements	\$8,543,293	\$2,216,535	\$3,000	\$483,630	\$1,636,519	\$746,062	\$479,019	\$639,301	\$2,188,425	\$150,802
Cash and sundries	\$3,819,849	\$169,955		\$3,000,000	\$372,917	\$117,850	\$75,347	\$3,005		\$80,775
Salaried officials, clerks, etc.:										
Total number	540	112	1	130	82	135	32	8	40	
Total salaries	\$466,497	\$92,857	\$1,500	\$31,320	\$84,720	\$138,489	\$27,478	\$9,977	\$80,156	
Men:										
Number	537	112	1	130	82	132	32	8	40	
Salaries	\$463,738	\$92,857	\$1,500	\$31,320	\$84,720	\$135,730	\$27,478	\$9,977	\$80,156	
Women:										
Number	3					3				
Salaries	\$2,759					\$2,759				
Wage-earners, including pieceworkers, and total wages:										
Greatest number employed at any one time during the year	9,520	1,441	6	694	1,634	2,450	590	149	2,358	198
Least number employed at any one time during the year	6,261	1,000	6	439	1,068	1,545	302	73	1,787	41
Average number	7,990	1,176	6	559	1,293	1,973	397	104	2,094	83
Wages:	\$6,222,263	\$1,111,486	\$4,808	\$470,248	\$902,579	\$1,654,727	\$307,913	\$47,667	\$1,659,214	\$64,121
Men, 16 years and over:										
Average number	7,664	1,162	6	559	1,293	1,962	397	104	2,094	82
Wages	\$6,202,882	\$1,103,986	\$4,808	\$470,248	\$902,579	\$1,642,946	\$307,913	\$47,667	\$1,659,214	\$64,021
Women, 16 years and over:										
Average number	25	14				11				
Wages	\$19,281	\$7,500				\$11,781				
Children, under 16 years:										
Average number	1									1
Wages	\$100									\$100
Average number of wage-earners, including pieceworkers, employed during each month: <sup>2</sup>										
Men, 16 years and over:										
January	7,437	1,019	6	493	1,123	1,978	302	105	2,302	44
February	7,530	1,001	6	450	1,123	2,064	410	73	2,358	45
March	7,827	1,025	6	444	1,371	2,036	402	117	2,309	67
April	7,779	1,143	6	478	1,450	2,000	401	98	2,115	88
May	8,185	1,101	6	512	1,536	2,212	399	75	2,098	196
June	8,090	1,245	6	660	1,508	2,109	414	73	2,044	131
July	7,458	1,408	6	627	1,205	1,734	338	136	1,813	191
August	7,389	1,184	6	628	1,293	1,968	348	120	1,787	55
September	7,941	1,277	6	661	1,253	2,053	455	143	2,051	42
October	8,289	1,247	6	688	1,346	2,071	439	118	2,331	43
November	7,154	1,153	6	610	1,272	1,701	453	106	1,811	42
December	6,909	1,097	6	555	1,097	1,570	353	80	2,111	40
Miscellaneous expenses:										
Total	\$29,064					\$9,564	\$14,875		\$4,625	
Rent of offices, insurance, and all sundry expenses	\$19,500						\$14,875		\$4,625	
Contract work	\$9,564					\$9,564				
Materials used:										
Total cost	\$3,805,326	\$536,836	\$2,981	\$205,012	\$843,795	\$1,115,650	\$243,518	\$24,567	\$764,558	\$68,359
Lumber, all kinds, including logs, timber, and knees, thousand feet, B. M.	12,478	1,740	45	792	1,590	3,344	483	188	3,096	300
Cost	\$320,049	\$43,556	\$1,125	\$19,375	\$39,759	\$83,614	\$19,957	\$4,700	\$99,963	\$7,500
Pig and scrap iron, tons	1,435	20		198	342	52	175	26	624	
Cost	\$20,636	\$250		\$3,147	\$5,489	\$600	\$788	\$362	\$10,000	
Iron and steel plates, beams, angles, forgings, bolts, spikes, rivets, girders, castings, etc., pounds	7,294,846	1,200,000	12,000	200,000	2,000,000	2,100,000	367,346	65,500	1,100,000	250,000
Cost	\$477,209	\$70,321	\$360	\$16,180	\$152,679	\$132,384	\$7,328	\$4,133	\$73,824	\$20,000
Anchors and chains purchased	\$9,964	\$326	\$200			\$161	\$8,082		\$1,195	
Cordage:										
Wire, feet	147,787	11,500		15,000	11,000	6,000	10,500	243	88,544	5,000
Cost	\$18,212	\$1,568		\$2,347	\$1,288	\$574	\$855	\$12	\$11,068	\$500
Manila and hemp, pounds	592,383	89,045	1,800	23,796	45,850	100,000	18,100	1,332	302,400	10,000
Cost	\$98,611	\$11,208	\$180	\$3,966	\$7,557	\$11,490	\$2,578	\$232	\$50,400	\$1,000
Duck	\$52,242	\$10,032	\$24	\$2,024	\$5,932	\$28,379	\$5,246	\$105		
Paints, oils, etc.	\$177,575	\$24,478	\$152	\$6,668	\$27,756	\$63,436	\$9,112	\$1,973	\$40,000	\$5,000
Oakum and pitch	\$45,316	\$2,175	\$72	\$751	\$6,237	\$560	\$151	\$248	\$33,122	\$2,000
Masts and spars purchased	\$2,145	\$1,375				\$14	\$506		\$150	
Blocks purchased	\$28,085	\$930		\$283	\$1,058	\$11,498	\$731	\$122	\$13,413	
Machinery and boilers purchased	\$913,387	\$109,083		\$27,857	\$166,408	\$274,703	\$65,285	\$6,400	\$248,011	\$15,000
Fittings and furniture purchased	\$52,103	\$3,642		\$7,391	\$3,926	\$12,353	\$169	\$1,146	\$18,476	\$5,000
Fuel	\$168,103	\$40,306	\$600	\$10,558	\$31,007	\$34,193	\$3,805	\$8,059	\$27,060	\$2,500
Mill supplies	\$88,465	\$320	\$200	\$1,756	\$9,572	\$8,296	\$393	\$717	\$66,211	\$500
All other materials	\$1,358,156	\$217,316		\$102,209	\$335,127	\$452,890	\$113,882	\$1,708	\$71,665	\$8,359
Freight	\$68		\$68							
Products:										
Total value	\$11,034,312	\$1,741,229	\$12,000	\$764,022	\$1,361,816	\$3,895,689	\$546,312	\$32,211	\$2,493,558	\$182,480
Barges, number	2									
Gross tonnage	180									
Net tonnage	120									
Value	\$1,200							\$1,200		
Small boats, launches and ships, life and row boats, etc.:										
Number	677			632			12	3	30	
Value	\$114,122			\$63,272			\$12,350	\$2,000	\$36,800	
All other products	\$4,448,752	\$852,222		\$367,825	\$555,752	\$1,709,864	\$248,432	\$23,227	\$691,890	
Repair work	\$5,470,238	\$889,007	\$12,000	\$332,925	\$706,064	\$2,185,825	\$285,480	\$55,784	\$1,870,673	\$132,480

<sup>1</sup> State institution.<sup>2</sup> The average number of women, 16 years and over, and children, under 16 years, employed during each month, are not included in the table, because of the small number reported.

TABLE 23.—SHIPBUILDING, GOVERNMENTAL ESTABLISHMENTS, BY STATES: 1900—Continued.

	United States.	California.	Illinois. <sup>1</sup>	Maine.	Massachusetts.	New York.	Pennsylvania.	South Carolina.	Virginia.	Washington.
Comparison of products:										
Number of establishments reporting for both years .....	8	1	1	1	1	1	1	1	1	1
Value for census year .....	\$10,901,832	\$1,741,229	\$12,000	\$764,022	\$1,361,816	\$3,895,689	\$546,312	\$82,211	\$2,498,553	.....
Value for preceding business year.....	\$8,061,093	\$575,727	\$12,000	\$373,620	\$678,443	\$4,286,935	\$97,578	\$12,817	\$2,023,973	.....
Power:										
Number of establishments reporting..	9	1	1	1	1	1	1	1	1	1
Total horsepower .....	10,998	1,954	25	980	2,467	2,754	685	833	950	350
Owned:										
Engines:										
Steam, number.....	95	18	1	16	21	19	9	6	7	3
Horsepower .....	7,465	1,555	25	780	1,682	1,200	540	833	600	350
Gas or gasoline, number.....	1	.....	.....	.....	.....	1	.....	.....	.....	.....
Horsepower .....	10	.....	.....	.....	.....	10	.....	.....	.....	.....
Electric motors, number.....	197	45	.....	11	15	122	4	.....	.....	.....
Horsepower .....	2,733	399	.....	200	445	1,544	145	.....	.....	.....
Other power, horsepower.....	790	.....	.....	.....	440	.....	.....	.....	350	.....

<sup>1</sup> State institution.

Twelfth Census of the United States.

# CENSUS BULLETIN.

No. 170.

WASHINGTON, D. C.

May 19, 1902.

## AGRICULTURE.

## MINNESOTA.

Hon. WILLIAM R. MERRIAM,

*Director of the Census.*

SIR: I have the honor to transmit herewith, for publication in bulletin form, the statistics of agriculture in the state of Minnesota, taken in accordance with the provisions of section 7 of the act of March 3, 1899. This section requires that—

The schedules relating to agriculture shall comprehend the following topics: Name of occupant of each farm, color of occupant, tenure, acreage, value of farm and improvements, acreage of different products, quantity and value of products, and number and value of live stock. All questions as to quantity and value of crops shall relate to the year ending December thirty-first next preceding the enumeration.

A "farm," as defined by the Twelfth Census, includes all the land, under one management, used for raising crops and pasturing live stock, with the wood lots, swamps, meadows, etc., connected therewith. It includes also the house in which the farmer resides, and all other buildings used by him in connection with his farming operations.

The farms of Minnesota, June 1, 1900, numbered 154,659, and had a value of \$669,522,315. Of this amount \$110,220,415, or 16.5 per cent, represents the value of buildings, and \$559,301,900, or 83.5 per cent, the value of land and improvements other than buildings. On the same date the value of farm implements and machinery was \$30,099,230, and that of live stock, \$89,083,097. These values, added to that of farms, give \$788,684,642, the "total value of farm property."

The products derived from domestic animals, poultry, and bees, including animals sold and animals slaughtered on farms, are referred to in this bulletin as "animal products." The total value of such products, together with the value of all

crops, is termed "total value of farm products." This value for 1899 was \$161,217,304, of which amount \$45,522,367, or 28.2 per cent, represents the value of animal products, and \$115,694,937, or 71.8 per cent, the value of crops, including forest products cut or produced on farms. The total value of farm products for 1899 exceeds that reported for 1889 by \$89,979,074, or 126.8 per cent. A part of this increase, however, is doubtless due to a more detailed enumeration of the products of 1899 than of those of 1889.

The "gross farm income" is obtained by deducting from the total value of farm products the value of the products fed to live stock on the farms of the producers. In 1899 the reported value of products fed was \$33,257,480, leaving \$127,959,824 as the gross farm income. The ratio which this latter amount bears to the "total value of farm property" is referred to in this bulletin as the "percentage of gross income upon investment." For Minnesota in 1899 it was 16.2 per cent.

As no reports of expenditures for taxes, interest, insurance, feed for stock, and similar items have been obtained by any census, no statement of net farm income can be given.

The statistics presented in this bulletin will be treated in greater detail in the final report on agriculture in the United States, which will be published about June 1, 1902. This publication is designed to present merely a summarized advance statement for Minnesota.

Very respectfully,



*Chief Statistician for Agriculture.*

# AGRICULTURE IN MINNESOTA.

## GENERAL STATISTICS.

Minnesota has a total land area of 79,205 square miles, or 50,691,200 acres, of which 26,248,498 acres, or 51.8 per cent, are included in farms.

The surface of the state is undulating, and although there are no mountains or foothills, it is the natural watershed of all that part of the North American continent lying east of the Rocky Mountains. It contains the remote sources of three great water systems, the Mississippi River, the Red River of the North, and the St. Louis River, the last named eventually finding its way to the Atlantic Ocean through the Great Lakes and the St. Lawrence River.

Partly as a result of this fact, four distinct divisions may be recognized, differing in soil and vegetable growth. The soil of the northwestern section is a rich alluvial deposit, admirably adapted to wheat growing. The northeastern slope contains important mineral deposits and forest tracts, and yields only fair crops. The north central division comprises an extensive area, heavily timbered with pine, its soil being generally sandy. In the southern division, comprising almost the entire southern half of the state, woodlands and rolling prairies alternate. This land is unsurpassed in fertility and productiveness.

### NUMBER AND SIZE OF FARMS.

Table 1 gives by decades since 1850 the number of farms, the total and average acreage, and the per cent of farm land improved.

TABLE 1.—FARMS AND FARM ACREAGE: 1850 TO 1900.

YEAR.	Number of farms.	NUMBER OF ACRES IN FARMS.				Per cent of farm land improved.
		Total.	Improved.	Unimproved.	Average.	
1900.....	154,669	26,248,498	18,442,585	7,805,913	169.7	70.8
1890.....	116,581	18,668,645	11,127,958	7,540,687	160.1	59.6
1880.....	92,386	13,403,019	7,246,693	6,156,326	145.1	54.1
1870.....	46,500	6,483,828	2,922,102	4,161,726	139.4	35.8
1860.....	18,181	2,711,968	556,250	2,155,718	149.2	20.5
1850.....	157	28,881	5,035	23,846	184.0	17.4

The number and aggregate area of farms have increased rapidly since 1850, and between 1890 and 1900 the rates of gain were 32.7 per cent and 40.6 per cent, respectively. The peculiar adaptability of the soil and climate of northwestern Minnesota to the growing of cereals and hay, became generally known just prior to 1880; the rapid

development of the industry which followed, resulted in the conversion of vast uncultivated areas into highly productive farms, and it is chiefly for this reason that, since that date, the total farm acreage has increased more rapidly than the number of farms. The division of farm holdings in the southern portion of the state, where the land is more intensively cultivated, has not been sufficient to overcome the expansive movement in the northwestern section; hence a steady increase in the average size of farms is noted for the past four decades. This gain has been attended by a correspondingly marked increase in the per cent of farm land improved.

### FARM PROPERTY AND PRODUCTS.

Table 2 presents a summary of the principal statistics relating to farm property and products for each census year, beginning with 1850.

TABLE 2.—VALUES OF SPECIFIED CLASSES OF FARM PROPERTY, AND OF FARM PRODUCTS: 1850 TO 1900.

YEAR.	Total value of farm property.	Land, improvements, and buildings.	Implements and machinery.	Live stock.	Farm products. <sup>1</sup>
1900.....	\$788,684,642	\$609,522,315	\$30,099,280	\$59,063,097	\$161,217,804
1890.....	414,701,626	340,059,470	16,916,473	57,725,683	71,238,280
1880.....	288,718,864	193,724,260	13,089,783	31,904,821	49,408,951
1870 <sup>2</sup> .....	124,687,403	97,847,442	6,721,120	20,118,841	233,446,400
1860.....	32,166,946	27,505,922	1,018,183	3,642,841	-----
1850.....	270,788	161,948	15,981	92,859	-----

<sup>1</sup> For year preceding that designated.

<sup>2</sup> Values for 1870 were reported in depreciated currency. To reduce to specie basis of the other figures, they must be diminished by one-fifth.

<sup>3</sup> Includes betterments and additions to live stock.

Between 1850 and 1900 the total value of farm property increased \$788,413,854, and in the last decade, \$373,983,016, or 90.2 per cent. Of the latter amount, \$329,462,845, or 88.1 per cent, represents the increase in the value of farms; \$13,182,757, or 3.5 per cent, in that of implements and machinery; and \$31,337,414, or 8.4 per cent, in that of live stock. The value of farm products for 1899 exceeds that for 1889 by 126.3 per cent, but a part of this gain, and of that in implements and machinery, is doubtless due to a more detailed enumeration in 1900 than heretofore.

### COUNTY STATISTICS.

Table 3 gives an exhibit of general agricultural statistics by counties.

TABLE 3.—NUMBER AND ACREAGE OF FARMS, AND VALUES OF SPECIFIED CLASSES OF FARM PROPERTY, JUNE 1, 1900, WITH VALUE OF PRODUCTS OF 1899 NOT FED TO LIVE STOCK, AND EXPENDITURES IN 1899 FOR LABOR AND FERTILIZERS, BY COUNTIES.

COUNTIES.	NUMBER OF FARMS.		ACRES IN FARMS.		VALUES OF FARM PROPERTY.				Value of products not fed to live stock.	EXPENDITURES.	
	Total.	With build-ings.	Total.	Improved.	Land and improve-ments (ex-cept build-ings).	Buildings.	Imple-ments and machinery.	Live stock.		Labor.	Fertili-zers.
The State	154,659	149,073	26,248,498	18,442,585	\$559,301,900	\$110,220,415	\$30,099,230	\$89,068,097	\$127,959,824	\$16,657,820	\$251,120
Aitkin	768	751	112,712	20,707	667,030	195,600	48,620	215,147	207,477	12,520	190
Anoka	1,356	1,295	174,698	87,072	2,692,680	766,750	152,370	587,146	729,466	75,280	3,130
Becker	1,947	1,856	304,968	144,459	3,373,800	813,860	283,280	700,909	1,062,238	109,010	1,740
Beltzrami	1,243	1,206	186,716	23,622	945,570	166,840	63,850	220,774	224,088	14,030	80
Bentonia	1,275	1,257	180,017	90,595	2,636,300	572,750	180,560	501,117	568,640	48,530	2,500
Bigstone	1,044	996	276,968	243,724	4,489,290	766,270	270,810	625,702	1,423,116	206,700	700
Blue Earth	3,186	3,087	450,612	864,138	16,128,840	3,058,230	671,770	2,124,128	2,805,152	270,660	3,980
Brown	1,857	1,799	372,680	313,492	9,818,560	1,740,920	434,280	1,335,601	1,962,215	237,180	3,310
Carlton	605	596	67,092	13,554	542,630	205,970	34,720	154,844	154,038	53,300	1,210
Carver	1,975	1,953	216,868	121,224	6,242,980	1,602,340	365,580	1,130,813	1,546,166	130,590	820
Cass	668	642	104,577	20,585	588,690	113,650	40,300	168,095	164,465	3,740	120
Chippewa	1,687	1,576	342,301	308,700	6,515,760	1,141,660	385,430	994,325	1,625,902	311,400	1,150
Chisago	1,969	1,934	214,778	85,277	3,419,310	1,374,640	237,210	815,166	1,031,154	102,420	3,300
Clay	1,994	1,852	546,636	438,802	8,767,950	1,224,020	574,430	1,371,832	2,544,500	486,650	940
Cook	86	86	5,523	327	32,830	23,620	1,810	5,835	8,747	3,940	
Cottonwood	1,568	1,489	370,715	341,627	7,601,560	2,149,710	431,930	1,145,457	1,745,382	245,950	2,250
Crow Wing	1,241	1,206	170,509	36,179	1,125,780	378,160	97,190	350,112	867,463	23,690	450
Dakota	2,152	2,103	332,238	272,490	8,342,895	1,684,280	450,490	1,314,181	2,168,589	229,030	7,200
Dodge	1,651	1,613	258,979	219,508	6,661,170	1,421,610	332,610	1,234,222	1,519,632	183,570	1,100
Douglas	2,407	2,348	348,302	192,034	5,634,650	1,329,410	368,090	940,891	1,607,509	259,990	12,570
Faribault	2,232	2,159	442,042	394,000	16,484,500	2,624,810	666,850	1,964,978	2,606,911	322,450	5,780
Fillmore	3,477	3,392	521,261	389,386	14,240,595	2,801,725	653,260	2,662,528	3,062,713	299,160	13,030
Freeborn	2,691	2,553	436,748	342,876	11,766,250	2,778,900	596,430	2,270,676	2,699,917	386,630	790
Goodhue	3,210	3,138	470,062	374,593	12,285,550	3,083,240	631,220	2,044,607	3,027,194	609,150	5,460
Grant	1,245	1,182	284,039	221,610	4,401,060	720,330	282,330	687,111	1,303,708	184,140	1,800
Hennepin	3,684	3,525	297,052	197,570	13,938,070	3,742,080	528,020	1,701,810	3,012,397	378,750	8,430
Houston	2,130	2,064	331,986	169,810	6,619,250	1,575,760	360,500	1,388,570	1,630,451	185,820	1,970
Hubbard	1,611	1,585	229,509	209,509	708,720	119,150	55,010	139,524	188,155	20,590	160
Isanti	2,044	1,978	221,576	85,747	2,552,340	978,690	212,790	587,709	820,890	96,510	4,960
Itasca	217	211	27,641	4,274	188,880	77,530	16,060	55,727	70,222	8,560	230
Jackson	1,949	1,880	404,014	354,253	10,401,960	1,615,670	544,100	1,581,924	1,810,921	136,980	1,590
Kanabec	749	724	127,475	13,832	1,019,480	47,230	201,747	182,471	182,471	18,110	
Kandiyohi	2,265	2,220	443,146	340,722	8,094,340	1,807,980	461,230	1,351,416	1,984,622	385,430	5,410
Kittson	1,266	1,129	339,677	205,544	4,533,830	804,110	336,980	848,568	1,415,082	351,600	4,320
Lac qui Parle	1,951	1,819	454,705	391,711	9,399,940	1,499,970	556,550	1,374,090	2,434,690	372,400	3,030
Lake	19	19	2,435	243	16,300	9,200	380	4,885	6,599	700	
Lesueur	2,472	2,380	288,609	148,939	8,041,680	1,579,270	394,660	1,111,167	1,707,797	135,360	1,100
Lincoln	1,340	1,285	300,274	237,636	5,658,460	861,520	339,190	815,125	1,344,839	134,060	4,710
Lyon	1,632	1,554	398,432	334,236	6,649,090	1,315,880	438,300	1,316,225	2,124,409	231,480	1,720
McLeod	2,335	2,264	302,091	223,943	8,740,020	1,942,190	428,420	1,331,321	1,949,713	161,980	480
Marshall	2,464	2,405	543,190	340,882	5,717,310	944,720	490,150	1,389,277	1,887,997	376,640	3,420
Martin	2,138	2,069	420,792	333,459	12,100,790	1,853,840	597,330	1,628,799	1,968,986	191,250	3,230
Meeker	2,511	2,422	345,982	255,314	8,215,350	1,738,960	463,860	1,373,140	1,955,417	222,500	1,550
Millacs	1,022	978	95,860	81,406	1,379,540	238,550	82,550	321,163	304,618	15,660	110
Morrison	2,400	2,340	331,816	148,365	5,365,240	907,380	337,570	909,769	1,102,016	78,430	6,120
Mower	2,447	2,370	432,006	394,801	14,935,660	2,635,510	615,540	2,095,438	2,707,766	327,820	850
Murray	1,713	1,550	385,061	338,656	9,438,590	1,151,630	486,820	1,309,205	1,978,560	126,050	980
Nicollet	1,454	1,421	272,290	209,259	7,008,310	1,623,860	388,040	1,136,152	1,643,601	350,030	2,400
Nobles	1,751	1,686	420,213	298,238	11,238,380	1,363,730	490,220	1,439,298	2,208,319	261,050	720
Norman	1,938	1,796	428,985	316,597	6,882,260	1,120,750	456,750	1,155,870	1,402,486	295,260	9,110
Olmsted	2,539	2,455	405,889	327,419	13,592,310	2,634,110	555,160	2,005,259	2,559,762	240,630	4,360
Ottertail	6,227	6,016	944,732	505,358	12,478,640	3,042,960	857,600	2,416,382	3,541,557	541,730	5,940
Pine	1,416	1,398	148,459	30,637	1,440,070	387,250	92,620	353,434	318,576	13,860	
Pipestone	907	865	241,623	208,280	5,611,290	672,430	250,330	745,568	1,258,276	119,300	1,720
Polk	4,340	4,205	973,281	651,755	13,302,800	2,252,100	1,044,520	2,431,721	3,662,269	341,780	10,400
Pope	1,872	1,761	378,312	286,540	5,082,360	1,180,240	352,310	1,010,422	1,567,910	328,480	8,890
Ramsey	923	897	60,783	38,967	3,989,910	1,056,280	145,900	429,333	1,093,833	122,790	9,100
Red Lake	1,885	1,845	258,367	146,274	2,119,770	435,060	214,820	637,564	717,978	86,450	1,470
Redwood	2,348	2,202	508,599	417,937	12,467,480	1,702,830	598,600	1,725,879	2,356,769	427,150	2,180
Renville	3,013	2,935	534,659	500,199	13,563,070	2,358,530	709,490	1,908,030	3,235,004	436,920	8,330
Rice	2,672	2,569	305,513	227,779	9,976,390	2,307,820	475,050	1,443,063	2,062,018	158,710	9,670
Rock	1,109	1,122	288,397	267,427	8,163,410	978,990	360,870	1,203,644	1,763,121	192,930	
Roseau	1,444	1,434	230,681	74,336	1,422,130	281,890	102,550	413,973	263,133	27,600	220
St. Louis	696	682	59,950	11,406	656,560	259,780	45,710	190,436	283,998	34,330	1,180
Scott	1,649	1,605	214,254	128,320	5,998,540	1,455,120	275,420	1,014,640	1,390,878	104,140	7,350
Sherburne	1,054	1,016	179,105	98,539	2,063,230	572,070	147,720	637,126	651,902	49,110	50
Sibley	2,177	2,118	357,846	277,643	9,362,280	2,020,300	453,690	1,312,193	1,959,182	207,630	3,130
Stearns	4,449	4,388	731,323	420,428	13,022,280	2,619,020	744,390	2,248,124	3,121,368	285,040	3,990
Steele	1,801	1,747	263,371	226,873	9,607,150	1,717,090	368,520	1,373,793	1,772,871	200,130	4,260
Stevens	1,156	1,076	312,081	350,151	4,734,980	839,790	326,930	751,561	1,365,509	240,680	3,450
Swift	1,795	1,684	414,950	343,863	6,854,510	1,166,730	401,830	1,043,668	1,698,333	304,070	1,780
Todd	3,034	2,931	365,988	151,002	6,027,330	1,093,400	356,020	948,679	1,162,160	120,790	2,460
Traverse	1,086	1,008	321,708	266,563	5,314,080	792,540	282,000	636,229	1,476,927	394,630	4,570
Wabasha	1,917	1,803	324,531	227,689	8,600,910	1,797,960	393,360	1,282,940	1,940,613	247,090	2,190
Wadena	990	966	111,375	61,284	1,814,530	284,930	112,760	322,641	409,610	27,000	100

TABLE 3.—NUMBER AND ACREAGE OF FARMS, AND VALUES OF SPECIFIED CLASSES OF FARM PROPERTY, JUNE 1, 1900, WITH VALUE OF PRODUCTS OF 1899 NOT FED TO LIVE STOCK, AND EXPENDITURES IN 1899 FOR LABOR AND FERTILIZERS, BY COUNTIES—Continued.

COUNTIES.	NUMBER OF FARMS.		ACRES IN FARMS.		VALUES OF FARM PROPERTY.				Value of products not fed to live stock.	EXPENDITURES.	
	Total.	With build-ings.	Total.	Improved.	Land and improve-ments (ex-cept build-ings).	Buildings.	Imple-ments and machinery.	Live stock.		Labor.	Fertili-zers.
Waseca .....	1,672	1,631	262,467	225,134	\$9,164,340	\$1,727,340	\$369,390	\$1,241,184	\$1,613,400	\$165,140	\$3,530
Washington .....	1,843	1,796	214,858	145,851	6,130,030	1,699,530	310,910	921,680	1,452,895	187,420	2,310
Watowan .....	1,291	1,212	255,815	219,558	7,006,990	1,225,400	302,890	1,031,282	1,261,126	160,900	2,260
Wilkin .....	1,117	1,062	318,998	267,764	5,460,700	745,930	323,400	722,245	1,488,039	198,970	2,850
Winona .....	2,359	2,286	371,659	230,698	10,182,780	2,312,390	461,120	1,415,519	1,912,093	243,230	4,150
Wright .....	3,992	3,891	383,966	215,436	9,493,540	2,414,470	553,970	1,646,309	2,267,059	139,240	3,610
Yellow Medicine .....	1,872	1,817	423,714	358,000	9,030,800	1,336,790	456,420	1,245,516	2,253,540	293,880	1,070
Red Lake <sup>1</sup> .....	144	141	4,752	2,276	28,190	23,740	6,180	14,600	22,942	2,230	-----
White Earth <sup>1</sup> .....	198	188	82,206	22,545	787,090	90,080	48,890	79,601	94,448	5,060	430
Winnbigoshish <sup>1</sup> .....	6	3	534	87	2,770	550	260	515	623	20	-----

<sup>1</sup> Indian reservation.

Increases since 1890 in the number of farms are shown for all counties except Nicollet, which reports only two farms less, and Polk, from which, in 1897, a tract was taken to form part of Red Lake county. Over one-sixth of the counties report more than twice as many farms in 1900 as in 1890, and in many of the remaining counties the increases were nearly as great.

All counties show increases in the total farm acreage, and all except Lake and Scott in the acreage of improved land. The improved area has doubled in more than one-third of the counties.

The average size of farms for the state is 169.7 acres, and the county averages show few marked variations from that figure. The average is smallest for the counties in which dairying is the chief industry, and largest for the counties along the northwestern border, which are devoted to the growing of cereals and to stock raising.

The average value of farms for the state is \$4,329; the total values having more than doubled in one-half of the counties. All except the adjoining counties of Anoka, Dakota, and Ramsey, in the southeastern part, and St. Louis, in the northern part of the state, show substantial gains over the values reported in 1890.

The value of implements and machinery has more than doubled in nearly one-half of the counties in the last ten years, Lake county alone showing a decrease.

The increases in the value of live stock have been general throughout the state, but are relatively smaller in the southeastern section than elsewhere. Nicollet and Ramsey are the only counties in which the value of live stock in 1900 is less than in 1890.

The average expenditure per farm for labor, including the value of board furnished, was \$107.71, the smallest amounts being paid in the northeastern counties, which comprise the mineral region.

Expenditures for fertilizers were considerably greater in 1899 than in 1889. Lesueur, McLeod, Nobles, Pine, Ren-

ville, Rock, and Wadena counties show decreases, but in most of the remaining counties the amounts thus expended have doubled.

#### FARM TENURE.

Table 4 gives a comparative exhibit of farm tenure for 1880, 1890, and 1900. The farms operated by tenants are divided into two groups, designated as farms operated by "cash tenants" and by "share tenants." These groups comprise, respectively: (1) Farms operated by individuals who pay a cash rental or a stated amount of labor or farm produce; (2) farms operated by individuals who pay as rental a stated share of the products. In Table 5 the tenure of farms for 1900 is given by race of farmer. The farms under the classification "owners" in Table 4 are subdivided in Table 5 into groups designated as farms operated by "owners," "part owners," "owners and tenants," and "managers." These terms denote, respectively: (1) Farms operated by individuals who own all the land they cultivate; (2) farms operated by individuals who own a part of the land and rent the remainder from others; (3) farms operated under the joint direction and by the united labor of two or more individuals, one owning the farm or a part of it, and the other, or others, owning no part, but receiving for supervision or labor a share of the products; and (4) farms operated by individuals who receive for their supervision and other services a fixed salary from the owners.

TABLE 4.—NUMBER AND PER CENT OF FARMS OF SPECIFIED TENURES: 1880 TO 1900.

YEAR.	Total number of farms.	NUMBER OF FARMS OPERATED BY—			PER CENT OF FARMS OPERATED BY—		
		Owners. <sup>1</sup>	Cash tenants.	Share tenants.	Owners. <sup>1</sup>	Cash tenants.	Share tenants.
1900 .....	154,659	127,904	5,129	21,626	82.7	3.3	14.0
1890 .....	116,851	101,747	3,421	11,683	87.1	2.9	10.0
1880 .....	92,386	83,933	1,251	7,202	90.8	1.4	7.8

<sup>1</sup> Including "part owners," "owners and tenants," and "managers."

TABLE 5.—NUMBER AND PER CENT OF FARMS OF SPECIFIED TENURES, JUNE 1, 1900, CLASSIFIED BY RACE OF FARMER.

PART 1.—NUMBER OF FARMS OF SPECIFIED TENURES.

RACE.	Total number of farms.	Owners.	Part owners.	Owners and tenants.	Managers.	Cash tenants.	Share tenants.
The State.....	154,659	111,248	14,805	756	1,095	5,129	21,626
White.....	154,287	110,906	14,796	756	1,090	5,124	21,615
Colored.....	372	342	9		5	5	11
Indian.....	341	326	7		3		5
Negro.....	31	16	2		2	5	6

PART 2.—PER CENT OF FARMS OF SPECIFIED TENURES.

	100.0	71.9	9.6	0.5	0.7	3.3	14.0
The State.....	100.0	71.9	9.6	0.5	0.7	3.3	14.0
White.....	100.0	71.9	9.6	0.5	0.7	3.3	14.0
Colored.....	100.0	92.0	2.4		1.3	1.3	3.0

Between 1890 and 1900 the number of farms operated by owners increased 25.7 per cent; cash tenant farms increased 49.9 per cent; and share tenant farms, 85.1 per cent. In 1890, 77.4 per cent of all tenants were share tenants, and in 1900, 80.8 per cent. The greatest relative numbers of share tenants are in the southwestern section of the state. The greatest relative numbers of owners are in the northwestern and north central sections of the state where the land has been entered by homesteaders, over 90 per cent of all farmers in those regions being owners.

No previous census has reported the number of farms operated by "part owners," "owners and tenants," or "managers," but it is believed that the number conducted by the last-named class is constantly increasing.

FARMS CLASSIFIED BY RACE OF FARMER AND BY TENURE.

Tables 6 and 7 present the principal statistics for farms classified by race of farmer and by tenure.

TABLE 6.—NUMBER AND ACREAGE OF FARMS, AND VALUE OF FARM PROPERTY, JUNE 1, 1900, CLASSIFIED BY RACE OF FARMER AND BY TENURE, WITH PERCENTAGES.

RACE OF FARMER, AND TENURE.	Number of farms.	NUMBER OF ACRES IN FARMS.			VALUE OF FARM PROPERTY.	
		Average.	Total.	Per cent.	Total.	Per cent.
The State.....	154,659	169.7	26,248,498	100.0	\$788,684,642	100.0
White farmers.....	154,287	169.7	26,182,627	99.8	787,795,188	99.9
Negro farmers.....	31	144.9	4,438	( <sup>1</sup> )	99,755	( <sup>1</sup> )
Indian farmers.....	341	180.0	61,378	0.2	789,699	0.1
Owners.....	111,248	158.7	17,098,666	65.1	508,541,250	64.5
Part owners.....	14,805	246.7	3,651,871	13.9	103,852,408	13.1
Owners and tenants.....	756	196.8	148,429	0.6	4,515,212	0.6
Managers.....	1,095	444.0	486,147	1.8	18,693,808	1.7
Cash tenants.....	5,129	181.1	672,173	2.6	27,057,625	3.4
Share tenants.....	21,626	194.0	4,196,212	16.0	181,524,844	16.7

<sup>1</sup>Less than one-tenth of 1 per cent.

TABLE 7.—AVERAGE VALUES OF SPECIFIED CLASSES OF FARM PROPERTY, AND AVERAGE GROSS INCOME PER FARM, WITH PER CENT OF GROSS INCOME ON TOTAL INVESTMENT IN FARM PROPERTY, CLASSIFIED BY RACE OF FARMER AND BY TENURE.

RACE OF FARMER, AND TENURE.	AVERAGE VALUES PER FARM OF—					Per cent of gross income on total investment in farm property.
	Farm property, June 1, 1900.				Gross income (products of 1899 not fed to live stock).	
	Land and improvements (except buildings).	Buildings.	Implements and machinery.	Live stock.		
The State.....	\$3,616	\$713	\$195	\$576	\$827	16.2
White farmers.....	3,621	714	195	576	829	16.2
Negro farmers.....	2,312	531	90	285	496	15.4
Indian farmers.....	1,733	222	119	242	281	10.0
Owners.....	3,158	698	182	543	751	16.4
Part owners.....	5,189	827	267	748	1,170	16.8
Owners and tenants.....	4,181	917	222	693	962	16.1
Managers.....	8,807	1,781	416	1,402	1,852	14.8
Cash tenants.....	3,896	679	162	538	788	14.9
Share tenants.....	4,604	685	205	588	939	15.4

Of the 365 farms, each containing 1,000 acres or over, 156 were operated by "owners;" 75, by "part owners;" 73, by "managers;" 48, by "share tenants;" 11, by "cash tenants;" and 2, by "owners and tenants." The farms operated by managers are larger and have a higher gross income per farm than those of any other class of farms grouped by tenure. The ratio which the gross income from farms operated by managers bears to the total value of their farm property is, however, smaller than for the other groups, because of the high average valuation of land and buildings, and the additional fact that some such farms are adjuncts to public institutions and, as such, are not operated primarily for profit.

FARMS CLASSIFIED BY AREA.

Tables 8 and 9 present the principal statistics for farms classified by area.

TABLE 8.—NUMBER AND ACREAGE OF FARMS, AND VALUE OF FARM PROPERTY, JUNE 1, 1900, CLASSIFIED BY AREA, WITH PERCENTAGES.

AREA.	Number of farms.	NUMBER OF ACRES IN FARMS.			VALUE OF FARM PROPERTY.	
		Average.	Total.	Per cent.	Total.	Per cent.
The State.....	154,659	169.7	26,248,498	100.0	\$788,684,642	100.0
Under 3 acres.....	555	2.3	1,284	( <sup>1</sup> )	827,521	0.1
3 to 9 acres.....	1,994	6.3	12,594	0.1	2,860,369	0.4
10 to 19 acres.....	2,254	13.1	29,453	0.1	3,657,790	0.5
20 to 49 acres.....	13,278	57.2	494,523	1.9	20,861,702	2.6
50 to 99 acres.....	80,990	74.8	2,816,708	3.8	83,759,534	10.6
100 to 174 acres.....	56,785	149.8	8,508,727	32.4	247,691,171	31.4
175 to 259 acres.....	24,988	215.4	5,371,078	20.5	168,254,982	21.3
260 to 499 acres.....	20,540	341.0	7,004,447	26.7	198,806,952	25.1
500 to 999 acres.....	2,955	631.4	1,871,977	7.1	48,600,032	6.2
1,000 acres and over.....	865	1,747.1	687,702	2.4	18,866,589	1.8

<sup>1</sup>Less than one-tenth of 1 per cent.

TABLE 9.—AVERAGE VALUES OF SPECIFIED CLASSES OF FARM PROPERTY, AND AVERAGE GROSS INCOME PER FARM, WITH PER CENT OF GROSS INCOME ON TOTAL INVESTMENT IN FARM PROPERTY, CLASSIFIED BY AREA.

AREA.	AVERAGE VALUES PER FARM OF—					Per cent of gross income on total investment in farm property.
	Farm property, June 1, 1900.					
	Land and improvements (except buildings).	Buildings.	Implements and machinery.	Live stock.	Gross income (products of 1899 not fed to live stock).	
The State.....	\$3,616	\$713	\$195	\$576	\$827	16.2
Under 3 acres .....	444	712	48	287	572	38.3
3 to 9 acres .....	618	617	50	149	395	27.5
10 to 19 acres .....	859	520	60	184	300	18.5
20 to 49 acres .....	948	348	67	213	276	17.6
50 to 99 acres .....	1,801	456	117	329	441	16.3
100 to 174 acres .....	3,038	631	178	515	704	16.1
175 to 259 acres .....	4,829	926	244	749	1,072	15.9
260 to 499 acres .....	7,148	1,148	335	1,024	1,546	16.0
500 to 999 acres .....	12,596	1,655	571	1,839	2,565	15.6
1,000 acres and over .....	29,051	3,676	1,492	3,769	7,579	20.0

The group of farms of 100 to 174 acres each contains more than one-third of all those in the state, showing the relative frequency of quarter-section holdings, and represents nearly one-third of the state totals for acreage and value of farms.

Aside from some exceptions in the groups of farms under 50 acres, the average values of the several classes of farm property and products increase with the size of the farms. The relatively high average value of live stock and the high average gross income shown for farms under 3 acres, are due to the fact that a very large per cent of the farms of this group are dairy or truck farms, which supply city markets. Florists' establishments comprise 8.3 per cent of the farms of this group. The incomes from these industries depend less upon the acreage used than upon the amount of capital invested in buildings, implements, and live stock, and the amounts expended for labor and fertilizers.

The average gross incomes per acre for the various groups classified by area are as follows: Farms under 3 acres, \$247.13; 3 to 9 acres, \$62.49; 10 to 19 acres, \$22.96; 20 to 49 acres, \$7.43; 50 to 99 acres, \$5.90; 100 to 174 acres, \$4.70; 175 to 259 acres, \$4.98; 260 to 499 acres, \$4.53; 500 to 999 acres, \$4.06; 1,000 acres and over, \$4.34.

#### FARMS CLASSIFIED BY PRINCIPAL SOURCE OF INCOME.

In Tables 10 and 11 the farms are classified by principal source of income. If the value of the hay and grain raised on any farm exceeds that of any other crop and constitutes at least 40 per cent of the total value of products not fed to live stock, the farm is classified as a "hay and grain" farm. If vegetables are the leading crop, constituting 40 per cent of the value of the products, it is a "vegetable" farm. The farms of the other groups are classified in accordance with the same general principle. "Miscellaneous" farms are those whose operators do not derive

40 per cent of their income from any one class of farm products. Farms with no income in 1899 are classified according to the agricultural operations upon other farms in the same locality.

TABLE 10.—NUMBER AND ACREAGE OF FARMS, AND VALUE OF FARM PROPERTY, JUNE 1, 1900, CLASSIFIED BY PRINCIPAL SOURCE OF INCOME, WITH PERCENTAGES.

PRINCIPAL SOURCE OF INCOME.	Number of farms.	NUMBER OF ACRES IN FARMS.			VALUE OF FARM PROPERTY.	
		Average.	Total.	Per cent.	Total.	Per cent.
		The State.....	154,659	169.7	26,248,498	100.0
Hay and grain.....	103,792	193.3	20,062,480	76.4	591,871,332	75.1
Vegetables .....	4,043	85.6	345,913	1.3	10,566,060	1.3
Fruit .....	381	33.2	12,667	0.1	962,683	0.1
Live stock .....	19,483	145.4	2,831,881	10.8	99,664,105	12.6
Dairy produce.....	9,249	117.7	1,088,988	4.2	36,910,565	4.7
Tobacco .....	6	62.7	376	(1)	48,585	(1)
Sugar .....	44	81.0	3,562	(1)	218,647	(1)
Flowers and plants.....	69	5.3	368	(1)	598,769	0.1
Nursery products.....	43	101.6	4,370	(1)	391,430	0.1
Miscellaneous.....	17,549	108.1	1,897,898	7.2	47,457,476	6.0

<sup>1</sup> Less than one-tenth of 1 per cent.

TABLE 11.—AVERAGE VALUES OF SPECIFIED CLASSES OF FARM PROPERTY, AND AVERAGE GROSS INCOME PER FARM, WITH PER CENT OF GROSS INCOME ON TOTAL INVESTMENT IN FARM PROPERTY, CLASSIFIED BY PRINCIPAL SOURCE OF INCOME.

PRINCIPAL SOURCE OF INCOME.	AVERAGE VALUES PER FARM OF—					Per cent of gross income on total investment in farm property.
	Farm property, June 1, 1900.					
	Land and improvements (except buildings).	Buildings.	Implements and machinery.	Live stock.	Gross income (products of 1899 not fed to live stock).	
The State.....	\$3,616	\$713	\$195	\$576	\$827	16.2
Hay and grain.....	4,170	719	218	595	924	16.2
Vegetables .....	1,708	546	103	256	491	18.8
Fruit .....	1,511	756	33	177	525	20.8
Live stock .....	3,286	901	188	740	808	15.8
Dairy produce.....	2,543	697	137	614	616	15.4
Tobacco .....	7,034	617	113	334	3,189	39.4
Sugar .....	8,303	753	327	473	892	18.4
Flowers and plants.....	3,939	4,431	229	79	4,025	46.4
Nursery products.....	6,481	1,814	374	434	9,129	100.3
Miscellaneous.....	1,752	492	114	346	442	16.4

Hay and grain farms constitute the leading group, with 67.1 per cent of the number of farms, 76.4 per cent of the acreage, and 75.1 per cent of the value of farm property. The group next in importance is that of live-stock farms, with 12.6 per cent of the number, and 10.8 per cent and 12.6 per cent of the acreage and value, respectively. For the several classes of farms the average values per acre of products not fed to live stock are as follows: Farms deriving their principal income from flowers and plants, \$765.14; nursery stock, \$89.83; tobacco, \$50.88; fruit, \$15.79; sugar, \$11.01; vegetables, \$5.74; live stock, \$5.56; dairy produce, \$5.24; hay and grain, \$4.78; and miscellaneous, \$4.09. In computing these averages the total area of the farms of each group is used, and not the acreage devoted to the crop from which the principal income is derived.

The wide variations in the averages and percentages of gross income are largely due to the fact that in computing gross income no deductions are made for expenses involved in operation. For florists' establishments and nurseries, the average expenditure for such items as labor and fertilizers represents a far greater percentage of the gross income than in the case of "live stock" or "miscellaneous" farms. If it were possible to present the average net income, the variations shown would be much smaller.

FARMS CLASSIFIED BY REPORTED VALUE OF PRODUCTS NOT FED TO LIVE STOCK.

Tables 12 and 13 present data relating to farms classified by the reported value of products not fed to live stock.

TABLE 12.—NUMBER AND ACREAGE OF FARMS, AND VALUE OF FARM PROPERTY, JUNE 1, 1900, CLASSIFIED BY REPORTED VALUE OF PRODUCTS NOT FED TO LIVE STOCK, WITH PERCENTAGES.

VALUE OF PRODUCTS NOT FED TO LIVE STOCK.	Number of farms.	NUMBER OF ACRES IN FARMS.			VALUE OF FARM PROPERTY.	
		Average.	Total.	Per cent.	Total.	Per cent.
The State.....	145,659	169.7	26,248,498	100.0	\$738,681,642	100.0
\$0.....	1,042	146.5	152,622	0.6	1,959,390	0.3
\$1 to \$49.....	2,382	94.9	226,156	0.9	2,404,035	0.3
\$50 to \$99.....	4,677	85.4	899,304	1.5	5,367,635	0.7
\$100 to \$249.....	17,460	83.8	1,464,016	5.6	26,554,645	3.4
\$250 to \$499.....	30,163	104.7	3,158,026	12.0	78,407,925	9.9
\$500 to \$999.....	52,240	152.1	7,944,860	30.3	241,646,790	30.6
\$1,000 to \$2,499.....	42,590	250.9	10,684,683	40.7	362,205,475	45.9
\$2,500 and over.....	4,105	540.5	2,218,831	8.4	70,188,747	8.9

TABLE 13.—AVERAGE VALUES OF SPECIFIED CLASSES OF FARM PROPERTY, AND AVERAGE GROSS INCOME PER FARM, WITH PER CENT OF GROSS INCOME ON TOTAL INVESTMENT IN FARM PROPERTY, CLASSIFIED BY REPORTED VALUE OF PRODUCTS NOT FED TO LIVE STOCK.

VALUE OF PRODUCTS NOT FED TO LIVE STOCK.	AVERAGE VALUES PER FARM OF—					Per cent of gross income on total investment in farm property.
	Farm property, June 1, 1900.				Gross income (products of 1899 not fed to live stock).	
	Land and improvements (except buildings).	Buildings.	Implements and machinery.	Live stock.		
The State.....	\$3,616	\$713	\$195	\$576	\$827	16.2
\$0.....	1,426	163	45	236	81	3.0
\$1 to \$49.....	708	162	37	102	67	5.9
\$50 to \$99.....	766	199	41	142	87	11.0
\$100 to \$249.....	981	276	62	202	167	14.1
\$250 to \$499.....	1,752	415	115	317	718	15.5
\$500 to \$999.....	3,212	698	188	528	1,424	16.7
\$1,000 to \$2,499.....	6,186	1,095	300	923	3,777	22.1
\$2,500 and over.....	12,496	2,025	636	1,929	3,777	22.1

Many of the farms reporting no income for 1899 were homesteads taken up too late for cultivation that year. The fact that more than half of them were between 100 and 175 acres in size—the group containing the quarter-section tracts commonly taken up as new holdings—and that four-fifths of them were operated by owners, sustains this view. There were, also, some farms for which no

reports of the products of 1899 could be secured, as the persons in charge, June 1, 1900, did not operate the farms the preceding year and could give no definite information concerning the products. To this extent the reports fall short of giving a complete report of farm products in 1899.

LIVE STOCK.

At the request of the various live-stock associations of the country, a new classification of domestic animals was adopted for the Twelfth Census. The age grouping for neat cattle was determined in accordance with their present and prospective relations to the dairy industry and the supply of meat products. Horses and mules are classified by age, and neat cattle and sheep by age and sex. The new classification permits a very close comparison with the figures published in previous census reports.

Table 14 presents a summary of live-stock statistics.

TABLE 14.—NUMBER OF DOMESTIC ANIMALS, FOWLS, AND BEES ON FARMS, JUNE 1, 1900, WITH TOTAL AND AVERAGE VALUES, AND NUMBER OF DOMESTIC ANIMALS NOT ON FARMS.

LIVE STOCK.	Age in years.	ON FARMS.			NOT ON FARMS.
		Number.	Value.	Average value.	
Calves.....	Under 1.....	565,994	\$4,254,414	\$7.52	5,989
Steers.....	1 and under 2.....	161,645	2,559,015	15.79	1,458
Steers.....	2 and under 3.....	58,685	1,423,199	24.27	707
Steers.....	3 and over.....	9,148	315,247	34.26	291
Bulls.....	1 and over.....	42,549	1,202,197	28.25	207
Heifers.....	1 and under 2.....	211,162	3,299,605	15.63	2,178
Cows kept for milk.....	2 and over.....	753,632	21,513,337	28.55	36,051
Cows and heifers not kept for milk.....	2 and over.....	68,565	1,689,684	24.64	520
Colts.....	Under 1.....	45,504	970,772	21.33	1,116
Horses.....	1 and under 2.....	51,399	2,081,657	39.53	1,008
Horses.....	2 and over.....	599,566	39,252,715	65.47	83,536
Mule colts.....	Under 1.....	722	24,632	34.19	20
Mules.....	1 and under 2.....	813	39,020	48.00	61
Mules.....	2 and over.....	6,804	422,878	62.15	146
Asses and burros.....	All ages.....	161	11,475	71.27	54
Lambs.....	Under 1.....	220,550	410,557	1.78	1,195
Sheep (owes).....	1 and over.....	829,984	1,205,275	3.65	2,738
Sheep (rams and wethers).....	1 and over.....	29,344	124,256	4.23	194
Swine.....	All ages.....	1,440,806	5,865,590	4.07	17,845
Goats.....	All ages.....	3,821	12,908	3.38	288
Fowls: 1.....					
Chickens <sup>2</sup> .....		7,780,940			
Turkeys.....		193,143			
Geese.....		90,975			
Ducks.....		127,635			
Bees (swarms of).....		45,877	167,280	3.65	
Unclassified.....			525		
Value of all live stock.....			89,063,097		

<sup>1</sup> The number reported is of fowls over 3 months old. The value is of all, old and young.  
<sup>2</sup> Including Guinea fowls.

The total value of live stock on farms, June 1, 1900, was \$89,063,097. Of this amount 47.4 per cent represents the value of horses; 24.2 per cent, that of dairy cows; 16.5 per cent, that of other neat cattle; 6.6 per cent, that of swine; 2.6 per cent, that of poultry; 1.9 per cent, that of sheep; and 0.8 per cent, that of all other live stock.

No reports were received concerning the value of live stock not on farms, but it is probable that such animals have higher average values than those on farms. Allowing the same averages, however, the value of all live stock not on farms would be \$6,813,280. Exclusive of poultry and bees not on farms, the total value of live stock in the state may be estimated at \$95,876,400.

## CHANGES IN LIVE STOCK ON FARMS.

The following table shows the changes since 1850 in the numbers of the most important domestic animals.

TABLE 15.—NUMBER OF SPECIFIED DOMESTIC ANIMALS ON FARMS: 1850 TO 1900.

YEAR.	Dairy cows.	Other neat cattle.	Horses.	Mules and asses.	Sheep. <sup>1</sup>	Swine.
1900.....	753,632	1,117,693	696,469	8,500	359,323	1,440,806
1890.....	599,908	779,671	461,509	9,511	399,049	853,715
1880.....	275,845	333,505	257,282	9,019	267,538	381,415
1870.....	121,467	183,912	93,011	2,350	132,343	148,473
1860.....	40,344	73,913	17,065	377	18,044	101,371
1850.....	607	1,395	860	14	80	734

<sup>1</sup>Lambs not included.

Half a century ago there were only 3,690 domestic animals in the state, while the census of 1900 shows a total of 4,376,428. Every decade since 1850 has shown an increase in all classes of live stock, with the exception of sheep, mules, and asses in the last decade. Between 1890 and 1900 the number of mules and asses decreased 10.6 per cent, and sheep of wool-bearing age 10.0 per cent.

Other domestic animals show the following increases since 1890: Dairy cows, 26.9 per cent; other neat cattle, 43.4 per cent; horses, 50.9 per cent; and swine, 68.8 per cent. The relative increase in the number of dairy cows would probably have been greater except for the stricter definition of the term "dairy cows" adopted by the Twelfth Census, by which many animals, so classed in former censuses, were excluded in 1900. The production of milk shows a gain for the decade of 66.2 per cent.

Although in 1900 the enumerators were instructed to report no fowls under 3 months old, while no such limitation was made in 1890, all classes of poultry show marked increases for the decade, as follows: Chickens, 73.8 per cent; ducks, 70.9 per cent; geese, 31.4 per cent; turkeys, 27.5 per cent.

## ANIMAL PRODUCTS.

Table 16 is a summarized exhibit of the animal products of 1899.

TABLE 16.—QUANTITIES AND VALUES OF SPECIFIED ANIMAL PRODUCTS, AND VALUES OF POULTRY RAISED, ANIMALS SOLD, AND ANIMALS SLAUGHTERED ON FARMS, IN 1899.

PRODUCTS.	Unit of measure.	Quantity.	Value.
Wool.....	Pounds.....	2,612,737	\$460,305
Mohair and goat hair.....	Pounds.....	556	180
Milk.....	Gallons.....	1,304,017,106	216,623,460
Butter.....	Pounds.....	41,188,845	
Cheese.....	Pounds.....	290,623	4,487,148
Eggs.....	Dozens.....	43,208,130	
Poultry.....			2,927,717
Honey.....	Pounds.....	986,446	118,334
Wax.....	Pounds.....	20,626	
Animals sold.....			16,046,622
Animals slaughtered.....			4,308,051
Total.....			45,622,367

<sup>1</sup>Comprises all milk produced, whether sold, consumed, or made into butter or cheese.

<sup>2</sup>Comprises the value of all milk sold and consumed, and of butter and cheese made.

The value of the animal products of the state for 1899 was \$45,522,367, or 28.2 per cent of the value of all farm

products. Of this amount, 46.0 per cent represents the value of animals sold and animals slaughtered on farms; 36.5 per cent, that of dairy produce; 16.2 per cent, that of poultry and eggs; 1.0 per cent, that of wool, mohair, and goat hair; and 0.3 per cent, that of honey and wax.

## ANIMALS SOLD AND ANIMALS SLAUGHTERED.

The value of animals sold and animals slaughtered on farms in 1899 was \$20,954,673, or 12.9 per cent of the value of all farm products. Of all farms reporting live stock, 118,276, or 76.4 per cent, report animals slaughtered, the average value per farm being \$43.33. Of the number reporting live stock, 97,614, or 65.8 per cent, report sales of live animals, the average receipts per farm being \$164.39.

## DAIRY PRODUCE.

In 1899 the proprietors of 9,249 farms, or 6.0 per cent of the total number in the state, derived their principal income from the sale of dairy produce. The production of milk in that year was 121,048,133 gallons greater than in 1889, a gain of 66.2 per cent. Notwithstanding the large increase in the number of creameries in the state in the last decade, the amount of butter made on farms increased 18.5 per cent. The increase in cheese factories, however, has been accompanied by a decrease in the production of cheese on farms, amounting to 57.0 per cent.

Of the \$16,623,460 given in Table 16 as the reported value of dairy produce, \$5,508,769, or 33.1 per cent, represents the value of such produce consumed on farms, and \$11,114,691, or 66.9 per cent, the amount derived from sales. The tabulated returns covering the dairying industry of the state indicate that as a result of a confusion between the terms "butter fat" and "butter" a considerable amount of the former was reported by the enumerators as butter sold instead of milk sold. Detailed consideration will be given to this fact in the final report.

## POULTRY AND EGGS.

Of the \$7,364,865 given as the value of poultry products in 1899, 60.2 per cent represents the value of eggs produced, and 39.8 per cent, that of poultry raised. There were 43,208,130 dozens of eggs reported in 1900, more than twice as many as ten years before.

## WOOL.

More wool was reported for 1899 than for any previous year, the increase between 1889 and 1899 having been from 312,861 fleeces weighing 1,945,249 pounds to 376,009 fleeces weighing 2,612,737 pounds, showing an increase in the average weight of fleeces from 6.2 pounds in 1889 to 6.9 pounds in 1899. Winona, Olmsted, Fillmore, and Murray counties lead in the production of wool.

## HONEY AND WAX.

There were 986,446 pounds of honey and 20,626 pounds of wax reported in 1900, a decrease of 15.0 per cent in the amount of honey and an increase of 71.2 per cent in the amount of wax produced, as compared with 1890. Winona, Hennepin, and Morrison counties lead in the production of honey.

HORSES AND DAIRY COWS ON SPECIFIED CLASSES OF FARMS.

Table 17 presents, for the leading groups of farms, the number of farms reporting horses and dairy cows, the total number of these animals, and the average number per farm. In computing these averages, only farms which report the kind of stock under consideration are included.

TABLE 17.—HORSES AND DAIRY COWS ON SPECIFIED CLASSES OF FARMS, JUNE 1, 1900.

CLASSES.	HORSES.			DAIRY COWS.		
	Farms reporting.	Number.	Average per farm.	Farms reporting.	Number.	Average per farm.
Total.....	140,519	696,469	5.0	139,438	753,632	5.4
White farmers.....	140,281	695,466	5.0	139,310	753,250	5.4
Colored farmers.....	238	1,003	3.6	128	382	3.0
Owners <sup>1</sup> .....	115,122	559,065	4.9	115,268	622,441	5.4
Managers.....	4,978	10,001	10.3	910	7,405	8.2
Cash tenants.....	4,457	19,521	4.4	4,232	27,338	6.5
Share tenants.....	19,967	107,382	5.4	19,028	96,388	5.1
Under 20 acres.....	8,217	6,824	2.0	3,279	10,195	3.1
20 to 99 acres.....	36,488	102,690	2.8	36,991	128,751	3.5
100 to 174 acres.....	58,823	231,214	4.3	52,423	263,317	5.0
175 to 299 acres.....	24,142	141,730	5.9	23,782	161,683	6.8
300 acres and over.....	23,849	214,541	9.2	23,023	189,686	8.2
Hay and grain.....	95,643	524,751	5.5	93,543	493,517	5.3
Vegetable.....	3,298	9,041	2.7	2,984	8,311	2.8
Fruit.....	291	628	2.2	240	496	2.1
Live stock.....	18,186	85,420	4.7	18,802	117,667	6.3
Dairy.....	8,847	31,008	3.7	9,249	77,274	8.4
Miscellaneous <sup>2</sup> .....	14,754	45,621	3.1	14,615	56,367	3.9

<sup>1</sup>Including "part owners" and "owners and tenants."  
<sup>2</sup>Including tobacco farms, sugar farms, florists' establishments, and nurseries.

CROPS.

The following table gives the statistics of the principal crops of 1899.

TABLE 18.—ACREAGES, QUANTITIES, AND VALUES OF THE PRINCIPAL FARM CROPS IN 1899.

CROPS.	Acres.	Unit of measure.	Quantity.	Value.
Corn.....	1,441,530	Bushels.....	47,256,920	\$11,387,105
Wheat.....	6,560,707	Bushels.....	95,278,660	50,601,948
Oats.....	2,201,325	Bushels.....	74,054,150	15,829,304
Barley.....	377,845	Bushels.....	24,314,240	7,220,739
Rye.....	118,869	Bushels.....	1,866,150	783,852
Buckwheat.....	6,700	Bushels.....	82,687	43,741
Flaxseed.....	566,801	Bushels.....	5,895,479	5,898,556
Kafir corn.....	48	Bushels.....	1,036	366
Clover seed.....	117	Bushels.....	8,034	34,536
Grass seed.....	117	Bushels.....	553,939	494,765
Hay and forage.....	3,187,930	Tons.....	4,411,667	14,585,281
Tobacco.....	117	Pounds.....	127,730	12,809
Hops.....	149	Pounds.....	51	9
Broom corn.....	149	Pounds.....	76,960	4,121
Dry beans.....	3,290	Bushels.....	86,317	49,685
Dry peas.....	670	Bushels.....	9,021	9,338
Potatoes.....	146,659	Bushels.....	14,043,327	3,408,997
Sweet potatoes.....	4	Bushels.....	136	149
Onions.....	923	Bushels.....	235,564	180,494
Miscellaneous vegetables.....	27,488	Bushels.....	1,372,907	2,738
Maple sugar.....	117	Pounds.....	29,580	2,738
Maple sirup.....	117	Gallons.....	1,079	939
Sorghum cane.....	2,288	Tons.....	1,232	2,318
Sorghum sirup.....	2,288	Gallons.....	157,605	56,896
Sugar beets.....	2,114	Tons.....	15,959	59,828
Small fruits.....	3,092	Tons.....	15,959	339,566
Grapes.....	1,280	Centals.....	5,733	215,598
Orchard fruits.....	120,061	Bushels.....	143,655	3109,050
Nuts.....	1	Bushels.....	1	597
Forest products.....	1			2,602,335
Flowers and foliage plants.....	148			288,055
Seeds.....	81			9,249
Nursery products.....	1,127			383,105
Miscellaneous.....	1			44,310
Total.....	15,139,962			115,694,937

<sup>1</sup> Estimated from number of vines or trees.  
<sup>2</sup> Including the value of raisins, wine, etc.  
<sup>3</sup> Including the value of cider, vinegar, etc.  
<sup>4</sup> The greater part of this value was derived from products for which no acreage was reported.

Of the total value of crops in 1899, wheat contributed 43.7 per cent; other cereals, including Kafir corn, 30.4 per cent; hay and forage, 12.6 per cent; vegetables, including potatoes, sweet potatoes, and onions, 4.3 per cent; forest products, 2.2 per cent; and all other products, 6.8 per cent.

Wheat occupied the largest area devoted to any one crop, having an acreage larger than that of all other cereals combined, and more than twice that of hay and forage, which ranks second.

The average values per acre of the various crops were as follows: Flowers and plants, \$2,014.37; onions, \$141.38; small fruits, \$109.82; miscellaneous vegetables, \$50.04; sugar beets, \$28.30; potatoes, \$23.24; cereals, \$7.66; and hay and forage, \$4.62. The crops yielding the greatest returns per acre were grown upon highly improved land. Their production required a relatively great amount of labor, and large expenditures for fertilizers.

CEREALS.

The following table is an exhibit of the changes in cereal production since 1849.

TABLE 19.—ACREAGE AND PRODUCTION OF CEREALS: 1849 TO 1899.

YEAR. <sup>1</sup>	PART 1.—ACREAGE.					
	Barley.	Buckwheat.	Corn.	Oats.	Rye.	Wheat.
1899.....	377,845	6,700	1,441,530	2,201,325	118,869	6,560,707
1889.....	358,510	22,090	901,690	1,579,258	62,869	3,372,627
1879.....	116,020	3,677	438,737	617,469	13,614	3,044,670

<sup>1</sup> No statistics of acreage were secured prior to 1879.

PART 2.—BUSHELS PRODUCED.

1899.....	24,314,240	32,687	47,256,920	74,054,150	1,866,150	95,278,660
1889.....	9,100,683	281,705	24,696,446	49,954,791	1,252,663	52,300,247
1879.....	2,972,065	41,756	14,831,741	23,382,158	215,245	34,601,030
1869.....	1,032,024	52,438	4,743,117	10,678,261	78,088	18,866,073
1859.....	109,668	28,052	2,911,952	2,176,002	121,411	2,186,938
1849.....	1,216	515	16,725	30,582	125	1,401

In 1879 the total area devoted to the cereals shown in the above table was 4,234,187 acres; in 1889, 6,297,044 acres; and in 1899, 11,207,026 acres. Increases in acreage in the decade from 1889 to 1899 were as follows: Barley, 144.9 per cent; wheat, 94.5 per cent; rye, 89.1 per cent; corn, 59.9 per cent; and oats, 39.4 per cent. For buckwheat, a decrease of 69.7 per cent is shown. The total number of bushels of all grains produced in 1849 was 50,564, and in 1899, 242,852,807.

Of the total acreage under cereals in 1899, 58.5 per cent was devoted to wheat; 19.6 per cent to oats; 12.9 per cent to corn; and 9.0 per cent to barley, rye, and buckwheat. While the cereals are quite generally distributed throughout the state, wheat is grown most extensively in the northwestern counties, and corn and oats in the southwestern counties.

FLAX.

Flax was grown in 1899 by 31,647 farmers, or 20.5 per cent of the total number in the state. The area devoted to this crop increased from 303,635 acres in 1889 to 566,801

acres in 1899, a gain of 86.7 per cent, and the yield increased from 2,721,987 to 5,895,479 bushels of seed. The average yield per acre was 9.0 bushels in 1889, and 10.4 bushels in 1899. In 1899 the average acreage of flax for each farm reporting this crop was 17.9 acres, and the average value of product, \$186.39.

Clay, Wilkin, Grant, Traverse, Stevens, and Murray counties, and other counties on or near the western and southern borders, report extensive areas in this crop. Very little flax is grown north and east of a line drawn from the extreme northwest to the extreme southeast of the state.

#### HAY AND FORAGE.

In 1900, 132,851 farmers, or 86.0 per cent of the total number, reported hay or forage crops. They obtained an average yield, exclusive of cornstalks, of 1.37 tons per acre. The total area devoted to hay and forage in 1899 was 3,157,690 acres, an increase of 12.9 per cent over that of ten years before. Of this area, 2,196,623 acres, or 69.6 per cent, produced 2,842,234 tons of wild, salt, and prairie grasses. In 1899 the acreages and yields of the various other kinds of hay and forage were as follows: Millet and Hungarian grasses, 58,339 acres and 93,954 tons; alfalfa or lucern, 658 acres and 1,781 tons; clover, 74,669 acres and 128,767 tons; other tame and cultivated grasses, 754,246 acres and 1,114,459 tons; grains cut green for hay, 26,304 acres and 45,633 tons; crops grown for forage, 46,851 acres and 112,500 tons; and corn stalks, 48,100 acres and 72,339 tons.

In Table 18 the production of cornstalks is included under "hay and forage," but the acreage is included under corn, as the forage secured was only a secondary product of the corn crop.

#### TOBACCO.

Tobacco was first reported in Minnesota in 1860, when 88,938 pounds were raised. The production fluctuated greatly during the succeeding decades, the quantity produced in 1899 being a little over three times as great as in 1859, but nearly six times as great as that reported in 1889. The enumeration of June 1, 1900, shows that tobacco was raised by 186 farmers, who obtained from 117 acres a yield of 127,730 pounds, valued at \$12,869. In Fillmore county 28 farmers obtained from 86 acres a yield of 105,420 pounds, or 82.5 per cent of all tobacco raised in the state. The average value was 10 cents per pound.

#### ORCHARD FRUITS.

The changes in orchard fruits since 1890 are shown in the following table.

TABLE 20.—ORCHARD TREES AND FRUITS: 1890 AND 1900.

FRUITS.	NUMBER OF TREES.		BUSHELS OF FRUIT.	
	1900.	1890.	1899.	1889.
Apples	875,905	165,294	120,148	80,131
Apricots	87	221	2	
Cherries	19,882	1,242	960	13
Peaches	1,626	334	180	5
Pears	9,602	832	226	96
Plums and prunes	191,318	47,458	21,820	5,358

The cultivation of orchard fruits, while general throughout the state, is most extensive in the south and southeast; nearly all counties in which orchard products were valued at more than \$5,000 in 1899 were located in those sections. In 1899 the total value of orchard products was \$109,050, of which amount 36.1 per cent was contributed by the six southeastern counties of Wabasha, Winona, Goodhue, Fillmore, Dakota, and Nicollet, ranking in the order named.

The total number of trees shows a marked gain in the last decade, the number of apple trees having increased more than fivefold and plum and prune trees more than fourfold.

In 1899, as in 1889, the apple was the leading fruit, both in the number of trees and in the quantity of product. Of the total number of trees reported in 1900, 79.9 per cent were apple trees; 17.4 per cent, plum and prune trees; 1.8 per cent, cherry trees; and 0.9 per cent, all other fruit trees. In addition to the number of trees shown in Table 20, unclassified orchard trees to the number of 4,029 were reported, with a yield of 314 bushels of fruit.

The value of orchard products, given in Table 18, includes the value of 194 barrels of cider, 106 barrels of vinegar, and 500 pounds of dried and evaporated fruits.

Seasonal variations so largely affect the quantity of fruit produced in any given year, that comparisons between the crops of 1889 and 1899 have little significance.

#### VEGETABLES.

The value of the vegetables grown in 1899, including potatoes, sweet potatoes, and onions, was \$4,912,547. Of this amount, the value of potatoes constitutes 69.4 per cent. Potatoes were grown in every county in the state, being reported by 116,595 farmers, or 75.4 per cent of the total number. Isanti and Chisago counties reported over one million bushels each. Aside from the land devoted to potatoes, sweet potatoes, and onions, 27,438 acres were used in the growing of miscellaneous vegetables. Of this latter area the products of 19,489 acres were not reported in detail. Of the remaining 7,949 acres, 2,633 were devoted to sweet corn, 1,759 to cabbage, 813 to muskmelons, 701 to tomatoes, 494 to cucumbers, 435 to watermelons, 316 to turnips, 190 to beets, 169 to squashes, 94 to pease, 88 to carrots, and 257 to other vegetables.

#### SMALL FRUITS.

The total area devoted to the cultivation of small fruits in 1899 was 3,092 acres, distributed among 13,379 farms. The value of the fruits grown was \$339,569, an average of \$25.38 per farm. Of the total area, 1,302 acres, or 42.1 per cent, were devoted to strawberries, and 1,115 acres, or 36.1 per cent to raspberries and Logan berries. The quantities of these fruits produced in 1899 were 2,506,020 and 1,252,930 quarts, respectively. The acreage and production of other berries were as follows: Currants, 259 acres and 311,950 quarts; blackberries and dewberries, 162 acres and 192,010 quarts; gooseberries, 112 acres and 128,250 quarts; and other berries, 142 acres and 151,480 quarts.

## SUGAR BEETS.

Though begun only in the last decade, the growing of sugar beets is rapidly becoming an important branch of agriculture in Minnesota. In 1899, 624 farmers devoted to this crop an area of 2,114 acres, or an average of 3.4 acres per farm. They obtained and sold from this land 15,959 tons of beets, an average of 7.5 tons per acre, and received therefor \$59,826, an average of \$95.88 per farm, \$28.30 per acre, and \$3.75 per ton.

The production of beets was reported by 31 counties, Carver, Sibley, Scott, McLeod, Hennepin, and Goodhue, ranking in the order named, showing 76.8 per cent of the total acreage.

## FLORICULTURE.

In 1899 the operators of 110 farms, including 69 commercial florists, raised flowers and foliage plants to the value of \$288,055. The florists derived \$270,058 from the sale of flowers and plants, and \$7,687 from other products. The capital invested in the 69 florists' establishments was \$598,759—\$271,750, in land; \$305,739, in buildings and other improvements; \$15,810, in implements; and \$5,460 in live stock. The expenditure for labor was \$76,075, and for fertilizers, \$1,625.

A total of 1,302,440 square feet of land under glass was reported by the operators of 471 farms, including that of the 69 florists, who reported 889,986 square feet of glass surface, covering a land area of about 667,490 square feet.

The reservations of Minnesota reporting agriculture are Red Lake, White Earth, and Winnibigoshish. Red Lake and White Earth contain good agricultural and grazing land; many of the Indians on these reserves have made fair progress in farming, while some are successful stock raisers. Winnibigoshish has but little cultivable land, only a few small tracts in the timber areas being devoted to the growing of crops.

The reservation Indians of Minnesota, with the exception of a band of Sioux, are the Chippewa (Algonquian), of which there are a number of different bands. The majority have adopted the ways of civilization and are practically self-supporting, the aged and infirm alone receiving aid from the Government. Those bands which have no opportunity to cultivate the soil, subsist on fish, game, wild rice, and berries, of which they are able, also, to sell large quantities. Logging is carried on to a considerable extent in the timbered districts, and large quantities of maple sugar are also made.

## RED LAKE RESERVATION.

Red Lake Reservation, comprising an area of 1,250 square miles, is situated in the northwestern part of the state, in Red Lake and Beltrami counties. The land is a rich prairie with occasional groves of timber, and is well adapted to agriculture; an abundant growth of blue joint

## NURSERIES.

The 43 nurseries in the state reported net products valued at \$392,536, of which amount \$376,956 was derived from the sale of nursery stock, and \$15,580 from other products. The total area of land used was 4,370 acres, making the gross income per acre \$89.83. The capital invested was: \$278,670, in land; \$78,000, in buildings and improvements; \$16,700, in implements; and \$18,690, in live stock. The expenditures for labor and fertilizers were \$54,122 and \$1,305, respectively.

## LABOR AND FERTILIZERS.

The total expenditure for labor on farms in 1899, including the value of board furnished, was \$16,657,820, an average of \$108 per farm. The average was highest per acre for the most intensively cultivated farms. The average per farm was \$1,259 for nurseries, \$1,103 for florists' establishments, \$147 for sugar farms, \$128 for hay and grain farms, \$87 for live-stock farms, \$75 for fruit farms, \$73 for tobacco farms, \$71 for dairy farms, and \$52 for vegetable farms. "Managers" expended, on an average, \$570; "share tenants," \$113; "owners," \$96; and "cash tenants," \$90. White farmers expended \$108 per farm, and colored farmers, \$18.

Fertilizers purchased in 1899 cost \$251,120, about four times the amount paid in 1889, and an average of \$1.63 per farm. The average expenditure was \$30 for nurseries, \$24 for florists' establishments, \$3 for vegetable farms, \$2 for fruit farms and for hay and grain farms, and \$1 each for dairy farms, sugar farms, and live-stock farms.

## INDIAN RESERVATIONS.

grass and a plentiful supply of water provide unexcelled opportunities for stock raising.

The Chippewa at Red Lake are the Red Lake and Pembina bands, the total population of the reserve being 1,450. They have made considerable progress in agriculture in the past few years and where formerly they raised only small quantities of corn and potatoes for local consumption, they now supply the demand for grain, hay, and vegetables, which has been created by the establishment of the lumber industry in the vicinity of the reservation. As a result of this stimulus, the acreage under cultivation has been greatly increased. A number of Indian farmers are engaged also in making maple sugar, some individual reports for the census year ranging as high as 800 pounds.

Most of the 138 Indian farmers reporting, cultivate from 3 to 10 acres of corn, oats, potatoes, beans, and miscellaneous garden vegetables, while a few cut large quantities of wild hay from much larger areas. The best farms lie along the Red Lake River and many more of the tribe could be induced to engage in farming there, if implements and lumber for building purposes were provided.

Stock raising could be made a much more profitable adjunct to their present agricultural operations if cattle were issued to them; a few now possess small numbers including dairy cows, but there is only one large-sized herd on

the reservation. Most farmers own a few work horses of Indian pony stock, and a number also raise swine and chickens.

#### WHITE EARTH RESERVATION.

White Earth Reservation, embracing an area of 1,099.25 square miles, is situated in the northwestern part of Minnesota, in Norman, Beltrami, and Becker counties. The western portion of the reserve is a large rolling prairie, with a deep, rich soil which is very productive; there is an abundance of wild meadow land, well watered by lakes and running streams. The eastern portion is principally timber land.

The Chippewa (Algonquian) on this reservation number 3,486 and comprise the Chippewa of the Mississippi, Gull Lake, Pembina, Otter Tail, and Pillager bands; they are a peaceable, industrious, and practically self-supporting people, agriculture being their principal occupation. The number and acreage of their farms have increased steadily each year. The best farms are owned by the mixed bloods, many of whom are practically civilized, while the full bloods cultivate only small areas, depending principally upon game, fish, wild rice, and berries, for their subsistence. The latter gather and sell large quantities of snake root, cranberries, etc., and in addition make quantities of maple sugar.

Of the 198 farms on the reserve, 131 were operated by Indians, those of the mixed bloods ranging from 75 to 355 acres in size and those of the full bloods from 5 to 30 acres.

The principal crops are wheat, oats, and flax, while potatoes and garden vegetables are grown in small quantities; in addition, considerable quantities of wild prairie grass are cut for hay. Hail storms destroyed a portion of the cereal crop in 1899.

Stock raising is not carried on extensively, although a few farmers have large herds and report considerable sales of live stock. The Indians generally possess a good grade of horses, many raise swine, and a few keep dairy cows and chickens.

#### WINNIBIGOSHISH RESERVATION.

The Winnibigoshish reserve is located in the north central part of the state in Itasca county, and contains an area of 198 square miles, of which only 22 square miles have been allotted, although the remainder will eventually be opened to settlement. The land is generally unsuited to agriculture, a large portion of it bordering on the lake of the same name, and being valuable principally for the timber upon it.

The Winnibigoshish Chippewa, like their neighbors, the Leech Lake and Cass Lake bands, do little farming, although they raise small quantities of potatoes and other vegetables in the cleared areas among the timber. Only 1 of the 6 farms reported on the reservation was operated by an Indian, but the members of the band practically support themselves by working in logging camps, gathering berries for market, and making maple sugar.

Twelfth Census of the United States.

# CENSUS BULLETIN.

No. 171.

WASHINGTON, D. C.

May 20, 1902.

## MANUFACTURES.

### RUBBER BOOTS AND SHOES.

Hon. WILLIAM R. MERRIAM,  
*Director of the Census.*

SIR: I transmit herewith, for publication in bulletin form, a report on the manufacture of rubber boots and shoes during the census year ending May 31, 1900, prepared under my direction by Mr. Harry E. Barbour, of the Census Office.

The statistics included in this report were collected, as at previous censuses, upon the schedule used for the general statistics of manufactures. But owing to the comparative importance of the industry it was decided to supplement the canvass made by the enumerators and local special agents, and to give to this industry a more detailed treatment than is given to manufacturing industries in general, or than this industry has received at previous censuses. Accordingly, supplemental schedules covering more fully certain important features, peculiar to the industry, were sent direct to the different establishments. It will be seen from the accompanying tables that this branch of manufacturing has developed steadily, showing, during each decade, a marked increase in the number of establishments, the amount of capital invested, the number of persons employed, and the value of the products.

The statistics are presented in 11 tables: Table 1 showing comparative figures for the industry at the Tenth, Eleventh, and Twelfth censuses; Table 2 showing, by states, the number of establishments in operation in 1890

and in 1900; Table 3 showing a comparative summary of the statistics of capital for 1890 and 1900; Table 4 showing statistics of miscellaneous expenses for 1900; Table 5 showing the cost of the materials used in 1900; Table 6 showing the quantity and value of the crude rubber imported during the fiscal year ending June 30, 1900, as published in the Report on Commerce and Navigation for that year; Table 7 showing the quantity, value, and source of the crude rubber used in the manufacture of boots and shoes during the census year; Table 8 showing the quantity and value of the products in 1900 by states, and according to the principal varieties of goods manufactured; Table 9 showing the statistics for establishments engaged in the manufacture of wool and felt boots in 1900; Table 10 showing the quantity and value of the rubber boot and shoe exports for 1890 and 1900, and the countries to which they were exported; and Table 11 showing, by states, the detailed statistics for the industry in 1900.

Table 1 shows the growth of the industry during the twenty years which terminate with the Twelfth Census. Owing to changes in the method of taking the census, comparisons between the earlier and later decades, represented in Table 1, should be drawn only in the most general way. Nevertheless, the rate of growth in the manufacture of rubber boots and shoes may be fairly inferred from the figures given.

In drafting the schedules of inquiry for the census of 1900 care was taken to preserve the basis of comparison

with prior censuses. Comparison may be made safely with respect to all the items of inquiry except those relating to capital, salaried officials, clerks, etc., and their salaries, the average number of employees, and the total amount of wages paid. Live capital, that is, cash on hand, bills receivable, unsettled ledger accounts, raw materials, stock in process of manufacture, finished products on hand, and other sundries, was first called for at the census of 1890. No definite attempt was made, prior to the census of 1890, to secure a return of live capital invested.

Changes were made in the inquiries relating to employees and wages in order to eliminate defects found to exist on the form of inquiry adopted in 1890. At the census of 1890 the average number of persons employed during the entire year was called for, and also the average number employed at stated weekly rates of pay, and the average number was computed for the actual time the establishments were reported as being in operation. At the census of 1900 the greatest and least numbers of employees were reported, and also the average number employed during each month of the year. The average number of wage-earners (men, women, and children) employed during the entire year was ascertained by using 12, the number of calendar months, as a divisor into the total of the average numbers reported for each month. This difference in the method of ascertaining the average number of wage-earners during the entire year may have resulted in a variation in the number, and should be considered in making comparisons.

At the census of 1890 the number and salaries of proprietors and firm members actively engaged in the business or in supervision were reported, combined with clerks and other officials. In cases where proprietors and firm members were reported without salaries, the amount that would ordinarily be paid for similar services was estimated. At the census of 1900 only the number of proprietors and firm members actively engaged in the industry or in supervision was ascertained, and no salaries were reported for this class. It is therefore impossible to compare the number and

salaries of salaried officials of any character for the two censuses.

Furthermore, the schedules for 1890 included in the wage-earning class overseers, foremen, and superintendents (not general superintendents or managers), while the census of 1900 separates from the wage-earning class such salaried employees as general superintendents, clerks, and salesmen. It is possible and probable that this change in the form of the question has resulted in eliminating from the wage-earners, as reported by the present census, many high-salaried employees included in that group for the census of 1890.

The reports show a capital of \$33,667,533 invested in the manufacture of rubber boots and shoes in the 22 establishments reporting for the United States. This sum represents the value of land, buildings, machinery, tools, and implements, and the live capital utilized, but does not include the capital stock of any of the manufacturing corporations engaged in this industry. The value of the products is returned at \$41,089,819, to produce which involved an outlay of \$597,239 for salaries of officials, clerks, etc.; \$6,426,579 for wages; \$2,089,154 for miscellaneous expenses, including rent, taxes, etc.; and \$22,682,543 for materials used, mill supplies, freight, and fuel. It is not to be assumed, however, that the difference between the aggregate of these sums and the value of the products is, in any sense, indicative of the profits in the rubber boot and shoe industry during the census year. The census schedule takes no cognizance of the cost of selling manufactured articles, or of interest on capital invested, or of the mercantile losses incurred in the business, or of depreciation in plant. The value of the product given is the value as obtained or fixed at the works. This statement is necessary in order to avoid erroneous conclusions from the figures presented.

Very respectfully,



*Chief Statistician for Manufactures.*

# RUBBER BOOTS AND SHOES.

By HARRY E. BARBOUR.

Although the rubber boot and shoe industry was successfully established in this country prior to 1850, it was not reported as a separate industry until the census of 1880. At previous censuses it was reported together with rubber coats, druggists' supplies, and various other rubber sundries, under the general captions of india-rubber and elastic goods, and india-rubber goods. The growth and development of the industry during the past two decades has been constant, and in many respects remarkable, as is shown by the statistics presented in the following tables. Table 1 is a comparative summary of the returns for this industry from 1880 to 1900, inclusive.

TABLE 1.—COMPARATIVE SUMMARY, 1880 TO 1900, WITH PER CENT OF INCREASE FOR EACH DECADE.

	DATE OF CENSUS.			PER CENT OF INCREASE.	
	1900.	1890.	1880.	1890 to 1900.	1880 to 1890.
Number of establishments..	22	11	9	100.0	22.2
Capital .....	\$33,667,533	\$17,790,970	\$2,425,000	89.2	633.6
Salaries, etc., number .....	483	1130	(2)	271.5	.....
Salaries .....	\$597,239	\$153,802	(2)	288.3	.....
Wage-earners, average number .....	14,391	9,134	4,662	57.6	95.9
Total wages .....	\$6,426,579	\$3,813,073	\$1,469,038	68.5	159.6
Men, 16 years and over .....	8,243	5,125	2,514	60.9	103.9
Wages .....	\$4,338,480	\$2,521,209	(2)	71.9	.....
Women, 16 years and over .....	5,942	3,924	1,984	51.4	97.8
Wages .....	\$2,082,462	\$1,273,580	(2)	61.2	.....
Children, under 16 years .....	201	84	164	139.3	48.8
Wages .....	\$35,637	\$15,284	(2)	133.2	.....
Miscellaneous expenses .....	\$2,089,154	\$943,918	(4)	121.3	.....
Cost of materials used .....	\$22,682,543	\$11,650,787	\$6,023,053	94.7	93.4
Value of products, including custom work and repairing .....	\$41,089,819	\$18,632,060	\$9,705,724	120.5	92.0

<sup>1</sup> Includes proprietors and firm members, with their salaries; number only reported in 1900. (See Table 11.)  
<sup>2</sup> Not reported separately.  
<sup>3</sup> Decrease.  
<sup>4</sup> Not reported.

Table 1 shows that from 1880 to 1900 the number of establishments increased from 9 to 22; the capital, from \$2,425,000 to \$33,667,533; wage-earners, from 4,662 to 14,391; wages, from \$1,469,038 to \$6,426,579; cost of materials, from \$6,023,053 to \$22,682,543; and the value of products, from \$9,705,724 to \$41,089,819. In 1880 there were 9 establishments engaged in this industry, having a capital of \$2,425,000; in 1890, 11 establish-

ments, having a capital of \$17,790,970; and in 1900, 22 establishments, having a capital of \$33,667,533.

The apparently abnormal increase in capital from \$2,425,000 in 1880 to \$17,790,970 in 1890, or 633.6 per cent, is probably due in part to the fact that a return of live capital was first called for at the census of 1890. As will be seen from Table 3, this item amounted in 1890 to 80.2 per cent of the total capital. If the total capital of 1880 be compared with that of 1890, less this new item of live capital, the per cent of increase will be found to be 45—a figure which may perhaps be regarded as fairly representative of the growth of capital in the industry during that decade. Since the value of products rose in the same period from \$9,705,724 to \$18,632,060, or 92 per cent, while the number of establishments increased only from 9 to 11, or 22.2 per cent, it is clear that the progress of the decade was chiefly in the development and increased business of established companies rather than in the inception of new enterprises.

Bearing in mind this difference in returns of capital for 1880 and 1890, we find that in every item (except wage-earners and wages, which are not comparable) the industry has made during the last ten years a greater progress than in the previous decade. In value of products the gain was 120.5 per cent against 92 per cent from 1880 to 1890; in number of establishments, 100 per cent against 22.2; and in capital, 89.2 per cent. The average capital per establishment was slightly smaller in 1900 than it was in 1890. In 1880 there were 4,662 wage-earners, an average of 518 for each establishment; in 1890 the number of wage-earners had increased to 9,134, or 95.9 per cent, an average of 830; and in 1900 there were 14,391 wage-earners, an increase of 57.6 per cent over 1890, and an average of 654 for each establishment. In 1880 the amount of wages paid was \$1,469,038; in 1890 it was \$3,813,073, showing an increase of 159.6 per cent; and in 1900 it was \$6,426,579, showing an increase of 68.5 per cent over 1890. No separate report was made of miscellaneous expenses in 1880; in 1890 this item amounted to \$943,918; in 1900 it amounted to \$2,089,154, showing an increase of 121.3 per cent. In 1880 the cost of materials was \$6,023,053; in 1890 it was \$11,650,787,

showing an increase of \$5,627,734, or 93.4 per cent; and in 1900 the cost of materials used was reported at \$22,682,543, an increase of \$11,031,756, or 94.7 per cent over 1890. In 1880 the industry showed products valued at \$9,705,724; in 1890 the value of the products was \$18,632,060, an increase of \$8,926,336, or 92 per cent. In 1900 the value of the products was \$41,089,819, an increase over 1890 of \$22,457,759, or 120.5 per cent.

The following graphic chart shows the comparative growth of capital, cost of materials, and value of products from 1880 to 1900, the unit of growth being \$1,000,000.

Table 2 presents, by states, the number of establishments actively engaged in the manufacture of rubber boots and shoes in 1890 and in 1900.

Comparative increase of capital, materials, and products, 1880 to 1900 inclusive.

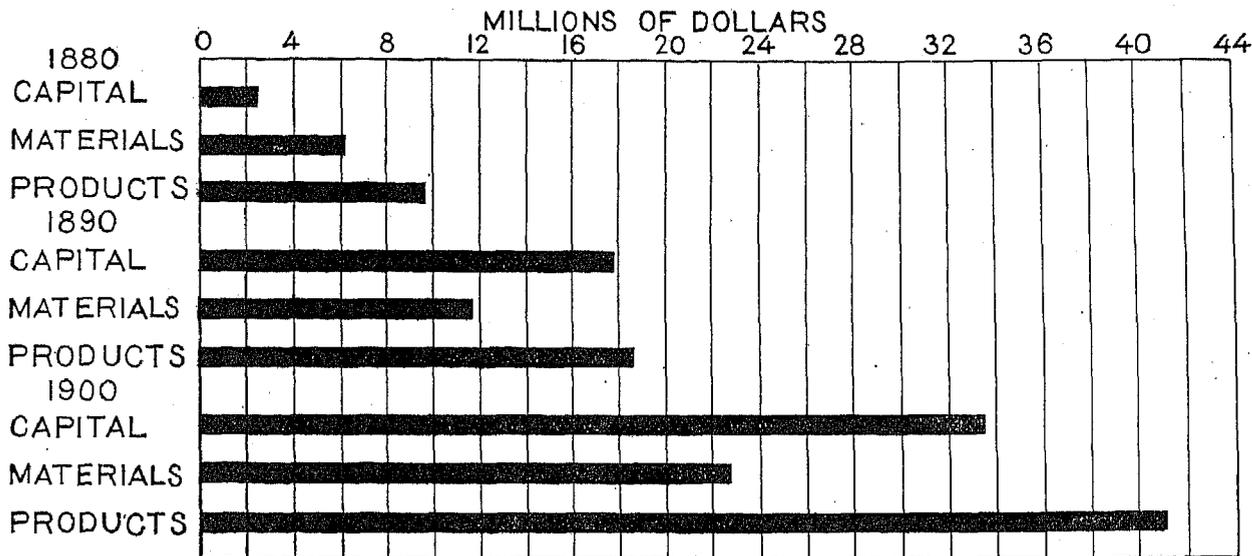


TABLE 2.—COMPARATIVE SUMMARY: NUMBER OF ACTIVE ESTABLISHMENTS, 1890 AND 1900, BY STATES.

STATES.	1900	1890
United States.....	22	11
Connecticut.....	5	2
Massachusetts.....	6	5
Missouri.....	1	1
New Jersey.....	2	2
Pennsylvania.....	2	1
Rhode Island.....	6	1

It appears from Table 2 that the number of establishments engaged in this industry increased from 11 to 22, or 100 per cent, during the decade. The greatest increase was shown in Rhode Island which reported 1 establishment in 1890 and 6 in 1900. Connecticut shows an increase of 3, while Massachusetts, Missouri, and Pennsylvania show an increase of 1 each. One plant was established in Massachusetts and 1 in Rhode Island during the census year.

Table 3 is a comparative summary of capital as returned at the censuses of 1890 and 1900, with the per cent each item is of the total, and the per cent of increase for the decade.

TABLE 3.—COMPARATIVE SUMMARY, CAPITAL: 1890 AND 1900.

	1900		1890		Per cent of increase.
	Amount.	Per cent of total.	Amount.	Per cent of total.	
Total.....	\$33,667,533	100.0	\$17,790,970	100.0	89.2
Land.....	939,089	2.8	463,615	2.6	102.6
Buildings.....	3,554,457	10.5	1,664,992	9.4	113.5
Machinery, tools, and implements.....	3,700,050	11.0	1,386,595	7.8	166.8
Cash and sundries.....	25,473,937	75.7	14,275,768	80.2	78.4

The principal item reported under the head of capital, both in 1890 and 1900, is that of cash and sundries, including cash on hand, bills receivable, unsettled ledger accounts, raw materials, stock in process of manufacture, finished products on hand, and other sundries. This item in 1890 amounted to \$14,275,768, or 80.2 per cent of the total; and in 1900 it was \$25,473,937, an increase of 78.4 per cent, and represented 75.7 per cent of the total capital. In 1890 the value of the land was reported at \$463,615, or 2.6 per cent of the total capital; in 1900 it was \$939,089, or 2.8 per cent of the total, showing an increase of 102.6 per cent. From 1890 to

1900, the value of the buildings increased from \$1,664,992 to \$3,554,457, or 113.5 per cent. This item in 1890 represented 9.4 per cent of the total capital, and 10.5 per cent in 1900. The amounts reported for land and buildings represent only such as are owned by the establishments engaged in this industry, and do not include leased property. The greatest proportional increase in any form of capital was in the item of machinery, tools, and implements, indicating the continual extension in the application of machinery to this industry. In 1890 the value of machinery, tools, and implements, was \$1,386,595, or 7.8 per cent of the total capital; in 1900 it was \$3,700,050, or 11 per cent of the total, showing an increase of 166.8 per cent. Notwithstanding the marked increase in capital during the decade, the amount reported for each item in Table 3 represents very nearly the same per cent of the total, in 1890 and in 1900, indicating a steady and uniform growth for the period. In addition to the capital for active establishments, shown in Table 3, there was a capital of \$105,000 reported for 1 idle establishment, located in New Jersey.

Table 4 shows in detail the statistics of miscellaneous expenses for 1900.

TABLE 4.—MISCELLANEOUS EXPENSES: 1900.

	1900	
	Amount.	Per cent of total.
Total .....	\$2,089,154	100.0
Rent of works .....	12,800	0.6
Taxes, not including internal revenue.....	184,892	8.9
Rent of offices, insurance, interest, repairs, advertising, and other sundries.....	1,891,462	90.5

Table 4 shows that the amount paid for miscellaneous expenses in 1900 was \$2,089,154. The total expenditures for rent of works, \$12,800, which represents six-tenths of 1 per cent of all miscellaneous expenses, was divided between two establishments. Taxes, not including internal revenue, amounted to \$184,892, or 8.9 per cent of the total. The principal item of miscellaneous expenses is that of rent of offices, insurance, interest, internal-revenue tax and stamps, repairs of buildings and machinery, advertising, and all other sundries not reported under the head of materials. This item represents \$1,891,462, or 90.5 per cent of the total. Interest, included under this head, comprises only such sums as were paid for money or credit during the year. No allowance is made for depreciation in value of buildings or machinery. None of the establishments engaged in this industry report having paid anything for contract work during the year.

Table 5 shows the cost of materials used in the manufacture of rubber boots and shoes, the cost of each item, and its proportion of the whole amount for 1900.

TABLE 5.—COST OF MATERIALS: 1900.

	1900	
	Amount.	Per cent of total.
Total .....	\$22,682,543	100.0
Principal materials.....	22,223,946	98.0
Purchased in raw state.....	14,582,768	64.3
Purchased in partially manufactured form.....	7,641,178	33.7
Fuel.....	242,619	1.1
Mill supplies.....	123,869	0.5
Freight.....	92,109	0.4

Table 5 shows that the total cost of materials for 1900 was \$22,682,543. The largest item is that reported for principal materials, or those which actually enter into the product. These are subdivided into materials purchased in a raw state and those purchased in a partially manufactured form. Materials purchased in the raw state are those upon which no manufacturing force has been expended, and consist chiefly of crude rubber. The cost of this class of materials was \$14,582,768, or 64.3 per cent of the total. Materials purchased in a partially manufactured form cost \$7,641,178, or 33.7 per cent of the total. This item includes reclaimed rubber, felt goods, chemicals, sheeting, and other necessary materials. It is impossible to estimate the exact quantity or value of reclaimed rubber used in 1900; many establishments included this item with the cost of all other materials, yet the fact that 5 establishments reported having used 2,971,806 pounds of reclaimed rubber, valued at \$387,371, shows it to be an important factor in this industry. Some establishments were unable to separate the amount paid for freight from the cost of materials, and reported the two together. For that reason the \$92,109 shown in Table 5 does not represent the actual cost of freight, and should be considered only in connection with the cost of materials. The amount paid for fuel, \$242,619, comprises that used for both motive power and heating purposes. Each establishment engaged in this industry produced its own power and heat. Mill supplies, including oil, waste, belting, tools, etc.—materials which do not enter into the product, but are necessary in the process of manufacture—cost \$123,869. The three items of fuel, mill supplies, and freight, together form but a small per cent of the total.

Table 6 is an extract from the report on commerce and navigation issued by the United States Treasury Department, showing the entire amount of crude rubber imported into this country during the fiscal year ending June 30, 1900, and the countries from which it was exported.

TABLE 6.—QUANTITY AND VALUE OF TOTAL IMPORTS OF CRUDE RUBBER FOR THE FISCAL YEAR ENDING JUNE 30, 1900.

COUNTRIES FROM WHICH IMPORTED.	Pounds.	Value.
Total .....	49,377,138	\$31,376,867
Europe .....	16,998,907	11,231,915
Belgium .....	2,844,404	2,243,964
France .....	1,198,209	745,592
Germany .....	1,750,498	592,246
Netherlands .....	106,621	68,122
Portugal .....	2,488,114	1,719,311
United Kingdom .....	8,611,061	5,562,680
North America .....	1,922,179	1,028,504
British Honduras .....	51,295	23,852
Dominion of Canada .....	586	440
Newfoundland and Labrador .....	9,171	5,997
Central American states:		
Costa Rica .....	134,789	78,870
Guatemala .....	204,546	74,596
Honduras .....	176,781	83,184
Nicaragua .....	827,087	523,131
Salvador .....	54,971	18,909
Mexico .....	450,712	214,886
West Indies:		
British .....	11,964	4,443
Cuba .....	327	196
South America .....	29,811,978	18,831,082
Brazil .....	28,026,714	17,876,121
Chile .....	15,186	10,394
Colombia .....	815,091	439,632
Ecuador .....	826,411	421,283
Guiana, Dutch .....	215	118
Peru .....	8,211	5,345
Uruguay .....	785	480
Venezuela .....	119,415	77,709
Asia .....	644,074	285,366
Chinese Empire .....	2,168	828
East Indies, British .....	640,483	284,165
Hongkong .....	1,423	333

During the year ending June 30, 1900, the total amount of crude rubber imported into the United States was 49,377,138 pounds, valued at \$31,376,867. Of this amount 29,811,978 pounds, valued at \$18,831,082, were shipped from South America; 16,998,907 pounds, valued at \$11,231,915, from Europe; 1,922,179 pounds, valued at \$1,028,504, from North America; and 644,074 pounds, valued at \$285,366, from Asia. Of the total amount imported, 28,026,714 pounds, valued at \$17,876,121, or more than half, was received from Brazil, the chief rubber-producing country, shipments being made directly from Brazilian to American seaports. In the quantity of rubber furnished, Brazil is followed by the United Kingdom, Belgium, Portugal, Germany, and France, in the order named. From these six countries were received about nine-tenths of the importation of crude rubber for the year.

Table 6 is not intended to show the source of the crude rubber used in this country, but rather the quantity received. Large amounts were shipped from non-producing countries, while none whatever came from Africa to the United States direct. Table 7 shows that 4,917,281 pounds of African rubber, costing \$3,624,442, were used in the manufacture of rubber boots and shoes. This rubber reached the United States by way of other countries. The entire importation of crude rubber for the year, shown in Table 6, should be considered in connection with Table 7, which shows the quantity, value, and source of that used in the manufacture of rubber boots and shoes.

TABLE 7.—QUANTITY AND VALUE OF THE IMPORTS OF CRUDE RUBBER USED IN THE MANUFACTURE OF RUBBER BOOTS AND SHOES: 1900.

COUNTRIES FROM WHICH IMPORTED.	Pounds.	Value.
Total .....	17,684,657	\$14,582,768
Brazil .....	10,891,367	9,638,992
Africa .....	4,917,281	3,624,442
Central America .....	1,858,473	1,304,754
Asia .....	17,536	14,580

Table 7 shows that in 1900 there were consumed in this industry 17,684,657 pounds of crude rubber, valued at \$14,582,768. A comparison of these figures with those of Table 6 shows that 35.8 per cent of the total quantity and 46.5 per cent of the total value of crude rubber imported during the year was used in the manufacture of rubber boots and shoes. Of the amount so used, 10,891,367 pounds, valued at \$9,638,992, came from Brazil; 4,917,281 pounds, valued at \$3,624,442, from Africa; 1,858,473 pounds, valued at \$1,304,754, from Central America; and 17,536 pounds, valued at \$14,580, from Asiatic countries.

Table 8 is a detailed statement, by states, of the number of pairs and the value of the different varieties of rubber boots and shoes manufactured during the census year.

The aggregate value of the products of this industry during the census year was \$41,089,819. There were produced 49,979,229 pairs of rubber boots and shoes of all kinds, or more than one pair for every two persons in the United States, the value of the output, including men's, women's, and children's, being \$38,761,320. For those states which reported 3 or more establishments, the product is shown separately, while, to avoid disclosing the operations of individual establishments, the product of those states reporting less than 3 is shown collectively under the head of "all others." Massachusetts, with 6 establishments, reported products valued at \$16,490,015, or 40.1 per cent of the aggregate; Connecticut, with 5 establishments, reported products valued at \$11,999,038, or 29.2 per cent; Rhode Island, with 6 establishments, reported products valued at \$8,034,417, or 19.6 per cent; and the 5 establishments located in Missouri, New Jersey, and Pennsylvania manufactured \$4,566,349 worth of products, or 11.1 per cent of the aggregate for the industry. By means of the supplemental reports furnished by the different establishments, it is possible to itemize the products, showing the quantity and value of each of the principal kinds of goods manufactured. In Table 8 the product is divided into men's, women's, and children's wear, and these groups are again subdivided into rubber boots, rubber shoes, rubber tennis shoes, arctic overs, lumbermen's overs, felt boots, and other varieties, the last-named subdivision including boots and shoes which can not be classified under any of the preceding headings. The item, "all other products," comprises the products for which

TABLE 8.—NUMBER OF PAIRS AND VALUE OF DIFFERENT KINDS OF RUBBER BOOTS AND SHOES: 1900.

	United States.	Massachusetts.	Connecticut.	Rhode Island.	All other states. <sup>1</sup>
Aggregate value.....	\$41,089,819	\$16,490,015	\$11,999,038	\$8,034,417	\$4,566,349
Boots and shoes, rubber:					
Total number of pairs.....	49,979,229	19,750,961	15,375,035	10,090,357	4,762,876
Total value.....	\$38,761,820	\$15,773,568	\$11,513,072	\$7,051,812	\$4,422,883
Men's—					
Total number of pairs.....	24,686,648	9,287,815	7,689,297	5,248,289	2,461,292
Total value.....	\$27,160,177	\$11,195,770	\$7,921,802	\$4,593,846	\$3,448,759
Rubber boots—					
Number of pairs.....	8,512,421	2,082,541	770,569	198,619	460,692
Value.....	\$10,572,214	\$6,465,974	\$2,400,637	\$460,432	\$1,245,171
Rubber shoes—					
Number of pairs.....	10,651,684	3,751,082	3,938,525	2,137,072	779,405
Value.....	\$5,518,515	\$1,674,087	\$2,168,097	\$1,185,504	\$495,827
Rubber tennis shoes—					
Number of pairs.....	1,424,448	623,426	30,000	748,728	22,294
Value.....	\$634,041	\$336,277	\$20,000	\$268,888	\$8,876
Arctic overs—					
Number of pairs.....	4,672,862	1,690,052	969,005	1,556,321	457,484
Value.....	\$4,815,075	\$1,602,013	\$922,608	\$1,795,733	\$404,661
Lumbermen's overs—					
Number of pairs.....	4,229,899	996,902	1,936,198	558,766	737,978
Value.....	\$5,488,166	\$1,031,158	\$2,415,400	\$342,550	\$1,199,038
Felt boots—					
Number of pairs.....	147,196	143,752			3,444
Value.....	\$91,427	\$86,261			\$5,166
Other varieties—					
Number of pairs.....	48,133			48,133	
Value.....	\$40,739			\$40,739	
Women's—					
Total number of pairs.....	18,847,355	8,105,873	6,247,549	2,964,976	1,528,957
Total value.....	\$8,165,695	\$3,042,142	\$2,969,100	\$1,504,691	\$649,702
Rubber boots—					
Number of pairs.....	303,622	159,174	86,485	29,246	28,717
Value.....	\$464,264	\$219,680	\$158,055	\$50,072	\$41,457
Rubber shoes—					
Number of pairs.....	16,113,746	7,102,051	5,579,019	2,086,395	1,846,291
Value.....	\$5,925,474	\$2,281,705	\$2,360,254	\$842,211	\$491,244
Rubber tennis shoes—					
Number of pairs.....	346,744	220,807	21,456	99,661	4,820
Value.....	\$185,199	\$129,357	\$15,044	\$38,987	\$1,811
Arctic overs—					
Number of pairs.....	2,003,286	623,841	551,330	678,986	149,129
Value.....	\$1,535,902	\$461,340	\$431,488	\$527,884	\$115,250
Lumbermen's overs—					
Number of pairs.....	9,259		9,259		
Value.....	\$9,259		\$9,259		
Other varieties—					
Number of pairs.....	70,698			70,698	
Value.....	\$45,537			\$45,537	
Children's—					
Total number of pairs.....	6,445,231	2,357,273	1,438,189	1,877,142	772,627
Total value.....	\$3,435,448	\$1,585,641	\$622,170	\$953,275	\$324,362
Rubber boots—					
Number of pairs.....	623,009	444,889	84,545	33,641	59,934
Value.....	\$1,123,060	\$906,406	\$99,327	\$45,795	\$71,532
Rubber shoes—					
Number of pairs.....	4,135,463	1,433,434	1,186,167	1,010,151	505,711
Value.....	\$1,299,182	\$342,197	\$425,176	\$381,025	\$150,784
Rubber tennis shoes—					
Number of pairs.....	558,089	206,726	20,000	298,224	33,139
Value.....	\$249,484	\$123,541	\$12,000	\$101,993	\$11,950
Arctic overs—					
Number of pairs.....	971,613	224,296	138,850	492,297	116,170
Value.....	\$694,710	\$135,437	\$82,827	\$371,974	\$44,472
Lumbermen's overs—					
Number of pairs.....	145,418	47,928	8,627	31,602	57,261
Value.....	\$122,176	\$28,060	\$2,840	\$46,260	\$45,016
Felt boots—					
Number of pairs.....	412				412
Value.....	\$608				\$608
Other varieties—					
Number of pairs.....	11,227			11,227	
Value.....	\$6,228			\$6,228	
All other products, including custom work and repairing.....	\$2,328,499	\$716,462	\$485,966	\$982,605	\$143,466

<sup>1</sup> Includes establishments located in Missouri, New Jersey, and Pennsylvania.

separate quantities and values have not been given, by-products, and custom work and repairing. The value of men's wear was reported at \$27,160,177, or 66.1 per cent of the aggregate product of the industry; women's at \$8,165,695, or 19.9 per cent; children's at \$3,435,448, or 8.3 per cent; and all other varieties, including custom work and repairing, at \$2,328,499, or 5.7 per cent of the aggregate product.

As wool and felt boots enter in considerable quantities into some of the finished products of the rubber boot and shoe industry, there is given in Table 9 a summary showing the statistics for this industry as carried on in 1900 by establishments separate and distinct from those engaged in the manufacture of rubber boots and shoes.

TABLE 9.—SUMMARY OF THE MANUFACTURE OF WOOL AND FELT BOOTS: 1900.

Number of establishments.....	5
Capital.....	\$2,361,871
Salaries, officials, clerks, etc., number.....	82
Salaries.....	\$184,149
Wage-earners, average number.....	1,400
Total wages.....	\$649,666
Men, 16 years and over.....	1,087
Wages.....	\$561,123
Women, 16 years and over.....	309
Wages.....	\$88,062
Children, under 16 years.....	4
Wages.....	\$481
Miscellaneous expenses.....	\$122,550
Cost of materials used.....	\$1,548,408
Value of products, including custom work and repairing.....	\$2,742,745

Table 9 shows that there were 5 establishments engaged in the wool and felt boot industry in 1900, with a total capital of \$2,361,871. The industry gave employment to 1,400 wage-earners, with total wages amounting to \$649,666, and the value of the products was \$2,742,745.

Table 10 is a comparative statement of the exports of rubber boots and shoes for 1890 and 1900, giving the number of pairs, their value, and the countries to which they were exported, as shown in the reports of the Bureau of Statistics of the United States Treasury Department.

TABLE 10.—EXPORTS OF RUBBER BOOTS AND SHOES:  
1890 AND 1900.

COUNTRIES TO WHICH EXPORTED.	1900		1890	
	Pairs.	Value.	Pairs.	Value.
Aggregate .....	767,104	\$420,746	171,473	\$149,055
Europe.....	647,189	301,040	66,616	43,925
Austria-Hungary.....	4,322	2,099	75	38
Azores and Madeira Islands.....	48	120	129	539
Belgium.....	9,753	4,880	5,139	2,344
Denmark.....	6,484	4,364	4,799	1,930
France.....	153,865	54,680	1,161	692
Germany.....	141,266	55,946	2,544	1,419
Italy.....	235	170	15	11
Netherlands.....	818	145	3,111	1,841
Portugal.....			31	29
Spain.....	13,519	6,442		
Sweden and Norway.....	884	414	100	50
Switzerland.....	3,810	1,132		
Turkey.....	7,006	3,844		
United Kingdom.....	305,079	166,804	49,412	34,932
North America.....	49,798	53,826	85,777	79,879
British Honduras.....	24	9		
British North America:				
Dominion of Canada—				
Nova Scotia, New Brunswick.....	18,880	19,996	14,841	10,776
Quebec, Ontario, Manitoba.....	8,661	4,562	37,921	32,489
British Columbia.....	5,764	15,146	20,494	27,216
Newfoundland and Labrador.....	4,985	4,087	4,024	3,393
Central American states:				
Costa Rica.....	36	17		
Guatemala.....	146	80	684	661
Honduras.....	15	15	24	11
Nicaragua.....	288	193	108	203
Mexico.....	1,894	1,043	3,931	1,779
Miquelon, Langley, etc.....	2,953	4,021	1,700	1,691
West Indies:				
British.....	90	111	422	504
Cuba.....	5,749	3,793	55	98
Danish.....	15	11	172	182
Dutch.....			182	101
French.....	4	12		
Haiti.....	38	24	625	619
Porto Rico.....	282	198	193	125
Santo Domingo.....	24	8	448	181
South America.....	9,492	6,852	5,801	2,792
Argentina.....	1,534	1,501	384	237
Brazil.....	3,016	2,874	326	467
Chile.....	264	672		
Colombia.....	3,932	1,442	3,142	1,274
Ecuador.....	168	79	144	60
Peru.....	290	177	224	141
Uruguay.....	288	107		
Venezuela.....			1,631	613
Asia.....	22,654	17,662	6,571	8,509
Chinese Empire.....	428	741	504	725
East Indies, British.....	163	85		
Hongkong.....	708	1,145	75	172
Japan.....	21,285	15,630	5,992	7,612
Turkey in Asia.....	80	61		
Oceania.....	36,639	40,635	6,806	14,546
British Australasia.....	34,513	35,769	5,416	11,225
French Oceania.....	14	30	83	214
Hawaii.....	2,070	4,631	1,307	3,107
Philippine Islands.....	92	205		
Africa.....	1,282	1,231	2	4
British Africa.....	1,268	1,169		
French Africa.....	24	72		
Liberia.....			2	4

Table 10 shows the development, during the past decade, of the export trade in rubber boots and shoes. In 1890 there were exported 171,473 pairs, valued at

\$149,055; in 1900 the total exports had increased to 767,104 pairs, valued at \$420,746. Nearly half of the exports in 1890 were sent to Canada, while 49,412 pairs, valued at \$34,932, went to the United Kingdom. The exports to other countries ranged in number and value from 5,416 pairs, valued at \$11,225, exported to British Australasia, to the 2 pairs, valued at \$4, which were sent to Liberia. The greatest increases have been in our exports to the United Kingdom, France, Germany, and other leading manufacturing countries. In 1900 our exports to the United Kingdom amounted to 305,679 pairs, valued at \$166,804. France, which received but 1,161 pairs, invoiced at \$692, in 1890, purchased 153,865 pairs, valued at \$54,680, in 1900. During the ten years the exports to Germany increased from 2,544 pairs, valued at \$1,419, to 141,266 pairs, valued at \$55,946. Notable increases were made in the exports to British Australasia, Japan, Brazil, Cuba, Denmark, Belgium, and Austria-Hungary; while Spain, Switzerland, Turkey, Chile, Uruguay, the Philippine Islands, British Africa, and several minor countries, to which no exports were sent in 1890, received in 1900 a total of 26,558 pairs, valued at \$13,817. Between 1890 and 1900 there were decreases in the exports to the Netherlands, Dominion of Canada, Mexico, Venezuela, and several smaller countries. The most notable decrease is found in the exports to the Dominion of Canada, which in 1900 amounted to 33,305 pairs, valued at \$39,704, compared with 73,256 pairs, valued at \$70,481, in 1890. While the rubber boot and shoe exports represented but a little more than 1 per cent of the product in 1900, they are increasing in value and have made their way into almost every part of the globe.

#### HISTORICAL AND DESCRIPTIVE.

The manufacture of boots and shoes is one of the oldest industries in America. There were many shoemakers among the early settlers in this country, and in an old document bearing date of 1629 it is found recorded that Thomas Beard, with "hides, both upper and bottom, was shipped out" on the *Mayflower*. But it was not until almost the middle of the last century that the manufacture of boots and shoes from rubber—the product of caoutchouc gum—was carried on with any degree of success in this or any other country. So closely is the early history of the manufacture of rubber boots and shoes associated with that of the rubber industry in general that a brief synopsis of the latter will truly describe the conditions of the former.

Crude rubber is prepared from the milky sap, or latex, of rubber-yielding plants, the habitat of which is limited to the regions between the thirtieth degree north and the thirtieth degree south latitude. Some botanists claim that all plants having a milky juice or sap contain rubber; and there is authority for the statement that the juice of the milkweed, so common in the

United States and Canada, contains 4 per cent of rubber. But even if this is true, rubber is not found in quantities sufficient to make the gathering of it profitable, except in tropical and semitropical regions. There are several different families and species of rubber-yielding plants, and the climatic conditions in which they thrive vary from the moist region of the Amazon to the hot, dry, granite rocks of Ceara. While rubber is produced in South America, Central America, Africa, Asia, and many tropical islands, the best quality is that known as Para rubber, which derives its name from the seaport whence it is exported. This is abundantly produced in the moist, warm regions of the Amazon River, where the annual rainfall is about 7 feet and inundations are frequent. Authorities are divided as to the species of rubber-yielding tree which produces the best quality of rubber, some claiming that it is the *Hevea guyanensis* (also called *Siphonia elastica*), while others designate *Hevea brasiliensis* (also called *Siphonia brasiliensis*) as the actual rubber tree. The milky sap of the rubber plant is obtained by either tapping or felling the tree, and the juice, when collected, is prepared for export in various ways. The best and most practical way of preparing the rubber for market is that used in the preparation of Para rubber and has much to do with its superior quality. This is known as the process of fumigation. A fire of brushwood or palm nuts is kindled, and over it is placed a clay funnel. The Seringueiro, or rubber gatherer, dips a paddle-shaped stick into his gourd of milky sap, then holds it in the dense smoke issuing from the funnel until the latex acquires sufficient density. This process is repeated, adding layer after layer, until the mass on the end of the paddle reaches the desired thickness, when it is slit up, and after drying in the open air is ready for market. By this process a good workman can cure five or six pounds of rubber in an hour.<sup>1</sup>

The first importations of rubber into the United States did not come as articles of commerce, but were brought here by sailors as a curious product of tropical lands. No particular commercial value was placed upon "gum elastic," as it was called, and it could readily be purchased at 5 cents a pound. In the year 1823 a Boston sea captain, returning from a tropical voyage, brought with him a pair of gilded rubber shoes, which, though heavy and awkward, aroused general interest because of their imperviousness to water. A few years later several hundred pairs of these rubber shoes, without the gilding, were brought into this country and readily sold at prices ranging from \$3 to \$5 per pair. The low cost of crude rubber and its relatively high value when made into shoes soon suggested to enterprising minds that considerable profit could be realized from the manufacture and sale of rubber goods, and both in the United States and Europe attention was given to the study and

development of this product of the Tropics. In 1831 Mr. Chaffee, a manufacturer of leather goods in Roxbury, Mass., discovered that crude rubber dissolved in spirits of turpentine and combined with a quantity of lampblack would produce a varnish which would give to leather or cloth a surface smooth, hard, and impervious to water, and in 1833 the Roxbury India Rubber Company was organized to place this discovery upon the market. This is said to have been the pioneer company in the American rubber trade. The manufacture of rubber goods offered so broad a field for development that others followed the lead of the Roxbury company. Several millions of dollars were invested in this new industry, and a large and profitable business seemed assured. But the rubber problem had not been solved. Hardly had the product of these factories been placed upon the market when it was discovered that for practical purposes it was almost useless. In warm weather the rubber melted and became sticky, and when exposed to cold it became brittle and cracked. The demand for rubber goods ceased, and large quantities which were on the market were returned to the manufacturers. Efforts to remedy this fault having proved unsuccessful, the factories were closed, and in 1835 the rubber industry was in a state of absolute collapse.<sup>2</sup>

Experiments were being carried on, however, simultaneously in the United States and in Europe, which were leading toward the correct solution of the rubber problem. In 1832 Luedersdorf, a German chemist, discovered that sulphur would deprive rubber dissolved in oil of turpentine of its stickiness. About the same time Nathaniel Hayward noticed that flowers of sulphur scattered upon leaves of rubber weakened their adhesive power. No further development of this process seems to have been made by either Luedersdorf or Hayward, and it remained for Charles Goodyear to discover the method by which rubber could be put to practical use. To those who are interested in the manufacture of rubber the story of Goodyear's discovery of the process of vulcanization is familiar. While surrounded by a small group of friends and neighbors to whom he was explaining his theories, based on the discovery of Hayward, he accidentally overturned a small quantity of rubber and sulphur upon a hot stove. It was by this accident that the remarkable discovery was made that heat was the one thing needed to make rubber insensible to both heat and cold. With the key to the solution of the problem thus exposed the process of vulcanization was rapidly developed. Goodyear's original method consisted in combining rubber with melted sulphur and heating the compound to about 300° F. A product similar to Goodyear's was shortly afterwards prepared by Hancock, by immersing rubber in melted sulphur heated to about 302° F., and allowing it to remain until thoroughly permeated. Alexander Parkes, of Birmingham,

<sup>1</sup> India Rubber, Gutta-percha, and Balata; William T. Brannt, pages 7-37.

<sup>2</sup> One Hundred Years of American Commerce; American Rubber Manufactures, by Charles L. Johnson, Vol. II, pages 498-500.

discovered the process of "cold vulcanization," which is accomplished by means of chloride of sulphur; and Gerard has demonstrated that small, thin articles can be vulcanized by the use of alkaline sulphur. But of all methods of treating rubber the most important and the one in most general use is that invented by Goodyear, which consists in mechanically mixing rubber and sulphur at a moderate temperature and subsequently curing the mixture by the use of superheated steam at a temperature ranging from 248° to 302° F.<sup>1</sup> Color, softness, and other properties are given to rubber by the use of litharge, white lead, chalk, lampblack, and other materials.

Vulcanized rubber possesses the following properties: It retains its elasticity at a temperature as high as 248° F. and as low as -22° F.;<sup>2</sup> it can not be dissolved by ordinary solvents; it acquires extraordinary powers of resisting compression, with a great increase of strength and elasticity. Thus, by the process of vulcanization, the almost useless "gum elastic" has been transformed into a useful article of commerce, and the field for further development seems almost unlimited.

When crude rubber is imported into this country it must first of all be purified. The impurities either originate in the rubber itself or consist of pieces of bark, dirt, stones, or other substances which become mixed with the mass in course of preparation. In cleansing the rubber, it is first softened by immersion in water heated by steam, where it is allowed to remain from three to twenty-four hours. The lump is then cut into slices, either by machine or by hand, and the larger impurities removed. The next step is that of rolling and washing, accomplished by passing the rubber between two massive iron rolls—usually corrugated—directly over the point of contact of which is an iron water pipe. The rubber is fed into this machine, ground and crushed by the rolls, while the water from the pipe directly above permeates the mass and washes away the small particles of bark, fiber, and other foreign substances. After the rubber has been repeatedly passed through these rolls it is placed in drying chambers, where it remains until entirely free from moisture, when it is stored away, in rooms protected from light and dampness, until needed for further working.<sup>3</sup>

In the manufacture of boots and shoes the cleansed rubber is first ground and masticated. It then undergoes the compounding process, by which it is mixed with the various ingredients, chiefly sulphur and litharge. After that it is rolled and pressed, the whole mass being

<sup>1</sup>India Rubber, Gutta-percha, and Balata; William T. Brannt, pages 110-120.

<sup>2</sup>Ibid., page 5.

<sup>3</sup>Ibid., pages 92-99.

kneaded into one homogeneous substance. The boots and shoes of the present day are not made of one solid piece of rubber, as were those first brought into this country. The ordinary rubber shoe consists of 7 or 8 different parts, and 23 parts are necessary to make the rubber boot. The rubber which is to form the uppers is coated with a tricotic tissue, by passing through a calender; that which is to make the soles is passed through another calender, from which it comes with the sole pattern marked out; and each of the other parts is prepared by being passed through the proper calender. From the sheets so formed the pieces are cut out, usually by hand, and cemented together over a smooth last. They are then varnished with asphalt lacquer and revulcanized for seven or eight hours at a temperature of 260° F. The product is then ready for the market. Another important feature of the industry is the process by which waste rubber is reclaimed and again used in manufacturing. This waste, which consists of old rubber boots, shoes, belting, and innumerable other rubber articles, is first run through masticating machines which reduce it to a powder-like mass. It is then passed over magnetic plates, by which all metallic substances are withdrawn, and by another machine the dirt is sifted out. The waste is next boiled in a vat with an acid solution, which destroys the fibrous matter; and, after being washed in large tubs, is thoroughly dried and returned to the mills for refining.<sup>4</sup>

The manufacture of rubber boots and shoes, as it exists in the United States, dates its inception from the granting of the Goodyear patent, in 1844; and from the very beginning to the present time the industry has shown a strong, steady development. This is noticeable not only in the quantity of goods produced but also in the style and quality of the product, which has been constantly improved, until to-day, considering shapes and sizes, fully 1,000 varieties of rubber boots and shoes are produced.<sup>5</sup> One of the greatest improvements has been the lessening of the feeling of tightness and uncomfortable heat caused by the wearing of rubber shoes. In the early days of the industry rubber boots and shoes were classed as luxuries to be enjoyed only by the well-to-do. But with the assistance of new machinery and improved methods the product of this industry is now offered to the public at a price within the reach of all. The rubber shoe has demonstrated its usefulness, and to-day is generally considered a necessity.

Table 11 presents in detail, by states, the statistics for the industry, as returned at the census of 1900.

<sup>4</sup>Rubber, W. E. Simpson, Wall Street Journal, October, 1900.

<sup>5</sup>One Hundred Years of American Commerce: American Rubber Manufactures, by Charles L. Johnson, Vol. II, page 503.

TABLE 11.—RUBBER BOOTS AND SHOES, BY STATES: 1900.

	United States.	Massachusetts.	Connecticut.	Rhode Island.	All other states. <sup>1</sup>
Number of establishments .....	22	6	5	6	5
Character of organization:					
Individual .....	2			1	1
Incorporated company .....	20	6	5	5	4
Established during the decade .....	9	2	1	4	2
Established during the census year .....	2	1		1	
Capital:					
Total .....	\$33,607,533	\$13,157,321	\$9,530,718	\$7,379,867	\$3,599,627
Land .....	\$939,089	\$377,473	\$290,400	\$141,027	\$180,189
Buildings .....	\$9,554,457	\$1,082,003	\$856,613	\$1,217,428	\$938,413
Machinery, tools, and implements .....	\$3,700,050	\$398,462	\$1,209,401	\$376,125	\$616,062
Cash and sundries .....	\$26,478,937	\$10,799,383	\$7,174,304	\$5,045,287	\$2,454,963
Proprietors and firm members .....	3			1	2
Salaried officials, clerks, etc.:					
Total number .....	488	153	107	105	118
Total salaries .....	\$597,239	\$220,321	\$150,396	\$124,955	\$101,567
Officers of corporations—					
Number .....	40	12	12	11	5
Salaries .....	\$167,202	\$49,100	\$60,750	\$43,620	\$13,832
General superintendents, managers, clerks, and salesmen—					
Total number .....	443	141	95	94	113
Total salaries .....	\$430,037	\$171,221	\$89,646	\$81,435	\$87,735
Men—					
Number .....	357	104	79	73	101
Salaries .....	\$389,427	\$156,360	\$80,408	\$70,702	\$81,957
Women—					
Number .....	86	37	16	21	12
Salaries .....	\$40,610	\$14,861	\$9,238	\$10,733	\$5,778
Wage-earners, including pieceworkers, and total wages:					
Greatest number employed at any one time during the year .....	17,821	6,913	5,041	3,584	2,333
Least number employed at any one time during the year .....	9,281	3,335	1,485	2,739	1,722
Average number .....	14,391	5,250	4,217	3,170	1,754
Wages .....	\$6,426,579	\$2,456,305	\$1,986,023	\$1,281,705	\$702,546
Men, 16 years and over—					
Average number .....	8,248	2,921	2,461	1,726	1,140
Wages .....	\$4,338,480	\$1,672,136	\$1,326,809	\$809,414	\$530,121
Women, 16 years and over—					
Average number .....	5,942	2,272	1,739	1,360	571
Wages .....	\$2,052,462	\$774,152	\$653,826	\$400,491	\$163,993
Children, under 16 years—					
Average number .....	201	57	17	84	43
Wages .....	\$85,637	\$10,017	\$5,388	\$11,800	\$8,432
Average number of wage-earners, including pieceworkers, employed during each month:					
Men, 16 years and over—					
January .....	8,406	3,120	2,375	1,688	1,223
February .....	8,353	2,912	2,546	1,673	1,222
March .....	6,996	2,626	1,832	1,639	899
April .....	8,040	2,643	2,450	1,693	1,254
May .....	8,909	3,363	2,618	1,744	1,184
June .....	8,756	3,371	2,609	1,701	1,075
July .....	9,136	3,413	2,793	1,730	1,200
August .....	8,706	2,989	2,757	1,759	1,201
September .....	8,331	2,822	2,692	1,773	1,204
October .....	8,179	2,866	2,558	1,763	997
November .....	7,995	2,917	2,328	1,764	986
December .....	7,109	2,006	2,082	1,784	1,237
Women, 16 years and over—					
January .....	6,269	2,595	1,727	1,290	657
February .....	6,061	2,293	1,836	1,275	657
March .....	5,070	2,223	1,120	1,247	480
April .....	6,272	2,626	1,792	1,295	559
May .....	6,367	2,639	1,913	1,322	493
June .....	6,312	2,610	1,925	1,353	424
July .....	6,683	2,638	2,043	1,410	592
August .....	5,982	1,946	2,026	1,399	611
September .....	5,937	2,017	1,878	1,433	609
October .....	5,966	2,070	1,887	1,441	568
November .....	5,911	2,375	1,523	1,431	582
December .....	4,474	1,238	1,192	1,429	615
Children, under 16 years—					
January .....	212	74	20	75	43
February .....	203	67	18	75	43
March .....	175	58	12	76	29
April .....	209	56	16	88	49
May .....	218	62	16	91	49
June .....	212	69	16	84	43
July .....	212	68	16	85	43
August .....	219	68	16	92	43
September .....	192	41	19	89	43
October .....	192	41	21	87	43
November .....	197	55	19	80	43
December .....	171	23	19	86	43
Miscellaneous expenses:					
Total .....	\$2,089,154	\$1,081,132	\$405,352	\$443,853	\$158,317
Rent of works .....	\$12,800		\$11,000		\$1,800
Taxes, not including internal revenue .....	\$184,892	\$127,566	\$40,417	\$8,888	\$8,021
Rent of offices, interest, insurance, etc. ....	\$1,891,462	\$953,566	\$354,435	\$434,965	\$148,496
Materials used:					
Aggregate cost .....	\$22,682,543	\$8,887,688	\$7,176,701	\$3,794,027	\$2,874,127
Principal materials .....	\$22,223,946	\$8,645,683	\$7,055,945	\$3,693,951	\$2,823,367
Purchased in raw state .....	\$14,582,768	\$5,741,653	\$4,887,673	\$1,813,274	\$2,140,168
Purchased in partially manufactured form .....	\$7,641,178	\$2,904,030	\$2,168,272	\$1,880,677	\$688,199
Fuel .....	\$242,619	\$85,206	\$71,628	\$62,297	\$23,488
Mill supplies .....	\$123,869	\$76,938	\$17,238	\$22,184	\$7,509
Freight .....	\$92,109	\$29,861	\$31,890	\$15,595	\$14,763

<sup>1</sup> Includes establishments distributed as follows: Missouri, 1; New Jersey, 2; Pennsylvania, 2.

TABLE 11.—RUBBER BOOTS AND SHOES, BY STATES: 1900—Continued.

	United States.	Massachusetts.	Connecticut.	Rhode Island.	All other states.
<b>Products:</b>					
Aggregate value.....	\$41,089,819	\$16,490,015	\$11,999,038	\$8,034,417	\$4,566,349
Boots and shoes, rubber:					
Total number of pairs.....	49,979,229	19,750,961	15,375,035	10,090,357	4,762,876
Total value.....	\$38,761,320	\$15,773,553	\$11,513,072	\$7,051,812	\$4,422,883
Men's—					
Total number of pairs.....	24,686,643	9,287,815	7,689,297	5,248,239	2,461,292
Total value.....	\$27,160,177	\$11,195,770	\$7,921,802	\$4,593,846	\$3,448,759
Rubber boots—					
Number of pairs.....	3,512,421	2,082,541	770,569	198,619	460,692
Value.....	\$10,672,214	\$6,465,974	\$2,400,837	\$460,432	\$1,245,171
Rubber shoes—					
Number of pairs.....	10,651,684	3,751,082	3,983,525	2,137,672	779,405
Value.....	\$5,518,515	\$1,674,087	\$2,168,097	\$1,185,504	\$495,827
Rubber tennis shoes—					
Number of pairs.....	1,424,448	623,426	30,000	748,728	22,294
Value.....	\$634,041	\$336,277	\$20,000	\$268,888	\$8,576
Arctic overs—					
Number of pairs.....	4,672,862	1,690,052	969,005	1,556,321	457,484
Value.....	\$4,815,075	\$1,602,013	\$922,668	\$1,795,733	\$494,661
Lumbermen's overs—					
Number of pairs.....	4,229,899	996,962	1,936,193	558,766	737,973
Value.....	\$5,488,166	\$1,031,158	\$2,415,400	\$842,550	\$1,199,058
Felt boots—					
Number of pairs.....	147,196	143,752			3,444
Value.....	\$91,427	\$86,261			\$5,166
Other varieties—					
Number of pairs.....	48,133			48,133	
Value.....	\$40,739			\$40,739	
Women's—					
Total number of pairs.....	18,847,355	8,105,873	6,247,549	2,904,976	1,528,057
Total value.....	\$8,165,695	\$3,042,142	\$2,969,100	\$1,604,691	\$649,762
Rubber boots—					
Number of pairs.....	303,622	159,174	86,485	29,246	28,717
Value.....	\$464,264	\$219,680	\$153,055	\$50,072	\$41,457
Rubber shoes—					
Number of pairs.....	16,113,746	7,102,051	5,579,019	2,086,385	1,846,291
Value.....	\$5,925,474	\$2,231,765	\$2,360,254	\$842,211	\$491,244
Rubber tennis shoes—					
Number of pairs.....	346,744	220,807	21,456	99,661	4,820
Value.....	\$185,199	\$129,357	\$15,044	\$38,987	\$1,811
Arctic overs—					
Number of pairs.....	2,003,286	623,841	551,330	678,986	149,129
Value.....	\$1,535,962	\$461,340	\$431,488	\$527,884	\$115,250
Lumbermen's overs—					
Number of pairs.....	9,259		9,259		
Value.....	\$9,259		\$9,259		
Other varieties—					
Number of pairs.....	70,698			70,698	
Value.....	\$45,537			\$45,537	
Children's—					
Total number of pairs.....	6,445,231	2,357,273	1,438,189	1,877,142	772,627
Total value.....	\$3,435,448	\$1,535,641	\$622,170	\$953,275	\$324,362
Rubber boots—					
Number of pairs.....	623,009	444,889	84,545	33,641	59,954
Value.....	\$1,123,060	\$906,406	\$99,327	\$45,795	\$71,532
Rubber shoes—					
Number of pairs.....	4,135,463	1,433,434	1,186,167	1,010,151	505,711
Value.....	\$1,299,182	\$942,197	\$425,178	\$381,025	\$150,784
Rubber tennis shoes—					
Number of pairs.....	558,089	206,726	20,000	298,224	33,139
Value.....	\$249,484	\$123,641	\$12,000	\$102,993	\$11,950
Arctic overs—					
Number of pairs.....	971,613	224,296	138,850	492,297	116,170
Value.....	\$634,710	\$135,437	\$82,827	\$371,974	\$44,472
Lumbermen's overs—					
Number of pairs.....	145,418	47,928	8,627	31,602	57,261
Value.....	\$122,176	\$28,060	\$2,840	\$46,260	\$45,016
Felt boots—					
Number of pairs.....	412				412
Value.....	\$608				\$608
Other varieties—					
Number of pairs.....	11,227			11,227	
Value.....	\$6,228			\$6,228	
Value of all other products, including custom work and repairing.....	\$2,328,499	\$716,462	\$489,968	\$982,605	\$143,466
<b>Comparison of products:</b>					
Number of establishments reporting for both years.....	17	4	4	5	4
Value for census year.....	\$37,581,998	\$14,167,116	\$10,974,884	\$8,010,042	\$4,429,956
Value for preceding business year.....	\$31,541,079	\$12,040,550	\$9,499,324	\$6,856,068	\$3,645,137
<b>Power:</b>					
Number of establishments reporting.....	22	6	5	6	5
Total horsepower.....	25,205	8,415	7,870	5,595	3,325
Owned:					
Engines (steam)—					
Number.....	88	27	27	23	11
Horsepower.....	23,442	8,190	6,467	5,460	3,325
Water wheels—					
Number.....	14	4	10		
Horsepower.....	1,525	175	1,350		
Electric motors—					
Number.....	15		8	7	
Horsepower.....	188		53	135	
Other power—					
Number.....	1	1			
Horsepower.....	50	50			
Furnished to other establishments—					
Horsepower.....	550		550		
<b>Establishments classified by number of persons employed, not including proprietors and firm members:</b>					
Total number of establishments.....	22	6	5	6	5
51 to 100.....	1			1	
101 to 250.....	3	1	1	1	
251 to 500.....	3			1	
501 to 1,000.....	6	1	1	1	3
1,001 to 5,000.....	9	4	3	2	

# CENSUS BULLETIN.

No. 172.

WASHINGTON, D. C.

MAY 21, 1902.

## MANUFACTURES.

### BUTTONS.

Hon. WILLIAM R. MERRIAM,  
*Director of the Census.*

SIR: I transmit herewith, for publication in bulletin form, a report on the manufacture of buttons for the census year ending May 31, 1900, prepared under my direction by Mr. Axel Josephsson, of the Census Office.

The statistics included in the report were collected, as in previous censuses, upon the schedule used for the general statistics of manufactures; but owing to the great development of the button industry during the last decade, it was decided to supplement the canvass made by the enumerators and local special agents with a special report.

The manufacture of buttons has figured in the reports of every census, beginning with the Third Census, but as this is the first time it has been made the subject of a special report, the accompanying bulletin presents, in addition to the statistics collected at the census of 1900, a concise history of the industry since its beginning. The most noteworthy feature of its development in the United States has been the rise within the last eight years of the fresh-water shell pearl button industry. This branch of the manufacture did not exist in 1890; since then vast quantities of mussel shells, formerly considered of no value, have been taken from the Mississippi River and made the source of a large revenue to the people of the states of Iowa and Illinois.

The statistics are presented in 11 tables: Table 1 showing comparative figures for the industry at the several censuses; Table 2 showing, by states, the number of establishments in operation in 1890 and 1900; Table 3 showing statistics for the industry by states for 1900; Table 4 showing statistics by states for 1900

for establishments manufacturing only fresh-water pearl button blanks; Table 5 showing statistics of capital for 1890 and 1900; Table 6 showing the cost of materials for 1900; Table 7 showing quantity, value, and percentage of the several kinds of buttons manufactured in the census year 1900; Table 8 showing the number of establishments and value of products for the states reporting button factories at the censuses of 1850 to 1880, inclusive; Table 9 showing the number of establishments, capital, and value of products, by states and geographic divisions for 1890 and 1900; Table 10 showing imports of buttons for each fiscal year from 1891 to 1900, inclusive; Table 11 showing the detailed statistics for the industry by states in 1900.

Table 1 shows the growth of the industry for the half century which terminates with the Twelfth Census. The manufacturing statistics of the censuses prior to 1850 were too imperfect and fragmentary in character to make it proper to reproduce them in such a table as a measure of industrial growth in the first half of the century. Owing to changes in the method of taking the census, comparisons between the earlier and later decades, represented in Table 1, should be drawn only in the most general way. Nevertheless, the rate of growth in the manufacture of buttons may be fairly inferred from the figures given.

In drafting the schedules of inquiry for the census of 1900 care was taken to preserve the basis of comparison with prior censuses. Comparison may be made safely with respect to all the items of inquiry except those relating to capital, salaried officials, clerks, etc., and their salaries, the average number of employees, and the total amount of wages paid. Live capital, that is,

cash on hand, bills receivable, unsettled ledger accounts, raw materials, stock in process of manufacture, finished products on hand, and other sundries, was first called for at the census of 1890. No definite attempt was made, prior to the census of 1890, to secure a return of live capital invested.

Changes were made in the inquiries relating to employees and wages in order to eliminate defects found to exist on the form of inquiry adopted in 1890. At the census of 1890 the average number of persons employed during the entire year was called for, and also the average number employed at stated weekly rates of pay, and the average number was computed for the actual time the establishments were reported as being in operation. At the census of 1900 the greatest and least numbers of employees were reported, and also the average number employed during each month of the year. The average number of wage-earners (men, women, and children) employed during the entire year was ascertained by using 12, the number of calendar months, as a divisor into the total of the average numbers reported for each month. This difference in the method of ascertaining the average number of wage-earners during the entire year may have resulted in a variation in the number, and should be considered in making comparisons.

At the census of 1890 the number and salaries of proprietors and firm members actively engaged in the business or in supervision were reported, combined with clerks and other officials. In cases where proprietors and firm members were reported without salaries, the amount that would ordinarily be paid for similar services was estimated. At the census of 1900 only the number of proprietors and firm members actively engaged in the industry or in supervision was ascertained, and no salaries were reported for this class. It is therefore impossible to compare the number and salaries of salaried officials of any character for the two censuses.

Furthermore, the schedules for 1890 included in the wage-earning class, overseers, foremen, and superintendents (not general superintendents or managers), while the census of 1900 separates from the wage-earning class such salaried employees as general superintendents, clerks, and salesmen. It is possible and probable that this change in the form of the question has resulted in eliminating from the wage-earners, as reported by the present census, many high-salaried employees included in that group for the census of 1890.

The reports show a capital of \$4,212,568 invested in the manufacture of buttons in the 238 establishments reporting for the United States. This sum represents the value of land, buildings, machinery, tools, and implements, and the live capital utilized, but does not include the capital stock of any of the corporations engaged in this industry. The value of the products is returned at \$7,695,910, to produce which involved an outlay of \$296,358 for salaries of officials, clerks, etc.; \$2,826,238 for wages; \$393,862 for miscellaneous expenses, including rent, taxes, etc.; and \$2,803,246 for materials used, mill supplies, freight, and fuel. It is not to be assumed, however, that the difference between the aggregate of these sums and the value of the products is, in any sense, indicative of the profits in the manufacture of buttons during the census year. The census schedule takes no cognizance of the cost of selling manufactured articles, or of interest on capital invested, or of the mercantile losses incurred in the business, or of depreciation in plant. The value of the product given is the value obtained or fixed at the works. This statement is necessary in order to avoid erroneous conclusions from the figures presented.

Very respectfully,



*Chief Statistician for Manufactures.*

# THE MANUFACTURE OF BUTTONS.

By AXEL JOSEPHSSON.

Table 1 is a comparative summary of the statistics for the manufacture of buttons as returned at the censuses of 1850 to 1900, inclusive, with the percentages of increase for each decade.

TABLE 1.—COMPARATIVE SUMMARY, 1850 TO 1900, WITH PER CENT OF INCREASE FOR EACH DECADE.

	DATE OF CENSUS.						PER CENT OF INCREASE.				
	1900	1890	1880	1870	1860	1850	1890 to 1900	1880 to 1890	1870 to 1880	1860 to 1870	1850 to 1860
Number of establishments.....	238	106	124	64	48	59	124.5	114.5	93.8	48.8	127.1
Capital.....	\$4,212,568	\$3,089,265	\$2,013,350	\$1,013,700	\$558,550	\$393,000	36.4	53.4	98.0	81.5	42.1
Salaried officials, clerks, etc., number.....	339	205	(3)	(3)	(3)	(3)	65.4	.....	.....	.....	.....
Salaries.....	\$296,358	\$262,787	(3)	(3)	(3)	(3)	12.8	.....	.....	.....	.....
Wage-earners, average number.....	8,685	3,831	5,825	1,912	1,161	1,088	126.7	134.2	204.7	64.7	6.7
Total wages.....	\$2,826,238	\$1,411,089	\$1,645,130	\$580,380	\$260,206	\$225,120	100.3	114.2	183.5	128.0	15.6
Men, 16 years and over.....	4,086	1,544	2,128	617	487	467	164.6	127.4	244.9	26.7	4.3
Wages.....	\$1,758,133	\$805,782	(3)	(3)	(3)	(3)	117.6	.....	.....	.....	.....
Women, 16 years and over.....	4,131	2,176	3,052	949	674	621	89.8	128.7	221.6	40.8	8.5
Wages.....	\$997,857	\$588,901	(3)	(3)	(3)	(3)	69.4	.....	.....	.....	.....
Children, under 16 years.....	468	111	645	346	(3)	(3)	321.6	182.8	86.4	.....	.....
Wages.....	\$75,248	\$16,406	(3)	(3)	(3)	(3)	358.7	.....	.....	.....	.....
Miscellaneous expenses.....	\$393,862	\$256,846	(4)	(4)	(4)	(4)	53.3	.....	.....	.....	.....
Cost of materials used.....	\$2,803,246	\$1,551,603	\$1,792,891	\$751,183	\$358,385	\$324,837	80.7	113.5	138.7	109.6	10.3
Value of products.....	\$7,695,910	\$4,216,795	\$4,449,542	\$1,778,898	\$949,408	\$964,359	82.5	15.2	150.1	87.4	11.5

<sup>1</sup> Decrease.

<sup>2</sup> Includes proprietors and firm members, with their salaries; number only reported in 1900. (See Table 11.)

<sup>3</sup> Not reported separately.

<sup>4</sup> Not reported.

The figures for 1900 in the above table do not include 20 establishments having a product of less than \$500 each. The combined capital of these establishments was \$10,405, and the total value of their products was \$3,798. They were not included in this table in order to preserve the basis of comparison with previous censuses, at which such establishments were not reported.

Although the manufacture of buttons in the United States began prior to 1810 and statistics for the industry appeared for the first time in the census reports of that year, the census of 1850 was the first at which statistics of a sufficiently uniform character to be compared were presented. The general progress of the industry during the past half century is shown by Table 1. The number of establishments increased from 59 to 238; the capital, from \$393,000 to \$4,212,568; the average number of wage-earners, from 1,088 to 8,685; the amount of wages paid, from \$225,120 to \$2,826,238; the cost of materials used, from \$324,837 to \$2,803,246; and the value of products, from \$964,359 to \$7,695,910. The greatest growth was that during the decade ending in 1880, when the increase in value of products was

150.1 per cent. From 1880 to 1890 there was a decrease in every particular except that of capital, the value of products, however, showing the least diminution, 5.2 per cent. The last decade showed an increase of 82.5 per cent in value of products. These statistics, while reflecting the increase in the value of products, do not indicate the real growth in the quantity of products manufactured, which has increased in far greater proportions on account of the introduction of new methods of manufacture, whereby prices have been considerably reduced.

A comparison of the statistics for 1900 and 1890 shows the growth of the industry during the decade and its present condition. The number of establishments increased from 106 in 1890 to 238 in 1900, or 124.5 per cent, while the capital increased only from \$3,089,265 to \$4,212,568, or 36.4 per cent. The button industry, in contrast with most of the larger industries, shows a considerable decrease in the average capital per establishment, the average being \$29,144 for 1890 and only \$17,700 for 1900. This decrease is due in part to the number of establishments engaged in the manufacture

of fresh-water pearl button blanks, a branch of the industry which has sprung into existence since 1890 and requires a comparatively small capital. Statistics for the establishments engaged exclusively in this manufacture are separately shown in Table 4, and if the capital for these establishments were deducted from the total capital as presented in Table 1, the average capital for establishments engaged principally in the manufacture of buttons would be \$21,797. The largest increase during the decade appears in the average number of wage-earners, which increased from 3,831 to 8,685, or 126.7 per cent. The amount of wages paid more than doubled. The cost of materials used increased from \$1,551,603 to \$2,803,246, or 80.7 per cent, and the value of products from \$4,216,795 to \$7,695,910, or 82.5 per cent.

Table 2 presents, by states, the number of active establishments in 1900 and 1890, with the increase, and the number of establishments constructed during the decade and during the census year.

TABLE 2.—COMPARATIVE SUMMARY: NUMBER OF ACTIVE ESTABLISHMENTS, 1900 AND 1890, AND INCREASE DURING DECADE, BY STATES, ARRANGED GEOGRAPHICALLY.

STATES.	1900	1890	Increase.
United States.....	238	106	132
New England states.....	28	34	16
New Hampshire.....	1	.....	1
Massachusetts.....	13	16	13
Rhode Island.....	3	4	11
Connecticut.....	11	14	13
Middle states.....	106	67	39
New York.....	49	34	15
New Jersey.....	34	17	17
Pennsylvania.....	21	14	7
Maryland.....	2	.....	1
District of Columbia.....	1	.....	11

<sup>1</sup> Decrease

TABLE 2.—COMPARATIVE SUMMARY: NUMBER OF ACTIVE ESTABLISHMENTS, 1900 AND 1890, ETC.—Continued.

STATES.	1900	1890	Increase.
Southern states.....	2	1	1
Kentucky.....	1	1	.....
Arkansas.....	1	.....	1
Central states.....	95	4	91
Ohio.....	4	.....	4
Michigan.....	2	.....	2
Illinois.....	14	4	10
Wisconsin.....	9	.....	9
Minnesota.....	2	.....	2
Iowa.....	53	.....	53
Missouri.....	11	.....	11
Western states.....	2	.....	2
Nebraska.....	2	.....	2
Pacific states.....	5	.....	5
California.....	5	.....	5

Table 2 shows that while in 1890 establishments were found in only 9 states and 1 territory, in 1900 they were distributed over 19 states. Iowa led in number, New York was second, and New Jersey third. Of the new plants, 53 were located in Iowa, where not one button factory existed ten years before. Besides Iowa, 9 of the states reporting button factories in 1900 had none in 1890. In New Jersey 17 establishments began operations during the decade. New York came next with 15, followed by Illinois with 10 establishments.

Table 3 is a summary of the industry, by states, for 1900. In 1890 only 7 states could be shown separately, because in these only was the number of establishments 3 or more; in 1900 there were 12 states having 3 or more. In 1900, 7 states reported fewer than 3 establishments each, and in order that the operations of individual establishments may not be disclosed, they are included under "all other states."

TABLE 3.—SUMMARY BY STATES: 1900.

	United States.	California.	Connecticut.	Illinois.	Iowa.	Massachusetts.	Missouri.	New Jersey.	New York.	Ohio.	Pennsylvania.	Rhode Island.	Wisconsin.	All other states. <sup>1</sup>
Number of establishments.	238	5	11	14	53	13	11	34	49	4	21	3	9	11
Capital:														
Total.....	\$4,212,588	\$6,487	\$532,178	\$53,493	\$324,315	\$626,439	\$39,495	\$509,681	\$1,195,343	\$49,645	\$557,488	\$29,116	\$34,499	\$254,389
Land.....	\$145,260	.....	\$46,400	\$525	\$15,685	\$33,800	\$600	\$6,250	\$13,100	.....	\$24,600	.....	\$1,300	\$3,100
Buildings.....	\$433,268	.....	\$96,000	\$1,450	\$24,991	\$105,300	\$3,150	\$34,672	\$46,900	.....	\$47,580	.....	\$4,595	\$68,630
Machinery, tools, and implements.	\$1,310,442	\$725	\$164,728	\$14,271	\$111,727	\$122,669	\$12,188	\$154,086	\$395,107	\$15,500	\$200,052	\$20,500	\$12,539	\$86,400
Cash and sundries.	\$2,323,598	\$5,762	\$225,050	\$37,247	\$171,912	\$364,670	\$23,557	\$314,723	\$740,236	\$34,145	\$285,356	\$8,616	\$16,065	\$96,259
Salaried officials, clerks, etc., number.....	339	1	24	14	42	19	4	53	105	7	42	4	4	20
Salaries.....	\$296,358	\$1,200	\$30,812	\$7,629	\$26,306	\$31,164	\$1,236	\$50,299	\$83,195	\$4,786	\$39,152	\$2,464	\$1,425	\$16,690
Wage-earners, average number.....	8,685	6	800	272	1,402	772	83	1,169	2,647	72	1,140	28	106	188
Total wages.....	\$2,326,238	\$938	\$305,687	\$101,039	\$458,086	\$276,202	\$23,881	\$410,056	\$812,978	\$18,268	\$321,473	\$8,501	\$32,108	\$56,971
Men, 16 years and over.....	4,086	.....	305	210	887	302	58	551	1,157	29	347	19	74	147
Wages.....	\$1,753,133	.....	\$169,763	\$86,174	\$361,062	\$141,049	\$19,133	\$258,119	\$464,518	\$10,504	\$166,892	\$5,730	\$26,088	\$44,101
Women, 16 years and over.....	4,131	2	466	48	441	443	21	544	1,349	40	711	9	26	37
Wages.....	\$997,857	\$336	\$132,018	\$11,302	\$86,550	\$131,929	\$4,220	\$136,610	\$326,130	\$7,140	\$141,601	\$2,771	\$5,880	\$12,370
Children, under 16 years.....	468	4	35	14	74	27	4	74	141	3	82	.....	6	4
Wages.....	\$75,248	\$652	\$3,906	\$3,563	\$10,474	\$3,224	\$528	\$16,327	\$22,330	\$624	\$12,980	.....	\$140	\$500
Miscellaneous expenses.....	\$393,862	\$1,277	\$117,643	\$11,329	\$37,252	\$27,505	\$10,788	\$37,379	\$110,717	\$5,701	\$17,683	\$4,393	\$1,880	\$9,865
Cost of materials used.....	\$2,803,246	\$2,795	\$430,187	\$66,213	\$196,842	\$237,835	\$26,679	\$393,616	\$943,432	\$20,946	\$403,106	\$9,040	\$18,751	\$43,804
Value of products.....	\$7,695,910	\$8,870	\$1,087,235	\$242,444	\$866,538	\$681,081	\$85,449	\$1,025,544	\$2,371,196	\$58,873	\$999,355	\$33,589	\$63,125	\$172,611

<sup>1</sup> Includes establishments distributed as follows: Arkansas, 1; Kentucky, 1; Maryland, 2; Michigan, 2; Minnesota, 2; Nebraska, 2; New Hampshire, 1.

Since the census of 1890 an entirely new branch of the industry has been introduced—the manufacture of fresh-water pearl button blanks. The statistics for the 52 establishments reporting these products exclusively in 1900 are included in Tables 1 and 3, but in view of the great interest taken in the development of this

branch, Table 4 is given, showing the statistics, by states, of establishments, number of salaried officials, clerks, etc., and their salaries, average number of wage-earners and their wages, miscellaneous expenses, cost of materials used, and value of products.

TABLE 4.—SUMMARY: ESTABLISHMENTS MANUFACTURING FRESH-WATER PEARL BUTTON BLANKS, BY STATES: 1900.

STATES.	Number of establishments.	Capital.	SALARIED OFFICIALS, CLERKS, ETC.		WAGE-EARNERS.		Miscellaneous expenses.	Cost of materials used.	Value of products.
			Number.	Salaries.	Average number.	Total wages.			
United States .....	52	\$158,373	36	\$16,124	771	\$304,984	\$12,044	\$161,038	\$656,036
Illinois.....	7	16,893	9	4,924	138	53,052	1,009	25,824	134,104
Iowa.....	35	102,135	20	9,365	561	227,937	9,521	114,478	467,351
Missouri.....	5	14,390	1	800	85	11,340	1,016	8,529	23,090
All other states <sup>1</sup> .....	5	24,955	6	1,535	37	12,655	498	12,207	31,491

<sup>1</sup> Includes establishments distributed as follows: Arkansas, 1; Minnesota, 1; Wisconsin, 3.

Table 4 shows a total of 52 establishments, with a capital of \$158,373, 771 wage-earners, and products valued at \$656,036. Iowa led with 35 establishments, and products valued at \$467,351, or 71.2 per cent of the total. Illinois ranked next with 7 establishments, and products valued at \$134,104, or 20.4 per cent of the total.

Table 5 is a comparative summary of capital for 1900 and 1890, with the percentage each item was of the total, and the per cent of increase for the decade.

TABLE 5.—COMPARATIVE SUMMARY: CAPITAL, 1890 AND 1900, WITH PER CENT OF INCREASE.

	1900		1890		Per cent of increase.
	Amount.	Per cent of total.	Amount.	Per cent of total.	
Total.....	\$4,212,568	100.0	\$3,089,265	100.0	36.4
Land.....	145,260	3.4	98,664	3.2	47.2
Buildings.....	433,268	10.3	208,185	6.7	108.1
Machinery, tools, and implements.....	1,310,442	31.1	956,094	31.0	37.1
Cash and sundries.....	2,323,598	55.2	1,826,322	59.1	27.2

Table 5 shows that the percentages of land, buildings, machinery, and live capital in 1900 did not differ materially from the corresponding percentages in 1890, although the rates of increase in the different items varied considerably, being largest for buildings. The total capital increased from \$3,089,265 to \$4,212,568, or 36.4 per cent. The value of land increased from \$98,664 to \$145,260, or 47.2 per cent; of buildings from \$208,185 to \$433,268, or 108.1 per cent; of machinery, tools, and implements from \$956,094 to \$1,310,442, or 37.1 per cent; and the live capital from \$1,826,322 to \$2,323,598, or 27.2 per cent.

The miscellaneous expenses increased from \$256,846 in 1890 to \$393,862 in 1900, or 53.3 per cent. Of this, \$207,107, paid for rent of offices, insurance, repairs of buildings and machinery, advertising, and all other sun-

dries not reported under the head of materials, constituted the principal item, or 52.6 per cent. This amount did not include expense of new equipment, machinery, and other apparatus, but only the amount expended for repair of buildings, machinery, and other incidental expenses. The amount of interest in this item did not include the interest paid on bonds by incorporated companies, but only the comparatively insignificant sums necessary for money or credit incidental to the conduct of the business. The amount expended for contract work, \$88,040, formed 22.3 per cent and the \$84,279 expended for rent of works 21.4 per cent of the total. The amount paid for taxes, \$14,436, was a relatively small per cent.

Table 6 gives the cost of the different materials used in 1900, with the per cent each item was of the total.

TABLE 6.—COST OF MATERIALS: 1900.

	1900	
	Amount.	Per cent of total.
Total.....	\$2,803,246	100.0
Purchased in raw state.....	1,232,938	44.0
Purchased in partially manufactured form.....	1,437,982	51.3
Fuel.....	46,666	1.6
Rent of power and heat.....	33,375	1.2
Freight.....	52,286	1.9

The total cost of materials used in 1890 was \$1,551,603, and in 1900, \$2,803,246, an increase of 80.7 per cent, of which \$1,232,938, or 44 per cent, was expended for raw materials. The three principal items that went to make up this total were mother-of-pearl shells, fresh-water mussel shells, and vegetable ivory. The quantity of mother-of-pearl (ocean pearl) shells used was 1,748,856 pounds, costing \$620,584; of fresh-water mussel shells, 4,830,112 pounds, costing \$238,046; and of vegetable ivory, 12,382,720 pounds, costing \$275,226. The average cost per pound of mother-of-pearl shells was 35.5 cents; of fresh-water shells, 4.9

cents; and of vegetable ivory, 2.2 cents. Vegetable ivory and mother-of-pearl shells are imported, and statistics for the year ending June 30, 1900, show importations of 16,036,389 pounds of vegetable ivory, valued at \$243,548, and shells to the value of \$1,016,728.

The value of materials purchased in partially manufactured form was \$1,437,982, or 51.3 per cent of the total reported. Among the partly manufactured materials are brass, tin, iron, horn, bone, cloth, and linen hanks and tufts. The fuel, rent of power and heat, and freight constituted 4.7 per cent of the total cost of materials.

In connection with Table 6 attention is directed to a duplication which occurs in the two principal items of materials. The establishments employed in cutting button blanks from mussel shells used a large proportion of the fresh-water shells included under raw material, while of their products, amounting to \$656,036, not less than \$561,985 reappeared as purchased in partially manufactured form by other factories. The remaining \$94,051 of blanks were not made into buttons during the census year.

Table 7 gives the quantity and value of the different varieties of buttons manufactured, with the percentage that each variety is of the total, and the average prices.

TABLE 7.—NUMBER OF GROSS, VALUE, PER CENT OF VALUE OF DIFFERENT KINDS OF TOTAL VALUE, AND AVERAGE PRICE PER GROSS: 1900.

KINDS.	QUANTITY.		VALUE.		Average price per gross.
	Gross.	Per cent of total.	Amount.	Per cent of total.	
Total.....	21,254,018	100.0	\$6,467,873	100.0	\$0.30
Bone.....	297,180	1.4	137,401	2.1	0.46
Cloth.....	1,372,870	6.5	468,121	7.2	0.34
Composition.....	2,407,319	11.3	246,410	3.8	0.10
Horn.....	717,047	3.4	237,874	3.7	0.33
Metal:					
Total.....	4,759,671	22.4	887,521	13.7	0.19
Brass.....	3,713,144	17.5	739,922	11.4	0.20
All other metals.....	1,046,527	4.9	147,599	2.3	0.14
Pearl, fresh-water.....	4,308,584	20.3	1,176,285	18.2	0.27
Pearl, ocean.....	4,049,452	19.0	1,951,558	30.2	0.48
Vegetable ivory.....	2,661,823	12.5	1,144,677	17.7	0.43
Wood.....	78,200	0.4	9,600	0.2	0.12
Celluloid and photo.....	105,086	0.5	77,570	1.2	0.74
Paper and all other.....	496,786	2.3	130,856	2.0	0.26

To obtain the aggregate value of all products for the button industry, there should be added to the value of buttons given in Table 7 the value of button blanks and of all other products. During the census year 5,432,246 gross of fresh-water pearl button blanks were manufactured, valued at \$656,036, making the value of buttons and button blanks \$7,123,409, or 92.6 per cent of the aggregate; the value of all other products amounted to \$572,501, or 7.4 per cent. The fresh-water blanks constituted 8.5 per cent of the aggregate. A total of 21,254,018 gross of buttons was manufactured, giving an average value of 30.4 cents per gross.

Ocean pearl buttons outclassed all others, constituting 30.2 per cent of the total value. Fresh-water pearl buttons stood next with 18.2 per cent, while the vegetable ivory buttons ranked third with a percentage of 17.7. Metal buttons of all kinds formed 13.7 per cent of the total, brass buttons alone constituting 11.4 per cent. Covered or cloth buttons comprised 7.2 per cent of the total value. Composition and horn buttons were nearly equal in importance, forming, respectively, 3.8 and 3.7 per cent of the total value. Last on the list came buttons made from wood, constituting only two-tenths of 1 per cent of the total value. While the price for each kind of buttons varies considerably according to quality and size, it is interesting to note the average price for the different kinds.

To the totals in Table 7 should be added 105,500 gross of buttons, valued at \$42,790, obtained from two establishments reporting buttons as a by-product. Of these 72,500 gross were horn, 3,000 metal, and 30,000 rubber buttons. There are, no doubt, a number of manufactories producing buttons as a by-product, but as they have not specified buttons separately, but have included them in "all other products," it is impossible to give any figures for them.

The growth of the button industry, by geographical divisions, is shown in Tables 8 and 9.

Table 8 shows, by states, the number of establishments and value of products in 1850, 1860, 1870, and 1880. Five states practically monopolized the industry in those years, only an insignificant percentage of product being reported from "all other states."

TABLE 8.—COMPARATIVE SUMMARY: NUMBER OF ESTABLISHMENTS AND VALUE OF PRODUCTS, BY STATES, 1850 TO 1880, INCLUSIVE.

STATES.	1880		1870		1860		1850	
	Number of establishments.	Value of products.						
United States.....	124	\$4,449,542	64	\$1,778,893	43	\$949,403	59	\$964,359
Connecticut.....	26	1,110,653	21	563,433	28	547,482	29	562,274
Massachusetts.....	28	1,085,864	9	511,175	9	275,700	14	284,925
New Jersey.....	25	797,205	8	190,385	.....	.....	3	22,892
New York.....	18	916,262	7	141,500	5	120,666	7	64,600
Pennsylvania.....	18	837,554	13	369,200	1	5,560	3	23,123
All other states.....	19	162,004	1	2,700	.....	.....	3	6,540

<sup>1</sup> Includes establishments distributed as follows: Illinois, 8; Kentucky, 1; Minnesota, 1; Rhode Island, 1; Tennessee, 1; Vermont, 2.

<sup>2</sup> Missouri.

<sup>3</sup> Includes establishments distributed as follows: Maryland, 1; Ohio, 1; Vermont, 1.

Table 9 presents a comparison between the number of establishments, capital, and value of products for 1890 and 1900, by states, arranged geographically; also the percentage of total and of increase of each item.

TABLE 9.—COMPARATIVE SUMMARY: NUMBER OF ESTABLISHMENTS, CAPITAL, AND VALUE OF PRODUCTS, BY STATES, ARRANGED GEOGRAPHICALLY, WITH PERCENTAGES, 1890 AND 1900.

STATES.	1900							1890							PER CENT OF INCREASE IN—		
	Establishments.		Capital.		Products.			Establishments.		Capital.		Products.			Number of establishments.	Capital.	Value of products.
	Number.	Per cent of total.	Amount.	Per cent of total.	Number of gross.	Value.	Per cent of total value.	Number.	Per cent of total.	Amount.	Per cent of total.	Value.	Per cent of total value.				
United States .....	288	100.0	\$4,212,568	100.0	26,686,264	\$7,695,910	100.0	106	100.0	\$3,089,265	100.0	\$4,216,795	100.0	124.5	36.4	82.5	
New England states....	28	11.8	1,877,222	32.7	7,278,370	1,902,527	24.7	34	32.1	1,761,254	57.0	2,131,572	50.6	117.6	121.8	110.7	
Massachusetts.....	13	5.5	626,439	14.9	2,127,345	681,081	8.9	16	15.1	779,135	25.2	1,071,687	25.4	118.8	119.6	136.4	
Connecticut.....	11	4.6	532,178	12.6	4,688,359	1,087,285	14.1	14	13.2	914,796	29.6	928,028	22.0	121.4	141.8	17.2	
All others <sup>2</sup> .....	4	1.7	218,605	5.2	477,666	134,211	1.7	34	3.8	67,323	2.2	131,857	3.2	.....	.....	1.8	
Middle states .....	104	43.7	2,282,512	53.7	11,898,171	4,896,095	57.1	65	61.3	1,244,126	40.3	1,996,013	47.3	60.0	81.9	120.2	
New York.....	49	20.6	1,195,343	28.4	6,779,482	2,371,196	30.8	34	32.1	653,215	21.1	1,012,694	24.0	44.1	83.0	134.2	
New Jersey.....	34	14.3	699,681	12.1	2,156,025	1,025,544	13.3	17	16.0	295,555	9.6	596,600	14.1	100.0	72.4	71.9	
Pennsylvania.....	21	8.8	567,488	13.2	2,968,664	999,355	13.0	14	13.2	295,356	9.6	388,719	9.2	50.0	88.8	158.4	
Central states.....	95	39.9	511,397	12.1	7,223,893	1,326,888	17.3	4	3.8	42,725	1.4	46,860	1.1	2,275.0	1,097.0	2,731.6	
Ohio.....	4	1.7	49,645	1.2	128,372	58,873	0.8	.....	.....	.....	.....	.....	.....	.....	.....	.....	
Illinois.....	14	5.9	53,493	1.3	851,098	242,444	3.2	4	3.8	42,725	1.4	46,860	1.1	250.0	25.2	417.4	
Wisconsin.....	9	3.8	34,499	0.8	806,556	63,125	0.8	.....	.....	.....	.....	.....	.....	.....	.....	.....	
Iowa.....	53	22.2	\$24,315	7.7	5,413,130	866,538	11.3	.....	.....	.....	.....	.....	.....	.....	.....	.....	
Missouri.....	11	4.6	39,495	0.9	440,360	85,449	1.1	.....	.....	.....	.....	.....	.....	.....	.....	.....	
All others <sup>4</sup> .....	4	1.7	9,950	0.2	34,377	10,459	0.1	.....	.....	.....	.....	.....	.....	.....	.....	.....	
All other states <sup>6</sup> .....	11	4.6	61,487	1.5	280,830	70,400	0.9	3	2.8	41,160	1.3	42,850	1.0	266.7	49.3	66.2	

<sup>1</sup> Decrease.

<sup>2</sup> Includes establishments distributed as follows: New Hampshire, 1; Rhode Island, 3.

<sup>3</sup> Includes establishments distributed as follows: Rhode Island, 4.

<sup>4</sup> Includes establishments distributed as follows: Michigan, 2; Minnesota, 2.

<sup>5</sup> Includes establishments distributed as follows: Arkansas, 1; California, 5; Kentucky, 1; Maryland, 2; Nebraska, 2.

<sup>6</sup> Includes establishments distributed as follows: District of Columbia, 1; Kentucky, 1; Maryland, 1.

From the beginning of button manufacture in this country down to 1890, almost the entire industry was carried on in the New England and Middle states. The census of 1810 was the first at which the manufacture was shown, and then only 3 states reported products: Connecticut, 155,000 gross, value \$102,125; Pennsylvania, 11,608 gross, value \$3,494; and Virginia, \$300; the total value of products for the industry being \$105,919. At the census of 1890 the New England and Middle states reported 93.4 per cent of the establishments, 97.3 per cent of the capital, and 97.9 per cent of the products.

The statistics for 1900 show a great change. The Central states, which in 1890 were credited with 4 establishments, or 3.8 per cent of the aggregate, reported 95, or 39.9 per cent. The capital invested in this group increased from \$42,725, or 1.4 per cent of the aggregate, to \$511,397, or 12.1 per cent, and the value of products increased from \$46,860, or 1.1 per cent of the aggregate, to \$1,326,888, or 17.3 per cent. In 1890 Illinois was the only state in this group reporting the manufacture of buttons; 4 establishments there having products valued at \$46,860. In 1900 the state had 14 establishments and products valued at \$242,444. Iowa contributed 53 new plants, with products valued at \$866,538, or 65.3 per cent of the total for the division. Thus, as to number of establishments, Iowa has taken the first place among all the states. The states of Ohio, Wisconsin, Michigan, Minnesota, Missouri, and Nebraska also engaged in the manufacture for the first time.

The number of establishments in the New England and Middle states increased from 99 in 1890 to 132 in 1900, or 33.3 per cent, but the percentage which they formed of the total number of establishments in the United States decreased from 93.4 in 1890 to 55.5 in 1900. The decrease in the proportion of the capital was not so marked. In 1890 the total capital for these two groups was \$3,005,380, or 97.3 per cent of the aggregate; in 1900 it was \$3,639,734, or 86.4 per cent of the aggregate, an increase of 21.1 per cent. In 1890 the value of products was \$4,127,585, or 97.9 per cent of the aggregate; in 1900 it was \$6,298,622, showing an increase of 52.6 per cent, although forming only 81.8 per cent of the aggregate value.

The growth of the industry outside of the New England and Middle states was chiefly in the manufacture of fresh-water pearl buttons and blanks—a branch of the industry, which, as already pointed out, requires a relatively small amount of capital per establishment. This explains why there was a greater reduction in the percentage of establishments reported for the New England and Middle states than in that of capital and products.

In 1900 New York held the first place in value of products, having displaced Massachusetts, which was first in 1890; Connecticut held the second place, New Jersey the third, Pennsylvania the fourth, Iowa the fifth, and Massachusetts the sixth. The number of establishments in New York increased from 7 in 1850 to 49 in 1900; and the value of products from \$64,600 to \$2,371,196.

The number of establishments in "all other states" was 3 in 1890, or 2.8 per cent of the aggregate; their capital was \$41,160, or 1.3 per cent of the aggregate; and the value of their products amounted to \$42,350, or 1 per cent of the aggregate. While the number of establishments reported at the census of 1900 was 11, an increase of 266.7 per cent, the capital had increased only 49.3 per cent, being 1.5 per cent of the aggregate, and the value of products increased only 66.2 per cent, forming nine-tenths of 1 per cent of the aggregate.

The New England states produced in 1900, 7,273,370 gross, or 27.3 per cent of the aggregate; the Middle states 11,898,171 gross, or 44.6 per cent; the Central states 7,233,893 gross, or 27.1 per cent; while all other divisions produced only 280,830 gross, or 1 per cent.

The centers of the different branches of the industry are located as follows:

- Bone buttons, Pennsylvania.
- Brass buttons, Connecticut, New York.
- Cloth buttons, Massachusetts.
- Composition buttons, Pennsylvania, New York.
- Fresh-water pearl button blanks, Iowa, Illinois.
- Fresh-water pearl buttons, New York, Iowa, Pennsylvania.
- Horn buttons, Connecticut.
- Ocean-pearl buttons, New York, New Jersey, Pennsylvania.
- Paper buttons, New Hampshire.
- Tin buttons, New Jersey.
- Vegetable ivory buttons, New York, Massachusetts, New Jersey.

Table 10 presents the kinds and value of buttons and button forms imported, 1891 to 1900, inclusive.

TABLE 10.—BUTTONS AND BUTTON FORMS, VALUE OF IMPORTS FOR CONSUMPTION, 1891 TO 1900, INCLUSIVE.<sup>1</sup>

KINDS.	1900	1899	1898	1897	1896	1895	1894	1893	1892	1891
Total.....	\$600,982	\$450,958	\$426,125	\$953,235	\$1,393,224	\$1,084,886	\$430,905	\$1,393,046	\$1,346,247	\$2,176,046
Agate buttons.....	103,745	81,102	53,736	229,083	240,410	195,737	130,138	191,538	161,848	322,003
Bone buttons.....	12,450	4,256	2,001	( <sup>2</sup> )						
Collar and cuff buttons and studs.....	156,576	131,081	113,896	( <sup>2</sup> )						
Glass buttons.....	27,937	39,701	5,725	31,221	132,553	66,463	8,843	51,022	104,676	( <sup>2</sup> )
Horn and vegetable ivory buttons.....	71,452	30,158	103,153	*259,599	*293,041	*267,456	*156,311	*471,075	*407,472	*175,343
Metal buttons, not specially provided for.....	58,189	64,348	29,738	110,428	295,293	79,749	41,098	195,696	139,728	( <sup>2</sup> )
Nickel bar buttons.....	1,044	821	400	( <sup>2</sup> )						
Pearl or shell buttons.....	36,262	24,239	36,557	259,278	332,210	375,886	38,234	275,216	292,332	100,001
Shoe buttons of paper, board, etc.....	425	549	2,004	8,333	12,285	12,614	2,552	7,703	12,100	6,811
Silk buttons.....	805	1,140	1,371	( <sup>2</sup> )	1,820	1,097	480	1,762	8,731	17,859
Trousers buttons:										
Steel.....	182	329	1,477	( <sup>2</sup> )						
Other metal.....	530	925	1,903	( <sup>2</sup> )						
Other buttons, not specially provided for.....	18,426	7,913	6,677	( <sup>2</sup> )						
Button forms, fastings, mohair cloth, silk, or other manufactures of cloth, made or cut in such manner as to be fit for buttons exclusively.....	112,059	64,181	67,487	55,293	85,612	85,534	52,299	199,034	225,360	599,843
Not specially provided for, not including brass, gilt, or silk buttons.....	( <sup>2</sup> )	954,181								

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

<sup>2</sup> Not reported separately.

<sup>3</sup> Includes values of bone buttons.

These imports were not classified until 1891. While the imports fell from \$3,899,132 in 1886 to \$3,155,500 in 1890, or only 19.1 per cent, the decrease from 1890 to 1900 was from \$3,155,500 to \$600,982, or 81 per cent. In 1886 and 1890 brass and gilt buttons were included under the manufactures of brass, and could not be separated. As they were included in the total for 1900, the decrease was in reality still larger than the above figures indicate.

The classification of button imports for 1891 was incomplete. The very large amount of "all other kinds" included metal, glass, and probably some pearl buttons, the value given under the separate heading "pearl buttons" being abnormally low. The importations of pearl buttons, which previous to 1891 constituted the largest part of the imports, had almost ceased in 1900. In this connection extracts from three reports of the United States consuls-general at Vienna, Austria, are interesting.

On December 30, 1887, Consul-General Jussen reported as follows: "The manufacture of pearl buttons is not an industry of the United States, and probably never will be. The reason why this industry can not thrive in the United States is quite obvious. Pearl

buttons can not be manufactured by machinery, but, owing to the brittle nature of the raw material, they must of necessity be made by hand. As this hand labor is performed at the low rate of from \$2 to \$2.80 per week, the competition of the American laborer is out of the question. The declared value of pearl buttons exported from Austria to the United States during the year 1886 amounted to \$1,681,747." On December 31, 1889, Consul-General Goldschmidt reported the exports of pearl buttons from Austria to the United States as follows: 1884, \$1,496,000; 1887, \$1,612,000; 1888, \$1,558,000; and 1889, \$1,352,000. Two years later, in 1891, the total importation of pearl buttons into the United States had fallen to \$100,001. In 1895 it was \$375,886, but in 1900 it amounted to only \$36,262. On April 29, 1898, Consul-General Hurst reported as follows: "The pearl button industry of Austria-Hungary, which in former years occupied a prominent place among the flourishing industries of the monarchy, has dwindled of late to such an insignificant figure that pearl buttons can no longer be regarded as one of the principal articles of export to the United States. This may be attributed to the development of the industry in the United States."

The principal kinds of buttons imported are agate

buttons, which are not manufactured in the United States; the higher grades of collar and cuff buttons; ivory buttons; and button coverings, including linen hanks and tufts. The importation of this last class decreased from \$599,848 in 1891 to \$112,959 in 1900, or 81.2 per cent. The importation of silk buttons had practically ceased. In 1886 it amounted to \$55,583, and in 1900 to \$805, or a decrease of 98.1 per cent.

Previous to 1890 there were no exports of buttons from the United States, but during the last few years considerable quantities have been sent abroad. The value of these exports can not be given, as they are not classified as buttons in the Treasury Department's schedule, but according to the material, or, in many instances, as "notions."

#### HISTORICAL AND DESCRIPTIVE.

The button, which to-day is one of the indispensable parts of civilized wearing apparel, is an article of comparatively modern invention. Its earliest appearance, in its modern application, is found in the time of Edward I. As a trade of any importance the making of buttons dates back no further than the reign of Elizabeth, when, in connection with the newly invented buttonhole, buttons were often used as a means of holding garments together. These buttons were wholly a product of needlework, with the exception of the wooden mold. A manufactory for the making of brass buttons was established at Birmingham, England, in 1689, and that city soon became the center of the industry, remaining so to this day. From that time buttons have been divided into three general classes: shank buttons, hole buttons, and covered buttons. As late as the beginning of the Nineteenth century covered buttons were made by hand by covering a wooden mold or form with the desired materials. This mode of manufacture was revolutionized by B. Sanders, a Dane, who emigrated to Birmingham after having lost all his property by the bombardment of Copenhagen in 1807. Mr. Sanders conceived the idea of making the button in two parts. Two disks or molds were made of sheet brass or tin. The upper disk, after having its edge turned up, was covered with cloth. The under disk, which was smaller than the upper and convex in shape, had a wire shank put inside. The material which was to keep this shank in place was inserted, and the two disks were pressed together, the turned edges interlocking, making a perfect button. A son of Mr. Sanders made the seemingly trivial, but, for practical purposes, very important improvement of substituting a canvas or cloth tuft for the metal shank. Though many improvements have been made in the process of manufacturing covered buttons, the principle of Mr. Sanders' invention has not been superseded.

It is stated that Casper Wistar manufactured brass buttons in Philadelphia prior to 1750.<sup>1</sup> This is the earliest mention of button manufacture in the United

<sup>1</sup>History of American Manufactures, by J. L. Bishop, Part I, page 574.

States. Soon after that Henry Witeman set up the manufacture of metal buttons near the Fly Market in New York.<sup>1</sup> Another pioneer was Benjamin Randolph, at the Golden Eagle, on Chestnut street, Philadelphia, who, toward the end of the Eighteenth century, manufactured wooden buttons "of apple, holly, and laurel wood, hard and clear," but as late as 1797 there were only two button factories in Philadelphia.<sup>2</sup> The soldiers of the Revolution wore metal buttons of prescribed patterns, but these were imported from France.

The first button factory in Waterbury, Conn.,—now the center of the metal-button industry—of which there is any record, was established just before 1800 by Henry, Samuel, and Silas Grilley.<sup>3</sup> Their buttons were made of block tin or pewter and cast iron molds. About 1800 great improvements were made in Europe in the making and attaching of shanks or eyes to metal buttons, and in 1802 the firm of Abel Porter & Co. was organized for the manufacture of metal buttons in Waterbury. It took this concern eighteen months to get started, and when ready for business it employed 13 men, of whom 4 were members of the firm. The copper was obtained by the purchase of old stills, teakettles, etc., which were cast into ingots and taken to an iron mill in Bradleyville to be rolled into sheets. These were afterwards finished at the button factory on a pair of rolls 2 inches wide, driven by horsepower. The capital of this concern had been exhausted during the long period of experiments, and the establishment soon changed hands. Little progress was made until 1820, when an Englishman, James Croft, who had a thorough knowledge of the business, was employed, and thereafter the development of the metal-button industry was comparatively rapid.

Metal buttons, whether oval or flat, are made from rolled brass plate. Originally the flat buttons were solid and struck out as blanks from a thick plate; the shank was soldered on afterwards, and the whole was then finished by gilding or silvering. Later, when Mr. Sanders' principle was applied in making metal buttons, the upper blank was driven by a heavy pressure into a die of hardened steel, which gave it the desired shape and pattern. The under blank was similarly pressed in another die, which also riveted the shank into the plate. The two dies were then pressed together and the button was complete except the finishing, which process was accomplished by electroplating.

The manufacture of covered buttons by machinery had not been attempted in the United States until about 1827. Samuel Williston was the founder of the industry. In his home at Easthampton, Mass., he and his wife commenced covering buttons by hand. By the gradual introduction of machinery the business grew, until about 1834 he associated with himself Joel and Josiah Hayden, of Haydenville, with the object of improving the machines. At first they met with failure, but later on, with the

<sup>2</sup>History of American Manufactures, by J. L. Bishop, Part I, page 575.

<sup>3</sup>Ibid., Part III, page 360.

assistance of Francis Sidney, who had worked in button factories in England, they succeeded in producing fairly good machinery. Inventors have been constantly introducing labor- and time-saving machinery, and to-day the greater part of the work is done automatically. At the present time nearly all the lastings and other parts used to cover the buttons are manufactured in the United States, but before 1892 they were imported from Europe.

Aaron Benedict started to manufacture ivory and horn buttons in Waterbury, Conn., about 1812. The raw material of the horn button is generally the hoofs of cattle. The hoofs are boiled in large kettles, which process softens them; then they are cut by machines into pieces, which other machines form into buttons. These go under a hydraulic press, which stamps the desired patterns upon them. Still different machines are used for boring holes and for polishing.

The vegetable ivory button industry was introduced into the United States in 1859, when A. W. Critchlow, an Englishman, started a factory at Leeds, Mass. The raw material is the seed of the fruit of *Phytelephas Macrocarpa*, a low-growing palm of South America; the principal shipping point for which is Colon, Colombia. The seed is commonly known as the ivory nut, and is about the size of a hen's egg. The albumen is close-grained and very hard, resembling the finest ivory in texture and color. These nuts are either cut in halves, from which the buttons are sawed out, or sawed in small blocks, from which the larger buttons are formed. The vegetable ivory is especially adapted to the application of colors. The methods of manufacture of the vegetable ivory buttons have changed very little since the time of its introduction here, but great progress has been made in the dyeing of the buttons in various colors and patterns, and also in the finish, and to-day the products of the home factories rival the European product. This branch of the industry ranks third.

In 1862 attempts were made in Newark, N. J., to manufacture composition buttons, but owing to mechanical difficulties which seemed insurmountable, the enterprise was soon abandoned. Twelve years later an attempt was made in New York City to start this industry, but, though more successful than the preceding ones, it had to be abandoned after one year. In 1875, however, Isaac Smith, of New York, associated himself with the Dickinson Hard Rubber Company, of Springfield, Mass., and this concern solved the mechanical difficulties and made the manufacture of composition buttons a success. These buttons, which closely resemble those manufactured from vegetable ivory, are made of plastic material, i. e., a mass which softens under the influence of heat and becomes hard when cold. The ingredients used are certain fossil and vegetable gums, combined with finely comminuted carbonate of lime, feldspar, mica, or kindred minerals. These ingredients are thoroughly mixed in steam-heated grinders. When the minerals are properly amalgamated with the gums, the mass is run off in sheets and allowed to cool. Later

these sheets are placed on hot platens, contact with which softens them, and facilitates cutting into strips of convenient form for placing in the dies.

Soon after 1875 a tremendous impetus was given to this branch of the button industry by the fashion, then coming into vogue, of trimming ladies' garments lavishly with buttons, not merely for fastening purposes but also for ornamentation. Such was the demand of the trade that the manufacturers were unable to supply it. This demand stimulated inventive genius, and several epoch-making inventions followed. Among these were the use of templates in making dies, invented by Charles R. Wickes and patented by him in 1877, and the pin plate to mold buttons with holes, invented by Mr. Wickes and Philip L. Sylvester and patented by them in 1878. Previous to this time all holes had to be bored by hand after the button had been molded. In 1880 hydraulic presses were introduced, and in 1882 one of the most progressive steps in the making of composition buttons was taken when the automatic button machine was invented by Mr. Sylvester. By the use of this machine the possible production of buttons was largely increased. The method of mixing and preparing the plastic material was greatly improved by another invention of Mr. Sylvester, as described in letters patent issued March, 1900. There are only 5 factories in the United States producing composition buttons, but 2 of them, located in Pennsylvania and New York, are among the largest in the world.

A peculiar branch of the button industry in the United States is the manufacture of campaign and society buttons, mostly from celluloid. Another kind which has been manufactured in large quantities during the last few years is the photo button. Buttons are also made from potatoes, and can not be distinguished from horn, ivory, and bone buttons save by a careful examination.<sup>1</sup> It is not commonly known that if the common Irish potato be treated with certain acids it becomes almost as hard as stone. A few years ago there was a factory in Brooklyn, N. Y., at which buttons, etc., were made from potatoes, but there is no record of its present existence. Buttons made from skim milk—casein—were introduced in London some years ago, and small quantities have been made in the United States. Buttons made from blood have also been on the market, and during the last decade buttons were made in Massachusetts from *Lamaniaria*, a brown seaweed. From the establishment of the United States Patent Office until the year 1900, 348 patents were granted for button machines and 1,355 for the making of buttons.

The most important branch of the button industry of to-day in the United States is the manufacture of pearl buttons. It embraces buttons made from mother-of-pearl and from the shells of the Unios, which are so abundant in the Mississippi River. In value the production of these varieties of buttons in 1900 formed 48.4 per cent of the product reported for the entire button industry (Table 7.) The making of buttons from

<sup>1</sup> Cole's Dictionary of Dry Goods.

mother-of-pearl was introduced into the United States on a small scale about 1855. At that time, and for many years thereafter, the shells were brought from China, but now the markets of the world are supplied principally from South Australia and from the South Sea Islands. The technical name for buttons made of mother-of-pearl is "ocean pearl," while those made from the shell of the Unio are called "fresh-water pearl" buttons. The higher grades of pearl buttons are still manufactured from the ocean shell, and the production of these far outranked that of all other kinds, constituting 30.2 per cent of the total value of buttons manufactured in the United States.

In 1890 there was not a single fresh-water pearl button made in the United States. In 1900 the making of these buttons constituted the second most important branch of the button industry. In Europe shells of the mussels found in rivers have been utilized for button making for the last fifty years. To Mr. J. F. Boepple, of Muscatine, Iowa, belongs the credit of having started the industry in the United States, and now it is the source of income for thousands of persons. In 1891 Mr. Boepple, who is a native of Hamburg, Germany, where he learned the trade of making pearl buttons, formed a partnership for the manufacture of buttons from the "Unio," or "niggerhead" shells, as they are called locally, which were banked up for miles along the river in front of Muscatine. After experimenting for some time this concern found the business unprofitable and it was dissolved. Nothing daunted, Mr. Boepple continued making the buttons, on a small scale, at his home. He finally organized a company which, by the process of manufacture and machinery utilized in Austria and Germany, succeeded in making the enterprise a success. The tools needed in the manufacture of shell buttons were of the simplest character, consisting, for the most part, of turning lathes worked by steam or foot power; consequently it was not long before the Mississippi River was lined with button factories all the way from Red Wing, Minn., to Louisiana, Mo. Muscatine, Iowa, became the center of this new industry. A few years ago there were more than 40 factories in that city for the cutting of blanks and for the making of buttons, but the tendency toward concentration has made itself felt, as has also the need of improved machinery and large capital to withstand the tremendous competition, and all along the river the smaller concerns are being eliminated. The difference in price between the ocean shells and the Unios has been an important factor in the development of the fresh-water button industry. A few years ago the mussel shells were delivered at the factories at about 50 to 60 cents per 100 pounds, while at the same time ocean shells were worth from \$30 to \$60 for the same quantity. In February, 1898, prices went up to \$18 to \$20 per ton for "niggerheads," but in July of the same year they were cheaper than ever before or since, selling at 30 cents per 100 pounds. The cheapest grade of ocean

shells are the Panama, which sell at 10½ cents per pound.

The improvements in machinery in recent years have been so rapid that some manufacturers have exchanged their machines three times in three years, each time practically reequipping the entire plants.

The following is a short résumé of the mode of making pearl buttons: After the mussels have been cooked and the meat removed, the shells are taken to the factories and stored in sheds. They are then sorted into three different sizes and soaked in barrels of water from three to six days to render them less brittle. They must be used while wet, otherwise they crumble under the saw. The next step is the cutting or sawing of the rough blanks. The shells are usually held with pliers while being cut, but some sawers hold them in their hands. The saws are hollow, cylindrical pieces of steel, 2 inches wide, and with a diameter corresponding to the size of the button. At one end these cylinders are provided with fine teeth; they are adjusted to lathes in which they revolve. As the sawer holds the shell against the saw, the blanks are cut out and passed back into the saw and saw holder and drop into a receiver. The next step is the dressing or grinding of the back of the blank to remove the skin and make an even surface. To accomplish this, each blank has to be held with the finger against a revolving emery wheel. Then comes the turning, by which the front of the button is given its form, including the central depression. When the holes are drilled the button is complete, with the exception of the polishing process, which brings out the natural luster which was lost in the grinding. It is this luster which gives the buttons their chief value. The polishing is effected by placing the buttons in bulk in large wooden tumblers or kegs, in which they are subjected to the action of a chemical fluid as the tumblers revolve. By mutual contact, combined with the effect of the fluid, the buttons become highly lustrous. Then they are washed, dried, and sorted into sizes and grades of quality. After being sewed on cards and packed in pasteboard boxes, the buttons are ready for the market.

The majority of the factories in the West do not finish the buttons, but merely cut the blanks. These are then sent to the factories in the East, which are supplied with improved machinery for the finishing of the buttons. Some of these Eastern factories formerly made buttons out of imported mother-of-pearl shells, but now their principal work is the finishing of the home product.

Notwithstanding the enormous progress this branch of the industry has made during the last five years, it is yet in its infancy. The only disquieting circumstance is the injudicious and wanton depredation of the shell deposits. The beds in front of Muscatine, Iowa, are already exhausted, and unless something is done to protect the mussels, it will not be long before the raw material for this industry will be exhausted.

Table 11 shows in detail the statistics relating to the manufacture of buttons as returned in 1900.

TABLE 11.—BUTTONS,

	United States.	California.	Connecticut.	Illinois.
1 Number of establishments .....	238	5	11	14
2 Established during the decade.....	186	5	1	13
3 Established during the census year .....	51			3
4 Capital:				
5 Total .....	\$4,212,568	\$6,487	\$532,178	\$53,493
6 Land .....	\$145,260		\$46,400	\$525
7 Buildings.....	\$433,268		\$96,000	\$1,450
8 Machinery, tools, and implements.....	\$1,310,442	\$725	\$164,728	\$14,271
9 Cash and sundries.....	\$2,323,598	\$5,762	\$225,050	\$37,247
Proprietors and firm members .....	267	6	10	15
10 Salaried officials, clerks, etc.:				
11 Total number .....	339	1	24	14
Total salaries.....	\$296,358	\$1,200	\$30,812	\$7,629
12 Officers of corporations:				
13 Number .....	51		4	
Salaries.....	\$76,966		\$9,000	
14 General superintendents, managers, clerks, and salesmen:				
15 Total number .....	288	1	20	14
16 Total salaries.....	\$219,392	\$1,200	\$21,812	\$7,629
17 Men:				
Number .....	235		16	13
18 Salaries.....	\$196,625		\$20,248	\$7,213
19 Women:				
Number .....	53	1	4	1
20 Salaries.....	\$22,767	\$1,200	\$1,564	\$416
21 Wage-earners, including pieceworkers, and total wages:				
22 Greatest number employed at any one time during the year .....	10,490	6	876	314
23 Least number employed at any one time during the year .....	7,708	6	668	264
24 Average number .....	8,685	6	800	272
25 Wages .....	\$2,826,238	\$988	\$305,687	\$101,039
26 Men, 16 years and over:				
27 Average number .....	4,086		305	210
28 Wages .....	\$1,753,133		\$169,763	\$86,174
29 Women, 16 years and over:				
30 Average number .....	4,131	2	460	48
31 Wages .....	\$997,857	\$336	\$132,018	\$11,302
32 Children, under 16 years:				
33 Average number .....	468	4	35	14
34 Wages .....	\$75,248	\$652	\$3,906	\$3,563
35 Average number of wage-earners, including pieceworkers, employed during each month:				
36 Men, 16 years and over:				
37 January .....	4,216		270	229
38 February .....	4,271		306	219
39 March .....	4,363		291	226
40 April .....	4,401		304	242
41 May .....	4,271		311	219
42 June .....	3,766		311	191
43 July .....	3,707		296	194
44 August .....	3,837		307	189
45 September .....	3,908		318	192
46 October .....	4,042		317	197
47 November .....	4,121		314	201
48 December .....	4,129		312	221
49 Women, 16 years and over:				
50 January .....	4,071	2	383	51
51 February .....	4,136	2	463	51
52 March .....	4,299	2	448	51
53 April .....	4,330	2	469	51
54 May .....	4,196	2	487	47
55 June .....	4,068	2	475	47
56 July .....	3,880	2	426	47
57 August .....	3,950	2	443	47
58 September .....	4,068	2	485	47
59 October .....	4,207	2	487	47
60 November .....	4,259	2	482	47
61 December .....	4,108	2	472	47
62 Children, under 16 years:				
63 January .....	459	4	31	14
64 February .....	449	4	35	14
65 March .....	450	4	36	14
66 April .....	478	4	37	14
67 May .....	462	4	39	14
68 June .....	475	4	34	14
69 July .....	455	4	34	14
70 August .....	458	4	36	14
71 September .....	477	4	36	14
72 October .....	492	4	36	14
73 November .....	493	4	34	14
74 December .....	468	4	37	14
75 Miscellaneous expenses:				
76 Total .....	\$393,862	\$1,277	\$117,643	\$11,329
77 Rent of works.....	\$84,279	\$635	\$3,979	\$3,487
78 Taxes, not including internal revenue.....	\$14,436	\$50	\$3,681	\$95
79 Rent of offices, interest, insurance, and all sundry expenses not hitherto included.....	\$207,107	\$592	\$87,751	\$7,747
80 Contract work .....	\$88,040		\$72,232	
81 Materials used:				
82 Total cost .....	\$2,803,246	\$2,795	\$430,187	\$66,213
83 Principal materials .....	\$2,386,696	\$2,567	\$287,404	\$60,824
84 Fuel .....	\$46,665	\$2	\$9,462	\$2,023
85 Rent of power and heat.....	\$33,375	\$48	\$1,898	\$530
86 Mill supplies .....	\$31,728	\$10	\$2,034	\$714
87 All other materials.....	\$252,496	\$138	\$120,709	\$1,350
88 Freight .....	\$52,236	\$30	\$8,680	\$772
89 Products:				
90 Aggregate value .....	\$7,695,910	\$8,870	\$1,087,235	\$242,444
91 Buttons:				
92 Total number of gross.....	21,254,018	23,570	4,668,359	220,155
93 Total value .....	\$6,467,373	\$7,250	\$360,308	\$101,640
94 Bone:				
95 Gross .....	297,180	2,500		
96 Value .....	\$137,401	\$500		
97 Cloth:				
98 Gross .....	1,872,870	20,600	232,141	57,700
99 Value .....	\$468,121	\$6,750	\$55,990	\$10,740

<sup>1</sup>Includes establishments distributed as follows: Arkansas, 1; Kentucky, 1; Maryland, 2; Michigan, 2; Minnesota, 2; Nebraska, 2; New Hampshire, 1.

BY STATES: 1900.

Iowa.	Massachusetts.	Missouri.	New Jersey.	New York.	Ohio.	Pennsylvania.	Rhode Island.	Wisconsin.	All other states.	
53	13	11	34	49	4	21	3	9	11	1
53	5	11	25	34	4	13	2	9	11	2
22	1	6	2	6	4	2	1	5	3	3
\$824,315	\$626,439	\$39,495	\$509,681	\$1,195,343	\$49,645	\$557,488	\$29,116	\$84,499	\$254,389	4
\$15,685	\$33,800	\$600	\$6,250	\$13,100		\$24,500		\$1,300	\$3,100	5
\$24,991	\$105,300	\$3,150	\$34,672	\$46,900		\$47,580		\$4,595	\$68,630	6
\$111,727	\$122,669	\$12,188	\$154,036	\$395,107	\$15,500	\$200,052	\$20,500	\$12,539	\$86,400	7
\$171,912	\$364,670	\$23,557	\$314,723	\$740,236	\$31,145	\$235,356	\$8,616	\$16,065	\$96,259	8
61	12	15	43	48	5	30	2	9	11	9
42	19	4	53	105	7	42	4	4	20	10
\$26,306	\$31,164	\$1,236	\$50,299	\$83,135	\$4,786	\$39,152	\$2,464	\$1,425	\$16,690	11
5	4		8	13	1	7		3	6	12
\$5,120	\$13,900		\$13,025	\$14,216	\$2,500	\$11,760		\$1,825	\$6,120	13
37	15	4	45	92	6	35	4	1	14	14
\$21,186	\$17,264	\$1,236	\$37,271	\$68,979	\$2,286	\$27,392	\$2,464	\$100	\$10,570	15
33	9	1	42	77	5	25	2	1	16	16
\$20,288	\$15,200	\$300	\$36,213	\$62,547	\$1,870	\$22,332	\$1,564	\$100	\$8,750	17
4	6	3	3	15	1	10	2		3	18
\$898	\$2,064	\$936	\$1,061	\$6,432	\$416	\$5,060	\$300		\$1,820	19
1,892	871	148	1,363	3,184	109	1,273	62	150	242	20
1,303	772	118	956	2,292	68	1,074	19	106	157	21
1,402	772	83	1,169	2,647	72	1,140	28	106	188	22
\$458,086	\$276,202	\$23,881	\$110,056	\$312,978	\$18,268	\$321,473	\$8,501	\$32,108	\$56,971	23
887	302	58	551	1,157	29	347	19	74	147	24
\$361,062	\$141,049	\$19,133	\$258,119	\$464,518	\$10,504	\$166,892	\$5,730	\$26,088	\$41,101	25
411	443	21	544	1,349	40	711	9	26	37	26
\$86,550	\$131,929	\$1,220	\$135,610	\$326,130	\$7,140	\$141,601	\$2,771	\$5,830	\$12,370	27
74	27	4	74	141	3	82		6	4	28
\$10,474	\$3,224	\$528	\$16,327	\$22,330	\$624	\$12,080		\$140	\$500	29
1,616	296	76	507	1,185	31	355	16	89	146	30
988	292	80	535	1,214	31	357	25	90	134	31
1,005	295	98	550	1,224	31	371	34	85	155	32
939	300	97	555	1,281	31	356	22	85	159	33
890	298	87	550	1,248	34	355	17	90	172	34
749	291	40	519	1,052	27	336	11	67	142	35
797	303	21	531	1,024	27	325	11	44	134	36
801	296	21	538	1,118	27	334	21	50	135	37
800	304	36	580	1,105	27	338	16	61	131	38
841	318	46	581	1,146	28	338	16	71	143	39
898	313	51	575	1,159	28	348	13	74	147	40
919	319	51	556	1,129	28	348	20	76	150	41
442	456	24	518	1,402	35	693	6	24	35	42
342	457	27	562	1,384	38	744	10	25	31	43
420	446	27	564	1,401	47	812	18	26	37	44
427	463	23	573	1,419	53	763	21	27	39	45
463	446	21	498	1,414	65	684	8	26	35	46
432	448	24	537	1,314	35	688	3	27	36	47
450	457	9	504	1,206	35	681	4	24	35	48
458	434	9	518	1,232	35	704	11	23	34	49
454	443	13	540	1,298	36	683	7	27	33	50
471	428	13	571	1,387	34	694	8	28	37	51
479	426	27	582	1,399	34	703	9	27	42	52
452	413	31	556	1,335	34	683	7	28	48	53
73	24	4	76	139	2	82		6	4	54
67	25	4	77	127	2	84		6	4	55
72	26	4	73	126	2	83		6	4	56
71	28	4	75	154	2	80		6	3	57
71	26	4	66	139	6	83		6	4	58
76	23	3	68	150	4	84		6	4	59
76	30	3	73	125	4	82		6	4	60
76	26	3	74	131	2	83		6	3	61
76	29	3	80	143	2	80		6	4	62
82	28	3	84	150	2	79		6	4	63
77	28	4	79	159	2	82		6	4	64
73	30	4	67	148	2	79		6	4	65
\$37,252	\$27,505	\$10,788	\$37,879	\$110,717	\$5,701	\$17,683	\$4,393	\$1,830	\$9,865	66
\$4,624	\$4,176	\$2,640	\$16,521	\$35,932	\$1,470	\$7,715	\$1,400	\$480	\$1,220	67
\$1,255	\$5,392	\$74	\$1,458	\$863	\$98	\$1,233		\$58	\$209	68
\$26,753	\$17,777	\$7,374	\$19,900	\$63,322	\$4,163	\$8,555	\$2,993	\$1,292	\$8,388	69
\$4,620	\$160	\$200		\$10,600		\$180			\$48	70
\$196,842	\$237,835	\$26,679	\$398,616	\$943,432	\$20,946	\$403,106	\$9,040	\$18,751	\$48,804	71
\$162,545	\$193,278	\$22,233	\$353,452	\$859,698	\$18,204	\$372,631	\$3,170	\$13,788	\$31,852	72
\$7,598	\$7,180	\$1,273	\$4,920	\$7,665	\$25	\$1,861	\$60	\$1,344	\$3,252	73
\$5,434	\$1,539	\$177	\$5,342	\$11,733	\$770	\$4,770	\$300	\$396	\$488	74
\$6,981	\$4,705	\$257	\$2,237	\$7,673	\$90	\$1,733	\$200	\$303	\$4,691	75
\$8,850	\$27,403	\$2,194	\$29,593	\$41,746	\$1,515	\$11,542	\$310	\$2,162	\$4,984	76
\$5,434	\$3,730	\$495	\$3,022	\$14,917	\$342	\$10,519		\$758	\$3,587	77
\$666,538	\$681,081	\$65,449	\$1,025,544	\$2,371,196	\$58,873	\$999,355	\$33,589	\$63,125	\$172,611	78
1,265,363	2,127,845	97,060	2,155,025	6,779,482	123,372	2,963,664	114,200	69,450	638,953	79
\$395,815	\$674,655	\$43,896	\$979,828	\$2,298,796	\$57,508	\$349,973	\$29,029	\$33,434	\$134,741	80
		1,520		32,280		260,880				81
		\$547		\$19,366		\$116,983				82
	584,810	6,125	170,000	150,000	12,000	172,344	2,000		15,150	83
	\$281,562	\$2,205	\$43,000	\$64,000	\$1,500	\$49,344	\$1,000		\$3,030	84

TABLE 11.—BUTTONS,

	United States.	California.	Connecticut.	Illinois.
Products—Continued.				
Aggregate value—Continued.				
Buttons—Continued.				
Total value—Continued.				
Composition:				
85	Gross .....	2,407,819		
86	Value .....	\$246,410		
Horn:				
87	Gross .....	717,047	306,867	
88	Value .....	\$237,874	\$173,405	
Metal:				
Brass:				
89	Gross .....	3,713,144		2,995,784
90	Value .....	\$739,922		\$449,373
All other metal:				
91	Gross .....	1,046,627		15,000
92	Value .....	\$147,699		\$22,000
Pearl, fresh-water:				
93	Gross .....	4,308,584		137,000
94	Value .....	\$1,176,285		\$37,500
Pearl, ocean:				
95	Gross .....	4,049,452		4,900
96	Value .....	\$1,951,558		\$7,400
Vegetable ivory:				
97	Gross .....	2,661,623	470	744,467
98	Value .....	\$1,144,677	\$1,000	\$160,127
All other kinds:				
99	Gross .....	680,072		12,000
100	Value .....	\$217,526		\$4,000
Blanks, fresh-water pearl:				
101	Gross .....	5,432,246		680,943
102	Value .....	\$656,086		\$134,104
103	Value of all other products .....	\$372,501	\$1,620	\$226,427
Comparison of products:				
104	Number of establishments reporting for both years .....	154	4	10
105	Value for census year .....	\$6,671,943	\$6,870	\$1,060,159
106	Value for preceding business year .....	\$5,492,921	\$5,215	\$1,020,879
Power:				
107	Number of establishments reporting .....	201	1	11
108	Total horsepower .....	4,235	1	546
Owned:				
Engines:				
Steam:				
109	Number .....	70		8
110	Horsepower .....	2,305		310
Gas or gasoline:				
111	Number .....	28		3
112	Horsepower .....	263		20
Water wheels:				
113	Number .....	8		3
114	Horsepower .....	144		45
Electric motors:				
115	Number .....	6		3
116	Horsepower .....	70		55
Other power:				
117	Number .....	1		
118	Horsepower .....	25		
Rented:				
119	Electric horsepower .....	117	1	20
120	All other horsepower .....	1,811		116
121	Furnished to other establishments, horsepower .....	99		
Establishments classified by number of persons employed, not including proprietors and firm members:				
122	Total number of establishments .....	238	5	11
123	No employees .....	1	1	
124	Under 5 .....	35	4	
125	5 to 20 .....	78		2
126	21 to 50 .....	59		4
127	51 to 100 .....	37		3
128	101 to 250 .....	22		1
129	251 to 500 .....	6		1



Twelfth Census of the United States.

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# CENSUS BULLETIN.

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No. 178.

WASHINGTON, D. C.

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## MANUFACTURES.

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### WATCHES AND WATCH CASES.

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Hon. WILLIAM R. MERRIAM,

*Director of the Census.*

SIR: I transmit herewith, for publication in bulletin form, a report on the manufacture of watches and watch cases for the census year 1900, prepared under my direction by Mr. William A. Countryman, of the Census Office.

The statistics included in the report were collected, as in previous censuses, upon the schedules used for the general statistics of manufactures. At no census has the manufacture of watches and watch cases been the subject of a special report, except that in 1880 a study of the manufacture of watches was presented in a report on manufactures of interchangeable mechanism. As 1900 virtually completed a half century of the systematic and continuous manufacture of machine-made watches in the United States (and, therefore, in the world), it was decided to supplement the ordinary presentation of statistics with a special report, setting forth the important features of the industry and giving a concise history of its rise and progress.

The statistics are presented in 17 tables. Table 1 is a summary for the combined manufacture of watches and watch cases for 1900; Table 2 presents comparative statistics for watches only, from 1870 to 1900, inclusive; Table 3 is a summary of watch manufacture by states for 1900; Table 4 shows the geographical distribution of watch establishments, and the increase or decrease during the decade 1890 to 1900; Table 5 is a comparative summary of capital invested in watchmaking for

1890 and 1900; Table 6 is a summary of miscellaneous expenses for watches for 1900; Table 7 shows the cost of the various materials used for watches, 1900; Table 8 presents the kind, quantity, and value of products of watch establishments for 1900; Table 9 is a detailed summary for watches by states for 1900; Table 10 presents comparative statistics for watch cases only, from 1870 to 1900, inclusive; Table 11 is a summary for watch cases by states for 1900; Table 12 shows the geographical distribution of watch-case establishments, 1890 and 1900, and the increase or decrease during the decade; Table 13 is a comparative summary of capital invested in watch-case making for 1890 and 1900; Table 14 is a summary of miscellaneous expenses for watch cases for 1900; Table 15 shows the cost of the various materials used for watch cases in 1900; Table 16 presents the kind, quantity, and value of products of watch-case establishments for 1900; and Table 17 is a detailed summary for watch cases by states for 1900.

Tables 2 and 10 show the growth of the industry for the thirty years which terminate with the Twelfth Census. As regards watchmaking, the manufacturing statistics of the censuses prior to 1870 were too imperfect and fragmentary in character to make it proper to reproduce them in such a table as a measure of the growth of the industry. Owing to changes in the method of taking the census, comparisons between the earlier and later decades, represented in Tables 2 and 10, should be drawn only in the most general way. Nevertheless, the rate of growth in the manufacture of watches

and watch cases may be fairly inferred from the figures given.

In drafting the schedules of inquiry for the census of 1900 care was taken to preserve the basis of comparison with prior censuses. Comparison may be made safely with respect to all the items of inquiry except those relating to capital, salaried officials, clerks, etc., and their salaries, the average number of employees, and the total amount of wages paid. Live capital, that is, cash on hand, bills receivable, unsettled ledger accounts, raw materials, stock in process of manufacture, finished products on hand, and other sundries, was first called for at the census of 1890. No definite attempt was made, prior to the census of 1890, to secure a return of live capital invested.

Changes were made in the inquiries relating to employees and wages in order to eliminate defects found to exist on the form of inquiry adopted in 1890. At the census of 1890 the average number of persons employed during the entire year was called for, and also the average number employed at stated weekly rates of pay, and the average number was computed for the actual time the establishments were reported as being in operation. At the census of 1900 the greatest and least numbers of employees were reported, and also the average number employed during each month of the year. The average number of wage-earners (men, women, and children) employed during the entire year was ascertained by using 12, the number of calendar months, as a divisor into the total of the average numbers reported for each month. This difference in the method of ascertaining the average number of wage-earners during the entire year may have resulted in a variation in the number, and should be considered in making comparisons.

At the census of 1890 the number and salaries of proprietors and firm members actively engaged in the business or in supervision were reported, combined with clerks and other officials. In cases where proprietors and firm members were reported without salaries, the amount that would ordinarily be paid for similar services was estimated. At the census of 1900 only the number of proprietors and firm members actively engaged in the industry or in supervision was ascer-

tained, and no salaries were reported for this class. It is, therefore, impossible to compare the number and salaries of salaried officials of any character for the two censuses.

Furthermore, the schedules for 1890 included in the wage-earning class, overseers, foremen, and superintendents (not general superintendents or managers), while the census of 1900 separates from the wage-earning class such salaried employees as general superintendents, clerks, and salesmen. It is possible and probable that this change in the form of the question has resulted in eliminating from the wage-earners, as reported by the present census, many high-salaried employees included in that group for the census of 1890.

The reports show a capital of \$22,754,483 invested in the manufacture of watches and watch cases in the 43 establishments reporting for the United States. This sum represents the value of land, buildings, machinery, tools, and implements, and the live capital utilized, but does not include the capital stock of any of the manufacturing corporations engaged in this industry. The value of the products is returned at \$14,606,571, to produce which involved an outlay of \$583,815 for salaries of officials, clerks, etc.; \$5,511,570 for wages; \$889,982 for miscellaneous expenses, including rent, taxes, etc.; and \$5,684,965 for materials used, mill supplies, freight, and fuel. It is not to be assumed, however, that the difference between the aggregate of these sums and the value of the products is, in any sense, indicative of the profits in the manufacture of watches and watch cases during the census year. The census schedule takes no cognizance of the cost of selling manufactured articles, or of interest on capital invested, or of the mercantile losses incurred in the business, or of depreciation in plant. The value of the product given is the value as obtained or fixed at the works. This statement is necessary in order to avoid erroneous conclusions from the figures presented.

Very respectfully,



*Chief Statistician for Manufactures.*

# WATCHES AND WATCH CASES.

By WILLIAM A. COUNTRYMAN.

The first systematic manufacture of watch movements in the world, by machinery, began in the United States in 1851, and of watch cases shortly afterwards. The census of 1900, therefore, was taken at substantially the completion of a half century in the history of this remarkable revolution, during which automatic machinery for the most delicate operations has been brought forward toward perfection in a more wonderful degree, perhaps, than in any other manufacture. A review of the manufacture is, therefore, of unusual interest at this time.

Unfortunately, early methods of census taking were not as accurate as those of to-day. At the census of 1860 the manufacture of watches was classified with "watches, watch repairing, and materials" for the United States, although occasionally for a state it was classified separately. It is a matter of regret that even in such a state it is impossible to trace the industry statistically, the establishments being fewer than three in number. Massachusetts, which was the pioneer in the manufacture, and which produces watch movements in greater quantity and value than any other state, was, for instance, necessarily included under "all other states" at the census of 1900, as at certain other censuses. Only those familiar with the industry know that Massachusetts has always led in the manufacture of watches. Illinois, which appears first among the states shown separately, is second, a position it has occupied for years. The manufacture of watch cases is most largely carried on in the states of New York, Pennsylvania, and New Jersey. The first statistics available for comparative purposes, either for watches or watch cases, are those of the census of 1870.

The census manufacturing classification of watches comprises those establishments of which watch movements are either the whole or the principal product. A watch is technically the movement and the case together, but the corporations owning and operating watch-movement factories are legally and commercially known as watch companies. Moreover, the two classifications of watches and watch cases, long known to the Census Office, are convenient and not wholly inaccurate, for the movement has been denominated the "watch proper." In order, however, to present a complete survey of watch manufacture, it is necessary to give the combined statistics for watches and watch

cases. This is done in Table 1, which is the summary for 1900.

TABLE 1.—WATCHES AND WATCH CASES: SUMMARY FOR THE UNITED STATES, 1900.

	Total.	Watches.	Watch cases.
Number of establishments .....	48	13	30
Capital:			
Total .....	\$22,354,483	\$14,235,191	\$8,119,292
Land .....	\$1,001,236	\$572,051	\$429,185
Buildings .....	\$2,298,869	\$1,686,544	\$612,325
Machinery, tools, and imple- ments .....	\$6,885,504	\$5,405,472	\$1,480,032
Cash and sundries .....	\$12,168,874	\$6,571,124	\$5,597,750
Salaried officials, clerks, etc., number .....	400	165	235
Salaries .....	\$583,815	\$294,449	\$289,366
Wage-earners, average number .....	10,787	6,880	3,907
Total wages .....	\$5,511,570	\$3,586,723	\$1,924,847
Miscellaneous expenses .....	\$889,982	\$572,080	\$317,902
Cost of materials used .....	\$5,684,965	\$1,291,318	\$4,393,647
Value of products .....	\$14,606,571	\$6,822,611	\$7,783,960

## WATCHES.

The analysis of the statistics shown in the tables under this head is really an analysis of the manufacture of watch movements. Table 2 is a comparative summary from 1870 to 1900, inclusive, with the percentages of increase for each decade.

TABLE 2.—WATCHES: COMPARATIVE SUMMARY, 1870 TO 1900, WITH PER CENT OF INCREASE FOR EACH DECADE.

	DATE OF CENSUS.				PER CENT OF INCREASE.		
	1900	1890	1880	1870	1890 to 1900	1880 to 1890	1870 to 1880
Number of establishments .....	18	19	11	37	31.6	72.7	70.8
Capital .....	\$14,235,191	\$10,106,114	\$4,144,327	\$2,666,133	40.9	143.9	55.4
Salaried officials, clerks, etc., number .....	165	280	(3)	(3)	103.3	.....	.....
Salaries .....	\$294,449	\$101,119	(3)	(3)	191.2	.....	.....
Wage-earners, average number .....	6,880	6,595	3,346	1,816	4.3	97.1	84.3
Total wages .....	\$3,586,723	\$3,587,808	\$1,712,276	\$1,304,304	(4)	109.5	31.3
Men, 16 years and over .....	3,381	3,935	2,127	1,202	114.1	85.0	77.0
Wages .....	\$2,247,617	\$2,575,068	(3)	(3)	112.7	.....	.....
Women, 16 years and over .....	3,473	2,640	1,219	592	31.6	116.6	105.9
Wages .....	\$1,336,332	\$1,007,300	(3)	(3)	32.7	.....	.....
Children, under 16 years .....	26	20	.....	22	30.0	.....	.....
Wages .....	\$2,774	\$5,400	.....	(3)	148.6	.....	.....
Miscellaneous expenses .....	\$572,080	\$783,404	(3)	(3)	122.0	.....	.....
Cost of materials used .....	\$1,291,318	\$995,740	\$982,224	\$412,783	29.7	1.4	138.0
Value of products .....	\$6,822,611	\$6,051,066	\$3,271,244	\$2,819,080	12.8	85.0	16.0

<sup>1</sup> Decrease.  
<sup>2</sup> Includes proprietors and firm members, with their salaries; number only reported in 1900.  
<sup>3</sup> Not reported separately.  
<sup>4</sup> Less than one-tenth of 1 per cent decrease.  
<sup>5</sup> Not reported.

The value of products as shown in Table 2 is not large compared with such values in manufactures of articles of less durability, or of greater necessity, but the increase of \$4,003,531, or 142 per cent, during the last thirty years, notwithstanding the fall in prices, is noticeable. It will be observed that the period of greatest absolute increase, as well as the greatest percentage of increase, was during the decade from 1880 to 1890. The average number of women employed has gradually increased and the number of men has gradually decreased, which is explainable by the increasing adaptability of women to the delicate operations of automatic machinery and to the assembling of the parts. There are practically no children employed in the industry. The table shows 26 in the entire United States in 1900. In some of the larger factories, making the higher grade movements, there were none. The amount paid in wages in 1900 was 52.6 per cent of the value of the products; but a better way of showing the large proportionate amount of labor expended upon the manufacture is to state that, of the total cost of materials used and wages paid, wages constituted 73.5 per cent. The diminution in the number of establishments during the thirty years from 1870 was 64.9 per cent, the greatest part of which was shown at the census of 1880. At the following census there was an increase, and at the census of 1900 there was a decrease.

Table 3 is a summary by states for 1900.

TABLE 3.—WATCHES: SUMMARY BY STATES, 1900.

	United States.	Illinois.	New Jersey.	All other states. <sup>1</sup>
Number of establishments.....	18	3	3	7
Capital:				
Total.....	\$14,235,191	\$3,353,411	\$910,592	\$6,971,188
Land.....	\$572,051	\$340,000	\$76,051	\$156,000
Buildings.....	\$1,086,544	\$312,518	\$155,125	\$718,901
Machinery, tools, and implements.....	\$5,405,472	\$2,548,581	\$336,410	\$2,520,481
Cash and sundries.....	\$6,571,124	\$2,652,812	\$343,006	\$3,575,806
Salaries:				
number.....	165	56	14	95
Salaries.....	\$294,449	\$60,266	\$35,026	\$190,157
Wage-earners, average number.....	6,880	2,578	525	3,777
Total wages.....	\$3,586,723	\$1,334,152	\$261,135	\$1,941,436
Wages:				
Men, 16 years and over.....	3,381	1,275	289	1,817
Women, 16 years and over.....	\$2,247,617	\$857,277	\$190,255	\$1,200,085
Wages.....	3,473	1,303	210	1,960
Children, under 16 years.....	\$1,336,332	\$526,875	\$68,106	\$741,351
Wages.....	26	26	26	26
Miscellaneous expenses.....	\$2,774	\$119,040	\$95,473	\$57,567
Cost of materials used.....	\$572,050	\$119,040	\$95,473	\$57,567
Value of products.....	\$1,201,818	\$240,392	\$134,259	\$910,687
Value of products.....	\$6,822,611	\$1,839,792	\$551,444	\$4,431,375

<sup>1</sup> Includes establishments distributed as follows: Connecticut, 1; Massachusetts, 2; New York, 1; Ohio, 2; Pennsylvania, 1.

The apparent center of the manufacture is the state of Illinois, but the statistics included under "all other states" are mostly those of Massachusetts, which is really the principal center. This table shows that the 26 children employed in the industry were all in New Jersey. The percentage of wages to total wages and materials was largest in Illinois.

The distribution of establishments by geographical divisions and states for 1890 and 1900, and the increase

or decrease, with the number established since 1890, are shown in Table 4.

TABLE 4.—WATCHES: NUMBER OF ESTABLISHMENTS, 1890 AND 1900, AND INCREASE DURING THE DECADE, BY GEOGRAPHICAL DIVISIONS AND STATES.

STATES.	1900	1890	Increase.
United States.....	18	19	16
New England states.....	3	3	.....
Massachusetts.....	2	2	.....
Connecticut.....	1	1	.....
Middle states.....	5	10	15
New York.....	1	7	16
New Jersey.....	3	2	1
Pennsylvania.....	1	1	.....
Central states.....	5	6	11
Ohio.....	2	2	.....
Illinois.....	3	4	11

<sup>1</sup> Decrease.

The net decrease of establishments is shown principally in the Middle states, but for that same group the returns show that two factories were established during the decade. The New England states had neither gain nor loss, and the Central states lost one. This is in accord with the tendency toward concentration in a manufacture where the capital must be large, owing to the costly character of the machinery.

A comparative summary of the capital, in its several subdivisions, with percentages of increase and of the total for each decade, for 1890 and 1900, is presented in Table 5.

TABLE 5.—WATCHES: COMPARATIVE SUMMARY, CAPITAL, 1890 AND 1900.

	1900		1890		Per cent of increase.
	Amount.	Per cent of total.	Amount.	Per cent of total.	
Total.....	\$14,235,191	100.0	\$10,106,114	100.0	40.9
Land.....	572,051	4.0	679,971	6.7	15.9
Buildings.....	1,086,544	11.8	1,554,510	15.4	8.5
Machinery, tools, and implements.....	5,405,472	38.0	2,706,786	26.8	99.7
Cash and sundries.....	6,571,124	46.2	5,164,897	51.1	27.2

<sup>1</sup> Decrease.

The investment in land, as in buildings and in live capital, was a much less proportion of the total in 1900 than in 1890, but the proportion of the value of machinery, tools, and implements was much greater. In this item also was the greatest increase, showing in part the importance and costliness of automatic machinery and the necessity of its frequent replacement with even more ingenious mechanisms. The slight valuation of land is an indication of the suburban location of the manufacture.

The miscellaneous expenses can not be divided for 1890, but they are divided for 1900 in Table 6.

TABLE 6.—WATCHES: MISCELLANEOUS EXPENSES, 1900.

	Amount.	Per cent of total.
Total .....	\$572,080	100.0
Rent of works .....	300	( <sup>1</sup> )
Taxes, not including internal revenue .....	90,300	15.8
Rent of offices, insurance, interest, repairs, advertising, and other sundries .....	481,480	84.2

<sup>1</sup> Less than one-tenth of 1 per cent.

Naturally, in an industry that must be housed in expensive buildings of a peculiar construction, the expenditure for rent was so small as hardly to be measured statistically. There was no expenditure for contract work, also a natural condition in a manufacture where there is such extensive use of automatic machinery requiring the most careful supervision. The amount for rent of offices, etc., includes a large sum for advertising, which is an essential of the successful manufacture.

An analysis of the cost of materials used in 1900,

with a showing, broadly, of their character, is found in Table 7.

TABLE 7.—WATCHES: COST OF MATERIALS, 1900.

	Amount.	Per cent of total.
Total .....	\$1,291,318	100.0
Purchased in partially manufactured form <sup>1</sup> .....	1,214,770	94.1
Fuel .....	57,292	4.4
Rent of power and heat .....	171	( <sup>2</sup> )
Freight .....	19,085	1.5

<sup>1</sup> Includes mill supplies and all other materials, which are shown separately in Table 9.

<sup>2</sup> Less than one-tenth of 1 per cent.

In the manufacture of watches the component materials used are wholly of the partly manufactured kind, such as brass, silver, steel, and other metals or alloys. Under the broad classification of materials used are fuel, rent of power and heat, and freight. Of the aggregate cost of all materials, the partly manufactured was 94.1 per cent.

Table 8, one of the most interesting of the series, is a summary, by states, of the kind, quantity, and value of the products of watch factories for 1900.

TABLE 8.—WATCHES: KIND, QUANTITY, AND VALUE OF PRODUCTS, BY STATES, 1900.

STATES.	Aggregate value.	WATCH MOVEMENTS.		WATCH CASES.								All other products.		
		Number.	Value.	Total.		Silver.		Gold filled.		Silverene.			Other varieties.	
				Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.		Number.	Value.
United States.....	\$6,822,611	1,825,769	\$6,036,240	296,424	\$395,259	25,271	\$75,813	38,229	\$191,145	209,246	\$104,623	23,678	\$23,678	\$301,112
Illinois .....	1,839,792	505,468	1,834,328											5,464
New Jersey .....	551,444	308,421	473,181											78,233
All other states <sup>1</sup> .....	4,431,375	1,011,880	3,728,731	296,424	395,259	25,271	75,813	38,229	191,145	209,246	104,623	23,678	23,678	307,385

<sup>1</sup> Includes establishments distributed as follows: Connecticut, 1; Massachusetts, 2; New York, 1; Ohio, 2; Pennsylvania, 1.

According to the statistics given in this table the average value, at the shop or factory, of the watch movements made in the United States was \$3.31. The combined states included in "all other states" show an average of \$3.68, which is practically that of Massachusetts. Illinois shows an average of \$3.63, and New Jersey only \$1.53. There are other elements of cost before the movement gets to the jobber and retailer; and many additional also in the value of the complete watch, with case, before it reaches the final purchaser. Machine processes have greatly reduced the cost, while, at the same time, the accuracy of the watch has been constantly improved. In addition to the watch movements shown in this table, 298,207, valued at \$725,695, were made in other than watch factories, and reported

as by-products, raising the total number for the United States to 2,123,976 and the value to \$6,761,935.

In this showing are not included low-priced or "dollar" watches; these are made exclusively in clock factories as a by-product, and their value appears under "clocks." This by-product for 1900 was 1,211,662 watch movements, valued at \$566,147, and 703,249 watch cases, valued at \$74,860.

Table 9 is a detailed summary, by states, for 1900. In this table the cost of materials used is divided into the cost of the partially manufactured, showing the principal component parts, excluding mill supplies and all other materials, in order that these may be shown separately, and into fuel, rent of power and heat, and freight.

TABLE 9.—WATCHES: DETAILED SUMMARY, BY STATES, 1900.

	United States.	Illinois.	New Jersey.	All other states. <sup>1</sup>
Number of establishments.....	18	3	3	7
Capital:				
Total .....	\$14,235,191	\$6,353,411	\$910,502	\$6,971,188
Land .....	\$572,051	\$340,000	\$76,051	\$156,000
Buildings .....	\$1,686,544	\$812,518	\$155,125	\$718,901
Machinery, tools, and implements .....	\$5,405,472	\$2,548,581	\$336,410	\$2,520,481
Cash and sundries .....	\$6,671,124	\$2,652,812	\$343,006	\$3,575,806

<sup>1</sup> Includes establishments distributed as follows: Connecticut, 1; Massachusetts, 2; New York, 1; Ohio, 2; Pennsylvania, 1.

TABLE 9.—WATCHES: DETAILED SUMMARY, BY STATES, 1900—Continued.

	United States.	Illinois.	New Jersey.	All other states.
Proprietors and firm members.....	2		1	1
Salaries of officials, clerks, etc.:				
Total number.....	165	56	14	95
Total salaries.....	\$294,449	\$69,266	\$35,026	\$190,157
Officers of corporations—				
Number.....	21	6	4	11
Salaries.....	\$89,060	\$28,600	\$21,060	\$40,000
General superintendents, managers, clerks, and salesmen:				
Total number.....	144	50	10	84
Total salaries.....	\$204,789	\$40,606	\$13,966	\$150,157
Men—				
Number.....	130	47	7	76
Salaries.....	\$196,403	\$89,406	\$12,218	\$144,889
Women—				
Number.....	14	3	3	8
Salaries.....	\$8,326	\$1,200	\$1,748	\$5,318
Wage-earners, including pieceworkers, and total wages:				
Greatest number employed at any one time during the year.....	7,534	2,976	586	3,972
Least number employed at any one time during the year.....	6,462	2,456	448	3,558
Average number.....	6,880	2,578	525	3,777
Wages.....	\$3,586,723	\$1,384,152	\$261,135	\$1,941,436
Men, 16 years and over—				
Average number.....	3,381	1,275	289	1,817
Wages.....	\$2,247,617	\$857,277	\$190,255	\$1,200,085
Women, 16 years and over—				
Average number.....	3,473	1,303	210	1,960
Wages.....	\$1,336,332	\$526,875	\$68,106	\$741,351
Children, under 16 years—				
Average number.....	26		26	
Wages.....	\$2,774		\$2,774	
Average number of wage-earners, including pieceworkers, employed during each month:				
Men, 16 years and over—				
January.....	3,421	1,460	256	1,705
February.....	3,411	1,401	286	1,724
March.....	3,427	1,372	294	1,761
April.....	3,392	1,372	294	1,785
May.....	3,308	1,221	295	1,792
June.....	3,309	1,221	287	1,801
July.....	3,131	1,074	264	1,796
August.....	3,390	1,242	299	1,849
September.....	3,413	1,248	294	1,871
October.....	3,439	1,258	292	1,894
November.....	3,461	1,254	303	1,904
December.....	3,465	1,245	299	1,921
Women, 16 years and over—				
January.....	3,582	1,540	177	1,865
February.....	3,529	1,420	200	1,909
March.....	3,525	1,383	205	1,937
April.....	3,487	1,359	204	1,924
May.....	3,424	1,278	208	1,938
June.....	3,442	1,278	212	1,952
July.....	3,163	1,038	191	1,939
August.....	3,433	1,251	214	1,968
September.....	3,462	1,248	220	1,994
October.....	3,527	1,275	226	2,026
November.....	3,546	1,286	229	2,031
December.....	3,551	1,281	237	2,033
Children, under 16 years—				
January.....	26		26	
February.....	26		26	
March.....	26		26	
April.....	26		26	
May.....	26		26	
June.....	25		25	
July.....	25		25	
August.....	26		26	
September.....	26		26	
October.....	26		26	
November.....	26		26	
December.....	26		26	
Miscellaneous expenses:				
Total.....	\$572,080	\$119,040	\$65,473	\$357,567
Rent of works.....	\$300			\$300
Taxes, not including internal revenue.....	\$90,300	\$21,137	\$1,775	\$67,388
Rent of offices, insurance, interest, and all sundry expenses not hitherto included.....	\$481,480	\$97,903	\$63,698	\$289,879
Materials used:				
Total cost.....	\$1,291,318	\$246,392	\$134,259	\$910,667
Purchased in partially manufactured form.....	\$934,311	\$169,722	\$98,521	\$666,068
Fuel.....	\$57,292	\$23,124	\$2,326	\$31,842
Rent of power and heat.....	\$171	\$171		
Mill supplies.....	\$27,501	\$5,537	\$11,688	\$10,276
All other materials.....	\$252,958	\$36,832	\$18,674	\$197,452
Freight.....	\$19,085	\$11,006	\$3,050	\$5,029
Products:				
Aggregate value.....	\$6,822,611	\$1,839,792	\$551,444	\$4,431,375
Movements—				
Number.....	1,825,769	505,468	308,421	1,011,880
Value.....	\$6,036,240	\$1,834,328	\$473,181	\$3,728,731
Cases—				
Number.....	296,424			296,424
Value.....	\$395,259			\$395,259
Silver—				
Number.....	25,271			25,271
Value.....	\$75,813			\$75,813
Gold filled—				
Number.....	38,229			38,229
Value.....	\$191,145			\$191,145
Silverene—				
Number.....	209,246			209,246
Value.....	\$104,623			\$104,623
Other varieties—				
Number.....	23,678			23,678
Value.....	\$28,678			\$23,678
All other products.....	\$391,112	\$5,464	\$78,263	\$307,385
Comparison of products:				
Number of establishments reporting for both years.....	13	3	3	7
Value for census year.....	\$6,822,611	\$1,839,792	\$551,444	\$4,431,375
Value for preceding business year.....	\$5,751,125	\$1,440,172	\$475,814	\$3,835,139

TABLE 9.—WATCHES: DETAILED SUMMARY, BY STATES, 1900—Continued.

	United States.	Illinois.	New Jersey.	All other states.
Power:				
Number of establishments reporting .....	12	3	3	6
Total horsepower .....	1,990	880	170	940
Owned—				
Engines, steam—				
Number .....	16	5	3	8
Horsepower .....	1,756	660	170	935
Electric motors—				
Number .....	34	34		
Horsepower .....	228	228		
Rented—				
Electric horsepower .....	7	2		5
Furnished to other establishments, horsepower .....	32	20	12	
Establishments classified by number of persons employed, not including proprietors and firm members:				
Total number of establishments .....	13	3	3	7
Under 5 .....	1			1
5 to 20 .....	1		1	
21 to 50 .....	1	1		
51 to 100 .....	1			1
101 to 250 .....	2			2
251 to 500 .....	2	1	2	
501 to 1,000 .....	2			2
Over 1,000 .....	2	1		1

## WATCH CASES.

The manufacture of watch cases was not shown separately at the censuses of the United States previous to 1870, and comparable statistics can not, therefore, be given for any decade before that year. Table 10 is a comparative summary from 1870 to 1900, inclusive, with the percentages of increase for each decade.

TABLE 10.—WATCH CASES: COMPARATIVE SUMMARY, 1870 TO 1900, WITH PER CENT OF INCREASE FOR EACH DECADE.

	DATE OF CENSUS.				PER CENT OF INCREASE.		
	1900	1890	1880	1870	1890 to 1900	1880 to 1890	1870 to 1880
Number of establishments .....	30	45	27	48	33.3	66.7	137.2
Capital .....	\$8,119,292	\$4,727,100	\$1,584,740	\$780,500	71.8	198.3	116.9
Salaried officials, clerks, etc., number .....	235	2190	( <sup>3</sup> )	( <sup>3</sup> )	23.7		
Salaries .....	\$289,366	\$219,699	( <sup>3</sup> )	( <sup>3</sup> )	31.7		
Wage-earners, average number .....	3,907	3,679	1,758	703	6.2	109.3	160.1
Total wages .....	\$1,924,847	\$1,896,587	\$976,041	\$555,018	1.5	94.3	75.9
Men, 16 years and over .....	2,929	2,944	1,418	619	10.5	107.6	129.1
Wages .....	\$1,642,930	\$1,690,661	( <sup>3</sup> )	( <sup>3</sup> )	13.3		
Women, 16 years and over .....	866	710	139	78	22.0	410.3	90.4
Wages .....	\$262,848	\$192,800	( <sup>3</sup> )	( <sup>3</sup> )	36.3		
Children, under 16 years .....	112	25	201	11	348.0	187.6	1,727.3
Wages .....	\$19,065	\$4,126	( <sup>3</sup> )	( <sup>3</sup> )	362.1		
Miscellaneous expenses .....	\$317,902	\$443,175	( <sup>4</sup> )	( <sup>4</sup> )	128.3		
Cost of materials used .....	\$4,393,647	\$5,022,455	\$2,812,922	\$1,152,979	112.5	78.6	144.0
Value of products .....	\$7,733,960	\$3,618,479	\$4,589,314	\$2,333,340	19.7	87.8	96.7

<sup>1</sup> Decrease.

<sup>2</sup> Includes proprietors and firm members, with their salaries; number only reported in 1900.

<sup>3</sup> Not reported separately.

<sup>4</sup> Not reported.

The increase in the value of products during the thirty years was \$5,450,620, or 233.6 per cent, much greater than the increase in the value of watch movements. The percentage of wages of value of products in 1900 was 24.7, and of total wages of total wages and materials 30.5, both of which percentages are less than half those shown for watch movements. The average

number of women has increased during the thirty years, but even in 1900 there were few compared with the number in watch factories. That a small number of children were employed is notable also. The manufacture of watch cases requires fewer wage-earners than the manufacture of watch movements; while the value of products in 1900 was 14.1 per cent more, the average number of wage-earners was 43.2 per cent less.

Table 11 is a summary, by states, for 1900.

TABLE 11.—WATCH CASES: SUMMARY BY STATES, 1900.

	United States.	Illinois.	New Jersey.	New York.	All other states. <sup>1</sup>
Number of establishments .....	30	4	5	13	8
Capital:					
Total .....	\$8,119,292	\$780,894	\$1,371,137	\$2,582,472	\$3,494,789
Land .....	\$429,185	\$200,685	\$28,000	\$110,500	\$90,000
Buildings .....	\$612,325	\$37,550	\$193,000	\$205,412	\$176,363
Machinery, tools, and implements .....	\$1,480,032	\$158,941	\$320,984	\$407,308	\$502,804
Cash and sundries .....	\$5,597,750	\$333,718	\$829,153	\$1,769,257	\$2,665,622
Salaried officials, clerks, etc., number .....	235	27	88	69	101
Salaries .....	\$289,366	\$18,884	\$40,420	\$106,858	\$114,704
Wage-earners, average number .....	3,907	407	637	1,075	1,788
Total wages .....	\$1,924,847	\$170,919	\$305,268	\$630,782	\$817,878
Men, 16 years and over .....	2,929	274	515	960	1,180
Wages .....	\$1,642,930	\$142,361	\$255,900	\$596,460	\$648,218
Women, 16 years and over .....	866	101	107	104	554
Wages .....	\$262,848	\$23,938	\$44,868	\$32,177	\$161,860
Children, under 16 years .....	112	32	15	11	54
Wages .....	\$19,065	\$4,020	\$4,500	\$2,145	\$7,800
Miscellaneous expenses .....	\$317,902	\$21,389	\$34,535	\$126,761	\$135,227
Cost of materials used .....	\$4,393,647	\$294,491	\$730,871	\$2,031,910	\$1,336,375
Value of products .....	\$7,733,960	\$560,934	\$1,258,601	\$3,165,512	\$2,798,913

<sup>1</sup> Includes establishments distributed as follows: Kentucky, 1; Maryland, 1; Massachusetts, 2; Ohio, 2; Pennsylvania, 2.

In this table, as in the corresponding table for watch movements and for the same reason, the statistics of one of the leading states are necessarily concealed in the classification "all other states." Pennsylvania was a great center of the manufacture, although New York led in value of products. The percentage of wages of wages and materials was largest in "all other states;" but of the states separately shown Illinois led in this respect.

Table 12 shows the number of establishments in 1890 and 1900, with the increase and number established during the decade, by geographical divisions and states.

TABLE 12.—WATCH CASES: NUMBER OF ESTABLISHMENTS, 1890 AND 1900, AND INCREASE DURING THE DECADE, BY GEOGRAPHICAL DIVISIONS AND STATES.

STATES.	1900	1890	Increase.
United States .....	30	45	15
New England states .....	2	6	4
Massachusetts .....	2	5	3
Rhode Island .....		1	1
Middle states .....	21	32	11
New York .....	13	20	7
New Jersey .....	5	4	1
Pennsylvania .....	2	7	5
Maryland .....	1	1	
Southern states .....	1	1	
Kentucky .....	1	1	
Central states .....	6	5	1
Ohio .....	2	1	1
Illinois .....	4	3	1
Missouri .....		1	1
Western states .....		1	1
Colorado .....		1	1

<sup>1</sup> Decrease.

The principal decrease shown in this table was, as with watch movements, in the Middle states, and here also were the greatest number of new establishments. The only Western state—Colorado—that had a part in the manufacture in 1890, disappeared from the industry in 1900.

A comparative summary of the capital in its several subdivisions, with percentages of increase, and of the total for 1890 and 1900, is presented in Table 13.

TABLE 13.—WATCH CASES: COMPARATIVE SUMMARY, CAPITAL, 1890 AND 1900.

	1900		1890		Per cent of increase.
	Amount.	Per cent of total.	Amount.	Per cent of total.	
Total .....	\$8,119,292	100.0	\$4,727,100	100.0	71.8
Land .....	429,185	5.3	127,850	2.7	235.7
Buildings .....	612,325	7.6	404,500	8.6	51.4
Machinery, tools, and implements .....	1,480,032	18.2	963,641	20.4	53.6
Cash and sundries .....	5,597,750	68.9	3,231,109	68.3	73.2

TABLE 16.—WATCH CASES: KIND, QUANTITY, AND VALUE OF PRODUCTS, BY STATES, 1900.

STATES.	Aggregate value.	WATCH CASES.												All other products.
		Total.		Gold.		Silver.		Gold filled.		Silverene.		Other varieties.		
		Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	
United States.....	\$7,783,960	1,719,362	\$7,175,157	233,993	\$3,170,629	171,837	\$461,882	748,735	\$3,187,103	356,126	\$238,391	208,671	\$122,152	\$608,808
Illinois .....	560,934	292,162	547,434	8,900	130,500	28,278	42,947	82,843	275,804	10,316	6,515	161,825	91,668	13,500
New Jersey .....	1,258,601	839,075	1,103,030	18,304	281,000	67,671	175,000	198,615	662,080	54,485	35,000			155,571
New York .....	3,165,512	322,198	2,838,510	177,170	2,293,908	35,517	114,052	15,823	392,993	93,688	37,557			327,002
All other states <sup>1</sup> .....	2,798,913	765,927	2,686,183	29,619	515,221	40,371	129,883	451,464	1,856,276	197,637	154,319	46,846	30,484	112,730

<sup>1</sup> Includes establishments distributed as follows: Kentucky, 1; Maryland, 1; Massachusetts, 2; Ohio, 2; Pennsylvania, 2.

The slight decrease in the proportion of machinery, tools, and implements, and the increase in the land investment to the total capital are noticeable features in this table, but the percentage of increase in each subdivision shows that the capital, in all respects, was greater, perhaps necessarily, in 1900 than in 1890.

Miscellaneous expenses can not be divided for 1890, but they are shown for 1900 in Table 14.

TABLE 14.—WATCH CASES: MISCELLANEOUS EXPENSES, 1900.

	Amount.	Per cent of total.
Total .....	\$317,902	100.0
Rent of works .....	18,218	5.7
Taxes, not including internal revenue .....	17,480	5.5
Rent of offices, insurance, interest, repairs, advertising, and other sundries .....	282,204	88.8

That no expenditure for contract work is shown is characteristic of the manufacture of watch cases, which, like that of watch movements, is of a delicate nature and highly specialized in factories with automatic machinery.

A division of the cost of materials is possible for 1900 and is given, with percentages of the total, in Table 15.

TABLE 15.—WATCH CASES: COST OF MATERIALS, 1900.

	Amount.	Per cent of total.
Total .....	\$4,393,647	100.0
Purchased in raw state .....	326,850	7.4
Purchased in partially manufactured form <sup>1</sup> .....	4,018,450	91.5
Fuel .....	36,412	0.8
Rent of power and heat .....	5,625	0.1
Freight .....	6,309	0.2

<sup>1</sup> Includes mill supplies and all other materials, which are shown separately in Table 17.

While in the manufacture of watch movements no raw material was used for component parts, in the manufacture of watch cases, as shown in this table, 7.4 per cent of the total material of all kinds (including rent of power and heat, and freight) was purchased in a raw state. This is quite small, however, the partly manufactured reaching 91.5 per cent of the total.

The kind, quantity, and value of watch cases made in 1900 are shown in Table 16.

Of the states shown separately New Jersey led in quantity but not in value, New York taking precedence in this. The total for "all other states" is made up largely of Pennsylvania's products, and the company having the largest output in the United States was reported from that state. The average value, at the shop or factory, of the watch cases made in the United States in 1900 was \$4.17. New York showed the greatest average value—\$8.81—and Illinois the least—\$1.87; New Jersey's average was \$3.25. The gold-filled cases predominated, constituting 43.6 per cent of the number

manufactured. Silverene came next with 20.7 per cent, and gold third with 13.6 per cent. Silver had 10 per cent and other varieties quoted 12.1 per cent. Pennsylvania is the home of the gold-filled case, and in 1900 returned the largest number, which is not separately shown, being included under "all other states." Pennsylvania also made the most of the kind called silverene, also variously denominated silveroid, silverore, nickel silver, and nickel—all these alloys having nickel for their base.

The details of the watch-case manufacture for 1900 are shown in Table 17.

TABLE 17.—WATCH CASES: DETAILED SUMMARY, BY STATES, 1900.

	United States.	Illinois.	New Jersey.	New York.	All other states. <sup>1</sup>
Number of establishments.....	30	4	5	13	8
Capital:					
Total.....	\$8,119,292	\$730,894	\$1,371,137	\$2,582,472	\$3,434,789
Land.....	\$429,185	\$200,685	\$28,000	\$110,500	\$90,000
Buildings.....	\$612,825	\$97,550	\$108,000	\$205,412	\$176,303
Machinery, tools, and implements.....	\$1,480,082	\$158,941	\$320,984	\$497,303	\$502,804
Cash and sundries.....	\$5,597,750	\$333,718	\$829,153	\$1,769,257	\$2,665,622
Proprietors and firm members.....	23	3	2	10	8
Salaried officials, clerks, etc.:					
Total number.....	235	27	38	69	101
Total salaries.....	\$289,366	\$18,854	\$49,420	\$106,353	\$114,704
Officers of corporations—					
Number.....	81	4	5	13	9
Salaries.....	\$115,700	\$6,800	\$18,200	\$45,700	\$45,000
General superintendents, managers, clerks, and salesmen—					
Total number.....	204	23	33	56	92
Total salaries.....	\$173,666	\$12,054	\$31,220	\$60,653	\$69,704
Men—					
Number.....	148	16	26	44	62
Salaries.....	\$150,925	\$8,770	\$27,450	\$56,122	\$58,584
Women—					
Number.....	56	7	7	12	30
Salaries.....	\$22,740	\$3,314	\$8,770	\$4,536	\$11,120
Wage-earners, including pieceworkers, and total wages:					
Greatest number employed at any one time during the year.....	4,215	445	681	1,151	1,938
Least number employed at any one time during the year.....	3,279	387	423	995	1,474
Average number.....	3,907	407	637	1,075	1,788
Wages.....	\$1,924,847	\$170,919	\$305,263	\$630,782	\$817,878
Men, 16 years and over—					
Average number.....	2,929	274	515	960	1,180
Wages.....	\$1,642,939	\$142,361	\$255,900	\$596,460	\$648,218
Women, 16 years and over—					
Average number.....	866	101	107	104	554
Wages.....	\$262,843	\$28,938	\$44,868	\$32,177	\$161,860
Children, under 16 years—					
Average number.....	112	32	15	11	54
Wages.....	\$19,065	\$4,620	\$4,500	\$2,145	\$7,800
Average number of wage earners, including pieceworkers, employed during each month:					
Men, 16 years and over—					
January.....	2,656	277	335	933	1,111
February.....	2,848	281	523	920	1,121
March.....	2,903	284	555	940	1,144
April.....	2,937	290	537	943	1,137
May.....	2,951	288	511	936	1,186
June.....	2,906	260	535	929	1,182
July.....	2,944	258	535	971	1,180
August.....	2,951	261	537	944	1,209
September.....	3,039	276	539	1,004	1,220
October.....	3,045	279	540	997	1,229
November.....	3,031	283	542	987	1,209
December.....	2,938	251	480	1,008	1,199
Women, 16 years and over—					
January.....	731	100	69	73	489
February.....	805	109	103	103	498
March.....	827	100	109	104	514
April.....	856	102	110	105	539
May.....	878	101	110	111	556
June.....	883	98	110	112	563
July.....	898	100	111	111	571
August.....	903	100	111	110	582
September.....	902	103	112	103	584
October.....	904	103	112	105	584
November.....	904	103	114	104	588
December.....	895	105	102	105	583
Children, under 16 years—					
January.....	83	27	14	10	32
February.....	86	27	15	10	34
March.....	92	27	15	10	40
April.....	94	27	15	11	41
May.....	100	27	15	11	47
June.....	103	27	15	10	51
July.....	121	35	15	12	59
August.....	129	35	15	12	67
September.....	134	37	16	13	68
October.....	137	37	16	12	72
November.....	138	37	16	13	72
December.....	135	37	16	13	69

<sup>1</sup> Includes establishments distributed as follows: Kentucky, 1; Maryland, 1; Massachusetts, 2; Ohio, 2; Pennsylvania, 2.

TABLE 17.—WATCH CASES: DETAILED SUMMARY, BY STATES, 1900—Continued.

	United States.	Illinois.	New Jersey.	New York.	All other states.
Miscellaneous expenses:					
Total.....	\$317,902	\$21,389	\$34,585	\$126,751	\$135,227
Rent of works.....	\$18,218	\$2,335	\$920	\$8,338	\$6,025
Taxes, not including internal revenue.....	\$17,480	\$989	\$4,120	\$6,856	\$6,515
Rent of offices, insurance, interest, and all sundry expenses not hitherto included.....	\$282,204	\$18,065	\$20,495	\$111,557	\$123,087
Materials used:					
Total cost.....	\$4,393,647	\$294,491	\$730,871	\$2,031,910	\$1,336,375
Purchased in raw state.....	\$826,856				\$320,850
Purchased in partially manufactured form.....	\$3,566,791	\$275,674	\$669,628	\$1,943,672	\$941,733
Fuel.....	\$30,412	\$5,846	\$5,145	\$10,082	\$15,839
Rent of power and heat.....	\$5,025	\$455	\$770	\$2,016	\$2,385
Mill supplies.....	\$16,594	\$1,993	\$1,465	\$999	\$12,132
All other materials.....	\$171,149	\$9,905	\$52,513	\$71,468	\$36,961
Freight.....	\$6,309	\$1,113	\$1,048	\$3,673	\$475
Products:					
Aggregate value.....	\$7,783,960	\$560,934	\$1,258,601	\$3,165,512	\$2,798,913
Cases—					
Total number.....	1,719,362	292,162	330,075	322,198	765,927
Total value.....	\$7,175,157	\$547,434	\$1,103,030	\$2,838,510	\$2,686,183
Gold—					
Number.....	233,903	8,900	18,304	177,170	29,619
Value.....	\$3,170,629	\$130,500	\$231,000	\$2,293,908	\$515,221
Silver—					
Number.....	171,837	28,278	67,671	35,517	40,371
Value.....	\$461,882	\$42,947	\$175,000	\$114,052	\$129,883
Gold filled—					
Number.....	748,735	\$2,843	198,615	15,823	451,454
Value.....	\$3,187,103	\$275,804	\$662,030	\$392,993	\$1,856,276
Silverene—					
Number.....	356,126	10,316	54,485	93,688	197,637
Value.....	\$233,391	\$6,515	\$35,000	\$37,557	\$154,319
Other varieties—					
Number.....	208,671	161,825			46,846
Value.....	\$122,152	\$91,668			\$30,484
All other products.....	\$603,803	\$13,500	\$155,571	\$327,002	\$112,730
Comparison of products:					
Number of establishments reporting for both years.....	24	3	4	10	7
Value for census year.....	\$7,187,311	\$541,384	\$1,257,001	\$2,758,826	\$2,630,100
Value for preceding business year.....	\$5,583,510	\$465,465	\$1,114,099	\$2,208,181	\$1,800,765
Power:					
Number of establishments reporting.....	23	4	5	11	8
Total horsepower.....	1,884	253	304	447	880
Owned—					
Engines—					
Steam—					
Number.....	15	2	3	5	5
Horsepower.....	1,555	180	290	385	700
Gas or gasoline—					
Number.....	1			1	
Horsepower.....	10			10	
Water wheels—					
Number.....	1	1			
Horsepower.....	5	5			
Electric motors—					
Number.....	7	4			3
Horsepower.....	86	60			26
Other power—					
Number.....	2				2
Horsepower.....	15				15
Rented—					
Electric, horsepower.....	59	3	6	20	30
Other kind, horsepower.....	154	5	8	32	109
Furnished to other establishments, horsepower.....	20			20	
Establishments classified by number of persons employed, not including proprietors and firm members:					
Total number of establishments.....	30	4	5	13	8
Number of employees.....	1			1	
Under 5.....	2			1	1
5 to 20.....	9	1	2	4	2
21 to 50.....	6	2	1	1	1
51 to 100.....	3			3	
101 to 250.....	4			2	2
251 to 500.....	3	1	2		
501 to 1,000.....	2			1	1
Over 1,000.....	1				1

HISTORICAL AND DESCRIPTIVE.

The watch came to the United States from the Old World perfect in principle. There have been no improvements for many years in arrangement of train, in escapements, or in other parts of movements. Its evolution from the clock with its pendulum, through the table clock with its lever, and thus to the perfect pocket timepiece, is a part of the history of Germany, of Great Britain, of France, and of Switzerland.

The English are said to have been the first successful watchmakers, and about a century and a half ago applied to the industry a division of labor which at one

time had multiplied into 102 distinct branches. The Swiss adopted this principle and extended it, giving employment to families—men, women, and children—at their homes. As the price of this labor was very low, and there were few other industries at which employment could be found, the Swiss became the watchmakers of the world, not only furnishing some of the most costly timepieces, but also some of the cheapest and most worthless. While the Swiss still manufacture a great many watches, which are sent to many parts of the world, it is a significant fact that some jobbers, who handled their goods a few years ago under an American name, advertised that the movements were made “by

the most improved American automatic machinery, insuring accuracy and precision." It is said to be a common practice thus to advertise Swiss movements, excepting those of the costliest varieties, upon which the hand work is of the most skillful and painstaking character or expended in fanciful combinations. It is asserted by manufacturers in the United States that the "American" machinery used in Switzerland has been rendered obsolete here by the advance of invention; but its adoption there is a most substantial recognition of the superiority of machine-made watches. It is also asserted that, while the Swiss watch trade fell off a few years ago, this loss has been partly recovered by the adoption of these American machines and American methods.

The earliest watches made in Europe took a year, it is said, in their making, cost the equivalent of \$1,500 apiece, and varied in their timekeeping from forty minutes to an hour a day. At the Waltham, Mass., factory nearly 600,000 watch movements were made during the census year 1900, or nearly 2,000 complete movements for each working day—not quite one a day per employee—more than any other factory in the world and a greater yearly production than any other country except Switzerland. The effort is now being made to raise this production to one per day per employee, which would be a total of 3,000 a day, or over 900,000 a year. The cost of these movements varies from \$3 to \$75, and their timekeeping quality is best shown by the fact that the three American watches, which received the highest award for accuracy of rate at the Centennial Exposition at Philadelphia in 1876, showed an average daily variation of only twenty-three hundredths of a second.

The unanswerable arguments showing the superiority of machine-made watches are now widely known and admitted, but they were made only a few years ago with most disheartening results. Almost everybody preferred a handmade watch, notwithstanding its greater cost, when of any worth as a timepiece, and the lack of interchangeable parts with which it could be cheaply repaired, on the theory that hand work was more accurate; but now conditions are reversed, and an American machine-made watch is preferred by the great number of persons who desire accuracy and durability at a reasonable price. An inventor puts the argument briefly thus: "If one of the qualities demanded in any certain kind of work be the highest attainable degree of uniformity, it will be readily admitted that the individual workman, with the certainty of constantly recurring periods of fatigue, which make imperative corresponding periods of rest, is at a great disadvantage when in competition with an impersonal and tireless machine which is capable of producing work of a like kind. \* \* \* It is also evident that if the large number of required pieces, whose function is the same, can be made with dimensions exactly uniform, there would result a great reduction in cost of manufacture because

of the avoidance of any individual or special fitting of the various parts."<sup>1</sup> In the hand system it is impossible that parts, upon which a hundred different personalities have been stamped, should come together with the precision required for such a delicate mechanism as a watch. The further the division of hand labor is carried the greater become the chances of imperfection; but with automatic machinery the most delicate processes are accomplished with complete uniformity and finish.

M. Edouard Favre-Perret states that 40,000 workmen in Switzerland each make an average of 40 watches yearly. But the average in the United States in 1880 was 150; at Waltham in 1900 it was over 250. It takes about five months to complete a single watch of the highest grade; but all processes are going on simultaneously, and the flow of the product is therefore continuous. In a lecture before the Horological Institute of London, more than thirty years ago, an English watchmaker who had visited the Waltham factory remarked: "On leaving the factory, I felt that the manufacture of watches on the old plan was gone."<sup>2</sup>

Various sporadic attempts, beginning, it is said, as early as 1809, had been made in this country to manufacture watches by hand, but all had ended in dismal failure, owing to inability to compete in price with the Swiss-made watch. When competition with Europe was thus found impossible, inventors in the United States thought they might construct them successfully by machinery, and in 1838 Pitkin Brothers established a plant at Hartford, Conn., for the manufacture of watches by machinery. After manufacturing about eight hundred movements, they were compelled to abandon their project. At this time the Swiss were using machines for special operations in making watches. In 1839 Gischoth established a factory at Geneva, Switzerland, for making the movements of a watch by machinery, and a few years after F. P. Ingold, another Swiss, elaborated a series of both case and movement machines, but they never made a success of their manufacture in factories.

The systematic beginning of watchmaking by machinery in the United States was in 1851, at Roxbury, Mass., and the machinery then used, while advanced for the times, now seems crude, so great have been the improvements. It is difficult to realize the primitive conditions of fifty years ago, and a half century hence the machines of to-day may likewise seem crude, for at no time have changes been so numerous or so radical as during the last few years. The effort has been not only to make a cheaper watch, but to make it a more accurate timepiece, and in effecting these results the great system of interchangeable mechanism in manufacturing has

<sup>1</sup> The Evolution of Automatic Machinery, by E. A. Marsh, page 11.

<sup>2</sup> Watchmaking in America, Appleton's Journal, July 2 and 9, 1870.

been promoted in a remarkable manner. Prof. W. P. Trowbridge, of the Sheffield Scientific School of Yale University, a chief special agent at the census of 1880, in submitting the report on the manufactures of interchangeable mechanism, compiled under his direction by Mr. Charles H. Fitch, wrote that "it may not be too much to say that, in some respects, this system has been one of the chief influences in the rapid increase of the national wealth;" that "the growth of the system is due to the inventive characteristics of our people, and their peculiar habit of seeking the best and most simple mechanical methods of accomplishing results by machinery, untrammelled by traditions or hereditary habits and customs;" and that "the art of making complete machines or implements, each part of which may be introduced into any machine of the same kind, and especially the adaptation of special tools, by which handwork in fitting the parts is often entirely avoided, is, I believe, of American origin."<sup>1</sup> One of the manufactures briefly treated in that report was the manufacture of watches.

To Aaron L. Dennison, born in Freeport, Me., in 1812, belongs the honor of founding the systematic manufacture of watches by automatic machinery in the United States. He learned the watchmaker's trade, and while a journeyman in Boston became impressed, by his experience with Swiss and English watches, with the necessity of securing greater uniformity of parts. At the United States armory at Springfield, Mass., muskets were made upon the interchangeable plan, and it was while working there that he became confirmed in his belief that a machine-made watch was a possibility. In 1849 he succeeded in impressing Edward Howard, a practical clock maker of Boston, with the importance of his undertaking, and these two interested a capitalist, Samuel Curtis, of the same city, who invested \$20,000. Mr. Howard himself says of this interesting beginning: "Mr. Dennison being a watch repairer, and myself a clock maker, we made a good combination to systematize watchmaking, and to invent labor-saving machinery for producing perfect and interchangeable parts. \* \* \* It is almost needless to say that we met with many obstacles. We were told by importers and dealers in watches that we would never be able to carry out our plans, and that our project would be an utter failure. Some of our friends even told us we were crazy to attempt such an undertaking, but we were Yankees, both of us, and had sufficient quantity of the proverbial 'grit,' and at least believed in ourselves, even if others did not have so much faith."<sup>2</sup>

Mr. Dennison went to Europe, where he investigated the English division of hand labor, cheerfully writing back that his theory "of Americans not finding any difficulty in competing with the English, especially if

the interchangeable system and manufacturing in large quantities was adopted, may be accepted as reasonable." A factory was built at Roxbury, Mass., and in 1851 a model watch was completed. It was an eight-day watch, but, being found impracticable, was abandoned for the ordinary thirty-six-hour watch. The first hundred movements were finished and put on the market in 1853. The factory at Roxbury was in a dusty place, and this drawback, together with the necessity of more room and the desire to make homes in a pleasant spot for the operatives, led to a removal to the present site at Waltham, on the Charles River, about 10 miles west of Boston.

In 1857 financial embarrassments compelled a sale of the property, which was bought by Mr. Royal E. Robbins, of New York, and others, by whom and their successors it has been conducted ever since through storm to sunshine. Mr. Robbins is still interested in active management as the treasurer of the American Waltham Watch Company.<sup>1</sup> The factory, situated on the edge of the river, is five stories in height, built of brick, having innumerable windows to secure the abundance of light required for such delicate operations. The surrounding grounds are neatly laid out and diversified with shrubbery and flowers. If the annexes were arranged on a line with the main building, the entire frontage would extend more than 2,500 feet, or almost half a mile. Nearly 3,000 operatives are employed in making—by over 3,700 processes—the more than 150 parts contained in a watch movement. Most of the processes are accomplished by the most ingeniously devised and constructed automatic machines. Under one roof, but in a multitude of departments, all parts of a watch movement are made, including the cutting and polishing of the jewels; but the primary or foundation department is the machine shop, where all the machines used in the manufacture are made from designs furnished by the company's own inventors and master mechanics. This latter plan, which in 1850 was a necessity, because of the lack of watch machines and of outside experts capable of designing and constructing them, has continued to be recognized as a desirable feature ever since, perhaps being no less a necessity now than it was then, owing to the delicate evolution of automatic machinery. Although many patents have been issued for designs and processes and for labor-saving machinery in the watch manufacture during the last half century, the number of such patents by no means registers the real activity of inventors in these lines. The watch companies now seldom patent an automatic machine, preferring to trust for protection to a thorough safeguarding of the complexity of the mechanism.

The panic of 1857 worked serious injury to the enterprise at Waltham, but the outlook became better in 1858, and in 1860 a 5 per cent dividend was declared. When the Civil War broke out, the depression deepened again,

<sup>1</sup>Tenth Census of the United States, Manufactures, folio 615.

<sup>2</sup>One Hundred Years of American Commerce, Vol. II, page 541.

<sup>1</sup>History of Middlesex County, Mass., Vol. III, Waltham, pages 738 and 739.

and so disastrously that only the machine shop was continued, and in that a few lathes were built and sold. But as the war went on a large demand sprang up among the soldiers. Had the watches furnished been of the high quality required to-day the demand could not have been met; there were not enough skilled and experienced mechanics available. The watches, such as they were, were made in sufficient quantities, and as prices were high, the manufacture became exceedingly prosperous. In 1868 the surplus was capitalized and the stock distributed to the stockholders as a special dividend.

As a result of the founding of the watch manufacture at Waltham a number of experts from the parent factory started an establishment at Nashua, N. H., but this was not a success and the Waltham Company bought it in 1862 and consolidated it with the home shop, retaining also the services of some of the experts. This Nashua watch was a valuable three-quarter plate movement, highly esteemed by the public. Some of the people who had been interested in the Nashua company went to Chicago and, with other experts, founded the now well-known factory at Elgin, Ill., one of the leading establishments in the manufacture. Other enterprises were offshoots of the Waltham idea, but many of them proved only experiments. It is noteworthy that the centers of the manufacture are still in the states of Massachusetts and Illinois.

The policy of the pioneer company was to utilize the skill and ingenuity of men who had been engaged either in the manufacture of watches or of interchangeable parts of any kind, or who had displayed inventive ability. Among these were Oliver and David Marsh, expert mechanics and watchmakers of Boston, Charles S. Moseley, a leading inventor and the originator of many of the machines now used in all watch factories, Nelson P. Stratton, who was connected with the watch factory at Hartford in 1838, Ambrose Webster, and James T. Shepard who had been employed at the Springfield Armory, where the system of interchangeable mechanism had attracted Mr. Dennison's attention. Among others called in then or later were George Hunter, who afterwards went to Elgin, Charles W. Fogg, Charles Vander Woerd, Edward A. Marsh, and D. H. Church, all of them notable inventors of automatic machinery. Of these Mr. Moseley and Mr. Church are selected as representatives, "the first as being to a certain extent a pioneer in the field of designing and building watchmaking machinery, and the second as one who has by his fertility and originality in the field of invention, achieved so much in the embodiment of automatic features as to render his recent machines wonders of mechanism."<sup>1</sup>

It is said that the number of scientific and mechanical appliances that have been brought out in the manufacture of watches is greater than in any other industry,

<sup>1</sup>The Evolution of Automatic Machinery, by E. A. Marsh, pages 149 and 150.

with the possible exception of the production and use of electricity. And it is probable that the ingenuity of inventors of automatic machinery is shown to greater advantage in this industry than in any other. The processes required are of the most perfect kind, and some of the products are so small as to be distinguishable in character under the glass only. The watch factories of the United States are filled with these automatic and semiautomatic machines, which not only make large numbers of parts of perfect uniformity at small cost, but have, in many cases, done away with the need of special skill in the individual workman. Frequently an operator can care for six or seven machines, and sometimes, as in the pioneer factory at Waltham, a track is laid on the floor and chairs are provided with grooved rolls; so that the attendant can glide easily and quickly the whole length of the line.

The only practicable way of treating the evolution of automatic machinery in watchmaking is to consider certain representative machines accomplishing certain representative results, and thus going from headland to headland, bridge the half century of progress and triumph in the United States. This Edward A. Marsh, of Waltham, has done. First he presents the "draw-in-chuck" and lathe, tracing their development by Ambrose Webster, Charles V. Woerd, and Charles S. Moseley into the self-closing, three-bearing slide-spindle lathe, with its application to the manufacture of watch plates. Within seven years two wholly automatic machines have been built for plate turning, their novelty being in the number of turnings they perform. Six recesses are turned in the train side of the pillar plate—for the barrel, escape wheel, pallets, balance, and for the center pinion, and a bearing for the intermediate setting wheel. The blank plates, faced on both sides, are taken from a tube at the left end of the machine one at a time by a swinging-carrier arm and placed in spindle after spindle until the six recesses are made, each unlike in size, position, and form. Bossing, when desired, is accomplished through a modification of the tool movement. By a change of chucks the turnings on the dial side of the plate can be made in a similar manner. "The boldness in the conception of this machine will be appreciated when it is realized that the watch plate must be placed in each succeeding chuck in a different position, and that it is required to be placed on three pins which fit in the three dial feet holes."<sup>1</sup> This is the work of one of these machines; the other by a somewhat similar process, utilizing self-closing chucks instead of pins, receives and faces the plates on both sides.

The history of watchmaking in the United States also goes back to the time when the arbors, staffs, and pinions, which constitute the moving parts of the watch, were made by the lathe and slide-rest, the feed screw of which was operated by hand. The first improvement

<sup>1</sup>Evolution of Automatic Machinery, pages 25 and 26.

was the semiautomatic turning lathe; then came an improved form in which there was a combination of levers designed to provide for turnings of various lengths without changing feed cams. But the great defect was that each piece had to be affixed by hand to its appropriate dog, making it impossible for one operator to run more than a single lathe; and, owing to the minuteness of the smaller staff blanks, like pallet arbors, only a small amount of metal could be removed at each turning. In some cases ten or twelve turnings were required, and they had to be alternated from end to end to avoid springing. Mr. Woerd some twenty years ago invented an automatic machine to make the rough turnings; but each of the finish turnings still required the application of a driving dog. The evolution of this into the Church battery of staff-turning lathes all on a single bed and driven by a single belt was a noteworthy event, but the dog was still essential. The triumph came within the past five years, when Mr. Church produced a completely automatic machine, adapting it to the most difficult, delicate, and complicated staff in the whole watch movement, namely, the balance staff. Four hundred of these, completely turned from start to finish, including both pivots, are made by each machine each day. This machine is one of the wonders of the Waltham factory, where automatic wonders abound, and it is asserted that "nothing in the way of turning has heretofore been done which could at all compare with the work of these machines in delicacy, complexity, and accuracy."<sup>1</sup> The balance staff is so minute that it can be handled only with great difficulty, having a diameter scarcely larger than that of a No. 9 sewing needle, and requiring a magnifying glass for its inspection.

For the cutting of pinions the Church automatic cutter is a higher development, as it secures axial truth by performing the cutting, in direct connection with the turning, from a long rod of wire. The evolution of the crown-wheel cutter is nearly as interesting a study, while the machines for the manufacture of the minute screws and stud pins, and those for vibrating balances and hairsprings, furnish a rare collection of ingenious American inventions.

Watch hairsprings were imported years ago, but for over a quarter of a century they have been made in the United States. The pioneer machine has been improved into a series of machines now nearly automatic in their action. The wire is drawn to the exact diameter required, then flattened by repeated rollings and polished. It is admitted that the coiling of hairsprings seems to be susceptible of no marked improvement in processes of production. A notable device for forming and confining the overcoil of the Breguet spring so that it can be tempered complete is that of the late John Logan, of Waltham. It is said of Mr. Logan and his brother that they "have probably made

more watch hairsprings than all the other makers in the world put together, all of them high-class springs."<sup>1</sup> Until within a few years the adaptation of these hairsprings which requires absolute exactness, an indispensable requisite for correct time, was secured by repeated trials, a spring being found to meet the requirements of the individual balance. Mr. Logan devised a system of tests of springs by a standard balance, and of all balances by a standard spring, and then grading the springs according to strength. Resort to a schedule of gradings indicates at once the proper spring for any balance.

The minuteness of some of the screws made in a watch factory may be measured by the statement that it takes nearly 150,000 of a certain kind to weigh a pound. Under the microscope they appear in their true character—perfectly finished bolts. The pivot of the balance wheel is only one two-hundredths of an inch in diameter, and the gauge with which pivots are classified measures to the ten-thousandth part of an inch. Each jewel hole into which a pivot fits is about one five-thousandths of an inch larger than the pivot to permit sufficient play. The finest screw for a small-sized watch has a thread of 260 to the inch and weighs one one hundred and thirty thousandths of a pound. Jewel slabs of sapphire, ruby, or garnet are first sawed into slabs one-fiftieth of an inch thick, and are shellacked to plates so that they may be surfaced. Then the individual jewels are sawed or broken off, drilled through the center, and a depression made in the convex side for an oil cup. A pallet jewel weighs one one hundred and fifty thousandths of a pound; a roller jewel a little more than one two hundred and fifty-six thousandths. The largest round hairspring stud is four-hundredths of an inch in diameter and about nine-hundredths of an inch in length.

It is only the finishing department of a watch factory in the United States that requires the services of skilled watchmakers. Even the assembling of a watch is done by others, the hairsprings being selected by girls with the aid of machines and put in on the balance, within an error of ten seconds per hour or four minutes per day, which is readily corrected by the time screws of the balance. The finishing department is of most interest to watchmakers, because it is in this that the movement is adjusted, being put through all the tests for heat and cold, from 95° down to 38° or 40°; tests in three vertical positions, and in "dial-up" and "dial-down." The balance in most modern watches is required to make 18,000 vibrations an hour. The change of one beat will cause an error of four and four-fifths seconds at the end of twenty-four hours. This statement indicates the extreme delicacy of the tests and the necessity of the demagnetizing of all the parts of the escapement so that electrical disturbances in whatever form will have

<sup>1</sup> The Evolution of Machinery, page 49.

<sup>1</sup> The Watch Adjusters' Manual, by Charles Edgar Fritts, pages 46 and 47.

no effect whatsoever. Not many years ago a watch would have been ruined by magnetic influences. Now it is made with a balance, roller, hairspring, pallet, and fork of nonmagnetic metals or alloys which are elastic in just the proper proportions to meet the varying conditions of heat and cold.

Between the manufacturers of the higher grades of watch movements and what may be called the "dollar" grade, including case, are a number who make a variety of grades of great utility and of considerable value. Much of the work is done by automatic machinery, but the hand finish is not so complete nor the testing so minute. These manufactures are a development of the cheap watch. Such movements are made largely by regular watch establishments, but in one case at least, possibly in others, are made by clock companies and classed as a by-product.

The rise of the low-priced grade of watches dates from the time of the long-wind Waterbury watch. The foundation patent for this was issued to D. A. A. Buck, May 21, 1878. The feature that made the watch a success was the improvement of the old duplex escapement, by which the parts were simplified so that they could be cheaply stamped out. None of these watches are now made. They have given place to a much higher grade, in which, however, the improved duplex escapement is still used. But the demand they excited continued and had to be satisfied. A number of clock companies now make the low-priced watches, case and all, as a by-product. Whether the evolution can be traced wholly to the Waterbury may be questioned. The clock companies for years have been making clocks of increasingly small dimensions, all with lever movements, such as the marine and the small shelf and alarm clocks. Some of these sizes became quite small for clocks, and at least one was made as an experiment for a pocket piece. It was thick and large, and used as a toy and for advertising purposes, retailing in some instances for \$2.50, whereas to-day a much better watch, both in appearance and in accuracy, can be bought for \$1, guaranteed for a year. But it was a beginning. The movement was that of a clock, with a pin escapement. Hence the cheap watch is sometimes called a "clock-watch," although it is true that the high-grade watches of to-day are also a development of the clock idea, but at a long remove, the definite line of variation having appeared many years ago. The secretary of a clock company making these low-priced watches writes: "In the evolution of this article from our regular goods, the progress has been so gradual that at no distinct time have we felt that we could draw the line where the 'clock' stopped and the 'watch' began. It is identical in character with our small clocks, and we have felt that the term 'pocket clock' was a legitimate and more accurate description than to class it as a watch. It does not have the element of value and solid construction usually associated with a watch."

The cheap watches are now made as small as ladies' size, are stem-winding, and will last, it is said, five years, including a year or two of fairly accurate timekeeping. The dials are of various colors and designs, the effort now being, in some instances, to make railroad and world's time dials. The remarkable cheapness of the low-grade watch is chiefly due to automatic machinery and the factory system. Not much finish, which is a costly matter, is possible. There are no jewels used against which the pivots may rest, as in the higher grade watches, to insure close accuracy and durability by lessening friction; nearly all parts are stamped out, not cut out; the mainsprings and hairsprings are of the quality required for comparatively rough work, and have been greatly reduced in cost by modern processes of manufacture in the United States; and the time devoted to testing and adjustment is necessarily limited. What can be expected in a movement and case which, perhaps, must be sold at wholesale at the rate of 60 cents the watch? The marvel is that it is possible to give so much.

The manufacture of these watches is limited to Connecticut and New York. At one establishment the maximum daily product is stated to be 2,000 watches. The demand for them in the United States is constant and it is yet far from being fully supplied. They are urged upon the public as really better than the cheapest of Swiss watches, which are so imperfect as frequently to require expensive repairs. Exportations of them have been made ever since the beginning of their manufacture, and the demand has been increased of late, it is said, by the presence of the American soldier abroad. When the home market becomes better supplied manufacturers assert that they will take up the export problem in earnest. The question arises: Will the clock manufacturers, with whom watches are a by-product, come to be watch manufacturers, with clocks as a by-product? The answer to this, as given by a clock manufacturer, is that it is not probable, at least in the immediate future. The destruction of clocks seems to be greater than that of watches. A person gets attached to a watch, even a cheap watch, and will expend much more than its cost in repairs, but when a clock becomes out of order he will buy another. There is, therefore, a greater proportional consumption of clocks than of watches, and, other things being equal, this will keep the cheap watch a by-product when made in a clock factory.

The imports and exports of watches and parts thereof vary with a variety of causes, but it is noteworthy that the net imports decreased from \$3,018,447 in 1870, to \$1,403,302 in 1900, or 53.5 per cent, while during the same time the domestic exports increased from \$4,335 to \$787,620, or over one hundred and eighty-fold. Of the imports in 1900, those from Switzerland were valued at \$1,023,967 and constituted 73 per cent of the total net imports; France sent a value of \$140,067; Germany,

\$114,886; and Great Britain, \$89,525. Watches from the United States are now exported to most of the countries of the world. In 1900 Canada received a value of \$274,537, or 34.9 per cent of the total; Japan, \$162,014; South America, \$125,692; Great Britain, \$82,315; British Australasia, \$36,995; British Africa, \$32,174; the Philippines, \$18,003; China, \$9,170; Hawaii, \$8,341; and Cuba, \$1,006.

When pocket timekeepers first came into general use, the cases were made with exposed glass fronts over the face and hands, now distinguished by the term "open face." That style prevailed in the United States as late as seventy years ago. The style called "hunter's" or "hunting" case was invented to accommodate the demands of Englishmen, whose vigorous riding in the hunting field necessitated better protection for their watches. In the United States a similar necessity arose, particularly among the more active classes—the pioneers and hunters of that period. In consequence of the frequent breaking of the crystal the idea of an entire metallic covering was naturally suggested. But there is a rapidly growing demand for open-face watches, the use of thick beveled-edge glasses rendering the case quite as reliable a protection as the cover of a "hunting" case, beside being more nearly dust proof.

Few, if any, watch cases are now made by the high-grade watch-movement factories, the manufacture having become specialized. Watch movements and watch cases are made for each other according to standard sizes, so that the jobber or dealer may order them to fit, in style according to the caprice of himself or his customer, just as he can order interchangeable parts of the watch movement by number for repair work, with no misgivings as to their fitting. The watch-case industry shows the same kind of evolution as the manufacture of watch movements. The effort has been to lower the cost, improve the quality, and increase the

uniformity of the product by automatic machinery and at the same time to furnish a rich variety of effects. In old times crude tools were used, but when the machine-made watch appeared improved methods became necessary to meet the increased demand. Cases were made at first by watch-movement factories, but their manufacture was gradually dropped for the more delicate fabrication. The automatic machines devoted to watch-case making are marvels, and the system of interchangeable parts prevails as in the manufacture of watch movements. The general system of division of labor is similar in the two manufactures. The metal for the cases undergoes several processes, from the furnace where it is melted, mixed, and shaped, through the cutting, rolling, turning, and stamping, until it reaches the several skilled mechanics who finish it in its final beauty of design.

One of the revolutionizing events in the history of the case industry was the invention of the popular filled case, patented in 1859, by James Boss, of Philadelphia, Pa. By this the people are provided with a tasty, serviceable, and durable gold case at about half the cost of a solid gold one. Besides the gold filled, the kinds of cases in most common use are silver, nickel—including silverene, silverore, silveroid, and nickel silver, which are the same under different trade-marks—and German silver. Gun metal is also used, and in the very low-priced grades, brass, nickel plated, is employed.

The gold case gives the artisan excellent opportunities for ornamentation, by its beautiful luster and richness of color. It is often delicately enameled or exquisitely engraved, and ornamented with gems. The prime requisite, however, in selecting material for the case, is to have it of sufficient stiffness to protect the delicate interior from injury by external pressure. The case should also be so constructed as to exclude all dust and moisture, two great hindrances to perfect timekeeping.

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# CENSUS BULLETIN.

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## MANUFACTURES.

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### MANUFACTURED ICE.

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Hon. WILLIAM R. MERRIAM,  
*Director of the Census.*

SIR: I transmit herewith, for publication in bulletin form, a report on the manufacture of ice in the United States during the census year, prepared under my direction by Mr. Arthur L. Hunt, of the Census Office.

The statistics included in the report were collected, as in previous censuses, upon the schedule used for the general statistics of manufactures. But in view of the remarkable growth of this industry and the decided impetus it has given to the production of early vegetables and small fruits in different sections of the United States, especially in the South, through the use of refrigerator cars and cold-storage warehouses, it was decided to supplement the canvass made by the enumerators and local special agents, and to give the industry more detailed treatment than is given to manufacturing industries in general, or than this industry has received heretofore.

As explained in the text, the statistics here presented pertain only to establishments engaged in the manufacture of ice for sale, and do not include the returns from establishments which manufacture ice for their own consumption, such as breweries, meat and provision cold-storage houses, dairies, chemical factories, and various other industries in which the production of cold air or the use of refrigerants is necessary for the preservation of their products.

The growth of the manufactured ice industry in the United States during the past decade indicates that the process of manufacture, through the perfection of machinery and apparatus and the general economy of the plant, has reached the point where the manufactured product can be produced at so low a cost that it has virtually displaced the use of natural ice in the South and

successfully competes with the natural product in certain sections of the North.

The statistics are presented in 11 tables: Table 1 showing comparative figures for the industry at the several censuses; Table 2 showing the summary for the industry for 1900 as it appears in Parts I and II of the Report on Manufactures, and also the summary of additional establishments, the schedules for which were received too late to be included in the totals for this industry as presented in Parts I and II, Manufactures; Table 3 showing, by states and territories, the number of establishments in operation in 1870, 1880, 1890, and 1900, the increase from 1890 to 1900, the number of plants constructed during the decade, and the number constructed during the census year; Table 4 showing, by states and territories, the total number of establishments in 1900, the number using the compressor and the absorption systems, and the per cent of each to the total number; Table 5 showing the comparative summary of the statistics of capital for 1890 and 1900; Table 6 showing statistics of miscellaneous expenses for 1900; Table 7 showing the cost of materials for 1900; Table 8 showing, by states and territories, the quantity, cost, and average cost per pound of aqua and anhydrous ammonia for 1900; Table 9 showing, by states and territories, the total number of tons and value of ice manufactured, the number of tons of can and plate ice, the average value per ton of each, and the per cent of each to the total for 1900; Table 10 showing the detailed statistics for cities of over 20,000 in population in 1900; Table 11 showing the detailed statistics for the industry in 1900, by states and territories.

Table 1 shows the growth of the industry during the thirty years which terminated with the Twelfth Census. Owing to changes in the method of taking the

census, comparisons between the earlier and later decades, represented in Table 1, should be drawn only in the most general way. Nevertheless, the rate of growth in the manufacture of ice may be fairly inferred from the figures given.

In drafting the schedules of inquiry for the census of 1900 care was taken to preserve the basis of comparison with prior censuses. Comparison may be made safely with respect to all the items of inquiry except those relating to capital, salaried officials, clerks, etc., and their salaries, the average number of employees, and the total amount of wages paid. Live capital, that is, cash on hand, bills receivable, unsettled ledger accounts, raw materials, stock in process of manufacture, finished products on hand, and other sundries, was first called for at the census of 1890. No definite attempt was made prior to the census of 1890 to secure a return of live capital invested.

Changes were made in the inquiries relating to employees and wages in order to eliminate defects found to exist on the form of inquiry adopted in 1890. At the census of 1890 the average number of persons employed during the entire year was called for, and also the average number employed at stated weekly rates of pay, and the average number was computed for the actual time the establishments were reported as being in operation. At the census of 1900 the greatest and least numbers of employees were reported, and also the average number employed during each month of the year. The average number of wage-earners (men, women, and children) employed during the entire year was ascertained by using twelve, the number of calendar months, as a divisor into the total of the average numbers reported for each month. This difference in the method of ascertaining the average number of wage-earners during the entire year may have resulted in a variation in the number, and should be considered in making comparisons.

At the census of 1890 the number and salaries of proprietors and firm members actively engaged in the business or in supervision were reported, combined with clerks and other officials. In cases where proprietors and firm members were reported without salaries, the amount that would ordinarily be paid for similar services was estimated. At the census of 1900 only the number of proprietors and firm members actively engaged in the industry or in supervision was ascertained, and no salaries were reported for this class.

It is therefore impossible to compare the number and salaries of salaried officials of any character for the two censuses.

Furthermore, the schedules for 1890 included in the wage-earning class overseers, foremen, and superintendents (not general superintendents or managers), while the census of 1900 separates from the wage-earning class such salaried employees as general superintendents, clerks, and salesmen. It is possible and probable that this change in the form of the question has resulted in eliminating from the wage-earners, as reported by the present census, many high-salaried employees included in that group for the census of 1890.

In some instances, the number of proprietors and firm members shown in the accompanying tables falls short of the number of establishments reported. This is accounted for by the fact that no proprietors or firm members are reported for corporations or cooperative establishments.

The reports show a capital of \$38,204,054 invested in the manufacture of ice in the 787 establishments reporting for the United States. This sum represents the value of land, buildings, machinery, tools, and implements, and the live capital utilized, but does not include the capital stock of any of the manufacturing corporations engaged in this industry. The value of the products is returned at \$13,874,513, to produce which involved an outlay of \$1,234,803 for salaries of officials, clerks, etc.; \$3,424,305 for wages; \$1,779,890 for miscellaneous expenses, including rent, taxes, etc.; and \$3,339,724 for materials used, mill supplies, freight, and fuel. It is not to be assumed, however, that the difference between the aggregate of these sums and the value of the products is in any sense indicative of the profits in the manufacture of ice during the census year. The census schedule takes no cognizance of the cost of selling manufactured articles, or of interest on capital invested, or of the mercantile losses incurred in the business, or of depreciation in plant. The value of the product given is the value as obtained or fixed at the works. This statement is necessary in order to avoid erroneous conclusions from the figures presented.

Very respectfully,



*Chief Statistician for Manufactures.*

# MANUFACTURED ICE.

By ARTHUR L. HUNT.

The following report presents the statistics concerning the establishments engaged in the manufacture of ice for sale during the census year ending May 31, 1900. Ice produced by mechanical or chemical means is commonly, but not very appropriately, designated as "artificial," to distinguish it from ice produced by nature. Artificial refrigeration consists simply in the removal of heat, and is accomplished by the use of ammonia, either aqua or anhydrous, or some other volatile liquid, such as sulphurous dioxide or ether, which absorbs heat upon evaporation.

The manufacture of ice as an industry existed as early as 1866, but has attained commercial importance only within the past fifteen or twenty years. The industry naturally had its inception in the South, where ice is not harvested in commercial quantities, and where the difficulties and loss attending its shipment from the North precludes its general use, and has extended not only throughout all the Southern states but into the majority of the Northern and Western states. The ice industry, in connection with the operation of cold-storage houses and the introduction of refrigerator cars, has aided greatly in the development of the natural resources of different sections of the United States, and forms a most important factor in the industrial development and progress of not only the Southern states but many of the Northern states. Refrigerator cars insure the safe transportation of perishable articles, and cold-storage warehouses obviate the necessity of their shipment as soon as produced or their consumption as soon as delivered, thus allowing the goods to be held before or after shipment until there

is a market for them. Artificial refrigeration has thus given a great stimulus to the production of early vegetables and small fruits, especially strawberries, in the South and on the Pacific coast. It has also been of great importance to the slaughtering and meat packing industry, facilitating the storage and the handling of dressed meats and making it possible to carry on the operations of this industry throughout the entire year, whereas previously it had been limited to the winter season.

The statistics presented in this report relate exclusively to establishments which manufactured ice for sale. Many of these establishments, however, operate cold-storage houses in connection with their ice plants, and the receipts for storage are included in the total value of products. The report does not include the statistics of establishments which manufactured ice for their own consumption, such as breweries, meat and provision cold-storage houses, chemical factories, and various other establishments.

Table 1 presents in summarized form the statistics of the industry as returned at the censuses of 1870 to 1900, inclusive, with the percentages of increase for each decade. The totals for 1900 include returns from 12 establishments, the reports for which were not secured in time to be included in the general report upon this industry, and therefore these totals do not agree with those given in Parts I and II, Manufactures. Table 2 shows the totals for the industry for 1900 as given in the general report, and also the totals for the additional reports received, a combination of the two making the totals shown in Table 1.

TABLE 1.—COMPARATIVE SUMMARY, 1870 TO 1900, WITH PER CENT OF INCREASE FOR EACH DECADE.

	DATE OF CENSUS.				PER CENT OF INCREASE.		
	1900 <sup>1</sup>	1890	1880	1870	1890 to 1900	1880 to 1890	1870 to 1880
Number of establishments.....	787	222	95	4	254.5	584.3	775.0
Capital.....	\$38,204,054	\$9,846,468	\$1,251,200	\$484,000	288.0	687.0	188.3
Salaried officials, clerks, etc., number.....	1,545	2,439	( <sup>3</sup> )	( <sup>3</sup> )	251.9	.....	.....
Salaries.....	\$1,234,803	\$345,191	( <sup>3</sup> )	( <sup>3</sup> )	257.7	.....	.....
Wage-earners, average number.....	6,938	2,826	447	97	145.3	532.2	360.8
Total wages.....	\$3,424,305	\$1,095,996	\$140,885	\$40,600	212.4	677.9	247.0
Men, 16 years and over.....	6,889	2,811	389	96	145.1	622.6	305.2
Wages.....	\$3,416,844	\$1,094,634	( <sup>3</sup> )	( <sup>3</sup> )	212.1	.....	.....
Women, 16 years and over.....	8	.....	50	.....	.....	.....	.....
Wages.....	\$3,592	.....	( <sup>3</sup> )	.....	.....	.....	.....
Children, under 16 years.....	86	15	8	1	140.0	87.5	700.0
Wages.....	\$3,869	\$1,362	( <sup>3</sup> )	( <sup>3</sup> )	184.1	.....	.....
Miscellaneous expenses.....	\$1,779,890	\$477,485	( <sup>4</sup> )	( <sup>4</sup> )	272.8	.....	.....
Cost of materials used.....	\$3,339,724	\$940,699	\$168,112	\$82,165	255.0	495.0	92.4
Value of products.....	\$13,874,513	\$4,900,983	\$544,763	\$258,260	183.1	799.7	110.9

<sup>1</sup> Exclusive of Hawaii, which reports as follows: Number of establishments, 4; capital, \$187,271; salaried officials, clerks, etc., 4; salaries, \$6,365; wage-earners, all men, average number, 19; total wages, \$12,015; miscellaneous expenses, \$5,805; cost of materials, \$15,735; value of products, \$56,522. The figures reported for 1900 include the statistics for 12 establishments, the schedules for which were received too late to be included in the totals for this industry as presented in the report on Manufactures, Parts I and II.

<sup>2</sup> Includes proprietors and firm members, with their salaries; number only reported in 1900. (See Table 11.)

<sup>3</sup> Not reported separately.

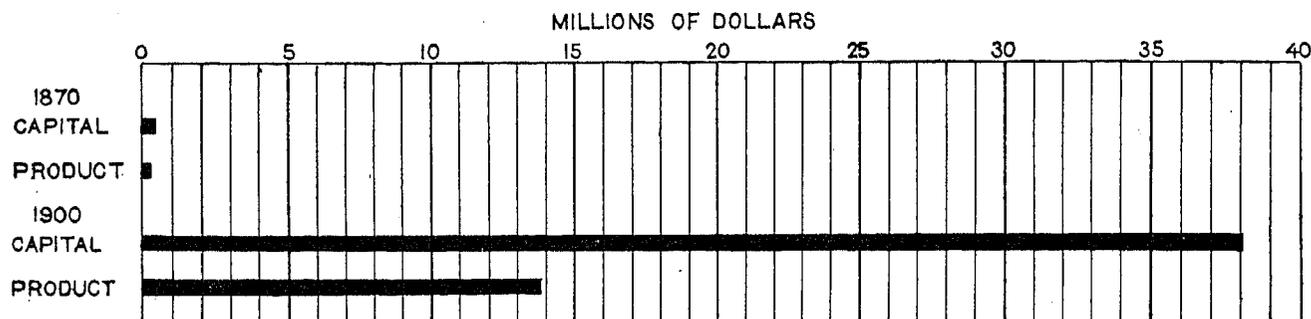
<sup>4</sup> Not reported.

TABLE 2.—SUMMARY, 1900.

	Reported in Manufactures, Parts I and II.	Additional establish- ments.
Number of establishments .....	775	12
Capital .....	\$38,019,507	\$184,547
Salaried officials, clerks, etc., number .....	1,531	14
Salaries .....	\$1,226,331	\$8,472
Wage-earners, average number .....	6,880	53
Total wages .....	\$3,402,745	\$21,560
Men, 16 years and over .....	6,838	51
Wages .....	\$3,395,428	\$21,416
Women, 16 years and over .....	8	.....
Wages .....	\$3,592	.....
Children, under 16 years .....	34	2
Wages .....	\$3,725	\$144
Miscellaneous expenses .....	\$1,773,692	\$6,198
Cost of materials used .....	\$3,312,393	\$27,331
Value of products .....	\$13,780,978	\$93,535

Table 1 indicates the remarkable progress which has taken place in this industry during the thirty years ending with 1900. Statistics of the manufacture of ice first appear in the census of 1870, when returns were received from 4 establishments with a capital of \$434,000 and products valued at \$258,250. In 1900 the number of establishments was 787, the capital \$38,204,054, and the value of products \$13,874,513. The growth of the industry is perhaps more forcibly illustrated by the following diagram:

COMPARATIVE GROWTH OF CAPITAL AND PRODUCTS, 1870 AND 1900.



During the period from 1870 to 1880 the number of establishments increased from 4 to 35, the capital from \$434,000 to \$1,251,200, and the value of products from \$258,250 to \$544,763. A comparison of the figures reported for 1890 with those reported for 1880 indicates that most notable progress occurred in this industry during this decade. The number of establishments increased from 35 to 222; the capital from \$1,251,200 to \$9,846,468; and the value of products from \$544,763 to \$4,900,983. During the past decade the industry has made still greater advances, although the per cent of increase is not as large as that shown during the preceding decade. The number of establishments increased from 222 to 787, an increase of 565, or 254.5 per cent; the capital from \$9,846,468 to \$38,204,054, an increase of \$28,357,586, or 288 per cent; and the value of products from \$4,900,983 to \$13,874,513, an increase of \$8,973,530, or 183.1 per cent.

A comparison of the average capital and value of products per establishment for the several censuses sheds further light upon the development of the industry since 1870. In that year the average capital per establishment was \$108,500 and the average value of products \$64,563. These averages are higher than for any of the subsequent censuses, probably because the four establishments included one which reported products valued at nearly \$250,000. This establishment had been erected in New Orleans in 1866 and was the first ice factory of importance built in the United States. At this time nearly all of the natural ice used in New Orleans came from Boston, and, on account of the dis-

tance, difficulties of shipping, and loss by melting, the price was excessively high, ranging from \$15 to \$20 per ton. Although the manufactured ice was crude and often very poor, the cost of production was excessive, owing to the experimental nature of the process, the imperfect knowledge of the operators, and the loss of ammonia by leakage. These circumstances combined with the excessive price of natural ice to keep the price for manufactured ice correspondingly high. In 1880 the average capital per establishment decreased to \$35,749 and the average value of products to \$15,565. The decade between 1870 and 1880 may be looked upon as the incipient and experimental stage of the industry. A number of small-capacity plants were installed, usually in Southern towns of considerable population, where the manufactured product would have to compete with natural ice only to a very limited extent. In this way a demand for ice was created and supplied. In many instances the surplus was sent to neighboring communities, and led generally to the establishment of plants in these localities also. Later the industry gained a foothold in the cities where natural ice was used to some extent by the wealthy families and by a few of the larger dealers in perishable products.

The decade from 1880 to 1890 witnessed a rapid growth in the industry and demonstrated that it was possible to manufacture ice on a scale commensurate with the needs of the community in which the plant was located. Thus the industry became firmly established. Small establishments began to increase their capacity and to install larger refrigerating machines:

The average capital per establishment increased to \$44,353, or 24.1 per cent, and the value of products to \$22,077, or 41.8 per cent. The decade from 1890 to 1900 witnessed a still further increase in the productive capacity, resulting in an increase in the average capital per establishment to \$48,544, or 9 per cent. There was a decrease, however, in the average value of products from \$22,077 to \$17,630, or \$4,461 per establishment, caused, in part at least, by a decrease in price to the consumer, which resulted from the general reduction in the cost of production, due to the increasing knowledge of refrigerants and refrigerating processes.

The corporate form of organization predominates in this industry. Of the total number of establishments reporting, 469, or 59.6 per cent, were operated by incorporated companies. Of the remainder, 180, or 22.9 per cent, were conducted by individuals, 134, or 17 per cent, by firms or limited partnerships, and the remaining 4 were miscellaneous in character.

Table 3 presents, by states and territories, the number of ice-manufacturing establishments as returned at the censuses of 1870 to 1900, inclusive, together with the increase and number established since 1890, and the number established during the census year.

TABLE 3.—COMPARATIVE SUMMARY, NUMBER OF ACTIVE ESTABLISHMENTS, 1870 TO 1900, INCLUSIVE; INCREASE, 1890 TO 1900; NUMBER ESTABLISHED SINCE 1890; AND NUMBER ESTABLISHED DURING THE CENSUS YEAR; BY STATES AND TERRITORIES; ARRANGED GEOGRAPHICALLY.

STATES AND TERRITORIES.	1900	1890	1880	1870	Increase, 1890 to 1900.	Established since 1890.	Established during census year.
The United States.....	787	222	35	4	565	544	89
New England states.....	7				7	5	
Rhode Island.....	2				2	2	
Connecticut.....	5				5	3	
Middle states.....	169	14			155	123	33
New York.....	41	1			40	36	12
New Jersey.....	26	1			25	16	6
Pennsylvania.....	73	5			68	54	12
Delaware.....	7	1			6	5	1
Maryland.....	18	5			13	11	2
District of Columbia.....	4	1			3	1	
Southern states.....	386	165	29	4	221	253	39
West Virginia.....	8	4			4	3	
Virginia.....	30	8			22	22	2
North Carolina.....	23	5			18	18	4
South Carolina.....	13	4			9	8	3
Georgia.....	32	16	8		16	19	2
Florida.....	35	9			26	23	2
Kentucky.....	81	12	1		19	20	3
Tennessee.....	27	13		1	14	16	2
Alabama.....	23	18	3		5	14	2
Mississippi.....	23	8			15	14	2
Arkansas.....	18	5	1		13	14	2
Louisiana.....	36	10	4	2	26	31	7
Indian Territory.....	3				3	3	2
Oklahoma.....	7				7	5	
Texas.....	77	53	12	1	24	43	6
Central states.....	152	23	1		129	111	15
Ohio.....	42	10			32	28	2
Indiana.....	47	3			44	37	5
Illinois.....	29	8			21	21	3
Iowa.....	3				3	3	1
Missouri.....	31	2	1		29	24	4
Western states.....	40	7			33	32	
Nebraska.....	1				1	1	
Utah.....	1				1	1	

TABLE 3.—COMPARATIVE SUMMARY, NUMBER OF ACTIVE ESTABLISHMENTS, 1870 TO 1900, INCLUSIVE; INCREASE, 1890 TO 1900; NUMBER ESTABLISHED SINCE 1890; AND NUMBER ESTABLISHED DURING THE CENSUS YEAR; BY STATES AND TERRITORIES; ARRANGED GEOGRAPHICALLY—Continued.

STATES AND TERRITORIES.	1900	1890	1880	1870	Increase, 1890 to 1900.	Established since 1890.	Established during census year.
Western states—continued.							
Colorado.....	6	1			5	5	
Kansas.....	19	4			15	15	
Arizona.....	9	2			7	7	
New Mexico.....	4				4	4	
Pacific states.....	33	13	5		20	20	2
Washington.....	4	2			2	1	
Oregon.....	9	4			5	4	
California.....	20	7	5		13	15	2

Table 3 indicates in a striking manner the growth of the industry since 1870. In 1870 all 4 of the establishments reporting were located in the Southern states, and the same is true of nearly all of the 35 plants returned at the census of 1880. From 1880 to 1890 the number of establishments increased rapidly and the industry extended to the Middle, Central, Western, and Pacific states, supplementing the supply of ice furnished by nature. Although, between 1890 and 1900, the number of establishments increased remarkably throughout the South, the greatest and most striking increases occurred in a few of the Middle and Central states, namely, Pennsylvania, Indiana, New York, and Ohio. In 1890 Ohio was the only one of these states which reported as many as 10 ice plants, and the number in each of the other states, with the exception of Pennsylvania, was under 5. At the present census not one of these states reported less than 40 ice-manufacturing plants, and in Pennsylvania the number reached 73. This remarkable growth of the industry in the North is largely accounted for by the fact that the process of manufacture, through the perfection of the refrigerating machines, the mechanical appliances used, and the general economy of the plant, has reached a point where the manufactured product can be produced at a cost which makes it possible to compete successfully with the natural product.

It is interesting to compare the number of establishments in the Southern states with the total number in the United States for 1890 and 1900. These 15 states comprise a little less than one-third of the 52 states and territories of the United States, and the comparison shows the growth of the industry in the North and West. In 1890, 165, or 74.3 per cent of the total number, were located in the South. In 1900 the number in the South increased to 386, an increase of 134 per cent, but formed only 49 per cent of the total number of establishments.

In no state or territory has there been a decrease in the number of establishments. The increase in the total number from 1890 to 1900 was one hundred and

forty-one times the total number reported for 1870, over sixteen times that returned for 1880, and over two and one-half times that reported for 1890. The leading 10 states in 1900, ranked according to the number of establishments, were: Texas, 77; Pennsylvania, 73; Indiana, 47; Ohio, 42; New York, 41; Louisiana, 36; Florida, 35; Georgia, 32; Missouri, 31; and Kentucky, 31. The rapid growth of the industry is still further illustrated by the 89 factories reported as established during the census year. This is over two and one-half times the total number reported for the entire country in 1880, and over one-tenth of the number returned for 1900. The following states reported no ice-manufacturing establishments: Idaho, Maine, Massachusetts, Michigan, Minnesota, Montana, Nevada, New Hampshire, North Dakota, South Dakota, Vermont, Wisconsin, and Wyoming.

In the manufacture of ice there are two systems used, commonly known as the "compressor" and the "absorption" systems. The compressor system, which is by far the more common of the two, involves three successive steps, respectively called compression, condensation, and expansion. In this system anhydrous ammonia, or ammonia which contains no water, in the gaseous form is subjected to a pressure of from 125 to 175 pounds per square inch, by the use of a pump employing steam or other power. At the beginning the gas contains a certain amount of heat, and substantially none of this is lost by compression. The gas is next reduced to the liquid state by condensation. This is performed by passing the ammonia through coils of pipe, the pipes being in contact with cold water or some other cooling medium. The excess of heat is thus given up, and the ammonia, reduced to the liquid state, is then caused to expand or become gaseous in coils of pipe which are in contact with the water to be frozen. This reduces the temperature of the ammonia gas below the freezing point of water, and the ammonia absorbs from the water to be cooled the heat which was taken from the former during condensation. This of necessity results in the freezing of water, owing to the well-known fact that if two substances of different temperatures are allowed to come in contact with each other, the warmer body will impart its heat to the colder, until the temperatures of the two are equalized. This is the theory of all refrigerating processes. The ammonia, having completed its cooling work, is then returned to the compressor where it may be reused repeatedly. There is, however, a small loss during each cycle of operations, and the supply must be replenished at intervals.

In the absorption system an aqueous solution of ammonia is used, the process involving four successive steps: the generation of gas, condensation, expansion, and absorption. The application of heat to the aqua ammonia converts it into a gas, and raises the pressure to from 120 to 160 pounds per square inch. The am-

monia is then condensed, or reduced to liquid form by being conducted through pipes which are in contact with cold water. The next step is the expansion, which is usually accomplished as in the compressor system. The ammonia is now changed from a liquid to a gas, and, being greatly reduced in temperature, absorbs heat from the pipes, thus producing ice or refrigeration.<sup>1</sup>

Table 4 presents, by states and territories, the number of establishments in 1900 using the compressor and the absorption systems, and the per cent of each to the total number.

TABLE 4.—NUMBER OF ESTABLISHMENTS USING THE COMPRESSOR AND THE ABSORPTION SYSTEMS, AND THE PER CENT OF EACH TO THE TOTAL NUMBER, BY STATES AND TERRITORIES; ARRANGED GEOGRAPHICALLY: 1900.

STATES AND TERRITORIES.	Total number of establishments.	COMPRESSOR SYSTEM.		ABSORPTION SYSTEM.	
		Number.	Per cent of total.	Number.	Per cent of total.
The United States .....	787	571	72.6	216	27.4
New England states .....	7	7	100.0		
Rhode Island .....	2	2	100.0		
Connecticut.....	5	5	100.0		
Middle states .....	169	158	93.5	11	6.5
New York.....	41	37	90.2	4	9.8
New Jersey .....	26	24	92.3	2	7.7
Pennsylvania .....	73	68	93.1	5	6.9
Delaware .....	7	7	100.0		
Maryland .....	18	18	100.0		
District of Columbia .....	4	4	100.0		
Southern states .....	386	247	64.0	139	36.0
West Virginia.....	8	4	50.0	4	50.0
Virginia .....	30	22	73.3	8	26.7
North Carolina .....	23	19	82.6	4	17.4
South Carolina.....	13	7	53.9	6	46.1
Georgia .....	32	16	50.0	16	50.0
Florida .....	35	14	40.0	21	60.0
Kentucky.....	31	12	38.7	19	61.3
Tennessee .....	27	22	81.5	5	18.5
Alabama .....	23	14	60.9	9	39.1
Mississippi .....	23	13	56.5	10	43.5
Arkansas .....	18	18	100.0		
Louisiana .....	36	13	36.1	23	63.9
Indian Territory .....	8	3	100.0		
Oklahoma .....	5	5	100.0		
Texas .....	77	65	84.4	12	15.6
Central states .....	152	105	69.1	47	30.9
Ohio .....	42	30	71.4	12	28.6
Indiana .....	47	25	53.2	22	46.8
Illinois .....	29	20	69.0	9	31.0
Iowa .....	3	2	66.7	1	33.3
Missouri .....	31	28	90.3	3	9.7
Western states .....	40	25	62.5	15	37.5
Nebraska .....	1	1	100.0		
Utah .....	1	1	100.0		
Colorado .....	6	2	33.3	4	66.7
Kansas .....	19	10	52.6	9	47.4
Arizona .....	9	9	100.0		
New Mexico .....	4	2	50.0	2	50.0
Pacific states.....	33	29	87.9	4	12.1
Washington.....	4	4	100.0		
Oregon .....	9	9	100.0		
California.....	20	16	80.0	4	20.0

From Table 4 it appears that of the 787 establishments reporting, 571, or 72.6 per cent, used the compressor

<sup>1</sup> Artificial Ice Making and Refrigeration, by Louis M. Schmidt, pages 5-8.

system, and the remainder, 216, or 27.4 per cent, employed the absorption system. These figures show that the compressor system is the one in general use. It is in fact superseding the absorption, which is the older of the two processes. The latter, however, is still used in the smaller plants and warm climates, as its operation requires less machinery and a less complicated arrangement of appliances. In three of the Southern states—Florida, Kentucky, and Louisiana—the number of establishments using the absorption system exceeded the number employing the compressor system. In West Virginia, Georgia, and New Mexico the number employing each system was the same, but in the majority of the remaining states, with the single exception of Colorado, the number using the compressor system was far in excess of the number employing the other system. It will also be noticed that a number of states reported no establishments using absorption machines. The following states reported plants using both systems: Colorado, 1; Kansas, 1; Kentucky, 2; Louisiana, 1; Mississippi, 1; Missouri, 1; Tennessee, 2. These latter establishments were classified according to the number or capacity of the compressor or absorption machines used.

Table 5 is a comparative summary of capital for 1890 and 1900, with the per cent of each item to the total, and the per cent of increase for the decade.

TABLE 5.—COMPARATIVE SUMMARY CAPITAL: 1890 AND 1900.

	1900		1890		Per cent of increase.
	Amount.	Per cent of total.	Amount.	Per cent of total.	
Total.....	\$38,204,054	100.0	\$9,846,468	100.0	288.0
Land.....	4,679,379	12.3	1,595,360	16.2	193.3
Buildings.....	7,387,014	19.3	1,338,652	13.6	451.8
Machinery, tools, and implements.....	22,852,158	59.8	5,939,719	60.8	284.7
Cash and sundries.....	3,285,503	8.6	972,737	9.9	237.8

As shown by Table 5, the increase between 1890 and 1900 in the total capital employed in the manufacture of ice was \$28,357,586, or 288 per cent. Of the total value of capital reported, the value of machinery, tools, and implements, including refrigerating apparatus and machinery, boilers, tanks, air compressors, small engines, pipe coils, ice receptacles, and all other apparatus and accessories required, constituted the principal item both in 1890 and 1900, amounting to \$5,939,719 in 1890 and \$22,852,158 in 1900, an increase of \$16,912,439, or 284.7 per cent. The per cent of this item to the total capital was substantially the same for each year. The value of buildings, the next largest item, increased from \$1,338,652 to \$7,387,014 during the decade, an increase of \$6,048,362, or 451.8 per cent. The value of land increased from \$1,595,360 to \$4,679,379, an increase of \$3,084,019, or 193.3 per

cent. It constituted, however, a smaller proportion of the total capital in 1900 than in 1890. The value of buildings, on the other hand, not only exhibited a striking increase, but constituted a larger proportion of the capital in 1900 than in 1890. This increase was probably due to the erection of cold-storage plants operated in connection with the manufacture of ice, to the increase in the ice-storage capacity, and to the generally increased productive capacity of the plants. Cash and sundries, including cash on hand, bills receivable, unsettled ledger accounts, raw materials, stock in process of manufacture, finished products on hand, and other sundries formed the smallest item of the total capital, amounting to \$972,737 in 1890, and to \$3,285,503 in 1900, an increase of \$2,312,766, or 237.8 per cent, and constituted 8.6 per cent of the total capital in 1900, or nearly the same per cent as in 1890. The above figures do not represent the capital stock of any of the corporations, but include only the actual value of the plants, together with the amount necessary for working capital.

The schedule of inquiry adopted for 1890 was the first which contained questions designed to show the cost of manufacture other than for wages and materials. The questions of the Twelfth Census relating to miscellaneous expenses were made as nearly uniform as possible with those of the previous census, and the returns are shown in Table 6, together with the per cent of each item to the total.

TABLE 6.—MISCELLANEOUS EXPENSES: 1900.

	Amount.	Per cent of total.
Total.....	\$1,779,890	100.0
Rent of works.....	116,026	6.5
Taxes, not including internal revenue.....	246,340	13.9
Rent of offices, insurance, interest, repairs, advertising, and other sundries.....	1,394,180	78.3
Amount paid for contract work.....	23,344	1.3

The amount paid for rent of offices, insurance, interest, internal-revenue tax and stamps, repairs of buildings and machinery, advertising, and all other sundries not reported under the head of materials, etc., was the principal item, and constituted 78.3 per cent of the total miscellaneous expenses. This amount does not include expenditures for new equipment, machinery, and other apparatus. The amount of interest in this item does not include the interest paid on bonds by incorporated companies, but only the small sums expended during the year for money or credit necessary to conduct the business. The remaining items under miscellaneous expenses formed but a relatively small per cent of the total amount reported.

Table 7 shows the cost of the different materials used in the manufacture of ice in 1900, with the per cent of each item to the total cost of materials.

TABLE 7.—COST OF MATERIALS: 1900.

	Amount.	Per cent of total.
Total .....	\$3,339,724	100.0
Ammonia .....	359,549	10.8
Anhydrous .....	279,680	8.4
Aqua .....	79,869	2.4
All other materials .....	506,586	15.2
Fuel .....	2,139,216	64.0
Rent of power and heat .....	20,336	0.6
Mill supplies .....	216,383	6.5
Freight .....	97,654	2.9

The total cost of materials in 1900 was \$3,339,724 as compared with \$940,699 in 1890, an increase of \$2,399,025, or 255 per cent. The quantities and values of the different materials used are presented in detail in Table 11, by states and territories.

The manufacture of ice is peculiar in that practically the only materials which affect the cost are those which do not enter into the product, but are used in the generation of the cold necessary for the production of ice. The principal item of expense is the cost of fuel used to propel the machinery. In 1900 this was \$2,139,216, or 64 per cent of the total cost. No attempt was made to ascertain the number of tons of coal represented by this amount. Ammonia, anhydrous and aqua, is the principal material used as a refrigerant. The cost of ammonia was \$359,549, or only 10.8 per cent of the total cost of materials used. The cost of anhydrous ammonia was \$279,680, or 8.4 per cent of the total cost of materials, and the cost of aqua ammonia was \$79,869, or 2.4 per cent of the total cost of materials.

The item "other materials" included the amounts expended for brine, made either with sodium chloride (common salt) or chloride of calcium, and also the

amount expended for water consumed, and constituted the remainder of the materials used directly in connection with the production of ice, the common salt and the chloride of calcium assisting in refrigeration, and the water entering into the product. The quantities of sodium chloride, chloride of calcium, and water were not ascertained and the cost of each was not given separately. Included also with "other materials" is the cost of anhydrous sulphurous dioxide and ether, which are used to some extent as refrigerants in place of ammonia in the Pictet machine, so called from its inventor, Professor Pictet, of Geneva, Switzerland. There were 7 establishments using anhydrous sulphurous dioxide, distributed as follows: California, 1; Kentucky, 3; New Jersey, 1; Pennsylvania, 1; Texas, 1. There was only 1 establishment using ether. The total quantity of anhydrous sulphurous dioxide used was 13,870 pounds, costing \$2,540, an average of 18.3 cents per pound. The cost of ether was given as \$350. A combination of these amounts with the sum expended for ammonia shows that the total amount expended for refrigerants was \$362,089, or 10.8 per cent of the total amount expended for materials used in the manufacture of ice.

As stated above, the ammonia used in artificial refrigeration is of two kinds, anhydrous and aqua. In the compressor machines, anhydrous ammonia is used exclusively, but in the absorption machines both aqua and anhydrous ammonia are used. Table 8 shows, by states and territories, the quantity and cost of each variety of ammonia used in 1900, including the anhydrous ammonia used in the compressor system, and the anhydrous and aqua ammonia used in the absorption system, with the average cost of each per pound.

TABLE 8.—QUANTITY AND COST OF AMMONIA USED; QUANTITY, COST, AND AVERAGE COST PER POUND OF ANHYDROUS AMMONIA USED IN THE COMPRESSOR SYSTEM; AND QUANTITY, COST, AND AVERAGE COST PER POUND OF ANHYDROUS AND OF AQUA AMMONIA USED IN THE ABSORPTION SYSTEM; BY STATES AND TERRITORIES; ARRANGED GEOGRAPHICALLY: 1900.

STATES AND TERRITORIES.	AMMONIA USED.										
	Total.		Compressor system.			Absorption system.					
	Pounds.	Cost.	Anhydrous.		Average cost per pound (cents).	Anhydrous.			Aqua.		
			Pounds.	Cost.		Pounds.	Cost.	Average cost per pound (cents).	Pounds.	Cost.	Average cost per pound (cents).
The United States.....	2,379,989	\$359,549	946,666	\$249,838	26.4	109,869	\$29,842	27.1	1,323,454	\$79,869	6.0
New England states.....	7,113	1,831	7,113	1,831	25.7						
Rhode Island.....	1,800	460	1,800	460	25.6						
Connecticut.....	5,313	1,371	5,313	1,371	25.8						
Middle states.....	400,013	88,108	328,285	81,910	25.0	9,386	2,384	25.4	62,342	3,314	6.1
New York.....	102,629	23,274	89,129	21,726	24.4	4,000	1,048	26.2	9,500	500	5.3
New Jersey.....	33,593	6,876	25,693	6,255	24.3	1,000	230	23.0	6,900	391	6.7
Pennsylvania.....	225,936	48,887	175,608	44,858	25.5	4,386	1,106	25.2	45,942	2,923	6.4
Delaware.....	6,080	1,580	6,080	1,580	26.2						
Maryland.....	22,515	5,177	22,515	5,177	23.0						
District of Columbia.....	9,310	2,314	9,310	2,314	24.9						
Southern states.....	1,270,026	164,931	383,020	93,562	28.1	66,105	17,893	27.1	870,901	53,476	6.1
West Virginia.....	74,870	5,573	4,100	975	23.8	3,075	727	23.6	67,695	3,871	5.7
Virginia.....	88,607	12,928	28,137	8,334	29.6	4,974	1,810	26.5	55,466	3,278	5.9
North Carolina.....	44,418	6,143	16,338	4,415	27.0	410	115	28.0	27,670	1,613	5.8
South Carolina.....	58,333	4,439	8,277	857	26.0				54,720	3,408	6.4
Georgia.....	107,925	12,736	26,090	6,778	26.0	3,858	986	25.6	77,977	4,977	6.4
Florida.....	149,086	13,276	17,881	5,174	29.0	1,905	576	30.2	129,350	7,526	5.8
Kentucky.....	99,007	12,006	23,527	6,612	28.1	5,980	1,691	28.3	69,500	3,703	5.3
Tennessee.....	88,573	13,685	28,649	7,478	26.1	12,757	3,438	26.9	47,167	2,769	5.9
Alabama.....	122,415	12,766	24,989	6,745	27.0				97,426	6,021	6.2
Mississippi.....	44,116	6,489	10,216	2,541	24.9	8,973	2,380	26.0	24,926	1,618	6.5
Arkansas.....	20,984	5,910	20,984	5,910	28.2						
Louisiana.....	191,178	24,424	32,807	9,222	28.1	20,819	5,825	28.0	137,552	9,377	6.8
Indian Territory.....	1,550	443	1,550	443	28.6						
Oklahoma.....	10,328	1,833	2,530	733	29.0	2,312	600	26.0	5,486	500	9.1
Texas.....	168,637	32,280	91,995	27,350	29.7	706	205	29.0	76,936	4,725	6.2
Central states.....	508,384	69,429	207,754	49,682	23.9	17,335	4,881	25.3	283,295	15,466	5.5
Ohio.....	141,866	14,756	39,096	9,617	24.6	855	234	24.5	101,314	4,905	4.8
Indiana.....	144,476	15,809	28,017	7,717	27.5	8,862	2,276	25.7	107,597	5,816	5.4
Illinois.....	74,829	14,813	49,266	12,324	25.0	5,140	1,350	26.3	20,433	1,139	5.6
Iowa.....	24,600	1,749	2,100	549	26.1				22,500	1,200	5.3
Missouri.....	123,114	22,302	39,265	19,375	21.7	2,378	521	21.9	31,451	2,406	7.6
Western states.....	113,874	17,798	32,915	10,401	31.0	9,043	2,784	30.8	71,916	4,613	6.4
Nebraska.....	1,035	300	1,035	300	29.0						
Utah.....	600	210	600	210	35.0						
Colorado.....	44,264	5,564	5,646	1,714	30.4	5,339	1,693	31.4	33,229	2,157	6.5
Kansas.....	42,988	5,891	13,019	3,434	26.4	3,354	1,001	29.8	26,565	1,456	5.5
Arizona.....	10,279	4,133	10,279	4,133	40.2						
New Mexico.....	14,758	1,700	2,336	610	26.1	300	90	30.0	12,122	1,000	8.2
Pacific states.....	80,579	17,452	37,579	12,552	33.4	8,000	2,400	30.0	35,000	2,500	7.1
Washington.....	6,883	2,605	6,883	2,605	37.8						
Oregon.....	6,043	1,934	6,043	1,934	32.0						
California.....	67,653	12,913	24,653	8,013	32.5	8,000	2,400	30.0	35,000	2,500	7.1

The total cost of ammonia is given as \$359,549 and the total number of pounds as 2,379,989. The cost of the anhydrous ammonia used in the compressor system was \$249,838 and the number of pounds 946,666, or 39.8 per cent of the total number of pounds of ammonia reported for both systems. The average cost was 26.4 cents per pound. The cost of anhydrous ammonia used in the absorption system was 27.1 cents per pound. The total cost of the aqua ammonia used was \$79,869, an average of 6 cents per pound, and the number of pounds was 1,323,454, or 55.6 per cent of the total. The average price for anhydrous and aqua ammonia was secured from the totals of the whole number of establishments from which reports were received, and there-

fore does not indicate the price in any one state or section of the country. The cost and also the quantity used vary considerably in different sections of the country. Furthermore, ammonia is sometimes bought delivered, and it was found impracticable to attempt to separate the amount chargeable to freight. The table, however, reflects in a general way the variations in the price of ammonia in different sections of the country. It appears that the average cost of anhydrous ammonia varied from 22 cents to 40 cents per pound, according to the distance from the source of supply, the average cost being lowest in the Middle and Central states and highest in the Pacific states. The average cost of aqua ammonia varied similarly

from 5 to 9 cents per pound. The quantity of ammonia used depends so much upon its strength and density, upon the type of refrigerating machine used and its condition as to leakage, and also upon the care of the engineers, that an establishment may be obliged to use during one year two to three times the quantity required during the previous year. This statement is necessary in order to obviate erroneous deductions from the figures presented in Table 8.

The total value of products, \$13,874,513, as given in Table 1, for 1900, as compared with \$4,900,983 for 1890, shows an increase of \$8,973,530, or 183.1 per cent, during the past decade. The value of the principal product, ice, amounted to \$13,303,874, and formed 96 per cent of the total value of product. The value of other products amounted to \$570,639, and formed 4 per cent of the total value of products. This item includes amounts received for cold storage and for the manufacture of bottled goods and soda water, but the amount received for each was not separately ascertained.

Practically all of the ice manufactured in the United States is produced by the can system or the plate system. In the can system distilled water is used, since if the water were not distilled the ice would be opaque, and, in most cases, of a brownish color. Distilled water is furnished by condensing exhaust steam from the refrigerating machine or by condensing live steam. In the plate system a clear ice is made without distilling the water.

In the can system ice may be formed either in stationary cells or in removable cans, the latter being the method in more general use at the present time. If stationary cells are used, all the cells in an entire tank must be emptied at the same time, which necessitates the use of more than one tank in order to make the operation continuous. In the other method the water to be frozen is placed in cans, which are in turn immersed in iron or wooden tanks containing cold brine. The cans can be taken out singly, and after the ice is removed can be filled again with water and replaced in the tank. Thus the process is continuous. The ice is removed either by dropping the can into, or sprinkling

it with tepid water. The time required for the formation of the ice varies from twenty to sixty-six hours, according to the thickness of the mold containing the water to be frozen and the temperature of the brine.

The following table indicates the weight of blocks, size of can, and the time required for freezing:

STANDARD ICE CANS OR MOLDS.<sup>1</sup>

WEIGHT OF BLOCKS.	Size of can.	Time of freezing (with 18° brine).
Pounds.	Inches.	Hours.
50	6 x 12 x 26	20
100	8 x 16 x 32	36
150	8 x 16 x 42	36
200	11 x 22 x 32	60
300	11 x 22 x 44	60
400	11 x 22 x 57	60

<sup>1</sup>Mechanical Refrigeration and Ice Making, the De La Vergne Refrigerating Machine Company.

In the plate system a hollow iron plate is immersed in a tank containing the water to be frozen, and as the plate contains coils for the freezing medium or is filled with brine, the ice is formed on the two outer surfaces. It may be loosened in several ways, according to the system of refrigeration used. The production of ice by the plate system is much slower than by the can system, and for this reason the use of several plates is necessary for a continuous process. The ice cake may be of several sizes, the standard being 16 feet long, 8 feet wide, and 11 inches thick. This system is used chiefly in connection with electric power where the conditions are such that the cost compares favorably with the cost of steam power.

Table 9 shows, by states and territories, the quantity and value of can ice and of plate ice in 1900, with the average value per ton of each, and the per cent which the production of each variety in each state was of the total production of that variety in the United States. Table 9 also includes the returns for one establishment engaged in the manufacture of spray ice—that is, the water is sprayed on pipes and frozen in that manner. The product of this establishment is included in the totals for can ice.

TABLE 9.—QUANTITY AND VALUE OF ICE MANUFACTURED; THE NUMBER OF TONS OF CAN AND OF PLATE ICE THE AVERAGE VALUE OF EACH PER TON; AND THE PER CENT WHICH EACH FORMS OF THE TOTAL; BY STATES AND TERRITORIES; ARRANGED GEOGRAPHICALLY: 1900.

STATES AND TERRITORIES.	TOTAL.		CAN.				PLATE.			
	Tons.	Value.	Tons.		Value.	Average value per ton.	Tons.		Value.	Average value per ton.
			Number.	Per cent of total.			Number.	Per cent of total.		
United States .....	4,294,439	\$13,303,874	4,139,764	96.4	\$12,863,160	\$3.11	154,675	3.6	\$440,714	\$2.85
New England states .....	40,059	131,876	31,650	79.0	99,804	3.15	8,409	21.0	31,572	3.75
Rhode Island .....	14,109	36,072	10,000	70.9	26,000	2.60	4,109	29.1	10,072	2.45
Connecticut .....	25,950	95,804	21,650	83.4	73,804	3.41	4,300	16.6	21,500	5.00
Middle states .....	1,574,980	3,983,498	1,480,988	94.0	3,787,962	2.52	93,992	6.0	245,536	2.61
New York .....	457,779	1,025,808	456,279	99.7	1,015,308	2.23	1,500	0.3	10,000	6.66
New Jersey .....	169,755	379,776	154,615	91.1	341,176	2.21	15,140	8.9	38,600	2.55
Pennsylvania .....	735,018	2,000,931	684,144	93.1	1,866,770	2.73	60,874	6.9	134,161	2.64
Delaware .....	26,738	71,240	24,700	92.4	61,050	2.47	2,038	7.6	10,190	5.00
Maryland .....	120,740	358,668	116,800	96.7	348,083	2.98	3,940	3.3	10,585	2.69
District of Columbia .....	64,950	147,575	44,450	68.4	105,575	2.38	20,500	31.6	42,000	2.05
Southern states .....	1,414,158	5,291,523	1,389,601	98.3	5,225,913	3.76	24,557	1.7	65,610	2.67
West Virginia .....	35,734	119,201	35,734	100.0	119,201	3.34	.....	.....	.....	.....
Virginia .....	118,240	417,052	96,458	81.6	362,542	3.76	21,782	18.4	54,510	2.50
North Carolina .....	61,338	228,305	61,338	100.0	228,305	3.72	.....	.....	.....	.....
South Carolina .....	45,228	116,357	44,853	99.2	114,857	2.56	375	0.8	1,500	4.00
Georgia .....	131,236	465,699	131,236	100.0	465,699	3.47	.....	.....	.....	.....
Florida .....	125,184	437,382	125,184	100.0	437,382	3.49	.....	.....	.....	.....
Kentucky .....	137,472	375,897	137,472	100.0	375,897	2.73	.....	.....	.....	.....
Tennessee .....	158,931	538,107	158,931	100.0	538,107	3.39	.....	.....	.....	.....
Alabama .....	55,908	252,675	55,908	100.0	252,675	4.52	.....	.....	.....	.....
Mississippi .....	57,207	268,175	57,207	100.0	268,175	4.69	.....	.....	.....	.....
Arkansas .....	51,236	225,029	51,236	100.0	225,029	4.39	.....	.....	.....	.....
Louisiana .....	179,716	563,561	179,716	100.0	563,561	3.14	.....	.....	.....	.....
Indian Territory .....	3,060	19,440	3,060	100.0	19,440	6.35	.....	.....	.....	.....
Oklahoma .....	22,218	106,003	22,218	100.0	106,003	4.77	.....	.....	.....	.....
Texas .....	231,450	1,168,640	229,050	99.0	1,159,040	5.06	2,400	1.0	9,600	4.00
Central states .....	986,043	2,640,850	968,326	98.2	2,604,354	2.69	17,717	1.8	36,496	2.06
Ohio .....	237,750	577,038	220,333	92.9	548,542	2.48	16,917	7.1	28,496	1.68
Indiana .....	199,184	514,531	199,184	100.0	514,531	2.58	.....	.....	.....	.....
Illinois .....	249,813	877,178	249,013	99.7	869,178	3.49	800	0.3	8,000	10.00
Iowa .....	13,500	36,600	13,500	100.0	36,600	2.71	.....	.....	.....	.....
Missouri .....	285,796	635,503	285,796	100.0	635,503	2.22	.....	.....	.....	.....
Western states .....	154,055	642,379	154,055	100.0	642,379	4.17	.....	.....	.....	.....
Nebraska .....	5,400	15,000	5,400	100.0	15,000	2.78	.....	.....	.....	.....
Utah .....	9,000	31,500	9,000	100.0	31,500	3.50	.....	.....	.....	.....
Colorado .....	51,545	204,029	51,545	100.0	204,029	3.96	.....	.....	.....	.....
Kansas .....	62,486	193,310	62,486	100.0	193,310	3.09	.....	.....	.....	.....
Arizona .....	14,709	120,765	14,709	100.0	120,765	8.21	.....	.....	.....	.....
New Mexico .....	10,915	77,775	10,915	100.0	77,775	7.13	.....	.....	.....	.....
Pacific states .....	125,144	614,248	115,144	92.0	552,748	4.80	10,000	8.0	61,500	6.15
Washington .....	17,300	103,600	17,300	100.0	103,600	5.99	.....	.....	.....	.....
Oregon .....	17,165	95,260	17,165	100.0	95,260	5.55	.....	.....	.....	.....
California .....	90,679	415,388	80,679	89.0	353,888	4.39	10,000	11.0	61,500	6.15

The total quantity of ice manufactured in the United States, as returned by the 787 establishments reporting, was 4,294,439 tons, valued at \$13,303,874. In addition to this quantity, returns were received from 8 establishments which were engaged primarily in other industries, but which reported the manufacture of ice for sale. These establishments manufactured during the census year 59,206 tons of can ice, valued at \$108,259. If these amounts are added to those given in Table 9, the total quantity of ice reported as manufactured for sale in 1900 is shown to be 4,353,645 tons, valued at \$13,412,133. This does not represent the total quantity manufactured during the census year, as it is probable that many establishments engaged in the manufacture of ice for sale in connection with other industries failed to state that fact, and reported the value of ice under

"all other products." Moreover, as stated above, this total does not include the number of tons produced by companies engaged in other industries but manufacturing ice for their own consumption. Notwithstanding these facts, the number of tons reported may be accepted as fairly representing the quantity of ice manufactured for sale during this period. Of the quantity given in Table 9, 4,139,764 tons, or 96.4 per cent of the total, valued at \$12,863,160, was can ice, and 154,675 tons, or 3.6 per cent, valued at \$440,714, was plate ice. The average value of can ice was \$3.10 per ton and of plate ice \$2.85 per ton. In this connection, however, it should be stated that local conditions, cost of production, and the supply of natural ice cause the value of manufactured ice to vary between very wide limits. The average value per ton, as given in

the above table, represents the value at the plant and is computed from the totals of the whole number of establishments from which reports were received. It can not therefore be regarded as the value in any particular section of the country.

It appears from Table 9 that the largest quantity of ice was manufactured in the Middle states, which reported 1,574,980 tons, valued at \$3,983,498. The group producing the smallest quantity of ice was the New England states, with 40,059 tons, valued at \$131,376. The Southern states, although having nearly one-half of the total number of establishments in the United States, reported a production of only 1,414,158 tons, valued at \$5,291,523, or 32.9 per cent of the total quantity produced. This indicates that the plants in the South were,

as a rule, smaller than those in other sections of the United States.

The leading state in the manufacture of ice in 1900 was Pennsylvania, with a production of 735,018 tons. New York came next, with 457,779 tons. Missouri ranked third, with 285,796 tons; Illinois fourth, with 249,813 tons; Ohio fifth, with 237,750 tons; Texas sixth, with 231,450 tons; Indiana seventh, with 199,184 tons; Louisiana eighth, with 179,716 tons; New Jersey ninth, with 169,755 tons; and Tennessee tenth, with 158,931 tons. The total quantity of ice produced by these 10 states was 2,905,192 tons, or 67.7 per cent of the total number of tons reported for the United States. The number of tons produced in each of these states is shown in the following diagram:

COMPARATIVE PRODUCTION OF MANUFACTURED ICE IN LEADING TEN STATES: 1900.

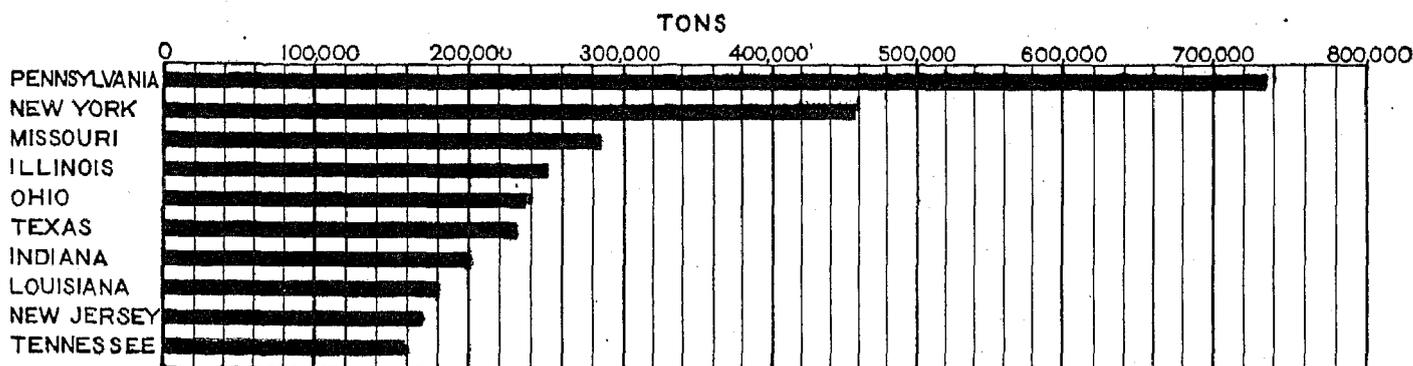


Table 10 presents the statistics of the cities in the United States having a population of over 20,000 in which there were three or more ice-manufacturing establishments in 1900. Estimates of the consumption of natural ice in several of these cities were secured for comparative purposes, but it was found impossible to

obtain such information in all cases. In this connection attention is called to the fact that where two or more plants located in the same city or town were controlled by the same corporation, firm, or individual, they were counted as one establishment.

TABLE 10.—STATISTICS OF CITIES OF OVER 20,000 IN POPULATION: 1900.

CITIES.	Rank by number of tons.	Number of establishments.	Capital.	SALARIED OFFICIALS, CLERKS, ETC.		WAGE-EARNERS.		Miscellaneous expenses.	Cost of materials used.	PRODUCTS.			
				Number.	Salaries.	Average number.	Wages.			Total value.	Ice.		All other products, value.
											Tons.	Value.	
Total		281	\$25,267,441	910	\$801,880	4,055	\$2,170,122	\$1,279,824	\$2,082,224	\$8,738,947	3,046,323	\$8,334,414	\$404,533
New York, N. Y.	1	26	2,042,582	45	37,832	256	162,602	160,863	230,507	900,308	410,837	868,239	32,064
Brooklyn borough		10	659,379	18	16,780	82	55,350	38,880	82,057	279,626	135,420	273,626	6,000
Manhattan and Bronx boroughs		8	1,062,767	12	13,020	121	76,817	102,755	116,908	498,510	280,218	467,446	26,064
Richmond and Queens boroughs		8	320,436	15	8,092	53	30,935	19,728	81,547	127,167	45,204	127,167	
Philadelphia, Pa.	2	20	3,158,914	117	71,435	345	191,465	118,795	204,085	894,592	342,602	894,592	
St. Louis, Mo.	3	10	1,034,768	28	33,508	129	78,358	47,966	112,419	305,718	180,413	305,718	
New Orleans, La.	4	10	1,538,280	28	38,180	185	48,010	52,438	116,396	308,683	139,654	308,683	
Baltimore, Md.	5	5	342,238	4	4,860	63	44,191	12,205	52,499	237,632	85,567	237,632	
Memphis, Tenn.	6	4	544,572	25	30,770	192	102,881	35,475	45,362	260,000	79,000	260,000	
Kansas City, Mo.	7	5	207,101	13	12,432	42	29,900	7,217	57,733	138,428	66,360	137,120	1,308
Washington, D. C.	8	4	629,992	16	14,310	83	40,603	36,979	61,267	182,575	64,950	147,575	35,000
Newark, N. J.	9	4	865,675	10	14,336	62	29,010	19,756	31,276	112,414	61,282	107,598	4,816
Louisville, Ky.	10	7	371,821	12	10,140	50	27,372	21,590	35,096	132,395	55,451	118,795	13,600
Norfolk, Va.	11	5	489,387	9	7,600	49	25,827	13,580	39,241	115,683	43,975	109,761	5,922
Cleveland, Ohio	12	4	193,654	12	11,020	26	19,203	13,680	30,500	95,100	43,800	95,100	
Cincinnati, Ohio	13	5	147,524	8	7,975	37	19,003	11,134	26,133	81,233	40,324	81,233	
Nashville, Tenn.	14	4	195,284	14	10,616	79	32,690	11,138	27,809	112,277	35,991	112,277	
Dallas, Tex.	15	3	371,000	52	26,400	68	27,700	14,511	47,275	149,800	32,000	149,800	
Indianapolis, Ind.	16	7	235,425	11	7,012	67	30,912	12,824	28,387	108,770	31,610	106,775	1,995
San Francisco, Cal.	17	3	510,141	30	28,140	50	40,009	21,463	43,733	134,411	31,214	134,411	
Atlanta, Ga.	18	4	227,238	8	10,100	32	14,946	18,903	30,203	104,913	28,879	104,913	
Augusta, Ga.	19	3	131,000	8	8,340	37	6,900	9,000	17,800	58,000	24,000	58,000	
Camden, N. J.	20	3	321,847	3	2,384	17	9,244	7,823	15,499	53,318	23,281	53,318	
Evansville, Ind.	21	3	291,600	9	7,506	58	26,691	12,678	13,332	76,392	22,713	76,392	
Allegheny, Pa.	22	4	546,500	8	10,200	70	43,773	13,837	15,830	111,212	21,830	82,400	28,372
Jacksonville, Fla.	23	5	159,600	7	6,720	56	27,000	3,720	26,903	87,647	21,609	86,647	1,000
Fort Worth, Tex.	24	3	155,500	7	11,400	49	29,800	9,837	20,050	81,000	20,786	81,000	
Richmond, Va.	25	3	222,500	8	7,680	15	10,800	5,790	14,133	64,932	19,178	59,932	5,000
Little Rock, Ark.	26	3	215,713	5	5,400	65	19,400	19,575	12,713	73,234	15,700	73,234	
Topeka, Kans.	27	3	75,400	6	3,000	16	8,420	3,320	11,000	38,800	14,100	38,800	
Portland, Oreg.	28	4	106,000	9	13,980	22	15,640	11,685	13,209	91,400	12,600	71,400	20,000
Montgomery, Ala.	29	3	40,700	2	1,200	8	3,945	1,190	2,020	20,325	3,985	20,325	
All other cities <sup>1</sup>		114	10,395,535	396	347,254	1,877	1,003,167	555,902	700,256	3,607,710	1,071,746	3,352,694	255,016

<sup>1</sup>Includes establishments distributed as follows: Akron, Ohio, 1; Allentown, Pa., 1; Altoona, Pa., 2; Anderson, Ind., 1; Aurora, Ill., 1; Austin, Tex., 2; Birmingham, Ala., 2; Bloomington, Ill., 1; Bridgeport, Conn., 1; Buffalo, N. Y., 2; Canton, Ohio, 1; Charleston, S. C., 2; Chattanooga, Tenn., 2; Chester, Pa., 1; Chicago, Ill., 2; Columbia, S. C., 1; Columbus, Ohio, 2; Covington, Ky., 1; Davenport, Iowa, 1; Dayton, Ohio, 1; Decatur, Ill., 1; Denver, Colo., 2; Des Moines, Iowa, 1; Easton, Pa., 1; East St. Louis, Ill., 1; Elizabeth, N. J., 1; Elmira, N. Y., 1; Erie, Pa., 1; Fort Wayne, Ind., 1; Galveston, Tex., 2; Harrisburg, Pa., 1; Houston, Tex., 1; Johnstown, Pa., 1; Joliet, Ill., 1; Knoxville, Tenn., 2; Lancaster, Pa., 1; Leavenworth, Kans., 1; Lexington, Ky., 2; Lincoln, Neb., 1; Los Angeles, Cal., 2; McKeesport, Pa., 1; Macon, Ga., 1; Mobile, Ala., 2; Muncie, Ind., 1; New Albany, Ind., 2; New Britain, Conn., 1; Newburg, N. Y., 1; Newcastle, Pa., 1; New Haven, Conn., 1; Newport, Ky., 1; Norristown, Pa., 2; Paterson, N. J., 1; Peoria, Ill., 1; Petersburg, Va., 2; Pittsburg, Pa., 2; Pueblo, Colo., 1; Quincy, Ill., 1; Reading, Pa., 2; Roanoke, Va., 2; St. Joseph, Mo., 1; Salt Lake City, Utah, 1; San Antonio, Tex., 2; Savannah, Ga., 2; Scranton, Pa., 1; Seattle, Wash., 2; Shenandoah, Pa., 1; Sioux City, Iowa, 1; Springfield, Ill., 1; Springfield, Mo., 1; Springfield, Ohio, 1; South Bend, Ind., 1; Tacoma, Wash., 1; Terre Haute, Ind., 1; Trenton, N. J., 1; Waco, Tex., 2; Wheeling, W. Va., 2; Wichita, Kans., 2; Wilkesbarre, Pa., 1; Williamsport, Pa., 1; Wilmington, Del., 2; Wilmington, N. C., 2; Yonkers, N. Y., 1; York, Pa., 2; Youngstown, Ohio, 1; Zanesville, Ohio, 1.

Table 10 indicates that New York city led in the manufacture of ice, having reported 26 establishments and 410,837 tons of ice valued at \$868,239, an average of 15,801 tons per establishment, and an average value of \$2.11 per ton.

Efforts were made to get estimates of the consumption of natural ice in each of the cities included in Table 10. In all cases except New York and Philadelphia the results were, however, too unreliable to be included in this report. In New York it was estimated that the annual consumption of ice is about 5,000,000 tons.<sup>1</sup> If these figures are approximately correct, the manufactured ice consumed during the census year formed 8.2 per cent of the total consumption. Correspondence with several of the leading ice manufacturers indicates that the average cost of production of manufactured ice was approximately \$1.50 per ton and the average wholesale price \$2 per ton, and that the average retail price

varied from 15 to 30 cents per 100 pounds, according to the season of the year. In Philadelphia the annual consumption of ice was estimated at from 1,000,000 to 1,600,000 tons,<sup>2</sup> 342,602 tons of which was represented by the local production of manufactured ice. The average cost of production was approximately \$2 per ton, the average wholesale price \$2.25 per ton, and the average retail price ranged from 20 to 40 cents per 100 pounds, according to the season of the year. In San Francisco from 10,000 to 15,000 tons of natural ice were used, brought from the Sierra Nevada Mountains, but, owing to climatic conditions, the consumption of ice in this city is much smaller than in Eastern cities of the same size. No statistics are available for the remaining cities relative to the consumption of natural ice or to the average cost of production per ton of manufactured ice. In New Orleans, Memphis, Norfolk, Nashville, Dallas, Atlanta, Augusta, Jacksonville, Fort Worth,

<sup>1</sup>Ice and Refrigeration, December, 1901, p. 243.

<sup>2</sup>Ice and Refrigeration, December, 1901, p. 243.

Little Rock, Montgomery, Austin, Birmingham, Charleston, Chattanooga, Columbia, Galveston, Houston, Knoxville, Macon, Mobile, San Antonio, Savannah, Waco, and Wilmington, N. C., manufacturers reported that no natural ice was sold during the census year, the entire quantity consumed being manufactured.

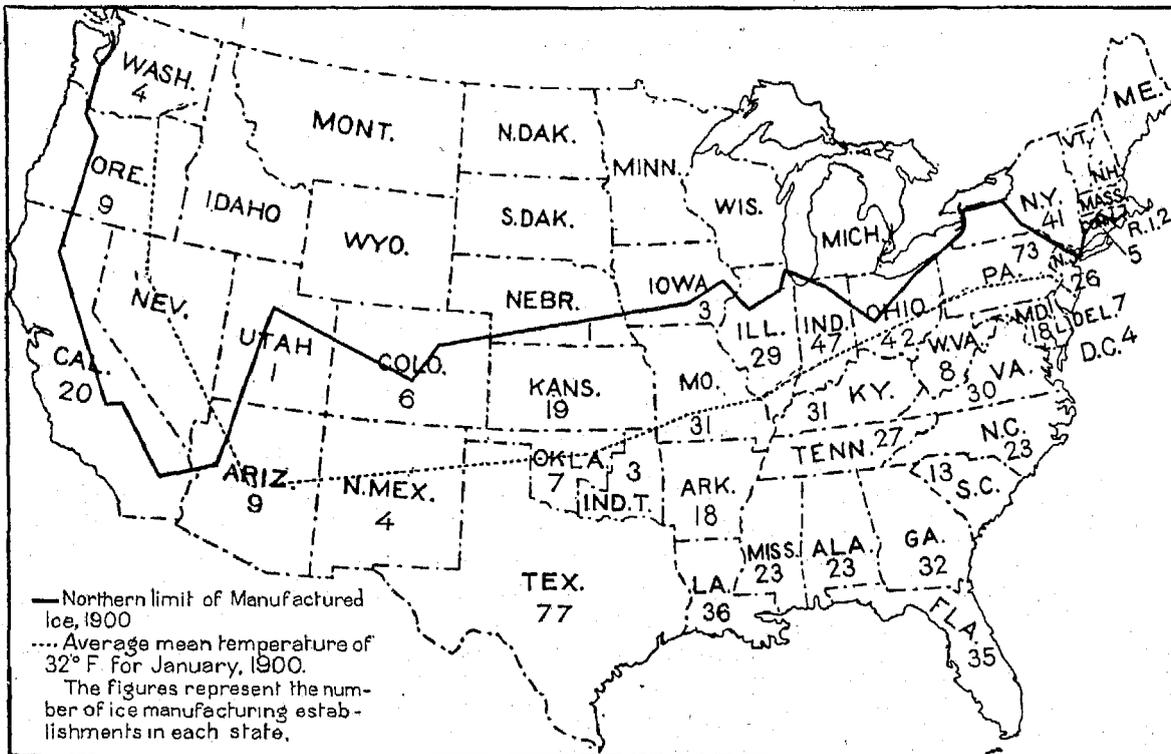
The development of the ice manufacture has naturally had a very close relation to the possibility of procuring natural ice, and there has always been considerable competition between the two products. This is illustrated by the development of the industry in the South. The situation in 1880 is described in the report on the Tenth Census as follows: "For fifteen years efforts have been made to reduce the cost of ice in the South and render her, in a measure, independent of outside sources of supply. Tennessee and Georgia have imported extensively from the Ohio River region by rail. The lower Mississippi has bought in the St. Louis region and Texas has imported by rail. Enterprise has, however, been chiefly in the direction of the manufacture of artificial ice. \* \* \* The cost of production has been reduced to about \$5 per ton in most places, which is a trifle below the rate at which ice can be delivered in Tennessee and Georgia by rail from the Ohio River, and considerably below the cost of the article from Maine, delivered in inland Southern towns. With this advantage in its favor, the business of manufacture is steadily growing at all points at a distance from the seacoast. The prospect is fair that they will soon be independent of outside sources of supply, although it will be many years before the cost to small consumers will fall anywhere nearly as low as in the North. On the seacoast Northern ice still has the preference. It can be

landed more cheaply than the local article can be made, and by purchasing in Maine or Massachusetts the dealers avoid the heavy risks of experimenting with expensive plants and imperfect methods of manufacture. The solitary exception is the city of New Orleans, which, though still buying Northern ice, is nevertheless manufacturing on an extensive scale."

The above statement is interesting in connection with the status of the manufactured-ice industry in Southern cities at the present time. Correspondence with men prominently identified with the ice industry in the South developed the fact that during the year 1900, with the possible exception of a few coast cities, the South depended entirely for her ice supply upon the manufactured product. In the large Southern cities it was stated that the cost of production was approximately \$2 per ton. In the smaller cities and towns, although the cost is in excess of that figure, it is so much reduced that they are now independent of outside sources of supply.

The United States may therefore be divided into three divisions or zones: A southern zone, where the expense of procuring natural ice gave manufactured ice a complete monopoly; a middle zone, where both natural and manufactured ice were sold in competition with each other; and a northern zone, where the low cost of natural ice made its monopoly complete. The southern zone comprises roughly all states south of a line drawn through the northern boundary of North Carolina. The boundary line between the middle and northern zones is indicated by the heavy line upon the accompanying map of the United States.

NORTHERN LIMIT OF MANUFACTURED ICE, 1900.



The most marked change in the industry in recent years has been the exclusion of natural ice from the southern zone and the steadily northward extension of the competitive zone. It is altogether probable that this movement will continue as the cost of production is further reduced. It is stated that under exceptional circumstances ice has been manufactured at as low a cost as 50 or 60 cents per ton. It is probable that at such a cost manufactured ice could compete successfully with the natural product in any part of the country in which there is a demand for ice. The larger plants located in the large cities, during the summer months, when running at full capacity and under favorable conditions, can manufacture ice at from 70 to 90 cents per ton. The average cost for the year, however, will vary from \$1.10 to \$1.50 per ton. The relation of the present northern limit of ice manufacture to the possibility of obtaining natural ice is shown on the map by the broken line connecting the cities which reported an average temperature of 32° for the month of January, 1900.

#### HISTORICAL AND DESCRIPTIVE.

The production of cold by artificial means commenced at a much earlier date than is generally supposed. In the warmer climates, especially in the Eastern countries—India, China, and Egypt—where ice and snow were not available, caves, either natural or artificial, were made use of to deposit food and drinks. It was early discovered that porous receptacles would keep the contents cooler than nonporous. In Egypt and East India the vessels containing the water to be frozen were covered with stalks of corn or sugar cane, which was a crude method of artificial refrigeration. A member of the Royal Philosophical Society of England, for some time a resident of the Indies, has described this method of ice making employed in the East, as follows:

A space of ground of about 4 acres, nearly level, is divided into square plats from 4 to 5 feet wide. The borders are raised by earth taken from the surface of the flat, to about 4 inches; the cavities are filled up with dry straw or sugar-cane haum, laid smooth, on which are placed as many broad shallow pans of unglazed earth as the spaces will hold. These pans are so extremely porous that their outsides become moist the instant water is put into them. They are smeared with butter on the inside to prevent the ice from adhering to them, and this it is necessary to repeat every three or four days. It would otherwise be impossible to remove the ice without either breaking the vessel or spending more time in effecting it than could be afforded where so much is to be done in so short a time. In the afternoon these pans are all filled with water by persons who walk along the borders or ridges. About 5 o'clock in the morning they begin to remove the ice from the pans, which is done by striking an iron hook into the center of it, and by that means breaking it into several pieces. If the pans have been many days without smearing, and it happens that the whole of the water is frozen, it is almost impossible to extract the ice without breaking the pans. The number of pans exposed at one time is computed at about 100,000, and there are employed in filling them with water in the evenings and taking out the ice in the mornings about 300 men, women, and children. The water is taken from a well contiguous to the spot. It is necessary that the

straw be dry. When it becomes wet, as it frequently does by accident, it is removed and displaced.<sup>1</sup>

References are found in the works of many ancient Greek authors indicating that some of the principles of artificial refrigeration were understood by the Greeks and practiced by them in cooling wine, water, and various other drinks. It also appears that they understood the present East Indian custom of using porous vessels. The Egyptians were accustomed to allow jars of boiling water to remain on the house roofs over night, and in the morning the jars were moistened with water on the outside, bound with grass or plants, and put in trenches. The discovery of the principle that warm or hot water exposed to the air is susceptible of greater evaporation than cold water, is generally ascribed to Nero, although it appears that Aristotle understood this principle, since he relates that if it was desired to cool water suddenly, it was customary to expose it first to the sun's rays. Medieval history indicates that the custom of cooling drinks spread from Greece and Italy to France and western Europe about the end of the Sixteenth century. At this time it was the custom to preserve snow and ice in cellars, to be used in cooling drinks during the summer months. This custom was at first looked upon as effeminate and luxurious, but by the end of the Seventeenth century the practice must have been common in France, as there were many who made a business of dealing in snow and ice. It is stated that saltpeter for refrigerating purposes was first used by the Italians about 1550. The liquor or liquid to be cooled was put into a little-necked bottle, which was immersed in a receptacle filled with cold water. Saltpeter was then added to the water of the outer vessel, and the bottle containing the water or wine to be cooled was twirled around on its axis. It was considered that the proportion of saltpeter to water should be one to four or five. The practice of mixing snow or ice with saltpeter or other salts to produce cold seems to have been well known early in the Seventeenth century, being referred to by several contemporary writers of that period. It is mentioned by Bacon, who stated that common salt could be used instead of saltpeter.

The development of ice manufacture has always had a very close relation to the possibility of procuring natural ice, and there has, therefore, been considerable competition between the two products. For this reason it is important to notice in this connection the development of the natural-ice industry. Notwithstanding the fact that the custom of icing wines and drinks prevailed among the wealthier Greeks and Romans in ancient times and among Italians and Frenchmen in the Seventeenth century, natural ice as an article of commerce did not obtain importance until the beginning of the Nineteenth century. From the inception of the industry the United States has been the great field for

<sup>1</sup> Ice and Refrigeration, July, 1901, page 3.

both the production and consumption of ice, and the commodity which in the Eighteenth century was rated a luxury has now become almost a necessity. The year 1805 may be looked upon as marking the beginning of the industry in the United States. The pioneer was Frederic Tudor, of Boston, Mass., who in 1805 shipped a cargo of 130 tons of ice to the West Indies. Although the venture resulted in a net loss of about \$4,500, the cargo arrived at its destination in excellent condition. Two years later Mr. Tudor shipped a cargo of 240 tons to Havana, but this venture was likewise unprofitable. About the year 1812 he was granted by Great Britain a monopoly of the ice trade with her colonies in the West Indies, and later, 1815-16, he received the same concessions from Spain. From 1817 to 1820 he extended the trade to Charleston, S. C., Savannah, Ga., and New Orleans, La. In this way a large and profitable trade was established with the southern countries and with the southern ports of the United States. The ultimate success of Mr. Tudor prompted competitors to enter the field as exporters. The growth in the exports of ice between 1850 and 1900, shown in the following table, is taken from the reports of the bureau of statistics, Treasury Department:

## EXPORTATION OF ICE.

YEAR.	Tons.	Value.
1850.....	.....	\$107, 018
1855.....	41, 117	180, 793
1860.....	49, 153	133, 134
1865.....	59, 927	225, 825
1870.....	65, 802	267, 702
1875.....	53, 724	208, 249
1880.....	45, 666	136, 686
1885.....	38, 901	89, 420
1890.....	44, 849	111, 762
1895.....	17, 295	41, 915
1900.....	13, 720	23, 501

It appears that the export trade in ice increased steadily until about 1870. After this date the exports of ice steadily decreased until in the year 1900 the number of tons exported was so insignificant that the foreign trade in ice may now be considered as practically extinct.

The growth of the domestic trade was simultaneous with the early increase in the export trade. In New York city ice was used by dealers in perishable goods as early as 1825, and the demand for it gradually developed in all the larger Eastern cities. The Civil War gave a decided impetus to the industry, as large quantities of ice were required for medical purposes in the hospital service. The rapidly increasing demand for ice in recent years is due in large part to the establishment and growth of industries which are dependent upon the use of this product. It has been impossible to obtain data relative to the production of the entire country, but some indication of the growth and extent of the industry may be obtained from the following table, which gives the quantity of ice harvested in the

state of Maine and on the Hudson River since 1878. Although these are the great harvesting regions of the country, their annual yield probably does not represent much more than half the ice harvest of the United States.

HARVEST OF MAINE AND HUDSON RIVER ICE SINCE 1878.<sup>1</sup>

YEAR.	Maine.	Hudson River.	Capacity of Hudson River ice houses.
	Tons.	Tons.	Tons.
1878.....	.....	2, 225, 000	2, 300, 000
1879.....	.....	2, 371, 000	2, 400, 000
1880.....	1, 426, 800	800, 000	2, 500, 000
1881.....	994, 800	2, 558, 000	2, 650, 000
1882.....	1, 227, 200	1, 954, 700	2, 728, 700
1883.....	1, 364, 500	3, 017, 600	3, 100, 000
1884.....	1, 118, 000	3, 026, 000	3, 100, 000
1885.....	1, 490, 400	3, 019, 500	3, 200, 000
1886.....	1, 368, 400	2, 355, 500	3, 259, 000
1887.....	1, 311, 100	3, 226, 000	3, 367, 000
1888.....	1, 037, 000	3, 330, 500	3, 330, 500
1889.....	1, 529, 600	2, 742, 000	3, 432, 000
1890.....	3, 092, 400	.....	3, 432, 000
1891.....	1, 285, 000	2, 624, 000	3, 425, 000
1892.....	1, 435, 900	2, 500, 000	3, 525, 000
1893.....	1, 444, 000	3, 407, 839	3, 454, 400
1894.....	1, 600, 800	2, 038, 500	3, 459, 500
1895.....	1, 413, 500	3, 409, 000	3, 528, 500
1896.....	1, 466, 000	2, 735, 500	3, 450, 400
1897.....	1, 526, 500	2, 675, 033	3, 716, 381
1898.....	1, 242, 500	2, 172, 400	4, 183, 434
1899.....	1, 326, 430	4, 300, 293	4, 316, 331
1900.....	723, 780	1, 480, 670	4, 216, 970

<sup>1</sup> Ice Trade Journal.

Some time before the natural-ice industry became a factor of commercial importance attempts had been made to produce ice by abstracting the latent heat from water by artificial means. The first machine for the manufacture of ice was invented in 1755 by Dr. William Cullen, and was based on the principle that the creation of a vacuum increases the evaporation of water and by this means produces ice. Cullen reduced the atmospheric pressure by means of an air pump. About 1810 the chemical affinity of sulphuric acid for water was discovered and ice was produced by its use. The invention of the first machine capable of producing ice in quantities sufficient for commercial use is generally accredited to Mr. Jacob Perkins, an American engineer residing in London. He obtained a patent for his machine in 1834. The refrigerant was ether, and the evaporator containing the same was inclosed in pipes through which brine circulated at a temperature of 5° F. Boxes filled with water were placed in a receptacle into which flowed the brine, freezing the water. The brine was then pumped back, and, after being exposed to the ether, could again be used. This machine is generally considered the forerunner of the modern compressor machine.<sup>1</sup> The use of the boxes developed into the use of cans and the manufacture of can ice. In order to describe adequately the development of the modern compressor and absorption machines it is necessary to mention several of the men prominently identified with the invention or improvement of ice-making apparatus.

<sup>1</sup> Ice and Refrigeration, August, 1901, page 46.

Prof. A. C. Twining, of New Haven, Conn., took out a patent for an ice machine in England in 1850 and in the United States in 1853. In 1855 he operated a machine in Cleveland, Ohio, which produced over 1,600 pounds of ice in twenty-four hours, and was operated intermittently until 1857. Although the Perkins machine was the forerunner of the compressor machine of the present time, the Twining machine more nearly represents the complete compressor system of to-day, and for this reason Professor Twining deserves the credit both for the invention of this system and for putting it into practical operation.<sup>1</sup> Professor Twining also discovered that ice frozen at a temperature slightly below the freezing point would be transparent with the exception of the small porous core, while if frozen at a lower temperature it would be opaque and porous throughout. A patent for the manufacture of ice by mechanical means was issued in 1857 to Dr. John Gorrie, of Appalachicola, Fla. The apparatus used by Dr. Gorrie is important in that it was the forerunner of the compressed-air machine later, invented by Dr. Alexander

<sup>1</sup> Mechanical Refrigeration, De La Vergne Refrigerating Machine Company, 1887, page 9.

Kirk. In 1858-1860 Ferdinand P. E. Carre, a Frenchman, introduced an ice-making and refrigerating apparatus from which has developed the modern ammonia absorption system. It was by means of this machine that the trade in frozen meat was introduced to the world. The Carre machine was also the first to obtain prominence in the ice-making industry of the United States. In the infancy of the industry the ice was opaque, and it was not until about 1868 that transparent ice was made by the use of distilled water. Capt. David Smith, of Chatham, Mass., was the originator of the plate-ice system. He erected in Oakland, Cal., the first machine of this character.

From the inception of the United States Patent Office to January 1, 1902, there have been 4,337 patents granted for various processes of refrigeration. Of this number, 681 have been issued for the manufacture of ice machines. These various inventions prepared the way for the development of the manufactured-ice industry, which has already been described in the pages of the bulletin.

Table 11, which follows, shows in detail the statistics relating to the manufacture of ice, as reported by the 787 establishments engaged in this industry for 1900.

TABLE 11.—ICE MANUFACTURE, BY

	United States.	Alabama.	Arizona.	Arkansas.	California.
1 Number of establishments.....	787	23	9	18	20
2 Character of organization:					
3 Individual.....	180	4	1	4	2
4 Firm and limited partnership.....	134	5	4	3	3
5 Incorporated company.....	469	14	4	11	15
6 Miscellaneous.....	4				
7 Established during the decade.....	544	14	7	14	15
8 Established during the census year.....	89	2		2	2
9 Capital:					
10 Total.....	\$38,204,054	\$631,667	\$228,670	\$637,639	\$1,805,971
11 Land.....	\$4,679,379	\$62,800	\$16,050	\$59,350	\$238,100
12 Buildings.....	\$7,387,014	\$79,900	\$49,916	\$80,365	\$106,553
13 Machinery, tools, and implements.....	\$22,852,158	\$439,600	\$136,000	\$415,006	\$806,135
14 Cash and sundries.....	\$3,285,503	\$49,367	\$26,704	\$82,918	\$97,183
15 Proprietors and firm members.....	459	13	11	11	7
16 Salaried officials, clerks, etc.:					
17 Total number.....	1,545	48	12	26	64
18 Total salaries.....	\$1,234,808	\$95,680	\$10,370	\$24,330	\$62,661
19 Officers of corporations:					
20 Number.....	446	16	2	11	12
21 Salaries.....	\$465,104	\$18,280	\$3,710	\$11,400	\$17,566
22 General superintendents, managers, clerks, and salesmen:					
23 Total number.....	1,099	27	10	15	52
24 Total salaries.....	\$769,699	\$17,400	\$6,660	\$12,930	\$45,095
25 Men:					
26 Number.....	1,024	26	10	15	50
27 Salaries.....	\$740,292	\$17,300	\$6,660	\$12,930	\$44,095
28 Women:					
29 Number.....	75	1			2
30 Salaries.....	\$29,407	\$100			\$1,000
31 Wage-earners, including pieceworkers, and total wages:					
32 Greatest number employed at any one time during the year.....	10,814	249	66	244	265
33 Least number employed at any one time during the year.....	4,898	155	25	105	131
34 Average number.....	6,938	168	44	169	190
35 Wages.....	\$3,424,305	\$56,251	\$30,608	\$61,064	\$132,023
36 Men, 16 years and over:					
37 Average number.....	6,889	168	44	162	188
38 Wages.....	\$3,416,844	\$56,251	\$30,608	\$60,944	\$131,543
39 Women, 16 years and over:					
40 Average number.....	8				2
41 Wages.....	\$8,592				\$480
42 Children, under 16 years:					
43 Average number.....	36			1	
44 Wages.....	\$3,869			\$120	
45 Average number of wage-earners, including pieceworkers, employed during each month: <sup>2</sup>					
46 Men, 16 years and over:					
47 January.....	3,885	112	19	87	181
48 February.....	4,058	118	21	96	164
49 March.....	4,676	120	25	125	162
50 April.....	6,477	170	41	158	192
51 May.....	6,570	225	62	196	208
52 June.....	8,483	218	63	226	187
53 July.....	9,508	220	64	226	220
54 August.....	9,794	222	66	229	220
55 September.....	9,236	213	63	212	193
56 October.....	7,300	163	53	165	191
57 November.....	5,124	122	31	122	167
58 December.....	4,268	107	22	101	175
59 Miscellaneous expenses:					
60 Total.....	\$1,779,890	\$31,777	\$10,408	\$30,762	\$89,759
61 Rent of works.....	\$116,026	\$3,790	\$244	\$696	\$6,160
62 Taxes, not including internal revenue.....	\$246,340	\$4,289	\$2,470	\$4,288	\$6,256
63 Rent of offices, interest, insurance, and all sundry expenses not hitherto included.....	\$1,394,150	\$23,689	\$6,599	\$25,478	\$77,343
64 Contract work.....	\$23,344		\$1,095	\$900	
65 Materials used:					
66 Aggregate cost.....	\$3,339,724	\$53,399	\$41,505	\$51,700	\$119,839
67 Ammonia:					
68 Total cost.....	\$359,549	\$12,766	\$4,133	\$5,910	\$12,913
69 Total pounds.....	2,379,939	122,415	10,279	20,984	67,653
70 Ammonia, anhydrous:					
71 Cost.....	\$279,680	\$6,745	\$4,133	\$5,910	\$10,413
72 Pounds.....	1,056,585	24,989	10,279	20,984	32,653
73 Ammonia, aqua:					
74 Cost.....	\$79,869	\$6,021			\$2,500
75 Pounds.....	1,323,454	97,426			35,000
76 Fuel.....	\$2,139,216	\$28,185	\$32,851	\$32,118	\$68,558
77 Rent of power and heat.....	\$20,336		\$350	\$2	\$10,390
78 Mill supplies.....	\$216,383	\$4,366	\$1,301	\$3,824	\$4,897
79 All other materials.....	\$506,586	\$4,293	\$2,295	\$7,296	\$20,611
80 Freight.....	\$97,651	\$3,759	\$485	\$2,550	\$2,520
81 Products:					
82 Aggregate value.....	\$13,874,513	\$253,475	\$132,611	\$236,289	\$511,197
83 Ice:					
84 Total value.....	\$13,303,874	\$252,675	\$120,765	\$225,029	\$415,338
85 Total tons.....	4,294,439	55,908	14,709	51,236	90,679
86 Can ice:					
87 Value.....	\$12,863,160	\$252,675	\$120,765	\$225,029	\$353,888
88 Tons.....	4,139,764	55,908	14,709	51,236	80,679
89 Plate ice:					
90 Value.....	\$440,714				\$61,500
91 Tons.....	154,675				10,000
92 All other products.....	\$570,639	\$800	\$11,846	\$11,260	\$95,809
93 Comparison of products:					
94 Number of establishments reporting for both years.....	551	14	4	10	15
95 Value for census year.....	\$10,379,966	\$201,761	\$68,900	\$168,737	\$469,497
96 Value for preceding business year.....	\$9,841,233	\$179,406	\$56,600	\$159,071	\$435,706

<sup>1</sup> Includes the statistics for 12 establishments, the schedules for which were received too late to be included in the tables presented in Parts I and II, Manufactures. These establishments are distributed as follows: Alabama, 2; Arkansas, 3; Florida, 2; Louisiana, 2; Mississippi, 2; Oklahoma, 1.

STATES AND TERRITORIES: 1900. (1)

Colorado.	Connecticut.	Delaware.	District of Columbia.	Florida.	Georgia.	Illinois.	Indiana.	Indian Territory.	Iowa.	Kansas.	Kentucky.	Louisiana.
6	5	7	4	35	32	29	47	3	3	19	31	36
2	2	2	1	20	6	3	15	1	6	6	6	9
4	3	5	3	6	4	9	9	1	3	7	7	3
5	3	5	1	23	19	21	37	1	3	15	20	31
		1		2	2	3	5	2	1		3	7
\$664,360	\$816,722	\$259,501	\$629,992	\$740,131	\$975,100	\$1,689,253	\$1,530,603	\$62,974	\$165,300	\$425,199	\$1,200,117	\$2,265,961
\$30,721	\$47,000	\$17,300	\$65,000	\$45,059	\$63,950	\$114,930	\$138,850	\$2,300	\$23,000	\$24,870	\$91,890	\$388,779
\$108,965	\$71,843	\$42,000	\$189,000	\$92,400	\$123,988	\$335,018	\$267,000	\$19,100	\$20,300	\$68,500	\$241,474	\$496,881
\$465,060	\$171,843	\$176,700	\$355,024	\$630,309	\$724,050	\$1,036,878	\$1,040,078	\$39,350	\$85,000	\$295,779	\$763,581	\$1,276,066
\$29,614	\$26,036	\$23,501	\$29,968	\$72,363	\$58,112	\$202,427	\$94,675	\$2,224	\$24,500	\$30,050	\$103,172	\$104,235
6	5	2	2	26	14	22	85	2	3	18	22	13
18	15	8	16	24	48	92	61	4	10	20	52	78
\$21,235	\$17,681	\$4,316	\$14,310	\$21,371	\$42,535	\$75,210	\$43,856	\$1,525	\$8,055	\$13,420	\$32,600	\$67,132
8	5	4	6	6	14	11	27		3	6	19	26
\$12,350	\$8,000	\$1,560	\$5,150	\$4,860	\$15,550	\$17,420	\$23,230		\$800	\$4,850	\$17,850	\$33,942
10	10	4	10	18	34	81	34	4	7	14	33	52
\$8,885	\$9,681	\$2,756	\$9,160	\$16,511	\$26,965	\$57,790	\$20,626	\$1,525	\$2,255	\$3,570	\$14,760	\$38,190
10	8	4	10	18	34	62	24	4	7	14	33	50
\$8,885	\$8,181	\$2,756	\$9,160	\$16,511	\$26,965	\$49,058	\$17,164	\$1,525	\$2,255	\$3,570	\$14,760	\$32,390
	2					19	10					2
	\$1,500					\$8,732	\$3,462					\$800
142	60	43	111	315	407	831	674	20	57	183	322	508
58	27	21	52	191	209	344	212	11	15	42	148	173
93	33	28	83	244	251	624	348	10	33	114	192	239
\$53,517	\$21,041	\$12,480	\$40,603	\$100,533	\$80,210	\$303,317	\$161,902	\$4,003	\$15,067	\$55,427	\$84,321	\$126,067
93	38	27	83	242	250	623	343	10	33	113	188	232
\$53,517	\$21,041	\$12,330	\$40,603	\$100,265	\$86,030	\$302,615	\$161,902	\$4,003	\$15,067	\$55,217	\$84,041	\$125,265
						1				1		1
						\$702				\$210		\$240
		1		2	1						4	6
		\$150		\$268	\$180						\$280	\$562
58	27	17	39	193	143	380	190	2	10	66	97	148
68	29	14	53	196	135	429	186	2	13	76	88	145
63	32	14	64	204	150	448	226	4	13	96	108	161
75	38	20	94	242	255	538	322	14	21	122	174	238
85	36	41	111	256	332	731	385	17	35	148	262	387
113	43	42	111	285	333	808	451	17	47	188	270	477
133	49	42	111	287	371	826	524	17	52	193	282	469
132	48	42	111	288	373	829	531	17	57	151	233	474
128	45	39	101	290	353	811	470	19	52	147	269	440
114	49	27	71	250	238	655	381	11	41	114	208	315
79	37	15	65	211	140	576	252	4	32	70	122	139
72	29	14	65	196	131	447	195	2	18	66	99	128
\$12,611	\$11,363	\$8,214	\$36,979	\$21,472	\$49,654	\$178,505	\$67,954	\$1,830	\$9,014	\$15,715	\$64,879	\$85,103
\$150	\$750		\$3,900	\$987	\$2,005	\$1,935	\$2,025		\$896	\$601	\$555	\$756
\$4,308	\$1,544	\$906	\$7,240	\$5,391	\$8,826	\$3,785	\$12,600	\$515	\$875	\$2,849	\$8,361	\$15,132
\$8,153	\$9,069	\$7,218	\$20,839	\$14,844	\$38,373	\$105,225	\$53,320	\$1,315	\$7,443	\$12,265	\$55,303	\$69,165
			\$300		\$450							50
\$31,446	\$16,014	\$18,654	\$61,267	\$131,816	\$126,512	\$173,850	\$121,300	\$5,327	\$10,530	\$55,784	\$81,564	\$198,241
\$5,564	\$1,371	\$1,580	\$2,314	\$13,276	\$12,736	\$14,813	\$15,309	\$443	\$1,749	\$5,891	\$12,006	\$24,424
44,264	5,313	6,030	9,310	149,086	107,925	74,829	144,476	1,550	24,600	42,938	99,007	191,178
\$3,407	\$1,371	\$1,580	\$2,314	\$5,750	\$7,759	\$13,674	\$9,993	\$443	\$549	\$4,435	\$8,303	\$15,047
11,035	5,313	6,030	9,310	19,736	29,948	54,396	36,879	1,550	2,100	16,373	29,507	58,626
\$2,157				\$7,526	\$4,977	\$1,139	\$5,816		\$1,200	\$1,456	\$3,708	\$9,377
33,229				129,350	77,977	20,433	107,597		22,500	26,565	69,500	137,552
\$23,754	\$11,166	\$9,746	\$35,504	\$30,253	\$30,531	\$97,425	\$65,630	\$3,732	\$7,772	\$38,441	\$58,080	\$119,160
	\$300		\$300	\$300		\$720						\$125
\$654	\$385	\$775	\$3,150	\$8,936	\$9,538	\$7,674	\$7,992	\$430	\$607	\$4,623	\$4,394	\$8,009
\$193	\$2,123	\$1,543	\$18,349	\$22,746	\$19,169	\$50,141	\$29,029	\$342	\$350	\$6,129	\$6,264	\$38,163
\$1,281	\$164	\$5	\$1,050	\$5,805	\$4,533	\$3,077	\$2,880	\$350	\$52	\$700	\$8,820	\$3,360
\$204,029	\$95,304	\$71,240	\$182,575	\$438,732	\$456,964	\$990,327	\$544,005	\$19,540	\$38,400	\$196,310	\$454,497	\$591,500
\$204,029	\$95,304	\$71,240	\$147,575	\$487,332	\$455,699	\$377,178	\$514,531	\$19,440	\$36,600	\$193,310	\$375,897	\$568,561
51,545	25,950	25,733	64,950	125,184	131,236	249,313	199,134	3,060	13,500	62,486	137,472	179,716
\$204,029	\$73,804	\$61,050	\$105,575	\$437,332	\$455,699	\$369,173	\$514,531	\$19,440	\$36,600	\$193,310	\$375,897	\$568,561
51,545	21,700	24,700	44,450	125,184	131,236	249,313	199,134	3,060	13,500	62,486	137,472	179,716
	\$21,500	\$10,190	\$12,000			\$8,000						
	4,300	2,033	20,500	\$1,400	\$1,265	\$113,649	\$29,474	\$100	\$1,800	\$3,000	\$78,600	\$27,939
			\$35,000									
4	4	4	3	21	23	22	37	2	2	13	25	22
\$158,329	\$88,500	\$51,800	\$149,500	\$271,638	\$370,063	\$638,624	\$446,825	\$18,100	\$97,600	\$151,970	\$412,897	\$411,836
\$129,353	\$78,088	\$52,100	\$146,000	\$264,567	\$338,488	\$584,373	\$452,363	\$16,537	\$27,600	\$152,350	\$403,846	\$418,046

\*The average number of women, 16 years and over, and children, under 16 years, employed during each month are not included in the table, because of the small number reported.

TABLE 11.—ICE MANUFACTURE, BY

	Maryland.	Mississippi.	Missouri.	New Jersey.	New Mexico.
1 Number of establishments.....	18	23	31	26	4
2 Character of organization:					
3 Individual.....	5	8	4	6	3
4 Firm and limited partnership.....	2	4	4	3	1
5 Incorporated company.....	11	9	23	17	1
6 Miscellaneous.....					
7 Established during the decade.....	11	14	24	16	4
8 Established during the census year.....	2	2	4	6	
9 Capital:					
10 Total.....	\$649,692	\$597,871	\$1,835,166	\$1,653,023	\$118,450
11 Land.....	\$93,191	\$93,510	\$271,383	\$175,700	\$10,650
12 Buildings.....	\$100,100	\$94,061	\$406,038	\$396,470	\$29,000
13 Machinery, tools, and implements.....	\$421,425	\$872,210	\$977,152	\$970,344	\$72,000
14 Cash and sundries.....	\$34,976	\$36,090	\$180,593	\$110,514	\$6,800
15 Proprietors and firm members.....	6	14	13	12	3
16 Salaried officials, clerks, etc.:					
17 Total number.....	19	23	65	52	2
18 Total salaries.....	\$14,535	\$23,900	\$66,315	\$37,999	\$2,400
19 Officers of corporations:					
20 Number.....	6	8	26	16	2
21 Salaries.....	\$2,550	\$5,500	\$33,618	\$14,410	\$2,400
22 General superintendents, managers, clerks, and salesmen:					
23 Total number.....	13	20	39	36	
24 Total salaries.....	\$11,985	\$18,400	\$32,697	\$23,589	
25 Men:					
26 Number.....	13	20	35	35	
27 Salaries.....	\$11,985	\$18,400	\$30,593	\$23,439	
28 Women:					
29 Number.....			4	1	
30 Salaries.....			\$2,104	\$150	
31 Wage-earners, including pieceworkers, and total wages:					
32 Greatest number employed at any one time during the year.....	204	271	476	272	39
33 Least number employed at any one time during the year.....	113	111	169	148	15
34 Average number.....	138	132	279	183	22
35 Wages.....	\$74,633	\$56,503	\$157,006	\$94,070	\$15,300
36 Men, 16 years and over:					
37 Average number.....	137	160	279	182	21
38 Wages.....	\$74,313	\$55,519	\$157,006	\$93,370	\$15,200
39 Women, 16 years and over:					
40 Average number.....		1		1	
41 Wages.....		\$900		\$500	
42 Children, under 16 years:					
43 Average number.....	1	1			1
44 Wages.....	\$320	\$24			\$100
45 Average number of wage-earners, including pieceworkers, employed during each month: <sup>2</sup>					
46 Men, 16 years and over:					
47 January.....	96	60	134	102	12
48 February.....	76	67	149	128	12
49 March.....	105	79	178	153	12
50 April.....	127	133	250	179	15
51 May.....	151	227	335	220	24
52 June.....	180	272	381	233	30
53 July.....	187	275	412	284	31
54 August.....	188	258	429	241	36
55 September.....	186	236	379	237	27
56 October.....	143	171	327	206	19
57 November.....	104	76	215	136	16
58 December.....	96	62	157	117	16
59 Miscellaneous expenses:					
60 Total.....	\$24,490	\$33,730	\$72,868	\$51,276	\$1,933
61 Rent of works.....	\$185	\$120	\$6,720	\$4,325	
62 Taxes, not including internal revenue.....	\$5,972	\$6,995	\$10,224	\$7,510	\$1,093
63 Rent of offices, interest, insurance, and all sundry expenses not hitherto included.....	\$18,333	\$26,615	\$55,924	\$39,441	\$950
64 Contract work.....					
65 Materials used:					
66 Aggregate cost.....	\$34,070	\$68,520	\$226,385	\$108,158	\$15,480
67 Ammonia:					
68 Total cost.....	\$5,177	\$6,489	\$22,302	\$6,876	\$1,700
69 Total pounds.....	22,515	44,115	123,114	33,593	14,758
70 Ammonia, anhydrous:					
71 Cost.....	\$5,177	\$4,871	\$19,896	\$6,485	\$700
72 Pounds.....	22,515	19,189	91,663	26,693	2,636
73 Ammonia, aqua:					
74 Cost.....		\$1,618	\$2,406	\$391	\$1,000
75 Pounds.....		24,926	31,451	6,900	12,122
76 Fuel.....	\$56,973	\$33,420	\$157,612	\$74,591	\$11,175
77 Rent of power and heat.....			\$2,300		
78 Mill supplies.....	\$4,189	\$4,337	\$9,840	\$5,992	\$330
79 All other materials.....	\$16,160	\$21,273	\$33,284	\$19,088	\$350
80 Freight.....	\$1,566	\$2,651	\$1,047	\$1,311	\$1,875
81 Products:					
82 Aggregate value.....	\$358,668	\$288,739	\$641,405	\$391,685	\$77,775
83 Ice:					
84 Total value.....	\$358,668	\$288,735	\$635,503	\$379,776	\$77,775
85 Total tons.....	120,740	57,207	285,796	169,755	10,915
86 Can ice:					
87 Value.....	\$348,083	\$268,175	\$635,503	\$341,176	\$77,775
88 Tons.....	116,800	57,207	285,796	154,615	10,915
89 Plate ice:					
90 Value.....	\$10,585			\$38,600	
91 Tons.....	3,940			15,140	
92 All other products.....		\$20,564	\$5,902	\$11,909	
93 Comparison of products:					
94 Number of establishments reporting for both years.....	13	15	24	11	2
95 Value for census year.....	\$318,727	\$180,619	\$526,067	\$257,931	\$48,000
96 Value for preceding business year.....	\$190,280	\$172,619	\$508,806	\$223,850	\$41,000

<sup>2</sup>Includes establishments distributed as follows: Nebraska, 1; Rhode Island, 2; Utah, 1.

STATES AND TERRITORIES: 1900—Continued.

New York.	North Carolina.	Ohio.	Oklahoma.	Oregon.	Pennsylvania.	South Carolina.	Tennessee.	Texas.	Virginia.	Washington.	West Virginia.	All other states. <sup>1</sup>	
41	23	42	7	9	73	13	27	77	30	4	8	4	1
10	3	12	-----	4	10	3	4	19	8	1	1	-----	2
3	5	3	2	2	16	2	8	8	6	-----	-----	-----	3
28	15	26	5	3	46	8	15	50	16	3	7	4	4
-----	-----	1	-----	-----	1	-----	-----	-----	-----	-----	-----	-----	5
36	18	26	5	4	54	8	16	43	22	1	3	3	6
12	4	2	-----	-----	12	3	2	6	2	-----	-----	-----	7
\$2,554,722	\$523,243	\$1,777,430	\$104,323	\$172,800	\$8,259,861	\$407,400	\$1,103,501	\$2,563,888	\$1,198,981	\$252,360	\$413,452	\$198,726	8
\$341,518	\$37,465	\$180,742	\$11,001	\$22,100	\$1,233,100	\$25,225	\$194,950	\$267,495	\$141,400	\$46,000	\$58,000	\$18,000	9
\$595,070	\$69,300	\$397,900	\$44,223	\$20,200	\$1,539,675	\$102,550	\$243,176	\$545,348	\$211,500	\$32,000	\$77,700	\$40,000	10
\$1,432,701	\$381,956	\$1,012,707	\$111,168	\$107,500	\$4,712,816	\$241,000	\$580,095	\$1,581,367	\$677,882	\$188,500	\$250,823	\$105,453	11
\$185,433	\$40,522	\$186,081	\$27,931	\$23,000	\$774,270	\$38,625	\$134,680	\$169,378	\$168,199	\$40,860	\$26,929	\$35,273	12
17	13	17	7	7	51	7	20	35	20	1	1	-----	13
63	37	79	16	9	246	13	67	171	46	13	19	9	14
\$51,789	\$32,317	\$53,410	\$13,080	\$13,980	\$169,993	\$10,182	\$58,622	\$124,671	\$34,934	\$13,750	\$13,716	\$7,923	15
20	12	35	1	1	50	2	18	85	18	3	7	1	16
\$17,990	\$16,922	\$26,304	\$300	\$4,800	\$45,884	\$2,100	\$24,110	\$41,550	\$17,240	\$5,400	\$6,300	\$1,208	17
43	25	44	15	8	187	11	49	136	28	10	12	8	18
\$33,799	\$15,395	\$27,106	\$12,780	\$9,180	\$124,109	\$8,082	\$34,512	\$83,121	\$17,694	\$8,350	\$7,416	\$6,715	19
41	24	33	14	8	171	11	48	136	27	16	11	8	20
\$33,362	\$14,915	\$22,774	\$12,300	\$9,180	\$119,501	\$8,082	\$34,152	\$83,121	\$17,392	\$8,350	\$6,916	\$6,715	21
2	1	11	1	-----	16	-----	-----	-----	1	-----	-----	-----	22
\$437	\$480	\$4,332	\$480	-----	\$4,608	-----	\$360	-----	\$362	-----	\$500	-----	23
453	290	501	81	51	1,564	114	600	964	306	48	120	63	24
261	144	198	23	33	730	62	277	375	170	23	51	26	25
319	161	299	51	35	930	73	385	618	205	35	80	41	26
\$201,394	\$52,617	\$154,561	\$28,171	\$25,235	\$537,748	\$23,781	\$177,461	\$305,282	\$87,193	\$25,700	\$39,537	\$23,649	27
319	160	297	50	35	930	73	381	607	205	35	80	41	28
\$201,394	\$52,532	\$154,411	\$28,096	\$25,235	\$537,748	\$23,781	\$177,036	\$303,682	\$87,193	\$25,700	\$39,537	\$23,649	29
-----	-----	-----	-----	-----	-----	-----	-----	1	-----	-----	-----	-----	30
-----	-----	-----	-----	-----	-----	-----	-----	\$500	-----	-----	-----	-----	31
-----	1	2	1	-----	-----	-----	4	10	-----	-----	-----	-----	32
-----	\$115	\$150	\$75	-----	-----	-----	\$425	\$1,100	-----	-----	-----	-----	33
182	74	150	18	28	487	48	219	289	91	25	52	45	34
197	102	155	22	28	491	43	242	238	98	25	52	45	35
237	119	184	37	29	504	45	270	330	145	25	54	45	36
312	197	245	55	31	942	65	320	576	194	25	67	35	37
389	253	308	62	35	1,263	101	444	755	251	26	92	38	38
424	230	415	74	42	1,322	103	532	872	333	47	116	40	39
425	205	431	77	50	1,362	102	551	897	311	47	116	40	40
420	202	448	77	49	1,273	109	654	906	319	47	116	40	41
410	197	413	75	38	1,185	101	622	888	299	47	111	40	42
344	143	352	62	30	937	78	393	435	249	58	71	36	43
269	111	213	26	23	710	47	224	330	123	27	60	32	44
218	84	185	16	23	624	41	224	330	94	27	59	32	45
\$177,727	\$18,042	\$71,065	\$17,968	\$14,502	\$290,339	\$18,225	\$58,878	\$132,485	\$37,174	\$10,735	\$11,189	\$15,876	46
\$31,056	\$1,230	\$1,500	\$1,500	\$3,000	\$24,474	\$460	\$180	\$5,200	\$1,350	\$1,500	-----	-----	47
\$13,813	\$4,076	\$20,139	\$2,755	\$1,097	\$24,748	\$3,107	\$16,345	\$22,334	\$6,850	\$1,285	\$3,042	\$1,081	48
\$112,282	\$12,136	\$48,783	\$10,713	\$10,405	\$241,079	\$14,638	\$42,403	\$104,892	\$28,974	\$7,950	\$8,146	\$14,795	49
\$20,576	-----	\$585	-----	-----	\$38	-----	-----	-----	-----	-----	-----	-----	50
\$268,695	\$66,291	\$138,135	\$30,662	\$19,155	\$392,484	\$37,327	\$109,505	\$320,331	\$106,323	\$17,818	\$22,327	\$19,620	51
\$23,274	\$6,143	\$14,756	\$1,833	\$1,934	\$48,887	\$4,439	\$13,685	\$32,280	\$12,928	\$2,605	\$5,573	\$970	52
102,629	44,418	141,365	10,328	6,043	225,936	58,333	58,573	168,637	83,607	6,888	74,870	3,435	53
\$22,774	\$4,580	\$9,851	\$1,333	\$1,934	\$45,964	\$941	\$10,916	\$27,555	\$9,650	\$2,605	\$1,702	\$970	54
93,129	16,748	40,051	4,842	6,048	179,994	3,613	41,406	92,701	33,111	6,883	7,175	8,435	55
\$500	\$1,613	\$4,905	\$500	-----	\$2,923	\$3,498	\$2,769	\$4,725	\$3,278	-----	\$3,371	-----	56
9,500	27,670	101,314	5,486	-----	45,942	54,720	47,137	75,936	55,496	-----	67,695	-----	57
\$188,349	\$45,114	\$89,478	\$22,070	\$10,930	\$235,555	\$25,005	\$82,321	\$208,863	\$71,923	\$12,302	\$12,404	\$13,030	58
-----	\$1,050	-----	-----	\$2,400	-----	-----	-----	\$348	\$651	-----	-----	-----	59
\$15,084	\$5,274	\$12,758	\$2,119	\$1,373	\$26,437	\$2,438	\$3,550	\$31,547	\$9,058	\$1,300	\$2,182	\$1,000	60
\$37,762	\$3,823	\$15,495	\$2,340	\$2,417	\$60,124	\$3,610	\$4,149	\$44,595	\$7,187	\$971	\$1,362	\$3,550	61
\$4,226	\$4,887	\$5,653	\$2,300	\$90	\$21,481	\$1,835	\$1,835	\$7,748	\$4,576	\$80	\$806	\$1,020	62
\$1,051,372	\$228,305	\$582,638	\$106,003	\$116,031	\$2,038,504	\$116,357	\$538,107	\$1,184,332	\$427,974	\$103,600	\$119,401	\$86,172	63
\$1,025,308	\$228,305	\$577,638	\$106,003	\$95,260	\$2,000,931	\$116,357	\$538,107	\$1,168,640	\$417,052	\$103,600	\$119,201	\$82,572	64
457,779	61,338	237,750	22,218	17,165	735,018	46,228	168,931	231,450	118,240	17,300	35,734	28,509	65
\$1,015,308	\$228,305	\$548,542	\$106,003	\$95,260	\$1,866,770	\$114,857	\$538,107	\$1,159,040	\$362,542	\$103,600	\$119,201	\$72,500	66
456,279	61,338	220,833	22,218	17,165	684,144	44,573	158,931	229,050	96,458	17,300	35,734	24,400	67
\$10,000	-----	\$28,496	-----	-----	\$134,161	\$1,500	-----	\$9,600	\$54,510	-----	-----	\$10,072	68
1,500	-----	16,917	-----	-----	50,374	375	-----	2,400	21,782	-----	-----	4,109	69
\$26,064	-----	\$5,500	-----	\$20,771	\$37,573	-----	-----	\$15,692	\$10,922	-----	\$200	\$3,600	70
26	15	36	4	6	50	9	20	62	20	3	6	4	71
\$306,628	\$174,892	\$532,478	\$61,516	\$41,631	\$1,172,228	\$92,857	\$461,727	\$970,290	\$267,187	\$97,600	\$106,837	\$86,172	72
\$789,728	\$168,241	\$561,080	\$69,000	\$39,565	\$1,167,063	\$97,923	\$571,453	\$870,529	\$248,321	\$78,000	\$105,157	\$78,072	73

<sup>1</sup>The average number of women, 16 years and over, and children, under 16 years, employed during each month, are not included in the table, because of the small number reported.

TABLE 11.—ICE MANUFACTURE, BY

	United States.	Alabama.	Arizona.	Arkansas.	California.
Power:					
74 Number of establishments reporting power .....	706	22	9	18	17
75 Total horsepower .....	102,695	1,872	609	2,561	2,343
Owned:					
Engines:					
76 Steam, number .....	1,447	29	14	44	18
77 Horsepower .....	96,711	1,872	609	2,551	1,420
78 Gas or gasoline, number .....	9				1
79 Horsepower .....	198				8
Water wheels:					
80 Number .....	23				6
81 Horsepower .....	807				330
Electric motors:					
82 Number .....	85			1	10
83 Horsepower .....	1,492			10	360
Other power:					
84 Number .....	101				
85 Horsepower .....	2,708				
Rented:					
86 Electric, horsepower .....	389				225
87 Other kinds, horsepower .....	310				
88 Furnished to other establishments .....	332				
Establishments classified by number of persons employed, not including proprietors and firm members:					
89 Total number of establishments .....	787	23	9	18	20
90 No employees .....	4				
91 Under 5 .....	98	4	1	3	5
92 5 to 20 .....	534	15	8	12	11
93 21 to 50 .....	130	4		2	3
94 51 to 100 .....	21			1	1
95 101 to 250 .....	3				
96 251 to 500 .....	2				

STATES AND TERRITORIES: 1900—Continued.

Colorado.	Connecticut.	Delaware.	District of Columbia.	Florida.	Georgia.	Illinois.	Indiana.	Indian Territory.	Iowa.	Kansas.	Kentucky.	Louisiana.	
6	5	7	4	35	31	28	44	3	3	19	30	35	74
292	779	631	1,460	3,049	3,555	4,104	3,620	190	450	2,142	3,232	4,980	75
12	12	11	16	58	61	61	88	3	6	25	60	65	76
292	767	591	1,300	2,563	3,555	4,056	3,507	190	450	2,122	3,201	4,650	77
						1				1			78
						12				20			79
		1	1	1									80
		30	50	4									81
		1											82
		10				3	3				4	1	83
						21	108				31	3	84
				27			1					19	85
				482			5					322	86
	12												87
			110			15						5	88
			5	2					110		20		89
6	5	7	4	35	32	29	47	3	3	19	31	36	90
				1								1	91
		2		4	8	3	9	1		1	2	2	92
2	3	5	1	28	19	18	29	2	2	17	25	27	93
3	2		2	2	4	6	7		1	1	4	5	94
1			1		1	1	2						95
													96
						1							

TABLE 11.—ICE MANUFACTURE, BY

	Maryland.	Mississippi.	Missouri.	New Jersey.	New Mexico.
Power:					
74 Number of establishments reporting power.....	18	23	31	26	3
75 Total horsepower.....	2,151	1,914	7,355	4,253	75
Owned:					
Engines:					
76 Steam, number.....	28	37	62	44	4
77 Horsepower.....	2,075	1,904	7,177	3,695	75
78 Gas or gasoline, number.....	1				
79 Horsepower.....	25				
Water wheels:					
80 Number.....	1			1	
81 Horsepower.....	15			25	
Electric motors:					
82 Number.....	2	1	4	9	
83 Horsepower.....	11	10	88	258	
Other power:					
84 Number.....	5			8	
85 Horsepower.....	25			275	
Rented:					
86 Electric horsepower.....			90		
87 Other kinds horsepower.....					
88 Furnished to other establishments.....			37	31	
Establishments classified by number of persons employed, not including proprietors and firm members:					
89 Total number of establishments.....	18	23	31	26	4
90 No employees.....	1				
91 Under 5.....	1	2	3	2	1
92 5 to 20.....	13	17	17	21	2
93 21 to 50.....	3	4	10	3	1
94 51 to 100.....			1		
95 101 to 250.....					
96 251 to 500.....					

STATES AND TERRITORIES: 1900—Continued.

New York.	North Carolina.	Ohio.	Oklahoma.	Oregon.	Pennsylvania.	South Carolina.	Tennessee.	Texas.	Virginia.	Washington.	West Virginia.	All other states. <sup>1</sup>	
41	23	41	7	9	71	11	25	75	30	4	8	4	74
5,487	2,275	6,205	670	720	17,028	1,080	3,612	8,964	3,502	425	685	475	75
75	31	84	9	13	206	13	51	128	56	4	14	5	76
5,357	1,845	5,175	670	605	16,622	744	3,589	8,825	3,288	425	589	355	77
					1			1				3	78
					6			2				120	79
1					1	1		3	6				80
25					18	30		100	180				81
5		7			26	1	2	2	1				82
65		55			382	6	23	15	8		2		83
1	11	18				3		7				1	84
10	365	975				300		16			18		85
				25				6	26				86
30	65			90									87
5				8	58			56					88
41	23	42	7	9	73	13	27	77	30	4	8	4	89
2	2	5		4	7	3		8	3	1	1	1	90
34	18	29	6	5	39	8	14	55	25	2	4	1	91
5	1	7	1		20	1	9	11	2	1	3	2	92
	2	1			6			8					93
							2						94
					1								95
													96

<sup>1</sup> Includes establishments distributed as follows: Nebraska, 1; Rhode Island, 2; Utah, 1.

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Twelfth Census of the United States.

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# CENSUS BULLETIN.

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NO. 173.

WASHINGTON, D. C.

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## MANUFACTURES.

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### GLOVES AND MITTENS—LEATHER.

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HON. WILLIAM R. MERRIAM,  
*Director of the Census.*

SIR: I transmit herewith, for publication in bulletin form, a report on the manufacture of leather gloves and mittens in the United States during the census year, prepared under my direction by Mr. Arthur L. Hunt, of the Census Office.

The manufacture of leather gloves and mittens is now for the first time made the subject of a special report by the Census Office, although the industry has been of commercial importance in the United States for nearly a century. The statistics included in the report were collected, as in previous censuses, upon the schedule used for the general statistics of manufactures. But in view of the notable growth of this industry it was decided to supplement the canvass made by the enumerators and local special agents, and to give the industry more detailed treatment than is given to manufacturing industries in general, or than this industry has received heretofore. Except in Tables 1 and 2 the statistics here presented pertain only to establishments engaged in the manufacture of leather gloves and mittens, and do not include the returns from establishments which manufactured gloves and mittens from other materials.

The statistics are presented in 14 tables: Table 1 showing comparative figures for the manufacture of all gloves and mittens, except knit gloves and mittens, at the several censuses; Table 2 showing the statistics of

leather gloves and mittens in comparison with the totals of the combined industry, including the statistics of 3 additional establishments, the schedules for which were received too late to be included in the totals for the industry as presented in Manufactures, Parts I and II; Table 3 showing by states and territories the number of establishments in operation in 1900, the number established during the decade, and the number established during the census year; Table 4 showing the statistics of capital for 1900; Table 5 showing a summary of wage-earners and wages by geographic divisions for 1900; Table 6 showing the statistics of miscellaneous expenses for 1900; Table 7 showing the cost of materials for 1900; Table 8 showing the quantities and cost of hides and skins for 1900; Table 9 showing the quantity and value of products for 1900; Table 10 showing the quantity and value of products by states and territories and by geographic divisions for 1900; Table 11 showing the statistics for New York, in comparison with the totals for the United States; Table 12 showing the statistics for cities of over 20,000 population for 1900; Table 13 showing the imports of gloves of kid and other leather from 1890 to 1900, inclusive; and Table 14 showing the detailed statistics for the industry in 1900.

Table 1 shows the growth of the combined glove and mitten industry for the half century which terminates with the Twelfth Census. The manufacturing statistics of the censuses prior to 1850 were too imperfect

and fragmentary in character to make it proper to reproduce them in such a table as a measure of industrial growth in the first half of the century. Owing to changes in the method of taking the census, comparisons between the earlier and later decades, represented in Table 1, should be drawn only in the most general way. Nevertheless, the rate of growth in the manufacture of gloves and mittens may be fairly inferred from the figures given.

In drafting the schedules of inquiry for the census of 1900 care was taken to preserve the basis of comparison with prior censuses. Comparison may be made safely with respect to all the items of inquiry except those relating to capital, salaried officials, clerks, etc., and their salaries, the average number of employees, and the total amount of wages paid. Live capital, that is, cash on hand, bills receivable, unsettled ledger accounts, raw materials, stock in process of manufacture, finished products on hand, and other sundries, was first called for at the census of 1890. No definite attempt was made, prior to the census of 1890, to secure a return of live capital invested.

Changes were made in the inquiries relating to employees and wages in order to eliminate defects found to exist on the form of inquiry adopted in 1890. At the census of 1890 the average number of persons employed during the entire year was called for, and also the average number employed at stated weekly rates of pay, and the average number was computed for the actual time the establishments were reported as being in operation. At the census of 1900 the greatest and least numbers of employees were reported, and also the average number employed during each month of the year. The average number of wage-earners (men, women, and children) employed during the entire year was ascertained by using 12, the number of calendar months, as a divisor into the total of the average numbers reported for each month. This difference in the method of ascertaining the average number of wage-earners during the entire year may have resulted in a variation in the number, and should be considered in making comparisons.

At the census of 1890 the number and salaries of proprietors and firm members actively engaged in the business or in supervision were reported, combined with clerks and other officials. In cases where proprietors and firm members were reported without sal-

aries, the amount that would ordinarily be paid for similar services was estimated. At the census of 1900 only the number of proprietors and firm members actively engaged in the industry or in supervision was ascertained, and no salaries were reported for this class. It is therefore impossible to compare the number and salaries of salaried officials of any character for the two censuses.

Furthermore, the schedules for 1890 included in the wage-earning class, overseers, foremen, and superintendents (not general superintendents or managers), while the census of 1900 separates from the wage-earning class such salaried employees as general superintendents, clerks, and salesmen. It is possible and probable that this change in the form of the question has resulted in eliminating from the wage-earners, as reported by the present census, many high-salaried employees included in that group for the census of 1890.

The reports show a capital of \$9,004,427 invested in the manufacture of leather gloves and mittens in the 381 establishments reporting for the United States. This sum represents the value of land, buildings, machinery, tools, and implements, and the live capital utilized, but does not include the capital stock of any of the manufacturing corporations engaged in this industry. The value of the products is returned as \$16,721,234, to produce which involved an outlay of \$544,170 for salaries of officials, clerks, etc.; \$4,151,126 for wages; \$562,870 for miscellaneous expenses, including rent, taxes, etc.; and \$9,382,102 for materials used, mill supplies, freight, and fuel. It is not to be assumed, however, that the difference between the aggregate of these sums and the value of the products is, in any sense, indicative of the profits in the manufacture of leather gloves and mittens during the census year. The census schedule takes no cognizance of the cost of selling manufactured articles, or of interest on capital invested, or of the mercantile losses incurred in the business, or of depreciation in plant. The value of the product given is the value as obtained or fixed at the works. This statement is necessary in order to avoid erroneous conclusions from the figures presented.

Very respectfully,



*Chief Statistician for Manufactures.*

# GLOVES AND MITTENS—LEATHER.

By ARTHUR L. HUNT.

The following tables, with the exceptions noted below, present the statistics concerning the establishments engaged exclusively in the manufacture of leather gloves and mittens during the census year ending May 31, 1900. The general classification adopted by the Census Office includes every variety of gloves and mittens manufactured, whether of leather or other material, except knit gloves and mittens; therefore it is impossible to present comparative statistics for establishments engaged exclusively in the manufacture

of leather gloves and mittens for previous censuses. Inasmuch, however, as the manufacture of gloves and mittens of materials other than leather has formed a comparatively small branch of the combined industry at the several censuses, the statistics for the combined industry fairly indicate the growth in the manufacture of leather gloves and mittens. Table 1 is a comparative summary of the combined industry as returned at the censuses of 1850 to 1900, with the percentages of increase for each decade.

TABLE 1.—GLOVES AND MITTENS: COMPARATIVE SUMMARY, 1850 TO 1900, WITH PER CENT OF INCREASE FOR EACH DECADE.

	DATE OF CENSUS.						PER CENT OF INCREASE.				
	1900 <sup>1</sup>	1890	1880	1870	1860	1850	1890 to 1900	1880 to 1890	1870 to 1880	1860 to 1870	1850 to 1860
Number of establishments.....	397	324	300	221	126	110	22.5	8.0	35.7	75.4	14.5
Capital.....	\$9,127,309	\$5,977,820	\$3,379,648	\$2,340,550	\$594,825	\$181,200	52.7	76.9	44.4	293.5	228.3
Salaried officials, clerks, etc., number.....	661	2,482	(3)	(3)	(3)	(3)	37.1				
Salaries.....	\$548,520	\$438,664	(3)	(3)	(3)	(3)	25.0				
Wage-earners, average number.....	14,436	8,187	7,697	4,058	1,429	1,938	76.3	6.4	89.7	184.0	426.3
Total wages.....	\$4,217,845	\$2,670,344	\$1,655,695	\$980,549	\$330,419	\$233,496	58.0	61.3	68.9	196.8	41.5
Men, 16 years and over.....	4,402	2,988	2,102	1,127	463	329	46.8	42.6	86.5	148.8	37.7
Wages.....	\$2,030,554	\$1,506,385	(3)	(3)	(3)	(3)	34.8				
Women, 16 years and over.....	9,754	5,091	5,249	2,894	976	1,609	91.6	48.0	81.4	196.5	439.3
Wages.....	\$2,150,480	\$1,150,943	(3)	(3)	(3)	(3)	86.8				
Children, under 16 years.....	280	98	346	37	(3)	(3)	185.7	471.7	835.1		
Wages.....	\$36,811	\$13,016	(3)	(3)	(3)	(3)	182.8				
Miscellaneous expenses.....	\$568,582	\$426,937	(3)	(3)	(3)	(3)	33.2				
Cost of materials used.....	\$9,554,105	\$5,021,144	\$4,351,469	\$1,884,146	\$537,589	\$322,837	90.3	15.4	131.0	250.5	66.5
Value of products, including custom work and repairing.....	\$17,048,656	\$10,103,821	\$7,879,605	\$8,998,521	\$1,176,795	\$708,184	68.7	36.9	84.6	239.8	66.2

<sup>1</sup>The figures reported for 1900 include the statistics for 1 institution and 2 establishments, the schedules for which were received too late to be included in the totals for this industry as presented in the report on Manufactures, Parts I and II.  
<sup>2</sup>Includes proprietors and firm members, with their salaries; number only reported in 1900.  
<sup>3</sup>Not reported separately.  
<sup>4</sup>Decrease.  
<sup>5</sup>Not reported.

Table 1 shows the notable growth which has occurred in the glove industry during the past half century. Although the manufacture of gloves and mittens was of commercial importance as early as 1810, the census of 1850 was the first at which the statistics were sufficiently accurate to justify a detailed comparison. In that year returns were received from 110 establishments, reporting a capital of \$181,200, and a product valued at \$708,184. In 1900, returns were received from 397 establishments, an increase of 287, or 260.9 per cent. The capital increased from \$181,200 to \$9,127,309, an increase of \$8,946,109, while the value of products increased to \$17,048,656, an increase of \$16,340,472. Reports were received from 126 establishments in 1860, showing an increase of but 14.5 per cent as compared with 1850, while the capital increased to \$594,825, an increase of \$413,625, or 228.3 per cent, and the value of products increased from \$708,184 to \$1,176,795, an

increase of \$468,611, or 66.2 per cent. The increase between 1860 and 1870 was primarily due to the large demand for gloves for the military service during the Civil War. During this period the number of establishments increased 95, or 75.4 per cent; the capital increased \$1,745,725, or 293.5 per cent; and the value of products, \$2,821,726, or 239.8 per cent. Since 1870 the industry has steadily increased. In 1900 the number of establishments was 397, an increase since 1890 of 73, or 22.5 per cent. During the decade the capital increased from \$5,977,820 to \$9,127,309, an increase of \$3,149,489, or 52.7 per cent, while the value of products increased from \$10,103,821 to \$17,048,656, or 68.7 per cent.

A comparison of the average capital per establishment for the several decades indicates the changes which have taken place in the industry during the past half century. In 1850 the average capital per establishment was \$1,647, and in 1860 it was \$4,721, an

increase of \$3,074, or 186.6 per cent. This comparatively large increase was probably due to the introduction, in 1852, of the sewing machine for glove manufacturing. Previous to this time all gloves were made by hand and very few people worked in the factories, most of the work being done by "home workers." Between 1860 and 1870 the average capital increased to \$10,591, an increase of \$5,870, or 124.3 per cent. From 1870 the average capital has shown a steady increase; in 1900 it was \$22,991 per establishment. Table 1 indicates that the capital invested in the glove industry by the 110 establishments in 1850 was \$181,200, a sum less than the amount of capital employed by several of the large glove factories of the present time. The value of products in 1850 was nearly four times the amount of capital reported. The ratio of capital to product since 1850 has remained comparatively the same. In 1850 the amount paid in wages exceeded the capital, but in each subsequent decade, with the exception of 1860, the amount of wages was less than one-half the amount invested in capital.

Table 2 is a comparative summary of the statistics for gloves and mittens manufactured from all materials, and from leather, with the per cent that the total of leather gloves and mittens formed of the combined total. Table 2 includes the statistics for 1 institution, and also for 2 establishments, the schedules for which were received too late to be included in the totals as given in the general report for the industry as presented in Manufactures, Parts I and II.

TABLE 2.—COMPARATIVE SUMMARY, GLOVES AND MITTENS OF ALL MATERIALS, AND OF LEATHER, WITH THE PER CENT THAT LEATHER GLOVES AND MITTENS FORMED OF THE TOTAL: 1900.

	All materials.	Leather.	Per cent of leather to total.
Number of establishments .....	397	381	96.0
Capital .....	\$9,127,309	\$9,004,427	98.7
Salaries of officials, clerks, etc., number....	661	687	96.4
Salaries.....	\$548,520	\$544,170	99.2
Wage-earners, average number .....	14,436	14,180	98.2
Total wages .....	\$4,217,845	\$4,151,126	98.4
Men, 16 years and over.....	4,402	4,364	99.1
Wages.....	\$2,030,554	\$2,014,134	99.2
Women, 16 years and over.....	9,754	9,542	97.8
Wages.....	\$2,150,480	\$2,101,044	97.7
Children, under 16 years.....	280	274	97.9
Wages.....	\$36,811	\$35,948	97.7
Miscellaneous expenses.....	\$568,582	\$562,870	99.0
Cost of materials used.....	\$9,554,105	\$9,382,102	98.2
Value of products, including custom work and repairing .....	\$17,048,656	\$16,721,234	98.1

<sup>1</sup> Includes the statistics for 1 institution, and also for 2 establishments, the schedules for which were received too late to be included in Manufactures, Parts I and II. These establishments are distributed as follows: New Jersey, 1; New York, 1; Ohio, 1.

It appears that 381 establishments, or 96 per cent of the total number reported, were engaged in the manufacture of leather gloves and mittens during the census year, as compared with 397 establishments, the total for the combined industry. The capital was \$9,004,427, or 98.7 per cent of the total capital; 14,180 wage-earners were employed, or 98.2 per cent of the total number

reported; the cost of materials was \$9,382,102, or 98.2 per cent of the total cost of materials; and the value of products was \$16,721,234, or 98.1 per cent of the total. In this connection, however, it should be stated that many establishments use large quantities of jersey cloth and knit goods in the manufacture of the cheaper grades of leather gloves and mittens, and this feature of the industry may be said to be constantly increasing.

The individual form of organization appears to predominate in this industry. Of the total number of establishments, 222, or 58.3 per cent, were conducted by individuals. Of the remaining number 125, or 32.8 per cent, were operated by firms or limited partnerships, 33, or 8.6 per cent, by incorporated companies, and the 1 remaining was miscellaneous in character.

Table 3 presents, by states and territories and geographic divisions, the number of leather glove and mitten establishments from which returns were received in 1900, with the number established during the decade and also the number established during the census year.

TABLE 3.—NUMBER OF ACTIVE ESTABLISHMENTS IN 1900, NUMBER ESTABLISHED SINCE 1890, AND NUMBER ESTABLISHED DURING THE CENSUS YEAR, BY STATES AND TERRITORIES; ARRANGED GEOGRAPHICALLY.

STATES AND TERRITORIES.	Number reporting.	Established since 1890.	Established during the census year.
The United States.....	381	205	27
New England states.....	17	9	3
Maine.....	1	1	.....
New Hampshire.....	6	.....	.....
Massachusetts.....	8	7	3
Rhode Island.....	1	.....	.....
Connecticut.....	1	1	.....
Middle states.....	255	135	12
New York.....	243	130	12
New Jersey.....	5	2	.....
Pennsylvania.....	4	3	.....
Maryland.....	3	.....	.....
Southern states.....	5	1	.....
West Virginia.....	1	.....	.....
Virginia.....	3	.....	.....
Oklahoma.....	1	1	.....
Central states.....	72	43	11
Ohio.....	5	3	3
Michigan.....	5	3	.....
Indiana.....	3	2	1
Illinois.....	24	17	2
Wisconsin.....	19	12	3
Minnesota.....	8	5	1
Iowa.....	6	1	1
Missouri.....	2	.....	.....
Western states.....	4	3	.....
Montana.....	1	.....	.....
Nebraska.....	1	1	.....
Utah.....	1	1	.....
Colorado.....	1	1	.....
Pacific states.....	28	14	1
Washington.....	3	3	1
Oregon.....	2	2	.....
California.....	23	9	.....

Table 3 indicates the remarkable progress that has occurred in the industry during the decade. Of the total number of establishments, 205, or 53.8 per cent,

were established since 1890, and of this number, 27, or 7.1 per cent, were established during the census year. The greatest development was shown in the Middle states, which reported 135 establishments constructed during the decade, or 52.9 per cent of the total number of establishments reported for the group. Of the number established during the decade, 12, or 8.9 per cent, were constructed during the census year. The Central states reported 43 establishments constructed, or 59.7 per cent of the number reported for the group, of which number 11 were established during the census year. The number of establishments in the Pacific states was 28, of which 14, or 50 per cent, were established during the decade. New York reported 130 factories established during the decade, of which number 12 were established during the census year. Illinois and Wisconsin showed a comparatively large number established during the past ten years; the former reporting 17 and the latter 12. This seems to be due to the growing tendency to manufacture as near as possible to the source of supply, and as sheep pelts and horse and cow hides are now largely dressed for gloves in these states, it is but natural that glove and mitten manufacturers have taken advantage of the opportunity to establish factories in close proximity to the source of the materials required by them. California reported 23 establishments engaged in this industry, of which 9 were established during the decade. Massachusetts reported 8 establishments, 7 of which were established during the decade, and of this number 3 were established during the census year.

Table 4 is a summary of the capital reported for 1900, with the per cent of each item to the total.

TABLE 4.—CAPITAL: 1900.

	Amount.	Per cent of total.
Total .....	\$9,004,427	100.0
Land .....	286,237	3.2
Buildings .....	582,095	6.5
Machinery, tools, and implements .....	675,650	7.5
Cash and sundries .....	7,460,445	82.8

The total capital invested was given as \$9,004,427, and of the several items, cash and sundries, including cash on hand, bills receivable, unsettled ledger accounts, raw materials, stock in process of manufacture, finished products on hand, and other sundries, amounted to \$7,460,445, or 82.8 per cent of the total. The preponderance of this item is, in a measure, due to the fact that a number of the larger manufacturers are heavy importers of leather, and the general statement may be made that glove manufacturers keep large quantities of leather on hand, together with costly furs, which are used for linings. The second largest item of capital was that reported for machinery, tools, and implements, and amounted to \$675,650, or 7.5 per cent of the total. The value of land and of buildings formed 3.2 and 6.5 per cent of the total capital, respectively. The capital reported does not include the capital stock of any of the corporations, but only the actual capital utilized in the business.

Table 5 shows the total number of wage-earners with wages, the number of men, women, and children with wages, and the per cent of each to the total number, by geographic divisions, for 1900.

TABLE 5.—WAGE-EARNERS, BY GEOGRAPHIC DIVISIONS: 1900.

GEOGRAPHIC DIVISIONS.	Total average number.	Total wages.	MEN.			WOMEN.			CHILDREN.		
			Average number.	Per cent of total average number.	Total wages.	Average number.	Per cent of total average number.	Total wages.	Average number.	Per cent of total average number.	Total wages.
The United States .....	14,180	\$4,151,126	4,364	30.8	\$2,014,134	9,542	67.3	\$2,101,044	274	1.9	\$35,948
New England states .....	444	169,290	203	45.7	99,142	220	49.6	67,256	21	4.7	2,892
Middle states .....	10,218	2,814,739	2,937	28.7	1,345,568	7,212	70.6	1,458,995	69	0.7	10,176
Southern states .....	262	46,450	43	16.4	15,950	192	73.3	28,000	27	10.3	2,500
Central states .....	2,599	881,718	990	38.1	451,130	1,476	56.8	413,598	133	5.1	17,080
Western states .....	5	1,478	2	40.0	820	3	60.0	656	.....	.....	.....
Pacific states .....	652	237,453	189	29.0	101,524	439	67.3	132,329	24	3.7	3,300

The total number of wage-earners was reported as 14,180, and the total wages as \$4,151,126. Of the total number of wage-earners, 4,364, or 30.8 per cent, were men, receiving \$2,014,134 for wages. The number of women was 9,542, or 67.3 per cent of the total number, and the wages received were given as \$2,101,044. The total number of children was 274, receiving \$35,948 as wages. With the exception of the operation of heavy machines for wax-thread work and palming, together with the cutting and preparation of the skin, which is done by the men, glove making is mostly done by women. In this connection it should be stated that, inasmuch as

a great majority of the persons employed in this industry are pieceworkers, any deductions from the above table relative to the average rate of wages would be misleading. The making by "home workers" is an important and interesting phase of their manufacture, and since the inception of the industry much of the glove making has been done at the homes of families, the members of which were unable, on account of various household duties, to take employment in a factory. Many of the large glove and mitten manufacturers of Gloversville and Johnstown, N. Y., employ delivery teams to distribute and collect the work of the home

workers. The following extract from a letter received by the division of statistics of the Agricultural Department from a prominent glove manufacturer of Fulton county, who has been intimately associated with the growth and development of the leather glove and mitten industry in this country, illustrates the extent to which gloves and mittens are made by farmers' families.

I have seen all large putters-out of gloves to country makers and from talks with them and manufacturers who have many farmers' families get work directly from them, I think I am very nearly correct in the following estimate of the number of farmers' families who make gloves:

Northville, with the adjoining towns in Hamilton and Saratoga counties.....	200
Broadalbin and Perth, with adjoining towns in Saratoga county.....	200
Garoga and Stratford, with adjoining towns in Herkimer county.....	150
Ephratah and Oppenheim, with adjoining towns in Herkimer county.....	250
Montgomery county.....	200
	1,000

This is but a rough estimate, and probably a full count of all families who do but a few dozens of pairs a year would add 100 or more to the above. All stitching on the backs of gloves is done in factories before they are sent out. The price of making varies from 20 cents per dozen for the cheapest gloves to \$1 per dozen for full outseam. The earnings vary as greatly. A general average would be about \$10 per month, although many women average 75 cents per day. There is not as much work sent out to farms as twenty years ago, but our two cities have grown up by farmers' families moving in and taking work daily from the factories. Only the high-priced work is made in factories, where not as many female operators are employed as there were ten years ago. I would estimate the total earnings of farmers' families in glove making to be about \$125,000 per year. A farmer's daughter usually learns making on her mother's machine and then buys one costing about \$35 for herself. Any girl naturally handy at sewing can learn to make common gloves in a week. All silk and thread are furnished by the manufacturers.

The schedule of inquiry adopted for 1890 was the first which contained questions designed to show the cost of manufacture other than for wages and materials. The questions of the Twelfth Census relating to miscellaneous expenses were made as uniform as possible with those of the previous census. The returns for 1900 are shown in Table 6, together with the per cent of each item to the total.

TABLE 6.—MISCELLANEOUS EXPENSES: 1900.

	Amount.	Per cent of total.
Total.....	\$562,870	100.0
Rent of works.....	85,888	15.2
Taxes, not including internal revenue.....	23,466	4.2
Rest of offices, insurance, interest, repairs, advertising, and other sundries.....	359,721	63.9
Contract work.....	93,795	16.7

The amount paid for rent of offices, insurance, interest, internal-revenue tax and stamps, ordinary repairs of buildings and machinery, advertising, and all other sundries not reported under the head of materials, was \$359,721, or 63.9 per cent of the total. This item does not include expense incurred for new equipment, machinery, and other apparatus, but only the amount expended for general repairs of buildings and machinery, and other minor expenses incident to the conduct of the business. The remaining items reported under miscellaneous expenses formed but a relatively small per cent of the total amount reported.

Table 7 shows the cost of the different materials used in the manufacture of leather gloves and mittens, with the per cent each item formed of the total for 1900.

TABLE 7.—COST OF MATERIALS: 1900.

	Amount.	Per cent of total.
Total.....	\$9,382,102	100.0
Hides and skins.....	7,356,433	78.4
Fuel.....	42,230	0.5
Rent of power and heat.....	19,919	0.2
Mill supplies.....	12,619	0.1
All other materials.....	1,904,778	20.3
Freight.....	46,123	0.5

The aggregate cost of materials was \$9,382,102, of which \$7,356,433, or 78.4 per cent, represented the cost of hides and skins; the remaining \$2,025,669, or 21.6 per cent, was made up of the cost of fuel, rent of power and heat, mill supplies, freight, and all other materials. Of these latter, the cost of all other materials was the largest item, amounting to \$1,904,778, or 20.3 per cent of the total. Under this head is the amount expended for furs of all descriptions, silk, thread, buttons, fasteners, and numerous other incidentals which are required for a complete glove or mitten.

Table 8 shows the quantities and cost of the different varieties of hides and skins used, the average cost per dozen, and the per cent of each variety to the total quantity and cost, for 1900.

TABLE 8.—QUANTITIES AND COST OF HIDES AND SKINS USED: 1900.

	QUANTITY.		COST.		
	Dozens.	Per cent of total.	Total.	Per cent of total.	Average per dozen.
Total.....	826,416	100.0	\$7,356,433	100.0	\$8.90
Deerskins.....	89,596	10.8	1,146,808	15.6	12.80
Mochas, Arabian sheepskins	105,372	12.7	1,071,636	14.6	10.17
Cabretta, Brazilian sheepskins.....	6,432	0.8	47,399	0.6	7.37
Roans, all kinds of domestic sheepskins.....	422,481	51.1	2,256,511	30.7	5.34
Horse and cow hides.....	30,180	3.7	1,352,148	18.4	44.80
Kid, imported.....	70,824	8.6	740,170	10.1	10.45
Kid, domestic.....	97,245	11.8	708,800	9.6	7.29
All other varieties.....	4,286	0.5	32,961	0.4	7.69

It appears from Table 8 that 826,416 dozens of hides and skins, valued at \$7,356,433, were used. This is an average cost of \$8.90 per dozen. Roans, including all kinds of domestic sheepskins, formed the principal material from which gloves and mittens were manufactured; 422,481 dozen skins of this variety were used, costing \$2,256,511, or 30.7 per cent of the total cost of leather, the average cost being \$5.34 per dozen. The mochas formed the second principal material used in point of number of dozens, although the cost of both horse and cow hides and deerskins exceeded the cost of the mochas. Relative to the quantity of horse and cow hides, it should be stated that as a rule they were reported by manufacturers as purchased by the square foot. However, in order to make them comparable with the other varieties of hides and skins, they were reduced to dozens. A horse or cow hide is generally split up the back, being two sides to the skin. The large users estimated 15 square feet to the side, or 30 square feet to the hide. The number of dozens reported was computed by considering the two sides as composing a hide. The number of square feet was given as 10,864,607. The cost of imported kid skins used exceeded that of domestic, although the quantity of the latter was larger. Under "all other varieties" are included a number of different varieties of skins, such as seal, hog, and dog. Attention should here be directed to the fact that the average cost is computed from the totals of the whole number of establishments from which reports were received, and therefore must not be assumed to be indicative of the actual cost in any particular section of the country.

In addition to the materials reported in Table 8, there were 7 establishments, engaged in other industries, which manufactured leather gloves and mittens as a by-product. These establishments reported \$106,114 for materials used for glove manufacture, as follows: Deerskins, 1,962 dozen, costing \$25,799; mochas, 191 dozen, costing \$2,091; cabretta, 35 dozen, costing \$274; roans, 3,490 dozen, costing \$18,159; kid, imported, 1,000 dozen, costing \$11,981; kid, domestic, 2,116 dozen, costing \$14,698; and 734 dozen horse and cow hides, costing \$33,112. In this connection it is interesting to note the grade of gloves and mittens into which each variety of leather is cut. Mocha and imported kid are used for men's, women's, and children's fine lined and unlined gloves and mittens, and the domestic kid is made into the more common varieties. The cabretta and Brazilian sheepskin are cut into men's medium-grade gloves for driving. The roans, or domestic sheepskins, are made into men's low-grade gloves and mittens, the cheapest leather gloves made. The deerskins are cut into men's gloves and mittens; the horse and cow hides and the goat and seal skins are used as a substitute for deerskins in the manufacture of men's imitation buck gloves and mittens. In a general way the quantity of the different hides and skins

reported for each state reflects the quality of gloves and mittens manufactured in that state. Reference to Table 14 shows that New York led in the consumption of every variety of hides and skins except horse and cow hides. Illinois led in the consumption of horse and cow hides, followed by New York, Wisconsin, and California, in the order named. In the consumption of domestic sheepskins New York ranked first, followed by Illinois, Indiana, California, and Wisconsin, in the order named.

Table 9 is a summary of the value of products, the number of dozens of pairs, and the value of the different varieties of gloves and mittens, the per cent of each variety to the total quantity and value of gloves and mittens, and the average value per dozen pairs, for 1900.

TABLE 9.—QUANTITIES AND VALUES OF PRODUCTS: 1900.

	Quantity (dozens of pairs).	VALUE.		PER CENT OF TOTAL, GLOVES AND MITTENS.	
		Total.	Average per dozen pairs.	Quantity.	Value.
Aggregate .....		\$16,721,234			
Gloves and mittens .....	2,895,661	16,039,168	\$5.54		
All other products .....		682,066			
Total, gloves and mittens .....	2,895,661	16,039,168	5.54	100.0	100.0
Men's .....	2,267,327	12,418,258	5.48	78.3	77.4
Lined .....	952,820	4,959,902	5.21	32.9	30.9
Unlined .....	1,314,507	7,458,356	5.67	45.4	46.5
Women's .....	323,826	2,461,760	7.60	11.2	15.3
Lined .....	78,783	538,362	6.83	2.7	3.4
Unlined .....	221,039	1,772,746	8.02	7.7	11.0
Gauntlets .....	24,004	150,652	6.27	0.8	0.9
Boys' and youths' .....	247,465	926,059	3.74	8.5	5.8
Lined .....	148,493	548,556	3.69	5.1	3.4
Unlined .....	98,972	377,503	3.81	3.4	2.4
Misses' and children's .....	57,043	233,091	4.09	2.0	1.5
Lined .....	39,873	160,998	4.04	1.4	1.0
Unlined .....	17,170	72,093	4.20	0.6	0.5
Lined .....	1,219,969	6,207,818	5.09	42.1	38.7
Unlined .....	1,651,688	9,680,698	5.86	57.1	60.4
Gauntlets .....	24,004	150,652	6.27	0.8	0.9

Table 9 shows that the total value of products was \$16,721,234. Of this amount, \$16,039,168, or 95.9 per cent of the total, was the value of 2,895,661 dozens of pairs of gloves and mittens, while \$682,066, or 4.1 per cent of the total, was reported as the value of all other products, including the amounts received for custom work and repairing.

Table 9 shows the proportions of the different varieties of gloves and mittens manufactured, and indicates that men's gloves and mittens formed over 75 per cent of the total quantity and value.

Of the total quantity and value of gloves and mittens, 1,219,969 dozens of pairs, valued at \$6,207,818, or 42.1 per cent of the total quantity and 38.7 per cent of the total value, were lined, with an average value of \$5.09 per dozen pairs; 1,651,688 dozens of pairs, valued at \$9,680,698, or 57.1 per cent of the total quantity and 60.4 per cent of the total value, were unlined, with an average value of \$5.86 per dozen pairs. It is interest-

ing to note the relative percentages of lined to unlined gloves and mittens. It has been customary to line the heavier and coarser working gloves and also some varieties of street gloves for winter wear, but it was not until about 1899 that silk linings for the finest grades of gloves came into general use; since then they have become decidedly popular, especially with the mocha glove. Gauntlets formed less than 1 per cent of the total quantity and value of gloves and mittens reported. Attention should also be called to the fact that the values are those obtained at the factory, and as the averages are computed from the totals of the entire number of establishments reporting, and as the varieties, styles, and grades of gloves and mittens are legion, the figures reported must not be taken as indicative of the price in any particular locality or of any specific grade of glove or mitten.

In addition to the above, the 7 establishments already referred to manufactured 32,971 dozen pairs of gloves

and mittens, valued at \$217,157, divided as follows: 25,327 dozen pairs of men's gloves and mittens, valued at \$171,105, of which 15,788 dozen pairs, valued at \$118,715, were unlined, and 9,539 dozen pairs, valued at \$52,390, were lined; 6,024 dozen pairs of unlined women's gloves, valued at \$39,771; also 1,620 dozen pairs of boys' and youths' gloves and mittens, valued at \$6,281, of which 1,215 dozen pairs, valued at \$4,894, were lined, and 405 dozen pairs, valued at \$1,387, were unlined. A combination of the number of pairs manufactured by glove establishments and those reported as a by-product of other leather industries shows that there were 35,142,852 pairs of gloves and mittens of all descriptions manufactured during the census year, valued at \$16,256,325. This was nearly equivalent to one pair for every two persons in the United States.

Table 10 is a summary of the quantity and value of gloves and mittens manufactured in each state and in each group of states for 1900.

TABLE 10.—QUANTITY AND VALUE OF GLOVES AND MITTENS, BY STATES AND TERRITORIES, ARRANGED GEOGRAPHICALLY: 1900.

STATES AND TERRITORIES.	TOTAL.		MEN'S.					
	Dozens of pairs.	Value.	Total.		Lined.		Unlined.	
			Dozens of pairs.	Value.	Dozens of pairs.	Value.	Dozens of pairs.	Value.
The United States.....	2,895,661	\$16,089,168	2,267,827	\$12,418,258	952,820	\$4,959,902	1,314,507	\$7,458,356
New England states.....	85,680	574,996	57,077	340,214	14,972	100,203	42,105	240,011
New Hampshire.....	49,085	281,186	44,385	256,636	10,800	70,200	33,585	180,436
Massachusetts.....	34,673	286,210	11,092	77,478	2,622	18,403	8,470	59,075
Other states <sup>1</sup> .....	1,922	7,600	1,600	6,100	1,550	5,600	50	500
Middle states.....	1,759,396	10,800,039	1,313,772	7,999,894	650,911	3,593,419	662,861	4,406,475
New York.....	1,721,891	10,507,789	1,280,595	7,731,868	643,440	3,547,825	637,155	4,184,043
New Jersey.....	18,755	171,065	16,697	152,931	1,004	9,564	15,693	143,867
Pennsylvania.....	9,223	38,500	8,223	35,625	4,910	22,050	3,313	13,575
Maryland.....	9,587	82,685	8,257	79,470	1,557	13,980	6,700	65,490
Southern states <sup>2</sup> .....	41,776	202,973	41,109	198,725	15,203	91,375	25,901	107,350
Central states.....	879,760	3,516,987	749,009	3,076,610	259,361	1,078,875	489,648	1,997,735
Ohio <sup>3</sup> .....	43,386	95,390	43,286	94,940	18,770	39,190	24,516	55,750
Michigan.....	15,225	54,725	15,175	54,275	550	4,600	14,625	49,675
Illinois.....	573,411	2,324,698	472,483	2,010,629	105,616	520,558	366,937	1,490,071
Wisconsin.....	95,235	493,375	89,255	461,922	58,790	253,287	30,465	208,635
Minnesota.....	2,873	20,628	2,873	20,628	2,088	12,490	785	8,138
Iowa.....	52,403	238,400	41,370	172,600	4,750	30,000	36,620	142,600
Other states <sup>4</sup> .....	97,167	289,771	84,567	261,616	68,867	218,750	15,700	42,866
Western states <sup>4</sup> .....	2,048	13,391	1,966	12,781	526	3,430	1,440	9,351
Pacific states.....	127,001	930,782	104,394	790,034	11,842	92,600	92,552	697,434
California.....	121,301	887,239	98,969	748,091	11,692	91,100	87,277	656,991
Other states <sup>5</sup> .....	5,700	43,543	5,425	41,943	150	1,500	5,275	40,443

<sup>1</sup> Includes establishments distributed as follows: Maine, 1; Rhode Island, 1; Connecticut, 1.

<sup>2</sup> Includes establishments distributed as follows: West Virginia, 1; Virginia, 3; Oklahoma, 1.

<sup>3</sup> Includes establishments distributed as follows: Indiana, 3; Missouri, 2.

<sup>4</sup> Includes establishments distributed as follows: Montana, 1; Nebraska, 1; Utah, 1; Colorado, 1.

<sup>5</sup> Includes establishments distributed as follows: Washington, 3; Oregon, 2.

TABLE 10.—QUANTITY AND VALUE OF GLOVES AND MITTENS, BY STATES AND TERRITORIES, ARRANGED GEOGRAPHICALLY: 1900—Continued.

STATES AND TERRITORIES.	WOMEN'S.									
	Total.		Lined.		Unlined.		Gauntlets.			
	Dozens of pairs.	Value.	Dozens of pairs.	Value.	Dozens of pairs.	Value.	Dozens of pairs.	Value.	Dozens of pairs.	Value.
The United States .....	323,826	\$2,461,760	78,783	\$538,862	221,039	\$1,772,746	24,004	\$150,652		
New England states .....	24,216	212,282	37	800	24,159	211,782	20	200		
New Hampshire .....	500	2,750			500	2,750				
Massachusetts .....	23,581	208,732			23,581	208,732				
Other states <sup>1</sup> .....	135	800	37	300	78	800	20	200		
Middle states .....	265,007	2,006,862	70,647	497,178	177,266	1,406,758	17,094	102,926		
New York .....	262,129	1,986,918	70,130	492,044	174,896	1,391,948	17,094	102,926		
New Jersey .....	2,058	18,134	508	5,134	1,550	13,000				
Pennsylvania .....										
Maryland .....	820	1,810			820	1,810				
Southern states <sup>2</sup> .....	363	3,025	180	1,365	155	1,240	28	420		
Central states .....	20,656	133,535	6,069	28,379	11,907	89,446	2,620	15,710		
Ohio .....										
Michigan .....	50	450	50	450						
Illinois .....	10,501	61,165	3,593	15,065	4,758	33,050	2,150	13,050		
Wisconsin .....	1,965	15,520	976	6,564	979	8,896	10	60		
Minnesota .....										
Iowa .....	8,040	56,000	1,450	6,300	6,230	47,500	360	2,200		
Other states <sup>3</sup> .....	100	400					100	400		
Western states <sup>4</sup> .....	72	588	40	240					32	348
Pacific states .....	13,512	105,468	1,810	10,900	7,492	68,520	4,210	31,048		
California .....	13,412	104,568	1,810	10,900	7,392	62,620	4,210	31,048		
Other states <sup>5</sup> .....	100	900			100	900				

STATES AND TERRITORIES.	BOYS' AND YOUTHS'.						MISSSES' AND CHILDREN'S.					
	Total.		Lined.		Unlined.		Total.		Lined.		Unlined.	
	Dozens of pairs.	Value.	Dozens of pairs.	Value.	Dozens of pairs.	Value.	Dozens of pairs.	Value.	Dozens of pairs.	Value.	Dozens of pairs.	Value.
The United States .....	247,465	\$926,059	148,493	\$548,556	98,972	\$377,503	57,043	\$233,091	39,878	\$160,998	17,170	\$72,033
New England states .....	4,300	22,200	1,050	6,200	3,250	16,000	87	300	41	150	43	150
New Hampshire .....	4,200	21,800	1,000	6,000	3,200	15,800						
Massachusetts .....												
Other states <sup>1</sup> .....	100	400	50	200	50	200	87	300	44	150	43	150
Middle states .....	128,088	575,650	87,629	374,900	40,459	200,750	52,529	217,633	36,982	152,125	15,547	65,508
New York .....	126,578	571,370	86,419	371,575	40,159	199,795	52,529	217,633	36,982	152,125	15,547	65,508
New Jersey .....												
Pennsylvania .....	1,000	2,875	900	2,475	100	400						
Maryland .....	510	1,405	310	850	200	555						
Southern states <sup>2</sup> .....	227	874	102	374	125	500	77	349	27	149	50	200
Central states .....	107,235	297,943	57,682	159,680	49,553	138,263	2,860	8,899	2,820	8,574	40	325
Ohio .....	100	450	100	450								
Michigan .....												
Illinois .....	87,572	244,029	40,515	113,550	47,057	130,479	2,855	8,875	2,815	8,550	40	325
Wisconsin .....	4,010	15,909	3,032	12,325	978	3,584	5	24	5	24		
Minnesota .....												
Iowa .....	3,053	9,800	2,035	6,600	1,018	3,200						
Other states <sup>3</sup> .....	12,500	27,755	12,000	26,755	500	1,000						
Western states <sup>4</sup> .....	10	22	10	22								
Pacific states .....	7,605	29,370	2,020	7,380	5,585	21,990	1,490	5,910			1,490	5,910
California .....	7,465	28,770	2,020	7,380	5,435	21,390	1,465	5,810			1,465	5,810
Other states <sup>5</sup> .....	150	600			150	600	25	100			25	100

<sup>1</sup> Includes establishments distributed as follows: Maine, 1; Rhode Island, 1; Connecticut, 1.

<sup>2</sup> Includes establishments distributed as follows: West Virginia, 1; Virginia, 3; Oklahoma, 1.

<sup>3</sup> Includes establishments distributed as follows: Indiana, 3; Missouri, 2.

<sup>4</sup> Includes establishments distributed as follows: Montana, 1; Nebraska, 1; Utah, 1; Colorado, 1.

<sup>5</sup> Includes establishments distributed as follows: Washington, 3; Oregon, 2.

Table 10 indicates that of the total quantity of gloves and mittens, 1,759,396 dozens of pairs, or 60.8 per cent, were manufactured in the Middle states, and 879,760 dozens of pairs, or 30.4 per cent, were manufactured in the Central states. The quantity reported in the Pacific states formed 4.4 per cent of the total quantity. The leading 5 states, ranked according to the quantity of gloves and mittens manufactured, with the number of dozens of pairs reported by each, are as follows: New

York, 1,721,831; Illinois, 573,411; California, 121,301; Wisconsin, 95,235; and Indiana, 92,300. The combined output of these states was 2,604,078 dozens of pairs, or 89.9 per cent of the total number manufactured in the United States.

Table 11 shows the totals for Fulton county in comparison with the state of New York, and also the totals for that state in comparison with the totals for the United States.

TABLE 11.—COMPARATIVE SUMMARY OF STATISTICS FOR FULTON COUNTY, N. Y., NEW YORK STATE, AND THE UNITED STATES: 1900.

	United States.	NEW YORK.		FULTON COUNTY.							
		Total.	Per cent of United States total.	Total.	Per cent of United States total.	Cities.				Outside of cities	Per cent of county total.
						Gloversville.	Per cent of county total.	Johnstown.	Per cent of county total.		
Number of establishments	381	243	63.8	166	43.6	101	60.9	49	29.5	16	9.6
Capital	\$9,004,427	\$6,219,647	69.1	\$5,517,850	61.3	\$3,600,883	66.3	\$1,686,604	30.6	\$170,863	3.1
Salaried officials, clerks, etc., number	637	328	51.5	250	39.2	171	68.4	72	28.8	7	2.8
Salaries	\$544,170	\$294,574	54.1	\$244,522	44.9	\$177,551	72.6	\$64,114	26.2	\$2,857	1.2
Wage-earners, average number	14,180	9,907	69.9	7,931	55.9	5,183	65.4	2,316	29.2	432	5.4
Total wages	\$4,151,126	\$2,728,702	65.6	\$2,381,160	57.4	\$1,695,085	71.2	\$580,146	24.4	\$105,979	4.4
Men, 16 years and over	4,364	2,843	65.1	2,295	52.6	1,497	65.2	670	29.2	128	5.6
Wages	\$2,014,184	\$1,299,595	64.5	\$1,158,193	57.5	\$822,201	71.0	\$287,875	24.9	\$48,117	4.1
Women, 16 years and over	9,542	7,001	73.4	5,601	58.7	3,674	65.6	1,625	29.0	302	5.4
Wages	\$2,101,044	\$1,416,156	67.4	\$1,214,998	57.8	\$868,422	71.5	\$288,997	23.8	\$57,574	4.7
Children, under 16 years	274	63	23.0	35	12.8	12	84.3	21	60.0	2	5.7
Wages	\$35,948	\$8,951	24.9	\$7,074	22.2	\$4,412	55.3	\$3,274	41.1	\$288	3.6
Miscellaneous expenses	\$562,870	\$341,486	60.7	\$287,446	42.2	\$153,275	64.6	\$60,172	25.3	\$23,999	10.1
Cost of materials used	\$9,382,102	\$6,328,036	67.4	\$5,689,613	60.6	\$3,900,897	68.5	\$1,506,198	26.5	\$282,523	5.0
Products:											
Total value	\$16,721,234	\$10,854,221	64.9	\$9,548,603	57.1	\$6,487,227	67.9	\$2,576,048	27.0	\$485,328	5.1
Gloves and mittens:											
Dozens of pairs	2,895,661	1,721,831	59.5	1,484,579	51.8	925,440	62.3	398,657	26.9	160,482	10.8
Value	\$16,039,168	\$10,507,789	65.5	\$9,379,560	58.5	\$6,350,809	67.7	\$2,554,717	27.2	\$474,034	5.1
All other products, value	\$682,066	\$346,432	50.8	\$169,043	24.8	\$136,418	80.7	\$21,331	12.6	\$11,294	6.7

Table 11 shows the extent to which the industry is local and peculiar to the state of New York, and especially to Fulton county. Of the total number of establishments in the leather glove and mitten industry, New York reported 243, or 63.8 per cent, with a capital of \$6,219,647, or 69.1 per cent of the total capital. They employed 9,907 wage-earners, or 69.9 per cent of the total number. The cost of materials was \$6,328,036, or 67.4 per cent, and the value of products \$10,854,221, or 64.9 per cent, of the total for the United States. Of the total quantity of gloves and mittens reported, 1,721,831 dozens of pairs, or 59.5 per cent, were manufactured in New York. Table 11 also shows the degree to which the industry was centralized in Fulton county, and in Gloversville and Johnstown. Fulton county returned 166 establishments, or 43.6 per cent of the total number reported. Their capital was \$5,517,850, or 61.3 per cent of the total, and the number of wage-earners constituted 55.9 per cent of the total number reported. This relatively large per cent of the total capital and the number of wage-earners reported for Fulton county as compared with the per cent of the total number of establishments, in a measure indicates that the larger glove and mitten factories are located in Fulton county. The value of products was \$9,548,603, or 57.1 per cent of the total, and the quantity of gloves and mittens was 1,484,579 dozens

of pairs, or 51.3 per cent of the total, valued at \$9,379,560. Table 11 further indicates that over 60 per cent of the glove and mitten establishments of Fulton county were located in Gloversville. This localization of the industry is not due to economic conditions, such as low price of coal or to advantageous freight rates, but it may be attributed to the nature of the industry itself, and to the circumstances connected with its inception in the United States. As indicated in the historical sketch which follows, gloves and mittens were first manufactured in the United States in what is now Fulton county. As the industry became of commercial importance the number of families that depended upon it for a livelihood increased, until nearly every man, woman, and child in the surrounding country became proficient in the making of some special part of the glove or mitten. Foreign cutters coming to this country naturally settled in Fulton county. In this way the industry became localized, and contemporaneously came the development of the tanning industry and the establishment of factories engaged in making glove and mitten dies.

Nearly all the factories are owned or controlled by local men, most of whom have at some time been employed in other factories in the country, and who by thrift and industry have risen from the cutter's table

to the management or ownership of a factory. Naturally everything tends to make the industry local; the expert and skilled laborers in most cases own their own homes; the manufacturer is able to depend upon the farmers' families for a great deal of work, and is himself interested in the development of local enterprises.

There are, however, large numbers of leather gloves and mittens manufactured, not only outside of Fulton county, but also outside of New York. They were made in the early part of the century, and are still made, at

Littleton and Plymouth, N. H. In 1900, as shown by Table 3, they were manufactured in 27 states, but, outside of Fulton county, N. Y., the product was mostly of the coarser and cheaper grades, as it is impossible to induce the expert labor to emigrate to another section of the country.

Table 12 shows the statistics of the leather glove and mitten industry for cities of over 20,000 population for 1900.

TABLE 12.—STATISTICS OF CITIES OF OVER 20,000 POPULATION: 1900.

CITIES.	Rank by value of products.	Number of establishments.	Capital.	SALARIED OFFICIALS, CLERKS, ETC.		AVERAGE NUMBER OF WAGE-EARNERS AND TOTAL WAGES.			
				Number.	Salaries.	Total.		Men, 16 years and over.	
						Average number.	Wages.	Average number.	Wages.
Total .....		124	\$1,780,328	238	\$195,411	3,317	\$1,250,906	1,195	\$609,850
Chicago, Ill. ....	1	21	615,489	79	75,407	1,532	598,982	656	313,528
San Francisco, Cal. ....	2	15	297,650	50	40,392	400	158,304	129	72,184
New York, N. Y. ....	3	34	245,410	27	24,780	483	191,851	104	74,021
Milwaukee, Wis. ....	4	6	85,423	3	2,209	124	43,423	58	23,649
Boston, Mass. ....	5	5	71,000	4	1,500	138	63,126	47	84,163
Buffalo, N. Y. ....	6	4	63,665	19	12,898	54	18,844	25	10,820
Syracuse, N. Y. ....	7	6	19,203	3	1,275	31	9,179	11	3,889
Binghamton, N. Y. ....	8	3	12,922	.....	.....	20	6,637	10	3,351
Minneapolis, Minn. ....	9	4	3,855	.....	.....	10	2,210	1	570
All other cities <sup>1</sup> .....		27	865,756	53	36,860	525	158,404	159	73,175

CITIES.	AVERAGE NUMBER OF WAGE-EARNERS AND TOTAL WAGES.				Miscellaneous expenses.	Cost of materials used.	PRODUCTS.			
	Women, 16 years and over.		Children, under 16 years.				Total value.	Gloves and mittens.		All other products, value.
	Average number.	Wages.	Average number.	Wages.				Dozens of pairs.	Value.	
Total .....	1,997	\$624,193	125	\$17,423	\$163,213	\$2,826,206	\$4,761,203	942,615	\$4,553,232	\$207,971
Chicago, Ill. ....	795	274,430	81	11,024	59,518	1,074,569	2,209,529	554,360	2,207,279	2,250
San Francisco, Cal. ....	262	84,820	9	1,300	35,865	319,226	604,181	88,428	634,371	29,760
New York, N. Y. ....	378	117,655	1	175	38,189	235,998	586,061	46,595	417,143	168,918
Milwaukee, Wis. ....	65	19,006	6	774	3,062	178,774	252,182	60,600	251,532	650
Boston, Mass. ....	91	28,963	.....	.....	5,142	101,390	230,202	25,558	230,262	.....
Buffalo, N. Y. ....	23	7,934	1	90	2,336	55,126	106,000	17,000	106,000	.....
Syracuse, N. Y. ....	20	5,290	.....	.....	3,340	32,958	56,437	14,953	55,957	480
Binghamton, N. Y. ....	10	3,286	.....	.....	253	24,046	36,263	11,615	36,263	.....
Minneapolis, Minn. ....	8	1,500	1	80	768	3,937	9,628	1,822	9,373	250
All other cities <sup>1</sup> .....	340	81,249	26	3,980	14,740	300,182	610,710	121,029	605,047	5,668

<sup>1</sup> Includes establishments distributed as follows: Oakland, Cal., 1; San Jose, Cal., 2; Denver, Colo., 1; Rockford, Ill., 1; Fort Wayne, Ind., 2; Des Moines, Iowa, 1; Salem, Mass., 1; Detroit, Mich., 2; Kalamazoo, Mich., 1; St. Louis, Mo., 1; Omaha, Nebr., 1; Jersey City, N. J., 2; West Hoboken, N. J., 1; Auburn, N. Y., 1; Elmira, N. Y., 1; Kingston, N. Y., 2; Rochester, N. Y., 2; Cincinnati, Ohio, 1; Portland, Oreg., 2; Seattle, Wash., 1.

Table 12 indicates the extent to which the industry was carried on in large cities in 1900. The 124 establishments in these cities constituted 57.7 per cent of all the establishments outside of Fulton county. The capital invested was \$1,780,328, or 51.1 per cent; the number of wage-earners 3,317, or 53.1 per cent; and the value of products \$4,761,203, or 66.4 per cent. The number of gloves and mittens manufactured was 942,615 dozens, valued at \$4,553,232, or 66.8 per cent. Chicago led the cities of over 20,000 population in value of products as well as in the number of dozen pairs of gloves and mittens manufactured, although New York city led in number of establishments. Chicago reported 554,360 dozen pairs of gloves and mittens, valued at \$2,207,279, or 58.8 per cent of the total quantity and 48.5 per cent

of the total value for the cities. San Francisco followed Chicago, both in quantity and value of products, and New York city ranked third. Milwaukee was next to New York in value of products, but exceeded it in the number of dozen pairs. This is due to the fact that a large amount was reported as the value of custom work and repairing in New York. Boston ranked fifth in both value of products and number of dozens. The totals of the remaining cities formed a comparatively small per cent of the totals for the cities. This rapid growth of the industry is due to improvements that have been made during the past twenty years. As already stated, the first mittens manufactured in the United States were used for the protection of the hands during the harvest. Later on, coarse gloves were made

for laborers who, from the nature of their employment, were exposed to the inclemency of the weather. Gradually the manufacture became diversified and manufacturers began to improve upon the quality and to turn their attention to gloves for street wear. It was subsequent to 1880, however, that the attempt was made to manufacture fine gloves. As the quality improved the demand increased, resulting in the establishment of new factories. At the present time the development of the industry in the United States has reached a point where the manufacturer is able to reproduce the best points of all the foreign makes and to combine them with his own. In men's fine gloves he can produce an article that is equal if not superior to any foreign manufacture.

The American glove is more durable, is better made, and fits more satisfactorily. This great advance has been accomplished mainly by the improved facilities for tanning, coloring, and finishing, and the expert knowledge of the glove makers and leather dressers, who have come to this country in great numbers from all of the glove-producing countries of Europe.

Table 13 shows the value of gloves of kid and other leather imported each year, 1890 to 1900, inclusive, and from what countries imported, according to the reports of the bureau of statistics of the Treasury Department.

Table 13 indicates that the importations of gloves and mittens have not increased to any great extent during the decade; in fact, during 1898 and 1899, the value of

TABLE 13.—VALUE OF GLOVES, OF KID OR OTHER LEATHER, IMPORTED FROM 1890 TO 1900, INCLUSIVE.

COUNTRIES.	1900	1899	1898	1897	1896	1895	1894	1893	1892	1891	1890
Total .....	\$6,107,765	\$5,398,125	\$5,384,168	\$6,486,813	\$6,763,082	\$6,463,872	\$4,412,597	\$6,925,876	\$5,830,380	\$5,627,964	\$5,501,336
EUROPE.											
Austria-Hungary .....	124,616	198,921	298,421	600,763	866,421	111,264	169,977	239,868	97,572	161,634	170,581
Belgium .....	275,340	264,186	286,287	372,096	410,608	458,654	267,142	357,025	203,582	400,924	361,791
Denmark .....	1,891	1,626	24	466	15	488	16	18	15	82	220
France .....	2,260,697	2,064,608	1,625,276	2,271,609	2,499,644	2,621,224	1,702,981	3,201,407	2,806,821	2,465,442	2,848,376
Germany .....	2,785,103	2,347,827	2,683,924	2,610,175	2,894,465	2,768,978	1,826,628	2,665,011	2,217,809	2,117,012	2,077,917
Gibraltar .....											
Italy .....	223,241	150,274	170,120	211,106	187,058	217,482	150,068	176,171	181,472	252,681	285,870
Netherlands .....	98		4	66	2,478	102	7,667	30,898	68,898	10	66
Russia—Baltic and White seas .....							66				
Spain .....						38					13
Sweden and Norway .....	14,336	7,888	9,048	6,890	6,218	3,804	1,468	5,168	1,679	1,788	734
Switzerland .....	7,990	1,454	1,622	6,492	1,017	6			12	3,157	187
Turkey in Europe .....											9
United Kingdom .....	413,622	860,750	809,086	407,416	390,948	281,256	286,612	344,694	262,818	222,149	254,713
NORTH AMERICA.											
Bermuda .....								6			
Dominion of Canada:											
Nova Scotia, New Brunswick, etc .....	245	143	76	81	19				2	2,908	122
Quebec, Ontario, Manitoba, etc .....	125	82	802	94	880	419	57	151	70	288	488
British Columbia .....	850	108	19	3	11	48	6	10	6	2	135
Newfoundland and Labrador .....			1			1					
Mexico .....	106	11	7	7	93	53	12	14	123	27	115
West Indies:											
British .....		1								8	
Cuba .....	5										
Danish .....		256									
French .....					3,156						
SOUTH AMERICA.											
Argentina .....			6								
ASIA.											
Chinese Empire .....			29								
Japan .....			9		7				1		
Turkey in Asia .....					19		3				
OCEANIA.											
British Australasia .....			7								

imports of gloves was less than the amount reported for 1890, 1891, or 1892. The increase from 1890 to 1900 is insignificant compared with the increase in the output of domestic factories. France and Germany have always been the largest exporters of gloves and mittens to the United States. In 1900 the value of the imports from these two countries amounted to \$5,045,800, or 82.6 per cent of the total. The United Kingdom followed, with \$413,622; Belgium was fourth, with \$275,340; and Italy fifth, with \$223,241. The imports from the remaining countries, with the exception of those from Austria-Hungary, amounting to \$124,616,

were insignificant. The imports were almost exclusively of the finer grade of gloves and, presumably, the greater per cent represented ladies' fine gloves.

The manufacture of ladies' fine gloves has not yet been attempted to any considerable extent in the United States. This is due to the fact that thus far glove manufacturers here have been unable to secure the finest grade of skins; the foreign manufacturers seem to have the monopoly of these, only the inferior grades being exported to this country. In the course of time, however, through competition and an increased local demand, it may be expected that the manufacturer in

the United States will be able to obtain as good a grade of skins as his European rival. Also, owing to the low wages paid in foreign countries, the manufacturer in this country can not yet compete with the foreign producer in these finer grades. Moreover, the character of the labor is another factor favoring the foreign manufacturer. The making of the best gloves not only requires expert skill and knowledge, but also extreme patience, as the finest work must be slowly executed. The economic conditions are so different in foreign countries, wages are so low, and employment so difficult to secure, that the glove makers, in order to retain their employment, are obliged to do exceedingly careful and painstaking work, which means that they are able to accomplish only a comparatively small amount of work a day. In the United States, on the other hand, the glove maker is accustomed to better living, better clothes, and more amusement than his European coworker, and, of necessity, he must receive higher wages. Accordingly he prefers to make the cheaper grade of gloves, as he can cut and make more during the day than if he were employed on the finer grades. All of these factors combine to seriously handicap the manufacturer in the United States. It is probable, however, that the ingenuity of inventors will bring to perfection labor-saving machines, which will result in

producing artistic work surpassing the best possible handwork. At any rate, the glove manufacturers of the United States will not be satisfied until they furnish every pair of gloves and mittens worn by the people of this country.

From the inception of the United States Patent Office to January 1, 1902, in connection with the manufacture of gloves and mittens there have been issued 340 patents, classified as follows:

Glove fastenings.....	54
Glove-sewing machines.....	46
Gloves.....	179
Mittens.....	61
Total.....	340

Probably the most notable of the glove-making machines is the multiple-needle machine, for stitching the back of gloves, which sews two, three, four, and even six rows at the same time. The automatic trimmer, which is attached to the head or needle bar of the machine, was introduced in 1893, and has greatly facilitated the making of outseam gloves, and it also trims the leather much better than do shears. Among the other machines which have given satisfaction are the ornamental stitch, the zigzag stitch, and the overstitch, the latter being used to close the edges of the seam from the outside.

#### HISTORICAL AND DESCRIPTIVE.

At various periods and in different countries the glove has been the theme for many fanciful and poetic theories. It has been a customary offering on occasions of joy and sorrow; the pledge of friendship, of love, and of safety; the symbol of hatred and defiance, of humiliation and honor; the token of loyalty, and the tenure by which estates have been granted and held.

The origin of the glove is unknown, and its material history is not aided to any extent by the history of the word itself. It is evident, however, that the farther back the word can be traced, the longer must gloves have been in existence; and while the etymologists invariably reach different conclusions regarding the origin of the word, their careful researches have demonstrated that the antiquity of the glove is certainly remote. From all evidence that is obtainable, it probably constituted a part of man's dress from time immemorial. If recent discoveries in the geological world are to be credited, it formed a part of the costume of the prehistoric cave dwellers. It is supposed that the gloves of the cave dwellers were made from roughly dressed skins and sewed with needles made of bone, and were not of ordinary size, but reached to the elbows, thus anticipating the multi-button glove of the Victorian era.<sup>1</sup> They were known to the Greeks and also

to the Persians and Romans. Among the Greeks they were chiefly used by the laborers as a protection for the hands in gathering harvests. Among the Persians and Romans they were also worn as ornaments, chiefly by the higher orders, particularly the clergy and military.

It is more than likely that they were always worn by the northern people of Europe for protection from the inclemency of the weather, as the early history and the literature of the Anglo-Saxon race contain references to their use. But with the English, as with other nations of Europe during the dark ages, their use was confined to and formed a part of the regalia of kings, princes, and other attendants on royal occasions. That great importance was paid to their quality even during this period may be inferred from an old proverb, "For a glove to be good, three nations must contribute to it: Spain to dress the leather, France to cut it, and England to sew it."<sup>2</sup>

During the Eighth and Ninth centuries it was an article of much importance, but was largely confined to the higher orders, the royalty, military, and clergy. Charlemagne, about the year 790, granted the abbot and monks of Sithin the unlimited right of hunting, so that they could make their gloves and girdles and

<sup>1</sup>Gloves, Their Annals and Associations, by S. William Beck, page 13.

<sup>2</sup>The History of the Glove Trade by William Hull, jr., page 11.

covers for their books from the skins of the deer they might kill. For centuries the glove continued to be an essential adjunct to the regalia of royalty. It was worn at the coronation of kings and at their funeral ceremonies. The church, in its efforts to teach principles and truth by sight, endowed gloves with hidden significance, and in this way they played an important part in ecclesiastical rites and ceremonies. They were a part of the dress worn at the consecration of bishops, and were placed on their hands at burial, and in the Fourteenth century the inferior clergy and attendants also were allowed to wear them at religious ceremonies. Their use and elegance, however, became so extravagant that the church was compelled to pass sumptuary restrictions regarding them. It is stated that they were not generally worn by women until about the period of the Reformation.

During the middle ages gloves were in general use among those vested with authority, possessing special significance when worn by justices. Another peculiar and interesting use of gloves, which to some extent gives proof of their antiquity, was in hawking. This sport had its origin about the Fourth century, and it may safely be inferred that the wearing of gloves was coeval with it, since some covering would seem to be necessary to protect the hands from the sharp talons of the hawk. They were also used in archery.

The Germans were probably the first people to adopt the custom of wearing gloves to any considerable extent, and their manufacture was introduced into Germany by French refugees from Grenoble. The gloves worn by ladies were of fine material and workmanship, and were usually adorned on the back with a number of stones or jewels. Those worn by the men had a thumb stall, but left the fingers free as do mittens; in workmanship and material they were not as fine as the gloves worn by ladies.

In England they were introduced as ornaments by the Normans after the conquest, and were then made quite long, reaching to the elbows, and ornamented at the top with embroidery. Their use was at that time confined to men, but in the Fourteenth century they were adopted to some extent by ladies of rank. At the time of John they were not a part of the dress of the commonalty, and were worn only by the higher classes. The cheverill gloves were in common use in the Sixteenth century. "Cheverill" is derived from the French *chèvre*, or goat. The skin of the goat, on account of its pliability, made better gloves than the skins which had been used before that time. In 1550 or thereabouts the use of gloves was common to all classes and conditions of men. Those worn by the higher classes during the Sixteenth century have been well described, as follows:

The magnificent embroidery on the cuff of the glove can hardly be done justice to in description. Every flower, the columbine and pink in particular, the butterflies, and even a little goldfinch in the middle of the cuff, are rendered in natural colors with an

exquisite fidelity, and with such skill as to make them veritable needle paintings, in which, too, the needle well holds its own against the brush. The work is done in fine silk and the shading is eloquent of the skill of early dyers, for the range of colors admitting of such indefinable gradations must have been very extensive. \* \* \* The glove is nearly 13 inches in total length. The whole cuff,  $4\frac{1}{2}$  inches in depth, is lined with crimson silk, and the side bands of cloth-of-gold ribbon, edged with gold fringe, were probably attached to the glove to confine the wide sleeves, and allow the ornamentation of the gauntlets unhindered admiration.<sup>1</sup>

Gloves for ordinary everyday wear were made of substantial leather and were not altogether destitute of ornament. More elaborate gloves were made of tanned doeskin, with a white kid lining, and with red silk turned up over the edge in the cuff. During the Stuart period in England, according to the dictates of fashion, the sleeves gradually became shorter, and as the sleeve receded the glove advanced in length. The varieties worn by the gay cavaliers were usually made of white leather and overloaded with ornaments. Lace was freely used at this period, and a glove which became very fashionable during the first half of the Eighteenth century, was made with broad black lace ruffles and heavy fringe. From this time on it receded in length and became more and more simple in construction and more and more immaculate in fit.

The industry owes much of its importance to a society of handcraftsmen known as "glovers." They were organized in France as early as 1190, and in Scotland the glovers of Perth were incorporated in 1165. This society not only promoted the growth of the trade, but contributed largely to improvements in the construction and material of the glove. It took upon itself the task of insuring honesty in workmanship and of aiding in the regulation of the trade. As early as the Fifteenth century these "glovers" secured the enactment of laws favorable to the glove trade in their respective countries. In the early part of the Seventeenth century a company of glovers was organized in London, and from that time this city has been a center of the glove industry. In Ireland the manufacture of gloves was formerly very extensive, Limerick, Cork, and Dublin having thousands of people employed in this occupation. The "Limerick" glove was of most exquisite texture and was manufactured principally from the skin of the very young calf, lamb, or kid. So delicate was the material that it is said that one of these gloves could be placed within a walnut shell. The industry, after enjoying a very prosperous era, declined and is now of no importance. Gloves have been manufactured in France for many centuries, Paris, Grenoble, Nicot, and Montpellier each having an extensive trade. Following the example of England, protection was afforded to the home manufacture by the enactment of favorable laws. The industry in France has always

<sup>1</sup> Gloves, Their Annals and Associations, by S. William Beck, page 121.

been very prosperous, and that country is to-day among the foremost of nations in the production of gloves. This success has resulted largely, perhaps, from persistent efforts to secure excellence in material and workmanship.

The manufacture of gloves and mittens in the United States dates from about the year 1760, when Sir William Johnson, chief agent of King George with the North American Indians, brought over from Scotland many families as settlers on his grants. Several families came from Perthshire and settled in the eastern part of what is now Fulton county, N. Y., calling the town Perth. Many of these settlers had been glove makers and members of the glove guild in Scotland, and brought with them glove patterns and the proper needles and threads for glove making. The first gloves and mittens were used chiefly by the farmers and woodchoppers as a protection for the hands while engaged in the rough and laborious work incident to their occupation. The entire output of the industry for many years was probably disposed of in the immediate vicinity. It was not until about 1809 that gloves were manufactured for more distant markets, and it is stated that Talmadge Edwards, a storekeeper of Johnstown, N. Y., was the pioneer in the manufacture of gloves in commercial quantities. Mr. Edwards took a bag of them on horseback to Albany when making a trip for the purpose of renewing his stock of merchandise. Finding a good demand for these articles, he had leather dressed in quantities, and secured farmers' girls to come to his factory to cut gloves, which were then sent out to farmers' wives to be sewed. In this manner the glove and mitten industry of the United States was established.<sup>1</sup> During the incipient stages of this industry the goods produced were really mittens, and not gloves. A glove, as distinguished from a mitten, is a covering for the hand in which each finger is separately inclosed, the part above the hand varying in length according to fashion or convenience. About the year 1810 a glove manufacturer, who had been associated with Mr. Edwards, sold a part of his output by the dozen, and this is said to be the first instance in which they were sold by the quantity. The local demand continued to increase, and each year some enterprising manufacturer would venture to make an extended trip to dispose of his product. In 1825 Elisha Johnson, of Gloversville, N. Y., went to Boston with a load of gloves in a lumber wagon, making the journey in six weeks. This is said to have been the longest trip that had been made in connection with the industry up to that time, and the results were highly gratifying to those interested.<sup>2</sup>

The early process of glove making differed from modern methods. In the first place, a skin was put on

a table, and a pattern cut from pasteboard or a shingle and having spaces between the fingers wide enough to admit a flat pencil, was placed on the skin. The gloves were then marked out or traced with sharp pointed pieces of lead, commonly called "plummetts" (which were often made by pouring melted lead into a crack in the kitchen floor), and then cut out with shears. They were then matched with fourchettes and thumb pieces, and tied with a buckskin string in lots of a dozen pairs, with thread, needles, and silk, and a handful of scraps for weltings. The cutting was usually done by men, the sewing or making by women. In the early days the manufacturer did not have his gloves and mittens sewn in his factory, but gave them out to the country people, who came to him from miles around and took the gloves home with them in bags. A small skein of silk was put in with the better class of goods, to be used in working a vine on the back of the glove as its only ornament. The maker threaded a square pointed needle with heavy linen thread, double tied a knot in the end, waxed it, placed a strip of buckskin between the edges as a welt, and sewed up the seams. The lighter gloves had no welt, but were backstitched, and it was possible for an expert to make a neat, close-fitting glove. The welted gloves, if well made, gave very satisfactory service. As each glove was completed it was placed between folds of pasteboard and the maker sat on it while engaged in sewing the next glove. This "patent pressing process," as it was jocularly called, partially served the purpose of the modern "laying-off" table, as it straightened out the glove and had a tendency to make it soft and flexible.

After a time dies of clumsy construction and wooden mauls were introduced to take the place of shears. These became of great service, and their construction has been greatly simplified. They are now in constant use. At first two sets were used—one for cutting the leather to size and one for cutting to shape. These were soon abandoned, however, as unprofitable, their use necessitating the waste of large quantities of leather. For a time a right and left die were used, but it was soon found that the same results could be obtained with one die by turning the skin.

The introduction and development of the sewing machine has been an important factor in the development of the glove industry. It was first used in 1852. The first machines were large, crude, cumbersome, and difficult to operate, both needle bar and shuttle being driven by cogwheels. They were used only in stitching the thin binding on the tops of gloves and mittens. In 1854 a machine was introduced to stitch the laps and bindings. In this branch of the business the sewing machine entirely superseded hand work. In 1856 a machine was introduced to make some grades of light goods throughout.

Although the wax thread was used in 1858, its use was not general until after the Civil War. Thousands

<sup>1</sup> M. S. Northrup, ex-secretary American Glove Association.

<sup>2</sup> History of Fulton County, N. Y., by Washington Frothingham, page 157.

of sewing machines are now in use in this industry, not only of American, but also of French and German make. A number of machines are used for special purposes, as for silking and palming, and making the prick and pique and other seams.

The industry received a decided stimulus during the Civil War, as large quantities of gloves, especially gauntlets, were required for military service. Both gloves and skins shared in the general rise of prices which took place during this period. Steam power was introduced for running sewing machines in 1875, and since that time the direct factory output has greatly increased. The variety of material used in glove making is limited, the most common material being leather. Many varieties of skins are now used which for a long time were thought valueless. In the infancy of the industry in the United States, deer were abundant and their skins were the chief material used. The deerskin glove, although necessarily crude, gave excellent protection to the hands. As the demands of the trade grew, the home product of deerskins became insufficient, and sheepskins were pressed into use. This leather, however, was not very suitable for glove making, being weak and pulpy, and as no process of tanning was as yet perfected to render the leather durable in all weather, deerskins began to be imported. At the present time, however, as indicated by Table 8, sheep and lamb skins, both domestic and imported, are more extensively used in the manufacture of gloves and mittens than any other skin, as, by means of the various processes of tanning and coloring, these skins can be made into different grades and qualities of leather. The domestic skins come principally from Chicago and St. Louis. The imported skins are received under the name of "fleshers," a term signifying that the skins have been split, and the flesh side, after the removal of the grain, is used for bindings.<sup>1</sup> Modern methods in tanning have brought into use for glove making many new kinds of leather. Buckskin in its various forms is the best material for heavy gloves, but this variety is also made of cowhide and horsehide. The finer gloves for street wear are made from the skins of the goat, kid, lamb, antelope, calf, colt, Arabian sheep, South American kid, chamois, and reindeer. Most of these skins are imported in the raw state and dressed in American tanneries. Deerskins are supplied by Mexico, Central and South America, and by all parts of the United States in which they can be found. The celebrated "Jacks," a variety of the Para deerskins, come from the country around the mouth of the Amazon.

The skin of the Mocha, a variety of sheep, native of Arabia, Abyssinia, and the region around the headwaters of the Nile, is at present much used in the manufacture of fine gloves, and it is interesting to note the

origin of this branch of the glove industry. In 1868 one of the large glove manufacturers of Johnstown, N. Y., engaged in the manufacture of castor gloves, mostly from vat-liquor-dressed antelope skins. After the extermination of the buffalo, the supply of antelope skins was also greatly diminished, and experiments were made with various other light skins in order to find a suitable substitute. In 1877 two bales of skins of unknown variety were found with a shipment of Mocha coffee shipped to Boston, Mass., from Hodeidah, a port on the Arabian side of the Red Sea. They appeared to be haired sheepskins and were sent to be dressed, and as they dressed out well, a Boston house was induced to import more. Two years later, a New York importer sent an agent to Aden, in southern Arabia, to collect these sheep. The name Mocha came from the fact that the first bales came with Mocha coffee, and as this name seemed as appropriate as any, it has continued to be used.

The skins of which gloves are made are put through an exhaustive variety of processes. In the early days of the industry the manufacturers dressed their own leather, and many of the larger manufacturers still continue this practice, as it allows them to produce the grade and quality desired. In general, however, the tanning and dressing of skins is a distinct and separate industry.

During the early period of the industry the Indian process of tanning was exclusively employed. The distinguishing feature of this process was the use of the brain of the deer, which insured a durable as well as a soft and pliable leather. Somewhat later an attempt was made to substitute the brain of the hog, but the results were not entirely satisfactory, as it lacked certain essential properties possessed by the deer brain. At the present time the sheep and lamb skins used are received in what is termed "salt pickle," which is applied to the skin after the removal of the hair. As soon as received they are thoroughly washed, to remove the salt and to extract the pickle, after which they remain in an alum bath for nearly twelve hours. They are then staked, a process which involves the stretching or the drawing of the skin over a thin round-face iron attached to a piece of wood about the height of a man's knee. This is done partly by the hand and partly by the knee of the operator. The process is generally termed "knee staking," in contradistinction to a similar process known as "arm staking," to which the leather is subjected after reaching the glove factory. The skins are then dried in the open air or in artificial dry rooms, the temperature of which is regulated according to the nature of the skin, and the time required to dry it, after which they are again carefully washed, staked, and dried.

As a rule, the skins are next sorted according to size and quality, and are then submerged in an egg bath

<sup>1</sup> History of Fulton County, page 165.

consisting of a preparation of 10 parts of salt with 90 parts of egg yolk. By revolving the skins in a drum the egg yolk is thoroughly absorbed, and the leather becomes soft and pliable. They are next colored, by placing them flesh side down on zinc or lead tables, and applying the color with a brush. After the color is set and the skins are thoroughly dried they are dampened, rolled up in bundles, flesh side out, and stored away to season for a varying length of time.<sup>1</sup> The milling of oil-dressed skins involves a somewhat different process. After the skins are soaked in vats from three days for water frizzling to four weeks for lime frizzling, they are scraped by the beam workers to remove the grain, then dried into parchment, soaked in water, and milled in oil. They are again placed on the beam and scoured of oil and natural grease through the agency of soda ash, being repeatedly dried during these various processes, after which they are subjected to the braking machine, and then staked with a blunt tool, which renders them pliable. They are next put on the "buck-tail," or emery wheel, and cut down for a face, and then returned to the water for a clean scouring, wrung out and dried, spread upon the grass for the night dew to bleach, and again staked, finished, and smoked or colored, after which they are ready for the glove maker.<sup>2</sup>

As soon as the skin is received by the glove maker it is immediately staked by the hand stake, which consists of two upright and two horizontal bars, one of the latter being movable to admit the skin, which is held in position by a wedge inserted at the end of the bar. The stretching is then done by pressing over the skin so placed, a blunt iron, like a spade, having round corners and a handle which fits under the arm. The oil-dressed skins are then split even in a belt-splitting machine, and the kid skins are shaved either by "moon-ing" or by placing them on a marble slab with the flesh side up, and shaving the surface with a broad chisel or so-called dowling knife. By this process the skin is reduced to the desired thinness, and the inequalities of the flesh side are removed. "Mooning" is done with a round steel shaped like a plate and having the center cut out and a handle placed across the opening; the skin is then hung on an elastic pole and the moon-shaped knife is drawn over the flesh until the desired result is secured. The skin is then ready to go to the cutters, of which there are two classes, the block and the table cutter, each class, as a rule, having separate rooms. The block cutters, most of whom are of American parentage, are engaged in cutting the cheaper and coarser grade of gloves.

The skin is placed on a block made of hard-wood planks placed on end and bolted together, and the die of the required shape and style is placed carefully on the skin and given a blow with the maul. In the table cutters' room tables instead of blocks are used. The

skin is dampened, then stretched over the end of the table until it will stretch no more, and then cut off the length of the glove; next stretched to width and cut off, after which the fingers and opening are put in with the die and press.

A table-cut glove, inasmuch as it is more elastic and will conform to the shape of the hands, will give a much better fit than a glove cut on the block.<sup>3</sup> In the cheaper and heavier grades, however, a perfect fit is not absolutely essential. The table cutters in the glove and mitten factories of the United States are of many nationalities, including French, English, German, Swedish, and, in fact, they include representatives of every country in which gloves are manufactured. The foreign cutters are, so to speak, born in the glove industry, as for generations their families and relatives have obtained a livelihood by cutting gloves. To be a good table cutter requires an apprenticeship of at least three years, and even after this period not more than one out of three can be considered an excellent workman. The fingers of the cutter must possess the habit and nimbleness which can only be acquired by long practice. He must make a careful examination of each skin and so shape it that he may get the greatest number of pairs of gloves and yet avoid the flaws. In the cutting of Mocha leather, young men who have served apprenticeship in this country have proven to be equal to the best cutters from Europe. From the cutters' room the leather, which has assumed the shape of the glove, is sent to the "silkers," who embroider the back, and then to the "makers." Some make the gloves, that is, they sew the fingers and put the thumbs in; others, called "welters," are engaged in welting or hemming the glove around the edge at the wrist; still others, called "pointers," work the ornamental lines on the back.

After the glove has reached this stage of completion, the fourchettes and the thumb are put in place; the back is then embroidered and the end of the silk is pulled out and tied, and the glove closed by beginning either at the upper end of the long seam and sewing toward the little finger, or at the end of the index finger and finishing with the long seam. The glove is now ready to be bound, hemmed, or banded, the buttonhole made, or the lacings or fastener adjusted. Each maker has his particular part of the work to do, and before a glove is finished it must pass through a number of hands. After the gloves are made they are drawn over metal hands heated by steam, a "laying-off" process, as it is termed, and by means of which the glove is shaped and given its finished appearance. The gloves are now ready for inspection, and are assorted according to grades and sizes, and finally forwarded to the stock room, ready for shipment.

Table 14 shows the detailed statistics, by states and territories, for the industry as returned for 1900.

<sup>1</sup> History of Fulton County, pages 167 and 170.

<sup>2</sup> M. S. Northrup, ex-secretary American Glove Association.

<sup>3</sup> Glove Trade Directory, O. H. Bame, publisher.

TABLE 14.—GLOVES AND MITTENS, LEATHER, BY STATES AND TERRITORIES: 1900.

	United States.	California.	Illinois.	Indiana.	Iowa.	Maryland.	Massachu- setts.
1	Number of establishments.....	381	23	24	3	6	8
2	Character of organization—						
3	Individual.....	222	15	8	1	1	3
4	Firm and limited partnership.....	125	7	6	1	3	3
5	Incorporated company.....	33	1	10	1	2	2
6	Miscellaneous.....	1					
7	Established during the decade.....	205	9	17	2	1	7
8	Established during the census year.....	27		2	1	1	3
9	Capital:						
10	Total.....	\$9,004,427	\$432,996	\$781,719	\$148,994	\$266,708	\$50,541
11	Land.....	\$286,237	\$4,010	\$56,250	\$9,000	\$22,000	\$100
12	Buildings.....	\$597,095	\$7,250	\$81,938	\$26,000	\$35,000	\$500
13	Machinery, tools, and implements.....	\$675,650	\$32,820	\$96,333	\$12,453	\$20,700	\$5,434
14	Cash and sundries.....	\$7,460,445	\$388,916	\$546,188	\$101,541	\$189,008	\$44,607
15	Proprietors and firm members.....	508	30	22	4	18	5
16	Salaried officials, clerks, etc.:						
17	Total number.....	637	65	108	7	42	8
18	Total salaries.....	\$544,170	\$52,902	\$93,782	\$10,300	\$80,948	\$6,175
19	Officers of corporations—						
20	Number.....	35	4	18	2		
21	Salaries.....	\$52,655	\$3,120	\$20,040	\$4,500		
22	General superintendents, managers, clerks, and salesmen—						
23	Total number.....	602	61	90	5	42	7
24	Total salaries.....	\$491,535	\$49,842	\$67,742	\$5,800	\$30,948	\$6,175
25	Men—						
26	Number.....	513	51	74	5	33	8
27	Salaries.....	\$451,700	\$46,000	\$59,764	\$5,800	\$26,670	\$6,175
28	Women—						
29	Number.....	89	10	16		9	3
30	Salaries.....	\$39,835	\$3,752	\$7,978		\$4,278	\$1,200
31	Wage-earners, including pieceworkers, and total wages:						
32	Greatest number employed at any one time during the year.....	17,441	693	2,032	245	215	89
33	Least number employed at any one time during the year.....	11,739	503	1,478	169	117	89
34	Average number.....	14,180	622	1,752	226	152	89
35	Wages.....	\$4,151,126	\$224,958	\$653,237	\$49,627	\$53,348	\$14,276
36	Men, 16 years and over—						
37	Average number.....	4,364	176	741	40	47	23
38	Wages.....	\$2,014,134	\$94,924	\$342,478	\$18,047	\$23,110	\$5,300
39	Women, 16 years and over—						
40	Average number.....	9,542	422	920	163	98	63
41	Wages.....	\$2,101,044	\$126,729	\$293,980	\$28,172	\$24,788	\$8,751
42	Children, under 16 years—						
43	Average number.....	274	24	91	23	7	3
44	Wages.....	\$85,948	\$3,300	\$11,829	\$3,408	\$450	\$225
45	Average number of wage-earners, including pieceworkers, employed during each month:						
46	Men, 16 years and over—						
47	January.....	4,179	171	677	40	52	23
48	February.....	4,359	165	691	30	49	23
49	March.....	4,405	171	711	42	49	23
50	April.....	4,600	176	761	43	50	23
51	May.....	4,625	175	773	45	50	23
52	June.....	4,360	170	746	45	44	23
53	July.....	4,298	167	762	44	43	23
54	August.....	4,394	179	785	34	43	23
55	September.....	4,419	181	786	31	45	23
56	October.....	4,426	182	797	40	43	23
57	November.....	4,321	183	748	42	46	23
58	December.....	3,956	184	697	43	46	23
59	Women, 16 years and over—						
60	January.....	8,882	414	816	171	81	63
61	February.....	9,234	410	831	165	84	63
62	March.....	9,698	413	892	174	90	63
63	April.....	9,358	417	952	168	91	63
64	May.....	9,947	416	981	164	95	63
65	June.....	9,680	411	973	163	74	63
66	July.....	9,448	414	963	175	123	63
67	August.....	9,771	426	984	151	123	63
68	September.....	9,825	430	951	149	123	63
69	October.....	9,905	489	946	165	123	63
70	November.....	9,739	441	968	153	98	63
71	December.....	8,524	437	828	146	72	63
72	Children, under 16 years—						
73	January.....	241	24	77	24	2	3
74	February.....	243	24	77	24	5	3
75	March.....	266	24	83	24	5	3
76	April.....	279	24	92	24	5	3
77	May.....	286	24	99	24	5	3
78	June.....	288	24	101	24	5	3
79	July.....	295	24	105	24	10	3
80	August.....	300	24	106	19	10	3
81	September.....	280	24	90	19	10	3
82	October.....	283	24	86	24	10	3
83	November.....	273	24	90	24	10	3
84	December.....	261	24	80	24	10	3
85	Miscellaneous expenses:						
86	Total.....	\$562,870	\$68,180	\$69,432	\$12,456	\$14,611	\$3,936
87	Rent of works.....	\$85,888	\$15,500	\$8,310	\$120	\$1,354	\$850
88	Taxes, not including internal revenue.....	\$23,466	\$1,845	\$3,723	\$808	\$1,057	\$225
89	Rent of offices, insurance, interest, and all sundry expenses not hitherto included.....	\$359,721	\$50,844	\$57,274	\$11,528	\$12,150	\$2,861
90	Contract work.....	\$93,795	\$200	\$125		\$50	
91	Materials used:						
92	Aggregate cost.....	\$9,382,102	\$436,512	\$1,224,333	\$173,195	\$118,963	\$54,008
93	Hides and skins—						
94	Total number of dozens.....	826,416	28,407	128,437	15,087	9,741	3,808
95	Total cost.....	\$7,356,433	\$372,136	\$1,076,922	\$157,263	\$79,414	\$41,630
96	Deerskins—						
97	Dozen.....	89,596	9,211	670		375	100
98	Cost.....	\$1,146,808	\$154,596	\$12,844		\$4,284	\$700
99	Mohas—Arabian sheepskins—						
100	Dozen.....	105,372	332	75		700	
101	Cost.....	\$1,071,636	\$4,000	\$665		\$7,550	
102							
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TABLE 14.—GLOVES AND MITTENS, LEATHER, BY STATES AND TERRITORIES: 1900.

Michigan.	Minnesota.	New Hampshire.	New Jersey. <sup>1</sup>	New York. <sup>1</sup>	Ohio.	Pennsylvania.	Virginia.	Washington.	Wisconsin.	All other states. <sup>2</sup>		
5	8	6	5	248	5	4	3	3	19	13	1	
5	5	5	3	148	3	2	2	2	10	7	2	
	3		2	88		2	1	2	5	3	3	
		1		7	2				4	2	4	
3	5		2	130	3	3		1	1	1	5	
	1			12	3			1	12	8	6	
\$29,241	\$13,437	\$351,492	\$65,894	\$6,219,647	\$113,791	\$28,950	\$136,300	\$8,250	\$219,789	\$27,628	8	
		\$21,200	\$9,500	\$150,677	\$900	\$7,800	\$7,800		\$4,250	\$1,050	9	
		\$33,200	\$9,600	\$331,820	\$1,700	\$4,600	\$29,100		\$14,937	\$1,550	10	
\$2,180	\$3,168	\$25,975	\$7,100	\$345,902	\$63,550	\$4,650	\$8,400	\$1,700	\$26,090	\$6,590	11	
\$27,061	\$10,279	\$271,117	\$12,694	\$5,391,248	\$47,641	\$19,300	\$91,000	\$6,650	\$172,512	\$18,338	12	
	11	5	9	344	3	3	4	2	23	13	13	
3	2	7		328	3	3	23	3	21	4	14	
\$700	\$550	\$9,150		\$294,574	\$3,600	\$1,800	\$13,700	\$720	\$17,939	\$3,310	15	
		1		5	2				3		16	
		\$2,000		\$13,000	\$1,200				\$2,775		17	
3	2	6		323	1	3	23	3	21	4	18	
\$700	\$550	\$7,150		\$281,574	\$2,400	\$1,800	\$13,700	\$720	\$16,164	\$3,310	19	
3	2	6		277	1	3	19	3	20	4	20	
\$700	\$550	\$7,150		\$260,771	\$2,400	\$1,800	\$12,600	\$720	\$14,540	\$3,310	21	
				46			4		1		22	
				\$20,803			\$1,200		\$624		23	
43	37	281	220	12,280	273	47	255	17	405	71	24	
33	19	222	155	7,908	267	36	255	14	219	48	25	
38	23	243	179	9,907	69	43	255	15	319	54	26	
\$12,206	\$4,497	\$32,080	\$67,002	\$2,723,702	\$22,030	\$9,759	\$43,900	\$6,300	\$78,473	\$20,326	27	
9	5	140	55	2,843	28	16	40	8	112	20	28	
\$4,148	\$1,470	\$55,329	\$35,873	\$1,299,595	\$10,080	\$4,800	\$14,700	\$4,000	\$41,997	\$10,370	29	
27	16	89	121	7,001	41	27	188	7	199	33	30	
\$7,746	\$2,922	\$24,959	\$30,129	\$1,415,156	\$11,950	\$4,959	\$26,700	\$2,300	\$35,500	\$9,756	31	
2	2	14	3	63			27		8	1	32	
\$312	\$105	\$1,792	\$1,000	\$3,951			\$2,500		\$976	\$200	33	
10	2	145	50	2,763	6	16	40	8	100	21	34	
10	2	144	49	2,919	6	16	40	8	118	21	35	
10	4	142	46	2,932	6	16	40	8	118	23	36	
10	6	136	45	2,956	127	16	40	8	118	23	37	
8	6	141	53	2,964	123	16	40	8	122	19	38	
8	6	142	59	2,854	6	16	40	8	112	19	39	
8	6	147	62	2,774	6	16	40	8	110	18	40	
9	7	138	68	2,850	6	16	40	8	113	18	41	
10	7	134	67	2,879	6	16	40	7	110	19	42	
10	7	136	52	2,901	6	16	40	7	112	20	43	
10	7	137	54	2,816	6	16	40	7	108	17	44	
10	5	140	53	2,605	6	16	40	8	99	14	45	
27	12	87	114	6,569	20	26	188	7	153	31	46	
25	12	87	112	6,800	20	26	188	7	202	31	47	
25	12	89	116	7,218	20	26	188	7	200	34	48	
27	14	89	108	7,187	145	26	188	7	206	36	49	
25	14	90	116	7,230	155	25	188	7	214	34	50	
25	14	91	137	7,114	20	27	188	7	206	31	51	
23	15	92	131	6,840	20	23	188	7	225	27	52	
23	18	84	137	7,184	20	27	188	4	233	32	53	
31	23	88	134	7,202	20	28	188	5	219	32	54	
31	24	90	115	7,291	20	29	188	8	199	34	55	
31	20	91	117	7,160	20	27	188	7	184	34	56	
27	18	90	116	6,162	20	29	188	7	151	37	57	
2	1	13	3	51			27		6	2	58	
2	1	12	3	48			27		11		59	
2	2	16	3	58			27		11	2	60	
2	2	15	3	63			27		11	2	61	
2	2	12	3	65			27		12	2	62	
2	1	14	3	67			27		9	2	63	
2	1	12	3	67			27		9	2	64	
2	2	16	3	71			27		9	2	65	
2	2	15	3	71			27		6	2	66	
2	2	16	3	73			27		5	2	67	
2	2	14	3	61			27		5	2	68	
2	1	16	3	58			27		5	2	69	
\$1,762	\$2,130	\$10,728	\$1,971	\$341,486	\$2,332	\$383	\$11,000	\$629	\$9,474	\$4,318	70	
\$1,160	\$909	\$50	\$260	\$47,115	\$332	\$223	\$180	\$180	\$2,833	\$2,152	71	
\$72	\$72	\$1,678	\$256	\$11,208	\$30	\$40	\$1,120	\$39	\$549	\$268	72	
\$380	\$1,149	\$9,000	\$1,455	\$197,343	\$1,470	\$620	\$5,480	\$110	\$5,442	\$393	73	
				\$35,820			\$5,000		\$600	\$1,000	74	
\$27,980	\$11,677	\$171,302	\$79,975	\$6,828,036	\$66,590	\$20,737	\$174,190	\$9,735	\$319,167	\$42,471	75	
4,918	464	10,505	6,696	566,932	8,144	1,961	8,116	540	18,892	2,488	76	
\$26,650	\$8,052	\$134,760	\$69,932	\$4,759,070	\$53,120	\$16,454	\$146,517	\$8,500	\$269,397	\$33,771	77	
	273	5,473		67,688	167		1,475	174	8,102	672	78	
	\$4,837	\$79,537		\$304,613	\$2,500		\$16,040	\$2,640	\$49,324	\$10,393	79	
70	13		42	97,228	33		466		2	16	80	
\$750	\$116		\$300	\$932,467	\$1,000		\$6,352		\$36	\$200	81	

<sup>1</sup> Includes 1 establishment the schedule for which was received too late to be included in the general report as presented in Manufactures, Parts I and II.  
<sup>2</sup> Includes establishments distributed as follows: Colorado, 1; Connecticut, 1; Maine, 1; Missouri, 2; Montana, 1; Nebraska, 1; Oklahoma, 1; Oregon, 2; Rhode Island, 1; Utah, 1; West Virginia, 1.

TABLE 14.—GLOVES AND MITTENS, LEATHER, BY STATES AND TERRITORIES: 1900—Continued.

	United States.	California.	Illinois.	Indiana.	Iowa.	Maryland.	Massachu- setts.
Materials used—Continued.							
Hides and skins—Continued.							
Total cost—Continued.							
Cabretta—Brazilian sheepskins—							
82	Dozen.....	6,432	677	1,000			
83	Cost.....	\$47,399	\$5,300	\$5,000			
Rams—All kinds of domestic sheepskins—							
84	Dozen.....	422,481	11,720	111,565	13,215	6,477	670
85	Cost.....	\$2,250,511	\$64,936	\$500,766	\$69,514	\$32,700	\$4,250
Horse and cow hides—							
86	Dozen.....	30,180	2,361	11,559	1,872	337	33
87	Cost.....	\$1,352,148	\$108,234	\$526,211	\$87,749	\$16,600	\$1,680
Kid, imported—							
88	Dozen.....	70,824	913	1,285		1,242	2,500
89	Cost.....	\$740,170	\$12,350	\$7,536		\$11,300	\$30,000
Kid, domestic—							
90	Dozen.....	97,245	2,481	706		443	500
91	Cost.....	\$708,800	\$16,220	\$6,500		\$2,980	\$5,000
All other varieties—							
92	Dozen.....	4,286	712	1,577		167	
93	Cost.....	\$32,961	\$6,500	\$12,500		\$4,000	
94	Fuel.....	\$12,230	\$935	\$6,527	\$1,132	\$1,800	\$39
95	Rent of power and heat.....	\$19,919	\$1,939	\$650	\$60	\$248	
96	Mill supplies.....	\$12,619	\$215	\$810	\$803	\$465	\$5
97	All other materials.....	\$1,904,778	\$59,830	\$136,010	\$13,537	\$33,386	\$12,197
98	Freight.....	\$46,123	\$1,457	\$3,420	\$350	\$3,650	\$227
Products:							
99	Aggregate value.....	\$16,721,234	\$920,624	\$2,454,252	\$264,271	\$273,000	\$86,675
Gloves and mittens—							
100	Total dozens of pairs.....	2,895,661	121,801	573,411	92,300	52,463	9,587
101	Total value.....	\$16,039,168	\$837,239	\$2,324,698	\$264,271	\$238,400	\$82,685
Men's—							
Lined—							
102	Dozens of pairs.....	952,820	11,692	105,546	67,500	4,750	1,557
103	Value.....	\$4,959,902	\$91,100	\$520,558	\$210,250	\$30,000	\$13,980
Unlined—							
104	Dozens of pairs.....	1,314,507	87,277	366,937	12,300	36,620	6,700
105	Value.....	\$7,458,356	\$656,991	\$1,490,071	\$26,266	\$142,600	\$65,490
Women's—							
Lined—							
106	Dozens of pairs.....	78,733	1,810	3,593		1,450	
107	Value.....	\$538,362	\$10,900	\$15,065		\$6,300	
Unlined—							
108	Dozens of pairs.....	221,039	7,392	4,758		6,230	320
109	Value.....	\$1,772,746	\$62,620	\$33,050		\$47,500	\$1,810
Gauntlets—							
110	Dozens of pairs.....	24,004	4,210	2,160		360	
111	Value.....	\$150,652	\$31,048	\$13,050		\$2,200	
Boys' and youths'—							
Lined—							
112	Dozens of pairs.....	148,493	2,020	40,515	12,000	2,035	310
113	Value.....	\$548,556	\$7,380	\$113,550	\$26,755	\$6,600	\$850
Unlined—							
114	Dozens of pairs.....	98,972	5,435	47,057	500	1,013	200
115	Value.....	\$377,503	\$21,390	\$130,479	\$1,000	\$3,200	\$555
Misses' and children's—							
Lined—							
116	Dozens of pairs.....	39,873		2,815			
117	Value.....	\$180,998		\$8,560			
Unlined—							
118	Dozens of pairs.....	17,170	1,465	40			
119	Value.....	\$72,093	\$5,810	\$325			
120	All other products, including custom work and repairing.....	\$682,066	\$33,385	\$129,554		\$34,600	\$3,990
Comparison of products:							
121	Number of establishments reporting for both years.....	305	22	22	3	5	3
122	Value for census year.....	\$13,831,038	\$891,624	\$2,428,518	\$264,271	\$267,000	\$86,675
123	Value for preceding business year.....	\$11,426,896	\$734,049	\$1,877,120	\$227,441	\$226,000	\$73,375
Power:							
124	Number of establishments reporting.....	192	14	15	3	5	1
125	Total horsepower.....	2,137	40	170	62	281	6
Owned—							
Engines—							
Steam—							
126	Number.....	45		4		3	1
127	Horsepower.....	1,336		93		255	6
Gas or gasoline—							
128	Number.....	34	4	7	2	2	
129	Horsepower.....	388	17	44	52	13	
Water wheels—							
130	Number.....	2					
131	Horsepower.....	30					
Electric motors—							
132	Number.....	4		2		1	
133	Horsepower.....	23		11		10	
Other power—							
134	Number.....	1					
135	Horsepower.....	1					
Rented—							
136	Electric horsepower.....	218	20			3	
137	All other horsepower.....	141	3	22	10		
138	Furnished to other establishments, horsepower.....	205				4	
Establishments classified by number of persons employed, not including proprietors and firm members.							
139	Total number of establishments.....	381	23	24	3	6	3
140	No employees.....	17		2			1
141	Under 5.....	55	5	3			1
142	5 to 20.....	120	6	3	1	3	1
143	21 to 50.....	96	6	7	1	1	4
144	51 to 100.....	48	5	2	1	1	1
145	101 to 250.....	35	1	5	1	1	
146	251 to 500.....	5		1			
147	501 to 1,000.....	5		1			

TABLE 14.—GLOVES AND MITTENS, LEATHER, BY STATES AND TERRITORIES: 1900—Continued.

Michigan.	Minnesota.	New Hampshire.	New Jersey.	New York.	Ohio.	Pennsylvania.	Virginia.	Washington.	Wisconsin.	All other states.	
			25	4,619	106					5	82
			\$221	\$85,828	\$1,000					\$50	88
4,400	115	4,220	400	242,428	7,508	1,778	2,133	273	10,665	1,250	84
\$17,898	\$620	\$25,913	\$2,000	\$1,337,004	\$44,000	\$7,850	\$67,125	\$1,360	\$58,633	\$6,697	85
149	49	563		9,007	74	183	680	93	2,962	308	86
\$6,995	\$2,329	\$27,419		\$371,884	\$3,600	\$8,604	\$30,092	\$4,500	\$141,495	\$14,756	87
49	9		5,729	55,421			1,300		1,516		88
\$512	\$110		\$64,111	\$566,291			\$14,200		\$18,165		89
250	5		500	89,166	100		2,112		145	187	90
\$500	\$40		\$3,000	\$658,733	\$700		\$12,708		\$1,244	\$1,175	91
		249		1,425	108					50	92
		\$1,891		\$7,250	\$20					\$500	93
\$75	\$165	\$1,439	\$365	\$21,405	\$390	\$203	\$5,418	\$25	\$1,569	\$943	94
\$838	\$40	\$25	\$180	\$14,679				\$20	\$720	\$65	95
\$15	\$10	\$240	\$20	\$7,455	\$180	\$79	\$2,000		\$195	\$17	96
\$500	\$3,140	\$29,466	\$9,454	\$1,498,909	\$12,400	\$2,976	\$20,225	\$990	\$45,901	\$8,032	97
\$402	\$270	\$5,372	\$24	\$26,518	\$500	\$1,025	\$30	\$200	\$1,385	\$243	98
\$54,850	\$24,328	\$296,557	\$171,065	\$10,854,221	\$111,050	\$42,236	\$205,925	\$24,685	\$507,495	\$83,790	99
15,225	2,873	49,085	18,755	1,721,831	43,386	9,223	41,075	2,060	95,235	18,178	100
\$54,725	\$20,628	\$281,186	\$171,065	\$10,507,789	\$95,390	\$38,500	\$196,925	\$18,400	\$493,375	\$77,682	101
550	2,088	10,800	1,004	643,440	18,770	4,910	15,200	150	58,790	3,451	102
\$4,600	\$12,490	\$76,200	\$9,564	\$3,547,825	\$39,190	\$22,050	\$91,200	\$1,500	\$253,287	\$17,705	103
14,625	785	33,585	15,693	637,155	24,516	3,313	26,400	1,635	30,465	9,031	104
\$49,675	\$8,138	\$180,436	\$143,367	\$4,184,048	\$55,750	\$13,575	\$103,000	\$15,300	\$208,635	\$55,944	105
50			508	70,139			25		976	282	106
\$450			\$5,184	\$492,044			\$150		\$6,564	\$1,755	107
		500	1,550	174,896			150	100	979	83	108
		\$2,750	\$13,000	\$1,391,948			\$1,150	\$900	\$8,896	\$390	109
				17,094			25		10	155	110
				\$102,926			\$350		\$60	\$1,018	111
		1,000		86,419	100	900	100		3,032	62	112
		\$6,000		\$371,575	\$450	\$2,475	\$350		\$12,325	\$246	113
		3,200		40,159		100	100	160	978	75	114
		\$15,800		\$199,795		\$400	\$400	\$600	\$3,584	\$300	115
				36,982			25		5	46	116
				\$152,125			\$125		\$24	\$174	117
				15,547			50	25		43	118
				\$65,503			\$200	\$100		\$150	119
\$125	\$3,700	\$15,371		\$846,432	\$15,660	\$3,736	\$69,000	\$6,245	\$14,120	\$6,108	120
5	5	6	4	190	3	3		3	15	10	121
\$54,850	\$20,500	\$296,557	\$126,065	\$8,520,142	\$64,300	\$40,936		\$21,085	\$445,715	\$68,190	122
\$39,700	\$16,050	\$269,251	\$92,452	\$7,139,109	\$59,500	\$29,250		\$20,500	\$384,485	\$68,064	123
2	1	1	1	126	4	2			8	2	124
3	1	405	6	922	38	10			88	23	125
		1		29	1	1		1	2	1	126
		225		612	10	5		20	40	20	127
		2		9	3				5		128
		180		29	28				25		129
				1		1					130
				25		5					131
				1							132
				2							133
				1							134
				1							135
3			6	163						23	136
	1			90							137
		200				1					138
5	8	6	5	243	5	4		3	19	13	139
	1			6					3	4	140
2	3		1	29	1	1		2	4	3	141
3	4	5		78	1	2		1	4	5	142
			2	68	1	1			5	1	143
			2	31	1			1	1		144
		1		23	1			1	1		145
				4							146
				4							147