

---

---

MUSICAL INSTRUMENTS  
AND MATERIALS

---

---

(509)

# THE MANUFACTURE OF MUSICAL INSTRUMENTS.

## GENERAL STATISTICS.

The statistics relating to the manufacture of musical instruments are presented in the general report on manufactures for the United States as a whole under two main classifications: (1) "Musical instruments, pianos and organs and materials," and (2) "Musical instruments and materials, not specified." The prod-

ucts of the establishments assigned to these two classifications are so dissimilar that a combination of the totals would have little significance. The industry covered by the first-named classification is much the more important of the two and is therefore treated at greater length.

## THE MANUFACTURE OF PIANOS AND ORGANS AND MATERIALS.

### SUMMARY FOR THE UNITED STATES.

Summary for the three branches of the industry: 1909.—Table 1 presents a summary of the statistics of the piano and organ industry as a whole for 1909. It also distinguishes three classes of establishments, as follows: (1) Establishments whose chief products were pianos, (2) establishments whose chief products were organs, and (3) establishments whose chief products were piano and organ materials, such as cases, piano actions, sounding boards, keyboards, pipes, keys, strings, and washers.

Table 1	Total for the industry.	ESTABLISHMENTS MANUFACTURING PRINCIPALLY—		
		Pianos.	Organs.	Piano and organ materials.
Number of establishments....	507	294	86	127
Persons engaged in the industry.....	41,882	28,415	2,754	10,713
Proprietors and firm members.....	297	126	83	88
Salaried employees.....	3,565	2,792	288	485
Wage earners (average number).....	38,020	25,497	2,383	10,140
Primary horsepower.....	41,623	28,246	3,334	15,043
Capital.....	\$103,234,301	\$81,544,094	\$4,553,609	\$17,136,598
Expenses.....	80,750,525	59,833,694	4,097,334	16,819,447
Services.....	28,313,754	20,192,875	1,777,649	6,343,230
Salaries.....	5,552,186	4,455,598	349,008	747,580
Wages.....	22,761,568	15,737,277	1,428,641	5,595,650
Materials.....	43,764,737	32,818,770	1,722,923	9,223,044
Miscellaneous.....	8,672,034	6,822,049	596,812	1,253,173
Value of products.....	189,789,544	66,569,273	4,745,655	18,474,616
Value added by manufacture (value of products less cost of materials).....	46,024,807	33,750,503	3,022,732	9,251,572

<sup>1</sup> In addition, parts and materials to the value of \$680,183 were made by establishments engaged primarily in the manufacture of products other than those covered by the industry designation.

The establishments in the first subclass manufactured chiefly upright and grand pianos with and without player attachments. Twenty of the establishments in this subclass also manufactured organs to the value of \$1,524,354; 23 manufactured player attachments to the value of \$1,474,630; 14 reported the manufacture of perforated music rolls to the value of \$212,925; and 46 made parts, materials, and supplies

to the value of \$2,112,320. Of the 86 establishments engaged chiefly in the manufacture of organs, there were 3 that also manufactured pianos to the value of \$188,321; 12 that manufactured parts, materials, and supplies to the value of \$330,291; and 3 that manufactured perforated music rolls to the value of \$3,225. The 127 establishments in the third subclass manufactured chiefly parts and materials used in the production of pianos and organs, but some of them made also parts and materials for other musical instruments. Because of this overlapping of the several branches of the industry, only combined totals for all three branches are presented in the tables in Volumes VIII and IX of the census reports.

The total value of products and the total cost of materials for the piano and organ industry as a whole contain considerable duplication, since the products of the establishments chiefly engaged in the manufacture of parts and supplies were largely used as materials by establishments manufacturing pianos and organs.

The establishments engaged primarily in the manufacture of pianos in 1909 turned out products to the value of \$66,569,273, or 74.1 per cent of the total value of products of the three branches of the industry combined. The value of the products reported by the establishments engaged chiefly in the manufacture of organs (\$4,745,655) represented 5.3 per cent of the total for all three branches, and the value of the products reported by the establishments engaged chiefly in the manufacture of piano and organ parts and materials (\$18,474,616) represented 20.6 per cent of the total value of products for the three branches.

The cost of the materials used in the three branches of the industry combined was \$43,764,737, which is equal to 48.7 per cent of the total value of products, while the value added by manufacture (that is, the value of products less the cost of materials) was \$46,024,807.

The establishments in the three branches of the industry combined gave employment to 41,882 persons, of whom 38,020 were wage earners, and paid out \$28,313,754 in salaries and wages. Of the total number of persons engaged, 67.8 per cent were employed in the piano branch of the industry, 6.6 per cent in the organ branch, and 25.6 per cent in the parts and materials branch.

Comparison with earlier censuses.—Table 2 summarizes the statistics for the manufacture of pianos and organs and piano and organ materials as reported at each census from 1869 to 1909, inclusive. The financial figures for 1869 are given in currency, which at that time was worth only about 80 cents, gold, to the dollar. For strict comparison, therefore, these figures should be reduced about 20 per cent.

	Number or amount.						Per cent of increase. <sup>1</sup>					
	1909	1904	1899	1889	1879	1869	1899-1909	1904-1909	1899-1904	1889-1899	1879-1889	1869-1879
	Number of establishments.....	507	444	390	351	345	254	30.0	14.2	13.8	2.4	10.4
Persons engaged in the industry.....	41,882	36,106	23,217	( <sup>2</sup> )	( <sup>2</sup> )	( <sup>2</sup> )	80.4	16.0	55.5			
Proprietors and firm members.....	297	303	390	( <sup>2</sup> )	( <sup>2</sup> )	( <sup>2</sup> )	-23.8	-2.0	-22.3			
Salaried employees.....	3,505	2,722	1,518	( <sup>2</sup> )	( <sup>2</sup> )	( <sup>2</sup> )	134.8	31.0	79.3			
Wage earners (average number).....	33,020	33,081	21,399	17,040	10,777	6,108	78.4	14.9	55.2	25.1	( <sup>3</sup> )	( <sup>3</sup> )
Primary horsepower.....	41,923	30,134	20,789	11,067	( <sup>2</sup> )	1,450	100.2	38.1	45.0	87.8		
Capital.....	\$103,234,301	\$68,431,910	\$43,810,481	\$28,321,160	\$13,701,915	\$8,203,161	135.6	50.7	56.3	54.7	105.3	68.1
Expenses.....	80,750,525	57,379,806	34,440,795	28,595,533	( <sup>2</sup> )	( <sup>2</sup> )	134.5	40.7	66.6	20.5		
Services.....	28,313,754	22,255,008	13,557,489	12,444,206	6,505,732	4,475,657	108.8	27.2	64.2	8.9	82.8	52.1
Salaries.....	5,552,186	3,727,930	2,014,626	( <sup>2</sup> )	( <sup>2</sup> )	( <sup>2</sup> )	175.6	48.9	85.0	43.8		
Wages.....	22,761,568	18,527,078	11,542,863	( <sup>2</sup> )	( <sup>2</sup> )	( <sup>2</sup> )	97.2	22.9	60.5			
Materials.....	43,704,737	27,950,927	17,370,685	13,925,499	7,975,451	3,901,895	151.9	56.4	61.1	24.7	74.6	104.4
Miscellaneous.....	8,072,034	7,138,171	3,512,621	2,215,828	( <sup>2</sup> )	( <sup>2</sup> )	146.9	21.5	103.2	58.5		
Value of products.....	89,789,544	60,092,630	41,024,244	34,079,556	18,400,993	11,886,444	118.9	35.9	61.1	17.3	90.1	54.8
Value added by manufacture (value of products less cost of materials).....	46,024,807	38,106,003	23,653,559	21,054,057	10,425,542	7,984,540	94.6	20.8	61.1	12.3	101.9	30.6

<sup>1</sup> A minus sign (-) denotes decrease. Where percentages are omitted, comparable figures are not available.  
<sup>2</sup> Comparable figures not available.  
<sup>3</sup> Figures not strictly comparable.

The manufacture of pianos and organs has had an uninterrupted development since 1869, when products to the value of \$11,886,444 were reported. In 1909 the value of products was more than seven times as great, \$89,789,544. The largest increases are shown for the decade from 1899 to 1909, when the number of persons engaged in the industry increased 80.4 per cent and the value of products 118.9 per cent. The large piano and organ factories are of comparatively recent development. In 1869 the average establishment gave employment to only 24 wage earners and the average value of products was \$46,797; in 1909 the average for wage earners was 75 and for value of products \$177,100.

The decrease in the number of proprietors and firm members is no doubt due to the growth in the corporate form of ownership. On the other hand, there was an increase of 134.8 per cent during the decade ending with 1909 in the number of salaried employees.

The censuses of 1909, 1904, and 1859 are the only censuses for which separate statistics are available for establishments whose chief products were pianos and organs, respectively, and the censuses of 1909 and 1904, the only ones for which separate statistics are available for establishments engaged chiefly in the manufacture of piano and organ parts and materials. The figures for the three classes of establishments at these censuses are summarized in Table 3.

	1909	1904	1859
<i>Establishments manufacturing principally pianos.</i>			
Number of establishments.....	294	249	110
Wage earners (average number).....	25,497	21,002	3,482
Wages.....	\$15,737,277	\$12,170,251	\$1,929,604
Cost of materials.....	32,818,770	19,587,770	1,727,885
Value of products.....	66,569,273	46,922,471	5,260,907
Value added by manufacture.....	33,750,503	27,334,701	3,533,022
<i>Establishments manufacturing principally organs.</i>			
Number of establishments.....	86	94	60
Wage earners (average number).....	2,383	3,623	718
Wages.....	\$1,428,641	\$2,034,559	\$343,116
Cost of materials.....	1,722,923	2,008,638	320,375
Value of products.....	4,745,655	6,041,844	971,725
Value added by manufacture.....	3,022,732	3,973,206	646,350
<i>Establishments manufacturing principally piano and organ materials.</i>			
Number of establishments.....	127	101	( <sup>1</sup> )
Wage earners (average number).....	19,140	8,456	( <sup>1</sup> )
Wages.....	\$5,595,650	\$4,322,268	( <sup>1</sup> )
Cost of materials.....	9,223,044	6,330,219	( <sup>1</sup> )
Value of products.....	18,474,016	13,128,315	( <sup>1</sup> )
Value added by manufacture.....	9,251,572	6,798,096	( <sup>1</sup> )

<sup>1</sup> Figures not available.

Summary, by states.—Table 4 summarizes the more important statistics for the establishments engaged in the manufacture of pianos and organs and materials, by states, the states being arranged according to the value of products reported for 1909.

In determining the rank of the states all states are considered, whether or not they are shown separately in the table; hence some omissions occur in the several series of numbers indicating rank, as certain states

included under "all other states" held a higher rank in some items than some of the states for which separate figures are given.

Although statistics are shown for 17 states separately, more than two-thirds (69 per cent) of the total value of products were reported by the first three states. New York reported 37.5 per cent of the total and Illinois 21.4 per cent. Wisconsin shows the greatest relative increase for the five-year period

1904-1909, advancing from fifteenth place in value of products in 1904 to twelfth place in 1909. Michigan also shows a marked gain in rank during this period, advancing from eighth to fifth. Most of the states held the same, or nearly the same, rank in 1909 as in 1904, and, in general, the states had in 1909 the same, or nearly the same, rank in number of wage earners and value added by manufacture as in value of products.

Table 4

PIANO AND ORGAN INDUSTRY.

STATE.	Number of establishments: 1909	Wage earners.			Value of products.			Value added by manufacture.			Per cent of increase. <sup>1</sup>											
		Average number: 1909	Per cent of total: 1909	Rank.		Amount: 1909	Per cent of total: 1909	Rank.		Amount: 1909	Per cent of total: 1909	Rank.		Wage earners (average number).			Value of products.			Value added by manufacture.		
				1909	1904			1909	1904			1909	1904	1899-1909	1904-1909	1899-1904	1899-1909	1904-1909	1899-1904	1899-1909	1904-1909	1899-1904
United States.	507	38,020	100.0			\$89,789,544	100.0			\$46,024,807	100.0			78.4	14.9	55.2	118.9	35.9	61.1	94.6	20.8	61.1
New York.....	184	11,938	31.4	1	1	33,679,953	37.5	1	1	10,185,206	35.2	1	1	75.5	24.2	41.4	128.4	44.0	58.6	97.8	30.1	52.0
Illinois.....	68	8,777	23.1	2	2	19,176,328	21.4	2	2	10,533,897	22.9	2	2	87.9	16.9	60.8	135.1	43.9	63.4	118.0	32.9	64.0
Massachusetts.....	59	4,245	11.2	3	3	9,106,470	10.1	3	3	4,957,214	10.8	3	3	33.7	1.8	31.4	47.5	10.0	34.1	28.1	-4.0	33.5
Connecticut.....	17	2,304	6.1	4	4	5,538,018	6.2	4	4	2,516,267	5.5	4	4	23.7	-10.8	38.6	63.1	5.0	55.3	37.8	-12.4	57.2
Michigan.....	17	1,779	4.7	6	8	4,226,266	4.7	5	8	2,216,791	4.8	5	8	134.1	66.4	40.7	258.1	113.0	68.1	214.0	79.7	74.8
Ohio.....	30	1,841	4.8	5	5	3,925,757	4.4	6	5	2,003,374	4.3	6	5	138.8	-16.7	186.6	170.6	6.6	153.9	170.4	-2.7	177.9
Indiana.....	15	1,667	4.4	7	7	3,685,962	4.1	7	6	1,982,923	4.3	7	6	288.6			352.8			339.7		
Pennsylvania.....	30	1,182	3.1	9	9	2,381,849	2.7	8	9	1,133,504	2.5	9	10	67.2			60.1			29.6		
New Jersey.....	18	1,393	3.7	8	6	2,229,145	2.5	9	7	1,153,072	2.5	8	7	82.6			67.3			49.9		
Maryland.....	7	757	2.0	10	10	1,466,344	1.6	10	10	899,930	2.0	10	9	44.7	17.4	23.3	55.6	5.5	47.5	67.3	-21.4	112.8
Vermont.....	4	610	1.6	11	11	1,267,566	1.4	11	11	865,629	1.9	11	11	99.3	51.7	31.4	208.5	109.6	47.2	219.6	107.2	54.2
Wisconsin.....	11	369	1.0	12	16	892,957	1.0	12	15	402,796	0.8	12	18				385.3					
Kentucky.....	6	343	0.9	13	12	588,352	0.7	13	12	316,617	0.7	13	12		-4.7		16.4					
Minnesota.....	5	143	0.4	15	17	294,452	0.3	15	16	168,013	0.4	15	15									
California.....	11	57	0.1	18	15	150,308	0.2	16	14	109,338	0.2	16	14		-45.7		-27.9					
Iowa.....	4	56	0.1	19	22	93,225	0.1	20	22	41,441	0.1	21	22									
Maine.....	3	20	0.1	22	19	43,274	( <sup>2</sup> )	22	19	24,525	0.1	22	19									
All other states.....	18	539	1.4			1,043,318	1.2			514,270	1.1											

<sup>1</sup> Percentages are based on figures in Table 20. A minus sign (-) denotes decrease. Percentage not shown where base is less than 100 for wage earners or less than \$100,00 for value of products or value added by manufacture, or where comparative figures can not be given without disclosing individual operations.

<sup>2</sup> Less than one-tenth of 1 per cent.

PERSONS ENGAGED IN THE INDUSTRY.

Summary, 1909.—Table 5 shows, for 1909, the number of persons engaged in the piano and organ industry as a whole and in each of the three branches, classified according to occupational status and sex,

and in the case of wage earners according to age. It should be borne in mind that the sex and age classification of the average number of wage earners in this and other tables is an estimate obtained by the method described in the Introduction.

Table 5

BRANCH OF INDUSTRY AND CLASS OF PERSONS.	PERSONS ENGAGED IN THE INDUSTRY: 1909			BRANCH OF INDUSTRY AND CLASS OF PERSONS.	PERSONS ENGAGED IN THE INDUSTRY: 1909		
	Total.	Male.	Female.		Total.	Male.	Female.
Pianos and organs and materials.....	41,882	39,005	2,877	Organs.....	2,754	2,592	162
Proprietors and officials.....	1,378	1,340	38	Proprietors and officials.....	175	168	7
Proprietors and firm members.....	297	285	12	Proprietors and firm members.....	83	78	5
Salaried officers of corporations.....	546	524	22	Salaried officers of corporations.....	42	40	2
Superintendents and managers.....	535	531	4	Superintendents and managers.....	50	50	
Clerks.....	2,484	1,788	696	Clerks.....	196	127	69
Wage earners (average number).....	38,020	35,877	2,143	Wage earners (average number).....	2,383	2,297	86
16 years of age and over.....	37,316	35,340	1,976	16 years of age and over.....	2,366	2,280	86
Under 16 years of age.....	704	537	167	Under 16 years of age.....	17	17	
Pianos.....	28,415	27,222	1,193	Piano and organ materials.....	10,713	9,191	1,522
Proprietors and officials.....	907	886	21	Proprietors and officials.....	296	286	10
Proprietors and firm members.....	126	121	5	Proprietors and firm members.....	88	86	2
Salaried officers of corporations.....	397	385	12	Salaried officers of corporations.....	107	99	8
Superintendents and managers.....	384	380	4	Superintendents and managers.....	101	101	
Clerks.....	2,011	1,483	528	Clerks.....	277	178	99
Wage earners (average number).....	25,497	24,853	644	Wage earners (average number).....	10,140	8,727	1,413
16 years of age and over.....	25,146	24,530	616	16 years of age and over.....	9,804	8,530	1,274
Under 16 years of age.....	351	323	28	Under 16 years of age.....	336	197	139

Of the 41,882 persons engaged in the industry during 1909, 38,020, or 90.8 per cent, were wage earners; 2,484, or 5.9 per cent, clerks, a class which includes other subordinate salaried employees; 1,081, or 2.6 per cent, salaried officials, superintendents, and managers; and 297, or seven-tenths of 1 per cent, proprietors and firm members.

Of the total number of wage earners, only 2,143, or 5.6 per cent, were females. The largest number of females, 1,413, or 65.9 per cent of the total, was reported for the manufacture of piano and organ materials. Females formed 13.9 per cent of the total number of wage earners in this branch of the industry. The total number of wage earners under 16 years of age (704) for the three branches of the industry combined formed but 1.9 per cent of the total number of wage earners in the industry as a whole, and was about equally divided between the piano branch and the piano and organ materials branch, only 17 being reported for the organ branch.

Comparison with previous censuses for the United States as a whole.—In order to compare the distribution of persons engaged in the industry in 1909 with that in 1904, it is necessary to use the classification employed at the earlier census (see Introduction). Such a comparison is made in Table 6 for the industry as a whole.

CLASS.	1909		1904		Per cent of increase: 1904-1909. <sup>1</sup>
	Number.	Per cent distribution.	Number.	Per cent distribution.	
Total.....	41,882	100.0	36,106	100.0	16.0
Proprietors and firm members...	297	0.7	303	0.8	-2.0
Salaried employees.....	3,565	8.5	2,722	7.5	31.0
Wage earners (average number).....	38,020	90.8	33,081	91.6	14.9

<sup>1</sup> A minus sign (-) denotes decrease.

Although there was an increase of 14.9 per cent in the average number of wage earners in the industry

as a whole from 1904 to 1909, they constituted a smaller proportion of the total number of persons engaged in 1909 than in 1904. There was an increase of 31 per cent in the number of salaried employees, but the number of proprietors and firm members decreased.

Table 7 shows the average number of wage earners in the industry as a whole, distributed according to age, and in the case of those 16 years of age and over according to sex, for 1909, 1904, and 1899. The most important fact brought out by this table is the increase during the decade in the employment of female wage earners 16 years of age and over, this class forming 5.2 per cent of the total number of wage earners in 1909 as compared with 2.6 per cent in 1899.

CLASS.	1909		1904		1899	
	Number.	Per cent distribution.	Number.	Per cent distribution.	Number.	Per cent distribution.
Total.....	38,020	100.0	33,081	100.0	21,309	100.0
16 years of age and over...	37,316	98.1	32,555	98.4	20,809	97.7
Male.....	35,340	93.0	31,322	94.7	20,254	95.1
Female.....	1,976	5.2	1,233	3.7	555	2.6
Under 16 years of age.....	704	1.9	526	1.6	500	2.3

The average number of wage earners employed in the industry in 1909, 1904, and 1899, is given for each state in Table 20. The average number distributed by sex and age is not shown for the individual states, but Table 21 gives such a distribution of the number employed on December 15, or the nearest representative day.

Wage earners employed, by months.—Table 8 gives, for the industry as a whole, the number of wage earners employed on the 15th (or the nearest representative day) of each month during the year 1909 for the 11 states in which an average of 500 or more wage earners were employed during the year.

STATE.	Average number during the year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
		<b>United States.....</b>	<b>38,020</b>	<b>36,900</b>	<b>37,241</b>	<b>37,530</b>	<b>37,679</b>	<b>37,696</b>	<b>37,455</b>	<b>36,269</b>	<b>37,238</b>	<b>38,522</b>	<b>39,752</b>
Connecticut.....	2,304	2,212	2,208	2,206	2,353	2,345	2,327	2,188	2,273	2,330	2,378	2,351	2,297
Illinois.....	8,777	<b>8,341</b>	8,346	8,434	8,524	8,649	8,629	8,708	8,877	9,031	9,293	9,290	9,196
Indiana.....	1,667	1,636	1,656	1,656	1,693	1,738	1,619	1,613	1,642	1,672	1,688	1,681	1,700
Maryland.....	757	721	728	734	738	761	761	772	764	758	772	787	782
Massachusetts.....	4,245	4,113	4,116	4,207	4,222	4,265	4,202	4,037	4,058	4,327	4,425	4,468	4,512
Michigan.....	1,779	<i>1,641</i>	1,680	1,713	1,739	1,726	1,747	1,687	1,821	1,840	1,875	1,927	1,956
New Jersey.....	1,393	1,407	1,423	1,436	1,406	1,402	1,425	1,349	1,325	1,341	1,304	1,382	1,417
New York.....	11,938	11,735	11,804	11,999	11,936	11,729	11,622	11,151	11,453	11,974	12,484	12,669	12,705
Ohio.....	1,841	1,792	1,853	1,840	1,859	1,827	1,862	1,716	1,801	1,820	1,953	1,924	1,845
Pennsylvania.....	1,182	1,151	1,160	1,148	1,167	1,209	1,153	1,030	1,149	1,227	1,241	1,235	1,264
Vermont.....	610	<b>635</b>	622	629	613	614	590	583	577	616	622	595	631

<sup>1</sup> The month of maximum employment for each state is indicated by boldface figures and that of minimum employment by italic figures.

In the United States the largest number of wage earners employed in this industry during any month of 1909 was 40,011 in December, and the smallest num-

ber 36,269 in July, the minimum number being equal to 90.6 per cent of the maximum number. The industry is not subject to great fluctuations from month to

month, but, like most manufacturing industries, has its busier and its duller seasons, depending on the demands of the trade. In 1904 December was the month of greatest employment, with 35,143, and July the month of least employment, with 31,498. In 1909 December was the month of maximum employment in New York and Massachusetts, the first and third states in the industry, while October was the month of maximum employment in Illinois, the second state in importance. The months of maximum and minimum employment for 1909 and the number of wage earners reported for these months are given for each state in Table 21.

**Prevailing hours of labor.**—In Table 9 the wage earners in the industry as a whole, for the 11 leading states, are classified according to the prevailing hours of labor per week in the establishments in which they were employed. In making this classification the average number of wage earners employed during the year in each establishment is classified as a total according to the hours prevailing in that establishment, even though a few employees worked a greater or a smaller number of hours.

**Table 9**  
AVERAGE NUMBER OF WAGE EARNERS IN THE PIANO AND ORGAN INDUSTRY—ALL BRANCHES COMBINED: 1909

STATE.	Total.	In establishments with prevailing hours—				
		48 and under.	Between 48 and 54.	54.	Between 54 and 60.	60.
United States.....	38,020	1,270	2,534	17,372	6,055	10,789
Connecticut.....	2,304	.....	.....	750	356	1,198
Illinois.....	8,777	121	564	4,604	842	2,046
Indiana.....	1,667	.....	.....	.....	486	1,181
Maryland.....	757	2	.....	400	203	147
Massachusetts.....	4,245	700	420	2,855	195	75
Michigan.....	1,779	.....	1	51	1,108	621
New Jersey.....	1,303	64	5	978	345	1
New York.....	11,938	364	1,481	6,967	649	2,477
Ohio.....	1,841	.....	3	219	782	837
Pennsylvania.....	1,183	.....	32	395	492	263
Vermont.....	610	.....	.....	4	340	266

Of the wage earners, 34,216, or 90 per cent, were employed in establishments in which the prevailing hours of employment were either 54, between 54 and 60, or 60 per week. The largest number of wage earners, 17,372, or 45.7 per cent of the total, were employed in establishments operating 54 hours per week.

In five of the eleven states for which separate data are shown, 54 hours per week was the most common period of employment, these states including the three leading states in the industry, New York, Illinois, and Massachusetts.

CHARACTER OF OWNERSHIP.

Table 10 presents statistics with respect to the character of ownership of establishments in the piano and organ industry.

**Table 10**  
PIANO AND ORGAN INDUSTRY.

CHARACTER OF OWNERSHIP.	Number of establishments.		Value of products.	
	1909	1904	1909	1904
	Total.....	507	444	\$89,789,544
Individual.....	125	142	7,923,369	6,354,769
Firm.....	68	168	4,900,983	15,900,439
Corporation.....	314	234	76,965,192	53,837,432
Per cent of total.....	100.0	100.0	100.0	100.0
Individual.....	24.7	32.0	8.8	9.6
Firm.....	13.4	15.3	5.5	18.9
Corporation.....	61.9	52.7	85.7	81.5

<sup>1</sup> Includes figures for one establishment reported as under "other" ownership, to avoid disclosure of individual operations.

The most important distinction shown is that between corporate and all other forms of ownership. In 1909, of the total number of establishments, 61.9 per cent were under corporate ownership, as compared with 52.7 per cent in 1904. While corporations thus controlled less than two-thirds of the total number of establishments in both years, the value of the products of these establishments represented 85.7 per cent of the total for the industry in 1909 and 81.5 per cent in 1904. Between 1904 and 1909 there was an actual decrease in the number of establishments under individual ownership, but an increase in the value of their products. The number of establishments under firm ownership was practically the same at the two censuses, but there was an absolute decrease of \$999,456, or 16.9 per cent, in the value of their products from 1904 to 1909.

Table 11 gives, for 1909, statistics for establishments classified according to form of ownership for each of the 11 states in which more than 500 wage earners were employed in this industry.

In 1909, of the entire number of wage earners, 2,751, or 7.2 per cent of the total, were employed in establishments under individual ownership; 2,547, or 6.7 per cent, in those under firm ownership; and 32,722, or 86.1 per cent, in those controlled by corporations. Corporations do by far the greater part of the business in each of the 11 states for which figures are presented. In New York establishments under individual ownership reported 17.1 per cent of the total value of products for the state, and those under firm ownership 8.5 per cent, these percentages being higher than those for the corresponding classes of establishments in any other state listed.

Table 11

STATE.	PIANO AND ORGAN INDUSTRY.											
	Number of establishments owned by—			Wage earners in establishments owned by—			Value of products of establishments owned by—			Value added by manufacture in establishments owned by—		
	Individuals.	Firms.	Corporations.	Individuals.	Firms.	Corporations.	Individuals.	Firms.	Corporations.	Individuals.	Firms.	Corporations.
United States.....	125	68	314	2,751	2,547	32,722	\$7,923,369	\$4,900,983	\$76,965,192	\$3,608,274	\$2,803,119	\$39,613,414
Connecticut.....	2	1	14	29	(X)	2,275	65,726	(X)	5,472,292	45,558	(X)	2,470,909
Illinois.....	9	4	55	116	64	8,597	250,434	314,353	18,611,541	105,440	176,200	10,252,257
Indiana.....	4	1	11	21		1,646	52,466		3,633,496	29,387		1,953,536
Maryland.....	4	2	1	(X)	(X)	767	(X)	(X)	1,466,344	(X)	(X)	899,330
Massachusetts.....	17	7	35	475	206	3,564	1,080,176	282,555	7,743,739	490,200	165,659	4,301,355
Michigan.....	2	3	12	(X)	78	1,701	(X)	249,080	3,977,186	(X)	102,202	2,114,589
New Jersey.....	4	1	13	47	(X)	1,346	51,261	(X)	2,177,884	31,262	(X)	1,121,810
New York.....	55	26	103	1,744	1,612	8,582	5,744,849	2,861,525	25,073,579	2,462,897	1,719,915	12,002,394
Ohio.....	4	6	20	30	66	1,745	63,900	129,156	3,732,701	41,603	81,493	1,880,278
Pennsylvania.....	8	6	16	57	74	1,051	98,399	172,616	2,110,834	65,575	94,359	873,570
Vermont.....			4			610			1,267,566			865,029

NOTE.—In some states, in order to avoid disclosing the returns for individual establishments, the figures for one group have been consolidated with those for establishments under another form of ownership. In such cases an (X) is placed in the column from which the figures have been omitted and the figures for the group with which they have been combined are printed in italics.

SIZE OF ESTABLISHMENTS.

Classification according to value of products.—Table 12, relating to the entire industry in the United States as a whole, presents statistics for 1909 and 1904 for establishments grouped according to the value of their products.

Table 12

VALUE OF PRODUCTS PER ESTABLISHMENT.	PIANO AND ORGAN INDUSTRY.			
	Number of establishments.		Value of products.	
	1909	1904	1909	1904
Total.....	507	444	\$89,789,544	\$66,092,630
Less than \$5,000.....	53	52	168,073	199,761
\$5,000 and less than \$20,000.....	85	84	900,917	945,116
\$20,000 and less than \$100,000.....	166	132	8,952,604	6,773,545
\$100,000 and less than \$1,000,000.....	193	171	63,736,264	50,139,758
\$1,000,000 and over.....	10	5	16,031,686	26,837,938
Per cent of total.....	100.0	100.0	100.0	100.0
Less than \$5,000.....	10.5	11.7	0.2	0.2
\$5,000 and less than \$20,000.....	16.8	18.9	1.0	1.4
\$20,000 and less than \$100,000.....	32.7	29.7	10.0	10.2
\$100,000 and less than \$1,000,000.....	38.1	38.5	71.0	75.9
\$1,000,000 and over.....	2.0	1.1	17.9	210.3

<sup>1</sup> Excluding figures for 18 establishments, to avoid disclosure of individual operations.  
<sup>2</sup> Excluding figures for 1 establishment, to avoid disclosure of individual operations.

Of the 507 establishments reported in 1909, there were only 10 whose products were valued at \$1,000,000 or over, but such establishments reported 17.9 per cent of the total value of products. In 1909 establishments reporting products valued at \$100,000 but less than \$1,000,000 constituted 38.1 per cent of the total number and contributed 71 per cent of the total value of products.

The average value of products per establishment for the industry as a whole increased from \$148,857 in 1904 to \$177,100 in 1909. In 1909 the average value of products for the several branches of the industry were as follows: Pianos, \$226,426; organs, \$55,182; piano and organ materials, \$145,469. In 1904, the corresponding averages were \$188,444, \$64,275, and \$129,983.

Classification according to number of wage earners.—Table 13 gives for 1909 a classification of the establishments engaged in the industry as a whole according to the number of wage earners and shows the average number of wage earners employed by establishments of each group in each of the 11 states in which 500 or more wage earners were employed.

Table 13

STATE.	PIANO AND ORGAN INDUSTRY: 1909																		
	Total.		Establishments employing—																
			No wage earners.		1 to 5 wage earners.		6 to 20 wage earners.		21 to 50 wage earners.		51 to 100 wage earners.		101 to 250 wage earners.		251 to 500 wage earners.		501 to 1,000 wage earners.		Over 1,000 wage earners.
Estab-lish-ments.	Wage earners (average number).	Estab-lish-ments.	Wage earners.	Estab-lish-ments.	Wage earners.	Estab-lish-ments.	Wage earners.	Estab-lish-ments.	Wage earners.	Estab-lish-ments.	Wage earners.	Estab-lish-ments.	Wage earners.	Estab-lish-ments.	Wage earners.	Estab-lish-ments.	Wage earners.	Estab-lish-ments.	Wage earners.
United States.....	507	38,020	12	100	242	123	1,577	96	3,221	63	4,633	74	12,017	31	10,265	7	4,541	1	1,524
Connecticut.....	17	2,304				4	35	3	111	3	203	4	734	2	610	1	611		
Illinois.....	68	8,777	1	8	23	17	223	14	471	6	423	12	1,979	7	2,601	2	1,533	1	1,524
Indiana.....	15	1,687		3	8	2	25	1	47	4	289	3	518	1	253	1	527		
Maryland.....	7	757	1	2	4			1	35			2	318	1	400				
Massachusetts.....	59	4,245	4	13	31	8	105	8	248	9	674	13	1,967	4	1,220				
Michigan.....	17	1,779	1	2	5	2	26	1	50	4	306	5	705	2	687				
New Jersey.....	18	1,393	1	3	7	2	28	4	146	4	279	3	587	1	346				
New York.....	184	11,938	1	32	71	51	655	40	1,343	27	1,981	23	3,655	7	2,363	3	1,870		
Ohio.....	30	1,841	1	4	11	12	152	6	143	2	189	4	719	2	627				
Pennsylvania.....	30	1,182	2	6	16	10	118	5	259	1	56	1	149	2	584				
Vermont.....	4	610		1	4			1	32					2	574				

Of the 507 establishments reported for the industry as a whole, 12, or 2.4 per cent, employed no wage earners, 62.9 per cent employed from 1 to 50 wage earners, 27 per cent employed from 51 to 250, and 7.7 per cent employed over 250.

Of the total number of wage earners, 43 per cent were reported by establishments employing more than 250 wage earners each, 31.6 per cent by establishments employing from 101 to 250 wage earners, 20.7 per cent by those employing from 21 to 100, and 4.8 per cent by those employing from 1 to 20.

**EXPENSES.**

As stated in the Introduction, the census figures for expenses do not purport to represent the total cost of manufacture, since they take no account of interest or depreciation, and consequently can not properly be used for determining profits. Facts of interest can be brought out, however, concerning the relative importance of the different classes of expenses which were reported. Table 2 shows the total reported expenses in the combined industry to have been \$80,750,525, distributed as follows: Cost of materials, \$43,764,737, or 54.2 per cent; wages, \$22,761,568, or 28.2 per cent; salaries, \$5,552,186, or 6.9 per cent; and miscellaneous expenses, made up of traveling expenses, advertising, ordinary repairs of buildings and machinery, insurance, and other sundry expenses, \$8,672,034, or 10.7 per cent. These proportions, as may be seen by comparing the figures for the different items in Table 21, vary somewhat in the several states, owing in a measure to differences in the branch of the industry which predominates.

The percentages represented by the several classes of expenses are shown for each of the three branches of the industry in Table 14.

BRANCH.	PER CENT OF TOTAL EXPENSES CONSISTING OF—			
	Cost of materials.	Salaries.	Wages.	Miscellaneous expenses.
All branches combined.....	54.2	6.9	28.2	10.7
Pianos.....	54.8	7.4	20.3	11.4
Organs.....	42.0	8.5	34.9	14.6
Piano and organ materials.....	54.8	4.4	33.3	7.5

**ENGINES, POWER, AND FUEL.**

**Engines and power.**—Table 15 shows the number of engines or other motors, according to their character,

employed in generating power (including electric motors operated by purchased current), and their total horsepower, as reported at the censuses of 1909, 1904, and 1899. It also shows separately the number and horsepower of electric motors, including those operated by current generated in the establishments using them.

POWER.	PIANO AND ORGAN INDUSTRY.								
	Number of engines or motors.			Horsepower.			Per cent distribution of horsepower.		
	1909	1904	1899	1909	1904	1899	1909	1904	1899
Primary power, total.....	1,144	539	265	41,623	30,134	20,789	100.0	100.0	100.0
Owned.....	390	329	265	35,702	27,314	19,444	85.8	90.6	93.5
Steam.....	299	263	219	33,314	25,700	18,258	80.0	85.3	87.8
Gas.....	55	37	20	1,271	741	311	3.1	2.5	1.5
Water wheels.....	30	22	24	1,015	802	872	2.4	2.7	4.2
Water motors.....	6	7	(1)	91	65	(1)	0.2	0.2	...
Other.....	.....	.....	2	11	6	3	(2)	(2)	(2)
Rented.....	754	210	(1)	5,921	2,820*	1,345	14.2	9.4	0.5
Electric.....	754	210	(1)	5,355	1,932	493	12.9	6.4	2.4
Other.....	.....	.....	.....	566	888	852	1.4	2.9	4.1
Electric motors.....	1,662	442	26	13,256	5,085	1,457	100.0	100.0	100.0
Run by current generated by establishment.....	908	232	26	7,901	3,153	904	59.6	62.0	66.2
Run by rented power.....	754	210	(1)	5,355	1,932	493	40.4	38.0	33.8

\* Not reported.

\* Less than one-tenth of 1 per cent.

The total primary power reported for the industry increased from 20,789 horsepower in 1899 to 41,623 in 1909, an increase of 20,834 horsepower, or 100.2 per cent. The greater part of the increase was in the power of steam engines. There was a considerable increase in rented electric power, which formed 12.9 per cent of the total primary power in 1909, as against 2.4 per cent in 1899. The power of gas and other internal combustion engines and of water wheels used is relatively small, and although the combined total for these forms of power increased considerably during the decade 1899-1909, their proportion of the total primary power remained practically the same. The number and horsepower of electric motors used for distributing power by means of current generated in the establishments shows a great increase during the decade.

Table 16 shows, for 1909, the amount of each of the several kinds of power and of the different kinds of fuel used in the combined industry in the 11 leading states.

Table 16

PIANO AND ORGAN INDUSTRY: 1909

STATE.	PIANO AND ORGAN INDUSTRY: 1909																
	Primary horsepower.							Electric horsepower.		Fuel used.							
	Number of establishments reporting.	Total horsepower.	Owned by establishments reporting.				Rented.		Total, rented and generated by establishment.	Generated in the establishment reporting.	Coal.		Coke (short tons).	Wood (cords).	Oil, including gasoline (barrels).	Gas (1,000 feet).	
Total.			Steam engines.	Gas engines.	Water wheels and motors.	Other.	Electric.	Other.			Anthracite (long tons).	Bituminous (short tons).					
United States.....	430	41,623	35,702	33,314	1,271	1,106	11	5,355	566	13,256	7,901	37,796	202,934	4,930	789	1,457	46,988
Connecticut.....	17	2,559	2,301	1,951	15	325	10	258	.....	1,017	759	4,185	9,955	.....	3	.....	500
Illinois.....	64	8,123	7,508	7,378	79	50	1	592	23	2,570	1,984	2,406	83,988	.....	6	403	448
Indiana.....	14	2,650	2,274	2,268	6	.....	.....	376	.....	811	435	18,761	.....	.....	25	200	.....
Maryland.....	4	613	610	385	225	.....	.....	3	.....	438	435	1,613	2,011	60	620	.....	.....
Massachusetts.....	54	4,454	4,197	3,970	52	175	.....	195	62	933	738	1,652	17,852	678	515	64	779
Michigan.....	16	2,690	2,670	2,640	.....	30	.....	2	18	369	367	88	19,414	50	.....	6	.....
New Jersey.....	15	1,121	948	940	.....	8	.....	152	21	642	490	3,110	5,125	566	10	241	98
New York.....	138	10,905	8,938	8,605	170	163	.....	1,550	417	3,184	1,634	23,062	26,120	1,338	83	19	4,673
Ohio.....	30	2,254	1,366	870	490	.....	.....	888	.....	1,180	301	7	6,061	2,284	73	33	32,776
Pennsylvania.....	24	1,260	958	819	139	.....	.....	302	.....	588	286	1,560	3,767	.....	1	.....	4,421
Vermont.....	4	1,966	1,430	1,265	.....	165	.....	536	.....	572	36	35	2,168	.....	4	.....	462
All other states.....	50	3,028	2,502	2,223	89	190	.....	501	25	937	436	78	7,712	14	34	46	2,631

Of the 507 establishments in the industry as a whole 430, or 84.8 per cent, reported power. The three leading states in the industry—New York, Illinois, and Massachusetts—together reported 56.4 per cent of the total horsepower. Steam power was the most important in all of the states for which separate figures are shown, except for Ohio, in which state rented electric power was slightly more important. Ohio led in the horsepower reported for gas and other internal combustion engines, with 39 per cent of the total.

**Fuel consumed.**—In the industry as a whole and in each of the states for which figures are given separately in the table, bituminous coal was the principal fuel used, a total of 202,934 tons being consumed in 1909. Illinois was the largest user of this fuel, consuming 83,988 tons, or 41.4 per cent of the total. New York consumed 23,062 tons of anthracite coal, or 61 per cent of the total. Ohio consumed 69.8 per cent of the gas reported for the industry.

PRODUCTS.

The special schedule used in collecting the statistics for the piano and organ industry at each of the last three censuses required a detailed statement of the number and value of the different kinds of pianos and organs manufactured. In the tables which follow, the statistics cover the instruments made in all three branches of the industry.

**Production of pianos.**—Table 17 shows the number and value of the upright and grand pianos made in the United States and in five of the leading states in 1909, 1904, and 1899, respectively.

There has been a steady increase in the number and value of both upright and grand pianos manufactured since 1899. Of the total number of pianos

reported in 1909, 97.7 per cent were uprights. Of their total value, that of the uprights represented 93.2 per cent. The total production of pianos of both kinds reported in 1909 was 374,154, valued at \$59,501,225, an increase in number of 203,143, or 118.8 per cent, and in value of \$32,498,373, or 120.4 per cent, over the totals for 1899. Upright pianos show the greater percentage of increase in number, but grand pianos show the greater percentage of increase in value.

Table 17

	Census.	PIANOS.				
		Total value.	Upright.		Grand.	
			Number.	Value.	Number.	Value.
United States....	1909	\$59,501,225	365,413	\$55,462,556	8,741	\$4,038,669
	1904	41,476,479	253,825	37,815,056	7,372	3,661,423
	1899	27,002,852	166,760	25,301,432	4,251	1,701,420
Per cent of total.	1909	100.0	97.7	93.2	2.3	6.8
	1904	100.0	97.2	91.2	2.8	8.8
	1899	100.0	97.5	93.7	2.5	6.3
Increase for decade.....		\$32,498,373	198,653	\$30,161,124	4,490	\$2,337,249
Per cent.....		120.4	119.1	119.2	105.6	137.4
Connecticut.....	1909	\$1,716,695	9,759	\$1,716,695	( <sup>2</sup> )	( <sup>2</sup> )
	1904	1,238,667	9,221	1,231,242	19	7,425
	1899	944,994	7,250	941,344	10	3,650
Illinois.....	1909	14,783,394	107,903	14,646,471	380	136,023
	1904	9,696,142	73,899	9,614,431	238	81,711
	1899	5,691,747	46,024	5,643,287	110	48,460
Massachusetts....	1909	5,328,716	25,644	4,411,927	2,533	916,789
	1904	5,129,833	20,907	4,022,237	2,159	1,107,596
	1899	3,566,662	15,872	3,177,217	937	889,446
New York.....	1909	23,771,763	137,091	21,401,242	4,298	2,370,521
	1904	16,684,911	98,491	14,819,717	3,541	1,865,194
	1899	11,862,257	69,274	10,899,392	2,581	962,865
Ohio.....	1909	1,901,294	11,118	1,778,629	229	122,665
	1904	1,855,610	11,119	1,782,910	160	72,700
	1899	1,214,068	8,696	1,150,293	166	63,775
All other states....	1909	11,999,363	73,898	11,507,592	1,301	491,771
	1904	6,871,316	40,128	6,344,519	1,255	526,797
	1899	3,723,124	19,635	3,489,899	447	233,235

<sup>1</sup> Does not include value of grand pianos. <sup>2</sup> Included in "all other states."

New York and Illinois were two the principal states in the manufacture of upright pianos at each of the three censuses covered by the table. In 1909, the number reported for these two states combined (244,994) formed 67 per cent of the total for the United States. In the manufacture of grand pianos, New York and Massachusetts were the two most important states, reporting in 1909, 6,831, or 78.1 per cent of the total number.

Table 18 shows, by states, for 1909 the number and value of the upright pianos for or with player attachments and without player attachments, of grand pianos, and of player attachments made separate.

	PIANOS AND PIANO-PLAYER ATTACHMENTS: 1909	
	Number.	Value.
<b>Pianos.....</b>	<b>374,154</b>	<b>\$59,501,225</b>
Upright.....	365,413	55,462,556
Without player attachments.....	330,918	46,187,555
Connecticut.....	7,438	1,023,254
Illinois.....	103,433	13,226,811
Indiana.....	21,204	2,781,512
Maryland.....	2,740	556,728
Massachusetts.....	25,049	4,265,061
Michigan.....	23,001	3,045,682
Minnesota.....	683	107,712
New Jersey.....	3,521	557,736
New York.....	118,174	16,777,094
Ohio.....	9,403	1,329,671
Pennsylvania.....	8,565	1,570,874
Wisconsin.....	4,685	522,475
All other states.....	3,016	422,345
For or with player attachments.....	34,495	9,275,001
Illinois.....	4,470	1,419,660
Indiana.....	1,687	537,678
Maryland.....	431	119,727
Massachusetts.....	595	146,266
Michigan.....	2,164	687,291
New York.....	18,917	4,624,148
Ohio.....	1,715	448,958
Pennsylvania.....	741	213,346
All other states.....	3,775	1,077,927
<b>Grand.....</b>	<b>18,741</b>	<b>14,038,069</b>
Illinois.....	380	136,923
Massachusetts.....	2,533	916,789
New Jersey.....	60	20,623
New York.....	4,298	2,370,521
Ohio.....	229	122,665
Pennsylvania.....	96	33,850
All other states.....	1,145	437,298
<b>Player attachments made separate from pianos.....</b>	<b>10,898</b>	<b>1,474,630</b>
Illinois.....	464	34,908
New York.....	2,789	829,405
All other states.....	7,645	610,317

<sup>1</sup> Includes a few pianos with player attachments.

Of the total number of upright pianos manufactured, 34,495, or 9.4 per cent, were for or with player attachments. The value of the instruments for or with player attachments formed 16.7 per cent of the total value of upright pianos. New York reported 18,917, or 54.8 per cent, of the upright pianos for or with player attachments.

Of the 10,898 player attachments which were not attached to pianos, 2,789, or 25.6 per cent, were reported by establishments located in New York, but the value of the attachments made in New York was more than half of the total for the country, which was \$1,474,630.

Production of organs.—Table 19 shows the number and value of the reed and the pipe organs reported for the United States and for seven of the leading states in the industry in 1909, 1904, and 1899.

	Census.	ORGANS.			
		Reed.		Pipe.	
		Number.	Value.	Number.	Value.
<b>United States.....</b>	<b>1909</b>	<b>64,111</b>	<b>\$2,595,429</b>	<b>1,224</b>	<b>\$3,713,587</b>
	1904	113,065	4,162,653	901	1,989,979
	1899	106,694	4,040,240	564	1,177,021
Per cent of total.....	1909	98.1	48.9	1.9	51.1
	1904	99.2	67.7	0.8	32.3
	1899	99.5	77.4	0.5	22.6
Increase for decade <sup>1</sup> .....		-42,583	-\$1,444,811	660	\$1,536,560
Per cent of increase <sup>1</sup> .....		-39.9	-35.8	117.0	130.5
<b>Illinois.....</b>	<b>1909</b>	<b>28,644</b>	<b>\$973,783</b>	<b>154</b>	<b>\$307,632</b>
	1904	55,619	1,739,220	140	230,323
	1899	52,307	1,668,043	87	105,157
<b>Massachusetts.....</b>	<b>1909</b>	<b>(<sup>2</sup>)</b>	<b>(<sup>2</sup>)</b>	<b>151</b>	<b>339,693</b>
	1904	2,073	150,883	137	520,887
	1899	3,323	190,582	137	365,510
<b>Michigan.....</b>	<b>1909</b>	<b>5,716</b>	<b>230,332</b>	<b>(<sup>2</sup>)</b>	<b>(<sup>2</sup>)</b>
	1904	12,381	511,009	( <sup>2</sup> )	( <sup>2</sup> )
	1899	9,624	397,198	( <sup>2</sup> )	( <sup>2</sup> )
<b>New York.....</b>	<b>1909</b>	<b>(<sup>2</sup>)</b>	<b>(<sup>2</sup>)</b>	<b>245</b>	<b>330,373</b>
	1904	( <sup>2</sup> )	( <sup>2</sup> )	58	133,471
	1899	( <sup>2</sup> )	( <sup>2</sup> )	73	216,120
<b>Ohio.....</b>	<b>1909</b>	<b>(<sup>2</sup>)</b>	<b>(<sup>2</sup>)</b>	<b>85</b>	<b>199,964</b>
	1904	1,949	94,577	137	251,486
	1899	1,643	98,572	16	25,075
<b>Pennsylvania.....</b>	<b>1909</b>	<b>(<sup>2</sup>)</b>	<b>(<sup>2</sup>)</b>	<b>82</b>	<b>192,901</b>
	1904	9,715	242,059	87	175,555
	1899	6,240	275,438	80	150,930
<b>Wisconsin.....</b>	<b>1909</b>			<b>38</b>	<b>85,223</b>
	1904			22	45,214
	1899			8	15,475
<b>All other states.....</b>	<b>1909</b>	<b>29,751</b>	<b>1,391,314</b>	<b>469</b>	<b>1,257,790</b>
	1904	35,328	1,424,305	320	633,043
	1899	33,557	1,410,407	163	298,694

<sup>1</sup> A minus sign (-) denotes decrease. <sup>2</sup> Included in "all other states."

In 1909, of the total number of reed and of pipe organs reported, 1.9 per cent were pipe organs, but of the combined value 51.1 per cent was contributed by pipe organs. In 1899, of the total number, only five-tenths of 1 per cent were pipe organs, while of the total value they contributed 22.6 per cent. In the number of reed organs there was a decrease during the decade 1899-1909 of 39.9 per cent and in their value a decrease of 35.8 per cent. For pipe organs there was an increase of 117 per cent in number and of 130.5 per cent in value.

In the manufacture of reed organs Illinois was the leading state in 1909 as in 1899, reporting 37.5 per cent and 41.3 per cent, respectively, of the total value. In the value of pipe organs manufactured Massachusetts, New York, and Illinois reported about equal amounts in 1909, Illinois showing much the largest gain from 1899 to 1909, while a decrease took place in Massachusetts.

## MANUFACTURES.

## DETAILED STATE TABLES.

The principal data secured by the census inquiry concerning the manufacture of pianos and organs and materials, other than those relating to the number and value of specific classes of instruments, are presented by states in Tables 20 and 21.

Table 20 shows, by states, for 1909, 1904, and 1899,

the number of establishments, number of persons engaged in the industry, primary horsepower, capital invested, salaries, wages, cost of materials, value of products, and value added by manufacture.

Table 21 gives more detailed statistics for the industry, by states, for 1909.

## MUSICAL INSTRUMENTS, PIANOS AND ORGANS AND MATERIALS—COMPARATIVE STATISTICS, BY STATES: 1909, 1904, AND 1899.

STATE.	Census.	Number of establishments.	PERSONS ENGAGED IN INDUSTRY.				Primary horsepower.	Capital.	Salaries.	Wages.	Cost of materials.	Value of products.	Value added by manufacture (value of products less cost of materials).
			Total.	Proprietors and firm members.	Salariéd employees.	Wage earners (average number).							
Expressed in thousands.													
United States.....	1909	507	41,882	297	3,565	38,020	41,623	\$103,234	\$5,552	\$22,762	\$43,765	\$89,790	\$46,025
	1904	444	36,104	303	2,722	33,081	30,134	68,482	3,728	18,527	27,987	66,093	38,106
	1899	390	23,217	390	1,518	21,309	20,789	43,810	2,015	11,543	17,371	41,024	23,653
California.....	1909	11	78	9	12	57	53	189	14	60	41	150	109
	1904	12	133	9	19	105	174	351	19	86	69	208	139
	1899	8	44	7	2	35	10	78	2	26	20	76	56
Connecticut.....	1909	17	2,469	5	160	2,304	2,559	5,627	312	1,251	3,022	5,538	2,516
	1904	17	2,715	6	126	2,583	2,224	5,226	240	1,337	2,402	5,273	2,871
	1899	15	1,953	6	84	1,863	2,000	3,586	146	890	1,570	3,396	1,820
Illinois.....	1909	68	9,628	18	833	8,777	8,123	27,719	1,215	5,009	8,642	19,176	10,534
	1904	56	8,205	18	739	7,508	6,809	16,471	886	3,932	5,398	13,323	7,925
	1899	45	5,092	33	389	4,670	4,424	11,166	486	2,392	3,323	8,156	4,833
Indiana.....	1909	15	1,985	4	314	1,667	2,650	4,270	462	994	1,703	3,686	1,983
	1904	12	1,420	3	180	1,237	2,346	2,617	187	630	884	2,270	1,386
	1899	5	496	4	63	429	220	857	51	235	363	814	451
Kentucky.....	1909	6	370	4	23	343	796	655	32	222	272	588	316
	1904	6	381	6	15	300	478	424	19	188	244	505	261
	1899	4	50	4	3	43	140	118	1	22	71	112	41
Maryland.....	1909	7	833	8	68	757	613	2,301	82	464	566	1,466	900
	1904	8	725	13	67	645	689	1,742	127	356	244	1,389	1,145
	1899	9	574	10	41	523	553	1,253	47	263	404	942	638
Massachusetts.....	1909	59	4,681	33	403	4,245	4,454	11,632	900	2,668	4,149	9,106	4,957
	1904	55	4,500	37	292	4,171	3,381	8,306	429	2,488	3,114	8,279	5,165
	1899	61	3,433	57	201	3,175	2,757	7,007	318	1,903	2,302	6,172	3,870
Michigan.....	1909	17	1,963	8	176	1,779	2,690	5,384	299	1,075	2,009	4,226	2,217
	1904	13	1,167	14	84	1,069	1,310	2,364	113	537	750	1,984	1,234
	1899	11	827	4	63	700	812	1,212	69	378	474	1,180	706
Minnesota.....	1909	5	172	3	26	143	153	619	20	100	126	294	168
	1904	13	27	3	1	23	26	28	1	16	28	55	27
	1899	23	42	3	4	35	6	68	3	12	26	53	27
New Jersey.....	1909	18	1,500	6	101	1,393	1,121	2,020	129	721	1,076	2,229	1,153
	1904	14	1,181	6	65	1,110	1,400	1,522	77	500	657	1,477	820
	1899	15	850	16	71	763	745	1,407	44	300	563	1,332	769
New York.....	1909	184	13,102	117	1,047	11,938	10,905	33,019	1,870	7,752	17,495	33,680	16,185
	1904	160	10,573	133	826	9,614	6,569	21,023	1,256	5,925	10,950	23,390	12,440
	1899	135	7,393	153	439	6,801	6,207	13,107	641	3,903	6,503	14,746	8,183
Ohio.....	1909	30	1,987	16	130	1,841	2,254	3,593	172	1,092	1,922	3,926	2,004
	1904	26	2,336	10	116	2,210	2,153	3,357	150	1,205	1,925	3,684	2,059
	1899	18	844	20	53	771	1,008	1,349	61	358	710	1,451	741
Pennsylvania.....	1909	30	1,331	21	128	1,182	1,260	3,158	165	505	1,248	2,382	1,134
	1904	28	1,110	20	82	1,008	877	2,286	104	525	646	1,757	1,111
	1899	31	807	36	64	707	787	1,389	91	415	613	1,488	875
Vermont.....	1909	4	654	.....	44	610	1,966	1,077	65	327	402	1,268	866
	1904	3	433	.....	31	402	455	1,443	44	195	187	605	418
	1899	3	322	.....	16	306	.....	623	30	147	140	411	271
Wisconsin.....	1909	11	443	26	48	369	339	754	54	202	490	893	403
	1904	3	92	3	5	84	37	41	4	45	120	184	64
	1899	3	18	3	.....	15	14	25	.....	7	6	18	12
All other states.....	1909	25	686	19	52	615	1,687	1,217	61	320	602	1,182	580
	1904	28	1,048	22	74	952	1,206	1,281	72	502	669	1,710	1,041
	1899	24	472	34	25	413	1,150	510	25	172	223	677	454

<sup>1</sup> Excluding statistics for 2 establishments, to avoid disclosure of individual operations.

<sup>2</sup> Excluding statistics for 1 establishment, to avoid disclosure of individual operations.

<sup>3</sup> Excluding statistics for 3 establishments, to avoid disclosure of individual operations.

THE MANUFACTURE OF MUSICAL INSTRUMENTS.

MUSICAL INSTRUMENTS, PIANOS AND ORGANS AND MATERIALS—DETAILED STATISTICS BY STATES: 1909.

**Table 21**

STATE.	Number of establishments.	PERSONS ENGAGED IN INDUSTRY.							WAGE EARNERS—DEC. 15, OR NEAREST REPRESENTATIVE DAY.						Primary horsepower.
		Total.	Proprietors and firm members.	Salaried officers, superintendents, and managers.	Clerks.		Wage earners.			Total.	16 and over.		Under 16.		
					Male.	Female.	Average number.	Number, 15th day of—			Male.	Female.	Male.	Female.	
								Maximum month.	Minimum month.						
United States...	507	41,882	297	1,081	1,788	696	38,020	De 40,011	Jy 36,269	40,373	37,527	2,098	571	177	41,623
California.....	11	78	9	8	2	2	57	Ja 74	Se 49	55	55				53
Connecticut.....	17	2,469	5	60	72	28	2,304	Oc 2,378	Jy 2,188	2,297	1,933	309	34	21	2,559
Illinois.....	68	9,628	18	199	455	179	8,777	Oc 9,293	Ja 8,341	9,187	8,361	503	264	59	8,123
Indiana.....	15	1,985	4	44	231	39	1,607	My 1,738	Jy 1,613	1,753	1,689	64			2,650
Iowa.....	4	68	3	4	5		56	Mh 66	My 47	58	64	4			51
Kentucky.....	6	370	4	10	9	4	343	De 305	Au 313	394	382	8	3	1	796
Maine.....	3	26	1	2	2	1	20	De 27	Ap 10	27	27				135
Maryland.....	7	833	8	12	43	13	757	De 792	Ja 721	792	741	12	39		613
Massachusetts.....	59	4,681	33	137	195	71	4,245	De 4,512	Jy 4,037	4,553	4,185	237	32	79	4,454
Michigan.....	17	1,963	8	54	97	25	1,770	De 1,956	Ja 1,641	1,967	1,892	55	10		2,690
Minnesota.....	5	172	3	9	9		143	De 167	Jy 131	167	166	1			153
New Jersey.....	18	1,500	6	28	33	40	1,393	Mh 1,436	Au 1,325	1,468	1,253	204	2	9	1,121
New York.....	184	13,102	117	359	472	216	11,938	De 12,705	Jy 11,131	12,878	12,181	556	133	8	10,905
Ohio.....	30	1,987	16	55	53	22	1,841	Oc 1,953	Jy 1,716	1,929	1,846	81	2		2,254
Pennsylvania.....	30	1,331	21	53	59	16	1,182	De 1,264	Jy 1,060	1,262	1,206	16	40		1,260
Vermont.....	4	654		9	23	12	610	Ja 635	Au 577	580	563	17			1,966
Wisconsin.....	11	443	26	21	15	12	369	Se 407	Mh 298	387	371	8	8		839
All other states <sup>1</sup> .....	18	592	15	17	13	8	539			620	622	3	4		1,501

STATE.	Capital.	EXPENSES.										Value of products.	Value added by manufacture (value of products less cost of materials).
		Total.	Services.			Materials.		Miscellaneous.					
			Officials.	Clerks.	Wage earners.	Fuel and rent of power.	Other.	Rent of factory.	Taxes, including internal revenue.	Contract work.	Other.		
United States...	\$103,234,301	\$80,750,525	\$3,047,625	\$2,504,561	\$22,761,568	\$737,500	\$43,027,237	\$907,360	\$423,964	\$292,907	\$7,047,803	\$39,789,544	\$46,024,807
California.....	189,183	135,999	12,301	1,485	60,403	2,194	38,776	4,976	845		15,019	150,308	109,338
Connecticut.....	5,626,585	4,984,149	201,612	110,483	1,251,393	56,768	2,964,983	16,546	22,189	7,731	352,444	5,538,018	2,516,267
Illinois.....	27,718,851	16,686,065	631,455	533,811	5,009,042	158,028	8,484,403	89,168	95,084	14,144	1,620,930	19,176,328	10,539,897
Indiana.....	4,266,762	3,522,884	121,606	349,265	993,609	44,158	1,658,881	5,391	12,170	300	346,504	3,685,962	1,982,023
Iowa.....	126,166	111,394	7,145	5,700	34,260	2,304	49,480	2,705	32	597	9,171	93,225	41,441
Kentucky.....	654,553	550,968	21,224	10,839	221,993	5,543	266,192	240	3,385		21,552	538,352	316,617
Maine.....	85,496	37,800	1,872	1,728	10,283	351	18,368	228	199		4,741	43,274	24,525
Maryland.....	2,301,096	1,260,845	37,875	43,799	463,631	10,304	556,110	1,980	16,214	38	130,894	1,466,344	890,930
Massachusetts.....	11,632,136	8,309,051	337,738	262,015	2,667,970	93,371	4,055,885	141,758	68,481	3,557	678,276	9,106,470	4,957,214
Michigan.....	5,384,400	3,821,211	143,279	156,089	1,075,304	38,609	1,970,866	8,530	22,419		406,115	4,226,266	2,219,791
Minnesota.....	618,547	288,427	13,514	6,978	99,546	6,380	120,059	495	1,226		40,229	294,452	168,013
New Jersey.....	2,019,925	2,141,486	65,962	62,605	720,594	24,766	1,051,307	26,700	7,647	24,994	156,911	2,229,145	1,153,072
New York.....	33,019,385	30,567,168	1,150,241	719,776	7,752,487	212,493	17,282,254	523,982	138,210	216,916	2,570,809	33,679,953	16,185,206
Ohio.....	3,593,177	3,549,176	111,593	60,562	1,092,113	30,944	1,891,439	53,606	19,209	1,985	287,525	3,925,767	2,003,374
Pennsylvania.....	3,157,965	2,117,165	104,161	61,249	505,343	21,104	1,227,241	17,827	3,293	1,151	175,796	2,381,849	1,133,504
Vermont.....	1,076,652	937,887	21,450	43,217	326,641	13,452	388,485	1,760	3,147	21,000	118,735	1,267,566	866,629
Wisconsin.....	753,643	820,820	34,647	19,594	202,223	9,373	480,788	8,100	4,228	394	61,473	892,957	492,796
All other states <sup>1</sup> .....	1,006,779	908,030	29,950	14,366	274,733	7,328	521,720	3,168	5,986	100	50,670	1,043,318	514,270

<sup>1</sup> All other states embrace: Colorado, 1 establishment; Delaware, 1; Kansas, 1; Missouri, 5; New Hampshire, 4; North Carolina, 1; Rhode Island, 1; Tennessee, 1; Virginia, 1; Washington, 2.

THE MANUFACTURE OF MUSICAL INSTRUMENTS AND MATERIALS, OTHER THAN PIANOS AND ORGANS.

The establishments assigned to this branch of the musical instrument industry are those engaged chiefly in the manufacture of various kinds of musical instruments other than pianos and organs, or of materials for such instruments. The instruments made include cornets, trombones, tubas, and other brass instruments for band and orchestral use, cymbals, drums, xylophones, castanets, dulcimers, harps, lyres, guitars, lutes, banjos, mandolins, zithers, violins, violoncellos,

flutes, flageolets, piccolos, etc., and parts of such instruments. Separate totals as to the number and value of any of the several classes of instruments were not secured. The industry is shown in Volumes VIII and IX of the Thirteenth Census Reports under the designation "Musical instruments and materials, not specified."

Table 22 summarizes the statistics for the industry as reported at each census from 1869 to 1909, inclusive.

	Number or amount.						Per cent of increase. <sup>1</sup>					
	1909	1904	1899	1889	1879	1869	1899-1909	1904-1909	1899-1904	1889-1899	1879-1889	1869-1879
	Number of establishments.....	187	181	229	293	84	83	-18.3	3.3	-21.0	-21.8	248.8
Persons engaged in the industry.....	2,269	2,554	2,799	( <sup>2</sup> )	( <sup>2</sup> )	( <sup>2</sup> )	-18.9	-11.2	-8.8	.....	.....	.....
Proprietors and firm members.....	187	190	236	( <sup>2</sup> )	( <sup>2</sup> )	( <sup>2</sup> )	-20.8	-1.6	-19.5	.....	.....	.....
Salaried employees.....	260	225	158	( <sup>2</sup> )	( <sup>2</sup> )	( <sup>2</sup> )	64.6	15.6	42.4	.....	.....	.....
Wage earners (average number).....	1,822	2,139	2,405	1,056	573	1,059	-24.2	-14.8	-11.1	127.7	( <sup>3</sup> )	( <sup>3</sup> )
Primary horsepower.....	1,423	1,003	1,417	696	( <sup>2</sup> )	562	0.4	-11.2	13.1	103.6	.....	.....
Capital.....	\$3,297,609	\$3,743,469	\$3,896,101	\$1,329,329	\$654,850	\$1,351,600	-15.4	-11.9	-3.9	193.1	103.0	-51.6
Expenses.....	2,647,477	2,970,696	2,850,214	1,551,329	( <sup>2</sup> )	( <sup>2</sup> )	-7.1	-10.9	4.2	83.7	.....	.....
Services.....	1,335,128	1,413,834	1,373,784	862,177	293,062	631,634	-2.8	-5.6	2.9	50.3	194.2	-53.6
Salaries.....	342,853	251,766	141,745	( <sup>2</sup> )	( <sup>2</sup> )	( <sup>2</sup> )	141.9	36.2	77.6	.....	.....	.....
Wages.....	992,275	1,162,068	1,232,039	( <sup>2</sup> )	( <sup>2</sup> )	( <sup>2</sup> )	-19.5	-14.6	-5.7	.....	.....	.....
Materials.....	889,600	1,129,939	1,205,337	510,604	335,776	932,657	-26.2	-21.3	-6.3	136.0	32.4	-58.6
Miscellaneous.....	422,749	426,823	271,093	178,488	( <sup>2</sup> )	( <sup>2</sup> )	55.9	1.0	57.4	51.9	.....	.....
Value of products.....	3,228,108	3,481,710	3,394,734	1,888,613	853,746	2,019,464	-4.9	-7.3	2.6	79.7	121.2	-57.7
Value added by manufacture (value of products less cost of materials).....	2,338,508	2,351,771	2,189,397	1,377,949	467,970	1,086,807	6.8	-0.6	7.4	58.9	194.4	-56.9

<sup>1</sup> A minus sign (-) denotes decrease. Where percentages are omitted comparable figures are not available.  
<sup>2</sup> Comparable figures not available. <sup>3</sup> Figures not strictly comparable.

The value of products for this branch of the musical instrument industry does not show a very general increase from census to census. The value in 1879 was 57.7 per cent less, and that in 1889 was 6.5 per cent less, than the value of products in 1869. The value in 1909 was 7.3 per cent less than that in 1904, and 4.9 per cent less than that in 1899. During the first half of the decade ending with 1909 there was considerable decrease in the number of establishments, accompanied by smaller decreases in the number of persons employed, capital invested, wages paid, and cost of materials, and an increase in the salaries, miscellaneous expenses, value of products, and value added by

manufacture. During the last half of the decade there was a decrease in all of the items except the number of establishments, number of salaried employees, and salaries.

Table 23 gives more detailed statistics for the industry in the United States and for the different states as reported for 1909. New Jersey, Illinois, and Indiana, in the order named, were the leading states in the industry as measured by value of products, each of these states reporting about one-fifth of the total value of products for the United States, and the three together reporting 58.1 per cent of the total. New York ranked fourth in value of products for the industry.

THE MANUFACTURE OF MUSICAL INSTRUMENTS.

523

MUSICAL INSTRUMENTS AND MATERIALS, NOT SPECIFIED—DETAILED STATISTICS, BY STATES: 1909.

**Table 23**

STATE.	Number of establishments.	PERSONS ENGAGED IN INDUSTRY.							WAGE EARNERS—DEC. 15, OR NEAREST REPRESENTATIVE DAY.						Primary horsepower.
		Total.	Proprietors and firm members.	Salaried officers, superintendents, and managers.	Clerks.		Average number.	Wage earners.		Total.	16 and over.		Under 16.		
					Male.	Female.		Number, 15th day of—			Male.	Female.	Male.	Female.	
								Maximum month.	Minimum month.						
United States.....	187	2,269	187	89	87	84	1,822	De 1,957	Ja 1,749	1,963	1,726	212	21	4	1,423
California.....	5	14	6	.....	.....	.....	8	Ja <sup>1</sup> 8	Jy <sup>1</sup> 8	9	9	.....	.....	.....	.....
Connecticut.....	3	5	3	.....	.....	.....	2	Ja <sup>1</sup> 2	Jy <sup>1</sup> 2	2	2	.....	.....	.....	4
Illinois.....	30	425	35	19	20	15	336	No 383	Jy 290	370	351	11	8	.....	208
Indiana.....	9	420	6	11	10	12	300	My 402	Ja 360	398	344	51	3	.....	216
Iowa.....	4	4	4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Massachusetts.....	18	193	17	7	5	10	154	No <sup>2</sup> 170	Ja <sup>2</sup> 136	170	140	27	3	.....	213
New Jersey.....	9	211	9	18	12	13	150	Ap <sup>2</sup> 163	Au 154	158	150	8	.....	.....	161
Minnesota.....	3	5	3	.....	.....	.....	2	Ja <sup>1</sup> 2	Jy <sup>1</sup> 2	2	2	.....	.....	.....	10
Missouri.....	4	14	3	3	.....	.....	8	My <sup>3</sup> 8	Ja <sup>3</sup> 7	8	8	.....	.....	.....	2
New York.....	7	435	5	13	18	14	385	De 442	Fe 350	442	341	92	5	4	335
Ohio.....	52	360	51	11	15	11	272	De 296	Je 260	297	274	23	.....	.....	176
Pennsylvania.....	8	63	8	1	3	4	47	My <sup>3</sup> 50	Ja <sup>3</sup> 44	46	46	.....	.....	.....	49
Washington.....	19	87	18	6	4	5	54	Oc 61	Ja 34	57	55	.....	2	.....	43
Wisconsin.....	5	6	6	.....	.....	.....	2	Ja <sup>2</sup> 2	Jy <sup>2</sup> 2	2	2	.....	.....	.....	1
All other states <sup>4</sup> .....	4	7	8	.....	.....	.....	3	.....	.....	2	2	.....	.....	.....	5

STATE.	Capital.	EXPENSES.										Value of products.	Value added by manufacture (value of products less cost of materials).
		Total.	Services.			Materials.		Miscellaneous.					
			Officials.	Clerks.	Wage earners.	Fuel and rent of power.	Other.	Rent of factory.	Taxes, including internal revenue.	Contract work.	Other.		
United States.....	\$3,297,669	\$2,647,477	\$251,702	\$91,151	\$992,275	\$38,447	\$851,153	\$73,815	\$12,494	\$14,990	\$321,450	\$3,223,108	\$2,338,508
California.....	10,220	10,897	.....	.....	6,534	36	2,965	812	109	.....	441	16,108	13,107
Connecticut.....	5,100	4,976	.....	.....	1,092	122	3,194	96	31	.....	441	10,850	7,534
Illinois.....	511,662	502,478	36,041	21,206	200,606	8,797	169,675	18,500	2,192	72	45,389	629,163	450,691
Indiana.....	603,640	562,454	110,394	12,756	208,479	7,684	100,046	1,725	2,481	.....	118,889	610,081	502,351
Iowa.....	3,925	1,211	.....	.....	.....	35	590	361	11	.....	214	6,234	5,609
Massachusetts.....	168,359	214,205	10,265	7,002	80,872	2,810	81,956	10,182	592	3,702	16,824	259,781	175,015
Michigan.....	179,151	193,123	22,566	12,768	83,960	3,212	37,246	1,781	1,310	.....	30,280	223,071	182,613
Minnesota.....	2,294	2,760	.....	.....	1,577	117	517	396	23	.....	130	4,405	3,771
Missouri.....	26,880	19,142	4,311	.....	4,885	219	7,901	980	49	.....	797	24,973	16,853
New Jersey.....	1,032,920	500,888	40,962	13,005	180,502	5,114	202,957	456	3,607	78	54,207	635,209	427,138
New York.....	450,712	463,489	17,422	16,396	153,632	7,052	204,115	28,672	1,182	6,789	28,229	569,985	358,818
Ohio.....	74,145	59,608	1,125	4,329	32,604	1,023	7,071	1,054	395	1,559	10,448	80,884	72,790
Pennsylvania.....	201,057	92,861	8,616	3,689	32,404	1,922	24,086	5,742	394	2,790	13,158	115,118	89,110
Washington.....	6,404	2,532	.....	.....	.....	.....	1,408	842	14	.....	268	9,995	8,587
Wisconsin.....	6,130	4,982	.....	.....	1,980	42	2,469	360	8	.....	123	11,241	8,730
All other states <sup>4</sup> .....	15,070	11,871	.....	.....	3,088	262	4,957	1,856	96	.....	1,612	21,010	15,791

<sup>1</sup> Same number reported throughout the year. <sup>2</sup> None reported throughout the year. <sup>3</sup> Same number reported for one or more other months. <sup>4</sup> All other states embrace: Colorado, 1 establishment; Georgia, 1; Kentucky, 2; Maine, 1; Maryland, 1; Utah, 1.

## THE PHONOGRAPH AND GRAPHOPHONE INDUSTRY.

The establishments assigned to this industry were engaged chiefly in the manufacture of phonographs or graphophones for either disk or cylinder records, including those for office dictation. The classification also includes the manufacture of records, blanks, horns, needles, or other supplies and materials used in the industry.

Table 24 summarizes the statistics for the manufacture of phonographs and graphophones as reported at the censuses of 1909, 1904, and 1899.

	PHONOGRAPHS AND GRAPHOPHONES.				
	Number or amount.			Per cent of increase. <sup>1</sup>	
	1909	1904	1899	1904-1909	1899-1904
Number of establishments.....	18	14	11	28.6	27.3
Persons engaged in the industry.....	5,928	3,940	1,415	50.5	178.4
Proprietors and firm members.....	2	6	4	-66.7	50.0
Salaried employees.....	727	537	144	35.4	272.9
Wage earners (average number).....	5,199	3,397	1,267	53.0	168.1
Primary horsepower.....	6,371	2,522	1,052	152.6	133.1
Capital.....	\$14,363,361	\$8,740,618	\$3,348,282	64.3	161.0
Expenses.....	9,388,735	8,165,230	1,830,565	15.0	346.1
Services.....	3,785,766	2,350,392	737,635	61.1	198.4
Salaries.....	945,203	686,459	179,145	41.8	272.0
Wages.....	2,840,563	1,663,933	608,490	68.7	176.7
Materials.....	3,099,361	4,161,136	827,529	-25.5	462.8
Miscellaneous.....	2,503,578	1,663,762	215,401	51.4	667.8
Value of products.....	11,725,996	10,237,075	2,246,274	14.5	355.7
Value added by manufacture (value of products less cost of materials).....	8,626,605	6,075,939	1,418,745	42.0	328.3

<sup>1</sup> A minus sign (-) denotes decrease.

No statistics are given for the industry in census reports prior to 1899; at that census there were only two establishments reported, and therefore the data were not shown separately. Each census since 1899 has shown an increase in the manufacture of phonographs and graphophones, but by far the greater development occurred during the five-year period 1899-1904, when there was an increase of 2,525, or 178.4 per cent, in the number of persons engaged in the industry, and of \$7,990,801, or 355.7 per cent, in the value of products. While there was an increase of only 7 in the number of establishments during the decade, the number of persons engaged in the industry in 1909 was more than four times and the value of products more than five times as great as the corresponding figures for 1899. In 1909, 16 of the 18 establishments were operated by corporations.

Table 25 gives in greater detail the statistics for the industry as reported for 1909. Pennsylvania is the only state for which the statistics could be given separately without disclosing the operations of individual establishments, and as Pennsylvania is not one

of the leading states in the industry, it has not been deemed worth while to present data in detail for this state. The value of the products of the three establishments in Pennsylvania in 1909 was \$134,659, or only 1.1 per cent of the total for the country. New Jersey is by far the leading state in the industry, as measured by value of products, followed by Connecticut and New York in the order named.

**Table 25**

	United States.
Number of establishments.....	18
Persons engaged in the industry.....	5,928
Proprietors and firm members.....	2
Salaried officers, superintendents, and managers.....	106
Clerks.....	621
Male.....	404
Female.....	217
Wage earners (average number).....	5,199
Number, 15th day of month:	
Maximum—	
Month.....	January.
Number.....	6,524
Minimum—	
Month.....	September.
Number.....	4,409
Wage earners—Dec. 15, or nearest representative day.....	5,996
16 and over.....	5,931
Male.....	5,249
Female.....	682
Under 16.....	65
Male.....	31
Female.....	34
Primary horsepower.....	6,371
Capital.....	\$14,363,361
Expenses.....	9,388,735
Services.....	3,785,766
Officials.....	477,041
Clerks.....	468,222
Wage earners.....	2,840,563
Materials.....	3,099,361
Fuel and rent of power.....	118,693
Other.....	2,980,698
Miscellaneous.....	2,503,578
Rent of factory.....	18,112
Taxes, including internal revenue.....	32,476
Contract work.....	259
Other.....	2,452,732
Value of products.....	11,725,996
Value added by manufacture (value of products less cost of materials).....	8,626,605

Of the total number of persons engaged in the industry, 5,199, or 87.7 per cent, were wage earners; 621, or 10.5 per cent, clerks, a class which includes other subordinate salaried employees; and 108, or 1.8 per cent, proprietors and officials. Of the number of wage earners reported on December 15, or the nearest representative day, 88.1 per cent were males and 11.9 per cent females. The number of wage earners under 16 years of age represented but 1.1 per cent of the total. January was the month of maximum and September that of minimum employment, the number shown for the latter month being equal to 67.6 per cent of the number for the former month.

The total expenses reported for the phonograph and graphophone industry amounted to \$9,388,735, of which 33 per cent represented the cost of materials, 30.3 per cent wages, 10.1 per cent salaries, and 26.7 per cent miscellaneous expenses.

Table 26 shows the number of establishments that manufactured each kind of product for which separate statistics were reported at the census of 1909.

CLASS OF PRODUCT.	Number of establishments.
Total.....	18
Phonographs or graphophones only.....	1
Phonographs or graphophones and records and blanks.....	1
Phonographs or graphophones and other products.....	3
Phonographs or graphophones, records and blanks, and other products.....	3
Records and blanks only.....	3
Disk records only.....	1
Cylinder records only.....	1
Cylinder records and blanks.....	1
Other products (including parts and supplies).....	7

Of the 18 establishments in the industry, 8 reported the manufacture of phonographs or graphophones, some of which also made other products of the industry; 3 made records and blanks only; and 7 reported the manufacture of parts, supplies, etc.

Table 27 shows for 1909 the number and value of such of the products as it is practicable to present without disclosing the operations of individual concerns.

PRODUCT.	PHONOGRAPHS AND GRAPHOPHONES: 1909	
	Number.	Value.
Total.....		\$11,725,996
Phonographs and graphophones.....	344,631	5,406,684
For disk records.....	191,990	3,224,720
For cylinder records and office dictation.....	152,691	2,181,964
Records and blanks.....	27,183,959	5,007,104
Disk records.....	8,572,805	2,567,717
Cylinder records and blanks.....	18,611,154	2,439,387
All other products.....		1,312,208

In addition to the products shown in Table 27, which were valued at \$11,725,996, similar products to

the value of \$31,889 were manufactured in establishments engaged primarily in other industries. On the other hand, a few of the 18 establishments in the industry "phonographs and graphophones" also manufactured other products, such as fire extinguishers and electrical supplies.

Of the total value of products reported for the industry in 1909, \$11,725,996, the value of complete instruments formed \$5,406,684, or 46.1 per cent, and that of records and blanks \$5,007,104, or 42.7 per cent. The remainder, \$1,312,208, or 11.2 per cent, represented for the most part horns, needles, matrices, and other supplies used in the manufacture or operation of the instruments.

The records and blanks, parts, and supplies are frequently sold to establishments that manufacture the complete instruments. In such cases the value of the parts and supplies are duplicated in the total value of products.

At the censuses of 1904 and 1899 separate totals were shown only for the value of the completed instruments, records and blanks, and of all other products. In Table 28 these values are placed in comparison with the totals for the same items reported in 1909.

	VALUE.			
	1909	1904	1899	Per cent of increase: 1899-1909
Total.....	\$11,725,996	\$10,237,075	\$2,246,274	422.0
Phonographs and graphophones.....	5,406,684	2,966,343	1,240,503	335.8
Records and blanks.....	5,007,104	4,678,547	539,370	828.3
All other products.....	1,312,208	2,592,185	466,401	181.3

---

---

# CHEMICALS

---

---

# THE MANUFACTURE OF CHEMICALS AND ALLIED INDUSTRIES.

## INTRODUCTION.

The first special report on the manufacture of chemicals and allied products issued by the Bureau of the Census was that presented in connection with the reports of the census of manufactures for 1879. This report, like those for succeeding censuses, covered the operations of establishments engaged in the manufacture of acids, sodas, potashes, alums, glycerin, dyestuffs and tanning materials, explosives, fertilizers, pigments, wood distillation products, salts, and certain elementary substances, such as bromine and phosphorus, and in addition, embraced the statistics for establishments engaged primarily in the manufacture of soap, candles, castor oil, glucose, and sulphur, which have not been included in the reports for subsequent censuses. At the census of 1889, the manufacture of pharmaceutical preparations and of paint and varnish were added to the group of industries covered by the special report, and at the census of 1899, the manufacture of essential oils and of bone, ivory, and lamp black were added, while the manufacture of pharmaceutical preparations was dropped from the group.

Tables 1 and 2 of the present report cover practically the same ground as those for 1904 and 1899, containing statistics for nine separate industries, according to the classification employed by the Bureau of the Census, taken together, and for each individual industry separately, as follows:

- The general chemical industry.
- The manufacture of sulphuric, nitric, and mixed acids.
- Wood distillation.
- The paint and varnish industry.
- The fertilizer industry.
- The manufacture of explosives.
- The manufacture of dyestuffs and extracts.
- The manufacture of essential oils.
- The manufacture of bone, carbon, and lamp black.

Separate reports containing detailed statistics are presented for each of the nine industries.

### SUMMARY FOR THE NINE INDUSTRIES.

Comparison with earlier censuses for the group as a whole.—Table 1 summarizes the statistics of the nine industries covered by this report for the censuses of 1909, 1904, and 1899.

The number of establishments in the nine industries

combined increased from 1,691 in 1899 to 2,140 in 1909, or 26.6 per cent, and the number of wage earners employed from 46,700 to 70,426, or 50.8 per cent. The value of products for the combined industries necessarily involves a considerable amount of duplication, because of the use of the products of establishments in some industries as material for establishments in others. The amount of this duplication may vary materially at different censuses, and for this reason the increase in the value added by manufacture (value of products less cost of materials) is a better measure of the growth of the industries than that in the value of products. The value added by manufacture was \$166,968,565 in 1909, as compared with \$78,488,032 in 1899, an increase of \$88,480,533, or 112.7 per cent for the decade. Although the absolute increase in value of products during the 10 years (\$222,578,464) was much greater than that in value added by manufacture, the relative increase, 109.9 per cent, was slightly less.

	Number or amount.			Per cent of increase.		
	1909	1904	1899	1899-1909	1904-1909	1899-1904
	Number of establishments.....	2,140	1,785	1,691	26.6	19.9
Persons engaged in the industries.....	88,097	71,448	( <sup>1</sup> )	.....	23.3	.....
Proprietors and firm members.....	1,155	1,125	( <sup>1</sup> )	.....	2.7	.....
Salaried employees ..	16,516	11,142	8,602	92.0	48.2	29.5
Wage earners (average number).....	70,426	59,181	46,700	50.8	19.0	26.7
Primary horsepower.....	398,880	280,765	191,489	108.3	42.1	46.6
Capital.....	\$483,729,410	\$323,891,131	\$238,471,290	102.8	49.3	35.8
Expenses.....	359,425,126	247,107,481	171,963,827	109.0	45.5	43.7
Services.....	62,700,787	44,508,161	33,122,930	89.3	40.9	34.4
Salaries.....	24,042,566	15,007,298	11,339,595	112.0	60.2	32.3
Wages.....	38,658,201	29,500,863	21,783,335	77.5	31.0	35.4
Materials.....	258,115,975	176,344,680	124,018,044	108.1	46.4	42.2
Miscellaneous.....	35,608,384	26,254,640	14,822,853	160.5	47.1	77.1
Value of products.....	425,084,540	282,077,616	202,506,076	109.9	50.7	39.3
Value added by manufacture (value of products less cost of materials).....	166,968,565	105,732,936	78,488,032	112.7	57.9	34.7

<sup>1</sup> Figures not available.

Summary, by industries.—Table 2 presents for 1909 a summary of the statistics of the several industries constituting the group as a whole.

Table 2	CHEMICALS AND ALLIED INDUSTRIES: 1909									
	Total.	Chemicals.	Sulphuric, nitric, and mixed acids.	Wood distillation, not including turpentine and rosin.	Paint and varnish.	Fertilizers.	Explosives.	Dyestuffs and extracts.	Essential oils.	Bone, carbon, and lamp black.
Number of establishments.....	2,140	349	42	120	791	550	86	107	68	27
Persons engaged in the industries..	88,097	27,791	2,582	3,095	21,890	21,950	7,058	3,015	408	302
Proprietors and firm members.....	1,155	154	.....	56	456	323	21	65	73	7
Salaried employees.....	16,516	3,923	330	318	7,200	3,317	763	553	45	67
Wage earners (average number).....	70,426	23,714	2,252	2,721	14,240	18,310	6,274	2,397	290	228
Primary horsepower.....	398,880	208,604	6,494	9,854	56,162	64,711	28,601	22,213	1,218	1,023
Capital.....	\$483,729,410	\$155,143,739	\$18,726,195	\$13,017,192	\$103,994,908	\$121,537,451	\$50,167,976	\$17,934,545	\$1,365,438	\$1,841,966
Expenses.....	359,425,126	93,931,193	8,347,722	8,473,558	111,202,408	90,101,293	31,460,284	13,492,987	1,522,171	833,510
Services.....	62,700,767	20,221,089	2,045,894	1,818,059	18,649,074	11,882,815	5,437,976	2,233,705	184,495	227,660
Salaries.....	24,042,566	6,136,588	551,000	355,211	10,378,361	4,405,636	1,133,606	942,326	61,505	78,333
Wages.....	38,658,201	14,084,501	1,494,894	1,462,848	8,270,713	7,477,179	4,304,370	1,291,379	122,990	149,327
Materials.....	258,115,975	64,121,536	5,385,828	5,875,851	79,015,555	69,521,920	22,811,548	9,683,651	1,255,478	444,608
Miscellaneous.....	38,608,384	9,648,568	916,000	779,648	13,537,779	8,696,558	3,210,760	1,575,631	82,198	161,242
Value of products.....	425,084,540	117,638,887	9,834,057	9,736,998	124,889,422	103,960,213	40,139,661	15,954,574	1,737,234	1,093,494
Value added by manufacture (value of products less cost of materials).....	166,968,565	53,567,351	4,498,229	3,861,147	45,873,867	34,438,293	17,328,113	6,270,923	481,756	648,886

"Chemicals" was the leading branch in number of wage earners, reporting 33.7 per cent of the total for the combined chemical industry, followed by "fertilizers" and "paint and varnish," with 26 per cent and 20.2 per cent, respectively. Paint and varnish led in value of products with 29.4 per cent of the total for the industry as a whole, followed by chemicals and fertilizers with 27.7 per cent and 24.5 per cent, re-

spectively. In value added by manufacture, "chemicals" is first with 32.1 per cent of the total, followed by "paint and varnish" and "fertilizers," with 27.5 per cent and 20.6 per cent, respectively. These three branches together reported 79.9 per cent of the average number of wage earners in the combined industry, 81.5 per cent of the value of products, and 80.2 per cent of the value added by manufacture.

# THE GENERAL CHEMICAL INDUSTRY.

## GENERAL STATISTICS.

**Scope of the industry.**—The classification "chemicals," as employed in the census statistics of manufactures, covers establishments engaged in the manufacture of a great variety of products, which may be grouped under the following heads:

I. Acids, except sulphuric, nitric, and mixed acids and such as are made by establishments in the wood distillation industry.

II. Sodas.

III. Potashes.

IV. Alums.

V. Coal-tar products.

VI. Cyanides.

VII. Bleaching materials.

VIII. Electrochemicals (substances produced by the aid of electricity, including metals and alloys produced by electrolytic or electrometallurgic processes).

IX. Plastics.

X. Compressed or liquefied gases.

XI. Fine chemicals.

XII. Chemicals not otherwise specified.

The classification, however, does not cover the production of all substances coming under the head of chemicals in the ordinary acceptance of the term, as in many instances the manufacture of such products is included under some more distinctive industry classification. Thus establishments engaged in the manufacture of sulphuric, nitric, or mixed acids as a primary product are included under the separate classification "sulphuric, nitric, and mixed acids"; the production of alcohol by wood distillation is included under the classification "wood distillation, not including turpentine and rosin"; and the production of chemical substances for use as fertilizers is included under the classification "fertilizers." The manufacture of dyestuffs and extracts, explosives, essential oils, and paint and varnish may also properly be classed as chemical. The statistics for the chemical industry, as defined by the Census Bureau, thus fall considerably short of constituting a complete presentation of the business of manufacturing chemical substances for sale, although it is probable that the classification covers the production of the great majority of the substances which are included under the term "chemicals" as popularly understood.

The scope of the classification was the same in 1909 as in 1904; in 1899 and at prior censuses, however, the classification included the manufacture of sulphuric, nitric, and mixed acids and wood distillation, which were classified as independent industries at the censuses of 1909 and 1904.

**Comparison with earlier censuses.**—Table 1 summarizes the statistics of the chemical industry for each census from 1899 to 1909, inclusive.

The statistics shown for 1899 in the table do not include those for the manufacture of sulphuric, nitric, and mixed acids and the wood distillation industry, which were included under the general classifica-

tion "chemicals" at that census and the figures for which are included with those for the chemical industry in some of the other tables of this report. The value of products shown in the table conveys no precise idea of the magnitude or extent of the industry, since it involves considerable duplication due to the use of the products of some establishments in the industry as materials in other establishments, and also because it does not include the products of the kind embraced in the enumeration which are produced in establishments engaged primarily in manufacturing other products. The number of establishments increased 17.5 per cent during the decade from 1899 to 1909; the average number of wage earners employed, 57 per cent; the value of products, 145 per cent; and the value added by manufacture, 155.3 per cent.

**Table 1**

	CHEMICAL INDUSTRY.					
	Number or amount.			Per cent of increase. <sup>1</sup>		
	1909	1904	1899 <sup>2</sup>	1899-1909	1904-1909	1899-1904
Number of establishments..	349	275	297	17.5	26.9	-7.4
Persons engaged in the industry.....	27,791	22,707	( <sup>3</sup> )	.....	22.4	.....
Proprietors and firm members.....	154	123	( <sup>3</sup> )	.....	25.2	.....
Salaried employees.....	3,923	2,778	1,590	146.7	41.2	74.7
Wage earners (average number).....	23,714	19,806	15,108	57.0	19.7	31.1
Primary horsepower.....	208,604	132,262	( <sup>3</sup> )	.....	57.7	.....
Capital.....	\$155,143,739	\$96,621,294	\$68,358,817	127.0	60.6	41.3
Expenses.....	93,991,193	64,493,132	40,323,799	133.1	45.7	59.9
Services.....	20,221,089	14,837,609	9,686,865	108.7	36.3	53.2
Salaries.....	6,136,888	4,047,889	2,321,662	164.3	61.6	74.4
Wages.....	14,084,501	10,789,780	7,365,203	91.2	30.5	46.5
Materials.....	64,121,536	42,062,611	27,057,609	137.0	52.4	55.5
Miscellaneous.....	9,648,568	7,592,852	3,579,325	169.6	27.1	112.1
Value of products.....	117,688,887	75,222,249	48,039,595	145.0	56.6	56.6
Value added by manufacture (value of products less cost of materials).....	53,567,351	33,159,638	20,081,986	155.3	61.5	58.0

<sup>1</sup> A minus sign (-) denotes decrease. Where percentages are omitted, comparable figures are not available.

<sup>2</sup> Excluding statistics for the manufacture of sulphuric, nitric, and mixed acids and wood distillation, which were included under the classification "chemicals" in 1899.

<sup>3</sup> Comparable figures not available.

Table 2 gives statistics for the chemical industry, the manufacture of sulphuric, nitric, and mixed acids, and wood distillation combined (the chemical industry as constituted at censuses prior to 1904), for each census from 1849 to 1909, inclusive.

**Table 2**

CENSUS.	CHEMICALS, SULPHURIC, NITRIC, AND MIXED ACIDS, AND WOOD DISTILLATION INDUSTRIES.					
	Number of establishments.	Wage earners (average number).	Wages.	Cost of materials.	Value of products.	Value added by manufacture.
1909.....	511	28,687	\$17,042,243	\$75,383,215	\$137,309,942	\$61,926,727
1904.....	448	24,525	13,361,972	61,883,219	92,088,378	40,205,159
1899.....	433	19,020	9,393,236	34,545,862	62,637,008	23,091,146
1889.....	563	15,038	7,308,411	33,694,927	58,352,548	25,657,621
1879.....	595	9,724	4,222,663	24,665,706	38,640,458	13,974,692
1869.....	408	5,119	2,252,856	12,010,576	20,091,575	8,080,999
1859.....	299	2,014	637,156	3,086,681	5,419,791	2,333,110
1849.....	170	1,389	422,560	3,235,380	4,979,630	1,744,250

## MANUFACTURES.

Summary, by states.—Table 3 summarizes the more important statistics of the industry, by states, the states being arranged according to the value of prod-

ucts reported for 1909. Some states for which data can not be shown separately ranked higher than some named in the table.

STATE.	Number of establishments: 1909	Wage earners.			Value of products.				Value added by manufacture.				Per cent of increase: 1904-1909 <sup>1</sup>			
		Average number: 1909	Per cent distribution: 1909	Rank.		Amount: 1909	Per cent distribution: 1909	Rank.		Amount: 1909	Per cent distribution: 1909	Rank.		Wage earners (average number).	Value of products.	Value added by manufacture.
				1909	1904			1909	1904			1909	1904			
United States....	349	23,714	100.0	.....	.....	\$117,688,887	100.0	.....	.....	\$53,567,351	100.0	.....	.....	19.7	56.5	61.5
New York.....	74	5,746	24.2	1	1	35,346,072	30.0	1	1	15,637,518	29.2	1	1	15.7	53.5	55.4
New Jersey.....	50	5,046	21.3	2	2	22,824,140	19.4	2	2	10,566,662	19.7	2	2	40.3	75.2	65.3
Pennsylvania.....	37	3,185	13.4	3	3	15,978,162	13.6	3	3	5,778,241	10.8	4	4	-5.6	35.7	28.1
Michigan.....	36	3,174	13.4	4	4	12,890,206	11.0	4	4	7,817,825	14.6	3	3	-4.8	42.6	68.7
Ohio.....	33	1,132	4.8	6	5	7,742,045	6.6	5	5	2,993,749	5.6	5	6	10.4	68.7	88.7
Massachusetts.....	24	1,358	5.7	5	6	5,918,451	5.0	6	6	2,868,199	5.4	6	5	57.9	68.6	43.8
Illinois.....	19	836	3.5	8	7	4,656,274	4.0	7	8	1,760,474	3.3	7	8	16.0	103.9	89.7
Missouri.....	9	619	2.6	9	8	3,640,116	3.1	8	7	1,416,152	2.6	8	7	-3.3	11.0	27.9
Maryland.....	3	285	1.2	11	9	1,313,103	1.1	11	10	629,115	1.2	11	9	-11.8	21.3	27.6
California.....	13	244	1.0	12	11	1,306,373	1.1	12	9	544,788	1.0	12	10	-5.8	16.2	28.3
Wisconsin.....	5	76	0.3	15	15	513,099	0.4	13	14	270,962	0.5	14	12	.....	93.6	111.7
Louisiana.....	4	36	0.2	19	19	248,815	0.2	17	22	76,877	0.1	19	21	.....	.....	.....
Georgia.....	4	53	0.2	17	16	245,725	0.2	18	15	185,750	0.3	16	13	.....	85.0	.....
Kentucky.....	5	30	0.2	18	.....	94,710	0.1	22	.....	54,205	0.1	22	.....	.....	.....	.....
All other states.....	33	1,885	7.9	.....	.....	4,973,598	4.2	.....	.....	2,960,834	5.5	.....	.....	.....	.....	.....

<sup>1</sup> Percentages of increase are based on figures in Table 51. A minus sign (-) denotes decrease. Percentages not shown where base is less than 100 for wage earners or less than \$100,000 for value of products or value added by manufacture, or where comparative figures can not be given without disclosing individual operations.

New York reported 30 per cent of the total value of products for the industry in 1909, New Jersey 19.4 per cent, Pennsylvania 13.6 per cent, and Michigan 11 per cent. These four states together contributed nearly three-fourths (74 per cent) of the total value of products and gave employment to 72.3 per cent of the average number of wage earners. Of the states which reported products valued at \$1,000,000 or over in 1909, Illinois shows the highest rate of increase in value of products from 1904 to 1909, 103.9 per cent, followed by New Jersey, Ohio, and Massachusetts in the order named.

## PERSONS ENGAGED IN THE INDUSTRY.

Summary: 1909.—Table 4 shows, for 1909, the number of persons engaged in the industry, classified according to occupational status and sex, and in the case of wage earners, according to age also. It should be borne in mind that the sex and age classification of the average number of wage earners in this and other tables is an estimate obtained by the method described in the Introduction.

CLASS.	PERSONS ENGAGED IN THE CHEMICAL INDUSTRY: 1909		
	Total.	Male.	Female.
All classes.....	27,791	26,215	1,576
Proprietors and officials.....	1,086	1,072	14
Proprietors and firm members.....	154	146	8
Salaried officers of corporations.....	387	361	6
Superintendents and managers.....	565	565	.....
Clerks.....	2,991	2,492	499
Wage earners (average number).....	23,714	22,651	1,063
16 years of age and over.....	23,548	22,555	993
Under 16 years of age.....	166	96	70

The average number of persons engaged in the industry during 1909 was 27,791, of whom 23,714, or 85.3 per cent, were wage earners, 1,086, or 3.9 per cent, proprietors and officials, and 2,991, or 10.8 per cent, clerks, this class including other subordinate salaried employees. Of the total number of persons engaged in the industry, 26,215, or 94.3 per cent, were males, and 1,576, or 5.7 per cent, females.

The average number of wage earners in each state for 1909, 1904, and 1899 is given in Table 51. The average number distributed by sex and age is not shown for the individual states, but Table 52 gives such a distribution of the number employed on December 15, or the nearest representative day.

In order to compare the distribution of the persons engaged in the industry in 1909 according to occupational status with that in 1904, it is necessary to use the classification employed at the earlier census (see Introduction). Such a comparison is made in Table 5.

CLASS.	PERSONS ENGAGED IN THE CHEMICAL INDUSTRY.				Per cent of increase: 1904-1909
	1909		1904		
	Number.	Per cent distribution.	Number.	Per cent distribution.	
Total.....	27,791	100.0	22,707	100.0	22.4
Proprietors and firm members.....	154	0.6	123	0.5	25.2
Salaried employees.....	3,923	14.1	2,778	12.2	41.2
Wage earners (average number).....	23,714	85.3	19,806	87.2	19.7

Table 6 shows the average number of wage earners in the industry, distributed according to age, and in the case of those 16 years of age and over, according to sex, for 1909 and 1904. Comparable figures for 1899 are not available.

**Table 6**

CLASS.	AVERAGE NUMBER OF WAGE EARNERS IN THE CHEMICAL INDUSTRY.			
	1909		1904	
	Number.	Per cent distribution.	Number.	Per cent distribution.
<b>Total</b> .....	23,714	100.0	18,866	100.0
16 years of age and over.....	23,548	99.3	19,732	99.6
Male.....	22,555	95.1	18,651	94.2
Female.....	993	4.2	1,081	5.4
Under 16 years of age.....	166	0.7	74	0.4

Wage earners employed, by months.—Table 7 gives the number of wage earners employed in the industry

on the 15th (or the nearest representative day) of each month during the year 1909 for eight of the states in which an average of 500 or more wage earners were employed during the year.

There was comparatively little variation from month to month in the number of wage earners employed. The largest number reported for any month of 1909 was 25,073, in December, and the smallest, 22,609, in January, the minimum number being equal to 90.2 per cent of the maximum. In 1904 the maximum number, 20,236, was shown for June, and the minimum number, 19,402, for August, the latter number being equal to 95.9 per cent of the former.

**Table 7**

STATE.	WAGE EARNERS EMPLOYED IN THE CHEMICAL INDUSTRY: 1909 <sup>1</sup>												
	Average number during the year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
<b>United States</b> .....	23,714	22,609	22,772	22,968	23,241	23,661	23,782	23,747	23,540	23,943	24,355	24,873	25,073
Illinois.....	836	707	660	735	805	809	853	868	858	863	917	993	968
Massachusetts.....	1,358	1,317	1,287	1,333	1,346	1,412	1,364	1,365	1,375	1,354	1,411	1,397	1,341
Michigan.....	3,174	2,960	2,997	3,039	2,889	3,077	3,156	3,248	3,350	3,330	3,292	3,347	3,405
Missouri.....	619	601	601	603	609	616	625	624	631	603	637	648	632
New Jersey.....	5,046	4,858	4,968	5,067	5,147	5,072	5,094	4,990	4,780	5,038	5,109	5,173	5,252
New York.....	5,746	5,561	5,621	5,430	5,625	5,680	5,795	5,787	5,706	5,763	5,824	5,965	6,130
Ohio.....	1,132	1,077	1,070	1,106	1,147	1,143	1,051	1,078	1,123	1,138	1,172	1,242	1,237
Pennsylvania.....	3,185	3,101	3,117	3,072	3,087	3,201	3,311	3,195	3,193	3,167	3,207	3,277	3,292

<sup>1</sup> The month of maximum employment for each state is indicated by boldface figures and that of minimum employment by italic figures.

In Massachusetts the greatest number of wage earners was employed in May, and in Pennsylvania, in June; but in the six other states shown in the table either November or December was the month of maximum employment. The months of maximum and minimum employment for 1909, and the number of wage earners reported for these months, are given for a larger number of states in Table 52.

Prevailing hours of labor.—In Table 8 the wage earners in the industry have been classified according to the hours of labor per week prevailing in the establishments in which they were employed. In making this classification the average number of wage earners employed during the year in each establishment was classified as a total according to the hours prevailing in that establishment, even though a few employees worked a greater or smaller number of hours.

Over half (56.2 per cent) of the wage earners employed in the industry in 1909 were in establishments where the prevailing hours were 60 or more per week. The largest single group shown in the table is that made up of the wage earners in establishments where the prevailing hours were between 54 and 60 per week, such wage earners constituting 38.8 per cent of the total number. Between 54 and 60 hours per week was the most common working time reported in Massachusetts, New Jersey, and New York. In Ohio and Pennsylvania the most common working time was 60 hours per week, in Illinois it was between 60 and 72 hours per week, and in Michigan it was 72 hours or over, while in Missouri it was between 48 and 54 hours per week.

**CHARACTER OF OWNERSHIP.**

Table 9 presents statistics with respect to the character of ownership of the establishments in the industry in the United States.

**Table 8**

STATE.	AVERAGE NUMBER OF WAGE EARNERS IN THE CHEMICAL INDUSTRY: 1909							
	Total.	In establishments with prevailing hours—						
		48 and under.	Between 48 and 54.	54.	Between 54 and 60.	60.	Between 60 and 72.	72 and over.
<b>United States</b> .....	23,714	77	703	383	9,213	6,581	2,050	4,707
Illinois.....	836	10	14	38	180	487	107	107
Massachusetts.....	1,358	8	8	16	1,033	241	52	52
Michigan.....	3,174	374	2	1,426	35	174	1,537	28
Missouri.....	619	6	30	00	2,804	692	198	930
New Jersey.....	5,046	38	190	61	3,599	1,324	37	497
New York.....	5,746	2	3	164	556	13	364	364
Ohio.....	1,132	5	98	68	2,130	177	707	707
Pennsylvania.....	3,185							

**Table 9**

CHARACTER OF OWNERSHIP.	CHEMICAL INDUSTRY.			
	Number of establishments.		Value of products.	
	1909	1904	1909	1904
<b>Total</b> .....	349	275	\$117,688,887	\$75,222,249
Individual.....	53	30	1,176,233	1,581,911
Firm.....	26	38	1,222,277	7,854,209
Corporation.....	266	207	115,290,377	65,786,129
<b>Per cent of total</b> .....	100.0	100.0	100.0	100.0
Individual.....	18.6	10.9	1.0	2.1
Firm.....	7.2	13.8	1.0	10.4
Corporation.....	76.2	75.3	98.0	87.5

MANUFACTURES.

In 1909, 76.2 per cent of the total number of establishments were under corporate ownership, as compared with 75.3 per cent in 1904. In 1909 the value of products of these establishments represented 98 per cent of the total for the industry, and in 1904, 87.5 per cent.

Table 10 gives statistics for establishments classified according to form of ownership for the eight states employing an average of more than 500 wage earners in 1909 for which figures can be shown without disclosing individual operations.

STATE.	Number of establishments owned by—			Wage earners in establishments owned by—			Value of products of establishments owned by—			Value added by manufacture in establishments owned by—		
	Individuals.	Firms.	Corporations.	Individuals.	Firms.	Corporations.	Individuals.	Firms.	Corporations.	Individuals.	Firms.	Corporations.
United States.....	58	25	266	233	206	23,275	\$1,176,233	\$1,222,277	\$115,290,377	\$501,470	\$365,495	\$52,700,386
Illinois.....		1	18		(X)	836		(X)	4,656,274		(X)	1,700,474
Massachusetts.....	5	2	17	13	(X)	1,340	146,992	(X)	5,769,459	43,053	(X)	2,825,146
Michigan.....	19	3	14	20	5	3,140	46,873	6,456	12,836,877	35,420	4,064	7,778,341
Missouri.....		1	8		(X)	610		(X)	3,640,116		(X)	1,416,152
New Jersey.....	2	1	47	7		5,039	65,225	(X)	22,758,915	23,438	(X)	10,538,224
New York.....	12	4	58	105	12	5,629	749,025	74,218	34,522,820	303,022	46,259	15,288,237
Ohio.....	9	2	22	23	(X)	1,104	100,069	(X)	7,641,976	35,682	(X)	2,958,067
Pennsylvania.....	4	6	27	55	94	3,036	63,209	770,822	15,144,131	48,219	144,048	5,585,974

NOTE.—In some states, in order to avoid disclosing the returns for individual establishments, the figures for establishments under firm ownership have been consolidated with those for establishments under some other forms of ownership. In such cases an (X) is placed in the column from which the figures have been omitted and the figures for the group with which they have been combined are printed in italics.

In 1909, 23,275 wage earners, or 98.1 per cent of the total, were employed in establishments under corporate ownership; 206, or nine-tenths of 1 per cent, in those under firm ownership; and 233, or 1 per cent, in those owned by individuals. Establishments operated by corporations were the most numerous class in every state for which figures are given in the table except Michigan, and in every state corporations reported all but an insignificant proportion of the value of products.

SIZE OF ESTABLISHMENTS.

Classification by value of products.—Table 11 presents statistics for 1909 and 1904 for establishments grouped according to the value of their products.

VALUE OF PRODUCTS PER ESTABLISHMENT.	Number of establishments.		Value of products.	
	1909	1904	1909	1904
Total.....	349	275	\$117,688,887	\$75,222,249
Less than \$5,000.....	51	17	110,922	48,778
\$5,000 and less than \$20,000.....	50	46	553,731	531,215
\$20,000 and less than \$100,000.....	97	95	4,985,195	4,722,025
\$100,000 and less than \$1,000,000.....	120	99	41,227,479	33,622,414
\$1,000,000 and over.....	31	18	70,806,560	36,296,917
Per cent of total.....	100.0	100.0	100.0	100.0
Less than \$5,000.....	14.6	6.2	0.1	0.1
\$5,000 and less than \$20,000.....	14.3	16.7	0.5	0.7
\$20,000 and less than \$100,000.....	27.8	34.5	4.2	6.3
\$100,000 and less than \$1,000,000.....	34.4	36.0	35.0	44.7
\$1,000,000 and over.....	8.9	6.5	60.2	48.3

In 1909, 8.9 per cent of the establishments in the industry manufactured products valued at \$1,000,000 or over, as against 6.5 per cent in 1904. While such establishments represented a small proportion of the total number at both censuses, they reported 60.2 per cent of the total value of products in 1909 and 48.3 per cent in 1904. Establishments manufacturing products valued at \$100,000 but less than \$1,000,000 reported 35 per cent of the total value for the industry for 1909, as compared with 44.7 per cent for 1904.

The average value of products per establishment increased from \$273,535 in 1904 to \$337,217 in 1909, and the average value added by manufacture, as computed from the figures in Table 1, from \$120,581 to \$153,488. The average number of wage earners per establishment shows a decrease from 72 in 1904 to 67.9 in 1909.

Classification by number of wage earners.—Table 12 classifies the establishments in the 10 leading states according to the number of wage earners employed.

Of the 349 establishments reported for 1909, 3.2 per cent employed no wage earners, 32.7 per cent employed from 1 to 5 wage earners each, 25.5 per cent from 6 to 20, 17.8 per cent from 21 to 50, 7.4 per cent from 51 to 100, and 6.6 per cent from 101 to 250. There were only 24 establishments that employed more than 250 wage earners. Of these, 11 employed over 500. More than three-fifths (61 per cent) of the wage earners in the industry worked in establishments employing over 250 wage earners, and about two-fifths (40.7 per cent) in establishments employing over 500.

Table 12

STATE.	CHEMICAL INDUSTRY: 1909																			
	Total.		Establishments employing—																	
			No wage earners.		1 to 5 wage earners.		6 to 20 wage earners.		21 to 50 wage earners.		51 to 100 wage earners.		101 to 250 wage earners.		251 to 500 wage earners.		501 to 1,000 wage earners.		Over 1,000 wage earners.	
Es-tab-lish-ments.	Wage earners (average number)	Es-tab-lish-ments.	Es-tab-lish-ments.	Wage earners.	Es-tab-lish-ments.	Wage earners.	Es-tab-lish-ments.	Wage earners.	Es-tab-lish-ments.	Wage earners.	Es-tab-lish-ments.	Wage earners.	Es-tab-lish-ments.	Wage earners.	Es-tab-lish-ments.	Wage earners.	Es-tab-lish-ments.	Wage earners.	Es-tab-lish-ments.	Wage earners.
United States.....	349	23,714	11	114	305	89	1,127	62	2,138	26	1,866	23	3,816	13	4,810	7	4,838	4	4,814	
Illinois.....	19	836		2	9	11	138	3	102	2	114			1	473					
Indiana.....	4	504		1	3			2	58					1	443					
Massachusetts.....	24	1,358		14	33	4	52	2	89			2	355	2	829					
Michigan.....	36	3,174	7	18	26		33	1	24			1	96	3	405				2	2,167
Missouri.....	9	619					25	4	143	1	85			1	366					
New Jersey.....	50	5,046	1	11	38	9	138	13	445	8	645	2	333	3	977	2	1,296	1	1,174	
New York.....	74	5,746		22	74	17	222	15	546	8	537	8	1,490	2	690	1	714	1	1,473	
Ohio.....	33	1,132	2	13	27	12	160	2	57	1	58	1	126	2	704					
Pennsylvania.....	37	3,185		9	28	10	137	10	374	2	128	3	496			3	2,022			
Virginia.....	4	895				1	11	2	78							1	806			

EXPENSES.

As stated in the Introduction, the census figures representing expenses do not purport to show the total cost of manufacture, since they take no account of interest or depreciation; hence they can not properly be used for determining profits. Facts of interest can be brought out, however, concerning the relative importance of the different classes of expenses which were reported. Table 1 shows the total expenses in 1909 to have been \$93,991,193, distributed as follows: Cost of materials, \$64,121,536, or 68.2 per cent; wages, \$14,084,501, or 15 per cent; salaries, \$6,136,588 or 6.5 per cent; and miscellaneous expenses, made up of advertising, ordinary repairs of buildings and machinery, insurance, traveling expenses, and other sundry expenses, \$9,648,568, or 10.3 per cent.

The variations among the states in the proportions represented by the several classes of expenses (see Table 52) are due largely to diversity of products and to differences with respect to the amount of duplication in the cost of materials reported.

ENGINES, POWER, AND FUEL.

Engines and power.—Table 13 shows statistics of power used in the industry as reported at the censuses of 1909, 1904, and 1899. The figures for 1899 include those for establishments engaged primarily in the manufacture of sulphuric, nitric, and mixed acids, and in wood distillation. As the total primary power reported for these industries in 1909 amounted to only 16,348 horsepower, this inclusion does not seriously affect the comparability of the figures.

The total primary power used in the chemical industry more than doubled during the decade. In 1909, as in 1904 and 1899, power generated by steam engines was the most important form of power used in

the industry, although such power represented a much smaller proportion of the total primary power in 1909 than in 1899, this decrease being due mainly to the great increase in the amount of rented electric power used. The horsepower of electric motors used for distributing power by means of current generated in the establishment reporting shows a great increase for the decade.

Table 13

POWER.	CHEMICAL INDUSTRY.								
	Number of engines or motors.			Horsepower.			Per cent distribution of horsepower.		
	1909	1904	1899 <sup>1</sup>	1909	1904	1899 <sup>1</sup>	1909	1904	1899 <sup>1</sup>
Primary power, total.....	2,202	1,397	1,173	208,604	132,262	80,349	100.0	100.0	100.0
Owned.....	1,304	1,134	1,173	115,701	78,198	71,866	55.5	59.1	79.5
Steam.....	1,231	1,081	1,091	103,273	70,194	69,560	49.5	53.1	77.0
Gas.....	34	25	17	1,147	438	361	0.5	0.3	0.4
Water wheels.....	30	25	65	10,913	6,455	1,915	5.2	4.9	2.1
Water motors.....	9	3	( <sup>2</sup> )	153	14	( <sup>2</sup> )	0.1	( <sup>2</sup> )	( <sup>2</sup> )
Other.....				215	1,097	30	0.1	0.8	( <sup>3</sup> )
Rented.....	898	263	( <sup>2</sup> )	92,903	54,064	18,483	44.5	40.9	20.5
Electric.....	898	263	( <sup>2</sup> )	402,057	10,078	418,231	44.1	7.6	20.2
Other.....				846	443,986	252	0.4	33.3	0.3
Electric motors.....	2,179	672	79	156,699	18,188	20,263	100.0	100.0	100.0
Run by current generated by establishment.....	1,281	409	79	64,642	8,110	2,032	41.3	44.6	10.0
Run by rented power.....	898	263	( <sup>2</sup> )	92,057	10,078	18,231	58.7	55.4	90.0

<sup>1</sup> Figures include those for establishments engaged in the manufacture of sulphuric, nitric, and mixed acids, and in wood distillation.

<sup>2</sup> Not reported.

<sup>3</sup> Less than one-tenth of 1 per cent.

<sup>4</sup> In some instances includes electric energy used in electrolytic and electrometallurgical processes.

Table 14 shows, for 1909, the amount of each of the several kinds of power and of the different kinds of fuel used in the industry in eight of the leading states.

Table 14

STATE.	CHEMICAL INDUSTRY: 1909																
	Primary horsepower.									Electric horsepower.		Fuel used.					
	Number of establishments reporting.	Total horsepower.	Owned by establishments reporting.					Rented.		Total, rented and generated by establishment.	Generated in the establishment reporting.	Coal.		Coke (short tons).	Wood (cords).	Oil, including gasoline (barrels).	Gas (1,000 feet).
			Total.	Steam engines.	Gas engines.	Water wheels and motors.	Other.	Electric.	Other.			Anthracite (long tons).	Bituminous (short tons).				
United States..	285	208,604	115,701	103,273	1,147	11,066	215	92,057	846	156,699	64,642	650,480	2,161,768	63,520	3,644	110,276	1,300,265
Illinois.....	18	5,907	5,639	5,625	14	.....	.....	43	225	3,913	3,870	.....	150,942	1,026	.....	38	13,840
Massachusetts.....	21	3,731	2,494	2,284	150	15	65	1,232	5	1,855	623	6,234	35,099	9,704	17	357	159
Michigan.....	14	26,594	23,835	23,681	4	150	.....	2,759	.....	5,281	2,522	1	1,065,882	320	2,194	2,440	.....
Missouri.....	9	886	855	855	.....	.....	.....	31	.....	221	190	.....	40,069	786	.....	2,852	.....
New Jersey.....	47	13,880	13,821	13,751	20	.....	.....	50	8	3,835	3,827	215,265	76,734	1,863	50	3,939	1,850
New York.....	64	116,197	30,264	26,086	78	4,000	100	85,713	220	136,519	50,806	366,505	105,056	3,514	54	6,872	229,978
Ohio.....	28	11,715	11,706	11,473	232	1	.....	9	.....	395	386	.....	160,558	23,231	360	403	876,615
Pennsylvania.....	32	9,771	9,271	8,671	600	.....	.....	50	.....	1,875	1,375	57,575	298,534	6,008	126	27,378	35,723
All other states....	52	19,923	17,816	10,897	49	6,900	.....	1,762	345	2,805	1,043	4,900	228,894	17,008	843	68,849	130,248

In 1909 New York alone reported 116,197 horsepower, or 55.7 per cent of the aggregate for the industry. The most important form of power reported from New York was rented electric power, a predominance due in the main to the importance of electrochemical establishments supplied with power from Niagara

Falls. Steam power was the most important form of power in all of the other states shown separately.

Fuel consumed.—Bituminous coal was the principal class of fuel used in the industry in 1909, Michigan reporting nearly one-half of the total. In New York and New Jersey anthracite coal was chiefly used.

#### SPECIAL STATISTICS RELATING TO MATERIALS AND PRODUCTS.

##### MATERIALS.

Summary for the United States.—Table 15 shows statistics of the materials used in the industry for 1909, 1904, and 1899, only such specific materials being shown as were separately reported in 1909. In order to make the figures for 1899 comparable with those for the other two censuses, the figures for establishments engaged in the manufacture of sulphuric, nitric, and mixed acids, and in wood distillation have been excluded from the figures for that year in all tables giving comparative statistics of materials and products.

The relative increase in the cost of all materials for the decade 1899-1909 was 137 per cent. Detailed information is available for but a few of the numerous materials consumed in the industry, and the cost of these represented less than one-twelfth (7.8 per cent) of the total cost of all materials in 1909.

The expenditures for sulphuric, nitric, and mixed acids purchased and for raw materials for making such acids—sulphur, pyrites, and nitrate of soda—increased from \$2,035,276 in 1899 to \$4,277,550 in 1909, or 110.2 per cent, and represented 85.2 per cent of the total cost of the materials shown separately, other than fuel and rent of power, in 1909. These amounts do not include, of course, the quantity of such materials used in establishments engaged primarily in the manufacture of sulphuric, nitric, and mixed acids.

The quantity of acids and other chemicals that establishments in the industry made for their own use

in the manufacture of their finished products was reported in the majority of cases, and is given in connection with the statistics as to products.

MATERIAL.	MATERIALS USED IN THE CHEMICAL INDUSTRY.		
	1909	1904	1899
Total cost.....	\$64,121,536	\$42,062,611	\$27,057,609
Sulphur:			
Tons.....	50,523	28,482	30,438
Cost.....	\$1,030,345	\$591,700	\$621,614
Pyrites:			
Tons.....	227,358	136,360	127,002
Cost.....	\$1,060,256	\$778,209	\$558,810
Nitrate of soda:			
Tons.....	25,818	17,615	8,591
Cost.....	\$1,147,286	\$751,968	\$276,091
Sulphuric acid:			
Tons.....	58,552	104,489	37,832
Cost.....	\$564,390	\$945,486	\$423,903
Nitric acid:			
Tons.....	1,525	3,068	1,220
Cost.....	\$139,591	\$320,818	\$127,811
Mixed acids:			
Tons.....	4,546	1,734	275
Cost.....	\$335,672	\$156,605	\$21,047
Ammonium sulphate:			
Tons.....	1,675	5,676	4,373
Cost.....	\$83,013	\$356,109	\$471,117
Alcohol:			
Grain—			
Gallons.....	479,428	187,389	120,474
Cost.....	\$287,416	\$449,604	\$263,472
Wood—			
Gallons.....	949,212	601,077	( <sup>1</sup> )
Cost.....	\$370,017	\$367,223	( <sup>1</sup> )
Fuel and rent of power.....	\$8,046,540	\$4,541,589	\$24,287,744
All other materials.....	\$51,051,700	\$32,803,300	

<sup>1</sup> Comparable figures not available.

Materials, by states.—Table 16 gives, by states, statistics for the materials shown separately for the chemical industry in Table 15, with the exception of fuel and rent of power, for 1909.

**Table 16**

MATERIAL AND STATE.	SPECIFIED MATERIALS USED IN THE CHEMICAL INDUSTRY: 1909		MATERIAL AND STATE.	SPECIFIED MATERIALS USED IN THE CHEMICAL INDUSTRY: 1909	
	Quantity.	Cost.		Quantity.	Cost.
<b>Sulphur</b> .....	<i>Tons.</i> 50,523	\$1,030,345	<b>Nitric acid</b> .....	<i>Tons.</i> 1,525	\$139,591
Massachusetts.....	2,914	61,843	New Jersey.....	893	93,916
New Jersey.....	16,038	340,212	New York.....	405	34,261
New York.....	16,352	320,929	All other states.....	227	11,414
Pennsylvania.....	6,419	141,931	<b>Mixed acids</b> .....	4,546	335,672
All other states.....	8,800	159,433	New Jersey.....	2,644	193,850
<b>Pyrites</b> .....	227,358	1,060,256	All other states.....	1,902	141,822
New Jersey.....	52,507	269,547	<b>Ammonium sulphate</b> .....	1,675	83,013
Pennsylvania.....	92,364	412,047	<b>Nitrate of soda</b> .....	25,818	1,147,296
All other states.....	82,487	378,662	Massachusetts.....	4,262	191,594
<b>Nitrate of soda</b> .....	25,818	1,147,296	New Jersey.....	10,604	446,284
Massachusetts.....	4,262	191,594	Pennsylvania.....	4,259	184,947
New Jersey.....	10,604	446,284	All other states.....	6,693	324,471
Pennsylvania.....	4,259	184,947	<b>Sulphuric acid</b> .....	58,552	564,390
All other states.....	6,693	324,471	Illinois.....	5,308	37,305
<b>Sulphuric acid</b> .....	58,552	564,390	Massachusetts.....	1,480	15,266
Illinois.....	5,308	37,305	Missouri.....	3,214	28,755
Massachusetts.....	1,480	15,266	New Jersey.....	13,038	135,049
Missouri.....	3,214	28,755	New York.....	7,288	119,240
New Jersey.....	13,038	135,049	Ohio.....	2,510	27,221
New York.....	7,288	119,240	Pennsylvania.....	3,202	34,406
Ohio.....	2,510	27,221	All other states.....	22,452	167,147
Pennsylvania.....	3,202	34,406			
All other states.....	22,452	167,147			

PRODUCTS.

Summary for the United States.—Table 17 shows the quantity and value of the leading individual classes of chemical products manufactured in 1909, 1904, and 1899 by establishments in the industry. As previously noted, the figures for 1899 are exclusive of those

for establishments engaged primarily in the manufacture of sulphuric, nitric, and mixed acids and in wood distillation. The quantities and values of some of the products in this table do not agree with those in the Abstract of the Thirteenth Census and in Volume VIII, because it was found necessary to revise the figures.

The total value of products for the industry in 1909 amounted to \$117,688,887, as compared with \$48,039,595 in 1899, the increase for the decade being \$69,649,292, or 145 per cent. Each of the groups of products shown in the table contributed to the increase except potashes, which show a decrease. The group showing the largest relative increase in value for the decade is that comprising chemical substances produced by the aid of electricity (Group VIII), the value of which was nearly fourteen times as great in 1909 as in 1899, the absolute increase amounting to \$16,662,909. Compressed and liquefied gases (Group X) rank next in respect to relative increase in value during the decade, the value in 1909 being more than four times as great as in 1899. The value of plastics more than trebled during the decade, that of fine chemicals more than doubled, and that of acids was almost four times as great. Sodas rank next to chemicals produced by the aid of electricity in amount of absolute increase in value for the decade (\$9,821,067).

**Table 17**

Group.	PRODUCT.	PRODUCTS OF THE CHEMICAL INDUSTRY.			Group.	PRODUCT.	PRODUCTS OF THE CHEMICAL INDUSTRY.		
		1909	1904	1899			1909	1904	1899
	<b>Total value</b> .....	\$117,688,887	\$75,222,249	\$48,039,595	IV	<b>Alums</b> .....	\$2,578,342	\$2,126,612	\$2,013,607
I	<b>Acids</b> .....	\$11,926,389	\$7,583,059	\$3,161,743		Alum cake—			
	Acetic—					Pounds.....	26,884,880	( <sup>o</sup> )	( <sup>o</sup> )
	Pounds.....	51,963,788	27,001,322	24,945,558		Value.....	\$273,711	( <sup>o</sup> )	( <sup>o</sup> )
	Value.....	\$1,136,134	\$537,542	\$396,323		Potash alum—			
	Boric—					Pounds.....	7,939,702	( <sup>o</sup> )	( <sup>o</sup> )
	Pounds.....	5,554,414	6,956,890	2,684,935		Value.....	\$128,623	( <sup>o</sup> )	( <sup>o</sup> )
	Value.....	\$205,739	\$527,190	\$198,212		Other.....	\$2,176,608	( <sup>o</sup> )	( <sup>o</sup> )
	Citric—				V	<b>Coal-tar products</b> .....	\$2,675,327	\$844,817	\$1,322,094
	Pounds.....	2,102,206	2,265,631	( <sup>o</sup> )		Coal-tar distillery products.....	\$2,462,330	\$340,641	\$309,830
	Value.....	\$777,200	\$598,718	( <sup>o</sup> )		Chemicals made from coal-tar distillery products.....	\$212,907	\$504,176	\$512,264
	Hydrofluoric—				VI	<b>Cyanides</b> .....	\$1,941,893	\$1,170,104	\$1,584,923
	Pounds.....	4,790,903	2,932,358	608,000		Yellow prussiate of potash—			
	Value.....	\$214,657	\$151,218	\$34,890		Pounds.....	3,510,208	5,027,264	6,140,406
	Muriatic—					Value.....	\$463,983	\$683,277	\$993,514
	Pounds.....	128,394,736	127,502,682	116,675,109		Other.....	\$1,477,910	\$495,827	\$591,409
	Value.....	\$1,171,082	\$1,180,910	\$1,015,915	VII	<b>Bleaching materials</b> .....	\$1,635,046	\$777,750	\$492,086
	Oleic—					Hydrogen peroxide—			
	Pounds.....	13,337,717	( <sup>o</sup> )	( <sup>o</sup> )		Pounds.....	9,403,717	( <sup>o</sup> )	( <sup>o</sup> )
	Value.....	\$680,015	( <sup>o</sup> )	( <sup>o</sup> )		Value.....	\$850,417	( <sup>o</sup> )	( <sup>o</sup> )
	Phosphoric—					Bisulphites—			
	Pounds.....	25,702,606	991,050	( <sup>o</sup> )		Pounds.....	28,656,000	( <sup>o</sup> )	( <sup>o</sup> )
	Value.....	\$505,791	\$68,541	( <sup>o</sup> )		Value.....	\$202,504	( <sup>o</sup> )	( <sup>o</sup> )
	Other.....	\$7,145,771	\$4,518,940	\$1,516,403		Other.....	\$582,125	( <sup>o</sup> )	( <sup>o</sup> )
II	<b>Sodas</b> .....	\$21,417,982	\$16,858,929	\$11,506,915	VIII	<b>Chemical substances produced by the aid of electricity</b> .....	\$17,968,277	\$5,896,632	\$1,305,368
	Soda ash—					Calcium carbide—			
	Tons.....	646,007	518,789	386,361		Pounds.....	121,946,967	( <sup>o</sup> )	( <sup>o</sup> )
	Value.....	\$10,361,756	\$9,202,292	\$4,768,383		Value.....	\$2,984,001	( <sup>o</sup> )	( <sup>o</sup> )
	Sal soda—					Caustic soda—			
	Tons.....	76,285	56,870	63,231		Tons.....	19,428	( <sup>o</sup> )	( <sup>o</sup> )
	Value.....	\$977,712	\$792,248	\$779,166		Value.....	\$1,032,647	( <sup>o</sup> )	( <sup>o</sup> )
	Bicarbonate of soda—					Chlorates—			
	Tons.....	82,800	68,867	68,185		Pounds.....	11,568,915	( <sup>o</sup> )	( <sup>o</sup> )
	Value.....	\$1,515,031	\$1,135,610	\$1,324,843		Value.....	\$904,525	( <sup>o</sup> )	( <sup>o</sup> )
	Caustic soda—					Hydrochlorites—			
	Tons.....	112,152	80,159	78,779		Tons.....	45,976	( <sup>o</sup> )	( <sup>o</sup> )
	Value.....	\$4,230,954	\$2,924,182	\$2,917,955		Value.....	\$1,506,831	( <sup>o</sup> )	( <sup>o</sup> )
	Borax—					Other.....	\$11,540,273	( <sup>o</sup> )	( <sup>o</sup> )
	Tons.....	20,154	20,882	5,637					
	Value.....	\$1,766,910	\$2,122,808	\$502,480					
	Other.....	\$2,565,619	\$1,681,789	\$1,304,088					
III	<b>Potashes</b> .....								
	Pounds.....	1,866,570	1,811,037	3,704,806					
	Value.....	\$88,940	\$104,655	\$174,476					

NOTE.—For notes corresponding to the reference figures in Table 17, refer to the end of table on page 10.

Table 17—Continued.		PRODUCTS OF THE CHEMICAL INDUSTRY.			Table 17—Continued.		PRODUCTS OF THE CHEMICAL INDUSTRY.		
Group.	PRODUCT.	1909	1904	1899	Group.	PRODUCT.	1909	1904	1899
IX	Plastics.....	\$7,180,172	\$4,755,761	\$2,099,400	XI	Fine chemicals—Continued.			
	Pyroxylin plastics—					Ether			
	Pounds.....	6,206,177	(?)	(?)		Pounds.....	1,177,886	660,783	283,238
	Value.....	\$5,389,819	\$2,857,093	\$1,970,387		Value.....	\$199,448	\$334,935	\$129,876
X	Other—				Acetone—				
	Pounds.....	10,234,928	(?)	(?)	Pounds.....	6,927,886	1,300,395	1,638,715	
	Value.....	\$1,790,353	\$1,898,068	\$129,013	Value.....	\$719,895	\$181,320	\$178,969	
	Compressed or liquefied gases...	\$4,969,805	\$2,787,689	\$1,215,011	Other.....	\$5,199,584	\$4,248,898	\$1,426,373	
	Anhydrous ammonia—				XII	Chemicals, not elsewhere specified:			
	Pounds.....	11,802,076	(?)	(?)		Glycerin—			
	Value.....	\$2,503,315	\$1,173,184	\$448,157		Pounds.....	33,986,974	18,791,997	15,383,798
	Carbon dioxide—					Value.....	\$4,838,826	\$2,345,205	\$2,012,886
	Pounds.....	47,498,937	35,991,827	(?)		Epsom salts—			
	Value.....	\$2,326,481	\$1,343,966	\$696,164		Pounds.....	21,546,297	15,935,837	6,072,309
Laughing gas—				Value.....		\$189,291	\$145,801	\$45,966	
Pounds.....	72,675	(?)	(?)	Blue vitriol—					
Value.....	\$33,689	(?)	(?)	Pounds.....		810,958	50,100	7,500,000	
Oxygen—				Value.....		\$37,626	\$2,500	\$375,000	
Cubic feet.....	637,064	(?)	(?)	Copperas—					
Value.....	\$98,150	(?)	(?)	Pounds.....	24,199,526	8,815,059	14,097,905		
Other—				Value.....	\$71,081	\$28,061	\$58,581		
Pounds.....	\$8,170	\$270,539	\$70,690	Phosphates of soda—					
Value.....				Pounds.....	24,541,801	12,018,815	3,478,360		
XI	Fine chemicals.....	\$10,956,666	\$9,145,853	\$4,220,339	Value.....	\$639,001	\$243,822	\$104,554	
	Alkaloids—				Tin compounds—				
	Ounces.....	3,482,492	4,949,525	3,387,522	Pounds.....	10,293,377	9,573,719	4,677,471	
	Value.....	\$3,188,691	\$2,925,789	\$1,743,264	Value.....	\$1,635,350	\$904,679	\$470,169	
	Gold salts—				Zinc salts—				
	Ounces.....	42,544	59,969	8,594	Pounds.....	20,741,225	(?)	(?)	
	Value.....	\$430,944	\$449,804	\$90,145	Value.....	\$368,799	(?)	(?)	
	Silver salts—				Other chemicals.....	\$22,239,550	\$13,748,250	\$15,786,487	
	Ounces.....	2,027,719	1,743,882	1,252,604	By-products and residues sold				
	Value.....	\$726,222	\$683,761	\$499,345	to other industries.....	\$4,530,024	\$5,743,070		
	Platinum salts—								
	Ounces.....	1,561	19,068	7,312					
	Value.....	\$19,123	\$175,682	\$54,600					
	Chloroform—								
Pounds.....	1,861,435	616,670	396,540						
Value.....	\$472,759	\$165,604	\$98,070						

<sup>1</sup> In addition, the following products were produced in 1909 by establishments engaged primarily in the manufacture of products other than those covered by the industry designation:

	Pounds.	Value.		Pounds.	Value.
Total.....		\$9,105,458	Pyroxylin plastics.....		\$292,560
Acids:			Compressed or liquefied gases:		
Acetic.....	4,959,985	200,740	Anhydrous ammonia c.....	167,770	40,923
Hydrofluoric.....	2,051,951	79,722	Carbon dioxide.....	454,354	19,262
Muriatic.....	74,820,143	587,253	Laughing gas.....	24,500	4,900
Oleic.....	2,959,346	165,091	Oxygen-gallons.....	23,826,325	79,319
Stearic.....	5,094,774	399,386	Other.....		9,072
Other a.....		49,530	Chloroform.....	8,250	4,779
Sodas:			Acetone.....	2,007,564	210,287
Sal soda..... tons.....	10,822	184,297	Glycerin d.....	1,022,920	123,472
Other b..... tons.....		778,237	Blue vitriol.....	37,185,585	1,496,645
Alums.....	33,854,100	251,393	Copperas.....	3,031,566	53,372
Coal-tar distillery products.....		1,610,792	Phosphates of soda.....	310,588	27,034
Bleaching materials:			Zinc salts.....	4,312,988	103,503
Hydrogen peroxide.....	521,851	20,124	Other chemicals.....		2,289,412
Bisulphite.....	3,082,000	23,650			
Other.....		20,703			

a Not including acids reported by manufacturers of explosives and fertilizers.  
 b Including sodas reported by manufacturers of paints and varnishes and fertilizers.  
 c Not including 4,871,014 pounds, valued at \$448,455, reported by manufacturers of coke.  
 d Not including 52,518,919 pounds, valued at \$6,790,264, reported by manufacturers of soap.

Table 18 shows the per cent distribution of the total value of products by groups for 1909, 1904, and 1899.

Group.	PRODUCT.	PER CENT OF TOTAL VALUE OF PRODUCTS.		
		1909	1904	1899
	Total value of products.....	100.0	100.0	100.0
I	Acids.....	10.1	10.1	6.6
II	Sodas.....	18.2	22.4	24.1
III	Potashes.....	0.1	0.7	0.4
IV	Alums.....	2.2	2.8	4.2
V	Coal-tar products.....	2.3	1.1	2.8
VI	Cyanides.....	1.7	1.6	3.3
VII	Bleaching materials.....	1.4	1.0	1.0
VIII	Chemicals produced by the aid of electricity.....	15.3	7.8	2.7
IX	Plastics.....	6.1	6.3	4.4
X	Compressed and liquefied gases.....	4.2	3.7	2.5
XI	Fine chemicals.....	9.3	12.2	8.8
XII	Chemicals not elsewhere specified.....	25.3	22.6	39.2
XIII	By-products and residues.....	3.8	7.6	

<sup>2</sup> In addition, similar products to the value of \$3,063,397 were produced in 1904 by establishments engaged primarily in the manufacture of products other than those covered by the industry designation:

	Pounds.	Value.		Pounds.	Value.
Total.....		\$3,063,397	Coal-tar distillery products.....		\$238,645
Acids:			Bleaching materials:		
Muriatic.....	47,018,080	431,938	Bisulphite, tons.....	536	\$11,937
Stearic.....	1,750,000	140,000	Glycerin.....	520,000	\$3,000
Hydrofluoric.....	1,217,578	71,698	Ether.....	193,628	92,466
Other.....		146,716	Epsom salts.....	1,350,000	13,500
Sodas:			Blue vitriol.....	107,160	5,994
Sal soda..... tons.....	1,763	29,561	Other.....	81,816	586
Caustic..... tons.....	14	608	Copperas.....	1,103,222	188,301
Other..... tons.....	14,200	363,795	Tin salts.....		81,816
Alums.....	33,074,349	532,185	Other chemicals.....		742,467

<sup>3</sup> For sulphuric, nitric, and mixed acids, see special report therefor.  
<sup>4</sup> Not reported separately.  
<sup>5</sup> See "Chemical substances produced by the aid of electricity" for additional product.  
<sup>6</sup> Figures not available.  
<sup>7</sup> Not reported.

Leaving out of consideration Group XII (chemicals not elsewhere specified), which is a miscellaneous group including a number of widely differing products, sodas (Group II) constitute the most important group, contributing nearly one-fifth (18.2 per cent) of the total value of products for the industry in 1909, although the proportion was somewhat less than in either 1904 or 1899.

Chemicals produced by the aid of electricity (Group VIII) rank second in importance in 1909, representing 15.3 per cent of the total value, as against only 2.7 per cent in 1899, while acids rank third with 10.1 per cent of the total, the same proportion as in 1904. Fine chemicals (Group XI), which ranked next to sodas in 1904, had dropped to fourth place in 1909.

Products, by states.—Table 19 shows, by states, the quantities and values of such of the more important products of the chemical industry in 1909 as can be

shown by states, and the quantities produced in 1904 and 1899, so far as this can be done without disclosing individual operations.

PRODUCT AND STATE.	SPECIFIED PRODUCTS OF THE CHEMICAL INDUSTRY, BY STATES.				PRODUCT AND STATE.	SPECIFIED PRODUCTS OF THE CHEMICAL INDUSTRY, BY STATES.							
	Value: 1909	Quantity.				Value: 1909	Quantity.						
		1909	1904	1899			1909	1904	1899				
<b>Potashes</b> .....	\$88,940	<i>Pounds.</i> 1,866,570	<i>Pounds.</i> 1,811,037	<i>Pounds.</i> 3,784,806	<b>Compressed and liquefied gases—Continued.</b> <b>Carbon dioxide (carbonic acid gas)</b> .....	\$2,317,808	<i>Pounds.</i> 47,238,267	<i>Pounds.</i> (?)	<i>Pounds.</i> (?)				
Michigan.....	53,319	1,049,102	1,049,102	California.....						121,491	2,798,230		
Ohio.....	5,760	91,117	91,117	Illinois.....						399,746	11,169,540		
All other states.....	29,861	726,351	726,351	New York.....						548,893	10,738,557		
				Ohio.....						158,888	2,588,738		
<b>Alums</b> .....	2,578,842	<i>Tons.</i> 113,422	<i>Tons.</i> 84,518	<i>Tons.</i> 76,260	Pennsylvania.....	163,330	3,007,480						
Pennsylvania.....	1,139,000	42,137	50,416	38,216	All other states.....	925,460							
All other states.....	1,439,842	71,285	34,100	38,044	<b>Oxygen</b> .....	<i>Cubic feet.</i> 98,150							
<b>Coal-tar products</b> .....	2,675,327				Massachusetts.....	637,000	(?)	(?)					
Ohio.....	607,514				New York.....	82,000							
Pennsylvania.....	318,946				All other states.....	58,110	392,000						
All other states.....	1,748,867					24,631	103,000						
<b>Bleaching materials:</b>					<b>Fine chemicals:</b>		<i>Ounces.</i>	<i>Ounces.</i>	<i>Ounces.</i>				
<b>Hydrogen peroxide</b> .....	850,417	4,702	(?)	(?)	<b>Gold salts</b> .....	430,944	42,544	59,969	8,594				
New York.....	691,008	3,434			Pennsylvania.....	35,630	3,059	6,435	2,500				
All other states.....	159,409	1,268			All other states.....	395,314	39,485	53,534	6,094				
<b>Bisulphites</b> .....	202,504	14,328	(?)	(?)	<b>Silver salts</b> .....	726,222	2,027,719	1,745,882	1,252,504				
Massachusetts.....	142,841	9,450			Pennsylvania.....	299,414	803,128	521,161	650,907				
All other states.....	59,663	4,878			All other states.....	426,808	1,104,591	1,222,721	601,697				
<b>Electrochemical products:</b>					<b>Chloroform</b> .....	472,759	1,861,435	618,670	396,540				
<b>Caustic soda</b> .....	1,032,647	19,428	(?)	(?)	New York.....	417,204	1,647,506	150,000	62,540				
New York.....	925,638	16,145			All other states.....	55,555	213,929	460,670	334,000				
All other states.....	107,009	3,283			<b>Chemicals not otherwise specified:</b>								
<b>Hypochlorites</b> .....	1,506,831	45,976	(?)	(?)	<b>Coppers</b> .....	71,081	24,199,526	8,815,059	14,037,905				
New York.....	1,113,887	28,591			Pennsylvania.....	48,062	21,531,000	6,932,050	3,000,000				
All other states.....	392,944	17,385			All other states.....	23,019	2,668,526	1,883,009	11,037,905				
<b>Compressed and liquefied gases:</b>					<b>Phosphates of soda</b> .....	539,001	24,541,801	12,018,815	3,478,350				
<b>Anhydrous ammonia</b> .....	2,503,315	<i>Pounds.</i> 11,802,076	<i>Pounds.</i> (?)	<i>Pounds.</i> (?)	New Jersey.....	377,667	17,212,576	6,428,562	3,478,350				
New Jersey.....	319,590	1,386,927			All other states.....	161,334	7,329,225	5,590,293					
All other states.....	2,183,725	10,415,149			<b>Tin compounds</b> .....	1,535,350	10,293,377	9,573,719	4,677,471				
					New Jersey.....	741,893	7,458,981	2,800,500	3,130,578				
					All other states.....	793,457	2,834,396	6,704,219	1,546,893				

<sup>1</sup> Exclusive of 3,302,669 pounds of potash salts which were combined with potashes in general report.

<sup>2</sup> Figures not available.

Individual groups of products.—*Group I—Acids.*—The first of the groups into which the products of the chemical industry are divided comprises the acids of commerce. The production of sulphuric, nitric, and mixed acids by establishments manufacturing them as primary products is, however, not included, such establishments constituting a separate industry under the classification employed by the Bureau of the Census. A considerable amount of these acids (chiefly sulphuric acid) was, however, produced by establishments engaged primarily in the chemical industry as defined by the Bureau of the Census, and this production is included in Table 17 under the heading of "Other acids," contributing the greater part of the value shown for this item. The total production of sulphuric, nitric, and mixed acids in all industries, so far as reported, is shown in the special report on the manufacture of these acids.

Muriatic or hydrochloric acid is the most important of the acids shown separately in Table 17, its value representing 9.8 per cent of the total for the group in 1909. Table 20 shows statistics for 1909, 1904, and 1899 of the production of muriatic acid by all establishments, including that consumed in the establishments where produced; the latter constituting 17 per cent of total production in 1909 and 13.1 per cent in 1899.

	TOTAL PRODUCTION OF MURIATIC ACID—ALL INDUSTRIES.					
	1909	1904	1899	Per cent of increase. <sup>1</sup>		
				1899-1909	1904-1909	1899-1904
Number of establishments reporting.....	38	36	31	22.6	5.6	16.1
Total quantity (pounds).....	244,719,817	188,538,309	134,229,012	82.3	29.8	40.5
For sale:						
Quantity (pounds).....	203,200,479	127,502,682	116,675,109	74.2	59.4	9.3
Value.....	\$1,758,335	\$1,180,910	\$1,015,915	73.1	48.9	16.2
Consumed in establishments where produced (pounds).....	41,519,338	61,035,714	17,553,903	136.5	-32.0	247.7

<sup>1</sup>A minus sign (-) denotes decrease.

Table 21 shows, by states, the number of all establishments manufacturing muriatic acid in 1909, 1904, and 1899.

STATE.	TOTAL NUMBER OF ESTABLISHMENTS MANUFACTURING MURIATIC ACID.			STATE.	TOTAL NUMBER OF ESTABLISHMENTS MANUFACTURING MURIATIC ACID.		
	1909	1904	1899		1909	1904	1899
United States.....	38	36	31	Maryland.....		1	
California.....	4	4	3	Massachusetts.....	2	3	2
Colorado.....	1	1	1	Michigan.....	3	3	1
Connecticut.....	3		1	Missouri.....	1		1
Illinois.....	3	1	3	New Jersey.....	6	5	6
Indiana.....	1	1	2	New York.....	6	5	4
Kansas.....	1	1		Ohio.....	3	2	2
Louisiana.....	1			Pennsylvania.....	3	9	5

MANUFACTURES.

Table 22 shows statistics for 1909, 1904, and 1899 for all establishments manufacturing acetic acid, including that consumed in the establishments where produced.

	TOTAL PRODUCTION OF ACETIC ACID—ALL INDUSTRIES.					
	1909	1904	1899	Per cent of increase. <sup>1</sup>		
				1899-1909	1904-1909	1899-1904
Number of establishments reporting.....	13	12	14	-7.1	8.3	-14.3
Total quantity (pounds).....	58,000,602	29,506,021	27,875,222	108.1	96.6	5.8
For sale:						
Quantity (pounds).....	56,923,773	27,074,280	26,660,555	113.5	110.2	1.6
Value.....	\$1,336,374	\$568,600	\$426,892	213.2	135.1	33.2
Consumed in establishments where produced (pounds).....	1,076,829	2,431,741	1,214,667	-11.3	-55.7	100.2

<sup>1</sup> A minus sign (-) denotes decrease.

Acetic acid, as considered in the census returns, does not include the acetic acid produced by the oxidation of alcohol through fermentation or otherwise, and known as vinegar. The commercial grades of acetic acid contain from 28 to 90 per cent of real acetic acid.

Table 23 shows, by states, the number of all establishments manufacturing acetic acid in 1909, 1904, and 1899.

STATE.	TOTAL NUMBER OF ESTABLISHMENTS MANUFACTURING ACETIC ACID.			STATE.	TOTAL NUMBER OF ESTABLISHMENTS MANUFACTURING ACETIC ACID.		
	1909	1904	1899		1909	1904	1899
United States.....	13	12	14	Michigan.....	1	1	2
Connecticut.....	2	1	1	Missouri.....	1	1	2
Illinois.....	1	1	2	New Jersey.....	2	5	2
Indiana.....	1	1	1	New York.....	1	1	3
Maryland.....	1	1	1	Pennsylvania.....	1	2	3
Massachusetts.....	3	3	2				

Of the 13 establishments reported in 1909, 8 were in the chemical industry and 5 were engaged primarily in the manufacture of other products, reporting this acid as a subsidiary product.

Table 24 shows statistics for all establishments manufacturing minor acids in 1909, 1904, and 1899, including those consumed in the establishments where produced, so far as statistics thereof are available.

PRODUCT.	TOTAL PRODUCTION OF MINOR ACIDS—ALL INDUSTRIES.						PRODUCT.	TOTAL PRODUCTION OF MINOR ACIDS—ALL INDUSTRIES.							
	1909	1904	1899	Per cent of increase. <sup>1</sup>				1909	1904	1899	Per cent of increase. <sup>1</sup>				
				1899-1909	1904-1909	1899-1904					1899-1909	1904-1909	1899-1904		
Boric acid:							Phosphoric acid:								
Number of establishments reporting.....	5	7	3				Number of establishments reporting.....	9	9	( <sup>6</sup> )					
Quantity (pounds).....	5,554,914	6,956,896	2,684,935	106.9	-20.2	159.1	Total quantity (pounds).....	50,290,006							
Value.....	\$295,776	\$527,190	\$193,212	49.2	-43.9	166.0	For sale—								
Citric acid:							Quantity (pounds).....	26,282,339	991,050	( <sup>6</sup> )				2,552.0	
Number of establishments reporting.....	5	4	3	( <sup>3</sup> )	-7.2	( <sup>5</sup> )	Value.....	\$508,163	\$68,541	( <sup>6</sup> )				641.4	
Quantity (pounds).....	2,102,256	2,265,631	3,886,332	( <sup>3</sup> )		( <sup>5</sup> )	Consumed in establishments where produced (pounds).....	24,007,167	( <sup>6</sup> )	( <sup>6</sup> )					
Value.....	\$777,235	\$598,718	\$335,297	( <sup>3</sup> )	29.8	( <sup>5</sup> )	Stearic acid:								
Lactic acid:							Number of establishments reporting.....	11	( <sup>6</sup> )	( <sup>6</sup> )					
Number of establishments reporting.....	4	3	( <sup>4</sup> )				Quantity (pounds).....	12,381,601							
Quantity (pounds).....	4,200,025	2,906,555	( <sup>4</sup> )		44.5		For sale—								
Value.....	\$176,654	\$158,911	( <sup>4</sup> )		11.2		Quantity (pounds).....	11,933,692							
Hydrofluoric acid:							Value.....	\$975,327	( <sup>6</sup> )	( <sup>6</sup> )					
Number of establishments reporting.....	10	6	4				Consumed in establishments where produced (pounds).....	447,909	( <sup>6</sup> )	( <sup>6</sup> )					
Total quantity (pounds).....	8,027,290						Other acids:								
For sale—							Number of establishments reporting.....	22	15	16					
Quantity (pounds).....	6,842,914	2,932,358	958,000	880.4	133.4	320.1	Value <sup>7</sup> .....	\$2,466,283	\$1,172,119	\$1,287,481					
Value.....	\$294,379	\$151,218	\$34,890	743.7	94.7	333.4									
Consumed in establishments where produced (pounds).....	1,184,376	( <sup>6</sup> )	( <sup>6</sup> )												
Oleic acid:															
Number of establishments reporting.....	3	( <sup>6</sup> )	( <sup>6</sup> )												
Quantity (pounds).....	16,377,063														
Value.....	\$845,103	( <sup>6</sup> )	( <sup>6</sup> )												

<sup>1</sup> A minus sign (-) denotes decrease.

<sup>2</sup> Includes lactic acid.

<sup>3</sup> Figures not strictly comparable.

<sup>4</sup> Included in citric acid.

<sup>5</sup> Not reported.

<sup>6</sup> Included in "other acids."

<sup>7</sup> Includes, for 1909, tartaric, chromic, hydrofluosilicic, carbolic, pyroligneous, and molybdic acids in the order named to the value of \$759,708, and undesignated acids to the value of \$1,706,575.

*Group II—Sodas.*—The class of sodas, as shown in Table 17, comprises soda ash, including white or refined alkali; sal soda, including natural soda, mild mineral alkali, soda crystals, washing soda, or crystallized sodium carbonate; bicarbonate of soda, including baking soda, saleratus, and sodium hydrogen carbonate; caustic soda, including soda lye and sodium

hydroxide; borax, including borax glass, lime and sodium borates, and sodium baborate; and other soda products, under which heading are included nitrate, sulphate, and sulphide of soda made by soda establishments, and in addition the products of compounders or packers who give an added value to soda lye or the carbonate.

Table 25 shows statistics for all establishments manufacturing sodas for each census from 1889 to 1909, inclusive. In order to make the statistics for 1909 comparable with those for earlier censuses, the figures are confined to the major soda products, viz, bicarbonate of soda, caustic soda, sal soda, and soda ash.

KIND AND CENSUS.	TOTAL PRODUCTION OF SPECIFIED SODAS—ALL INDUSTRIES.		
	Number of establishments reporting.	Quantity (tons).	Value.
<b>Total:</b>			
1909.....	65	947,576	\$18,304,583
1904.....	63	734,209	13,357,983
1899.....	50	689,541	10,237,944
1889.....	32	166,562	5,432,400
<b>Bicarbonate of soda:</b>			
1909.....	7	82,800	1,515,031
1904.....		68,867	1,135,610
1899.....		68,856	1,332,765
1889.....		30,339	2,009,800
<b>Caustic soda:</b>			
1909.....	17	131,612	15,264,887
1904.....		86,840	3,185,959
1899.....		106,793	3,170,280
1889.....		16,501	661,114
<b>Sal soda:</b>			
1909.....	50	87,107	1,162,009
1904.....		59,548	831,869
1899.....		63,249	875,243
1889.....		72,322	1,581,766
<b>Soda ash:</b>			
1909.....	11	646,057	10,362,656
1904.....		518,954	8,204,545
1899.....		300,653	4,859,656
1889.....		47,400	1,179,720
<b>Per cent of increase: <sup>2</sup></b>			
<b>Total—</b>			
1899-1909.....		37.4	78.8
1904-1909.....		29.1	37.0
1899-1904.....		6.5	30.5
1889-1899.....		314.0	88.5
<b>Bicarbonate of soda:</b>			
1899-1909.....		20.2	13.7
1904-1909.....		20.2	33.4
1899-1904.....		( <sup>3</sup> )	-14.8
1889-1899.....		127.0	-33.7
<b>Caustic soda:</b>			
1899-1909.....		-21.1	66.1
1904-1909.....		51.6	65.3
1899-1904.....		-47.9	0.5
1889-1899.....		910.7	379.5
<b>Sal soda:</b>			
1899-1909.....		37.7	32.8
1904-1909.....		46.3	39.7
1899-1904.....		-5.9	-5.0
1889-1899.....		-12.5	-44.7
<b>Soda ash:</b>			
1899-1909.....		65.4	113.2
1904-1909.....		24.5	26.3
1899-1904.....		32.8	68.8
1889-1899.....		724.2	311.9

<sup>1</sup> Includes 19,428 tons of caustic soda, valued at \$1,032,647, reported under "chemicals produced by the aid of electricity."  
<sup>2</sup> A minus sign (-) denotes decrease.  
<sup>3</sup> Less than one-tenth of 1 per cent.

Soda ash is the most important of these products, both in quantity and value, while caustic soda ranks next. There has been a steady growth since 1889 in the quantity and value of the sodas produced, the total tonnage of these products in 1909 being more than five times and the value more than three times that in 1889. Each class with the exception of caustic soda shows a considerable relative increase in quantity for the decade 1899-1909, the largest increase (65.4 per cent) being that for soda ash.

Table 26 shows, by states, the number of all establishments manufacturing sodas in 1909, 1904, and 1899.

STATE.	TOTAL NUMBER OF ESTABLISHMENTS MANUFACTURING SODAS.			STATE.	TOTAL NUMBER OF ESTABLISHMENTS MANUFACTURING SODAS.		
	1909	1904	1899		1909	1904	1899
United States.....	65	63	55	Montana.....	1	1	.....
California.....	8	6	6	Nevada.....	1	2	5
Colorado.....	1	1	.....	New Jersey.....	3	7	3
Georgia.....	2	.....	.....	New York.....	8	9	12
Illinois.....	6	4	4	Ohio.....	3	4	1
Indiana.....	3	3	2	Pennsylvania.....	3	8	9
Iowa.....	2	.....	.....	Rhode Island.....	1	.....	1
Kansas.....	2	1	.....	Virginia.....	1	1	1
Maryland.....	4	1	1	Washington.....	1	.....	.....
Massachusetts.....	3	3	1	Wisconsin.....	3	4	4
Michigan.....	5	5	3	Wyoming.....	1	1	.....
Missouri.....	3	2	2				

<sup>1</sup> Includes 5 establishments producing caustic soda reported under "chemicals produced by the aid of electricity."

**Group III—Potashes.**—Properly speaking, the term "potash" includes only potassium carbonate in its various forms and degrees of purity. The term has long been applied, however, to potassium hydroxide or caustic potash and this substance has been included with potassium carbonate in the statistics of products given in this report. The group "potashes" covers four products commercially distinguished, namely, (1) Potash or black salts, or black flux, which is the unrefined potassium carbonate produced by calcining stone ash, argols, or wine lees; (2) pearlash, or white flux, which is refined potassium carbonate; (3) stone ash, known also as crude potash or lump potash, which is a mixture of potassium carbonate, potassium hydroxide, and potassium sulphate with various organic and inorganic matter; and (4) potassium hydroxide, or caustic potash. There is included in Table 17 such of these potashes as were reported.

Table 27 shows statistics of all establishments manufacturing potashes for each census from 1849 to 1909, inclusive, such establishments being assigned to the chemical industry.

CENSUS.	PRODUCTION OF POTASHES IN THE CHEMICAL INDUSTRY.		
	Number of establishments reporting.	Quantity (pounds).	Value.
1909.....	31	1,856,570	\$88,940
1904.....	39	1,811,037	104,655
1899.....	67	3,864,766	178,180
1889.....	75	5,106,839	197,507
1879.....	68	4,571,671	232,643
1869.....	105	( <sup>1</sup> )	327,671
1859.....	212	( <sup>1</sup> )	538,550
1849.....	509	( <sup>1</sup> )	1,401,533

<sup>1</sup> Not reported.

There was a steady decrease in the value of potash products from 1849 to 1909. Statistics as to quantity of output were not obtained until the census of 1879. From 1879 to 1904 the output decreased, but between 1904 and 1909 it increased slightly.

Of the total quantity of potash reported for 1909, 1,049,102 pounds, valued at \$53,319, were reported from Michigan.

The product shown in the table for 1909 includes the solid and liquid potash produced electrolytically by one establishment in New York.

*Group IV—Alums.*—The group of alums comprises alum cake, or crude aluminum sulphate; concentrated alum, or crystalized aluminum sulphate; potash, ammonia, and soda alums and all other double sulphates of aluminum with alkali metals or their isomorphs, such as chrome alum; burnt alum; porous alum, which is effloresced soda alum in various degrees of purity; aluminoferric cake, or alum cake containing a considerable amount of iron; and aluminum hydrate or hydroxide.

In addition to the production, as shown in Table 19, for 1909 (113,422 tons), there was a large production by establishments engaged primarily in the manufacture of sulphuric, nitric, and mixed acids and of paint and varnish. Table 28 shows statistics for all establishments producing alums in 1909, 1904, and 1899, including that consumed in the establishments where produced in 1909 and 1899.

TOTAL PRODUCTION OF ALUMS—ALL INDUSTRIES.	TOTAL PRODUCTION OF ALUMS—ALL INDUSTRIES.			Per cent of increase. <sup>1</sup>		
	1909	1904	1899			
				1899-1909	1904-1909	1899-1904
Total quantity (tons)...	139,917	112,772	92,323	51.6	24.1	21.1
For sale:						
Quantity (tons).....	138,147	112,772	89,734	54.0	22.5	25.7
Value.....	\$3,022,355	\$2,956,844	\$2,446,576	23.5	2.2	20.9
Consumed in establishments where produced (tons).....	1,770	( <sup>2</sup> )	2,589	-31.6		

<sup>1</sup> A minus sign (-) denotes decrease.

<sup>2</sup> Figures not available.

The quantity of alums consumed in the establishments where produced was not reported in 1904, and it is probable that such alums were not in all cases reported for 1909. Table 29 shows the quantity and value of the several kinds of alum produced for sale in 1909, 1904, and 1899.

PRODUCT.	TOTAL PRODUCTION OF ALUMS—ALL INDUSTRIES.					
	1909		1904		1899	
	Quantity (tons).	Value.	Quantity (tons).	Value.	Quantity (tons).	Value.
Total.....	138,147	\$3,022,355	112,772	\$2,956,844	89,734	\$2,446,576
Alum cake.....	13,501	274,307	9,748	161,906	2,024	34,047
Burnt alum.....	5,873	209,904	7,029	364,328	3,315	174,600
Concentrated alum.....	27,439	468,795	40,460	972,892	51,508	1,062,547
Potash alum.....	5,127	155,318	5,154	156,448	7,100	215,004
Soda alum.....	359	14,360	41	4,923	4,700	223,500
Other alums.....	85,848	1,899,670	49,440	1,296,347	21,087	731,878

It seems probable that the statistics for the products shown separately in the table may not in all cases represent the total output of the specified product, as some establishments making these products may not have reported them separately but included them under "other alums." Some manufacturers, moreover, do not consider soda alum, which is known in the

trade as "C. T. S.," or cream of tartar substitute, as an alum, and hence may have reported it under Group XII (chemicals, not elsewhere specified). As the extent to which the different products were reported under other headings may have varied at different censuses, the figures for the different years may not be entirely comparable. Of the products shown separately in the table, concentrated alum was the most important in 1909, both in quantity and in value of output, alum cake coming next.

The 85,848 tons of "other alums" shown for 1909 include 50,298 tons of aluminum sulphate, valued at \$843,956; 11,758 tons of porous alum, valued at \$471,378; 3,672 tons of sodic aluminum sulphate, valued at \$119,581; 950 tons of aluminum hydroxide, valued at \$46,917; and 19,170 tons of unspecified kinds of alum, valued at \$417,838.

Table 30 shows, by states, for 1909, 1904, and 1899, the total value of the alums produced for sale both in the chemical and in other industries.

STATE.	TOTAL VALUE OF ALUMS MANUFACTURED—ALL INDUSTRIES.		
	1909	1904	1899
United States.....	\$3,022,355	\$2,956,844	\$2,446,576
Massachusetts.....	( <sup>1</sup> )	270,614	300,754
Illinois.....	440,976	481,764	( <sup>1</sup> )
New York.....	646,437	( <sup>1</sup> )	( <sup>1</sup> )
Pennsylvania.....	1,390,589	1,479,340	1,411,652
All other states <sup>2</sup> .....	544,353	725,136	728,170

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

<sup>2</sup> Includes, for 1909, Massachusetts, Michigan, Nebraska, and New Jersey; for 1904, California, Michigan, New York, and Ohio; for 1899, Illinois, New York, and Michigan.

Pennsylvania is the leading state in the production of alums, reporting 46 per cent of the total value for 1909, as compared with 50 per cent in 1904, and 57.7 per cent in 1899; the alum output of the state, however, shows a decrease of 6 per cent in value between 1904 and 1909.

Table 31 shows, by states, the number of establishments manufacturing alums in 1909, 1904, and 1899.

STATE.	TOTAL NUMBER OF ESTABLISHMENTS MANUFACTURING ALUMS.			STATE.	TOTAL NUMBER OF ESTABLISHMENTS MANUFACTURING ALUMS.		
	1909	1904	1899		1909	1904	1899
	United States.....	19	17		13	Nebraska.....	1
California.....	2	1	1	New Jersey.....	1	1	1
Illinois.....	2	3	1	New York.....	4	2	2
Massachusetts.....	2	3	3	Ohio.....	1	1	1
Michigan.....	2	1	1	Pennsylvania.....	7	6	6

*Group V—Coal-tar products.*—Coal tar is produced in the destructive distillation of bituminous coal, and is, therefore, a by-product of the coal-gas industry and of the coke industry when by-product ovens are used. The products obtained from it are reported under two heads: (1) The direct products of the distillation of coal-tar sold as such, which include pitch, creosote oil, dead oil, and other tar oils, benzol (benzene), toluol, xylol, naphthalene, anthracene, and other coal-tar hydrocarbons, phenol (carbolic acid), cresol, naphthol,

resorcin, or resorcinol, and other coal-tar tertiary alcohols, and aniline, toluidine, xylydine, and other coal-tar amines; and (2) chemicals made from coal-tar distillery products, which include the aldehydes, acids, ketones, salts, and various other so-called benzene derivatives. The latter cover the coal-tar dyes, which are also produced by establishments assigned to the classification "dyestuffs and extracts," and many nitro-substitution compounds and synthetic preparations which are also made by establishments assigned to the classification "oil, essential," and also a number of substances, such as are included under the heading of "fine chemicals" in Table 17. Many establishments distilling coal tar consume part of the product in the manufacture of roofing felt, roofing paper, and roofing preparations or paints, and hence are classified as engaged in other industries. On account of the great diversity existing in the kind and the value of the products, only the total value is given.

Table 32 shows, by states, for 1909, 1904, and 1899, the total value of the coal-tar products reported by all establishments, whether in the chemical industry or in other industries.

STATE.	TOTAL VALUE OF COAL-TAR PRODUCTS—ALL INDUSTRIES.		
	1909	1904	1899
United States.....	\$4,286,119	\$3,984,821	\$1,421,720
Massachusetts.....	526,025	175,978	(1)
Missouri.....	183,473	284,637	415,600
New York.....	262,299	926,329	44,016
Ohio.....	607,514	463,001	(1)
Pennsylvania.....	783,382	375,757	396,759
All other states <sup>2</sup> .....	1,923,426	1,759,119	565,345

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

<sup>2</sup> Includes for 1909: Alabama, Illinois, Kentucky, Louisiana, Michigan, Minnesota, Nebraska, New Jersey, Tennessee, and Wisconsin; for 1904, California, Illinois, Maine, Michigan, New Jersey, Rhode Island, and Tennessee; and for 1899, California, Louisiana, Massachusetts, Minnesota, New Jersey, Ohio, and Tennessee.

The total value of coal-tar products increased from \$1,421,720 to \$4,286,119, or 201.5 per cent, during the decade. Of the states shown separately in the table, Pennsylvania leads, followed by Ohio and Massachusetts. New Jersey and Illinois, which are included under "all other states," were also important states in the manufacture of coal-tar products in 1909. The value of the coal-tar products reported from New York shows a considerable decrease, amounting to 71.7 per cent for the five-year period 1904-1909. Missouri also shows a decrease from 1904 to 1909. Massachusetts, Pennsylvania, and Ohio, on the other hand, show considerable increases.

Table 33 shows, by states, the total number of establishments reporting coal-tar products in 1909, 1904, and 1899.

STATE.	TOTAL NUMBER OF ESTABLISHMENTS MANUFACTURING COAL-TAR PRODUCTS.			STATE.	TOTAL NUMBER OF ESTABLISHMENTS MANUFACTURING COAL-TAR PRODUCTS.		
	1909	1904	1899		1909	1904	1899
United States..	42	39	22	Minnesota.....	2	.....	1
Alabama.....	1	.....	.....	Missouri.....	3	3	3
California and Maine.....	.....	4	1	Nebraska.....	1	.....	2
Connecticut.....	1	.....	.....	New Jersey.....	3	8	.....
District of Columbia.....	1	.....	.....	New York.....	3	8	3
Georgia.....	1	.....	.....	Ohio.....	5	3	2
Illinois.....	1	1	.....	Pennsylvania.....	7	3	6
Indiana.....	1	.....	.....	Rhode Island.....	1	6	.....
Kentucky.....	2	.....	.....	Tennessee.....	1	1	1
Louisiana.....	1	.....	1	Washington.....	1	.....	.....
Massachusetts.....	3	3	2	Wisconsin.....	1	.....	.....
Michigan.....	2	1	.....				

*Group VI—Cyanides.*—The cyanides reported for 1909 comprise sodium cyanide, yellow prussiate of potash (prussiate of soda), and potassium cyanide. Only the production of yellow prussiate of potash, however, can be given separately, 3,510,208 pounds of this product, valued at \$463,983, being reported for 1909.

Table 34 shows the quantity and value of cyanides produced by establishments in all industries in 1909, 1904, and 1899.

	TOTAL PRODUCTION OF CYANIDES—ALL INDUSTRIES.					
	1909	1904	1899	Per cent of increase.		
				1899-1909	1904-1909	1899-1904
Total quantity (pounds).....	13,291,080	11,196,318	8,460,989	57.1	18.7	32.3
Value.....	\$1,941,893	\$1,710,823	\$1,595,505	21.7	13.5	7.2

In 1909 the entire production was reported by establishments assigned to the chemical industry, as defined by the Bureau of the Census, but in 1904 cyanides to the value of \$531,719, and in 1899 cyanides to the value of \$10,582, were produced as secondary products by establishments in other industries, these amounts being included in the above table.

Table 35 shows, by states, the total number of establishments manufacturing cyanides in 1909, 1904, and 1899.

STATE.	TOTAL NUMBER OF ESTABLISHMENTS MANUFACTURING CYANIDES.			STATE.	TOTAL NUMBER OF ESTABLISHMENTS MANUFACTURING CYANIDES.		
	1909	1904	1899		1909	1904	1899
United States..	7	11	18	Ohio.....	2	2	3
Massachusetts.....	1	1	1	Pennsylvania.....	2	3	4
New Jersey.....	1	1	6	Maryland, Michigan, and Missouri.....	.....	2	4
New York.....	1	2	.....				

*Group VII—Bleaching materials.*—This group of products includes chlorine, chloride of lime (bleaching powder), chloride of soda and other hypochlorites, hydrogen dioxide (peroxide), sodium, magnesium, calcium, barium, and other dioxides (peroxides), sulphur dioxide or sulphurous acid, sulphites, and sodium, potassium, calcium, and other bisulphites. Many of these substances are now manufactured by the aid of electricity, and the products made in this manner are included in Group VIII (chemicals produced by the aid of electricity) in Tables 17 and 19.

Table 36 gives statistics of the bleaching materials reported as made in 1909, 1904, and 1899 by all establishments, whether in the chemical industry or in other industries. Bleaching materials manufactured by the aid of electricity are included.

PRODUCT.	TOTAL PRODUCTION OF BLEACHING MATERIALS—ALL INDUSTRIES.					
	1909	1904	1899	Per cent of increase.		
				1899-1909	1904-1909	1899-1904
<b>Total value.....</b>	<b>\$3,206,354</b>	<b>\$1,158,064</b>	<b>\$592,658</b>	<b>441.0</b>	<b>176.9</b>	<b>65.4</b>
Hypochlorites: <sup>1</sup>						
Quantity (tons).....	58,401	19,588	10,979	431.9	198.1	78.4
Value.....	\$1,786,840	\$535,835	\$402,949	286.0	233.5	15.7
Hydrogen peroxide:						
Quantity (tons).....	4,963	2,185	294	1,588.1	127.1	643.2
Value.....	\$870,541	\$413,221	\$63,754	1,265.5	110.7	548.1
Bisulphites:						
Quantity (tons).....	16,059	6,223	1,461	999.2	153.1	325.9
Value.....	\$226,154	\$110,155	\$34,480	555.8	105.3	219.4
Other bleaching agents <sup>1</sup>	\$322,813	\$98,853	\$31,469	925.8	226.6	214.1

<sup>1</sup> Includes electrolytic products.

Hypochlorites constitute the most important class of bleaching materials manufactured, contributing 55.7 per cent of the total value of this class of products in 1909, while hydrogen peroxide ranks next. Under "other bleaching agents" are included liquid chlorine, sulphur dioxide, sodium bisulphate, aluminum chloride, and other agents not specified. There was a marked increase during the decade 1899-1909 in the manufacture of each class of bleaching materials, the output of hydrogen peroxide being nearly seventeen times as great in 1909 as in 1899, and that of bisulphites nearly eleven times as great.

Table 37 shows, by states, the total value of bleaching materials manufactured in 1909, 1904, and 1899.

STATE.	TOTAL VALUE OF BLEACHING MATERIALS—ALL INDUSTRIES.		
	1909	1904	1899
<b>United States.....</b>	<b>\$3,206,354</b>	<b>\$1,112,536</b>	<b>\$587,691</b>
Massachusetts.....	217,492	41,746	.....
Michigan.....	576,408	( <sup>1</sup> )	( <sup>1</sup> )
New Jersey.....	75,941	46,595	39,171
New York.....	2,045,893	799,521	407,327
All other states.....	290,620	224,676	141,493

<sup>1</sup> In addition, sulphur dioxide, valued at \$45,526, was consumed in the establishment where produced.

<sup>2</sup> In addition, sulphur dioxide, valued at \$4,667, was consumed in the establishment where produced.

<sup>3</sup> Includes electrolytic products.

<sup>4</sup> Included in "all other states."

New York reported nearly two-thirds of the value of the bleaching materials manufactured in 1909, and a little over two-thirds of the value in 1904 and 1899. The value of the bleaching materials manufactured in New York, the greater part of which consists of hypochlorites made by the electrolytic process, was more than five times as great in 1909 as in 1899.

Table 38 shows the total number of establishments manufacturing bleaching materials in 1909, 1904, and 1899.

STATE.	TOTAL NUMBER OF ESTABLISHMENTS MANUFACTURING BLEACHING MATERIALS.			STATE.	TOTAL NUMBER OF ESTABLISHMENTS MANUFACTURING BLEACHING MATERIALS.		
	1909	1904	1899		1909	1904	1899
<b>United States..</b>	<b>47</b>	<b>33</b>	<b>26</b>	Michigan.....	4	2	1
California.....	1	.....	.....	Missouri.....	2	2	2
Georgia.....	1	.....	.....	New Jersey.....	4	3	3
Indiana.....	1	.....	.....	New York.....	17	13	10
Illinois.....	3	.....	3	Ohio.....	2	3	1
Maryland.....	2	1	.....	Pennsylvania.....	2	7	6
Massachusetts.....	8	4	.....				

*Group VIII—Chemicals produced by the aid of electricity.*—The segregation of chemicals produced by the aid of electricity under a separate classification was made for the first time in the report on chemicals and allied products for the census of 1899. This branch of the chemical industry shows a rapid increase both in range of products and in their quantity and value. Many of the products are, or have until recently, been made under the protection of patents, the manufacture of a particular product being confined to one or two establishments; consequently detailed statistics of production can not be given for some of the most important products. The group includes some substances which are also made by other chemical processes, as, for example, caustic soda and hypochlorites, but only products produced by the aid of electricity are included in this group.

Table 39 shows the total production of chemicals produced by the aid of electricity in 1909, including that of establishments in other industries. The caustic soda product has also been included in the total production of sodas, as shown in Table 25, and the hypochlorites in the total production of bleaching materials, as shown in Table 36. As already explained, it is possible to give the output of only a few products without disclosing the operations of individual concerns.

The class "metals and alloys" includes aluminum, silicon, ferrovanadium, ferrosilicon, ferrotitanium, cuprovanadium, and other metals and alloys. Elements and compounds produced by the aid of electricity specifically reported and included under the heading of "all other" are phosphorus, sodium, aluminum, lead oxides, liquid chlorine, carbon disulphide, sodium carbonate, potash, and potassium bromide.

The most important class of products produced by the aid of electricity shown in the table, as measured

by value, is that comprising metals and alloys, which contributed 41.5 per cent of the total value of chemicals produced by the aid of electricity in 1909.

PRODUCT.	TOTAL PRODUCTION OF CHEMICALS PRODUCED BY THE AID OF ELECTRICITY—ALL INDUSTRIES.		
	Number of establishments reporting.	Quantity (tons).	Value.
Total.....	34		\$18,451,461
Calcium carbide.....	4	60,973	2,984,001
Caustic soda <sup>1</sup> .....	5	19,428	1,032,647
Chlorates.....	5	5,785	904,550
Hypochlorites <sup>2</sup> .....	5	45,976	1,506,831
Metals and alloys.....	9		7,653,984
Abrasives and electrodes.....	4		1,415,799
All other.....	11		2,953,049

<sup>1</sup> See Table 25 for total production of caustic soda, including that made in electrochemical establishments.

<sup>2</sup> See Table 36 for total production of hypochlorites, including those made in electrochemical establishments.

Table 40 shows, by geographic divisions, the value of products produced by the aid of electricity, for 1909, 1904, and 1899.

DIVISION.	TOTAL VALUE OF CHEMICALS PRODUCED BY THE AID OF ELECTRICITY—ALL INDUSTRIES.		
	1909	1904	1899
United States.....	\$18,451,461	\$7,068,246	\$2,045,535
North Atlantic.....	14,445,668	6,037,533	1,852,279
North Central.....	3,453,462	827,583	
All other divisions.....	552,331	203,130	193,256
Per cent of total.....	100.0	100.0	100.0
North Atlantic.....	78.3	85.4	90.6
North Central.....	18.7	11.7	
All other divisions.....	3.0	2.9	9.4

The value of all products produced by the aid of electricity in 1909 by all establishments, including those manufacturing them as secondary products, was \$18,451,461, as compared with \$7,068,246 in 1904 and \$2,045,535 in 1899, an increase of 802 per cent for the decade, the increase for the five-year period 1899-1904, amounting to 245.5 per cent, and that for the five-year period 1904-1909 to 161 per cent.

Niagara Falls, N. Y., is the chief seat of the electrochemical industry, and it has held this position from the beginning, several large manufacturing establishments there employing electricity generated by the water power of the falls in the manufacture of chemical substances. The North Atlantic states reported 90.6 per cent of the total value of products produced by the aid of electricity in 1899 and 78.3 per cent in 1909. Of the total value of products produced by the aid of electricity in 1909, New York reported \$13,401,878, or 72.6 per cent; Michigan, \$1,513,198, or 8.2 per cent; Pennsylvania, \$903,196, or 4.9 per cent; and all other states, \$2,633,189, or 14.3 per cent.

Table 41 shows, by states, the number of establishments manufacturing products by the aid of electricity in 1909, 1904, and 1899.

STATE.	TOTAL NUMBER OF ESTABLISHMENTS MANUFACTURING PRODUCTS BY THE AID OF ELECTRICITY.			STATE.	TOTAL NUMBER OF ESTABLISHMENTS MANUFACTURING PRODUCTS BY THE AID OF ELECTRICITY.		
	1909	1904	1899		1909	1904	1899
United States.....	34	21	14	New York.....	18	14	10
Illinois.....	1			Pennsylvania.....	3		
Maine.....	1	1		Virginia.....	1	1	
Maryland.....	1		1	West Virginia.....	1	1	
Michigan.....	5	4	1	Connecticut.....			1
Minnesota.....	1			New Hampshire.....			1
New Jersey.....	2						

*Group IX—Plastics.*—This group embraces pyroxylin plastics (including those sold under such trade names as celluloid, xylonite, fiberloid, viscoloid, pegamoid, pyrolin, etc.), pyroxylin or soluble cotton, viscose, rubber substitutes, and all plastics formed by using caoutchouc, gutta-percha, casein, fibrin, gluten, gums, and glue, or other cementing material by which sawdust, wood pulp, bone dust, zinc oxide, antimony sulphide, kaolin, and other fillers are held in solid aggregations which may be molded or shaped. The value of the products reported under this head includes the value of finished goods manufactured from plastics in the establishments producing the plastic material. Table 42 shows the value of the production of plastics by establishments in all industries in 1909, 1904, and 1899.

CLASS.	TOTAL VALUE OF PLASTICS PRODUCED IN ALL INDUSTRIES.		
	1909	1904	1899
Total value.....	\$7,472,732	\$3,949,124	\$3,191,330
Pyroxylin plastics.....	5,682,379	2,136,976	1,526,572
Other plastics.....	1,790,353	1,812,148	1,664,758

<sup>1</sup> In addition, plastics valued at \$3,244,553 were consumed in the establishments where produced.

<sup>2</sup> In addition, plastics valued at \$2,009,185 were consumed in the establishments where produced.

The comparability of the returns for the different censuses may possibly be affected by variations in the extent to which manufactures of plastics were included; moreover, it is probable that some manufactured pyroxylin goods are included under "other plastics." The value of plastics, as reported, increased from \$3,191,330 in 1899 to \$7,472,732 in 1909, or 134.2 per cent, the relative increase being higher for the last half of the decade than for the first. Pyroxylin plastics are by far the most important class, contributing 76 per cent of the total in 1909. Of the total value reported for plastics in 1909, New Jersey contributed \$4,634,200, or 62 per cent; Massachusetts, \$2,127,742, or 28.5 per cent; New York, \$556,005, or 7.4 per cent; and all other states, \$154,785, or 2.1 per cent.

Table 43 shows, by states, the total number of establishments manufacturing plastics in 1909, 1904, and 1899.

STATE.	TOTAL NUMBER OF ESTABLISHMENTS MANUFACTURING PLASTICS.			STATE.	TOTAL NUMBER OF ESTABLISHMENTS MANUFACTURING PLASTICS.		
	1909	1904	1899		1909	1904	1899
<b>United States...</b>	<b>24</b>	<b>14</b>	<b>13</b>				
California.....	1			Massachusetts.....	5	3	1
Connecticut.....	1	1		Michigan.....	3		
Florida.....	1			New Jersey.....	6	8	11
Illinois.....	1			New York.....	6	2	1

*Group X—Compressed and liquefied gases.*—This group of products embraces all gases that are compressed or liquefied for sale, with the exception of illuminating gases (acetylene and pintsch gas), the production of which is included under the gas industry. The gases of commerce which are handled in compressed form in considerable quantities are anhydrous ammonia, carbon dioxide (carbonic acid gas, CO<sub>2</sub>), chlorine, oxygen, and laughing gas (nitrous oxide, N<sub>2</sub>O). Others of minor importance are hydrogen, liquid air, and sulphur dioxide (sulphurous acid gas, SO<sub>2</sub>). Table 44 shows statistics of the total production of these gases by establishments in all industries for 1909, 1904, and 1899.

PRODUCT.	TOTAL PRODUCTION OF COMPRESSED AND LIQUEFIED GASES—ALL INDUSTRIES.					
	1909	1904	1899	Per cent of increase.		
				1899-1909	1904-1909	1899-1904
<b>Total value.....</b>	<b>\$5,571,820</b>	<b>\$2,791,359</b>	<b>\$1,230,797</b>	<b>352.0</b>	<b>99.3</b>	<b>126.8</b>
<b>Anhydrous ammonia:</b>						
Quantity (pounds)...	16,840,860	5,752,233	2,443,729	589.1	192.8	135.4
Value.....	\$2,992,693	\$1,176,854	\$438,157	583.0	154.3	168.6
<b>Carbon dioxide (carbonic acid gas):</b>						
Quantity (pounds)...	47,953,291	35,991,627	12,084,281	298.8	33.2	197.8
Value.....	\$2,345,743	\$1,343,966	\$719,864	226.1	74.5	86.8
<b>Laughing gas (nitrous oxide):</b>						
Quantity (pounds)...	97,175	41,020	(1)		136.9	
Value.....	\$38,589	\$28,311	(1)		36.3	
<b>Oxygen:</b>						
Quantity (cubic feet)...	3,814,000	(2)	(2)			
Value.....	\$177,469	\$69,246	\$38,170	364.9	156.3	81.4
<b>All other gases.....</b>	<b>\$17,826</b>	<b>\$172,982</b>	<b>\$35,106</b>			

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

<sup>2</sup> Comparable figures not available.

The growth in the production of compressed gases has been rapid, the value of all products of this group increasing during the decade from \$1,230,797 to \$5,571,820, or 352.7 per cent. This growth is chiefly due to the increasing amounts of anhydrous ammonia consumed in ice manufacture and refrigeration and of carbon dioxide consumed by the soda-fountain trade. The value of these two products represented 96 per cent of the total value of this class of products in 1909, that of anhydrous ammonia alone representing 53.8 per cent.

The anhydrous ammonia product for 1909 includes 4,871,014 pounds, valued at \$448,455, reported by establishments engaged in the coke industry, where it is a product of the retort or by-product ovens. The

value of compressed and liquefied gases, as shown in the table, does not include the value of the containers in which the gases are shipped to the consumers. These are returned to the factory, and the freight on the containers from and to the factory constitutes a considerable part of the cost of these products to the consumer.

The oxygen reported includes medicated oxygen, but the bulk of the product was straight oxygen; oxygen manufactured for use in the production of calcium lights is also included. Some establishments reported the quantity of oxygen in gallons, following the trade practice of former years, though most of the larger producers now use the cubic foot at atmospheric pressure as the unit of quantity; where the quantity was reported in gallons it was reduced to cubic feet on the basis of 7.5 gallons to 1 cubic foot.

Table 45 shows, by states, the total number of establishments manufacturing compressed and liquefied gases in 1909, 1904, and 1899, and the number manufacturing anhydrous ammonia and carbon dioxide in 1909. The manufacture of laughing gas was reported by 5 establishments in 1909 and oxygen by 20.

STATE.	TOTAL NUMBER OF ESTABLISHMENTS MANUFACTURING COMPRESSED AND LIQUEFIED GASES.				
	1909			1904	1899
	Total for all gases.	Anhydrous ammonia.	Carbon dioxide.		
<b>United States.....</b>	<b>76</b>	<b>21</b>	<b>34</b>	<b>56</b>	<b>37</b>
California.....	5	1	4	5	2
Colorado.....	1	1	1	1	
Connecticut.....	1				
Delaware.....					1
Georgia.....	2		2	2	
Illinois.....	7	2	4	3	3
Louisiana.....	1		1	1	
Massachusetts.....	9	1	1	3	2
Michigan.....					1
Minnesota.....	4	1	2	4	2
Missouri.....	5	2	3	3	7
New Jersey.....	7	5	5	6	9
New York.....	15	2	5	14	9
Ohio.....	4	1	3	3	3
Pennsylvania.....	9	4	3	7	5
Tennessee.....	1				
Texas.....	1		1	1	
Vermont.....	1				1
Virginia.....	1		1	1	
Washington.....	1	1			
Wisconsin.....	1		1	2	1

*Group XI—Fine chemicals.*—This group of products embraces chemicals sold in the trade as chemically or absolutely pure; the chemicals which are more especially made use of in analytical operations, in scientific research, and in pharmacy; and chemicals like the salts of gold, of silver, and of platinum, for which the value per unit is high. Among the chemicals which are embraced here may be named chemically pure or "analyzed" acids, bases, and salts; acetone and other ketones; absolute alcohols and all alcohols other than commercial grain and wood alcohols; aldehydes, such as vanillin; alkaloids; elementary substances other than common and low-priced ones; enzymes, ferments, or diastases, such as pancreatin, pepsin, rennet, trypsin, lactose, sucrose, and zymose; esters

(ethereal salts or compound ethers); refined and artificial camphor; chloroform; and ethers, simple and mixed; rare earth compounds, such as the salts of cerium, lanthanum, thorium, radium, and uranium; terpenes; toxins and antitoxins; and urea and the ureides.

Table 46 shows the quantity and value of fine chemicals produced by establishments in all industries in 1909, 1904, and 1899, so far as they can be shown in detail.

PRODUCT.	TOTAL PRODUCTION OF FINE CHEMICALS—ALL INDUSTRIES.		
	1909	1904	1899
Total value.....	\$11,532,086	\$9,640,073	.....
Alkaloids:			
Quantity (ounces).....	3,482,617	5,797,925	4,054,478
Value.....	\$3,188,914	\$3,220,527	\$1,750,503
Gold salts:			
Quantity (ounces).....	42,544	47,641	12,347
Value.....	\$430,944	\$453,202	\$120,696
Silver salts:			
Quantity (ounces).....	2,030,399	1,899,081	1,606,108
Value.....	\$727,428	\$778,439	\$627,252
Platinum salts:			
Quantity (ounces).....	1,561	19,068	8,112
Value.....	\$19,123	\$178,682	\$61,400
Refined camphor:			
Quantity (pounds).....	1,821,030	<sup>2</sup> 1,186,372	<sup>2</sup> 598,708
Value.....	\$431,616	\$723,907	\$254,190
Chloroform:			
Quantity (pounds).....	1,869,685	616,670	( <sup>3</sup> )
Value.....	\$477,538	\$166,604	( <sup>3</sup> )
Ether:			
Quantity (pounds).....	4,177,914	<sup>5</sup> 854,411	<sup>5</sup> 263,238
Value.....	\$199,448	\$427,401	\$129,876
Acetone:			
Quantity (pounds).....	8,935,446	<sup>7</sup> 1,300,395	1,638,715
Value.....	\$930,182	\$161,320	\$178,668
All other.....	\$5,126,893	\$3,525,991	( <sup>3</sup> )

<sup>1</sup> Not including camphor consumed in the establishment where refined, which quantity exceeds that made for sale.

<sup>2</sup> Includes artificial camphor.

<sup>3</sup> Figures not available.

<sup>4</sup> In addition, 2,084,792 pounds were consumed in the establishments where produced.

<sup>5</sup> In addition, 3,384,763 pounds were consumed in the establishment where produced.

<sup>6</sup> In addition, 1,222,704 pounds were consumed in the establishment where produced.

<sup>7</sup> In addition, 288,820 pounds were consumed in the establishment where produced.

Alkaloids are the most important class of fine chemicals shown separately, contributing 27.7 per cent of the total value in 1909, while acetone ranked next. The production of alkaloids, however, decreased considerably during the five-year period 1904-1909, being less in 1909 than in 1899, although the value was nearly twice as great. There was also a marked decrease in the production of platinum salts, but chloroform, ether, and acetone show striking increases in output. The decrease in the average unit value of ether as reported, from 50 cents per pound in 1904 to 16 cents per pound in 1909, is chiefly due to the remission of the internal-revenue tax on alcohol used in chemical manufacture. Ether is largely, if not wholly, made from alcohol and the tax of \$1.10 per proof gallon is theoretically equal to 36.7 cents per pound of ether.

The large proportion of the total value of this group of products included under the heading of "all other" suggests the possibility that a part of the output of some of the products shown specifically in the table

may have been reported under this head and consequently that the statistics given do not show the total production of some of these substances. Among the numerous products included under the heading of "all other" for 1909 which were specifically reported were 43,660 pounds of thorium compounds, valued at \$131,151; 1,470,568 pounds of amyl acetate, valued at \$442,771; and 8,171 pounds of ethyl chloride, valued at \$37,142.

Table 47 shows, by states, the total number of establishments manufacturing fine chemicals in 1909, 1904, and 1899.

STATE.	TOTAL NUMBER OF ESTABLISHMENTS MANUFACTURING FINE CHEMICALS.			STATE.	TOTAL NUMBER OF ESTABLISHMENTS MANUFACTURING FINE CHEMICALS.		
	1909	1904	1899		1909	1904	1899
United States.....	63	67	49	New Jersey.....	21	23	15
Colorado.....	1	1	1	New York.....	11	14	7
Connecticut.....	1	.....	.....	Ohio.....	8	3	2
Kentucky.....	1	.....	.....	Pennsylvania.....	7	11	13
Louisiana.....	1	.....	.....	Rhode Island.....	1	1	1
Massachusetts.....	4	2	1	Wisconsin.....	1	1	.....
Michigan.....	3	3	1	All other states.....	4	.....	6
Missouri.....	3	4	2				

Group XII—Chemicals, not elsewhere specified.—This class embraces all chemicals the production of which is covered by the chemical industry as defined by the Bureau of the Census and which are not included in the groups previously considered. Table 48 presents statistics of the total production by establishments in all industries of such of these chemicals as were reported separately.

PRODUCT.	TOTAL PRODUCTION OF CHEMICALS NOT ELSEWHERE SPECIFIED—ALL INDUSTRIES.		
	1909	1904	1899
Total value.....	\$44,882,608	.....	.....
Glycerin:			
Quantity (pounds).....	<sup>1</sup> 81,885,536	46,972,658	26,512,454
Value.....	\$11,752,562	\$5,355,320	\$3,096,601
Cream of tartar:			
Quantity (pounds).....	15,592,937	15,650,000	10,981,680
Value.....	\$2,925,883	\$2,892,563	\$2,117,704
Epsom salts:			
Quantity (pounds).....	21,621,297	20,566,443	9,239,809
Value.....	\$189,791	\$215,088	\$75,066
Blue vitriol:			
Quantity (pounds).....	36,546,543	( <sup>2</sup> )	( <sup>2</sup> )
Value.....	\$1,531,574	( <sup>2</sup> )	( <sup>2</sup> )
Copperas:			
Quantity (pounds).....	25,637,092	9,700,104	27,595,909
Value.....	\$78,467	\$28,096	\$199,869
Phosphate of soda:			
Quantity (pounds).....	24,580,159	9,659,519	4,679,160
Value.....	\$540,282	\$244,373	\$155,989
Tin compounds:			
Quantity (pounds).....	10,293,377	11,621,378	6,259,794
Value.....	\$1,535,350	\$1,361,299	\$603,937
Zinc salts:			
Quantity (pounds).....	25,054,213	11,579,546	9,511,909
Value.....	\$472,302	\$201,771	\$353,900
All other chemicals.....	\$20,699,716	( <sup>2</sup> )	( <sup>2</sup> )
By-products and residues.....	\$5,156,681	.....	.....

<sup>1</sup> In addition, there were 5,633,197 pounds with no value and 5,879,279 pounds used in establishments where produced.

<sup>2</sup> Figures not available.

Glycerin is the most important of the products shown separately in Table 48. Of the total production of glycerin shown in the table, which repre-

sents the output of establishments manufacturing chemicals either as chief or as secondary products, a large part was produced as a secondary product in the manufacture of soap. It was not manifest, in all cases, whether the product was refined or crude, and there is duplication in the figures representing the amount of the output to the extent that crude glycerin, the product of some establishments, was bought and refined by others, but the amount of this duplication can not be definitely ascertained.

Table 49 presents, by states, detailed statistics as to the glycerin produced in 1909. The total production, including that reported as of no value at the works, is given in order to show the total available supply in the United States.

STATE.	TOTAL PRODUCTION OF GLYCERIN—ALL INDUSTRIES: 1909				
	Total quantity (pounds).	Reported with value.		Of no value at works (pounds).	Produced and consumed (pounds).
		Quantity (pounds).	Value.		
United States.....	93,398,012	81,885,536	\$11,752,562	5,633,197	5,879,279
California.....	1,045,846	749,685	61,331	271,541	24,620
Illinois.....	15,671,677	13,767,098	1,858,329	514,684	1,389,985
Massachusetts.....	1,467,147	1,143,760	144,112	.....	323,387
Missouri.....	3,424,779	1,997,790	188,734	22,880	1,404,109
New Jersey.....	5,711,398	4,947,695	653,295	713,360	50,323
New York.....	28,829,614	27,785,268	3,979,485	1,044,346	.....
Ohio.....	18,722,210	17,185,148	2,891,709	966,372	570,660
Pennsylvania.....	2,646,169	1,967,823	256,460	545,307	133,039
All other states.....	15,879,172	12,341,359	1,719,107	1,554,687	1,983,126

Of the total production of glycerin in industries other than the soap industry (35,009,894 pounds), 31,725,366 pounds were reported as refined glycerin, and 923,296 pounds were reported as crude glycerin. The returns did not state whether the remaining 2,361,232 pounds were crude or refined. Soap factories reported the value for 46,896,021 pounds, with a total value of \$6,790,264, the average value per pound (\$.14) indicating that it was chiefly refined glycerin. Although as stated the duplication due to the purchase of crude glycerin for refining can not be definitely determined, yet the quantity was considerable, amounting to at least 20,000,000 pounds. Allowing for this duplication, the production of marketable glycerin in 1909 (not including that used in the establishments where made) was approximately 60,000,000 pounds.

New York was the leading state in the production of glycerin in 1909, reporting 30.9 per cent of the total output, while Ohio and Illinois ranked second and third, respectively, these three states together contributing 67.7 per cent of the total.

California and New York were the only states reporting the manufacture of cream of tartar.

Maryland, Ohio, and Georgia, in the order named, were the leading states in respect to the manufacture of Epsom salts. Blue vitriol is chiefly a by-product of copper refining, and all but a small part of the production was reported by establishments in the copper and lead smelting and refining industries located in New York, New Jersey, Nebraska, California, and Illinois.

More than four-fifths of the copperas was produced in Pennsylvania, though considerable amounts were also reported from California and Indiana.

The phosphate of soda reported was the product of 10 establishments located in New Jersey, Maryland, Missouri, New York, Pennsylvania, Connecticut, and Massachusetts, named in order of output.

The chief states in the manufacture of tin compounds were New Jersey, Pennsylvania, Ohio, and Massachusetts, and the leading states in the production of zinc salts were Indiana, Ohio, and Illinois.

Table 50 gives the reported quantities and values of such of the chief products included under the heading of "all other chemicals" in Table 48 as can be shown without disclosing individual operations.

PRODUCT.	PRODUCTS INCLUDED UNDER "ALL OTHER CHEMICALS" IN TABLE 48.		
	Quantity.		Value.
	Unit.	Amount.	
Aqua ammonia.....	Pounds.....	20,983,476	\$839,820
Blanc fixé.....	Tons.....	4,076	86,986
Calcium chloride.....	Tons.....	8,475	70,933
Formaldehyde.....	Pounds.....	3,794,488	363,717
Glauber's salt.....	Tons.....	46,471	512,464
Oxide of zinc.....	Tons.....	12,360	953,467
Refined sulphur.....	Tons.....	25,269	891,601
Silicate of soda.....	Tons.....	34,170	366,621
Sugar of milk.....	Pounds.....	<sup>1</sup> 7,099,992	637,503
Sulphides of soda.....	Tons.....	7,673	206,450

<sup>1</sup> In addition, approximately 2,000,000 pounds were reported by establishments in the butter, cheese, and condensed milk industry.

#### DETAILED STATE TABLES.

The principal statistics secured by the census inquiry concerning the chemical industry are presented, by states, in Tables 51 and 52.

Table 51 shows for 1909, 1904, and 1899 the number of establishments, number of persons engaged in

the industry, primary horsepower, capital invested, salaries, wages, cost of materials, value of products, and value added by manufacture.

Table 52 gives more detailed statistics for the industry for 1909 only.

# THE GENERAL CHEMICAL INDUSTRY.

## CHEMICALS—COMPARATIVE STATISTICS, BY STATES: 1909, 1904, AND 1899.

STATE.	Census.	Number of establishments.	PERSONS ENGAGED IN INDUSTRY.				Primary horse-power.	Capital.	Salaries.	Wages.	Cost of materials.	Value of products.	Value added by manufacture (value of products less cost of materials).
			Total.	Proprietors and firm members.	Salaried employees.	Wage earners (average number).							
			Expressed in thousands.										
United States.....	1909	349	27,791	154	3,923	23,714	208,604	\$155,144	\$6,137	\$14,085	\$84,122	\$117,689	\$53,567
	1904	275	22,707	123	2,778	19,806	132,262	96,621	4,048	10,790	42,063	75,222	33,169
	1899	143			2,123	19,020	90,349	89,069	2,923	9,393	34,546	62,637	28,091
California.....	1909	13	294	2	48	244	1,368	2,788	66	168	762	1,306	544
	1904	15	303	3	41	259	1,060	1,969	44	189	700	1,124	424
	1899	21	463	11	62	390	984	1,845	70	230	1,406	2,061	655
Georgia.....	1909	4	75	2	20	53	200	379	29	24	60	246	186
	1904	3	50	3	17	30	109	292	21	12	41	133	92
Illinois.....	1909	19	972	2	134	836	5,907	4,639	181	531	2,896	4,656	1,760
	1904	14	846	2	123	721	2,874	4,280	186	392	1,355	4,656	1,760
	1899	26	688	13	96	579	1,461	2,384	119	309	1,176	2,086	928
Louisiana.....	1909	4	52	1	15	36	159	337	18	21	172	249	77
	1904	3	13	1	2	10	85	41	1	6	11	29	18
Maryland.....	1909	3	316		31	285	1,855	1,676	37	158	684	1,813	629
	1904	3	366	2	41	323	625	1,028	52	141	589	1,082	493
	1899	7	511	3	33	475	455	1,806	51	246	782	1,271	489
Massachusetts.....	1909	24	1,604	9	237	1,358	3,731	5,185	385	811	3,048	5,916	2,868
	1904	14	969	3	106	860	3,281	2,652	188	504	1,514	3,509	1,995
	1899	17	722	8	92	622	2,169	1,877	133	339	1,081	2,011	930
Michigan.....	1909	36	3,512	25	313	3,174	26,594	20,015	500	2,012	5,072	12,890	7,818
	1904	14	3,657	2	322	3,333	22,860	14,797	388	1,848	4,403	9,037	4,634
	1899	25			143	2,863	21,967	7,452	216	1,154	2,689	5,325	2,636
Missouri.....	1909	9	845	42	184	619	886	3,950	338	333	2,224	3,640	1,416
	1904	11	827	1	186	640	1,330	4,366	233	310	2,172	3,279	1,107
	1899	8	419	1	78	340	344	1,070	112	162	1,336	1,804	468
New Jersey.....	1909	50	5,937	4	887	5,046	13,880	24,355	1,594	2,895	12,257	22,824	10,567
	1904	47	4,048	26	425	3,597	9,082	16,294	678	1,853	6,030	13,024	6,394
	1899	61	3,488	38	402	3,048	8,147	17,285	577	1,575	6,995	12,207	5,212
New York.....	1909	74	6,869	19	1,104	5,746	116,197	46,465	1,623	3,376	19,709	35,346	15,637
	1904	68	5,845	30	848	4,967	66,049	23,149	1,274	2,678	12,958	23,022	10,064
	1899	92	5,057	23	503	4,531	33,950	22,106	719	2,303	8,670	15,994	7,324
Ohio.....	1909	33	1,346	17	197	1,132	11,715	8,994	324	749	4,748	7,742	2,994
	1904	18	1,304	10	269	1,025	6,169	3,655	400	632	3,003	4,590	1,587
	1899	35	794	21	164	609	1,280	3,670	199	340	2,084	3,576	1,492
Pennsylvania.....	1909	37	3,573	19	369	3,185	9,771	23,535	559	1,892	10,200	15,978	5,778
	1904	41	3,692	29	200	3,373	10,662	20,657	456	1,892	7,265	11,774	4,509
	1899	100	4,747	54	415	4,278	12,442	22,757	573	2,198	6,806	13,034	6,228
Wisconsin.....	1909	5	115	3	36	76	495	329	39	41	242	513	271
	1904	5	96	2	29	65	243	194	23	29	137	265	128
	1899	4	99	2	33	64	205	288	43	26	131	254	123
All other states.....	1909	38	2,281	9	348	1,924	15,906	12,497	384	1,074	2,048	5,070	3,022
	1904	24	691	9	79	603	7,233	2,647	104	284	1,285	2,071	786
	1899	37			102	1,221	5,633	5,509	111	511	1,390	3,014	1,624

<sup>1</sup> Includes establishments in the industries designated "sulphuric, nitric, and mixed acids" and "wood distillation, not including turpentine and rosin."

MANUFACTURES.

CHEMICALS—DETAILED STATISTICS, BY STATES: 1909.

**Table 52**

STATE.	Number of establishments.	PERSONS ENGAGED IN INDUSTRY.										WAGE EARNERS—DEC. 15, OR NEAREST REPRESENTATIVE DAY.					Primary horse-power.
		Total.	Pro-prietors and firm members.	Salaried officers, super-intendents, and man-agers.	Clerks.		Wage earners.			Total.	16 and over.		Under 16.				
					Male.	Fe-male.	Average number.	Number, 15th day of—			Male.	Fe-male.	Male.	Fe-male.			
								Maximum month.	Minimum month.								
United States.....	349	27,781	154	932	2,492	499	23,714	De 25,073	Ja 22,609	25,341	24,102	1,061	103	75	208,604		
California.....	13	294	2	22	19	7	244	No 361	Mh 195	360	350	10	.....	.....	1,308		
Georgia.....	4	75	2	7	9	4	53	Oc 57	Fy 47	55	48	7	.....	.....	230		
Illinois.....	19	972	2	37	69	28	836	No 993	Fe 660	976	964	12	.....	.....	5,907		
Kentucky.....	5	49	2	7	1	.....	39	Au 44	Ja <sup>1</sup> 36	37	.....	.....	.....	.....	162		
Louisiana.....	4	52	1	3	10	2	36	Mh 56	Jy 29	37	37	.....	.....	.....	159		
Maryland.....	3	316	.....	7	16	8	285	Oc <sup>1</sup> 321	Ja 231	315	313	2	.....	.....	1,855		
Massachusetts.....	24	1,604	9	49	133	55	1,358	My 1,412	Fe 1,287	1,391	1,257	105	14	15	3,731		
Michigan.....	36	3,512	25	89	199	25	3,174	De 3,405	Ap 2,889	3,406	3,372	26	8	.....	26,594		
Missouri.....	9	845	42	48	112	24	619	No 648	Ja <sup>1</sup> 601	642	533	68	24	.....	886		
New Jersey.....	50	5,937	4	213	587	87	5,046	De 5,252	Au 4,780	5,267	4,758	458	17	34	13,880		
New York.....	74	6,869	19	228	714	162	5,746	De 6,130	Mh 5,480	6,123	5,932	177	7	7	116,197		
Ohio.....	33	1,346	17	60	107	30	1,132	No 1,242	Je 1,051	1,282	1,241	41	.....	.....	11,715		
Pennsylvania.....	37	3,573	19	83	242	44	3,185	Je 3,311	Mh 3,072	3,286	3,174	110	.....	.....	9,771		
Wisconsin.....	5	115	3	4	20	6	76	Se 85	Ja 68	76	63	13	.....	.....	495		
All other states <sup>2</sup> .....	33	2,232	7	75	248	17	1,885	.....	.....	2,088	2,023	32	33	.....	15,804		

STATE.	Capital.	EXPENSES.										Value of products.	Value added by manufac-ture (value of products less cost of materials).
		Total.	Services.			Materials.		Miscellaneous.					
			Officials.	Clerks.	Wage earners.	Fuel and rent of power.	Other.	Rent of factory.	Taxes, includ-ing internal revenue.	Con-tract work.	Other.		
United States.....	\$155,143,739	\$93,091,193	\$3,134,056	\$3,002,532	\$14,084,501	\$8,046,840	\$56,074,696	\$167,805	\$689,074	\$181,011	\$8,610,678	\$117,683,887	\$53,567,351
California.....	2,788,028	1,155,870	40,160	25,505	168,190	71,461	690,124	720	12,873	.....	146,837	1,306,373	544,788
Georgia.....	378,568	190,030	16,700	11,852	24,342	7,333	52,592	5,731	2,812	.....	68,618	245,725	185,750
Illinois.....	4,639,170	3,927,458	88,886	92,443	631,315	205,714	2,690,086	6,607	8,830	4,160	299,408	4,656,274	1,760,474
Kentucky.....	154,105	72,623	9,607	706	16,688	4,923	35,582	100	540	.....	4,477	94,710	54,205
Louisiana.....	337,320	242,806	7,840	10,542	21,430	7,392	164,546	920	1,993	.....	28,143	248,815	76,877
Maryland.....	1,675,900	943,885	18,400	18,391	158,346	60,006	623,982	.....	7,435	16,539	40,786	1,313,103	629,115
Massachusetts.....	5,185,221	5,048,399	164,928	219,742	811,378	187,090	2,861,192	9,147	44,009	.....	750,943	5,916,451	2,868,199
Michigan.....	20,015,346	8,592,007	322,015	237,725	2,012,122	2,487,283	2,585,098	1,215	93,476	.....	853,073	12,800,206	7,817,825
Missouri.....	3,930,186	3,356,570	119,832	218,444	333,338	61,982	2,161,982	9,300	20,806	.....	430,886	3,640,116	1,416,152
New Jersey.....	24,355,116	18,831,485	856,382	737,417	2,894,964	690,321	11,567,157	27,099	109,394	100,996	1,897,755	22,824,140	10,566,682
New York.....	46,464,550	27,482,455	792,610	830,270	3,375,688	2,707,706	17,000,848	66,760	250,819	7,864	2,449,890	35,346,072	15,637,518
Ohio.....	8,993,786	6,268,370	194,180	129,748	748,913	565,999	4,181,297	11,687	43,324	.....	392,222	7,742,045	2,993,749
Pennsylvania.....	23,534,639	13,503,138	304,829	254,228	1,892,313	509,580	9,690,341	10,990	42,142	200	798,444	15,978,162	5,778,241
Wisconsin.....	329,217	407,069	7,737	31,314	41,324	7,666	234,471	8,848	1,615	.....	74,094	513,099	270,902
All other states <sup>2</sup> .....	12,342,587	3,919,030	189,950	184,205	1,054,150	471,304	1,535,398	8,681	48,997	51,183	375,102	4,973,596	2,966,834

<sup>1</sup> Same number reported for one or more other months.  
<sup>2</sup> "All other states" embrace: Connecticut, 3 establishments; District of Columbia, 1; Florida, 1; Indiana, 4; Kansas, 1; Maine, 1; Minnesota, 4; Montana, 1; Nebraska, 2; Rhode Island, 3; Texas, 2; Vermont, 1; Virginia, 4; Washington, 2; West Virginia, 2; Wyoming, 1.

---

---

BONE, CARBON, AND LAMPBLACK

---

---

# MANUFACTURE OF BONE, CARBON, AND LAMP BLACK.

**Scope of the industry.**—The census classification "bone, carbon, and lamp black" covers establishments engaged primarily in the carbonization of bones in retorts, producing bone black; in the manufacture of carbon black by the burning of natural gas, the flame impinging upon slate or metallic slabs or revolving cylinders with a deposition of carbon; and in the production of lampblack by the imperfect combustion of coal and wood tar, petroleum, rosin, etc. The industry also includes establishments engaged primarily in the manufacture of ivory black, a pigment made by the carbonization of ivory scraps and waste. At prior censuses the industry was known as "bone, ivory, and lamp black."

**Comparison with earlier censuses.**—At the census of 1849, 5 establishments were reported as engaged in the manufacture of bone, ivory, and lamp black, these establishments giving employment on the average to 24 hands and turning out products valued at \$42,250. At the census of 1859, 24 establishments were reported, with an average of 168 hands and products valued at \$376,710; and at the census of 1869, 9 establishments were reported, employing on the average 56 hands and turning out products valued at \$193,800. The variations from census to census may be due to differences in the classification of individual establishments.

Table 1 summarizes the statistics of the industry for each census from 1879 to 1909, inclusive.

**Table 1**

	NUMBER OR AMOUNT.					PER CENT OF INCREASE. <sup>1</sup>				
	1909	1904	1899	1889	1879	1899-1909	1904-1909	1899-1904	1889-1899	1879-1889
Number of establishments.....	27	25	15	24	18	80.0	8.0	66.7	-37.5	33.3
Persons engaged in the industry.....	302	258	123	( <sup>2</sup> )	( <sup>2</sup> )	145.5	17.1	109.8		
Proprietors and firm members.....	7	11	17	( <sup>2</sup> )	( <sup>2</sup> )	-58.8	-36.4	-55.3		
Salaried employees.....	67	47	21	( <sup>2</sup> )	( <sup>2</sup> )	219.0	42.6	123.8		
Wage earners (average number).....	228	200	85	( <sup>2</sup> )	( <sup>2</sup> )	168.2	14.0	135.3		
Primary horsepower.....	1,023	1,085	365	( <sup>2</sup> )	( <sup>2</sup> )	180.3	-5.7	197.3		( <sup>2</sup> )
Capital.....	\$1,841,966	\$1,663,143	\$782,247	\$1,627,651	\$627,350	135.5	10.8	112.6	-51.9	159.4
Expenses.....	833,510	426,499	251,147	787,027	520,317	231.9	95.4	69.8	-68.1	51.3
Services.....	227,660	153,649	69,757	216,288	80,249	226.4	48.2	120.3	-67.7	169.5
Salaries.....	78,333	43,490	23,650	( <sup>2</sup> )	( <sup>2</sup> )	231.2	61.5	105.0		
Wages.....	149,327	105,159	46,107	( <sup>2</sup> )	( <sup>2</sup> )	223.9	42.0	128.1		
Materials.....	444,608	203,396	105,712	485,867	440,068	320.6	118.6	92.4	-78.2	10.4
Miscellaneous.....	161,242	69,454	75,678	84,872	( <sup>2</sup> )	113.1	132.2	-8.2	-10.8	
Value of products.....	1,093,494	647,717	359,787	1,031,030	661,376	203.9	68.8	80.0	-65.1	55.0
Value added by manufacture (value of products less cost of materials).....	648,886	444,321	254,075	545,163	221,308	155.4	46.0	74.9	-53.4	146.3

<sup>1</sup> A minus sign (-) denotes decrease. Where percentages are omitted, comparable figures are not available.  
<sup>2</sup> Comparable figures not available.  
<sup>3</sup> Figures not strictly comparable.

The statistics indicate that there was a general growth in the industry during each intercensal period covered by the table except the decade 1889-1899, for which period large decreases are shown. The decreases for this decade are no doubt due in part to changes in classification whereby establishments included under the classification "bone, ivory, and lamp black" in 1889 were assigned to other industries in 1899.

At the census of 1909, 27 establishments were reported as engaged primarily in the manufacture of bone black, carbon black, and lamp black, these establishments employing an average of 228 wage earners and paying out \$149,327 in wages during the year. The value of their products amounted to \$1,093,494, and the cost of materials used to \$444,608, equal to 40.7 per cent of the value of products, the value added by manufacture being \$648,886.

**Persons engaged in the industry.**—The average number of persons engaged in the industry during 1909

was 302, of whom 228, or 75.5 per cent were wage earners, 52, or 17.2 per cent, were proprietors and officials, and 22, or 7.3 per cent, clerks, the last-named class including other subordinate salaried employees. Of the total number of persons engaged in the industry, 286, or 94.7 per cent, were males and 16, or 5.3 per cent, females, 8 of the latter being employed as clerks and 8 as wage earners.

**Wage earners employed, by months.**—The largest number of wage earners reported for any month of 1909 was 243, for October, and the smallest number, 215, equal to 88.5 per cent of the maximum, was reported for both February and March. In 1904 the maximum number, 218, was reported for December and the minimum number, 182, for January, the latter number being equal to 83.5 per cent of the maximum.

**Prevailing hours of labor.**—Of the 228 wage earners in the industry, 85, or 37.3 per cent were employed in establishments where the prevailing hours of labor per week were from 54 to 60 inclusive, 79, or 34.6 per

cent, in establishments where the prevailing hours were 72 or more per week, and 64, or 28.1 per cent, in establishments where the prevailing hours were from 48 to 54 per week.

**Character of ownership.**—Of the 27 establishments in the industry in 1909, 22, with products valued at \$928,242, or 84.9 per cent of the total for the industry, were under corporate ownership. There were 4 establishments under individual ownership and 1 under firm ownership. The average number of wage earners in the establishments owned by corporations was 192, and the value added by manufacture \$546,357.

**Size of establishments.**—Table 2 presents statistics for 1909 and 1904 for establishments grouped according to the value of their products.

VALUE OF PRODUCTS PER ESTABLISHMENT.	NUMBER OF ESTABLISHMENTS.		VALUE OF PRODUCTS.	
	1909	1904	1909	1904
<b>Total</b> .....	27	25	\$1,083,494	\$647,717
Less than \$5,000.....	3	4	7,114	9,479
\$5,000 and less than \$20,000.....	7	7	86,163	74,142
\$20,000 and less than \$100,000.....	13	14	519,114	504,096
\$100,000 and less than \$1,000,000.....	4	.....	481,103	.....
<b>Per cent of total</b> .....	100.0	100.0	100.0	100.0
Less than \$5,000.....	11.1	16.0	0.6	1.5
\$5,000 and less than \$20,000.....	25.9	28.0	7.9	11.4
\$20,000 and less than \$100,000.....	48.1	56.0	47.5	87.1
\$100,000 and less than \$1,000,000.....	14.8	.....	44.0	.....

<sup>1</sup> Percentage not shown where base is less than 100.

Establishments manufacturing products valued at \$20,000 but less than \$100,000 constituted the most important class at each census, both numerically and as measured by value of products, reporting 47.5 per cent of the total value of products for the industry in 1909 and 87.1 per cent in 1904. In 1904 no establishments with products valued at as much as \$100,000 were reported; in 1909 there were four such establishments, which reported 44 per cent of the total value of products. The average value of products per establishment increased from \$25,909 in 1904 to \$40,500 in 1909 and the average value added by manufacture, as computed from the figures in Table 1, from \$17,773 in 1904 to \$24,033 in 1909. The average number of wage earners per establishment shows a slight increase, from 8 in 1904 to 8.4 in 1909.

Of the 27 establishments in 1909, 1 employed no wage earners; 15 employed from 1 to 5 wage earners; 9, from 6 to 20; and 2, from 21 to 50.

**Expenses.**—As stated in the Introduction, the census figures representing expenses do not purport to show the total cost of manufacture, since they take no

account of interest or depreciation; hence they can not properly be used for determining profits. Facts of interest can be brought out, however, concerning the relative importance of the different classes of expenses which were reported. Table 4 shows the total expenses in 1909 to have been \$833,510, distributed as follows: Cost of materials, \$444,608, or 53.3 per cent; wages, \$149,327, or 17.9 per cent; salaries, \$78,333, or 9.4 per cent; and miscellaneous expenses, made up of advertising, ordinary repairs of buildings and machinery, insurance, traveling expenses, and other sundry expenses, \$161,242, or 19.3 per cent.

**Engines and power.**—All of the establishments in the industry reported the use of power, a total of 1,023 horsepower being reported for 1909. Of the total primary power steam engines furnished 537 horsepower and gas engines 476 horsepower, while the remainder represented rented electric power.

**Fuel consumed.**—In 1909, 3,579 short tons of bituminous coal, 46,000 barrels of oil, and 12,516,733,000 cubic feet of gas were consumed in the industry for all purposes. The amount expended for fuel and rent of power in 1909, as shown in Table 4, was \$158,604. The bulk of the oil and gas used was consumed as material in the manufacture of lampblack and carbon black, respectively, but little of either being employed in the generation of power.

**Products.**—In addition to the output of establishments manufacturing bone, carbon, and lamp black as their chief product a considerable quantity was reported by establishments engaged in the production of pigments in the paint and varnish industry, and by establishments in other industries. Table 3 shows the total production of these blacks in 1909, so far as statistics are available.

PRODUCT.	Number of establishments reporting: 1909	VALUE: 1909			
		Total.	Reported by establishments engaged primarily in the manufacture of—		
			Bone, carbon, and lamp black	Paint and varnish.	Fertilizers and glue.
<b>Bone, carbon, and lamp black.</b>	57	\$2,135,554	\$1,068,496	\$105,063	\$961,995
Bone black.....	7	1,070,333	108,338	.....	961,995
Carbon black.....	18	625,514	625,514	.....	.....
Lampblack.....	32	439,707	334,644	105,063	.....

<sup>1</sup> Reported as lamp and other blacks.

The total production of bone, carbon, and lamp black reported for 1909 was valued at \$2,135,554, of which

amount approximately one-half was reported by establishments engaged primarily in the manufacture of fertilizers, glue, and paint and varnish. Approximately one-half of the total represented the value of bone black, three-tenths that of carbon black, and one-fifth that of lampblack.

**Detailed state table.**—The principal statistics secured for 1909 concerning the "bone, carbon, and lamp black" industry are presented in Table 4.

West Virginia ranked first among the states in the industry, as measured by value of products, in both 1909 and 1904, and Pennsylvania second, the prominence of these states in the industry resulting largely from their supply of natural gas, which is used in the manufacture of carbon black. New Jersey ranked third in 1909. The products of West Virginia, the only state for which statistics can be shown without disclosing individual operations, were valued at \$596,058 in 1909, contributing 54.5 per cent of the total for the industry, as compared with products valued at \$274,022, and representing 42.3 per cent of the total, in 1904. The increase in value of products for the industry as a whole during this five-year period amounted to 68.8 per cent, while for West Virginia alone, it amounted to 117.5 per cent.

Table 4	United States.	West Virginia.	All other states. <sup>1</sup>
Number of establishments.....	27	16	11
Persons engaged in the industry.....	302	137	165
Proprietors and firm members.....	7	1	6
Salariéd officers, superintendents, and managers.....	45	28	17
Clerks.....	22	7	15
Male.....	14	5	9
Female.....	8	2	6
Wage earners (average number).....	228	101	127
Number 15th day of month:			
Maximum—			
Month.....	October.	January.	
Number.....	243	104	
Minimum—			
Month.....	February. <sup>2</sup>	November.	
Number.....	215	95	
Wage earners—Dec. 15, or nearest representative day.....	243	102	141
16 years of age and over.....	243	102	141
Male.....	235	102	133
Female.....	8		8
Primary horsepower.....	1,023	641	382
Capital.....	\$1,841,966	\$1,313,228	\$528,740
Expenses.....	833,510	426,050	407,400
Services.....	227,660	101,379	126,281
Officials.....	58,629	31,350	27,279
Clerks.....	19,704	3,780	15,824
Wage earners.....	149,327	66,249	83,078
Materials.....	444,608	249,038	195,570
Fuel and rent of power.....	158,604	116,933	41,621
Other.....	286,004	132,055	153,949
Miscellaneous.....	161,242	75,633	85,609
Rent of factory.....	12,027	5,677	6,350
Taxes, including internal revenue.....	10,324	5,682	4,042
Other.....	138,891	64,274	74,617
Value of products.....	1,093,494	596,058	497,436
Value added by manufacture (value of products less cost of materials).....	648,886	347,020	301,866

<sup>1</sup> Includes the following, with number of establishments as indicated: Massachusetts, 3; New Jersey, 1; New York, 1; Ohio, 1; Pennsylvania, 5.  
<sup>2</sup> Same number reported for one or more other months.

---

---

# DYESTUFFS AND EXTRACTS

---

---

(557)

# THE MANUFACTURE OF DYESTUFFS AND EXTRACTS.

Scope of the industry.—The manufacture of dyestuffs and extracts used in the dyeing industry and that of extracts used in the tanning industry are so closely associated that since the census of 1879 the statistics for the two have been combined under the designation "dyestuffs and extracts." The class of dyestuffs comprises: (1) Natural dyestuffs, including logwood, fustic, quercitron, cochineal, lac dye, kermes, gambier, Persian berries, curcuma, Brazil wood, madder, cutch, and yellow oak bark, the ground and chipped wood, bark, or berries of these natural dyestuffs, and extracts such as logwood extract; (2) artificial dyestuffs, such as the aniline, phenol, azo, quinoline, and anthracene colors, including synthetic indigo, and the so-called coal tar dyes, special compositions or mixtures of dyes, and mineral dyes used in printing, such as chrome yellow, orange and green, iron buff or nankin yellow, prussian blue, ultramarine, and manganese brown; (3) mordants, such as myrobalans, valonia, divi-divi, chestnut, nutgalls, oak and hemlock barks, the ground product and the extracts of these materials, and special mordanting liquors containing inorganic compounds; and (4) assistants, such as turkey red oil, iron liquor (black liquor, pyrolignite of iron), red liquor (aluminum sulpho-acetate), gums, dextrins, and sizes.

The class of tanning materials includes the ground, chipped, or comminuted products of oak, chestnut, and hemlock wood or bark, palmetto roots, and sumac leaves; the fluid or solid extracts from these materials or from quebracho wood, quercitron bark, or other tannin-containing materials; tannic or gallic acid; and chrome tannage or other tannage solutions.

The statistics pertain only to establishments producing dyestuffs or tanning materials for sale, and do not represent the entire manufacture of these products, as there is also a large production by establishments that use them in their own processes. This is especially true of the various textile industries and is often true also in regard to the tanning industry.

Summary and comparison with earlier censuses.—Table 1 summarizes the statistics of the industry for each census from 1869 to 1909, inclusive. At the census of 1849 there were reported 41 establishments with 114 wage earners and products valued at \$229,841, and at the census of 1859, 40 establishments with 76 wage earners and products valued at \$171,253.

The financial figures for 1869 are given in currency, which at that time was worth only about 80 cents, gold, to the dollar. For strict comparison, therefore, these figures should be reduced about 20 per cent.

Table 1

	NUMBER OR AMOUNT.						PER CENT OF INCREASE. <sup>1</sup>					
	1909	1904	1899	1889	1879	1869	1899-1909	1904-1909	1899-1904	1889-1899	1879-1889	1869-1879
Number of establishments.....	107	98	(?) 77	(?) 62	(?) 41	(?) 73	39.0	9.2	27.3	24.2	51.2	-43.8
Persons engaged in the industry.....	3,015	3,150	(?)	(?)	(?)	(?)	-4.3	-20.7				
Proprietors and firm members.....	65	82	(?)	(?)	(?)	(?)						
Salaried employees.....	553	361	(?) 229	(?)	(?)	(?)	141.5	53.2	57.6			
Wage earners (average number).....	2,397	2,707	(?)	(?)	(?)	(?)	45.5	-11.5	64.4	(?)	(?)	(?)
Primary horsepower.....	22,213	17,671	11,647	2,111	(?) 992	803	94.7	25.7	54.9	-3.9		
Capital.....	\$17,034,545	\$14,904,150	\$7,839,034	\$8,645,453	\$2,363,700	\$1,802,710	128.8	20.3	90.1	-9.3	265.8	31.1
Expenses.....	13,492,987	9,646,982	6,304,175	8,170,946	(?)	(?)	114.0	39.9	53.0	-22.9		
Services.....	2,233,705	1,873,282	1,100,051	1,289,987	512,097	398,649	103.1	19.2	70.3	-14.7	151.9	23.5
Salaries.....	942,326	608,790	312,109	252,336	(?)	(?)	201.9	54.8	95.1	23.7		
Wages.....	1,291,379	1,264,492	787,942	1,037,651	(?)	(?)	63.9	2.1	60.5	-24.1		
Materials.....	9,683,651	6,829,340	4,745,912	6,500,928	3,918,741	1,667,257	104.0	41.8	43.9	-27.0	65.9	135.0
Miscellaneous.....	1,575,631	944,360	458,212	380,030	(?)	(?)	243.9	66.8	106.1	20.6		
Value of products.....	15,954,574	10,893,113	7,350,748	9,292,514	5,253,038	2,878,609	117.0	46.5	48.2	-20.9	78.9	82.5
Value added by manufacture (value of products less cost of materials).....	6,270,923	4,063,773	2,604,836	2,791,586	1,334,297	1,211,352	140.7	54.3	56.0	-6.7	109.2	10.1

<sup>1</sup> A minus sign (-) denotes decrease. Where percentages are omitted, comparable figures are not available.

<sup>2</sup> Comparable figures not available.

<sup>3</sup> Figures not strictly comparable.

The value of products reported for 1909 was five and a half times the value reported for 1869, part of this increase, however, being attributable to the general advance in prices. With the exception of the decade 1889-1899, in which decreases took place in most of the items included in the table, the industry has shown a substantial growth at each successive census.

Summary, by states.—Table 2 summarizes the more important statistics, by states, the states being arranged according to the value of products reported for 1909. The states shown in this table are given their actual ranking among all states, the rank of certain states for which data can not be presented being higher than that of some named in the table.

In 1909 New York, New Jersey, and Pennsylvania, in order, were the three leading states when ranked by value of products, these states combined reporting 62.6 per cent of the total value of products, 60.1 per cent of the value added by manufacture, and 44.5 per

cent of the average number of wage earners. New Jersey shows the largest relative increase in value of products and value added by manufacture during the decade 1899-1909, 522.6 per cent and 426.8 per cent, respectively.

STATE.	Number of establishments: 1909	WAGE EARNERS.			VALUE OF PRODUCTS.				VALUE ADDED BY MANUFACTURE.				PER CENT OF INCREASE. <sup>1</sup>									
		Average number: 1909	Per cent of total: 1909	Rank.		Amount: 1909	Per cent of total: 1909	Rank.		Amount: 1909	Per cent of total: 1909	Rank.		Wage earners (average number).			Value of products.			Value added by manufacture.		
				1909	1904			1909	1904			1909	1904	1909	1904	1899-1909	1904-1909	1899-1904	1899-1909	1904-1909	1899-1904	1899-1909
United States.....	107	2,397	100.0	.....	.....	\$15,954,574	100.0	.....	.....	\$6,270,923	100.0	.....	.....	45.5	-11.5	64.4	117.0	46.5	48.2	140.7	54.3	56.0
New York.....	18	418	17.4	1 1	1	4,505,310	28.2	1 1	1	1,638,233	26.1	1 1	1	-22.3	-19.5	-3.5	113.3	66.5	28.1	93.2	55.4	24.3
New Jersey.....	13	270	11.7	5 5	5	3,130,214	19.6	2 2	2	1,161,484	18.5	2 2	2	.....	11.6	.....	522.6	43.8	332.8	426.8	71.7	206.8
Pennsylvania.....	14	360	15.4	2 0	0	2,345,251	14.7	3 4	3	972,075	15.5	3 6	6	43.6	81.8	-21.0	84.8	142.7	-23.9	59.9	188.6	-44.0
Tennessee.....	6	336	14.0	4 4	4	1,313,020	8.2	4 6	4	671,089	10.7	4 4	4	.....	29.7	.....	.....	82.3	.....	.....	.....	87.5
Virginia.....	14	346	14.4	3 3	3	1,199,706	7.5	5 5	5	513,427	8.2	5 5	5	72.1	-18.4	110.9	150.3	62.9	53.7	198.7	40.3	100.0
Rhode Island.....	10	87	3.6	8 9	9	927,676	5.8	6 9	9	296,012	4.7	7 9	9	.....	.....	.....	.....	80.8	.....	.....	59.3	.....
Massachusetts.....	10	80	3.3	9 8	8	725,385	4.5	7 3	3	213,767	3.4	8 3	3	.....	-46.7	.....	-45.1	-27.4	-24.4	8.5	-44.1	94.2
All other states.....	22	482	20.1	.....	.....	1,808,011	11.4	.....	.....	804,835	12.8	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

<sup>1</sup> A minus sign (-) denotes decrease. Percentage not shown where base is less than 100 for wage earners or less than \$100,000 for value of products or value added by manufacture, or where comparative figures can not be given without disclosing individual operations.

Persons engaged in the industry.—Table 3 shows, for 1909, the number of persons engaged in the industry, classified according to occupational status and sex, and in the case of wage earners, according to age. It should be borne in mind that the sex and age classification of the average number of wage earners in this and other tables is an estimate obtained by the method described in the Introduction.

CLASS.	PERSONS ENGAGED IN THE INDUSTRY: 1909		
	Total.	Male.	Female.
All classes.....	3,015	2,901	114
Proprietors and officials.....	264	262	2
Proprietors and firm members.....	65	64	1
Salaried officers of corporations.....	91	91	.....
Superintendents and managers.....	108	107	1
Clerks.....	354	278	76
Wage earners (average number).....	2,397	2,361	36
16 years of age and over.....	2,391	2,355	36
Under 16 years of age.....	6	6	.....

The average number of persons engaged in the industry during 1909 was 3,015, of whom 2,397, or 79.5 per cent, were wage earners; 264, or 8.8 per cent, were proprietors and officials; and 354, or 11.7 per cent, were clerks, this class including other subordinate salaried employees. Of the total number engaged in the industry, 96.2 per cent were males and 3.8 per cent were females. Of the wage earners, 2,355 were men, 36 were women, and 6 were boys under 16 years of age. In 1904 there were 2,707 wage earners, comprising 2,678 males and 25 females 16 years of age and over, and 4 children under 16 years of age.

Wage earners employed, by months.—The industry is not subject to any considerable seasonal variations. The largest number of wage earners employed during any month in 1909 was 2,478, reported for August, and the smallest number 2,293, reported for January, the latter number being equal to 92.5 per cent of the maximum number. In 1904 the maximum number of wage earners, 2,925, was reported for August, and the minimum, 2,340, for December, the latter number being equal to 80 per cent of the maximum.

Prevailing hours of labor.—The wage earners in the industry have been classified according to the hours of labor prevailing in the establishments in which they were employed. In making this classification the average number of wage earners employed during the year in each establishment is classified as a total, according to the hours prevailing in that establishment, even though some of the employees may have worked a greater or less number of hours. Of the 2,397 wage earners in the industry, 1,361, or 56.8 per cent of the total, were employed in establishments where the usual hours were 60 per week; 545, or 22.7 per cent, worked in establishments where less than 60 hours per week was the usual working time; and 491, or 20.5 per cent, were in establishments where the working time was over 60 hours per week.

Character of ownership.—Table 4 presents data with respect to the character of ownership of the establishments in the industry for 1909 and 1904.

Of the total number of establishments in the industry, 64.5 per cent were under corporate ownership in 1909, as compared with 56.1 per cent in 1904; these establishments reported 91.2 per cent of the total value of products in 1909 and 86.2 per cent in 1904.

CHARACTER OF OWNERSHIP.	NUMBER OF ESTABLISHMENTS.		VALUE OF PRODUCTS.	
	1909	1904	1909	1904
Total.....	107	98	\$15,954,574	\$10,893,113
Individual.....	23	22	946,201	806,069
Firm.....	15	21	449,828	692,409
Corporation.....	69	55	14,558,545	9,394,635
Per cent of total.....	100.0	100.0	100.0	100.0
Individual.....	21.5	22.4	5.9	7.4
Firm.....	14.0	21.4	2.8	6.4
Corporation.....	64.5	56.1	91.2	86.2

Size of establishments.—Table 5 presents statistics for 1909 and 1904 for establishments grouped according to the value of their products.

VALUE OF PRODUCTS PER ESTABLISHMENT.	NUMBER OF ESTABLISHMENTS.		VALUE OF PRODUCTS.	
	1909	1904	1909	1904
Total.....	107	98	\$15,954,574	\$10,893,113
Less than \$5,000.....	10	9	25,838	(1)
\$5,000 and less than \$20,000.....	19	17	240,409	(1)
\$20,000 and less than \$100,000.....	36	39	1,892,747	1,850,948
\$100,000 and over.....	42	33	13,795,580	2,759,825
Per cent of total.....	100.0	100.0	100.0	100.0
Less than \$5,000.....	9.3	9.2	0.2	.....
\$5,000 and less than \$20,000.....	17.8	17.3	1.5	.....
\$20,000 and less than \$100,000.....	33.6	39.8	11.9	17.0
\$100,000 and over.....	39.3	33.7	86.5	69.7

<sup>1</sup> Figures can not be shown without disclosing individual operations.  
<sup>2</sup> Excluding figures for one establishment to avoid disclosure of individual operations.

Of the 107 establishments in 1909 there were 42, or 39.3 per cent of the total, whose products were valued at more than \$100,000, including 2 with products valued at \$1,000,000 and over. These 42 establishments reported 86.5 per cent of the total value of products of the industry.

The average value of products per establishment increased from \$111,154 in 1904 to \$149,108 in 1909, and the value added by manufacture from \$41,467 to \$58,607, while the average number of wage earners per establishment decreased from 28 in 1904 to 22 in 1909.

In some respects, and especially from the standpoint of conditions under which persons engaged in manufactures work, the best classification of establishments to bring out the feature of size is a classification according to the number of wage earners employed. From this standpoint, the majority of the establishments engaged in the industry are comparatively small. Of the 107 establishments in 1909, 3 employed no wage earners, 36 from 1 to 5 wage earners, 35 from 6 to 20, 20 from 21 to 50, 7 from 51 to 100, and 6 more than 100 wage earners. No establishments employed over 250 wage earners.

Of the 2,397 wage earners in 1909, 462, or 19.3 per cent, were in establishments employing from 1 to 20 wage earners; 687, or 28.7 per cent, in establishments employing from 21 to 50; 491, or 20.5 per cent, in establishments employing from 51 to 100; and 757, or 31.6 per cent, in establishments employing more than 100 wage earners.

Expenses.—As stated in the Introduction, the census figures for expenses do not purport to represent the total cost of manufacture, since they take no account of interest or depreciation, and consequently can not properly be used for determining profits. Facts of interest can be brought out, however, concerning the relative importance of the different classes of expenses which were reported.

Table 1 shows the total reported expenses to have been \$13,492,987, distributed as follows: Cost of materials, \$9,683,651, or 71.7 per cent; wages, \$1,291,379, or 9.6 per cent; salaries, \$942,326, or 7 per cent; and miscellaneous expenses, made up of traveling expenses, advertising, ordinary repairs of buildings and machinery, insurance, and other sundry expenses, \$1,575,631, or 11.7 per cent.

Engines and power.—As shown by Table 1, the amount of primary power reported for this industry at the census of 1869 was 2,694, which had increased to 22,213 in 1909. Table 6 shows the number of engines or other motors, according to their character, employed in generating power (including electric motors operated by purchased current), and their total horsepower, as reported at the censuses of 1909, 1904, and 1899. It also shows the number and horsepower of electric motors, including those operated by current generated in the establishments reporting.

POWER.	NUMBER OF ENGINES OR MOTORS.			HORSEPOWER.			PER CENT DISTRIBUTION OF HORSEPOWER.		
	1909	1904	1899	1909	1904	1899	1909	1904	1899
<b>Primary power, total.....</b>	<b>270</b>	<b>201</b>	<b>154</b>	<b>22,213</b>	<b>17,671</b>	<b>11,409</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>
Owned.....	251	199	154	22,020	17,624	11,133	99.1	99.7	97.6
Steam.....	247	192	144	21,685	17,348	10,508	97.6	98.2	92.1
Gas.....	1	1	1	15	4	300	0.1	(1)	2.6
Water wheels.....	3	6	9	320	196	325	1.4	1.1	2.8
Other power.....	.....	.....	.....	.....	76	.....	.....	0.4	.....
Rented.....	19	2	.....	193	47	276	0.9	0.3	2.4
Electric motors..	19	2	(2)	191	20	20	0.9	0.1	0.2
Other.....	.....	.....	.....	2	27	256	(1)	0.2	2.2
<b>Electric motors.</b>	<b>106</b>	<b>35</b>	<b>15</b>	<b>1,664</b>	<b>659</b>	<b>179</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>
Run by current generated by establishment.....	87	33	15	1,473	639	159	88.5	97.0	88.8
Run by rented power.....	19	2	.....	191	20	20	11.5	3.0	11.2

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

<sup>2</sup> Not reported.

The total primary power used in the industry increased 94.7 per cent from 1899 to 1909, the increase being practically all in steam power. Of the total primary horsepower, 97.6 per cent was steam power in 1909, as compared with 92.1 per cent in 1899. The amount of rented electric power used in the industry is small. The horsepower of electric motors operated by current generated in the establishment reporting increased from 159 in 1899 to 1,473 in 1909.

Fuel consumed.—Table 7 shows the amount of each kind of fuel consumed in the industry in 1909. The amount expended for fuel and rent of power is shown, by states, in Table 10.

KIND.	Unit.	Quantity.
Anthracite coal.....	Long tons.....	20,069
Bituminous coal.....	Short tons.....	104,789
Coke.....	Short tons.....	81
Wood.....	Cords.....	17,182
Oil, including gasoline.....	Barrels.....	2,200
Gas.....	1,000 feet.....	223,467

**Materials and products.**—The special schedule used in collecting the statistics from the manufacturers of dyestuffs and extracts called for the quantity and cost of acids (sulphuric, nitric, and mixed) and alcohol (grain and wood) consumed in this industry, the quantity and value of the different products, and the quantity of certain products made and consumed in the establishments producing them.

In 1909 there was reported the consumption of 8,303 tons of sulphuric acid, costing \$72,638; 85 tons of nitric acid, costing \$7,066; 242 tons of mixed acid, costing \$17,291; 6,341 gallons of grain alcohol, costing \$3,309; and 724 gallons of wood alcohol, costing \$391. Comparative data for the consumption of these materials in former years are not available except with respect to sulphuric acid, the consumption of which in 1904 was 1,779 tons, costing \$49,779. In 1909 certain specific materials were called for, but in 1904 the selection was left to the manufacturer.

Table 8 gives the quantity and value of the chief products reported by the establishments engaged primarily in the manufacture of dyestuffs and extracts in 1909, 1904, and 1899.

PRODUCT.	1909	1904	1899	PRODUCT.	1909	1904	1899
<b>Total value.....</b>	<b>\$15,954,574</b>	<b>\$10,893,113</b>	<b>\$7,350,748</b>	Gums and dextrins:			
Artificial dyestuffs:				Pounds.....	16,148,931	6,651,731	(?)
Pounds.....	12,207,399	4,600,462	6,581,850	Value.....	\$610,999	\$231,708	(?)
Value.....	\$3,462,436	\$1,704,454	\$1,806,730	Iron liquors:			
Extracts:				Pounds.....	3,079,418	1,860,744	954,240
Hemlock—				Value.....	\$30,282	\$30,757	\$7,525
Pounds.....	12,588,078	18,833,450	26,011,714	Mordants:			
Value.....	\$220,487	\$406,619	\$563,591	Pounds.....	1,735,887	733,245	734,000
Logwood—				Value.....	\$69,515	\$64,656	\$85,466
Pounds.....	22,317,248	29,799,606	39,252,743	Sizes:			
Value.....	\$901,974	\$1,472,047	\$1,485,971	Pounds.....	54,054,711	7,812,433	101,920
Oak and chestnut—				Value.....	\$1,735,600	\$217,859	\$2,548
Pounds.....	237,908,285	156,520,123	28,983,036	Tannic acid:			
Value.....	\$6,061,162	\$2,411,184	\$529,670	Pounds.....	5,085,748	5,165,500	1,326,515
Sumac—				Value.....	\$249,297	\$200,136	\$149,662
Pounds.....	3,148,790	4,093,619	4,349,742	Turkey-red oil:			
Value.....	\$107,456	\$95,958	\$103,085	Pounds.....	1,048,719	3,022,470	2,210,000
Ground sumac:				Value.....	\$72,053	\$159,668	\$14,757
Pounds.....	554,032	5,051,333	9,284,000	Chrome tannage solution:			
Value.....	\$24,531	\$65,190	\$114,600	Pounds.....	7,361,008	2,847,400	(?)
Ground bark:				Value.....	\$298,830	\$85,422	(?)
Pounds.....	25,142,076	38,001,017	27,028,000	Other tanning liquors:			
Value.....	\$176,510	\$249,101	\$149,365	Pounds.....	2,464,040	43,311,629	16,144,292
Ground and chipped wood:				Value.....	\$77,274	\$1,653,621	\$405,659
Pounds.....	15,046,654	9,999,906	12,690,037	All other products <sup>3</sup> .....	\$1,562,448	\$1,680,498	\$1,730,128
Value.....	\$143,720	\$95,237	\$201,931				

<sup>1</sup> In addition, dyestuffs and extracts to the value of \$834,102 in 1909, and \$19,111 in 1904, were produced by establishments engaged primarily in the manufacture of other products.

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

<sup>3</sup> Including a small production of natural dyestuffs in 1909, a production in 1904 valued at \$233,935, and a production in 1899 valued at \$1,035,711.

In addition to the products shown above, the products shown in the following table were made and used in further processes of manufacture in the establishments where produced.

PRODUCT.	1909	1904
Ground and chipped wood..... pounds..	936,578,482	524,505,744
Ground bark..... pounds..	299,062,168	40,390,640
Ground leaves..... pounds..	1,955,040	3,586,171

By far the most important products, both in quantity and value, in 1909, was oak and chestnut extracts. There has been a very great increase in the quantity and value of these products since 1899. Other important increases are shown by artificial dyestuffs, iron liquors, sizes, and tannic acid, while considerable decreases are shown in the production of hemlock and logwood extracts, and of ground sumac.

In addition to the items in the table, there was reported in 1909 a small production of natural dyestuffs which can not be given without disclosing individual operations and which was considerably less than in 1904, when the production was valued at \$233,935, or in 1899, when it was valued at \$1,035,711.

The report on Forest Products<sup>1</sup> for 1909 gives 386,817,895 pounds as the total consumption of tanning extracts in that year, which quantity exceeds the quantity of oak, chestnut, hemlock, and sumac extracts here reported by over 83,000,000 pounds. This difference may be assumed to represent the tanning extracts imported or made and consumed in tanning establishments.

In addition to the production above reported, dyestuffs and tanning materials to the value of \$834,102 in 1909 and to the value of \$19,111 in 1904 were produced as subsidiary products by establishments engaged primarily in the manufacture of chemicals, flavoring extracts, and miscellaneous products other than dyestuffs and extracts. Including the subsidiary products reported, which, however, presumably do not cover all such products made in other industries, the total production of artificial dyes in 1909 was approximately 12,759,000 pounds; of mordants, 1,788,000 pounds; of sizes, 57,400,000 pounds; of tannic acid, 8,000,000 pounds; and of turkey-red oil, 3,398,000 pounds.

<sup>1</sup> Department of Commerce and Labor, Bureau of the Census, Forest Products of the United States, 1909.

Table 10 gives for 1909 the production of the specific products reported by establishments manufacturing dyestuffs and tanning materials as their principal prod-

ucts for the United States and for individual states as far as such statistics can be presented without disclosing the operations of individual establishments.

PRODUCT AND STATE.	Pounds.		Value.		
Artificial dyestuffs.....	12,267,399		\$3,462,436		
Massachusetts.....	1,848,980		239,495		
New Jersey.....	3,226,061		1,599,528		
New York.....	5,371,951		1,477,456		
All other states.....	1,820,407		145,987		
Hemlock extract.....	12,588,078		280,487		
Logwood extract.....	22,317,248		991,974		
Oak and chestnut extract.....	287,908,285		6,061,162		
Pennsylvania.....	51,723,637		1,017,645		
Tennessee.....	85,053,193		1,205,390		
Virginia.....	69,310,711		993,289		
All other states.....	81,820,744		2,844,838		
Sumac extract.....	3,148,790		107,456		
Ground sumac.....	554,032		24,531		
Ground bark.....	25,142,076		176,510		
Ground and chipped wood.....	15,046,954		143,720		
Mordants.....	1,735,887		69,515		
New Jersey.....	1,424,458		49,054		
All other states.....	311,429		20,461		
Iron liquors.....				3,070,418	\$30,282
Turkey-red oil.....				1,048,719	72,053
Chrome tannage solution.....				7,861,008	298,830
New Jersey.....				7,102,328	285,576
All other states.....				258,680	13,254
Other tanning liquors.....				2,464,040	77,274
Tannic acid.....				5,085,748	249,297
Sizes.....				54,054,711	1,735,600
Massachusetts.....				6,027,359	118,098
New Jersey.....				2,971,767	152,380
Rhode Island.....				9,943,453	387,930
All other states.....				35,112,132	1,077,192
Gums and dextrins.....				16,148,931	610,999
Massachusetts.....				5,103,361	216,829
All other states.....				11,045,570	394,170

Detailed statistics, by states.—The principal data secured by the census inquiry concerning the dyestuff and extract industry are presented, by states, in Table 11, which gives detailed statistics for 1909 concerning the number of establishments, the number

of persons engaged in the industry, the number of wage earners on December 15, or the nearest representative day, primary horsepower, capital, expenses, the total value of products, and the value added by manufacture.

STATE.	Number of establishments.	PERSONS ENGAGED IN INDUSTRY.							WAGE EARNERS—DEC. 15, OR NEAREST REPRESENTATIVE DAY.					Primary horsepower.	
		Total.	Proprietors and firm members.	Salaried officers, superintendents, and managers.	Clerks.		Wage earners.			Total.	16 and over.		Under 16.		
					Male.	Female.	Average number.	Number, 15th day of—			Male.	Female.	Male.		Female.
								Maximum month.	Minimum month.						
United States.....	107	3,015	65	199	278	76	2,397	Au 2,478	Ja 2,293	2,465	2,422	37	0	22,213	
Georgia.....	3	46	3	1	1		41	Ja 53	My 34	44	44			541	
Massachusetts.....	10	114	6	14	11	3	80	Ja 85	Se 74	78	78			325	
New Jersey.....	13	429	7	36	90	17	279	Au 287	Ap 270	281	263	15	3	1,606	
New York.....	18	579	7	38	84	32	418	Fe 444	Jy 392	404	390	14		3,647	
Pennsylvania.....	14	439	10	30	21	9	369	Se 438	My 316	372	371		1	3,516	
Rhode Island.....	10	118	7	13	7	4	87	Se 1 97	Ja 70	97	97			689	
Tennessee.....	6	374		18	19	1	336	De 371	My 307	371	368	1	2	4,119	
Virginia.....	14	390	10	17	22	4	346	No 363	Oc 308	363	362	1		4,209	
West Virginia.....	3	81	11	6	6		63	Au 70	My 57	63	63			506	
All other states <sup>2</sup> .....	16	436	4	26	22	6	378			392	386	6		3,655	

STATE.	Capital.	EXPENSES.									Value of products.	Value added by manufacture (value of products less cost of materials).	
		Total.	Services.			Materials.		Miscellaneous.					
			Officials.	Clerks.	Wage earners.	Fuel and rent of power.	Other.	Rent of factory.	Taxes, including internal revenue.	Contract work.			Other.
United States.....	\$17,934,846	\$13,492,987	\$570,075	\$372,251	\$1,291,379	\$462,189	\$9,221,462	\$34,007	\$71,508	\$4,738	\$1,464,478	\$15,954,574	\$6,270,923
Georgia.....	294,455	108,171	1,217	1,453	19,180	12,532	50,806	426	817		21,740	125,353	62,015
Massachusetts.....	396,084	630,103	34,426	12,572	49,975	12,345	499,274	7,920	3,265	4,408	25,918	725,386	213,707
New Jersey.....	2,162,906	2,084,465	122,639	133,173	178,956	41,762	1,926,908	4,060	9,254		267,653	3,130,214	1,161,484
New York.....	4,145,223	3,884,806	145,933	118,129	259,501	46,969	2,820,108	15,648	18,511		460,007	4,505,310	1,638,233
Pennsylvania.....	3,009,245	1,909,192	58,424	18,278	186,826	95,865	1,277,310	1,245	10,263		260,981	2,345,251	972,076
Rhode Island.....	607,057	832,562	36,965	19,630	81,753	16,141	615,523	3,600	1,376		57,574	927,076	296,012
Tennessee.....	2,190,386	954,803	38,641	17,789	150,653	73,805	568,126		6,932		93,457	1,813,020	671,089
Virginia.....	1,879,916	1,018,718	34,828	24,842	123,032	71,599	614,680	63	8,280		141,394	1,199,706	513,427
West Virginia.....	262,268	238,260	36,262	910	24,068	14,849	143,657		647		17,867	252,854	94,348
All other states <sup>2</sup> .....	2,993,026	1,211,847	60,740	25,475	212,035	76,322	705,010	1,945	12,163	270	117,887	1,420,804	648,472

<sup>1</sup> Same number reported for one or more other months.  
<sup>2</sup> All other states embrace: California, 1 establishment; Connecticut, 1; Florida, 1; Illinois, 2; Indiana, 1; Maine, 2; Michigan, 2; North Carolina, 4; South Carolina, 1; Wisconsin, 1.

---

---

# EXPLOSIVES

---

---

(565)

# THE MANUFACTURE OF EXPLOSIVES.

## GENERAL STATISTICS.

Scope of the industry.—The statistics for the manufacture of explosives cover the operations of commercial establishments engaged primarily in the manufacture of gunpowder and blasting powder, nitroglycerin, dynamite, guncotton, nitrosubstitution compounds and the explosives of which they are components, smokeless powder, and fulminates. Statistics for governmental establishments are not included except as specially noted. Establishments engaged primarily in the manufacture of cartridges, detonators and fuses, and other devices containing explosives are assigned to the industry bearing the designation "firearms and ammunition," while those making colored fires, rockets, railroad torpedoes, signal lights, and

similar products, are included under the heading of "fireworks."

Comparison with earlier censuses.—At the census of 1859, 58 establishments, with 747 wage earners and products valued at \$3,223,090, were reported as engaged in the manufacture of explosives, and at the census of 1849, 54 establishments, with 579 wage earners and products valued at \$1,590,332. Table 1 summarizes the statistics relating to this industry for each census from 1869 to 1909, inclusive. The financial figures for 1869 are given in currency, which at that time was worth only about 80 cents, gold, to the dollar. For strict comparison, therefore, these figures should be reduced about 20 per cent.

	NUMBER OR AMOUNT.						PER CENT OF INCREASE. <sup>1</sup>					
	1909	1904	1899	1889	1879	1869	1899-1909	1904-1909	1899-1904	1889-1899	1879-1889	1869-1879
Number of establishments.....	86	124	97									
Persons engaged in the industry.....	7,058	7,113	5,293	( <sup>2</sup> ) 69	( <sup>2</sup> ) 54	( <sup>2</sup> ) 36	-11.3	-30.6	27.8	40.6	27.8	50.0
Proprietors and firm members.....	21	24	23	( <sup>2</sup> )	( <sup>2</sup> )	( <sup>2</sup> )	33.3	-0.8	34.4			
Salaries.....	763	1,289	768	( <sup>2</sup> )	( <sup>2</sup> )	( <sup>2</sup> )	-8.7	-12.5	4.3			
Wage earners (average number).....	6,274	5,800	4,502	( <sup>2</sup> )	( <sup>2</sup> )	( <sup>2</sup> )	-0.7	-40.8	67.8			
Primary horsepower.....	28,601	29,065	19,195		2,353	1,340	39.4	8.2	23.8	( <sup>2</sup> )	( <sup>2</sup> )	( <sup>2</sup> )
Capital.....	\$50,167,976	\$42,307,103	\$19,465,846		10,674	3,750	49.0	-3.0	54.5	79.8		
Expenses.....	31,460,284	23,967,156	14,729,781	\$13,539,478	\$6,555,185	\$4,099,900	157.7	18.6	117.3	43.8	105.6	60.6
Services.....	5,437,978	5,105,824	3,293,203		( <sup>2</sup> )	( <sup>2</sup> )	113.6	31.3	62.7	79.6		
Salaries.....	1,133,606	1,797,050	914,447		675,414	594,379	64.9	6.5	54.8	112.9	129.4	13.6
Wages.....	4,304,370	3,308,774	2,383,756		( <sup>2</sup> )	( <sup>2</sup> )	24.0	-36.9	96.5			
Materials.....	22,811,548	17,203,637	10,334,374	5,481,723	3,271,549	2,398,407	80.6	30.1	33.8			
Miscellaneous.....	3,210,760	1,657,665	1,095,004	1,168,920	( <sup>2</sup> )	( <sup>2</sup> )	120.7	32.6	66.5	83.5	67.6	36.4
Value of products.....	40,139,661	29,602,884	17,125,418	11,352,615	5,802,029	4,237,539	192.8	93.7	51.2	-0.2		
Value added by manufacture (value of products less cost of materials).....	17,328,113	12,399,217	6,790,444	5,870,892	2,530,480	1,830,132	134.4	35.6	72.9	50.8	95.7	36.9
							155.2	30.8	82.6	15.7	132.0	37.6

<sup>1</sup> A minus sign (-) denotes decrease. Where percentages are omitted, comparable figures are not available.  
<sup>2</sup> Comparable figures not available.  
<sup>3</sup> Figures not strictly comparable.

The value of products reported for 1909 was more than nine times the value of products in 1869, the decade 1899-1909 showing the most rapid increase. The decrease between 1904 and 1909 in the number of establishments shown is due to the fact that a larger number of individual plants operated under a common ownership were combined and reported as single establishments in 1909 than in 1904. In 1909 there were 54 plants, located in 14 states, which were reported as 16 establishments.

Comparative summary, by states.—Table 2 gives, for the three states which can be shown separately, the number of establishments, average number of wage earners, primary horsepower, capital, salaries, wages, cost of materials, value of products, and value added by manufacture for 1909, 1904, and 1899.

The three states for which comparative statistics are given show increases during the decade 1899-1909 in the more important items, such as average number of wage earners, value of products, and value added by manufacture.

The presentation of statistics by states for the manufacture of explosives is unsatisfactory, because the totals for a number of states can not be shown without the possibility of disclosing the operations of individual establishments. New Jersey, the most important state in the industry, and several other states—notably California, Wisconsin, and Missouri—are of more importance than some for which figures are given but are omitted from the table for the reason stated, while Colorado and Iowa were also of considerable importance.

**Table 2**

STATE.	Census.	Number of establishments.	PERSONS ENGAGED IN INDUSTRY.				Primary horse-power.	Capital.	Salaries.	Wages.	Cost of materials.	Value of products.	Value added by manufacture (value of products less cost of materials).
			Total.	Proprietors and firm members.	Salaried employees.	Wage earners (average number).							
Expressed in thousands.													
United States.....	1909	86	7,058	21	763	6,274	28,601	\$50,168	\$1,134	\$4,304	\$22,812	\$40,140	\$17,328
	1904	124	7,113	24	1,289	5,800	29,665	42,307	1,797	3,309	17,204	29,603	12,399
	1899	97	5,293	23	768	4,502	19,195	19,466	914	2,384	10,335	17,125	6,790
Illinois.....	1909	8	327	.....	37	200	1,828	1,562	44	190	935	1,469	534
	1904	5	174	.....	32	142	1,383	775	56	83	412	712	300
	1899	3	85	.....	14	71	560	493	14	32	144	290	146
Ohio.....	1909	11	424	.....	66	358	2,692	2,248	102	204	1,104	1,719	615
	1904	16	513	.....	83	428	4,075	2,868	126	236	1,275	1,843	568
	1899	9	411	.....	56	352	2,738	1,972	93	179	773	1,330	557
Pennsylvania.....	1909	27	1,225	.....	20	172	1,033	4,594	6,313	629	4,088	6,388	2,300
	1904	40	1,079	.....	19	163	807	5,699	5,320	527	2,517	4,013	1,496
	1899	36	748	.....	17	102	629	3,673	330	320	1,500	2,595	1,085
All other states.....	1909	40	5,082	.....	1	488	4,593	19,487	40,045	3,281	16,685	30,564	13,879
	1904	63	5,347	.....	3	1,011	4,333	18,508	33,344	1,382	13,000	23,035	10,035
	1899	49	4,049	.....	3	506	3,450	12,224	14,182	677	7,918	12,910	4,982

Persons engaged in the industry.—Table 3 shows, for 1909, the number of persons engaged in the industry, classified according to occupational status and sex and, in the case of wage earners, according to age. It should be borne in mind that the sex and age classification of the average number of wage earners in this and other tables is an estimate obtained by the method described in the Introduction.

**Table 3**

CLASS.	PERSONS ENGAGED IN THE INDUSTRY: 1909		
	Total.	Male.	Female.
All classes.....	7,058	6,787	271
Proprietors and officials.....	242	232	10
Proprietors and firm members.....	21	13	8
Salaried officers of corporations.....	66	64	2
Superintendents and managers.....	155	155	.....
Clerks.....	542	488	54
Wage earners (average number).....	6,274	6,067	207
16 years of age and over.....	6,267	6,060	207
Under 16 years of age.....	7	7	.....

The average number of persons engaged in the industry during 1909 was 7,058 of whom 6,274 or 88.9 per cent, were wage earners; 242, or 3.4 per cent, were proprietors and officials; and 542, or 7.7 per cent, were clerks, this class including other subordinate salaried employees. Of the total number of persons engaged in the industry, 6,787, or 96.2 per cent, were males and 271, or 3.8 per cent, females. The average number of wage earners under 16 years of age was only seven.

Wage earners employed, by months.—Table 4 gives the number of wage earners employed in the industry on the 15th (or the nearest representative day) of each month during the year 1909. The number of wage earners for the months of maximum and minimum employment are shown for several states in Table 13.

The largest number, 7,106, was reported for December, and the smallest number, 5,504, for April, the

minimum being equal to 77.5 per cent of the maximum. In 1904 the maximum number was reported for April, and the minimum number, reported for December, was equal to 95.7 per cent of the maximum.

**Table 4**

MONTH.	WAGE EARNERS IN THE INDUSTRY: 1909	
	Number.	Per cent of maximum.
January.....	5,813	81.8
February.....	5,737	80.7
March.....	5,771	81.2
April.....	5,504	77.5
May.....	5,893	82.9
June.....	6,138	86.4
July.....	6,407	90.2
August.....	6,548	92.1
September.....	6,689	94.0
October.....	6,799	95.7
November.....	6,899	97.1
December.....	7,106	100.0

Prevailing hours of labor.—In Table 5 the wage earners in the industry have been classified according to the number of hours of labor per week prevailing in the establishments in which they were employed. In making this classification the average number of wage earners employed during the year in each establishment was classified as a total according to the hours prevailing in that establishment, even though a few employees worked a greater or smaller number of hours.

**Table 5**

PREVAILING HOURS OF LABOR.	WAGE EARNERS IN THE INDUSTRY: 1909	
	Average number.	Per cent of total.
Total.....	6,274	100.0
48 and under.....	210	3.4
54.....	373	5.9
Between 54 and 60.....	205	3.3
60.....	5,344	85.2
Between 60 and 72.....	136	2.2

Of the 6,274 wage earners, 5,344, or 85.2 per cent, were employed in establishments where the prevailing

hours of labor were 60 per week; 794, or 12.6 per cent, in establishments where they were less than 60 hours per week; and 136, or 2.2 per cent, in establishments where the prevailing hours were over 60 per week.

**Character of ownership.**—Table 6 presents statistics with respect to the character of ownership of establishments in the explosive industry.

CHARACTER OF OWNERSHIP.	NUMBER OF ESTABLISHMENTS.		VALUE OF PRODUCTS.	
	1909	1904	1909	1904
	<b>Total</b> .....	86	124	\$40,139,661
Individual.....	5	8	210,103	277,930
Firm.....	4	7	129,563	138,748
Corporation.....	77	109	39,799,995	29,186,206
<b>Per cent of total</b> .....	100.0	100.0	100.0	100.0
Individual.....	5.8	6.5	0.5	0.9
Firm.....	4.7	5.6	0.3	0.5
Corporation.....	89.5	87.9	99.2	98.6

In 1909, of the total number of establishments, 89.5 per cent were under corporate ownership, as compared with 87.9 per cent in 1904. The proportions for 1909 are affected by the inclusion of a number of reports in that year which covered more than one plant, whereas in 1904 separate reports were received for each plant. The corporations reported 99.2 per cent of the value of products in 1909 and 98.6 per cent in 1904.

**Expenses.**—As stated in the Introduction, the census figures representing expenses do not purport to show the total cost of manufacture, since they take no account of interest or depreciation; hence they can not properly be used for determining profits. Facts of interest can be brought out, however, concerning the relative importance of the different classes of expenses which were reported. Table 1 shows the total expenses in 1909 to have been \$31,460,284, distributed as follows: Cost of materials, \$22,811,548, or 72.5 per cent; wages, \$4,304,370, or 13.7 per cent; salaries, \$1,133,606, or 3.6 per cent; and miscellaneous expenses, made up of advertising, ordinary repairs of buildings and machinery, insurance, traveling expenses, etc., \$3,210,760, or 10.2 per cent.

**Engines and power.**—The amount of power was first reported for the industry at the census of 1869. The total horsepower increased from 3,750 in 1869 to 28,601 in 1909. Table 7 shows the statistics of power as reported at the censuses of 1909, 1904, and 1899.

SPECIAL STATISTICS RELATING TO MATERIALS AND PRODUCTS.

**Materials.**—Table 9 shows statistics for materials used in the industry for 1909, 1904, and 1899.

The figures in Table 9 relate only to materials purchased, and do not include acids or other materials produced in establishments where they were used in further processes of manufacture.

In addition to the materials purchased by establishments manufacturing explosives as their chief product in 1909, statistics for which are given in Table

POWER.	NUMBER OF ENGINES OR MOTORS.			HORSEPOWER.			PER CENT DISTRIBUTION OF HORSEPOWER.		
	1909	1904	1899	1909	1904	1899	1909	1904	1899
<b>Primary power, total.</b>	433	605	512	28,601	29,665	19,195	100.0	100.0	100.0
Owned.....	426	605	512	28,468	29,665	19,085	99.5	100.0	99.4
Steam.....	346	375	315	25,558	21,636	13,242	89.4	72.9	69.0
Gas.....	17	15	7	221	427	72	0.8	1.4	0.4
Water wheels.....	62	186	190	2,687	6,902	5,674	9.4	23.5	29.6
Water motors.....	1	29	( <sup>1</sup> )	2	215	( <sup>1</sup> )	( <sup>2</sup> )	0.7	.....
Other.....	.....	.....	.....	.....	425	97	.....	1.4	0.5
Rented—Electric.....	7	.....	( <sup>1</sup> )	133	.....	110	0.5	.....	0.6
<b>Electric motors</b>	885	428	177	14,836	7,889	2,985	100.0	100.0	100.0
Run by current generated by establishment.....	878	428	177	14,703	7,889	2,885	99.1	100.0	98.3
Run by rented power.....	7	.....	( <sup>1</sup> )	133	.....	110	0.9	.....	3.7

<sup>1</sup> Not reported. <sup>2</sup> Less than one-tenth of 1 per cent.

The total primary power increased 49 per cent from 1899 to 1909, steam power increasing 93 per cent, while water power decreased 52.6 per cent. In 1899 steam power formed 69 per cent and water power 29.6 per cent of the total power, but in 1909 the corresponding proportions were 89.4 and 9.4 per cent, respectively. Rented electric power is little used in this industry, and the 133 horsepower reported in 1909 formed only five-tenths of 1 per cent of the total primary power. The horsepower of motors used for the distribution of power by means of current generated in the establishments in the industry increased from 2,885 in 1899 to 14,703 in 1909.

**Fuel consumed.**—Table 8 shows the amount of each kind of fuel consumed in the industry in 1909. The amount expended for fuel and rent of power and heat is shown for the few states for which statistics can be given without disclosing individual operations in Table 13.

KIND OF FUEL.	Unit.	Quantity.
Anthracite coal.....	Long tons.....	30,482
Bituminous coal.....	Short tons.....	926,700
Coke.....	Short tons.....	664
Wood.....	Cords.....	633
Oil, including gasoline.....	Barrels, 50 gallons	144,427
Gas.....	1,000 feet.....	284,797

9, 100,000 pounds of sulphuric acid, 137,400 pounds of nitric acid, and 300,140 pounds of mixed acid were used in the manufacture of explosives by establishments engaged primarily in the manufacture of other products; and 546 tons of pyrites, 619 tons of nitrate of soda, 386,000 pounds of sulphuric acid, 1,500 pounds of nitric acid, and 1,051,713 pounds of mixed acid in establishments operated by the United States Government.

	1909	1904	1899
<b>Total cost</b> .....	\$22,811,548	\$17,203,667	\$10,334,974
Nitrate of soda:			
Tons.....	138,889	133,034	88,524
Cost.....	\$7,802,336	\$5,608,557	\$2,902,866
Acids:			
Mixed—			
Pounds.....	51,764,694	105,552,404	66,906,146
Cost.....	\$1,512,626	\$3,093,429	\$1,505,754
Nitric—			
Pounds.....	7,591,756	2,609,500	467,587
Cost.....	\$541,314	\$122,047	\$17,171
Sulphuric—			
Pounds.....	45,002,000	36,506,000	15,728,000
Cost.....	\$406,204	\$247,301	\$130,699
Sulphur or brimstone:			
Tons.....	17,389	18,570	12,742
Cost.....	\$367,866	\$501,820	\$317,383
Pyrites:			
Tons.....	36,544	12,256	(1)
Cost.....	\$183,509	\$67,261	(1)
All other materials.....	\$11,907,693	\$7,563,252	\$5,461,101

<sup>1</sup> Not reported.

In comparing statistics in regard to materials for different years the fact should not be overlooked that in addition to the materials which are purchased certain materials are also made in the establishments that used them. Table 10 shows the quantities of the most important materials which were manufactured in the establishments in which they were used in 1909 and 1904. The statistics given do not cover materials made and used in establishments engaged primarily in the manufacture of products other than explosives or in establishments operated by the Federal Government.

MATERIAL.	QUANTITY OF SPECIFIED MATERIAL PRODUCED IN ESTABLISHMENTS WHERE USED.	
	1909	1904
Potassium nitrate.....pounds	12,050,225	3,559,376
Nitroglycerin.....pounds	70,289,667	44,077,828
Sulphuric acid.....pounds	85,110,000	61,988,000
Nitric acid.....pounds	62,968,000	37,976,000
Charcoal.....bushels	737,884	1,156,918
Nitrate of ammonia.....pounds	10,904,319	2,863,857
Ether.....pounds	2,052,932	2,740,236

**Products.**—Table 11 shows the quantity and value of the different kinds of explosives reported by establishments engaged primarily in the manufacture of explosives in 1909, 1904, and 1899.

Including the product of the establishments operated by the Federal Government and the explosives made as secondary product by establishments not engaged primarily in the manufacture of explosives, the total production in 1909 was 489,171,650 pounds, and in 1904, 362,085,816 pounds.

The total production of smokeless powder by all classes of establishments in 1909 was 6,315,167 pounds, valued at \$4,292,984, as compared with 7,009,720 pounds, valued at \$4,406,477, in 1904, and 3,053,126 pounds, valued at \$1,716,101, in 1899.

During the decade 1899–1909 the production of explosives by establishments engaged chiefly in their manufacture increased 271,500,533 pounds, or 125.7 per cent, in quantity, and \$21,032,892, or 124.1 per cent, in value. Of the total increase in output, blast-

ing powder and gunpowder contributed 123,025,772 pounds, and dynamite, including “permissible explosives,” 118,916,843 pounds.

The production of guncotton in 1909 by all establishments was 257,212 pounds, valued at \$124,660, as compared with 383,162 pounds, valued at \$226,687, in 1904 and 848,342 pounds, valued at \$403,702, in 1899.

PRODUCT.	1909	1904	1899
<b>Total:</b>			
Pounds.....	<sup>1</sup> 487,481,252	<sup>2</sup> 360,980,734	215,980,719
Value.....	\$37,983,868	\$27,695,963	\$16,950,976
Dynamite:			
Pounds.....	195,155,851	130,920,829	85,846,456
Value.....	\$18,099,746	\$12,900,193	\$8,247,223
Permissible explosives:			
Pounds.....	9,607,448	( <sup>3</sup> )	( <sup>3</sup> )
Value.....	\$863,209	( <sup>3</sup> )	( <sup>3</sup> )
Nitroglycerin, sold as such:			
Pounds.....	28,913,253	7,935,936	3,618,602
Value.....	\$3,162,434	\$1,620,117	\$783,299
Blasting powder:			
Pounds.....	233,477,175	205,436,200	
Value.....	\$9,608,265	\$7,377,977	
Gunpowder:			
Pounds.....	12,862,700	10,383,044	123,314,103
Value.....	\$1,736,427	\$1,541,483	\$5,310,351
Other explosives, including smokeless powder and guncotton or pyroxylin, sold as such:			
Pounds.....	<sup>1</sup> 7,464,825	<sup>2</sup> 6,303,825	3,201,468
Value.....	\$3,913,787	\$4,250,193	\$2,610,103

<sup>1</sup> In addition, 1,471,042 pounds of “other explosives,” valued at \$656,969, were made by Federal establishments, and 219,350 pounds, valued at \$135,979, by establishments not engaged primarily in the manufacture of explosives.

<sup>2</sup> In addition, 1,105,082 pounds, valued at \$67,804, were made by Federal establishments and establishments not engaged primarily in the manufacture of explosives.

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

<sup>4</sup> Includes the value of explosives for which no quantities were reported, as follows: In 1904, \$150,798, and in 1899, \$850,453.

From 1904 to 1909 the production of nitroglycerin sold as such increased 20,977,317 pounds, or 264.3 per cent, in quantity, and \$1,542,317, or 95.2 per cent, in value. The larger part of the nitroglycerin manufactured, however, was used in the manufacture of dynamite and similar explosives in the establishments where it was produced (see Table 10), 70.9 per cent being so used in 1909, and 84.7 per cent in 1904.

Explosives which are intended for use in coal mines where there are inflammable gases and which have passed the prescribed tests of the United States Bureau of Mines are designated as “permissible explosives.” These explosives were reported separately for the first time at the census of 1909. Generally they are similar in composition to dynamite, and such quantities as were manufactured in 1904 and 1899 were reported as dynamite. The aggregate production of dynamite and permissible explosives in 1909 by establishments engaged primarily in the industry was 204,763,299 pounds, valued at \$19,562,955, as compared with 130,920,829 pounds, valued at \$12,900,193, in 1904 and 85,846,456 pounds, valued at \$8,247,223, in 1899, an increase for the decade of 138.5 per cent in quantity and 137.2 per cent in value.

In 1909, 44 establishments reported the manufacture of nitroglycerin, 25 the manufacture of dynamite, and 13 the manufacture of permissible explosives.

Table 12 shows the quantity of gunpowder and of blasting powder produced by establishments in the industry in 1909, 1904, and 1899.

# THE MANUFACTURE OF EXPLOSIVES.

571

The production of gunpowder and blasting powder in 1909 aggregated 246,339,875 pounds, valued at \$11,344,692, as compared with 215,820,144 pounds, valued at \$8,919,460, in 1904 and 123,314,103 pounds, valued at \$5,310,351, in 1899. The manufacture of blasting powder was reported by 38 establishments in 1909, and that of gunpowder by 8 establishments.

Recovered acid constitutes an important by-product in the manufacture of explosives. In 1909 the commercial establishments engaged primarily in the industry reported the recovery of 14,137,857 pounds of acid, valued at \$62,935, and the establishments oper-

ated by the Federal Government reported the recovery of 1,610,646 pounds.

PRODUCT.	GUNPOWDER AND BLASTING POWDER PRODUCED (POUNDS).		
	1909	1904	1899
Total.....	246,339,875	215,820,144	123,314,103
Gunpowder.....	12,862,700	10,383,944	(1)
Blasting powder.....	233,477,175	205,436,200	(1)
Per cent of total.....	100.0	100.0	.....
Gunpowder.....	5.2	4.8	.....
Blasting powder.....	94.8	95.2	.....

<sup>1</sup> Figures not strictly comparable.

## DETAILED STATE TABLE.

The principal statistics secured by the census inquiry concerning the manufacture of explosives are presented, by states, in Table 13, which gives detailed figures for 1909 for number of establishments,

number of persons engaged in the industry, number of wage earners on December 15, or the nearest representative day, primary horsepower, capital, expenses, value of products, and value added by manufacture.

### EXPLOSIVES—DETAILED STATISTICS, BY STATES: 1909.

STATE.	Number of establishments.	PERSONS ENGAGED IN INDUSTRY.										WAGE EARNERS—DEC. 15, OR NEAREST REPRESENTATIVE DAY.				Primary horsepower.
		Total.	Proprietors and firm members.	Salaried officers, superintendents, and managers.	Clerks.		Wage earners.			Total.	16 and over.		Under 16.			
					Male.	Female.	Average number.	Number, 15th day of—			Male.	Female.	Male.	Female.		
								Maximum month.	Minimum month.							
United States.....	86	7,058	21	221	488	54	6,274	Do	7,106	Ap	5,504	7,121	6,878	235	8	28,601
Illinois.....	8	327	.....	15	15	7	290	Do	326	Ap	251	326	326	.....	.....	1,828
Ohio.....	11	424	.....	24	34	8	358	Au	385	Ap	323	378	355	23	.....	2,692
Pennsylvania.....	27	1,225	20	59	97	16	1,033	Se	1,159	Mh	906	1,111	1,002	101	8	4,594
All other states <sup>1</sup> .....	40	5,082	1	123	342	23	4,593	.....	.....	.....	.....	5,306	5,195	111	.....	19,487

STATE.	Capital.	EXPENSES.										Value of products.	Value added by manufacture (value of products less cost of materials).
		Total.	Services.			Materials.		Miscellaneous.					
			Officials.	Clerks.	Wage earners.	Fuel and rent of power.	Other.	Rent of factory.	Taxes, including internal revenue.	Contract work.	Other.		
United States.....	\$60,167,976	\$31,460,284	\$518,080	\$615,526	\$4,304,370	\$826,981	\$21,984,567	\$4,600	\$142,062	\$3,065	\$3,061,033	\$40,139,661	\$17,328,113
Illinois.....	1,561,612	1,250,894	28,030	15,190	189,558	29,226	906,060	150	4,414	1,503	76,157	1,469,469	534,177
Ohio.....	2,247,776	1,685,325	66,608	35,586	203,782	40,997	1,062,874	400	14,799	.....	160,659	1,718,871	615,000
Pennsylvania.....	6,313,307	5,479,440	119,973	111,357	629,643	84,786	4,002,780	2,485	21,008	127	507,281	6,387,869	2,300,303
All other states <sup>1</sup> .....	40,045,191	23,144,125	302,809	453,393	3,281,387	671,972	16,012,847	1,505	101,841	1,435	2,316,936	30,563,452	13,878,633

<sup>1</sup> All other states embrace: Alabama, 2 establishments; Arkansas, 1; California, 2; Colorado, 1; Connecticut, 1; Delaware, 1; Indiana, 3; Iowa, 1; Kansas, 2; Maryland, 1; Massachusetts, 2; Michigan, 3; Missouri, 3; New Jersey, 2; New York, 3; Oklahoma, 3; Tennessee, 2; Texas, 1; Washington, 2; West Virginia, 3; Wisconsin, 1.

---

---

# FERTILIZERS

---

---

(573)

# THE FERTILIZER INDUSTRY.

## GENERAL STATISTICS.

**Scope of industry.**—This classification covers establishments making artificial fertilizers, the products being ordinarily ready for use without being subjected to further treatment. The production of certain kinds of products which are used more or less extensively for fertilizing without special manufacture is not covered by this report. For example, the production of raw phosphate rock, including the process of grinding it, is treated as a mining industry, and, while part of the phosphate rock is used as material by fertilizer factories, a great deal of it is used directly as such on the farms. Crude cottonseed, a farm product, is often used as a fertilizer without being subjected to any manufacturing process, and cottonseed meal and other products of cottonseed-oil mills are also so used. Tankage, which consists of various waste materials of slaughtering and meat-packing establishments, is also used to a considerable extent as a fertilizer without further preparation. Much cottonseed meal and tankage, however, are used as materials by the fertilizer factories included under the present classification.

The raw materials used by fertilizer factories include animal, vegetable, and mineral products, while sulphuric and other acids are employed extensively in the treatment of the basic materials. The finished products include a variety of classes, such as "complete" fertilizers, which consist of a mixture of super-

phosphates with both potash and ammoniates, superphosphates with or without ammoniates, concentrated phosphates, and other minor classes.

In addition to the production of fertilizers by establishments assigned to the present classification, there is a considerable production of similar finished fertilizers by concerns engaged primarily in the manufacture of other products, especially by slaughtering and meat-packing establishments and cottonseed-oil mills. In cases where the manufacture of fertilizers by concerns of this character was conducted as a separate department a separate report for this department was secured, and the statistics are included with those for the fertilizer industry, while in other cases separate reports were not secured, since the statistics of capital, labor, etc., for this branch of the business could not be segregated. As a rule, however, the quantity and value of the fertilizers produced and the quantity and cost of the fertilizer materials used by such establishments were given, making it possible to present more complete statistics for these items.

**Summary and comparison with earlier censuses.**—Table 1 summarizes the statistics for the fertilizer industry for each census from 1869 to 1909, inclusive. The financial figures for 1869 are given in currency, which at that time was worth only about 80 cents, gold, to the dollar. For strict comparison, therefore, these figures should be reduced about 20 per cent.

**Table 1**

	NUMBER OR AMOUNT.						PER CENT OF INCREASE. <sup>1</sup>					
	1909	1904 <sup>2</sup>	1899	1889	1879	1869	1899-1909	1904-1909	1899-1904	1889-1899	1879-1889	1869-1879
Number of establishments.....	550	399	422	(8)	390	(8)	30.3	37.8	-5.5	8.2	7.1	188.9
Persons engaged in the industry.....	21,950	16,091	13,054	(8)	364	(8)	60.8	36.4	17.9			
Proprietors and firm members.....	323	294	361	(8)	(8)	(8)	-10.5	9.9	-18.6			
Salaried employees.....	3,317	1,613	1,712	(8)	(8)	(8)	93.8	105.6	-5.8			
Wage earners (average number).....	18,310	14,184	11,581	(8)	0,026	(8)	58.1	20.1	22.5	(4)	(4)	(4)
Primary horsepower.....	64,711	47,989	38,680	(8)	8,598	2,501	67.3	34.8	24.1			
Capital.....	\$121,537,461	\$68,917,264	\$60,685,753	\$40,504,168	\$17,913,660	\$4,395,948	100.3	76.4	13.6	49.5	126.0	307.5
Expenses.....	90,101,293	51,264,749	39,003,019	32,575,787	(8)	(8)	131.0	75.8	31.4	19.7		
Services.....	11,882,815	7,061,139	6,310,261	4,671,831	2,648,422	768,712	88.3	68.3	11.9	35.1	76.4	245.4
Salaries.....	4,405,636	1,933,992	2,124,972	(8)	(8)	(8)	107.3	127.8	-9.0			
Wages.....	7,477,179	5,127,147	4,185,289	(8)	(8)	(8)	78.7	45.8	22.5			
Materials.....	69,521,920	39,287,914	28,958,473	25,113,874	15,595,078	3,808,025	140.1	77.0	35.7	15.3	61.0	309.5
Miscellaneous.....	8,696,558	4,915,696	3,734,285	2,700,082	(8)	(8)	132.9	76.9	31.6	33.8		
Value of products.....	103,960,213	56,541,253	44,657,355	39,180,844	23,650,795	5,815,118	132.8	83.9	26.6	14.0	65.7	306.7
Value added by manufacture (value of products less cost of materials).....	34,438,293	17,253,339	15,098,912	14,066,970	8,055,717	2,007,093	119.4	99.6	9.9	11.6	74.6	301.4

<sup>1</sup> A minus sign (-) denotes decrease. Where percentages are omitted comparable figures are not available.  
<sup>2</sup> Exclusive of the statistics for Alaska, which were included in the totals published at the census of 1904.  
<sup>3</sup> Comparable figures not available.  
<sup>4</sup> Figures not strictly comparable.

In 1859, statistics for which are not included in the table, 47 establishments were reported as making fertilizers, with 308 wage earners and products valued at \$891,344. The growth of the industry from census to census has been continuous and for the most part rapid, the value of products reported for 1909 being nearly eighteen times as great as that for 1869. Be-

tween 1899 and 1909 the value of products increased 132.8 per cent, the number of wage earners 58.1 per cent, the amount paid in wages 78.7 per cent, and the value added by manufacture 119.4 per cent. The growth of the industry was greater during this decade than in any other decade covered by the table, except that from 1869 to 1879.

Summary, by states.—Table 2 summarizes the more important statistics for the fertilizer industry, by states, the states being arranged according to the value of products reported for 1909. The states

shown in this table are given their actual ranking among all states, the rank of certain states for which data can not be presented being higher than that of some named in the table.

STATE.	Number of establishments: 1909	WAGE EARNERS.			VALUE OF PRODUCTS.			VALUE ADDED BY MANUFACTURE.			PER CENT OF INCREASE. <sup>1</sup>								
		Average number: 1909	Per cent of total: 1909	Rank.	Amount: 1909	Per cent of total: 1909	Rank.	Amount: 1909	Per cent of total: 1909	Rank.	Wage earners.			Value of products.			Value added by manufacture.		
											1909	1904	1899	1904	1899	1904	1899	1904	1899
United States....	550	18,310	100.0	.....	\$103,980,213	100.0	.....	\$34,438,293	100.0	.....	58.1	29.1	22.5	132.8	83.9	26.5	119.4	99.6	9.8
Georgia.....	110	2,770	15.1	1	16,800,301	16.2	1	5,856,150	17.0	1	146.0	26.4	94.7	399.0	77.6	181.0	475.8	99.6	188.8
Maryland.....	41	1,439	7.9	3	9,672,786	9.3	2	2,710,061	7.9	3	41.6	14.6	23.6	76.5	45.9	21.0	47.4	65.2	-10.7
South Carolina.....	26	1,851	10.1	4	9,024,900	8.7	3	3,305,442	9.9	2	4.5	72.8	-39.6	84.8	148.1	-25.5	01.3	259.0	-46.7
Virginia.....	45	1,956	10.7	2	8,034,543	7.7	4	2,645,433	7.7	4	67.0	8.6	53.8	135.2	72.5	36.4	119.8	86.6	13.1
New Jersey.....	22	1,208	6.6	7	7,671,859	7.4	5	1,986,672	5.8	7	25.6	6.1	18.4	78.8	35.7	31.7	73.5	15.3	50.0
Pennsylvania.....	48	1,224	6.7	6	6,542,844	6.3	6	1,929,974	5.6	8	60.0	27.8	25.2	79.6	59.8	12.4	82.1	60.3	13.1
Alabama.....	42	1,233	6.7	5	6,423,233	6.2	7	2,158,868	6.3	5	180.9	123.8	25.5	210.6	174.4	13.2	217.0	193.7	7.9
North Carolina.....	34	933	5.1	8	6,316,485	6.1	8	2,133,282	6.2	6	118.5	2.8	112.6	321.6	103.8	106.9	369.8	142.1	94.1
Ohio.....	27	841	4.6	10	4,434,541	4.3	9	1,899,756	5.5	9	110.2	71.6	22.5	167.6	93.8	38.1	196.9	110.4	41.1
New York.....	15	908	5.0	9	4,250,568	4.1	10	1,565,801	4.6	10	-12.1	52.3	-42.3	35.0	104.2	-33.9	23.8	113.4	-39.4
Florida.....	12	589	3.2	11	3,878,296	3.7	11	1,003,679	2.9	13	403.4	143.4	106.8	675.6	143.9	218.0	493.5	273.5	56.8
Tennessee.....	12	559	3.1	12	3,249,343	3.2	13	1,127,615	3.3	12	26.2	-23.4	76.3	121.6	20.3	84.2	66.7	14.0	46.3
Illinois.....	11	444	2.4	15	2,385,951	2.3	14	961,434	2.8	14	31.8	.....	-85.8	28.6	1,721.4	-92.9	13.2	.....	-95.3
California.....	15	226	1.2	18	2,312,555	2.2	15	516,777	1.5	16	.....	83.7	.....	244.7	158.7	33.2	175.0	37.9	99.5
Mississippi.....	10	449	2.5	13	2,125,029	2.0	16	740,071	2.1	15	.....	29.0	.....	331.0	96.4	119.5	300.1	223.9	49.0
Louisiana.....	6	295	1.6	16	1,767,091	1.7	17	432,613	1.2	18	6.1	-14.2	23.7	93.1	12.9	71.0	46.3	-20.1	83.1
Connecticut.....	12	295	1.6	17	1,572,575	1.5	18	481,514	1.4	17	121.8	-4.8	133.1	302.3	66.8	141.2	195.7	15.3	156.4
Delaware.....	10	134	0.7	19	859,517	0.8	19	407,530	1.2	19	-9.5	-10.1	0.7	16.4	13.2	-49.8	20.4	.....	-75.2
Maine.....	5	95	0.5	22	596,623	0.6	21	165,787	0.5	23	.....	.....	.....	.....	.....	.....	.....	.....	.....
Indiana.....	15	123	0.7	20	456,362	0.4	23	202,608	0.6	22	.....	.....	.....	78.8	52.5	17.3	.....	41.3	.....
All other states.....	32	738	4.0	.....	5,594,811	5.4	.....	2,087,226	6.1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

<sup>1</sup> Percentages of increase are based on figures in Table 19. A minus sign (-) denotes decrease. Percentage not shown where base is less than 100 for wage earners or less than \$100,000 for value of products or value added by manufacture.

Although reported from 34 states, the industry is largely concentrated in the Southern states, the states of the South Atlantic division alone reporting more than half of the total value of products in 1909. In this connection it may be noted that, according to the census of agriculture, much the larger part of the expenditure of farmers for fertilizers is in the South. In 1909 the farmers of the United States reported the expenditure of \$114,882,541 for fertilizers, of which \$75,752,296, or 65.9 per cent, was spent by the farmers of the South. The farmers of the South Atlantic division alone spent \$59,625,130, or more than half of the total. Most of the expenditure for fertilizers outside of the South was reported from the three northeastern divisions of the country—the New England, Middle Atlantic, and East North Central.

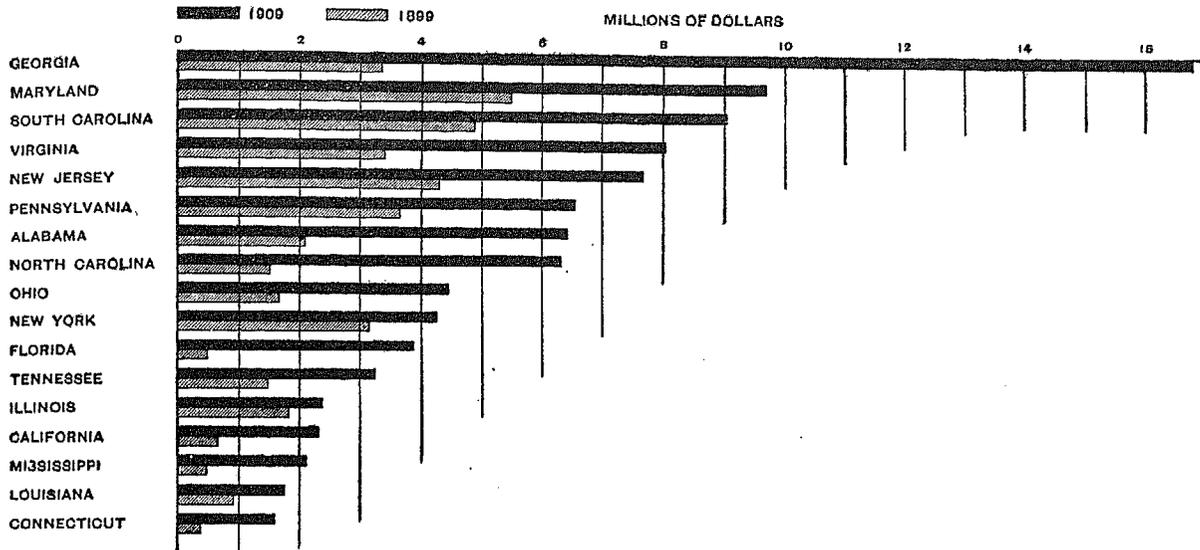
Georgia is by far the most important state in the production of fertilizers, the value of its product in 1909 representing nearly one-sixth of the total for the country. Maryland ranks second among the states in value of products of the fertilizer industry. Florida, one of the important states in this industry, shows the

greatest rate of increase in value of products between 1899 and 1909, 675.6 per cent. In Georgia the increase was 399 per cent, and in Virginia, Alabama, North Carolina, Ohio, Tennessee, Mississippi, and Connecticut the rate of increase exceeded 100 per cent. Although the percentage of increase during the decade was less conspicuous for South Carolina, this state advanced from sixth place in value of products in 1904 to third place in 1909. The increase shown for Illinois from 1904 to 1909 has little significance, as the fertilizer business of certain establishments making fertilizers as a subsidiary product was classed with the fertilizer industry in 1899 and 1909 but not in 1904. The figures for other states also may have been affected by changes in the method of reporting the manufacture of fertilizers by concerns primarily engaged in other industries.

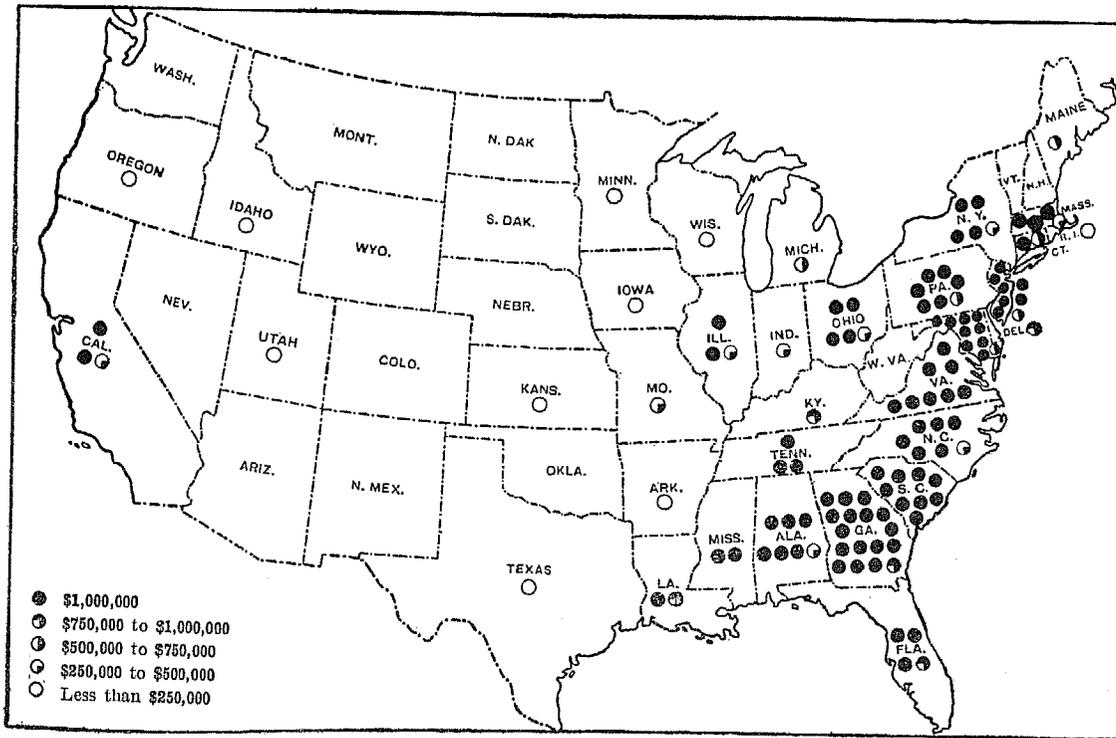
The following diagram shows graphically the value of products for the most important states in the industry in 1909 and 1899, while the map shows graphically the distribution, by states, of the value of products in 1909.

# THE FERTILIZER INDUSTRY.

VALUE OF PRODUCTS FOR LEADING STATES: 1909 AND 1899.



VALUE OF PRODUCTS, BY STATES: 1909.



Persons engaged in the industry.—Table 3 shows, for 1909, the number of persons engaged in the industry, classified according to occupational status and sex, and in the case of wage earners, according to age also. It should be borne in mind that the sex and age classification of the average number of wage earners in this and other tables is an estimate obtained by the method described in the Introduction.

The average number of persons engaged in the industry during 1909 was 21,950, of whom 18,310, or 83.4 per cent, were wage earners, 1,323, or 6 per cent, proprietors and officials, and 2,317, or 10.6 per cent, clerks, this class including other subordinate salaried

employees. Of the total number of persons engaged in the industry, 21,547, or 98.2 per cent, were males, and 403, or 1.8 per cent, females, most of the latter being clerks. The average number of wage earners under 16 years of age (all of whom were males) was only 67.

The average number of wage earners for each state in 1909, 1904, and 1899 is given in Table 19. The distribution of the average number by sex and age is not shown for the individual states, but Table 20 gives such a distribution of the number of wage earners employed on the representative day. No women were reported as wage earners in 12 of the 22

states for which separate figures are shown. The largest number of female wage earners, 47, was reported for the state of Illinois, and the next largest, 20, for Connecticut. More than one-half of the boys under 16 years of age were reported from Georgia.

CLASS.	PERSONS ENGAGED IN THE INDUSTRY: 1909		
	Total.	Male.	Female.
All classes .....	21,950	21,547	403
Proprietors and officials .....	1,323	1,313	10
Proprietors and firm members.....	323	316	7
Salaried officers of corporations.....	406	404	2
Superintendents and managers.....	594	593	1
Clerks.....	2,317	2,042	275
Wage earners (average number).....	18,310	18,192	118
16 years of age and over.....	18,243	18,125	118
Under 16 years of age.....	67	67	0

In order to compare the distribution of the persons engaged in the industry in 1909 according to occupational status with that in 1904 it is necessary to use the classification employed at the earlier census. (See Introduction.) Such a comparison is made in Table 4.

CLASS.	PERSONS ENGAGED IN THE INDUSTRY.				Per cent of increase: 1904-1909
	1909		1904		
	Number.	Per cent distribution.	Number.	Per cent distribution.	
Total .....	21,950	100.0	18,091	100.0	36.4
Proprietors and firm members.....	323	1.5	294	1.8	9.9
Salaried employees.....	3,317	15.1	1,613	10.0	105.6
Wage earners (average number).....	18,310	83.4	14,184	83.1	29.1

Table 5 shows the average number of wage earners in the industry, distributed according to age, and in the case of those 16 years of age and over, according to sex, for 1909, 1904, and 1899. The number of women and children employed was so small that the increase from 1899 to 1909 has little significance.

CLASS.	AVERAGE NUMBER OF WAGE EARNERS IN THE INDUSTRY					
	1909		1904		1899	
	Number.	Per cent distribution.	Number.	Per cent distribution.	Number.	Per cent distribution.
Total.....	18,310	100.0	14,184	100.0	11,581	100
16 years of age and over.....	18,243	99.6	14,158	99.8	11,560	99
Male.....	18,125	99.0	14,048	99.0	11,435	98
Female.....	118	0.6	110	0.8	131	1
Under 16 years of age.....	67	0.4	26	0.2	15	0

Wage earners employed, by months.—Table 6 give the number of wage earners employed in the industry on the 15th (or the nearest representative day) of each month during the year 1909, for the 12 states in which an average of 500 or more wage earners were employed during the year.

The industry is considerably affected by the seasonal demand for fertilizers. The largest number of wage earners employed during any month of 1909 was 29,310 in March, and the smallest number 14,264 in July, the minimum number being equal to 48.7 per cent of the maximum. In 1904 the maximum number, 20,834, was shown for March, and the minimum number, 11,122, for June, the latter number forming 53.4 per cent of the former. In the more southern states—Alabama, Florida, Georgia, and South Carolina—the month of maximum employment was February or March and that of minimum employment July or August, and there was no marked renewal of activity in the fall, but rather a general increase in number employed from the month of minimum employment to the end of the year. In some of the other states however, there were periods of considerable activity both in the spring and in the late summer, and in Maryland, New York, Ohio, and Virginia the maximum employment was in August or September.

The months of maximum and minimum employment in 1909, and the number of wage earners reported for these months, are given for a larger number of states in Table 21.

STATE.	Average number during the year.	WAGE EARNERS EMPLOYED IN THE INDUSTRY: 1909 <sup>1</sup>											
		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
United States .....	18,310	17,076	24,196	29,310	23,198	16,737	14,506	14,264	15,514	18,163	16,232	15,095	15,425
Alabama.....	1,233	1,446	2,316	2,785	1,844	1,083	771	667	658	793	700	821	911
Florida.....	559	702	820	705	518	506	494	471	472	522	556	559	654
Georgia.....	2,770	3,006	5,619	6,851	3,697	2,003	1,392	1,366	1,402	1,879	1,904	2,070	2,240
Maryland.....	1,430	1,185	1,403	1,688	1,833	1,380	1,210	1,331	1,499	2,115	1,837	1,110	1,178
New Jersey.....	1,208	1,086	1,100	1,518	1,482	1,153	1,112	1,138	1,173	1,216	1,196	1,164	1,143
New York.....	908	771	809	908	946	857	897	1,089	1,143	1,110	988	671	700
North Carolina.....	933	686	1,227	1,642	1,694	879	743	494	644	817	954	672	744
Ohio.....	841	692	676	779	826	749	742	775	1,129	1,522	789	716	697
Pennsylvania.....	1,224	1,161	1,270	1,451	1,473	1,190	1,109	1,140	1,235	1,250	1,126	1,112	1,171
South Carolina.....	1,851	1,875	3,389	4,356	2,352	1,323	1,069	922	1,030	1,176	1,477	1,462	1,779
Tennessee.....	559	503	745	893	823	438	372	408	406	550	567	480	522
Virginia.....	1,956	1,321	1,579	1,926	2,388	2,492	2,190	2,130	2,166	2,517	2,065	1,757	1,087

<sup>1</sup> The month of maximum employment for each state is indicated by boldface figures and that of minimum employment by italic figures.

Prevailing hours of labor.—In Table 7 the wage earners in the industry have been classified according to the number of hours of labor per week prevailing in the establishments in which they were employed. In making this classification the average number of wage earners employed during the year in each establishment was classified as a total, according to the hours prevailing in that establishment, even though a few employees worked a greater or smaller number of hours.

**Table 7**

AVERAGE NUMBER OF WAGE EARNERS IN THE INDUSTRY: 1909

STATE.	Total.	In establishments with prevailing hours—						
		48 and under.	Between 48 and 54.	54.	Between 54 and 60.	60.	Between 60 and 72.	72 and over.
United States.....	13,310	51	22	332	808	14,502	1,408	1,189
Alabama.....	1,233	4	22	16	12	997	175	41
Florida.....	589	4	7	7	159	562	15	360
Georgia.....	2,770	4	3	30	51	2,146	87	360
Maryland.....	1,439	9	11	1	573	1,030	376	.....
New Jersey.....	1,208	11	2	70	686	1,137	36	139
New York.....	908	11	60	26	755	258	60	.....
North Carolina.....	933	1	2	197	425	109	419	.....
Ohio.....	841	6	8	4	1,708	6	43	.....
Pennsylvania.....	1,224	1	1	40	512	255	107	.....
South Carolina.....	1,851	4	3	14	108	1,405	.....	.....
Tennessee.....	559	4	3	14	108	1,405	.....	.....
Virginia.....	1,956	4	3	14	108	1,405	.....	.....

More than nine-tenths (93.4 per cent) of the wage earners employed in the industry in 1909 worked in establishments where the prevailing hours were 60 or more per week. Less than 1 per cent were employed

in establishments where the usual hours were less than 54 per week. In the industry as a whole, 14,502 wage earners, or 79.2 per cent of the total, were employed in establishments operating 60 hours per week, and this was the most common time of employment in every state for which data are shown in the table.

Character of ownership.—Table 8 presents statistics with respect to the character of ownership of the establishments in the fertilizer industry.

**Table 8**

CHARACTER OF OWNERSHIP.	NUMBER OF ESTABLISHMENTS.		VALUE OF PRODUCTS.	
	1909	1904	1909	1904
Total.....	550	399	\$103,960,213	\$56,541,253
Individual.....	95	99	1,907,199	1,809,406
Firm.....	86	73	4,046,342	3,409,295
Corporation.....	369	227	98,006,672	51,322,552
Per cent of total.....	100.0	100.0	100.0	100.0
Individual.....	17.3	24.8	1.8	3.2
Firm.....	15.6	18.2	3.9	6.0
Corporation.....	67.1	57.0	94.3	90.8

In 1909, of the total number of establishments reported for the industry, 67.1 per cent were under corporate ownership, as compared with 57 per cent in 1904. In 1909 the value of products of these establishments represented 94.3 per cent of the total, and in 1904, 90.8 per cent.

Table 9 gives statistics for establishments classified according to form of ownership for the 12 states employing an average of more than 500 wage earners in 1909. The table shows that in every state listed corporations controlled the great bulk of the business.

**Table 9**

STATE.	NUMBER OF ESTABLISHMENTS OWNED BY—			WAGE EARNERS IN ESTABLISHMENTS OWNED BY—			VALUE OF PRODUCTS OF ESTABLISHMENTS OWNED BY—			VALUE ADDED BY MANUFACTURE IN ESTABLISHMENTS OWNED BY—		
	Individuals.	Firms.	Corporations.	Individuals.	Firms.	Corporations.	Individuals.	Firms.	Corporations.	Individuals.	Firms.	Corporations.
United States.....	95	86	369	354	790	17,166	\$1,907,199	\$4,046,342	\$98,006,672	\$512,731	\$1,271,246	\$32,654,316
Alabama.....	2	4	36	(X)	27	1,206	(X)	263,840	6,154,393	(X)	37,177	2,121,691
Florida.....	11	21	12	36	202	589	284,645	1,376,817	3,878,296	50,068	504,663	1,003,679
Georgia.....	10	10	21	55	61	1,323	392,939	222,175	15,138,939	97,138	75,500	5,301,519
Maryland.....	5	6	11	18	53	1,137	104,590	180,535	9,057,672	97,138	75,500	2,537,423
New Jersey.....	4	1	10	16	(X)	890	129,284	(X)	7,386,734	18,776	70,140	1,897,756
New York.....	6	6	22	22	38	873	59,123	141,881	4,121,284	31,008	58,384	1,564,201
North Carolina.....	4	4	19	13	12	816	41,245	84,200	6,115,481	19,716	21,481	2,043,890
Ohio.....	22	12	14	65	110	1,049	312,432	561,916	4,309,096	97,295	116,367	1,858,559
Pennsylvania.....	1	1	25	(X)	(X)	1,851	(X)	(X)	5,668,496	(X)	(X)	1,716,312
South Carolina.....	1	3	8	(X)	20	539	(X)	72,132	9,024,000	(X)	(X)	3,305,442
Tennessee.....	6	2	37	147	(X)	1,809	327,941	(X)	3,177,161	(X)	17,100	1,110,515
Virginia.....	6	2	37	147	(X)	1,809	327,941	(X)	7,706,602	101,486	(X)	2,483,947

NOTE.—In some states, in order to avoid disclosing the returns for individual establishments, the figures for one group have been consolidated with those for establishments under some other form of ownership. In such cases an (X) is placed in the column from which the figures have been omitted and the figures for the group with which they have been combined are printed in italics.

Size of establishments.—Table 10 presents statistics reported for 1909 and 1904 for establishments in the fertilizer industry grouped according to the value of their products.

In 1909, 1.8 per cent of the establishments manufactured products valued at \$1,000,000 or over, as against 1.5 per cent in 1904. These establishments reported 16.6 per cent of the value of products in 1909 and 15.6 per cent in 1904. By far the greater part

of the value of products of the industry, 73.8 per cent in 1909 and 70.5 per cent in 1904, was reported by establishments having products valued at \$100,000 but less than \$1,000,000 each.

The average number of wage earners per establishment decreased from 36 in 1904 to 33 in 1909, but the average value of products per establishment increased from \$141,707 to \$189,019, and the average value added by manufacture from \$43,241 to \$62,615.

VALUE OF PRODUCTS PER ESTABLISHMENT.	NUMBER OF ESTABLISHMENTS.		VALUE OF PRODUCTS.	
	1909	1904	1909	1904
Total.....	550	399	\$103,960,213	\$56,541,253
Less than \$5,000.....	54	46	134,901	126,687
\$5,000 and less than \$20,000.....	95	87	1,103,092	1,007,796
\$20,000 and less than \$100,000.....	180	131	8,668,288	6,643,941
\$100,000 and less than \$1,000,000.....	211	129	78,746,170	39,909,070
\$1,000,000 and over.....	10	6	17,307,762	8,853,859
Per cent of total.....	100.0	100.0	100.0	100.0
Less than \$5,000.....	9.8	11.5	0.1	0.2
\$5,000 and less than \$20,000.....	17.3	21.8	1.1	1.8
\$20,000 and less than \$100,000.....	32.7	32.8	8.3	11.8
\$100,000 and less than \$1,000,000.....	38.4	32.3	73.8	70.6
\$1,000,000 and over.....	1.8	1.5	16.6	15.7

Table 11 classifies the establishments in 12 of the leading states according to the number of wage earners employed. It should be borne in mind that because of the seasonal character of the industry, the average number of employees in any given establishment for the entire year is usually much less than the number employed during the busy months.

Of the 550 establishments reported in 1909, 2 per cent employed no wage earners, 38.2 per cent employed from 1 to 5, 24.2 per cent from 6 to 20, 27.1 per cent from 21 to 100, and 8.5 per cent more than 100 wage earners.

STATE.	TOTAL.		ESTABLISHMENTS EMPLOYING IN 1909—												
			No wage earners.		1 to 5 wage earners.		6 to 20 wage earners.		21 to 50 wage earners.		51 to 100 wage earners.		101 to 250 wage earners.		Over 250 wage earners.
	Estab-lish-ments.	Wage earners (average number).	Estab-lish-ments.	Estab-lish-ments.	Wage earners.	Estab-lish-ments.	Wage earners.	Estab-lish-ments.	Wage earners.	Estab-lish-ments.	Wage earners.	Estab-lish-ments.	Wage earners.	Estab-lish-ments.	Wage earners.
United States.....	550	18,310	11	210	583	133	1,411	73	2,565	76	5,539	39	5,697	8	2,511
Alabama.....	42	1,233	.....	16	58	11	88	5	163	7	532	3	392	.....	.....
Florida.....	12	589	.....	2	8	3	39	2	59	4	303	.....	180	.....	.....
Georgia.....	110	2,770	.....	49	149	27	262	14	507	14	1,093	.....	759	.....	.....
Maryland.....	41	1,439	.....	21	52	7	87	4	150	5	354	.....	447	.....	.....
New Jersey.....	22	1,208	.....	9	19	6	65	2	66	.....	.....	.....	3	452	2
New York.....	15	908	.....	4	15	3	37	1	44	2	149	.....	304	1	369
North Carolina.....	34	933	.....	11	30	11	127	4	144	7	494	.....	133	.....	.....
Ohio.....	27	841	.....	9	30	7	66	2	83	4	288	.....	374	.....	.....
Pennsylvania.....	48	1,224	.....	28	66	11	110	2	75	3	254	.....	300	1	419
South Carolina.....	26	1,851	.....	6	23	3	35	2	63	8	599	.....	1,131	.....	.....
Tennessee.....	12	559	.....	4	11	1	13	2	96	3	192	.....	541	.....	.....
Virginia.....	45	1,956	.....	10	20	11	135	9	332	10	676	.....	.....	.....	.....

Of the total number of wage earners reported, 10.9 per cent were reported by establishments employing on the average from 1 to 20; 14 per cent by establishments employing from 21 to 50; 30.3 per cent by establishments employing from 51 to 100; and 44.8 per cent by establishments employing more than 100 wage earners. There were no establishments in the industry employing an average of more than 500 wage earners during the year.

**Expenses.**—As stated in the Introduction, the census does not purport to furnish figures that can be used for determining the total cost of manufacture, since they take no account of interest or depreciation, and hence they can not properly be used for determining profits. Facts of interest can be brought out, however, concerning the relative importance of the different classes of expenses which were reported.

Table 1 shows the total expenses in 1909 to have been \$90,101,293, distributed as follows: Cost of materials, \$69,521,920, or 77.2 per cent; wages, \$7,477,179, or 8.3 per cent; salaries, \$4,405,636, or 4.9 per cent; and miscellaneous expenses, made up of advertising, ordinary repairs of buildings and machinery, insurance, traveling expenses, and other sundry expenses, \$8,696,558, or 9.7 per cent.

**Engines and power.**—As shown in Table 1 the amount of power used in the fertilizer industry increased from 2,951 horsepower in 1869 to 64,711 in 1909. Table 12 shows the statistics of power as reported at the censuses of 1909, 1904, and 1899.

POWER.	NUMBER OF ENGINES OR MOTORS.			HORSEPOWER.			PER CENT DISTRIBUTION OF HORSEPOWER.		
	1909	1904	1899	1909	1904	1899	1909	1904	1899
Primary power, total.....	1,338	830	637	64,711	47,989	38,680	100.0	100.0	100.0
Owned.....	900	752	637	51,967	45,456	37,980	80.3	94.7	98.2
Steam.....	804	720	591	49,740	44,672	37,121	76.9	93.1	96.0
Gas.....	83	17	30	1,825	246	410	2.8	0.5	1.1
Water wheels.....	10	15	16	300	353	359	0.5	0.7	0.9
Water motors.....	3	.....	.....	65	.....	.....	0.1	.....	.....
Other.....	.....	.....	.....	37	185	90	0.1	0.4	0.2
Rented.....	438	78	( <sup>1</sup> )	12,744	2,533	700	19.7	5.3	1.8
Electric.....	438	78	( <sup>1</sup> )	12,579	2,358	220	19.4	4.9	0.6
Other.....	.....	.....	.....	165	175	480	0.3	0.4	1.2
Electric motors.....	761	204	36	19,238	5,275	1,061	100.0	100.0	100.0
Run by current generated by establishment.....	323	126	36	6,659	2,917	841	34.6	55.3	79.3
Run by rented power.....	438	78	( <sup>1</sup> )	12,579	2,358	220	65.4	44.7	20.7

<sup>1</sup> Not reported.

The total primary power of the fertilizer factories increased from 38,680 horsepower in 1899 to 64,711 in 1909, or 67.3 per cent. The greater part of the increase was in steam power and rented electric power. In 1899 steam power formed 96 per cent of the total primary power, but in 1909 it formed only 76.9 per cent. The horsepower of electric motors operated by current generated in the establishments reporting increased from 841 in 1899 to 6,659 in 1909.

Table 13 shows, for 1909, the statistics of power and of the different kinds of fuel used in the fertilizer works in 12 of the leading states.

The largest amount of steam power, gas-engine power, and rented electric power was reported for Georgia. Rented electric power was reported for all the states listed, and formed more than one-third of the total primary power in Alabama, Georgia, and New York.

**Table 13**

STATE.	PRIMARY HORSEPOWER.							ELECTRIC HORSEPOWER.		FUEL USED.							
	Number of establishments reporting.	Total horsepower.	Owned by establishments reporting.				Rented.		Total, rented and generated by establishment.	Generated in the establishment reporting.	Coal.		Coke (short tons).	Wood (cords).	Oil, including gasoline (barrels).	Gas (1,000 feet).	
			Total.	Steam engines.	Gas engines.	Water wheels and motors.	Other.	Electric.			Other.	Anthracite (long tons).					Bituminous (short tons).
United States.....	485	64,711	51,967	49,740	1,825	365	37	12,579	165	10,238	6,669	20,698	462,023	6,148	9,795	19,721	111,859
Alabama.....	42	4,484	2,845	2,745	73	.....	27	1,614	25	1,684	70	.....	33,549	.....	420	85	.....
Florida.....	12	1,710	1,305	970	395	.....	.....	345	.....	1,279	934	290	4,956	.....	702	.....	.....
Georgia.....	91	10,438	9,493	5,893	600	.....	.....	3,995	.....	4,577	582	.....	43,977	25	4,333	377	848
Maryland.....	30	5,324	4,224	4,090	84	50	.....	1,100	.....	1,383	283	.....	25,183	10	10	61	150
New Jersey.....	18	2,459	2,450	2,424	35	.....	.....	.....	.....	1,368	1,368	11,479	30,304	.....	10	50	7
New York.....	14	2,799	1,650	1,025	25	.....	.....	1,039	110	1,114	75	2,177	18,645	4,507	.....	.....	.....
North Carolina.....	92	3,132	2,597	2,537	60	.....	.....	535	.....	647	12	.....	19,220	.....	1,270	74	.....
Ohio.....	24	3,059	2,819	2,689	130	.....	.....	240	.....	585	345	.....	34,111	.....	50	.....	11,306
Pennsylvania.....	46	5,174	4,997	4,852	10	105	.....	177	80	981	804	4,701	55,930	683	.....	17	.....
South Carolina.....	26	4,766	4,379	4,338	41	.....	.....	387	.....	607	220	.....	45,046	.....	986	27	.....
Tennessee.....	10	2,152	1,799	1,799	.....	.....	.....	353	.....	629	276	.....	16,160	1,000	12	48	.....
Virginia.....	38	5,560	5,335	5,228	72	85	.....	225	.....	573	348	1,937	49,289	.....	283	37	.....
All other states.....	102	13,604	11,035	10,550	300	175	10	2,569	.....	3,911	1,342	114	85,663	23	1,719	18,945	99,548

Fuel consumed.—The expenditures for fuel and rent of power in 1909 amounted to \$1,452,809, this item being distributed by states in Table 20. Bituminous

coal was by far the principal kind of fuel used, 462,023 tons being consumed during 1909. Anthracite coal was used to a considerable extent in New Jersey.

**SPECIAL STATISTICS RELATING TO MATERIALS AND PRODUCTS.**

Materials used by establishments in the fertilizer industry.—Table 14 shows the statistics of the materials used in the fertilizer industry for 1909, 1904, and 1899.

As judged by the amount expended for them, ammoniates, animal and vegetable, were in 1909 the most important materials, followed by phosphate rock, potash salts, superphosphates, nitrate of soda, ammonium sulphate, sulphuric acid, fish, pyrites, and kainit, in the order named.

The cost of the materials named specifically in the table aggregated \$55,360,423 in 1909, \$28,975,713 in 1904, and \$23,454,126 in 1899. Of these totals, the cost of ammoniates formed 29 per cent in 1909 as compared with 34.2 per cent in 1904 and 42.4 per cent in 1899. The cost of phosphate rock shows only slight changes in its proportion of the total; it constituted 15.6 per cent of the total of the materials shown separately in 1909, 14.6 per cent in 1904, and 15.2 per cent in 1899. The cost of potash salts represented 13.2 per cent, 12.4 per cent, and 13.2 per cent of the respective totals, and the aggregate cost of sulphuric acid, pyrites, and sulphur constituted 11.2 per cent of the total in 1909, 11 per cent in 1904, and 13.2 per cent in 1899.

Table 15, on the next page, shows for 1909 statistics regarding the consumption of sulphuric acid in the fertilizer industry in 10 of the leading states.

**Table 14**

MATERIAL.	1909	1904	1899
Total cost.....	\$69,521,920	\$39,287,914	\$28,958,473
Ammoniates:			
Tons.....	778,639	(1)	(1)
Cost.....	\$16,065,978	\$9,915,648	\$9,934,145
Ammonium sulphate:			
Tons.....	63,381	10,540	4,120
Cost.....	\$3,640,592	\$600,856	\$186,609
Kainit:			
Tons.....	322,720	190,493	54,700
Cost.....	\$2,783,658	\$1,891,073	\$520,833
Nitrate of soda:			
Tons.....	85,714	42,213	19,518
Cost.....	\$3,730,070	\$1,760,432	\$709,841
Phosphate rock:			
Tons.....	1,520,124	888,571	787,927
Cost.....	\$8,621,094	\$4,244,554	\$3,554,174
Potash salts:			
Tons.....	257,766	122,107	(1)
Cost.....	\$7,327,549	\$3,606,701	\$3,098,400
Pyrites:			
Tons.....	456,574	342,962	288,778
Cost.....	\$2,531,994	\$2,020,750	\$1,466,285
Sulphuric acid:			
Tons.....	603,672	197,865	231,527
Cost.....	\$3,312,687	\$1,084,304	\$1,355,382
Sulphur:			
Tons.....	4,236	4,210	12,728
Cost.....	\$98,924	\$92,234	\$268,670
Superphosphates:			
Tons.....	415,656	320,559	286,898
Cost.....	\$3,946,440	\$2,912,010	\$2,176,245
Fish.....	\$3,031,437	\$847,142	\$183,542
All other materials.....	\$14,161,497	\$10,312,261	\$5,504,347

<sup>1</sup> Figures not available.

**Table 15**

STATE.	SULPHURIC ACID (TONS).				
	Total amount consumed in the industry.	Manufactured by fertilizer works.			Purchased.
		Number of establishments.	Consumed by establishments producing.	Sold.	
United States.....	1,445,607	94	841,935	153,057	603,679
Alabama.....	124,681	12	97,015	36,843	27,668
California.....	13,509	3	6,740	8,334	6,789
Florida.....	34,189	4	28,232	8,527	6,957
Georgia.....	263,143	27	220,503	40,794	42,550
Maryland.....	210,483	4	22,405	15,359	187,988
Mississippi.....	41,647	5	37,420	.....	4,227
North Carolina.....	88,094	8	87,899	576	195
South Carolina.....	169,243	14	161,509	11,839	7,734
Tennessee.....	70,145	4	53,188	866	16,957
Virginia.....	74,503	6	53,253	933	21,250
All other states.....	355,970	7	73,591	19,986	282,379

Of the total quantity of sulphuric acid used in 1909 in the establishments engaged primarily in the manufacture of fertilizers, 58.2 per cent was manufactured in the establishments and 41.8 per cent was purchased. Of the sulphuric acid made in fertilizer works, 84.6 per cent was used and 15.4 per cent was sold.

All fertilizer establishments manufacturing sulphuric acid employed the chamber process, 16 using the Hoffman intensifier system, 11 the Pratt, 9 the Gilchrist, 3 the Meyer tangential system, and 1 the Luney. The manufacture, for consumption in their own works, of 1,826,358 tons of acid phosphate was reported by establishments engaged primarily in the fertilizer industry, and 12,507 tons were made and consumed by establishments manufacturing fertilizers as a subsidiary product.

Materials used by all establishments making fertilizers.—The data in Tables 14 and 15 relate to the materials reported by the establishments manufacturing fertilizers as their chief product. There is a considerable consumption of these materials by establishments in other industries which make fertilizers as a subsidiary product. Table 16 shows the total consumption of these materials in 1909 by all establishments manufacturing fertilizers, whether as a primary or subsidiary product.

**Table 16**

MATERIAL.	CONSUMPTION BY ALL ESTABLISHMENTS MANUFACTURING FERTILIZERS WHETHER AS PRIMARY OR SUBSIDIARY PRODUCTS: 1909	
	Quantity (tons).	Cost.
Ammoniates.....	842,557	\$17,200,611
Ammonium sulphate.....	65,592	3,732,112
Kainit.....	347,104	3,008,183
Nitrate of soda.....	89,846	3,916,320
Phosphate rock.....	1,549,497	8,828,834
Potash rock.....	270,459	7,714,367
Pyrites.....	456,574	2,831,994
Sulphuric acid.....	620,708	3,460,132
Sulphur.....	4,236	68,924
Superphosphates.....	532,886	5,175,157
Fish.....	242,045	3,076,613

Products of all establishments making fertilizers.—The total production of fertilizers in 1909, including those manufactured by slaughtering and meat-packing establishments and as a subsidiary product by other industries, was 5,618,234 tons, valued at \$100,089,971. The total production by all establishments in 1904 was 3,440,171 tons, valued at \$56,882,034, and in 1899, 2,887,004 tons, valued at \$42,097,673.

It should be noted in considering these statistics that the superphosphates purchased for use as material represent a duplication, the value of such superphosphates being reported as part of the value of product of other establishments in the industry, and the same may be true to some extent of sulphuric acid purchased. In 1909 there were purchased and used as material 532,886 tons of superphosphates, costing \$5,175,157 (see Table 16), which leaves 5,095,348 tons, valued at \$94,914,814, for the net production of fertilizers by all establishments.

Products of establishments in the fertilizer industry.—Table 17 shows the statistics of the products of establishments engaged primarily in the manufacture of fertilizers for 1909, 1904, and 1899.

**Table 17**

PRODUCT.	1909	1904	1899
Total value.....	\$103,960,213	\$56,541,253	\$44,657,395
Fertilizers:			
Tons.....	5,240,164	3,267,777	2,794,705
Value.....	\$92,369,631	\$50,460,694	\$40,545,061
Superphosphates from minerals, bones, etc.—			
Tons.....	1,201,354	766,338	923,108
Value.....	\$13,318,529	\$7,515,257	\$8,471,949
Ammoniated fertilizers—			
Tons.....	472,757	775,987	142,888
Value.....	\$10,061,193	\$12,901,057	\$2,441,838
Concentrated phosphate fertilizers—			
Tons.....	313,888	( <sup>2</sup> )	( <sup>2</sup> )
Value.....	\$3,038,210	( <sup>2</sup> )	( <sup>2</sup> )
Complete fertilizers—			
Tons.....	2,717,797	1,329,149	1,436,630
Value.....	\$57,243,899	\$25,673,511	\$25,446,045
Other fertilizers—			
Tons.....	534,368	304,703	291,927
Value.....	\$8,107,800	\$4,370,869	\$4,178,284
Sulphuric acid, for sale (reduced to 50° Baumé):			
Tons.....	153,057	24,502	71,176
Value.....	\$923,492	\$194,578	\$427,925
Other acids for sale:			
Tons.....	30,651	45,689	( <sup>2</sup> )
Value.....	\$611,288	\$241,506	\$17,872
All other products.....	\$10,055,802	\$5,644,475	\$3,655,927

<sup>1</sup> In addition, in 1909, fertilizers and allied products to the value of \$7,911,268, and in 1904 to the value of \$8,487,340, were made by establishments engaged primarily in the manufacture of products other than fertilizers, including those in the slaughtering and meat-packing industry.

<sup>2</sup> Not reported.

In addition to the products covered by Table 17, the products shown in the following table were made and used in further processes of manufacture in the establishment where produced:

**Table 18**

PRODUCT.	1909	1904
Acid phosphate..... tons..	1,836,865	884,211
Sulphuric acid..... tons..	841,935	692,904

The total quantity of fertilizers reported by fertilizer factories proper in 1909 was 5,240,164 tons, an increase of 2,445,459 tons, or 87.5 per cent, over the production in 1899. The highest rate of increase for

the decade appears for ammoniated fertilizers, 230.8 per cent, and the lowest for superphosphates, 30.1 per cent. Changes in grade and in place of production render comparisons of average values per ton of these products in the different years of little significance.

Table 19 gives, for 1909, the quantity and value of the different kinds of fertilizers produced by establishments engaged primarily in their manufacture, for the leading states.

In Table 2 the states are ranked according to the total value of products in 1909, the leading states being Georgia, Maryland, South Carolina, Virginia, New Jersey, Pennsylvania, and Alabama, in the order named. The three states first named had the same

rank according to tonnage of fertilizers produced, but Alabama ranked fourth in this respect, ahead of Virginia, New Jersey, and Pennsylvania. Georgia ranked first in 1909 in the production of complete fertilizers, ammoniated fertilizers, and superphosphates, fifth in concentrated phosphates, and second in the group of "other" fertilizers, while Maryland was second in complete fertilizers and superphosphates, third in ammoniated fertilizers, fourth in concentrated phosphates, and first in the group of "other" fertilizers. In ammoniated fertilizers and concentrated phosphates Alabama ranked second. New York ranked first in the production of concentrated phosphates.

THE FERTILIZER INDUSTRY—PRODUCTS, BY STATES: 1909.

Table 19 PRODUCT AND STATE.	Tons.	Value.	PRODUCT AND STATE.	Tons.	Value.	PRODUCT AND STATE.	Tons.	Value.
<b>Fertilizers, all kinds</b> .....	5,240,164	\$92,369,631	<b>Superphosphates from min-erals, bones, etc.—Con.</b>			<b>Complete fertilizers</b> .....	2,717,797	\$57,243,899
Alabama.....	411,177	6,003,893	New York.....	47,538	\$533,640	Alabama.....	121,824	2,292,445
California.....	62,610	2,032,428	North Carolina.....	90,180	1,140,790	California.....	43,918	1,766,476
Connecticut.....	31,581	956,974	Ohio.....	44,624	582,537	Connecticut.....	27,090	890,230
Delaware.....	14,222	259,784	Pennsylvania.....	31,397	322,339	Florida.....	87,378	372,108
Florida.....	155,852	3,592,882	South Carolina.....	176,005	2,036,220	Georgia.....	492,532	10,050,146
Georgia.....	888,187	15,908,284	Tennessee.....	25,322	244,278	Illinois.....	74,810	1,277,555
Illinois.....	105,124	2,051,240	Virginia.....	68,046	786,217	Indiana.....	15,130	301,598
Indiana.....	21,850	408,323	All other states.....	9,822	150,902	Louisiana.....	44,488	860,072
Louisiana.....	78,878	1,396,960				Maine.....	18,137	329,417
Maine.....	28,777	530,657	<b>Ammoniated fertilizers</b> .....	472,757	10,061,193	Maryland.....	268,570	4,754,510
Maryland.....	608,699	8,983,205	Alabama.....	87,353	1,581,800	Mississippi.....	72,193	1,167,632
Mississippi.....	133,101	1,725,256	Florida.....	10,946	205,538	Missouri.....	8,875	176,945
Missouri.....	11,415	230,423	Georgia.....	102,573	2,071,728	New Jersey.....	247,595	5,433,495
New Jersey.....	343,703	6,506,890	Illinois.....	12,603	448,608	New York.....	73,560	1,345,716
New York.....	260,554	3,188,056	Maryland.....	49,972	1,260,624	North Carolina.....	142,592	3,031,198
North Carolina.....	323,562	5,945,996	New Jersey.....	6,721	112,696	Ohio.....	131,400	2,547,888
Ohio.....	224,222	4,011,943	New York.....	6,628	151,978	Pennsylvania.....	168,751	3,499,834
Pennsylvania.....	274,699	4,895,528	North Carolina.....	32,879	776,562	South Carolina.....	237,208	4,943,873
South Carolina.....	512,714	8,728,312	Ohio.....	12,310	302,362	Tennessee.....	139,343	2,776,322
Tennessee.....	179,856	3,234,114	Virginia.....	33,009	544,797	Virginia.....	149,181	3,090,124
Texas.....	2,509	67,391	Pennsylvania.....	41,686	872,025	All other states.....	163,224	4,027,200
Virginia.....	364,613	6,560,787	South Carolina.....	40,318	996,454			
All other states.....	202,800	5,040,309	Virginia.....	29,759	736,021	<b>Other fertilizers</b> .....	534,368	8,107,800
<b>Superphosphates from min-erals, bones, etc.</b> .....	1,201,354	13,318,529	<b>Concentrated phosphates</b> .....	313,888	3,638,210	Alabama.....	27,852	401,782
Alabama.....	109,619	1,147,291	Alabama.....	64,629	580,605	Florida.....	10,960	321,934
California.....	14,420	159,208	Delaware.....	11,872	225,529	Georgia.....	75,438	1,229,775
Florida.....	37,787	293,315	Florida.....	8,783	99,987	Illinois.....	5,609	59,416
Georgia.....	196,885	2,334,293	Georgia.....	20,709	212,342	Louisiana.....	4,813	81,784
Illinois.....	7,317	211,836	Illinois.....	4,785	53,831	Maine.....	6,240	106,040
Indiana.....	4,639	68,559	Indiana.....	4,328	84,383	Maryland.....	81,256	838,839
Louisiana.....	22,249	288,386	Louisiana.....	24,377	290,324	New Jersey.....	17,064	299,515
Maryland.....	184,624	1,838,959	Maryland.....	107,806	776,324	New York.....	25,028	389,398
Mississippi.....	59,902	540,200	New York.....	38,552	769,235	North Carolina.....	55,763	999,512
New Jersey.....	71,178	639,559	Virginia.....	28,053	555,650	Ohio.....	35,638	574,706
						Pennsylvania.....	39,523	504,208
						South Carolina.....	55,044	801,827
						Tennessee.....	13,937	194,756
						Virginia.....	62,516	928,757
						All other states.....	17,687	414,581

DETAILED STATE TABLES.

The principal statistics secured by the census inquiry concerning the fertilizer industry are presented in Tables 20 and 21.

Table 20 shows for 1909, 1904, and 1899 the number of establishments, persons engaged in the industry,

primary horsepower, capital invested, principal items of expense, value of products, and value added by manufacture.

Table 21 gives more detailed statistics for the industry for 1909 only.

## FERTILIZERS—COMPARATIVE STATISTICS, BY STATES: 1909, 1904, AND 1899.

Table 20	STATE.	Census.	Number of establishments.	PERSONS ENGAGED IN INDUSTRY.			Primary horse-power.	Capital.	Salaries.	Wages.	Cost of materials.	Value of products.	Value added in manufacture (value of product less cost of materials).	
				Total.	Proprietors and firm members.	Salaried employees.								Wage earners (average number).
	United States.....	1909	550	21,950	323	3,317	18,310	64,711	\$121,537	\$4,406	\$7,477	\$69,522	\$103,960	\$34,432
		1904	399	16,091	294	1,613	14,184	47,989	68,917	1,934	5,127	39,288	66,541	17,282
		1899	422	13,654	361	1,712	11,581	38,880	60,686	2,125	4,185	28,968	44,657	15,668
	Alabama.....	1909	42	1,473	12	228	1,233	4,484	8,507	305	302	4,204	6,423	2,151
		1904	19	636	6	79	551	1,485	3,051	68	153	1,606	2,341	73
		1899	17	531	32	60	439	1,450	1,407	62	95	1,387	2,068	68
	California.....	1909	15	278	1	51	226	1,579	2,097	72	155	1,796	2,313	51
		1904	14	168	10	35	123	852	904	39	69	519	894	37
		1899	8	80	3	16	70	415	648	20	40	483	671	18
	Connecticut.....	1909	12	374	9	70	295	1,273	1,591	78	137	1,091	1,573	48
		1904	10	348	6	32	310	607	987	37	124	625	943	41
		1899	9	171	8	30	133	326	383	28	54	228	391	16
	Delaware.....	1909	10	153	5	14	134	805	406	22	52	452	860	40
		1904	7	162	8	5	149	665	206	4	33	287	371	8
		1899	11	174	9	17	148	725	407	17	51	400	739	33
	Florida.....	1909	12	710		121	589	1,710	3,758	160	218	2,875	3,878	1,000
		1904	8	304	1	61	242	555	899	63	70	1,325	1,590	266
		1899	7	150	4	29	117	412	733	27	40	331	500	169
	Georgia.....	1909	110	3,373	71	532	2,770	10,488	24,233	609	921	10,944	16,800	5,856
		1904	57	2,442	40	210	2,192	6,581	11,158	260	581	6,527	9,461	2,938
		1899	41	1,279	39	114	1,126	3,795	6,664	147	295	2,350	3,367	1,011
	Illinois.....	1909	11	615	3	168	444	2,145	2,525	208	225	1,425	2,386	96
		1904	4	61		13	48	445	546	16	24	91	131	4
		1899	5	393	4	52	337	1,315	1,633	75	172	1,006	1,855	84
	Indiana.....	1909	15	172	14	35	123	1,012	617	36	62	254	456	20
		1904	14	130	20	13	97	652	235	14	46	156	299	14
		1899	14	82	19	18	45	565	216	12	19	159	255	9
	Louisiana.....	1909	6	347		52	295	1,178	2,438	72	127	1,324	1,757	433
		1904	4	380		36	344	910	2,144	66	123	1,014	1,556	519
		1899	6	305		27	278	764	1,290	51	87	614	910	26
	Maine.....	1909	5	118	7	16	95	323	439	19	36	431	597	168
		1904	3	31	4	1	26	228	54	1	12	39	66	27
		1899	3	37	1	2	34	80	49	3	7	22	40	18
	Maryland.....	1909	41	1,750	36	275	1,439	5,324	9,098	418	617	6,063	9,673	2,710
		1904	39	1,500	38	206	1,256	3,984	6,058	230	524	4,992	6,632	1,640
		1899	40	1,265	37	212	1,016	3,442	7,003	246	458	3,044	5,482	1,338
	Mississippi.....	1909	10	524		75	449	1,823	2,607	72	141	1,385	2,125	749
		1904	5	371		23	348	645	1,049	28	79	857	1,082	225
		1899	3	109		15	94	415	353	19	33	342	493	151
	New Jersey.....	1909	22	1,384	17	159	1,208	2,459	7,398	255	541	5,685	7,672	1,987
		1904	25	1,253	23	91	1,139	3,555	6,291	151	637	3,928	5,652	1,724
		1899	28	1,147	30	155	962	2,078	5,090	230	441	3,140	4,291	1,145
	New York.....	1909	15	1,041	8	125	908	2,799	3,692	188	542	2,655	4,251	1,596
		1904	13	673	9	68	596	1,537	2,598	100	254	1,334	2,082	745
		1899	32	1,249	24	192	1,033	2,456	4,601	211	492	1,909	3,148	1,233
	North Carolina.....	1909	34	1,117	22	162	933	3,132	7,080	242	363	4,183	6,316	2,133
		1904	27	1,019	33	78	908	2,653	3,698	75	282	2,218	3,099	831
		1899	18	404	16	51	427	1,292	2,819	66	109	1,044	1,498	454
	Ohio.....	1909	27	1,064	13	210	841	3,059	4,950	237	368	2,535	4,435	1,900
		1904	17	604	8	106	490	2,630	3,551	136	235	1,386	2,289	903
		1899	27	506	26	80	400	2,108	1,888	104	174	1,017	1,657	640
	Pennsylvania.....	1909	48	1,517	52	241	1,224	5,174	6,532	293	575	4,613	6,543	1,930
		1904	43	1,135	48	129	958	4,551	5,386	170	447	2,801	4,095	1,204
		1899	51	975	43	167	765	3,835	3,803	201	352	2,584	3,644	1,030
	South Carolina.....	1909	26	2,057	2	204	1,851	4,766	11,857	333	671	5,629	9,025	3,396
		1904	20	1,221	1	149	1,071	4,286	7,087	153	364	2,692	3,638	946
		1899	22	1,862	5	85	1,772	3,940	10,505	165	479	3,108	4,883	1,775
	Tennessee.....	1909	12	670	12	99	559	2,152	4,106	137	204	2,122	3,249	1,127
		1904	10	854	6	67	781	1,970	3,381	98	210	1,712	2,701	989
		1899	5	492	4	45	443	943	950	49	94	790	1,466	676
	Virginia.....	1909	45	2,199	10	233	1,956	5,560	9,767	269	760	5,380	8,035	2,646
		1904	37	1,935	16	118	1,801	5,643	4,872	111	571	3,241	4,659	1,415
		1899	39	1,318	35	112	1,171	4,213	4,908	142	321	2,161	3,416	1,255
	All other states.....	1909	32	1,014	29	247	738	3,466	7,239	286	340	3,507	5,593	2,084
		1904	23	864	17	93	754	3,605	4,762	114	349	1,948	2,960	1,012
		1899	36	1,026	22	233	771	3,451	4,646	250	372	2,233	3,883	1,650

Expressed in thousands.

# THE FERTILIZER INDUSTRY.

## FERTILIZERS—DETAILED STATISTICS, BY STATES: 1909.

**Table 21**

STATE.	Number of establishments.	PERSONS ENGAGED IN INDUSTRY.							WAGE EARNERS—DEC. 15, OR NEAREST REPRESENTATIVE DAY.					Primary horse-power.	
		Total.	Proprietors and firm members.	Salaried officers, superintendents, and managers.	Clerks.		Wage earners.			Total.	16 and over.		Under 16.		
					Male.	Female.	Average number.	Number, 15th day of—			Male.	Female.	Male.		Female.
								Maximum month.	Minimum month.						
United States....	550	21,950	323	1,000	2,042	275	18,310	Mh 29,310	Jy 14,264	18,653	18,465	120	68	64,711	
Alabama.....	42	1,473	12	89	129	10	1,233	Mh 2,785	Au 658	1,421	1,413	.....	8	4,484	
California.....	15	278	1	19	28	4	226	Mh 263	Au 203	230	229	1	.....	1,579	
Connecticut.....	12	374	9	18	41	11	295	My 394	Ja 185	224	202	20	2	1,273	
Delaware.....	10	153	5	6	7	1	134	Oc 284	Ja 19	120	120	.....	.....	805	
Florida.....	12	710	.....	40	67	14	589	Fe 820	Jy 471	591	583	2	6	1,710	
Georgia.....	110	3,373	71	195	310	27	2,770	Mh 6,851	Jy 1,366	3,070	3,030	4	36	10,488	
Illinois.....	11	615	3	23	127	18	444	Se 508	Oc 377	459	412	47	.....	2,145	
Indiana.....	15	172	14	13	14	8	123	Se 204	Jy 93	123	122	.....	1	1,012	
Louisiana.....	6	347	.....	12	37	3	295	Fe 607	Jy 94	360	360	.....	.....	1,178	
Maine.....	5	118	7	5	6	5	95	Ap 144	Au 44	104	102	.....	2	323	
Maryland.....	41	1,750	36	94	165	16	1,439	Se 2,115	No 1,110	1,326	1,316	10	.....	5,324	
Mississippi.....	10	524	.....	29	41	5	449	Mh 811	Jo 216	523	523	.....	.....	1,823	
Missouri.....	5	142	.....	11	31	1	98	Se 122	Oc 77	98	98	.....	.....	700	
New Jersey.....	22	1,384	17	40	110	9	1,208	Mh 1,518	Ja 1,086	1,235	1,217	15	3	2,459	
New York.....	15	1,041	8	28	75	22	908	Au 1,143	No 671	688	688	.....	.....	2,799	
North Carolina.....	34	1,117	22	58	97	7	933	Ap 1,694	Jy 494	896	896	.....	.....	3,132	
Ohio.....	27	1,064	13	61	138	21	841	Se 1,522	Fe 676	739	738	1	.....	3,059	
Pennsylvania.....	43	1,517	52	67	147	34	1,224	Ap 1,473	Je 1,109	1,162	1,159	.....	3	5,174	
South Carolina.....	26	2,057	2	67	127	10	1,861	Mh 4,356	Jy 922	1,669	1,668	1	.....	4,766	
Tennessee.....	12	670	12	23	71	5	559	Mh 893	Je 372	517	517	.....	.....	2,152	
Texas.....	3	22	5	1	6	1	9	Fe 21	De 4	21	21	.....	.....	53	
Virginia.....	45	2,199	10	92	121	20	1,950	So 2,517	De 1,027	2,516	2,504	7	5	5,500	
All other states <sup>2</sup> .....	24	850	23	26	147	23	631	.....	.....	563	549	12	2	2,713	

STATE.	Capital.	EXPENSES.										Value of products.	Value added by manufacture (value of products less cost of materials).
		Total.	Services.			Materials.		Miscellaneous.					
			Officials.	Clerks.	Wage earners.	Fuel and rent of power.	Other.	Rent of factory.	Taxes, including internal revenue.	Contract work.	Other.		
United States....	\$121,537,451	\$90,101,293	\$2,110,616	\$2,295,020	\$7,477,179	\$1,452,909	\$68,069,111	\$192,605	\$623,637	\$36,935	\$7,843,381	\$103,960,213	\$34,438,293
Alabama.....	8,507,401	5,658,019	156,423	148,931	392,413	93,177	4,171,188	3,154	64,429	1,491	626,813	6,423,233	2,158,898
California.....	2,096,654	2,167,710	38,066	34,169	154,802	28,740	1,707,032	16,041	10,235	.....	118,628	2,312,555	516,777
Connecticut.....	1,590,640	1,413,764	39,823	37,930	130,893	25,788	1,065,273	.....	5,137	.....	102,920	1,572,575	481,514
Delaware.....	406,091	610,037	17,378	4,455	51,970	14,510	437,477	29,815	2,418	.....	52,014	859,517	407,530
Florida.....	3,758,094	3,526,475	87,159	72,923	217,947	28,672	2,845,945	5,160	24,287	.....	244,352	3,878,296	1,003,679
Georgia.....	24,232,757	14,090,036	349,745	348,812	920,513	177,905	10,766,240	24,764	104,683	2,894	1,394,474	16,800,301	5,850,150
Illinois.....	2,525,349	1,978,538	50,480	148,430	225,464	65,716	1,358,801	10,459	3,643	.....	106,545	2,385,951	961,434
Indiana.....	616,553	390,187	18,810	16,735	62,379	12,849	240,905	745	2,389	.....	35,375	456,362	202,008
Louisiana.....	2,438,332	1,641,722	29,205	42,526	127,705	18,846	1,304,632	765	8,162	.....	108,881	1,757,091	432,613
Maine.....	438,735	503,167	8,750	10,020	36,690	2,210	428,626	262	827	.....	16,782	596,623	165,787
Maryland.....	9,097,853	8,568,599	222,847	194,996	616,033	79,320	6,893,405	20,763	45,820	171	504,644	9,672,786	2,710,061
Mississippi.....	2,606,092	1,749,831	42,456	29,910	140,860	45,769	1,339,189	.....	24,509	.....	120,529	2,125,029	740,071
Missouri.....	521,166	309,578	24,060	31,202	46,934	11,037	171,750	.....	1,473	3,000	20,113	301,949	119,133
New Jersey.....	7,398,293	6,973,589	126,056	120,020	541,188	94,821	5,500,366	2,175	22,933	.....	407,030	7,671,859	1,986,672
New York.....	3,692,388	3,610,137	89,158	98,617	542,119	85,799	2,568,968	7,020	11,734	1,300	205,422	4,250,568	1,595,801
North Carolina.....	7,679,857	5,389,466	117,534	124,799	392,752	69,658	4,113,545	6,502	69,953	7,307	487,116	6,316,485	2,133,282
Ohio.....	4,950,438	3,583,213	99,069	137,822	367,948	66,782	2,468,003	2,264	22,741	1,229	416,755	4,434,541	1,899,756
Pennsylvania.....	6,531,843	5,956,189	140,531	152,512	575,099	128,781	4,484,089	40,523	25,051	.....	409,603	6,542,844	1,929,974
South Carolina.....	11,857,225	7,571,240	181,057	156,445	671,261	161,717	5,467,741	13,444	83,006	.....	836,569	9,024,900	3,395,442
Tennessee.....	4,105,633	2,847,758	49,532	87,167	203,750	32,629	2,089,099	1,550	18,854	.....	365,177	3,249,343	1,127,615
Texas.....	19,763	59,803	143	4,855	2,892	905	47,734	15	90	.....	3,169	8,732	8,732
Virginia.....	9,766,831	7,198,108	149,315	120,087	759,514	152,499	5,236,611	3,202	49,333	.....	727,547	8,034,543	2,645,433
All other states <sup>2</sup> .....	6,698,863	4,304,118	63,419	162,657	289,444	53,673	3,222,477	3,082	21,930	19,543	467,893	5,235,471	1,959,391

<sup>1</sup> Same number reported for one or more other months.  
<sup>2</sup> All other states embrace: Arkansas, 1 establishment; Idaho, 1; Iowa, 1; Kansas, 1; Kentucky, 4; Massachusetts, 6; Michigan, 3; Minnesota, 1; Oregon, 1; Rhode Island, 2; Utah, 2; Wisconsin, 1.

---

---

OIL, ESSENTIAL

---

---

(587)

# THE MANUFACTURE OF ESSENTIAL OILS.

**Scope of the industry.**—The establishments included under the designation "oil, essential," embrace those engaged primarily in the manufacture of the natural essential vegetable oils, both crude and refined, except turpentine, and that of witch-hazel extract. The list of essential oils is a long one, but the bulk of the production is represented by peppermint, wintergreen, black-birch, and spearmint oils. The statistics for the production of essential oils by establishments engaged primarily in the manufacture of products other than essential oils (chemicals, flavoring extracts, etc.) are not included in this report except as specially noted.

**Summary and comparisons with earlier censuses.**—Statistics for the essential-oil industry were first obtained at the census of 1859. At this census 45 establishments, giving employment to 74 hands, were reported, the value of their products amounting to \$124,317.

Table 1 summarizes the statistics for the manufacture of essential oils for each census from 1869 to 1909, inclusive. The financial figures for 1869 are given in currency, which at that time was worth only about 80 cents, gold, to the dollar. For strict comparison, therefore, these figures should be reduced about 20 per cent.

	NUMBER OR AMOUNT.						PER CENT OF INCREASE. <sup>1</sup>					
	1909	1904	1899	1889	1879	1869	1899-1909	1904-1909	1899-1904	1889-1899	1879-1889	1869-1879
Number of establishments.....	68	52	47	67	124	118	44.7	30.8	10.6	-29.9	-45.0	5.1
Persons engaged in the industry.....	408	277	( <sup>2</sup> )	( <sup>2</sup> )	( <sup>2</sup> )	( <sup>2</sup> )	72.2	72.2	.....	.....	.....	.....
Proprietors and firm members.....	73	68	( <sup>2</sup> )	( <sup>2</sup> )	( <sup>2</sup> )	( <sup>2</sup> )	.....	7.4	.....	.....	.....	.....
Salaried employees.....	45	37	39	( <sup>2</sup> )	( <sup>2</sup> )	( <sup>2</sup> )	15.4	21.6	-5.1	.....	.....	.....
Wage earners (average number).....	290	132	168	197	278	( <sup>2</sup> )	72.6	119.7	-21.4	( <sup>2</sup> )	( <sup>2</sup> )	.....
Primary horsepower.....	1,218	849	1,048	465	( <sup>2</sup> )	34	16.2	43.5	-19.0	125.4	.....	.....
Capital.....	\$1,365,438	\$723,004	\$576,286	\$102,223	\$87,755	\$145,475	136.9	88.9	25.5	463.8	50.9	-53.4
Expenses.....	1,522,171	1,299,060	723,505	201,689	( <sup>2</sup> )	( <sup>2</sup> )	110.4	17.2	79.6	258.7	.....	.....
Services.....	184,495	109,713	86,148	37,402	24,030	32,864	114.2	68.2	27.4	129.8	85.0	-28.9
Salaries.....	61,505	40,002	24,733	( <sup>2</sup> )	( <sup>2</sup> )	( <sup>2</sup> )	148.7	53.8	61.7	.....	.....	.....
Wages.....	122,990	69,711	61,415	( <sup>2</sup> )	( <sup>2</sup> )	( <sup>2</sup> )	100.3	76.4	13.5	.....	.....	.....
Materials.....	1,255,478	1,110,470	588,594	120,735	125,167	274,058	113.3	13.1	88.7	353.7	3.6	-54.3
Miscellaneous.....	82,195	78,886	48,763	34,462	( <sup>2</sup> )	( <sup>2</sup> )	68.6	4.2	61.8	41.5	.....	.....
Value of products.....	1,737,234	1,464,662	813,495	255,847	248,858	631,445	113.6	18.6	80.0	218.0	2.8	-60.6
Value added by manufacture (value of products less cost of materials).....	481,756	354,192	224,901	126,112	123,601	357,387	114.2	36.0	57.5	78.3	2.0	-65.4

<sup>1</sup> A minus sign (-) denotes decrease. Where percentages are omitted, comparable figures are not available.  
<sup>2</sup> Comparable figures not available.  
<sup>3</sup> Figures not strictly comparable.

The number of establishments in this industry shows a considerable decrease between 1879 and 1899, but has increased somewhat since that date. The very considerable decrease in value of products shown for the period 1869-1879, even after making allowance for the fact that the figures for 1869 were reported in a depreciated currency, taken in connection with the even greater increase from 1859 to 1869, makes it seem probable that at the census of 1869 the production of essential oils on farms was included in the manufactures statistics. The value of products shows an increase for each intercensal period since 1879.

**Summary, by states.**—The five leading states in the manufacture of essential oils in 1909, as measured by value of products, were Michigan, New Jersey, Connecticut, New York, and Pennsylvania, in the order named; the five leading states in 1904 were New York, Connecticut, New Jersey, Michigan, and Indiana. Michigan ranked first in 1909, with products valued at \$486,159, or 28 per cent of the total, and fourth in 1904, with products valued at \$240,215, showing an increase for the five-year period of 102.4 per cent, while New York ranked fourth in 1909, with products valued at \$195,363, and first in 1904, with products

valued at \$502,014, showing a decrease of 61.1 per cent. For the industry as a whole the increase in value of products from 1904 to 1909 was 18.6 per cent.

**Persons engaged in the industry.**—Table 4 shows, for 1909, the number of persons engaged in the industry, classified according to occupational status and sex, and in the case of wage earners, according to age also. It should be borne in mind that the sex and age classification of the average number of wage earners in this and other tables is an estimate obtained by the method described in the Introduction.

CLASS.	PERSONS ENGAGED IN THE INDUSTRY: 1909		
	Total.	Male.	Female.
All classes.....	408	390	18
Proprietors and officials.....	91	91	.....
Proprietors and firm members.....	73	73	.....
Salaried officers of corporations.....	8	8	.....
Superintendents and managers.....	10	10	.....
Clerks.....	27	22	5
Wage earners (average number).....	290	277	13
16 years of age and over.....	290	277	13
Under 16 years of age.....	.....	.....	.....

The average number of persons engaged in the industry during 1909 was 408, of whom 290, or 71.1 per cent, were wage earners; 91, or 22.3 per cent, proprietors and officials; and 27, or 6.6 per cent, clerks, the latter class including other subordinate salaried employees. Of the total number engaged in the industry, 390, or 95.6 per cent, were males, and 18, or 4.4 per cent, females. No wage earners under 16 years of age were reported. The average number of wage earners distributed by sex and age is not shown for the individual states, but Table 9 gives such a distribution of the number employed on December 15, or the nearest representative day.

**Wage earners employed, by months.**—Table 3 gives the number of wage earners employed in the industry on the 15th (or nearest representative day) of each month during the year 1909.

MONTH.	WAGE EARNERS IN THE INDUSTRY: 1909	
	Number.	Per cent of maximum.
January.....	211	53.4
February.....	215	54.4
March.....	310	78.5
April.....	395	100.0
May.....	380	96.2
June.....	317	80.3
July.....	206	52.2
August.....	234	59.2
September.....	303	76.7
October.....	338	85.6
November.....	330	85.1
December.....	233	59.0

In the industry as a whole the largest number of wage earners employed during any month of 1909 was 395, in April, and the smallest number, 206, in July, the minimum number being equal to 52.2 per cent of the maximum. In 1904 the maximum number was 168, in January and March, and the minimum, 88, in July.

**Prevailing hours of labor.**—In Table 4 the wage earners in the industry have been classified according to the number of hours of labor per week prevailing in the establishments in which they were employed. In making this classification the average number of wage earners employed during the year in each establishment was classified as a total according to the hours prevailing in that establishment, even though a few employees worked a greater or smaller number of hours.

PREVAILING HOURS OF LABOR PER WEEK.	WAGE EARNERS IN THE INDUSTRY: 1909	
	Average number.	Per cent of total.
Total.....	200	100.0
48 and under.....	12	4.1
Between 48 and 54.....	13	4.5
54.....	41	14.1
Between 54 and 60.....	9	3.1
60.....	172	59.3
Between 60 and 72.....	15	5.2
72.....	27	9.3
Over 72.....	1	0.3

Of the 290 wage earners reported for 1909, 172, or 59.3 per cent, were employed in establishments where the prevailing hours of labor were 60 per week; 75, or 25.9 per cent, in establishments where the prevailing hours were less than 60 per week; and 43, or 14.8 per cent, in establishments where the prevailing hours were more than 60 per week.

**Character of ownership.**—Table 5 presents statistics with respect to the character of ownership of the establishments in the essential-oil industry for 1909 and 1904.

CHARACTER OF OWNERSHIP.	NUMBER OF ESTABLISHMENTS.		VALUE OF PRODUCTS.	
	1909	1904	1909	1904
Total.....	68	52		
Individual.....	44	32	\$1,737,234	\$1,464,666
Firm.....	13	13	490,042	305,182
Corporation.....	11	7	65,283	498,332
			1,181,309	661,138
Per cent of total.....	100.0	100.0	100.0	100.0
Individual.....	64.7	61.5	28.2	26.0
Firm.....	19.1	25.0	3.8	34.0
Corporation.....	16.2	13.5	68.0	45.1

Of the total number of establishments in the industry, 16.2 per cent were under corporate ownership in 1909, as compared with 13.5 per cent in 1904; these establishments reported 68 per cent of the total value of products in 1909 and 45.1 per cent in 1904. Establishments under firm ownership decreased considerably in relative importance during the five-year period, reporting only 3.8 per cent of the total value of products in 1909, as compared with 34 per cent in 1904.

**Size of establishments.**—Table 6 presents statistics for 1909 and 1904 for establishments grouped according to the value of their products.

VALUE OF PRODUCTS PER ESTABLISHMENT.	NUMBER OF ESTABLISHMENTS.		VALUE OF PRODUCTS.	
	1909	1904	1909	1904
Total.....	68	52	\$1,737,234	\$1,464,666
Less than \$5,000.....	44	33	70,594	56,633
\$5,000 and less than \$20,000.....	12	8	120,310	62,966
\$20,000 and less than \$100,000.....	7	6	249,908	205,273
\$100,000 and less than \$1,000,000.....	5	5	1,296,410	1,139,794
Per cent of total.....	100.0	100.0	100.0	100.0
Less than \$5,000.....	64.7	63.5	4.1	10
\$5,000 and less than \$20,000.....	17.6	15.4	6.9	14
\$20,000 and less than \$100,000.....	10.3	11.5	14.4	15
\$100,000 and less than \$1,000,000.....	7.4	9.6	74.6	77

Of the total number of establishments (68 in 1909 and 52 in 1904) there were 5 at each census whose products were valued at more than \$100,000, and these establishments reported 74.6 per cent of the total value of products in 1909, as compared with 77.8 per cent in 1904. The average value of products per establishment decreased from \$28,167 in 1904 to \$25,548 in 1909, but the average value added by manufacture, as computed from the figures in Table 1, increased from \$6,811 in 1904 to \$7,085 in 1909, while the average number of wage earners per establishment increased from 2.5 in 1904 to 4.3 in 1909.

A classification of the establishments according to the number of wage earners employed shows that of the 68 establishments in the industry in 1909, 5 employed no wage earners, 52 employed from 1 to 5 wage earners, 9 employed from 6 to 20, and 2 employed more than 20. Of the total number of wage earners, however, 41 per cent were in the 2 establishments employing more than 20 wage earners.

**Expenses.**—As stated in the Introduction, the census figures for expenses do not purport to show the total cost of manufacture, since they take no account of interest or depreciation; hence they can not properly be used for determining profits. Facts of interest can be brought out, however, concerning the relative importance of the different classes of expenses which were reported. Table 1 shows the total expenses in 1909 to have been \$1,522,171, distributed as follows: Cost of materials, \$1,255,478, or 82.5 per cent; wages, \$122,990, or 8.1 per cent; salaries, \$61,505, or 4 per cent; and miscellaneous expenses, made up of advertising, ordinary repairs of buildings and machinery, insurance, traveling expenses, and other sundry expenses, \$82,198, or 5.4 per cent. These proportions vary somewhat in the several states, largely by reason of differences in the character of the products.

**Engines and power.**—Of the 68 establishments in the industry, 43 reported the use of power, with a total of 1,218 primary horsepower. The greater part of the power reported (80.4 per cent) was steam power.

**Fuel consumed.**—The fuel consumed in the industry in 1909 for all purposes—generation of power, distillation, etc.—comprised 5,743 long tons of anthracite coal, 2,107 short tons of bituminous coal, 594 cords of wood, and small quantities of other fuels. The amount expended for fuel and rent of power in 1909 was \$26,305.

**Materials and products.**—The principal materials used in the industry are grain alcohol, crude essential oils for refining, and the herbs, leaves, bark, roots, etc., from which the crude oil is extracted. The consumption of grain alcohol in the industry amounted to 75,274 gallons, costing \$188,618, in 1909, as compared with 84,602 gallons, costing \$206,255, in 1904, and 13,258 gallons, costing \$44,888, in 1899.

Table 7 gives the quantity and value of the most important products reported by the establishments engaged primarily in the manufacture of essential oils, for 1909, 1904, and 1899.

The production of essential oils increased in value during the decade 1899-1909, 58.2 per cent, while the value of the witch-hazel extract produced in 1909 was over seven times that in 1899. The production of each kind of essential oil for which comparative figures are available was considerably greater in 1909 than in either 1904 or 1899. The production of witch-hazel in 1909, however, represented a decrease of 14.9 per

cent as compared with 1904, although it was more than six times as great as in 1899.

PRODUCT.	1909	1904	1899
Total value.....	\$1,737,234	\$1,464,662	\$813,495
Essential oils.....	\$1,108,603	\$1,023,937	\$700,709
Peppermint—			
Pounds.....	305,781	130,022	202,550
Value.....	\$519,079	\$470,037	\$188,550
Black birch—			
Pounds.....	67,053	( <sup>2</sup> )	( <sup>2</sup> )
Value.....	\$102,045	( <sup>2</sup> )	( <sup>2</sup> )
Spearmint—			
Pounds.....	33,400	( <sup>2</sup> )	( <sup>2</sup> )
Value.....	\$83,283	( <sup>2</sup> )	( <sup>2</sup> )
Wintergreen—			
Pounds.....	22,281	4,737	2,166
Value.....	\$68,983	\$15,579	\$3,638
Other—			
Pounds.....	( <sup>2</sup> )	327,908	638,024
Value.....	\$335,213	\$538,321	\$508,512
Witch-hazel extract:			
Gallons.....	679,190	797,700	110,260
Value.....	\$412,322	\$307,873	\$54,649
All other products.....	\$216,309	\$72,852	\$58,137

<sup>1</sup> In addition, essential oils to the value of \$117,489 in 1909 and \$14,500 in 1904 were produced by establishments engaged primarily in the manufacture of products other than essential oils.

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

Table 8 gives, by states, the amount and value of each of the specific products manufactured in 1909, so far as such statistics can be given in detail.

PRODUCT AND STATE.	Quantity.	Value.
	<i>Pounds.</i>	
Essential oils.....		\$1,108,603
Indiana.....		20,320
Massachusetts.....		13,156
Michigan.....		484,099
New York.....		169,553
Pennsylvania.....		43,250
Virginia.....		6,230
All other states.....		371,995
Black birch.....	67,053	102,045
Connecticut.....	49,498	74,059
Pennsylvania.....	11,500	18,250
All other states.....	6,055	9,736
Peppermint.....	305,781	519,079
Crude.....	269,081	450,981
Refined.....	36,700	68,098
Michigan.....	227,521	382,613
All other states.....	78,260	186,466
Sassafras.....	9,704	6,355
Spearmint (crude).....	33,400	83,283
Spruce <sup>1</sup> .....	9,462	3,420
Massachusetts.....	9,462	3,420
Tansy.....	2,548	6,994
Michigan.....	2,548	6,994
Wintergreen <sup>1</sup> .....	22,281	68,983
Wormwood.....	1,989	9,514
Michigan.....	1,646	7,864
All other states.....	343	1,650
All other essential oils <sup>1</sup> .....		308,930
New York.....		35,287
All other states.....		270,643
Witch-hazel extract <sup>1</sup> .....	<i>Gallons.</i> 679,190	412,322

<sup>1</sup> In addition, essential oils and allied products to the value of \$117,489 were produced by establishments engaged primarily in the manufacture of products other than essential oils, these products comprising oil of wintergreen to the value of \$81,419, oil of spruce to the value of \$3,202, other essential oils to the value of \$25,397, and witch-hazel extract to the value of \$7,471.

The group of "other" essential oils includes, among others, the oils of camphor, capsicum, cedar, cloves, dittany, erigeron, fireweed, ginger, lemon, orange,

MANUFACTURES.

592

orris, parsley, patchouli, pennyroyal, and sandalwood. Connecticut is the chief producer of oil of black birch and witch-hazel extract; Michigan, of oil of peppermint, spearmint, tansy, and wormwood; New Jersey, of oil of wintergreen; and Virginia, of oil of sassafras.

Detailed state table.—The principal statistics secured by the census inquiry concerning the essential-

oil industry are presented, by states, in Table 9, which gives detailed statistics for 1909 concerning the number of establishments, the number of persons engaged in the industry, the number of wage earners reported on December 15, or the nearest representative day, primary horsepower, capital, expenses, the total value of products, and the value added by manufacture.

OIL, ESSENTIAL—DETAILED STATISTICS, BY STATES: 1909.

STATE.	Number of establishments.	PERSONS ENGAGED IN INDUSTRY.										WAGE EARNERS—DEC. 15, OR NEAREST REPRESENTATIVE DAY.					Primary horsepower.
		Total.	Proprietors and firm members.	Subordinated officers, superintendents, and managers.	Clerks.		Average number.	Wage earners.		Total.	16 and over.		Under 16.				
					Male.	Female.		Maximum month.	Minimum month.		Male.	Female.	Male.	Female.			
United States.....	68	408	73	18	22	5	290	Ap 395	Jy 206	376	359	17			1,424		
Indiana.....	8	25	10				15	My 43	Ja 0	20	20				60		
Massachusetts.....	5	12	0				6	No <sup>2</sup> 11	Jy 2	11	11				17		
Michigan.....	23	89	27	3	4	1	54	Aug 111	Ja <sup>2</sup> 15	104	100	4			35		
New York.....	0	28	5	4	1		18	No <sup>2</sup> 27	Je <sup>2</sup> 13	32	31	1			14		
Pennsylvania.....	5	97	3	2	2	1	89	Oc 164	Jy <sup>2</sup> 20	40	40				10		
Virginia.....	5	12	0				6	Ap <sup>2</sup> 13	Ja 0	16	16				4		
All other states <sup>3</sup> .....	16	145	16	0	16	3	102			153	141	12			67		

STATE.	Capital.	EXPENSES.										Value of products.	Value added by manufacture (value of products less cost of materials).
		Total.	Services.			Materials.		Miscellaneous.					
			Officials.	Clerks.	Wage earners.	Fuel and rent of power.	Other.	Rent of factories.	Taxes, including int. and local revenue.	Contract work.	Other.		
United States.....	\$1,365,438	\$1,522,171	\$40,360	\$21,130	\$122,990	\$26,305	\$1,229,173	\$3,025	\$6,370	\$20	\$72,883	\$1,737,234	\$40,754
Indiana.....	85,570	11,032			4,750	532	1,320	1,350	298	20	2,742	20,570	18,711
Massachusetts.....	3,450	9,701			2,544	300	5,628	790	35		994	13,156	7,228
Michigan.....	305,895	454,857	0,200	3,000	10,574	2,444	412,639	1,904	7,200		498,169	21,577	68,660
New York.....	133,818	165,047	6,100	855	11,250	7,194	129,160	1,155	324		17,992	195,363	64,660
Pennsylvania.....	49,006	85,919	2,356	1,220	28,062	674	45,579	15	821		7,252	111,065	64,310
Virginia.....	3,850	4,151			1,240	65	2,640	28	178		6,230	6,230	3,322
All other states <sup>3</sup> .....	780,819	792,474	22,710	15,164	58,624	15,098	644,207	180	2,961		30,525	904,691	248,288

<sup>1</sup> None reported for one or more other months.

<sup>2</sup> Same number reported for one or more other months.

<sup>3</sup> All other states embrace: California, 1 establishment; Connecticut, 11; New Jersey, 2; Wisconsin, 2.

---

---

# PAIN T AND VARNISH

---

---

# THE PAINT AND VARNISH INDUSTRY.

## GENERAL STATISTICS.

Scope of the classification.—The statistics of the paint and varnish industry cover the returns of two classes of establishments—(1) those engaged primarily in the manufacture of pigments or paints, and (2) those engaged primarily in the manufacture of varnishes, japans, lacquers, or fillers. Linseed oil manufactured for use within the producing establishment was not separately returned as a product, but separate reports were made for the value of oil manufactured for sale as such. The principal products of establishments of the second class—varnishes, shellacs, japans, and lacquers—are mainly solutions of gums, resins, asphaltum, or other ingredients in such solvents or vehicles as turpentine, linseed oil, alcohol, naphtha, benzine, etc.

The statistics for each branch of the paint and varnish industry have been tabulated separately, but the tables following generally show totals for the combined industry only, since many establishments manufacture both classes of products and can not properly be classified as belonging solely to either branch.

Table 1 presents a summary of the statistics of the paint and varnish industry as a whole and of each branch for the year 1909.

Of the 791 establishments in the industry as a whole in 1909, about three-fourths (588) manufactured pigments or paints as products of chief value, and these reported approximately three-fourths of the value of products, five-sixths of the number of wage earners, and four-fifths of the amount paid for wages and the cost of materials. The establishments in the industry as a whole gave employment to an average of 21,896

persons, of whom 14,240 were wage earners, and paid out \$18,649,074 in salaries and wages. The cost of materials used in the industry in 1909 was \$79,015,555, or more than three-fifths (63.3 per cent) of the total value of products, which was \$124,889,422, and the value added by manufacture (that is, the value of products less the cost of materials) was \$45,873,867.

	Total for the industry.	Establishments engaged primarily in the manufacture of—	
		Paint.	Varnish.
Number of establishments.....	791	588	203
Persons engaged in the industry.....	21,896	17,168	4,728
Proprietors and firm members.....	456	355	101
Salaries.....	7,200	4,049	2,251
Wage earners (average number).....	14,240	11,564	2,376
Primary horsepower.....	56,162	50,566	5,596
Capital.....	\$103,994,908	\$77,886,395	\$26,108,513
Expenses.....	111,202,408	84,786,984	26,415,424
Services.....	18,649,074	13,326,786	5,322,288
Salaries.....	10,378,361	6,589,088	3,788,373
Wages.....	8,270,713	6,736,798	1,533,915
Materials.....	79,015,555	62,458,250	16,557,305
Miscellaneous.....	13,537,779	9,001,948	4,535,831
Value of products.....	124,889,422	94,672,005	30,317,417
Value added by manufacture (value of products less cost of materials).....	45,873,867	32,118,755	13,760,112

Comparison with earlier censuses.—Table 2 summarizes the statistics of the combined industry for each census from 1869 to 1909, inclusive. The financial figures for 1869 are given in currency, which at that time was worth only about 80 cents, gold, to the dollar. For strict comparison, therefore, these figures should be reduced about 20 per cent.

	Number or amount.						Per cent of increase. <sup>1</sup>					
	1909	1904	1899	1889	1879	1869	1899-1909	1904-1909	1899-1904	1889-1899	1879-1889	1869-1879
	Number of establishments.....	791	639	600	522	325	202	31.8	23.8	6.5	14.9	60.6
Persons engaged in the industry.....	21,896	16,480	13,819	(2)	(2)	(2)	58.4	32.9	19.3	.....	.....	.....
Proprietors and firm members.....	456	439	412	(2)	(2)	(2)	10.7	3.9	6.6	.....	.....	.....
Salaries.....	7,200	4,408	3,710	(2)	(2)	(2)	94.1	63.3	18.8	.....	.....	.....
Wage earners (average number).....	14,240	11,633	9,697	8,189	5,056	3,355	46.8	22.4	20.0	(?)	(?)	(?)
Primary horsepower.....	56,162	41,288	30,443	24,640	(2)	7,487	84.5	36.0	35.6	23.6	.....	.....
Capital.....	\$103,994,908	\$75,486,214	\$60,052,674	\$45,318,146	\$17,333,392	\$13,325,140	73.2	37.8	25.7	32.5	161.4	30.1
Expenses.....	111,202,408	81,419,070	59,727,461	44,441,120	(2)	(2)	58.2	36.6	36.3	34.4	.....	.....
Services.....	18,649,074	11,941,059	9,942,241	7,354,687	2,493,971	1,819,096	87.6	56.2	20.1	35.2	104.3	37.4
Salaries.....	10,378,361	5,677,451	5,016,651	(2)	(2)	(2)	106.9	82.8	13.2	.....	.....	.....
Wages.....	8,270,713	6,263,608	4,925,590	(2)	(2)	(2)	67.9	32.0	27.2	.....	.....	.....
Materials.....	79,015,555	59,826,674	44,738,517	32,736,195	20,762,236	14,779,825	78.6	32.1	33.7	36.7	57.7	40.5
Miscellaneous.....	13,537,779	9,651,637	5,046,703	4,350,238	(2)	(2)	168.2	40.3	91.2	16.0	.....	.....
Value of products.....	124,889,422	90,839,609	69,562,235	54,233,681	29,111,941	21,923,810	79.5	37.5	30.6	28.3	86.3	32.8
Value added by manufacture (value of products less cost of materials).....	45,873,867	31,012,935	24,823,718	21,497,486	8,349,705	7,143,985	84.8	47.9	24.9	15.5	157.4	16.9

<sup>1</sup> Where percentages are omitted, comparable figures are not available.

<sup>2</sup> Comparable figures not available.

<sup>3</sup> Figures not strictly comparable.

The value of products increased \$55,327,187, or 79.5 per cent, during the decade 1899-1909, being almost six times as great in 1909 as in 1869. The largest relative increase in value of products during any decade was that during the period 1879-1889,

86.3 per cent, but the rate of increase for the decade 1899-1909 was also high, 79.5 per cent, and in absolute amount the increase for the latter period was more than twice that for the former period. Increases in all items are shown for each census period.

Summary by states.—Table 3 summarizes the more important statistics of the industry as a whole, by states, the states being arranged according to the value of products reported for 1909. The states shown in

this table are given their actual ranking among all states, the rank of certain states for which data can not be presented being higher than that of some named in the table.

Table 3

PAINT AND VARNISH INDUSTRY.

STATE.	Number of establishments: 1909	Wage earners.			Value of products.			Value added by manufacture.			Per cent of increase. <sup>1</sup>													
		Average number: 1909	Per cent of total: 1909	Rank.		Amount: 1909	Per cent of total: 1909	Rank.		Amount: 1909	Per cent of total: 1909	Rank.		Wage earners (average number).			Value of products.			Value added by manufacture.				
				1909	1904			1909	1904			1909	1904	1899-1909	1904-1909	1899-1904	1899-1909	1904-1909	1899-1904	1899-1909	1904-1909	1899-1904		
																					1909	1904	1899-1904	
United States.	791	14,240	100.0	.....	.....	\$124,889,422	100.0	.....	.....	\$46,873,867	100.0	.....	.....	46.8	22.4	20.0	79.5	37.5	30.6	84.8	47.9	24.9		
New York.....	147	3,047	21.4	1	1	28,559,474	22.9	1	1	10,664,108	23.2	1	1	12.4	-6.2	19.6	51.3	13.7	33.1	62.1	28.2	25.4		
Illinois.....	74	1,792	12.6	3	3	20,434,291	16.4	2	2	7,532,680	16.4	2	2	101.6	40.4	43.5	149.9	53.4	62.9	108.3	61.3	64.9		
Pennsylvania.....	114	1,992	14.0	2	2	14,019,744	11.2	3	3	4,818,750	10.5	4	3	0.7	0.5	0.2	24.1	20.5	3.0	2.4	34.9	24.1		
Ohio.....	87	1,535	10.8	4	4	13,617,189	10.9	4	4	5,047,143	11.0	3	5	82.3	38.2	31.9	103.1	59.0	27.2	04.9	88.7	3.3		
New Jersey.....	63	1,493	10.5	5	5	12,766,929	10.2	5	5	4,540,956	9.9	5	4	76.3	55.5	13.3	105.5	83.2	12.1	90.1	63.7	23.7		
Michigan.....	20	1,024	7.2	6	6	7,415,914	5.9	6	7	3,383,568	7.4	6	6	100.0	58.0	32.2	118.9	24.5	75.9	138.5	33.0	73.3		
Missouri.....	32	685	4.8	7	7	6,827,747	5.5	7	7	2,129,487	4.6	7	7	33.0	13.4	17.3	49.9	6.7	40.5	78.1	28.1	39.0		
California.....	35	396	2.8	9	9	3,758,000	3.0	8	9	1,105,996	2.4	0	0	123.7	35.2	65.5	198.5	58.0	88.2	248.9	69.8	118.3		
Massachusetts.....	41	428	3.0	8	8	3,468,560	2.8	9	8	1,393,806	3.0	8	8	10.3	-4.0	14.9	38.4	34.8	2.7	54.9	47.7	4.9		
Kentucky.....	17	146	1.0	14	12	1,962,081	1.6	10	11	749,538	1.6	10	10	.....	2.1	.....	182.7	91.8	47.4	234.4	63.5	104.5		
Connecticut.....	17	236	1.6	10	13	1,543,010	1.2	11	14	717,547	1.6	11	11	.....	.....	.....	.....	.....	.....	.....	.....	.....		
Wisconsin.....	12	194	1.4	12	11	1,525,896	1.2	12	10	483,223	1.1	13	14	.....	27.6	.....	.....	73.0	45.0	18.8	134.5	70.1	37.9	
Minnesota.....	14	164	1.2	13	15	1,488,692	1.2	13	12	599,475	1.3	12	13	.....	.....	.....	.....	.....	.....	.....	.....	.....		
Nebraska.....	4	112	0.8	16	18	1,254,475	1.0	14	17	405,318	0.9	15	17	.....	.....	.....	.....	40.6	201.4	-68.6	33.2	208.2	-63.8	
Indiana.....	18	200	1.4	11	16	1,107,805	0.9	15	13	424,760	0.9	14	12	.....	.....	.....	.....	174.9	48.1	85.0	187.2	36.7	110.1	
Maryland.....	12	127	0.9	15	10	1,000,938	0.8	16	15	301,424	0.7	16	15	.....	4.1	.....	.....	97.2	.....	.....	.....	.....	.....	
Kansas.....	6	104	0.7	17	26	579,674	0.5	17	28	165,049	0.4	19	28	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	
Rhode Island.....	5	37	0.3	22	23	471,391	0.4	18	18	184,238	0.4	17	21	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	
Tennessee.....	6	71	0.5	18	17	306,712	0.3	20	16	158,731	0.4	20	16	.....	.....	.....	.....	102.9	-17.5	218.5	.....	.....	-17.0	
Virginia.....	8	53	0.4	21	14	344,626	0.3	21	22	156,587	0.3	21	19	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	
Washington.....	5	57	0.4	19	20	281,838	0.2	23	24	127,343	0.3	22	24	.....	.....	.....	.....	.....	69.9	.....	.....	.....	.....	.....
Delaware.....	4	57	0.4	19	21	245,445	0.2	24	27	96,123	0.2	23	25	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Georgia.....	7	35	0.2	23	21	221,598	0.2	25	20	49,026	0.1	29	20	.....	.....	.....	.....	22.0	-14.0	41.8	.....	.....	-51.5	
Iowa.....	4	18	0.1	27	25	153,782	0.1	27	20	68,607	0.1	25	26	.....	.....	.....	.....	-51.3	.....	-74.6	.....	.....	.....	.....
Maine.....	4	15	0.1	28	27	140,097	0.1	28	25	39,760	0.1	30	27	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Texas.....	6	26	0.2	26	27	114,418	0.1	29	33	51,678	0.1	28	33	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
All other states.....	29	196	1.4	.....	.....	1,189,126	1.0	.....	.....	478,700	1.0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

<sup>1</sup> Percentages are based on figures in Table 23. A minus sign (-) denotes decrease. Percentages are omitted where base is less than 100 for wage earners or less than \$100,000 for value of products or value added by manufacture, or where comparable figures can not be given without disclosing individual operations.

New York ranked first at the censuses of 1909 and 1904 in average number of wage earners, value of products, and value added by manufacture. In average number of wage earners, Pennsylvania held second place at both censuses, but in value of products and value added by manufacture Illinois was second. The highest percentages of increase for the decade as a whole which are shown for any of the 10 leading states are those for California, but for the five-year period 1904-1909 Michigan shows the highest rate of increase in wage earners, Kentucky in value of products, and Ohio in value added by manufacture.

Persons engaged in the industry.—Table 4 shows for 1909 the number of persons engaged in the industry classified according to occupational status and sex, and in the case of wage earners according to age also. It should be borne in mind that the sex and age classification of the average number of wage earners in this and other tables is an estimate obtained by the method described in the Introduction.

The average number of persons engaged in the paint and varnish industry during 1909 was 21,896, of whom 14,240, or 65 per cent, were wage earners; 2,016, or 9.2 per cent, proprietors and officials; and 5,640, or 25.8 per cent, clerks, this class including other subordinate salaried employees. Of the total number of

persons engaged in the industry, 19,496, or 89 per cent, were males, and 2,400, or 11 per cent, females.

The average number of wage earners employed in 1909, 1904, and 1899 is given for each state in Table 23. The sex and age distribution of the average number is not shown for the individual states, but Table 24 gives such a distribution of the number employed on December 15, or the nearest representative day. This table shows that the largest number of females employed as wage earners on the representative day, 254, was reported for the state of New York, and the next largest, 197, for Illinois.

Table 4

CLASS.	PERSONS ENGAGED IN THE PAINT AND VARNISH INDUSTRY: 1909		
	Total.	Male.	Female.
All classes.....	21,896	19,496	2,400
Proprietors and officials.....	2,016	1,960	56
Proprietors and firm members.....	456	422	34
Salaried officers of corporations.....	793	773	20
Superintendents and managers.....	767	765	2
Clerks.....	5,640	4,436	1,204
Wage earners (average number).....	14,240	13,100	1,140
16 years of age and over.....	14,159	13,037	1,122
Under 16 years of age.....	81	63	18

In order to compare the distribution of persons engaged in the industry in 1909 according to occupational status with that in 1904, it is necessary to use the classification employed at the earlier census. (See Introduction.) Such a comparison is made in Table 5.

**Table 5**

CLASS.	PERSONS ENGAGED IN THE PAINT AND VARNISH INDUSTRY.					
	1909		1904		Per cent of increase: 1904-1909	
	Number.	Per cent distribution.	Number.	Per cent distribution.		
Total.....	21,896	100.0	16,480	100.0	32.9	
Proprietors and firm members...	456	2.1	439	2.7	3.9	
Salaried employees.....	7,200	32.9	4,408	26.7	63.3	
Wage earners (average number)...	14,240	65.0	11,633	70.6	22.4	

The largest increase, both absolute and relative, is shown for salaried employees.

Table 6 shows the average number of wage earners distributed according to age, and in the case of those 16 years of age and over according to sex, for 1909, 1904, and 1899.

The number of women 16 years of age and over formed a slightly smaller proportion of the average

number of wage earners in 1909 than in either 1904 or 1899, although the absolute number of women employed increased somewhat during each five-year period. The number of children employed is so small as to have little significance.

**Table 6**

CLASS.	AVERAGE NUMBER OF WAGE EARNERS IN THE PAINT AND VARNISH INDUSTRY.					
	1909		1904		1899	
	Number.	Per cent distribution.	Number.	Per cent distribution.	Number.	Per cent distribution.
Total.....	14,240	100.0	11,633	100.0	9,697	100.0
16 years of age and over..	14,159	99.4	11,584	99.6	9,642	99.4
Male.....	13,037	91.5	10,542	90.6	8,836	91.1
Female.....	1,122	7.9	1,042	9.0	866	8.3
Under 16 years of age....	81	0.6	49	0.4	55	0.6

Wage earners employed, by months.—Table 7 gives the number of wage earners employed in the industry on the 15th (or the nearest representative day) of each month during the year 1909 for the 7 states in which an average of 500 or more wage earners were employed during the year.

**Table 7**

STATE.	WAGE EARNERS EMPLOYED IN THE PAINT AND VARNISH INDUSTRY: 1909 <sup>1</sup>												
	Average number during the year.	January	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
<b>United States</b> .....	14,240	<b>13,223</b>	<b>13,835</b>	<b>14,360</b>	<b>14,635</b>	<b>14,692</b>	<b>14,582</b>	<b>14,202</b>	<b>14,141</b>	<b>14,236</b>	<b>14,444</b>	<b>14,296</b>	<b>14,281</b>
Illinois.....	1,792	<i>1,601</i>	1,716	1,905	1,880	1,843	1,887	1,735	1,761	1,775	1,811	1,777	1,815
Michigan.....	1,024	<i>915</i>	977	1,006	1,033	1,065	1,049	1,042	988	1,044	1,060	1,059	1,048
Missouri.....	685	<i>492</i>	685	740	739	718	637	661	744	706	759	707	628
New Jersey.....	1,493	<b>1,453</b>	1,491	1,502	1,535	1,529	1,522	<i>1,434</i>	1,469	1,511	1,511	1,472	1,479
New York.....	3,047	<b>2,908</b>	2,931	3,024	3,048	3,037	3,073	3,063	3,095	3,072	3,106	3,137	3,063
Ohio.....	1,535	<i>1,448</i>	1,529	1,602	1,636	1,662	1,631	1,532	1,512	1,492	1,471	1,474	1,451
Pennsylvania.....	1,992	<i>1,888</i>	1,929	1,967	2,007	2,037	2,029	1,979	1,962	1,988	2,020	2,026	2,072

<sup>1</sup>The month of maximum employment for each state is indicated by boldface figures and that of minimum employment by italic figures.

The largest number of wage earners employed during any month of 1909 was 14,692 in May, and the smallest number was 13,223, in January, the minimum number being equal to 90 per cent of the maximum number. A comparison of the statistics for 1909 with those for 1904 shows very little change in the relative numbers employed for the several months. In 1904 the maximum number, 12,307, was reported for April, and the minimum number, 11,062, for January, the minimum being equal to 89.9 per cent of the maximum.

The months of maximum and minimum employment for 1909, and the number reported for these months is given for a larger number of states in Table 24.

Prevailing hours of labor.—In Table 8 the wage earners in the industry as a whole have been classified according to the hours of labor per week prevailing in the establishments in which they were employed. In making this classification the average number of wage earners employed during the year in each establishment was classified as a total according to the hours prevailing in that establishment, even though a few

employees worked a greater or smaller number of hours.

**Table 8**

STATE.	AVERAGE NUMBER OF WAGE EARNERS IN THE PAINT AND VARNISH INDUSTRY: 1909							
	Total.	In establishments with prevailing hours—						
		48 and under.	Between 48 and 54.	54.	Between 54 and 60.	60.	Between 60 and 72.	72 and over.
<b>United States</b> .....	14,240	656	2,332	2,601	4,681	3,440	67	463
Illinois.....	1,792	152	217	148	982	281	12	.....
Michigan.....	1,024	.....	25	634	69	296	.....	.....
Missouri.....	685	16	25	130	15	432	.....	64
New Jersey.....	1,493	93	480	28	282	364	17	229
New York.....	3,047	121	951	512	844	619	.....	.....
Ohio.....	1,535	53	267	198	520	497	.....	.....
Pennsylvania.....	1,992	49	90	326	1,127	345	38	17

Practically three-fourths (75.3 per cent) of the wage earners in 1909 worked in establishments where the prevailing hours of labor per week were from 54 to 60, inclusive. Only 21 per cent were employed in establishments where the usual hours were less than 54 per week. Of the seven groups of establishments

for which figures are given in Table 8, that employing the largest number of wage earners was the group of establishments reporting more than 54 but less than 60 hours per week as their prevailing hours of labor, these establishments giving employment to 4,681 wage earners, or 32.9 per cent of the total.

**Character of ownership.**—Table 9 presents statistics with respect to the character of ownership of the paint and varnish establishments in the United States.

The most important distinction shown is that between corporate and all other forms of ownership. Of the total number of establishments reported for the industry in 1909, 66.5 per cent were under corporate ownership. The corresponding figure for 1904 was 56.3 per cent. The value of the products of the establishments under corporate ownership represented 85.2 per cent of the total value of products for all es-

tablishments engaged in the industry in 1909 and 83.1 per cent in 1904.

Table 9

CHARACTER OF OWNERSHIP.	PAINT AND VARNISH INDUSTRY.			
	Number of establishments.		Value of products.	
	1909	1904	1909	1904
<b>Total</b> .....	791	639	\$124,889,422	\$90,839,609
Individual.....	160	160	7,536,788	6,460,167
Firm.....	105	119	11,002,823	8,906,163
Corporation.....	526	360	106,349,811	75,473,279
<b>Per cent of total</b> .....	100.0	100.0	100.0	100.0
Individual.....	20.2	25.0	6.0	7.1
Firm.....	13.3	18.6	8.8	9.8
Corporation.....	66.5	56.3	85.2	83.1

Table 10 gives statistics for establishments classified according to form of ownership for the seven states employing an average of 500 or more wage earners in 1909.

Table 10

STATE.	PAINT AND VARNISH INDUSTRY: 1909											
	Number of establishments owned by—			Wage earners in establishments owned by—			Value of product of establishments owned by—			Value added by manufacture in establishments owned by—		
	Individu-als.	Firms.	Corporations.	Individu-als.	Firms.	Corporations.	Individu-als.	Firms.	Corporations.	Individu-als.	Firms.	Corporations.
<b>United States</b> .....	150	105	526	910	1,243	12,087	\$7,536,788	\$11,002,823	\$106,349,811	\$2,839,154	\$4,396,325	\$38,638,388
Illinois.....	10	5	59	115	67	1,610	675,344	502,894	19,256,053	258,466	209,403	7,067,811
Michigan.....	3	1	16	(X)	(X)	1,024	(X)	(X)	7,415,914	(X)	(X)	3,389,598
Missouri.....	2	1	29	8	(X)	682	13,175	(X)	6,814,572	6,140	(X)	2,124,947
New Jersey.....	12	7	44	60	314	1,119	654,862	2,101,070	10,010,988	254,106	749,206	3,637,644
New York.....	36	17	94	402	196	2,449	3,799,659	2,047,838	22,711,977	1,226,900	813,220	8,628,988
Ohio.....	14	9	64	27	28	1,480	194,005	222,645	13,201,139	83,195	104,573	4,859,375
Pennsylvania.....	38	24	52	176	199	1,017	1,184,661	1,535,211	11,299,872	552,232	647,538	3,618,880

NOTE.—In some states, in order to avoid disclosing the returns for individual establishments, the figures for one group have been consolidated with those for establishments under some other form of ownership. In such cases an (X) is placed in the column from which the figures have been omitted and the figures for the group with which they have been combined are printed in italics.

Of the total number of wage earners employed in the industry in 1909, 910, or 6.4 per cent, were in establishments operated by individuals; 1,243, or 8.7 per cent, in those operated by firms; and 12,087, or 84.9 per cent, in those operated by corporations.

**Size of establishments.**—Table 11 presents statistics for 1909 and 1904 for establishments grouped according to the value of their products.

Table 11

VALUE OF PRODUCTS PER ESTABLISHMENT.	PAINT AND VARNISH INDUSTRY.			
	Number of establishments.		Value of products.	
	1909	1904	1909	1904
<b>Total</b> .....	791	639	\$124,889,422	\$90,839,609
Less than \$5,000.....	104	76	244,517	215,192
\$5,000 and less than \$20,000.....	175	151	2,034,095	1,078,523
\$20,000 and less than \$100,000.....	273	230	13,241,833	11,129,970
\$100,000 and less than \$1,000,000.....	213	166	65,259,238	47,942,835
\$1,000,000 and over.....	26	16	44,109,139	29,875,089
<b>Per cent of total</b> .....	100.0	100.0	100.0	100.0
Less than \$5,000.....	13.1	11.9	0.2	0.2
\$5,000 and less than \$20,000.....	22.1	23.6	1.6	1.8
\$20,000 and less than \$100,000.....	34.5	36.0	10.6	12.3
\$100,000 and less than \$1,000,000.....	26.9	26.0	52.3	52.8
\$1,000,000 and over.....	3.3	2.5	35.3	32.9

Of the 791 establishments engaged in the industry in 1909, 26 reported products valued at more than \$1,000,000; the corresponding figures for 1904 were 16 establishments out of 639. While establishments of this class constituted a comparatively small proportion of the total number of establishments—3.3 per cent in 1909 and 2.5 per cent in 1904—they reported a large proportion of the value of products—35.3 per cent in 1909 and 32.9 per cent in 1904. The great bulk of the products of the industry represented the output of establishments having products valued at \$100,000 or over, such establishments reporting 87.6 per cent of the total value of products in 1909 and 85.7 per cent in 1904. Although the average number of wage earners per establishment remained the same in 1909 as in 1904 (18), the average value of products per establishment increased from \$142,159 in 1904 to \$157,888 in 1909 and the average value added by manufacture from \$48,534 to \$57,995.

Table 12 classifies the establishments in the seven leading states according to the number of wage earners employed.

**Table 12** PAINT AND VARNISH INDUSTRY: 1909

STATE.	Establishments employing—																
	Total.		No wage earners.	1 to 5 wage earners.		6 to 20 wage earners.		21 to 50 wage earners.		51 to 100 wage earners.		101 to 250 wage earners.		251 to 500 wage earners.		Over 500 wage earners.	
	Es-tab-lish-ments.	Wage earners (average number)	Es-tab-lish-ments.	Es-tab-lish-ments.	Wage earners.	Es-tab-lish-ments.	Wage earners.	Es-tab-lish-ments.	Wage earners.	Es-tab-lish-ments.	Wage earners.	Es-tab-lish-ments.	Wage earners.	Es-tab-lish-ments.	Wage earners.	Es-tab-lish-ments.	Wage earners.
United States.....	791	14,240	38	411	1,017	191	2,056	79	2,551	38	2,588	31	4,682	2	715	1	631
Illinois.....	74	1,792	2	38	109	11	164	13	480	5	395	5	644				
Michigan.....	20	1,024	1	7	17	8	79	1	39			2	258				
Missouri.....	32	685	1	13	25	13	147	2	64	1	64	1	127	1	258	1	631
New Jersey.....	63	1,493	3	29	64	14	149	9	327	4	258	4	695				
New York.....	147	3,047	2	78	195	31	319	19	625	9	649	8	1,259				
Ohio.....	87	1,535	3	49	129	22	217	7	227			6	962				
Pennsylvania.....	114	1,992	8	54	133	31	335	9	207	9	544	2	316	1	457		

The table shows that from the standpoint of employment the majority of the establishments engaged in the industry are comparatively small. Of the 791 establishments reported, 4.8 per cent employed no wage earners, 52 per cent employed from 1 to 5, 24.1 per cent from 6 to 20, 10 per cent from 21 to 50, and 4.8 per cent from 51 to 100. There were 31 establishments that employed from 101 to 250 wage earners, and 3 establishments that employed over 250 wage earners.

Of the total number of wage earners reported, 21.6 per cent were in establishments employing from 1 to 20 wage earners, 17.9 per cent in establishments employing from 21 to 50, 18.2 per cent in establishments employing from 51 to 100, and 42.3 per cent in the 34 establishments employing more than 100 wage earners.

**Expenses.**—As stated in the Introduction, the census figures for expenses do not purport to represent the total cost of manufacture, since they take no account of interest or depreciation; hence they can not properly be used for determining profits. Facts of interest can be brought out, however, concerning the relative importance of the different classes of expenses which were reported. Table 13 shows, in percentages, for 1909, the distribution of these expenses among the classes indicated for the paint and varnish industry as a whole and for each branch separately.

**Table 13** PER CENT OF TOTAL EXPENSES REPORTED.

BRANCH OF INDUSTRY	PER CENT OF TOTAL EXPENSES REPORTED.			
	Salaries.	Wages.	Materials.	Miscellaneous expenses.
The industry as a whole.....	9.3	7.4	71.1	12.2
Paint.....	7.8	7.9	73.7	10.6
Varnish.....	14.3	5.8	62.7	17.2

In Table 24 the amounts paid in 1909 for the various items of expense reported are given by states for the industry as a whole. The highest proportion of the total reported expenses represented by cost of materials for any of the nine leading states was that for California and the lowest that for Michigan.

The miscellaneous expenses reported for the industry in 1909, as shown in Table 24, amounted to

\$13,537,779. Of this amount, \$494,331, or 3.7 per cent, was paid for the rent of factories; \$483,420, or 3.6 per cent, for taxes; \$91,549, or seven-tenths of 1 per cent, for contract work; and \$12,468,479, or 92.1 per cent, for other miscellaneous expenses.

**Engines and power.**—The amount of power used in the industry, as shown in Table 2, increased from 7,487 horsepower in 1869 to 56,162 horsepower in 1909. Table 14 shows the statistics of power as reported at the censuses of 1909, 1904, and 1899.

**Table 14** PAINT AND VARNISH INDUSTRY.

POWER.	Number of engines or motors.						Horsepower.			Per cent distribution of horsepower.								
	1909			1904			1899			1909			1904			1899		
	1909	1904	1899	1909	1904	1899	1909	1904	1899	1909	1904	1899	1909	1904	1899			
Primary power, total.....	1,378	781	517	56,162	41,288	30,443	100.0	100.0	100.0									
Owned.....	651	572	517	47,487	37,622	28,666	84.0	91.1	94.2									
Steam.....	510	450	400	42,166	34,952	26,890	75.1	84.7	88.3									
Gas.....	110	87	28	3,290	1,673	501	5.9	4.1	1.6									
Water wheels.....	30	22	29	2,004	969	950	3.0	2.3	3.1									
Water motors.....	1	7	( <sup>1</sup> )	2	28	( <sup>2</sup> )	( <sup>2</sup> )	0.1	.....									
Other.....				25		325			1.1									
Rented.....	727	209	( <sup>1</sup> )	8,675	3,666	1,777	15.4	8.9	5.8									
Electric.....	727	209	( <sup>1</sup> )	7,814	2,650	856	13.9	6.4	2.8									
Other.....				861	1,016	921	1.5	2.5	3.0									
Electric motors.....	1,353	515	92	17,037	7,540	1,788	100.0	100.0	100.0									
Run by current generated by establishment.....	626	306	92	9,223	4,890	932	54.1	64.9	52.1									
Run by rented power.....	727	209	( <sup>1</sup> )	7,814	2,650	856	45.9	35.1	47.9									

<sup>1</sup> Not reported.

<sup>2</sup> Less than one-tenth of 1 per cent.

The total primary power used in the paint and varnish industry increased 25,719 horsepower, or 84.5 per cent, from 1899 to 1909. The greater part of the increase was in steam and rented electric power. In 1909, as in 1904 and 1899, steam power formed the major part of the primary power employed in the industry, but despite the increase of 56.8 per cent for the decade, its relative importance has decreased considerably since 1899. In that year such power formed 88.3 per cent of the total primary power; in 1904 the proportion was 84.7 per cent; and in 1909 it was 75.1 per cent. There has been a marked increase in the use

of power generated by gas and other internal combustion engines and of rented electric power.

The practice of using electric motors for the distribution of power by means of current generated in the establishments reporting has also increased rapidly, the horsepower of such motors being nearly ten times

as great in 1909 as in 1899 (9,223, as compared with 932).

Table 15 shows for 1909 the amount of each of the several kinds of power and of the different kinds of fuel used in the industry for seven of the leading states.

Table 15

PAINT AND VARNISH INDUSTRY: 1909																	
STATE.	Primary horsepower.							Electric horsepower.		Fuel used.							
	Number of establishments reporting.	Total horsepower.	Owned by establishments reporting.				Rented.		Total, rented and generated by establishment.	Generated in the establishment reporting.	Coal.		Coke (short tons).	Wood (cords).	Oil, including gasoline (barrels).	Gas (1,000 feet).	
			Total.	Steam engines.	Gas engines.	Water wheels and motors.	Other.	Electric.			Other.	Anthracite (long tons).					Bituminous (short tons).
United States.....	672	56,162	47,487	42,166	3,280	2,006	25	7,814	861	17,037	9,223	66,587	299,930	24,667	1,318	19,613	269,367
Illinois.....	66	7,108	6,524	6,221	298	.....	5	574	10	3,196	2,622	378	55,018	3,088	178	2,736	8,729
Michigan.....	16	2,362	2,098	2,098	.....	.....	.....	244	20	419	375	31	17,827	2,040	.....	49	631
Missouri.....	28	2,706	2,335	2,331	4	.....	.....	371	.....	.....	90	2	20,414	310	30	40	3,061
New Jersey.....	40	5,024	5,208	5,129	45	29	.....	721	.....	1,875	1,154	17,903	42,871	1,581	3	13	1,064
New York.....	123	10,857	8,882	8,133	259	475	15	1,412	563	3,200	1,788	37,408	23,408	4,518	11	331	8,624
Ohio.....	74	5,572	4,666	3,337	1,329	.....	.....	896	10	2,548	1,652	1	29,040	6,523	64	24	32,702
Pennsylvania.....	98	9,862	9,399	7,567	1,012	820	.....	377	86	1,112	735	9,821	70,635	1,948	607	447	181,924
All other states.....	215	11,771	8,380	7,350	343	682	5	3,219	172	4,687	807	1,053	40,717	3,759	365	15,963	32,632

Fuel consumed.—Bituminous coal is the principal kind of fuel used, 299,930 tons having been consumed

in 1909. Considerable natural gas was used by the establishments in Pennsylvania and Ohio.

SPECIAL STATISTICS RELATING TO MATERIALS AND PRODUCTS.

Materials.—The more important materials used in the manufacture of paint and varnish are lead in the form of pig lead or as oxides and white lead, zinc white, iron oxides and other earth colors, barytes, dry colors, gums, and solvents or vehicles such as linseed oil, turpentine, benzine, and wood and grain alcohol. Pig lead and wood and grain alcohol were the only materials concerning which a separate statement was called for on the census schedule. The total quantities and cost of these materials used in the manufacture of paint and varnish in all establishments, including those primarily engaged in other industries, are given in Table 16 for 1909, 1904, and 1899.

wood alcohol, 327.6 per cent; and that of grain alcohol, 354.9 per cent. Grain alcohol formed approximately one-fifth of the total quantity of alcohol used in the manufacture of paint and varnish in 1909 and 1899, but a considerably smaller proportion in 1904.

The cost of all materials used in the combined industry as given in Table 23 was \$79,016,000 in 1909, \$59,827,000 in 1904, and \$44,739,000 in 1899, the increase for the decade 1899–1909 being 76.6 per cent.

The quantity and cost of the pig lead and the alcohol used as materials in establishments manufacturing paint or varnish as their product of chief value in 1909 are given in Table 17, by states.

Table 16

MATERIAL.	PIG LEAD AND ALCOHOL USED IN THE MANUFACTURE OF PAINT AND VARNISH.		
	1909 <sup>1</sup>	1904 <sup>2</sup>	1899
Pig lead:			
Tons of 2,000 pounds.....	150,163	129,629	99,052
Cost.....	\$12,380,524	\$11,214,961	\$8,585,688
Alcohol:			
Gallons.....	1,682,032	1,416,746	388,368
Cost.....	\$920,086	\$928,946	\$461,417
Wood:			
Gallons.....	1,325,807	1,357,682	310,059
Cost.....	\$693,362	\$790,243	\$285,510
Grain:			
Gallons.....	356,225	59,064	78,309
Cost.....	\$220,724	\$193,703	\$176,907

<sup>1</sup> Includes the following materials used in establishments engaged primarily in the manufacture of products other than paint and varnish: Pig lead, 1,072 tons, valued at \$93,418; wood alcohol, 25,833 gallons, valued at \$12,759; and grain alcohol, 34,758 gallons, valued at \$14,462.

<sup>2</sup> Includes the following materials used in establishments engaged primarily in the manufacture of products other than paint and varnish: Pig lead, 1,116 tons, valued at \$95,559; wood alcohol, 91,966 gallons, valued at \$50,816; and grain alcohol, 1,381 gallons, valued at \$4,299.

The quantity of pig lead used in the manufacture of paint and varnish in all establishments increased 51.6 per cent during the decade 1899–1909; that of

Table 17

STATE.	PIG LEAD AND ALCOHOL USED IN THE PAINT AND VARNISH INDUSTRY: 1909.					
	Pig lead.		Alcohol.			
	Quantity (tons of 2,000 pounds).	Cost.	Wood.		Grain.	
			Quantity (gallons).	Cost.	Quantity (gallons).	Cost.
United States.....	149,091	\$12,287,106	1,299,974	\$680,603	321,467	\$212,862
California.....	5,220	441,168	10,686	4,908	37,877	16,126
Connecticut.....	.....	.....	38,937	18,473	2,797	1,149
Illinois.....	26,204	2,242,307	120,131	57,792	85,050	76,073
Indiana.....	.....	.....	742	474	2,755	1,247
Kentucky.....	.....	.....	1,080	521	2,808	1,236
Massachusetts.....	2,122	190,364	42,395	21,840	16,454	7,268
Michigan.....	1,120	97,039	846,035	402,062	3,630	4,074
Minnesota.....	.....	.....	12,001	5,542	3,000	1,470
Missouri.....	17,218	1,484,840	3,877	1,955	3,126	2,145
Nebraska.....	4,246	365,665	150	79	6,100	2,930
New Jersey.....	12,151	807,317	28,794	15,047	56,128	30,815
New York.....	36,203	2,733,997	101,669	49,906	46,520	23,381
Ohio.....	17,270	1,498,241	9,305	7,141	6,515	4,911
Pennsylvania.....	27,253	2,419,104	47,411	25,786	27,601	28,787
Rhode Island.....	75	6,639	17,263	7,141	6,515	4,405
Wisconsin.....	1	145	17,150	3,132	5,260	2,295
All other states.....	2	280	2,358	1,207	6,200	3,060

Products.—Table 18 gives a detailed statement of the products of the industry for 1909, 1904, and 1899.

and paints produced in 1909 was \$73,748,884, representing an increase of 61.1 per cent as compared with the figure for 1899 (\$45,785,072), while the relative increase in value for varnishes and japans during the decade was 69 per cent. The quantity of pyroxylin varnishes made in 1909 was more than eleven times as great as in 1899, and large relative gains are shown also for iron oxides and other earth colors, for spirit varnishes other than turpentine, and for ready mixed paints.

Table 19 gives statistics in regard to products made in establishments in the paint and varnish industry for use in further processes of manufacture in the establishment where produced.

PRODUCT.	PRODUCTS OF THE PAINT AND VARNISH INDUSTRY.		
	1909	1904	1899
Total value <sup>1</sup> .....	\$124,889,422	\$90,839,609	\$69,562,235
Pigments.....	\$16,985,588	\$11,965,806	\$13,319,487
White lead, dry—			
Pounds.....	85,234,414	62,395,898	116,102,316
Value.....	\$3,921,803	\$2,877,109	\$4,211,181
Oxides of lead—			
Pounds.....	63,404,846	49,734,330	50,789,023
Value.....	\$3,662,062	\$2,591,772	\$2,550,340
Lamp black and other blacks—			
Pounds.....	1,810,445	757,244	1,065,000
Value.....	\$105,063	\$40,869	\$60,250
Iron oxides and other earth colors—			
Pounds.....	111,674,675	48,345,978	33,453,896
Value.....	\$876,331	\$331,416	\$318,242
Other dry colors, including vermilion and other fine colors—			
Pounds.....	162,409,565	98,194,081	167,479,090
Value.....	\$6,874,333	\$5,066,083	\$5,317,943
Barytes—			
Pounds.....	49,490,025	22,299,980	
Value.....	\$268,757	\$134,174	
Pulp colors, sold moist—			
Pounds.....	28,435,722	25,351,515	20,060,935
Value.....	\$1,277,239	\$615,383	\$861,531
Paints in oil.....	\$56,763,296	\$40,390,050	( <sup>2</sup> )
White lead in oil—			
Pounds.....	246,567,570	216,496,450	( <sup>2</sup> )
Value.....	\$15,234,411	\$11,228,889	( <sup>2</sup> )
Paste—			
Pounds.....	162,356,330	131,940,464	308,410,398
Value.....	\$11,279,459	\$8,713,183	\$17,601,459
Already mixed for use—			
Gallons.....	33,272,033	22,379,020	16,879,595
Value.....	\$30,249,426	\$20,447,987	\$14,864,126
Varnishes and japans.....	\$91,262,535	\$22,871,486	\$18,502,210
Oleoresinous varnishes—			
Gallons.....	18,476,523		
Value.....	\$17,350,113		
Dammar and similar turpentine and benzine varnishes—			
Gallons.....	3,481,231	17,162,719	14,282,851
Value.....	\$2,836,341	\$15,702,997	\$14,333,554
Spirit varnishes, other than turpentine—			
Gallons.....	1,181,746	1,553,562	549,811
Value.....	\$1,408,948	\$2,180,713	\$905,229
Pyroxylin varnishes—			
Gallons.....	1,880,141	148,920	100,127
Value.....	\$2,351,425	\$162,163	\$178,820
Dryers, japans, and laquers—			
Gallons.....	9,474,939	( <sup>2</sup> )	( <sup>2</sup> )
Value.....	\$5,004,973	\$3,346,355	\$3,084,610
All other.....	\$2,221,635	\$1,479,258	( <sup>2</sup> )
Fillers.....	\$3,126,271	\$2,344,636	( <sup>2</sup> )
Liquid—			
Gallons.....	1,189,569	1,051,148	( <sup>2</sup> )
Value.....	\$823,063	\$785,617	( <sup>2</sup> )
Paste—			
Pounds.....	14,050,329		
Value.....	\$887,948		
Dry—			
Pounds.....	50,983,472	68,761,174	( <sup>2</sup> )
Value.....	\$295,728	\$1,580,019	( <sup>2</sup> )
Putty—			
Pounds.....	63,502,048		
Value.....	\$1,119,532		
Water paints and kalsomine:			
Dry or in paste—			
Pounds.....	47,465,265	27,932,447	( <sup>2</sup> )
Value.....	\$1,917,038	\$924,807	( <sup>2</sup> )
Already mixed for use—			
Gallons.....	522,283	123,400	( <sup>2</sup> )
Value.....	\$61,969	\$9,230	( <sup>2</sup> )
Linseed oil:			
Gallons.....	3,477,004	( <sup>2</sup> )	( <sup>2</sup> )
Value.....	\$1,912,594	( <sup>2</sup> )	( <sup>2</sup> )
Bleached shellac:			
Pounds.....	3,014,195	( <sup>2</sup> )	( <sup>2</sup> )
Value.....	\$578,650	( <sup>2</sup> )	( <sup>2</sup> )
All other products.....	\$12,281,481	\$12,333,585	\$5,274,944

PRODUCT.	PRODUCTS OF THE PAINT AND VARNISH INDUSTRY CONSUMED IN THE ESTABLISHMENTS WHERE PRODUCED.	
	1909	1904
White lead, dry.....	162,702,089	122,288,484
Lead oxides.....	4,526,425	13,589,147
Varnishes.....	4,407,312	1,202,674
Drying japans and dryers.....	3,090,756	988,979
Collodion and other cellulose nitrate solutions.....	20,600	1,576,442
Pyroxylin and other cellulose nitrates.....	24,750	12,000
Coppers.....	11,531,006	

Table 18 covers only the products of establishments engaged primarily in the manufacture of paint and varnish. The quantity and value of these specific products reported by all establishments manufacturing paint and varnish, including those reporting them as subsidiary products, are given in greater detail for 1909 in Table 20.

PRODUCT.	PRODUCTS OF ALL ESTABLISHMENTS MANUFACTURING PAINT AND VARNISH.	
	Quantity.	Value.
Pigments:	Pounds.	
White lead, dry.....	85,269,414	\$3,924,528
Oxides of lead.....	65,767,254	3,798,551
Lamp black and other blacks.....	1,811,445	105,174
Iron oxides and other earth colors.....	213,285,734	1,085,438
Vermilion.....	259,558	107,472
Fine colors, other than vermilion.....	8,420,120	1,052,443
Other dry colors.....	161,902,137	6,418,554
Barytes.....	56,254,838	348,470
Pulp colors, sold moist.....	28,600,222	1,294,239
Paints in oil:		
White lead in oil.....	246,569,970	15,234,539
Paste.....	165,038,353	11,435,937
Gallons.....	34,278,980	30,710,063
Already mixed for use.....		
Varnishes and japans:		
Oleoresinous varnishes.....	18,692,527	17,550,898
Dammar and similar turpentine and benzine varnishes.....	3,483,994	2,839,534
Spirit varnishes, other than turpentine.....	1,273,411	1,502,398
Pyroxylin varnishes.....	1,886,541	2,356,692
Drying japans and dryers.....	6,638,706	3,165,589
Baking japans and laquers.....	2,933,285	2,079,927
All other.....	4,265,298	2,264,697
Fillers:		
Liquid.....	1,166,533	828,393
Paste.....	14,164,923	903,867
Dry.....	50,983,472	295,728
Putty.....	67,767,348	1,169,683
Water paints and kalsomine:		
Dry or in paste.....	47,465,715	1,917,047
Gallons.....	543,733	64,114
Already mixed for use.....		
Linseed oil:		
Raw.....	2,098,696	1,106,181
Boiled.....	1,379,025	806,846
Bleached shellac.....	3,905,593	772,240

<sup>1</sup> In addition, paint and varnish products to the value of \$2,583,397 in 1909, \$1,221,338 in 1904, and \$3,036,751 in 1899 were made by establishments engaged primarily in the manufacture of products other than those covered by the industry designation.

<sup>2</sup> Includes white lead in oil.

<sup>3</sup> Figures not available.

During the period 1899-1909 the value of all products of the industry increased from \$69,562,235 to \$124,889,422, or 79.5 per cent, the rate of increase for the first half of the decade being 30.6 per cent, and that for the last half 37.5 per cent. The value of pigments

Table 21 shows separately the paint and varnish products of establishments engaged primarily in the manufacture of other products.



Table 22—Continued. PRODUCT AND STATE.	PRODUCTS OF THE PAINT AND VARNISH INDUSTRY: 1909		PRODUCT AND STATE.	PRODUCTS OF THE PAINT AND VARNISH INDUSTRY: 1909		PRODUCT AND STATE.	PRODUCTS OF THE PAINT AND VARNISH INDUSTRY: 1909	
	Quantity.	Value.		Quantity.	Value.		Quantity.	Value.
<b>Varnishes and japans—Continued.</b>			<b>Varnishes and japans—Continued.</b>			<b>Fillers—Continued.</b>		
<i>Dammar and similar turpentine and benzine varnishes—Continued.</i>	<i>Pounds.</i>		<i>All other—Continued.</i>	<i>Pounds.</i>		<i>Putty—Continued.</i>	<i>Pounds.</i>	
Massachusetts.....	68,920	\$59,488	Illinois.....	364,045	\$232,704	Ohio.....	2,313,450	\$40,905
Michigan.....	75,245	74,936	Massachusetts.....	89,890	84,328	Pennsylvania.....	7,391,483	138,850
Missouri.....	89,750	35,917	Michigan.....	488,009	131,299	Wisconsin.....	3,807,788	53,268
New Jersey.....	815,905	685,966	Missouri.....	80,925	56,838	All other states.....	3,930,823	73,740
New York.....	277,667	221,343	New Jersey.....	39,811	34,344	<b>Water paints and kalsomine.....</b>		<b>1,979,007</b>
Ohio.....	309,080	259,204	New York.....	2,196,435	1,084,033	<i>Dry or in paste.....</i>		
Pennsylvania.....	602,987	309,029	Ohio.....	401,757	100,346	California.....	47,465,265	1,917,038
All other states.....	178,851	107,857	Pennsylvania.....	183,581	170,121	Illinois.....	347,351	54,062
<b>Spirit varnishes, other than turpentine.....</b>	<b>1,181,746</b>	<b>1,408,048</b>	All other states.....	119,507	71,844	Michigan.....	9,081,330	449,799
California.....	53,133	52,589	<b>Fillers.....</b>	<b>3,126,271</b>		New Jersey.....	3,955,395	98,929
Illinois.....	483,227	509,500	<i>Liquid.....</i>	<i>1,159,569</i>	<i>823,083</i>	New York.....	5,851,755	345,988
Indiana.....	5,765	15,109	California.....	64,014	31,669	New York.....	25,490,495	856,159
Massachusetts.....	87,475	77,278	Connecticut.....	18,000	13,100	Pennsylvania.....	1,263,020	59,529
Michigan.....	16,650	27,673	Illinois.....	92,341	80,282	All other states.....	1,476,009	52,572
New Jersey.....	60,876	84,402	Indiana.....	20,711	15,020	<i>Already mixed for use.....</i>	<i>Gallons.</i>	
New York.....	253,266	306,681	Massachusetts.....	18,327	11,614	Linseed oil.....	522,283	61,989
Ohio.....	77,786	106,848	Michigan.....	160,349	99,823	<i>Raw.....</i>	<b>3,477,004</b>	<b>1,912,594</b>
Pennsylvania.....	72,567	93,945	Missouri.....	39,550	31,076	<i>Boiled.....</i>		
All other states.....	71,501	79,973	New Jersey.....	31,667	31,076	New York.....	3,098,014	1,105,772
<b>Pyroxylin varnishes.....</b>	<b>1,880,141</b>	<b>2,351,425</b>	New York.....	201,232	189,561	Pennsylvania.....	1,347,959	712,592
New Jersey.....	125,670	233,322	Ohio.....	292,807	155,869	All other states.....	692,081	418,271
New York.....	372,689	422,550	Pennsylvania.....	163,238	119,223	<b>Bleached shellac.....</b>	<b>3,014,195</b>	<b>578,650</b>
Pennsylvania.....	56,808	85,269	All other states.....	57,273	49,674	New York.....	1,739,727	368,253
All other states.....	1,324,074	1,610,284	<i>Paste.....</i>	<i>Pounds.</i>		All other states.....	1,274,468	210,397
<b>Driers, japans, and lacquers.....</b>	<b>9,474,939</b>	<b>5,094,973</b>	Illinois.....	14,050,329	887,948	<b>All other products, including custom work.....</b>		<b>12,281,481</b>
California.....	209,329	109,737	Illinois.....	3,250,327	151,191	California.....		462,510
Connecticut.....	171,001	252,559	Indiana.....	554,494	45,902	Illinois.....		1,552,172
Illinois.....	1,171,565	682,261	Michigan.....	1,275,686	89,780	Kentucky.....		71,918
Indiana.....	278,217	70,926	New York.....	1,788,989	165,422	Massachusetts.....		922,668
Kentucky.....	218,112	86,866	Ohio.....	2,289,914	118,515	Michigan.....		1,319,140
Massachusetts.....	178,325	89,979	Pennsylvania.....	1,617,267	91,304	Minnesota.....		224,077
Michigan.....	516,397	215,961	All other states.....	3,273,642	225,774	Missouri.....		697,559
Missouri.....	356,180	153,823	<b>Dry.....</b>	<b>50,983,472</b>	<b>295,728</b>	Nebraska.....		142,157
New Jersey.....	677,516	645,685	<b>Putty.....</b>	<b>63,502,048</b>	<b>1,119,532</b>	New Jersey.....		485,569
New York.....	1,646,881	1,276,148	California.....	3,928,190	94,084	New York.....		3,331,522
Ohio.....	1,715,173	672,443	Illinois.....	12,604,189	165,180	Ohio.....		862,420
Pennsylvania.....	2,199,056	800,082	Maryland.....	3,548,931	61,890	Pennsylvania.....		1,625,481
All other states.....	135,027	38,503	Massachusetts.....	4,633,361	83,724	Rhode Island.....		138,349
<b>All other.....</b>	<b>4,238,097</b>	<b>2,221,635</b>	Michigan.....	3,163,957	48,550	All other states.....		445,939
California.....	161,487	63,414	Minnesota.....	1,358,740	21,932			
Connecticut.....	112,700	102,364	Missouri.....	2,070,000	32,170			
			New Jersey.....	3,403,706	59,747			
			New York.....	11,347,425	245,402			

DETAILED STATE TABLES.

The principal statistics secured from the census inquiry concerning the paint and varnish industry are presented, by states, in Tables 23 and 24.

Table 23 shows, for 1909, 1904, and 1899, the number of establishments, number of persons engaged in the

industry, primary horsepower, capital invested, salaries, wages, cost of materials, value of products, and value added by manufacture.

Table 24 gives more detailed statistics for the industry for 1909 only.

## PAINT AND VARNISH—COMPARATIVE STATISTICS, BY STATES: 1909, 1904, AND 1899.

Table 23	STATE.	Census.	Number of establishments.	PERSONS ENGAGED IN INDUSTRY.				Primary horse-power.	Capital.	Salaries.	Wages.	Cost of materials.	Value of products.	Y add m fac (va pro less of r rit
				Total.	Proprietors and firm members.	Salaried employees.	Wage earners (average number).							
	United States.....	1909	791	21,896	456	7,200	14,240	56,162	\$103,995	\$10,378	\$8,271	\$79,016	\$124,889	
		1904	639	16,480	439	4,408	11,833	41,288	75,480	6,077	6,204	59,827	90,840	\$4
		1899	600	13,819	412	3,710	9,697	30,443	60,053	5,017	4,926	44,739	69,562	3
	California.....	1909	25	530	14	120	396	1,387	2,675	158	275	2,652	3,758	
		1904	22	395	13	80	293	614	1,617	86	201	1,678	2,370	
		1899	14	227	11	89	177	614	1,022	48	108	942	1,259	
	Connecticut.....	1909	17	390	6	118	238	1,024	1,100	171	147	825	1,543	
		1904	110	83	6	24	53	170	369	44	28	302	515	
		1899	28	55	6	17	32	62	374	22	19	234	400	
	Delaware.....	1909	4	72	2	13	57	323	260	12	33	149	245	
		1904	4	37	2	7	28	195	118	0	21	41	82	
		1899												
	Georgia.....	1909	7	56	5	16	35	95	176	15	16	172	222	
		1904	5	57	7	22	28	102	157	19	12	155	258	
		1899	5	38	3	12	23	90	101	9	10	112	182	
	Illinois.....	1909	74	2,906	31	1,083	1,792	7,108	15,725	1,657	1,114	12,902	20,434	7,
		1904	63	1,979	19	684	1,276	5,068	11,340	987	771	8,656	13,325	4,
		1899	52	1,425	13	518	889	3,231	5,733	703	473	5,033	8,178	2,
	Indiana.....	1909	18	297	4	93	200	521	841	112	74	683	1,108	
		1904	14	140	7	52	81	420	550	67	42	437	748	
		1899	8	90	1	35	51	309	340	44	23	256	403	
	Iowa.....	1909	4	51	3	30	18	170	119	37	13	85	154	
		1904	5	29	4	13	12	76	61	12	8	50	86	
		1899	6	30	0	31	40	147	207	23	15	256	337	
	Kansas.....	1909	6	127	2	21	104	621	848	27	56	415	580	1
		1904	3	15	2	2	11	51	28	2	5	36	60	
		1899												
	Kentucky.....	1909	17	272	6	120	146	768	1,150	196	79	1,213	1,062	7
		1904	13	199	4	52	143	498	591	44	59	565	1,023	4
		1899	12	144	7	44	93	396	362	39	40	470	604	2
	Maryland.....	1909	12	190	20	43	127	450	503	35	55	700	1,001	3
		1904	11	253	16	55	182	509	444	51	74	411	681	2
		1899	10	181	24	35	122	380	339	33	51	300	507	2
	Massachusetts.....	1909	41	672	24	220	428	1,819	2,195	286	251	2,075	3,460	1,2
		1904	33	580	25	109	446	1,536	1,858	152	237	1,630	2,574	9,
		1899	44	542	37	117	388	1,657	1,659	147	208	1,607	2,507	90
	Michigan.....	1909	20	1,657	11	622	1,024	2,362	7,113	888	557	4,032	7,416	3,38
		1904	17	968	10	300	648	1,413	4,521	308	304	3,414	5,958	2,54
		1899	17	752	14	248	490	1,004	2,494	286	179	1,969	3,388	1,41
	Minnesota.....	1909	14	294	8	122	164	420	1,387	148	101	889	1,489	60
		1904	45	125	2	45	78	222	672	56	37	454	709	25
		1899	46	86	5	29	52	203	325	28	20	209	358	14
	Missouri.....	1909	32	1,034	4	345	685	2,706	5,235	503	366	4,668	6,828	2,13
		1904	30	1,014	15	333	604	2,028	4,116	439	313	4,737	6,400	1,66
		1899	27	689	14	157	515	1,745	3,244	241	243	3,359	4,555	1,19
	Nebraska.....	1909	4	150		38	112	425	734	65	68	849	1,254	40
		1904	3	61	1	20	40	170	227	34	19	237	347	110
		1899	3	134		41	93	310	882	58	53	534	838	304
	New Jersey.....	1909	63	2,143	41	609	1,493	5,924	11,372	1,100	844	8,226	12,767	4,541
		1904	42	1,404	19	428	960	2,799	5,887	630	527	4,013	6,967	2,954
		1899	51	1,200	31	382	847	2,333	6,457	551	476	3,826	6,214	2,388
	New York.....	1909	147	4,741	78	1,616	3,047	10,857	22,002	2,311	1,863	17,895	28,550	10,604
		1904	128	4,306	107	949	3,250	10,559	20,007	1,339	1,323	16,370	25,121	6,275
		1899	122	3,566	53	803	2,710	6,745	16,949	1,350	1,519	12,299	18,878	6,974
	Ohio.....	1909	87	2,587	39	1,013	1,535	5,572	11,757	1,877	904	8,570	13,617	5,047
		1904	75	1,635	40	484	1,111	4,275	7,906	600	581	5,855	8,530	2,675
		1899	65	1,410	62	515	842	2,445	5,502	636	414	4,115	6,704	2,589
	Pennsylvania.....	1909	114	2,747	105	650	1,992	9,862	14,834	947	1,102	9,201	14,020	4,819
		1904	98	2,432	96	517	1,819	7,714	12,319	613	928	8,065	11,037	3,572
		1899	93	2,405	64	525	1,816	6,925	12,080	625	856	6,595	11,299	4,704
	Rhode Island.....	1909	5	65	6	22	37	209	234	33	23	287	471	184
		1904	4	40	5	13	22	137	112	15	13	177	248	71
		1899	4	35	4	13	18	108	105	16	10	106	167	61
	Tennessee.....	1909	6	117	1	45	71	1,045	408	52	37	238	397	159
		1904	4	91	1	14	76	295	224	25	30	288	481	193
		1899	5	56	3	8	45	122	74	11	18	89	151	62
	Virginia.....	1909	8	80	5	22	53	241	294	25	21	188	345	157
		1904	3	115	5	17	93	645	213	28	23	114	195	81
		1899												
	Washington.....	1909	5	74		17	57	221	296	18	51	154	282	128
		1904	6	62	1	27	34	80	121	14	23	92	166	74
		1899	3	16	2	<	10	50	66	5	7	31	58	27
	Wisconsin.....	1909	12	283	5	89	194	935	1,260	93	99	1,043	1,526	483
		1904	9	192	6	34	152	731	936	30	70	784	1,043	284
		1899	5	127	6	43	78	367	463	29	28	676	882	206
	All other states.....	1909	39	388	36	113	237	1,092	1,417	112	122	875	1,442	567
		1904	32	278	26	59	163	931	1,112	73	115	786	1,311	525
		1899	34	495	38	91	266	1,200	1,275	104	156	1,102	1,603	501

<sup>1</sup> Excluding statistics for four establishments, to avoid disclosure of individual operations.

<sup>2</sup> Excluding statistics for two establishments, to avoid disclosure of individual operations.

<sup>3</sup> Figures can not be shown without disclosing individual operations.

<sup>4</sup> Excluding statistics for one establishment, to avoid disclosure of individual operations.

# THE PAINT AND VARNISH INDUSTRY.

## PAINT AND VARNISH—DETAILED STATISTICS, BY STATES: 1909.

**Table 24**

STATE.	Number of establishments.	PERSONS ENGAGED IN INDUSTRY.										WAGE EARNERS—DEC. 15, OR NEAREST REPRESENTATIVE DAY.					Primary horse-power.
		Total.	Proprietors and firm members.	Salaried officers, superintendents, and managers.	Clerks.		Wage earners.			Total.	16 and over.		Under 16.				
					Male.	Female.	Average number.	Number, 15th day of—			Male.	Female.	Male.	Female.			
								Maximum month.	Minimum month.								
<b>United States..</b>	<b>791</b>	<b>21,896</b>	<b>456</b>	<b>1,560</b>	<b>4,436</b>	<b>1,204</b>	<b>14,240</b>	<b>My 14,692</b>	<b>Ja 13,223</b>	<b>14,426</b>	<b>13,207</b>	<b>1,137</b>	<b>64</b>	<b>18</b>	<b>56,162</b>		
California.....	35	530	14	54	51	15	396	Ja 440	Ja 357	378	353	21	4		1,387		
Connecticut.....	17	360	6	29	68	21	236	My 244	No 229	230	222	8			1,024		
Delaware.....	4	72	2	8	5		57	Fe 73	Ap 53	71	71				328		
Georgia.....	7	56	5	6	9		35	Ja 37	Je 23	35	32	2	1		95		
Illinois.....	74	2,006	31	204	671	208	1,792	Mh 1,905	Ja 1,601	1,855	1,650	190	8	7	7,108		
Indiana.....	18	297	4	31	52	10	200	Ja 235	Ja 174	203	197	6			521		
Iowa.....	4	51	3	19	8	3	18	Ja 19	Fe 17	19	19				170		
Kansas.....	6	127	2	8	9	4	104	My 151	An 43	43	40	3			621		
Kentucky.....	17	272	6	30	74	16	146	De 178	Ja 128	178	144	32		2	765		
Maine.....	4	28	4	3	4	2	15	Je 17	Ja 14	15	15				157		
Maryland.....	12	190	20	7	24	12	127	Oc 133	Fe 120	134	115	19			450		
Massachusetts.....	41	672	24	56	137	27	428	Ap 442	Ja 395	422	385	34	3		1,819		
Michigan.....	20	1,057	11	59	444	119	1,024	My 1,065	Ja 915	1,056	934	103	11	3	2,362		
Minnesota.....	14	294	8	26	67	29	164	Je 185	Oc 147	162	143	19			420		
Missouri.....	32	1,034	4	98	202	45	655	Oc 759	Ja 492	647	599	41	5	2	2,706		
Nebraska.....	4	150		6	27	5	112	Ap 122	Oc 103	118	108	10			425		
New Jersey.....	63	2,143	41	128	307	84	1,493	Ap 1,535	Je 1,434	1,487	1,353	112	2		5,924		
New York.....	147	4,741	78	305	1,041	270	3,047	No 3,137	Ja 2,908	3,125	2,862	252	9	2	10,857		
Ohio.....	87	2,587	39	214	616	183	1,535	My 1,662	De 1,431	1,517	1,342	174	1		5,572		
Pennsylvania.....	114	2,747	105	176	362	112	1,992	De 2,072	Ja 1,888	2,089	2,012	65	10	2	9,802		
Rhode Island.....	5	65	6	7	9	6	37	No 43	Fe 33	39	37				209		
Tennessee.....	6	117	1	17	22	6	71	My 77	Ja 63	74	65	7	2		1,045		
Texas.....	6	61	4	8	22	1	26	Ap 27	Fe 24	24	22				82		
Virginia.....	8	80	5	12	5	5	53	Se 58	Ap 48	57	55	2			241		
Washington.....	5	74		5	8	4	57	My 67	Ja 41	57	55	1	1		221		
Wisconsin.....	12	288	5	19	63	7	194	Ap 211	De 173	184	161	23			935		
All other states <sup>2</sup> .....	29	297	28	25	39	9	196			227	216	6	5		853		

STATE.	Capital.	EXPENSES.										Value of products.	Value added by manufacture (value of products less cost of materials).
		Total.	Services.			Materials.		Miscellaneous.					
			Officials.	Clerks.	Wage earners.	Fuel and rent of power.	Other.	Rent of factory.	Taxes, including internal revenue.	Contract work.	Other.		
<b>United States..</b>	<b>\$103,994,908</b>	<b>\$111,202,408</b>	<b>\$4,156,058</b>	<b>\$6,222,303</b>	<b>\$8,270,713</b>	<b>\$1,306,297</b>	<b>\$77,709,258</b>	<b>\$494,331</b>	<b>\$183,420</b>	<b>\$31,549</b>	<b>\$12,468,479</b>	<b>\$124,869,422</b>	<b>\$45,873,867</b>
California.....	2,674,666	3,244,074	104,140	54,041	275,177	35,566	2,616,528	16,188	8,785	267	133,382	3,758,090	1,165,996
Connecticut.....	1,100,131	1,404,872	69,322	101,821	146,891	23,468	801,995	2,364	3,605	2,063	253,343	1,543,010	717,547
Delaware.....	280,369	202,963	9,426	2,467	32,870	17,484	131,838	900	318		7,680	245,445	96,123
Georgia.....	176,711	220,953	7,960	6,975	16,115	2,455	170,027	3,540	792		13,080	221,508	49,026
Illinois.....	15,725,376	17,926,283	608,050	1,048,943	1,114,298	149,280	12,752,331	61,785	72,083	6,144	2,113,369	20,434,291	7,532,690
Indiana.....	840,783	991,465	52,822	58,703	74,229	10,184	672,861	8,464	5,783	267	108,152	1,107,805	424,760
Iowa.....	118,825	138,716	20,779	16,649	12,500	2,391	82,694	510	857		2,336	153,782	63,697
Kansas.....	847,623	656,686	13,925	13,140	55,941	3,521	411,104	1,686	1,934		55,435	579,674	165,049
Kentucky.....	1,149,600	1,666,523	74,577	121,189	78,541	12,045	1,200,498	5,061	8,498	75	166,039	1,062,081	749,538
Maine.....	83,149	129,789	7,940	4,024	10,491	1,997	98,340	2,510	320		4,167	140,097	39,760
Maryland.....	502,670	917,052	9,336	25,862	54,982	5,998	693,516	3,625	2,440		121,293	1,000,938	301,424
Massachusetts.....	2,195,084	3,028,327	133,439	152,962	250,962	47,837	2,026,827	31,283	21,145		363,872	3,468,560	1,363,896
Michigan.....	7,113,027	6,573,599	210,098	677,233	556,984	52,176	3,980,170	4,340	31,570	1,729	1,058,399	7,415,914	3,383,563
Minnesota.....	1,886,751	1,828,480	63,277	84,944	100,550	10,210	879,007	11,425	7,685	200	171,182	1,488,692	569,475
Missouri.....	5,294,896	6,206,694	238,996	264,150	366,164	47,258	4,651,002	32,505	25,762	860	579,988	6,827,747	2,120,487
Nebraska.....	734,041	1,131,769	14,900	50,206	68,331	9,431	839,726	600	3,269		145,306	1,254,475	405,318
New Jersey.....	11,372,234	11,091,618	460,456	640,036	843,924	193,829	8,032,144	36,019	49,499	9,300	826,411	12,766,029	4,540,956
New York.....	22,002,185	25,598,078	880,904	1,430,334	1,863,339	290,705	17,604,661	141,841	104,977	67,513	3,213,801	28,559,474	10,664,108
Ohio.....	11,757,377	12,482,218	598,965	778,140	904,378	96,353	8,473,693	42,917	72,046	600	1,515,126	13,617,180	5,047,143
Pennsylvania.....	14,833,702	12,598,754	416,052	531,026	1,101,669	252,023	8,948,071	59,740	43,359	2,060	1,243,554	14,019,744	4,818,750
Rhode Island.....	234,273	355,950	15,320	17,926	23,003	3,495	283,628	860	1,355		10,363	471,361	184,238
Tennessee.....	407,679	365,609	25,510	26,560	37,314	5,017	232,964	3,000	2,041		33,263	396,712	158,731
Texas.....	114,484	107,109	4,421	5,329	18,618	2,664	60,076	2,635	579		36,357	114,418	51,678
Virginia.....	293,937	275,408	20,857	4,112	20,928	2,084	185,955	4,235	1,048		12,189	344,620	150,587
Washington.....	296,273	265,178	7,370	10,806	50,745	3,382	151,113	3,740	1,445		36,577	281,838	127,343
Wisconsin.....	1,260,288	1,352,236	45,938	47,153	99,127	15,173	1,027,500	4,836	4,766	71	107,072	1,525,896	483,223
All other states <sup>2</sup> .....	1,219,774	1,041,948	40,378	47,563	92,342	9,371	700,939	7,722	7,459		136,124	1,189,126	478,766

<sup>1</sup> Same number reported for one or more other months.  
<sup>2</sup> All other states embrace: Alabama, 3 establishments; Arkansas, 1; Colorado, 4; District of Columbia, 1; Florida, 2; Louisiana, 3; Nevada, 1; North Carolina, 4; Oklahoma, 1; Oregon, 5; South Carolina, 1; South Dakota, 1; Utah, 1; West Virginia, 1.

---

---

SULPHURIC, NITRIC, AND  
MIXED ACID

---

---

(607)

# THE MANUFACTURE OF SULPHURIC, NITRIC, AND MIXED ACIDS.

## GENERAL STATISTICS.

Scope of the industry.—The segregation under a separate classification of establishments engaged primarily in the manufacture of sulphuric acid, nitric acid, and mixed acids (the latter being mixtures of sulphuric and nitric acids in various proportions) was first made at the census of 1904. At prior censuses such establishments were included under the classification "chemicals"; the returns for 1899, however, were so recorded that it has been possible to separate the statistics for establishments manufacturing these products from those engaged primarily in the manufacture of other acids and chemicals, so that the totals for that census may be placed in comparison with those for 1909 and 1904. Although the statistics here presented pertain to establishments manufacturing sulphuric, nitric, and mixed acids as chief products, additional statistics are given in certain of the tables showing the total production of these acids by all establishments, including those engaged primarily in the manufacture of fertilizers and explosives and those refining petroleum.

Comparison with earlier censuses.—Table 1 summarizes the statistics of the industry for 1909, 1904, and 1899.

At the census of 1909, 42 establishments were reported as engaged primarily in the manufacture of

sulphuric, nitric, and mixed acids, these establishments giving employment to 2,502 persons, of whom 2,252 were wage earners, and paying out \$1,494,894 in wages. The value of their products was \$9,884,057, the cost of the materials used, \$5,385,828, and the value added by manufacture, \$4,498,229, the cost of materials being equal to 54.5 per cent of the value of products.

	Number or amount.			Per cent of increase. <sup>1</sup>		
	1909	1904	1899	1899-1909	1904-1909	1899-1904
Number of establishments..	42	32	34	23.5	31.2	-5.9
Persons engaged in the industry.....	2,582	2,757	2,654	-2.7	-6.3	3.0
Proprietors and firm members.....	330	2	( <sup>2</sup> )	10.7	7.1	3.4
Salaried employees.....	330	308	298	10.7	7.1	3.4
Wage earners (average number).....	2,252	2,447	2,356	-4.4	-8.0	3.9
Primary horsepower.....	6,494	5,416	( <sup>2</sup> )	19.9	.....	.....
Capital.....	\$18,726,195	\$12,761,920	\$13,081,506	33.9	46.7	-8.7
Expenses.....	8,347,722	7,747,303	6,164,111	35.4	7.8	25.7
Services.....	2,045,894	2,061,512	1,715,895	19.2	-0.8	20.1
Salaries.....	551,000	556,106	388,346	41.9	-0.9	43.2
Wages.....	1,494,894	1,505,406	1,327,549	12.6	-0.7	13.4
Materials.....	5,385,828	4,972,838	4,033,238	33.5	8.3	23.3
Miscellaneous.....	916,000	712,953	414,978	120.7	28.5	71.8
Value of products.....	9,884,057	9,052,646	8,596,390	15.0	9.2	5.3
Value added by manufacture (value of products less cost of materials).....	4,498,229	4,079,808	4,563,152	-1.4	10.3	-10.6

<sup>1</sup> A minus sign (-) denotes decrease. <sup>2</sup> Comparable figures not available.

STATE.	Number of establishments.	PERSONS ENGAGED IN INDUSTRY.							WAGE EARNERS—DEC. 15, OR NEAREST REPRESENTATIVE DAY.				Primary horsepower.		
		Total.	Proprietors and firm members.	Salaried officers, superintendents, and managers.	Clerks.		Wage earners.			Total.	16 and over.			Under 16.	
					Male.	Female.	Average number.	Number, 15th day of—			Male.	Female.		Male.	Female.
								Maximum month.	Minimum month.						
United States.....	42	2,582	106	190	34	2,252	Oct 2,327	Apr 2,129	2,332	2,328	1	3	6,494		
California.....	6	247	11	16	3	217	Feb 230	Aug 203	210	210	.....	.....	735		
Connecticut.....	3	128	5	11	1	111	No 125	July 101	122	122	.....	.....	397		
New Jersey.....	6	494	19	33	8	434	No 475	Feb 395	452	452	.....	.....	1,575		
Ohio.....	4	148	8	10	1	129	Se 162	Jan 101	121	121	.....	.....	213		
Pennsylvania.....	6	172	11	22	7	132	Mh 149	Aug 121	155	151	1	3	286		
All other states <sup>1</sup> .....	17	1,393	52	98	14	1,229	.....	.....	1,272	1,272	.....	.....	3,248		

STATE.	Capital.	EXPENSES.										Value of products.	Value added by manufacture (value of products less cost of materials).
		Total.	Services.			Materials.		Miscellaneous.					
			Officials.	Clerks.	Wage earners.	Fuel and rent of power.	Other.	Rent of factory.	Taxes, including internal revenue.	Contract work.	Other.		
United States.....	\$18,726,195	\$8,347,722	\$311,573	\$239,427	\$1,494,894	\$520,084	\$4,865,744	\$4,525	\$85,620	\$212	\$825,643	\$9,884,057	\$4,498,229
California.....	2,614,500	1,112,402	38,020	19,205	172,864	105,811	634,504	.....	8,889	.....	133,109	1,160,937	420,622
Connecticut.....	998,270	460,435	12,350	11,362	69,279	36,680	287,395	.....	3,460	183	39,725	497,688	173,612
New Jersey.....	3,450,357	1,631,720	62,460	42,682	281,437	103,622	958,602	.....	17,045	.....	165,872	2,127,637	1,065,413
Ohio.....	574,391	394,571	17,307	12,268	82,350	20,238	228,339	.....	3,276	.....	30,793	417,702	169,125
Pennsylvania.....	1,142,636	506,459	17,060	27,848	87,240	29,196	298,797	.....	5,353	.....	40,965	624,473	296,480
All other states <sup>1</sup> .....	9,946,041	4,242,135	164,316	126,062	801,724	224,537	2,458,106	4,525	47,597	29	415,239	5,055,620	2,372,977

<sup>1</sup> All other states embrace: Colorado, 1 establishment; Illinois, 2; Kansas, 1; Louisiana, 1; Maryland, 3; Massachusetts, 1; Michigan, 1; New York, 4; Tennessee, 1; and Virginia, 2.

In comparing the figures in Table 1 for different censuses, it should be borne in mind that large quantities of sulphuric, nitric, and mixed acids are used in the manufacture of fertilizers and explosives and in other industries, and that variations from census to census in the relative extent to which the establishments in these industries manufacture the acids which they use as materials affect the figures for the establishments engaged in the manufacture of these acids as primary products.

During the decade 1899-1909 the value of products increased 15 per cent, but the average number of wage earners and value added by manufacture decreased 4.4 per cent and 1.4 per cent, respectively, all of the decrease in the former item taking place during the second half of the decade, and all of that in the latter item taking place in the first half of the decade.

**Summary, by states.**—Table 2 gives in detail the principal statistics of the manufacture of sulphuric, nitric, and mixed acids, by states, for 1909.

New Jersey was the leading state in 1909 in average number of wage earners, value of products, and value added by manufacture. In three of the four remaining states for which totals are presented, the value of products increased between 1904 and 1909, and in one (Ohio) it decreased. The states of Colorado, Illinois, Kansas, Maryland, and New York, included under "all other states," were large producers of sulphuric, nitric, and mixed acids.

**Persons engaged in the industry: 1909.**—Table 3 shows for 1909 the number of persons engaged in the industry, classified according to occupational status and sex, and in the case of wage earners, according to age also. It should be borne in mind that the sex and age classification of the average number of wage earners in this and other tables is an estimate obtained by the method described in the Introduction.

CLASS.	PERSONS ENGAGED IN THE SULPHURIC, NITRIC, AND MIXED ACID INDUSTRY: 1909		
	Total.	Male.	Female.
All classes.....	2,582	2,547	35
Proprietors and officials.....	106	106	
Proprietors and firm members.....	27	27	
Salaried officers of corporations.....	79	79	
Superintendents and managers.....			
Clerks.....	224	190	34
Wage earners (average number).....	2,252	2,251	1
16 years of age and over.....	2,249	2,248	1
Under 16 years of age.....	3	3	

The average number of persons engaged in the manufacture of sulphuric, nitric, and mixed acids in 1909 was 2,582, of whom 2,252, or 87.2 per cent, were wage earners, 106, or 4.1 per cent, officials, and 224, or 8.7 per cent, were clerks, this class including other subordinate salaried employees. Of the total number of persons engaged in the industry, 2,547, or 98.6 per cent, were males and 35, or 1.4 per cent, females.

There were only three wage earners under 16 years of age.

**Wage earners employed, by months.**—Table 4 gives the number of wage earners employed in the industry on the 15th (or the nearest representative day) of each month during the year 1909.

MONTH.	WAGE EARNERS IN THE SULPHURIC, NITRIC, AND MIXED ACID INDUSTRY: 1909	
	Number.	Per cent of maximum.
January.....	2,227	95.7
February.....	2,191	94.2
March.....	2,212	95.1
April.....	2,129	91.5
May.....	2,279	97.9
June.....	2,246	96.5
July.....	2,300	98.5
August.....	2,233	95.1
September.....	2,291	98.5
October.....	2,327	100.0
November.....	2,288	98.3
December.....	2,315	98.5

The largest number of wage earners employed during any month of 1909 was 2,327, in October, and the smallest number, 2,129, in April, the minimum number being equal to 91.5 per cent of the maximum. In 1904 the maximum number 2,640, was shown for March, and the minimum number, 2,248, for July, the latter number being equal to 85 per cent of the maximum. The months of maximum and minimum employment for 1909, and the number of wage earners reported for both months, are given for five states in Table 2.

**Prevailing hours of labor.**—In Table 5 the wage earners in the industry have been classified according to the number of hours of labor per week prevailing in the establishments in which they were employed. In making this classification the average number of wage earners employed during the year in each establishment was classified as a total according to the hours prevailing in that establishment, even though a few employees worked a greater or smaller number of hours.

PREVAILING HOURS OF LABOR PER WEEK.	WAGE EARNERS IN THE SULPHURIC, NITRIC, AND MIXED ACID INDUSTRY: 1909	
	Average number.	Per cent of total.
Total.....	2,252	100.0
54.....	203	9.0
Between 54 and 60.....	51	2.3
60.....	555	24.6
Between 60 and 72.....	446	19.8
72.....	130	5.8
Over 72.....	867	38.5

Of the 2,252 wage earners in the industry, 867, representing 38.5 per cent of the total, were employed in establishments where the prevailing hours of labor were over 72 per week; 130, or 5.8 per cent, in establishments where the prevailing hours were 72 per week; 1,001, or 44.4 per cent, in establishments where the prevailing hours were 60 but less than 72 per week; and only 254, or 11.3 per cent, in establishments where the prevailing hours were less than 60 per week.

**Character of ownership.**—All of the 42 establishments in the industry in 1909 were under corporate ownership. In 1904, 31 of the 32 establishments were operated by incorporated companies and one by a firm.

**Size of establishments.**—In 1909, 19 establishments manufactured products valued at \$100,000 but less than \$1,000,000, and 2, products valued at \$1,000,000 and over; these 21 establishments together reported products valued at \$8,644,108, or 87.5 per cent of the total for the industry. The remaining 21 establishments included 19 with products valued at \$20,000 but less than \$100,000, 1 with products valued at \$5,000 but less than \$20,000, and 1 with products valued at less than \$5,000. In 1904, although there were no establishments having products valued at \$1,000,000 or over, 21 had products valued at \$100,000 but less than \$1,000,000, these establishments reporting a combined product valued at \$8,395,689, or 92.7 per cent of the total for the industry. Of the remaining establishments, 10 reported products valued at \$20,000 but less than \$100,000, and 1 reported products valued at \$5,000 but less than \$20,000.

The average value of products per establishment decreased from \$282,895 in 1904 to \$235,335 in 1909, and the average value added by manufacture, as computed from the figures in Table 1, from \$127,494 to \$107,101. The average number of wage earners per establishment shows a decrease from 76.5 in 1904 to 53.6 in 1909.

Table 6 classifies the establishments in the industry in 1909 according to the number of wage earners employed.

WAGE EARNERS PER ESTABLISHMENT.	SULPHURIC, NITRIC, AND MIXED ACID INDUSTRY: 1909		
	Number of establishments.	Wage earners employed.	
		Average number.	Per cent of total.
1 to 20.....	18	211	9.4
21 to 50.....	10	328	14.6
51 to 100.....	7	540	24.0
101 to 250.....	5	651	28.0
Over 250.....	2	522	23.2

**Expenses.**—As stated in the Introduction, the census figures representing expenses do not purport to show the total cost of manufacture, since they take no account of interest or depreciation; hence they can not properly be used for determining profits. Facts

#### SPECIAL STATISTICS RELATING TO MATERIALS AND PRODUCTS.

**Materials.**—Table 8 presents statistics of the materials used in establishments manufacturing sulphuric, nitric, and mixed acids as their primary products in 1909, 1904, and 1899.

The quantity of sulphur used in the industry shows an increase of 8.3 per cent for the decade as a whole, all of which took place during the five-year period 1904-1909, while its cost shows a decrease of 12.1 per

of interest can be brought out, however, concerning the relative importance of the different classes of expenses which were reported. Table 1 shows the total expenses in 1909 to have been \$8,347,722, distributed as follows: Cost of materials, \$5,385,828, or 64.5 per cent; wages, \$1,494,894, or 17.9 per cent; salaries, \$551,000, or 6.6 per cent; and miscellaneous expenses, made up of advertising, ordinary repairs of buildings and machinery, insurance, traveling expenses, and other sundry expenses, \$916,000, or 11 per cent. These proportions, as may be seen by comparing the items in Table 2, vary somewhat in the several states.

**Engines and power.**—Table 7 shows statistics of power as reported at the censuses of 1909 and 1904.

POWER.	SULPHURIC, NITRIC, AND MIXED ACID INDUSTRY.					
	Number of engines or motors.		Horsepower.		Per cent distribution of horsepower.	
	1909	1904	1909	1904	1909	1904
Primary power, total.....	254	174	6,494	5,416	100.0	100.0
Owned.....	184	142	5,454	5,001	84.0	92.3
Steam.....	176	135	5,083	3,945	78.3	72.8
Gas.....	8	7	371	161	5.7	3.0
Other.....				895		16.5
Rented.....	70	32	1,040	415	16.0	7.7
Electric motors.....	70	32	878	415	13.5	7.7
Other.....			162		2.5	
Electric motors.....	195	45	2,230	540	100.0	100.0
Run by current generated by establishment.....	125	13	1,352	125	60.6	23.1
Run by rented power.....	70	32	878	415	39.4	76.9

The total primary power used in the industry increased from 5,416 horsepower in 1904 to 6,494 horsepower in 1909, or 19.9 per cent. Steam engines furnished the greater part of the power used, 78.3 per cent of the total in 1909 and 72.8 per cent in 1904. Rented electric power ranked second in importance in 1909, constituting 13.5 per cent of the total.

**Fuel consumed.**—The fuel consumed in the industry in 1909, for all purposes, including that used in the generation of power, comprised 35,943 long tons of anthracite coal, 106,310 short tons of bituminous coal, 124,286 barrels of oil, 104,864,000 cubic feet of gas, 1,298 tons of coke, and 400 cords of wood. Table 2 shows that \$520,084 was expended for fuel and rent of power in 1909.

cent, the average cost per ton in 1909 being considerably less than that in 1904 or 1899. The quantity of pyrites used, on the other hand, increased 87.6 per cent and the cost increased 121.2 per cent during the decade, practically all of these increases taking place between 1904 and 1909. There was a decrease of 7.3 per cent during the decade in the quantity of nitrate of soda used; its cost, however, increased 25.8 per cent.

MATERIAL.	MATERIALS USED IN THE SULPHURIC, NITRIC, AND MIXED ACID INDUSTRY.			
	1909	1904	1899	Per cent of increase: <sup>1</sup> 1899-1909
Total cost.....	\$5,385,828	\$4,972,838	\$4,033,238	33.5
Sulphur or brimstone:				
Tons.....	26,927	23,044	24,858	8.3
Cost.....	\$403,398	\$479,529	\$459,102	-12.1
Pyrites:				
Tons.....	370,333	197,847	197,459	87.6
Cost.....	\$2,109,932	\$967,207	\$953,680	121.2
Nitrate of soda:				
Tons.....	27,158	27,406	29,301	-7.3
Cost.....	\$1,225,924	\$1,143,280	\$974,429	25.8
All other materials.....	\$1,646,574	\$2,382,822	\$1,646,027	( <sup>2</sup> )

<sup>1</sup> A minus sign (-) denotes decrease. <sup>2</sup> Less than one-tenth of 1 per cent.

Since a very large proportion of the total amount of sulphuric, nitric, and mixed acids manufactured is made by establishments in other industries, either as secondary products or for their own use in further processes of manufacture, the quantity and value of the sulphur, pyrites, and nitrate of soda used by such establishments are shown in Table 9, which also gives the quantity and value of these materials used by establishments in the industry, together with the combined total reported for all establishments making these acids.

MATERIAL.	PRINCIPAL MATERIALS USED IN THE MANUFACTURE OF SULPHURIC, NITRIC, AND MIXED ACIDS: 1909		
	Total.	In establishments engaged primarily in the manufacture of sulphuric, nitric, and mixed acids.	In establishments engaged primarily in the manufacture of other products. <sup>1</sup>
Number of establishments reporting....	165	42	123
Sulphur or brimstone:			
Quantity (tons).....	42,728	26,927	15,801
Cost.....	\$718,520	\$403,398	\$315,122
Pyrites:			
Quantity (tons).....	990,043	370,333	619,710
Cost.....	\$5,747,007	\$2,109,932	\$3,637,075
Nitrate of soda:			
Quantity (tons).....	46,907	27,158	19,749
Cost.....	\$2,112,251	\$1,225,924	\$886,327

<sup>1</sup> Not including those used by 13 establishments manufacturing explosives and producing for use in further processes of manufacture 42,555 tons of sulphuric acid and 31,484 tons of nitric acid for which separate figures are not available.

In the aggregate, 183 establishments reported the manufacture of sulphuric, nitric, and mixed acids. These establishments include 13 engaged in the manufacture of explosives, for which separate figures as to the materials used in the manufacture of acids are not available, and 5 which reported the utilization of sulphur fumes from the roasting or smelting of copper and zinc sulphide ores. The quantity of ore used by these latter establishments was not fully reported, but was approximately 275,000 tons, and is not included with the pyrites above reported. The sulphur fumes are considered a waste product, and no cost was assigned to them.

The establishments engaged primarily in other industries which manufactured sulphuric, nitric, and

mixed acids include 94 fertilizer factories manufacturing sulphuric acid for their own use, which reported 4,236 tons of sulphur and 456,574 tons of pyrites, or nearly one-half of the aggregate quantity of pyrites reported.

Table 10 shows, by states, the aggregate quantity of sulphur, pyrites, and nitrate of soda used in all establishments manufacturing sulphuric, nitric, and mixed acids, the quantity and cost of such materials used in the industry proper, and the quantity used in establishments engaged chiefly in the manufacture of other products.

MATERIAL AND STATE.	PRINCIPAL MATERIALS USED IN THE MANUFACTURE OF SULPHURIC, NITRIC, AND MIXED ACIDS: 1909			
	Total quantity (tons).	In establishments engaged primarily in the manufacture of sulphuric, nitric, and mixed acids.		In establishments engaged primarily in the manufacture of other products (quantity—tons).
		Quantity (tons).	Cost.	
Sulphur or brimstone.....	42,728	26,927	\$403,398	15,801
California.....	3,030	3,030	37,722	.....
Connecticut.....	3,572	3,496	73,615	76
Pennsylvania.....	14,829	13,287	148,742	1,542
All other states.....	20,891	6,508	143,319	14,183
Pyrites.....	990,043	370,333	2,109,932	619,710
Alabama.....	73,868	.....	.....	73,868
California.....	51,310	43,185	307,103	8,125
Florida.....	17,359	.....	.....	17,359
Georgia.....	121,073	.....	.....	121,073
Maryland.....	75,050	58,558	347,242	16,492
Mississippi.....	20,684	.....	.....	20,684
New Jersey.....	144,807	88,073	443,608	59,794
New York.....	64,812	48,417	304,606	16,395
North Carolina.....	47,715	.....	.....	47,715
Ohio.....	44,206	27,394	152,162	17,012
Pennsylvania.....	32,247	9,110	59,412	23,131
South Carolina.....	80,653	.....	.....	80,653
Tennessee.....	22,902	( <sup>1</sup> )	( <sup>1</sup> )	22,902
Virginia.....	65,082	( <sup>1</sup> )	( <sup>1</sup> )	( <sup>1</sup> )
All other states.....	126,715	58,391	433,165	68,324
Nitrate of soda.....	46,907	27,158	1,225,924	219,749
California.....	4,597	4,536	178,190	61
Connecticut.....	1,534	1,499	54,344	35
Illinois.....	3,625	( <sup>1</sup> )	( <sup>1</sup> )	( <sup>1</sup> )
Massachusetts.....	4,240	( <sup>1</sup> )	( <sup>1</sup> )	( <sup>1</sup> )
New Jersey.....	11,830	7,661	351,330	4,178
New York.....	5,728	5,006	237,663	722
Ohio.....	1,243	328	1,560	920
Pennsylvania.....	2,020	243	11,864	1,777
All other states.....	12,076	4,653	224,292	7,423

<sup>1</sup> Included in total, but amount omitted to avoid disclosure of individual operations.

<sup>2</sup> Not including nitrate of soda used as a fertilizer material by establishments in the fertilizer industry.

**Products.**—Table 11 shows for 1909, 1904, and 1899 the quantity and value of the products reported by establishments manufacturing sulphuric, nitric, and mixed acids as their principal products.

Sulphuric acid is produced in several grades: 50° Baumé acid, also known as chamber acid, containing on an average 51.04 per cent of SO<sub>3</sub>; 60° Baumé acid, containing on an average 63.7 per cent of SO<sub>3</sub>; and 66° Baumé acid, known as oil of vitriol, containing on an average 76.35 per cent of SO<sub>3</sub>. Oleum or fuming sulphuric acid, which consists of SO<sub>3</sub> dissolved in sulphuric acid, usually contains 30 per cent free SO<sub>3</sub>, or a total of 87.14 per cent of free and combined SO<sub>3</sub>. Oleum is readily produced by the contact process, which was described in the report on chemicals and allied products for 1899, and had then but recently

been introduced into this country; it was first reported at the census of 1904. For the purpose of reducing the different grades to the basis of 50° Baumé acid, the quantity of 60° acid is multiplied by the factor 1.25, that of 66° acid by 1.5, and that of oleum by 1.71.

In 1909, 601,024 tons of pyrite cinder and 43,301 tons of niter cake were reported by all establishments manufacturing sulphuric, nitric, and mixed acids, but a considerable portion of both these residual products had no commercial value at the works.

In addition to the production shown in Table 11, sulphuric, nitric, and mixed acids to the value of \$5,735,370 in 1909 and \$5,195,433 in 1904 were made for sale by establishments engaged primarily in the manufacture of other chemicals and of fertilizers and in other industries. Table 13 gives the aggregate production of these acids for sale both by the establishments in the sulphuric, nitric, and mixed acid industry and by those in other industries during 1909 and 1904.

PRODUCT.	PRODUCTS OF THE SULPHURIC, NITRIC, AND MIXED ACID INDUSTRY.			
	1909	1904	1899	Per cent of increase, 1899-1909
Total value.....	\$9,884,057	\$9,052,648	\$8,596,390	15.0
Acids.....	\$7,567,274	\$6,955,078	\$6,200,872	21.9
Sulphuric:				
Quantity (tons).....	683,588	354,954	324,365	110.7
Reduced to 50° Baumé.....	855,191	407,614	452,942	88.8
Value.....	\$5,629,496	\$4,286,312	\$4,071,848	38.3
50° Baumé:				
Quantity (tons).....	315,437	128,369	60,387	422.4
Value.....	\$1,650,406	\$917,683	\$627,882	162.9
60° Baumé:				
Quantity (tons).....	73,073	13,634	13,650	435.3
Value.....	\$401,734	\$121,432	\$199,380	101.5
66° Baumé:				
Quantity (tons).....	267,476	199,663	250,328	6.8
Value.....	\$3,158,007	\$2,886,179	\$3,244,586	-2.7
Oleum or fuming sulphuric acid:				
Quantity (tons).....	27,602	13,268	.....	.....
Value.....	\$419,250	\$361,018	.....	.....
Nitric:				
Quantity (tons).....	4,198	15,153	10,201	-58.8
Value.....	\$499,303	\$1,446,471	\$1,028,266	-51.5
Mixed:				
Quantity (tons).....	22,681	21,406	21,151	7.2
Value.....	\$1,438,475	\$1,222,295	\$1,109,758	29.6
All other products.....	\$2,316,783	\$2,097,568	\$2,386,518	-2.9

<sup>1</sup> A minus sign (-) denotes decrease.

Of the total value of products in 1909, that of sulphuric acid represented 57 per cent, that of nitric acid 5.1 per cent, and that of mixed acids, 14.6 per cent. The total production of these acids increased 21.9 per cent in value during the decade 1899-1909. The output of sulphuric acid sold as such increased 88.8 per cent on the basis of 50° Baumé acid, and that of mixed acids 7.2 per cent, while the production of nitric acid sold as such shows a decrease of 58.8 per cent, all of which, however, took place between 1904 and 1909.

The value of "all other products" includes the value of pyrite cinder and niter cake sold. Table 12 gives the statistics for these waste products for 1909.

	SULPHURIC, NITRIC, AND MIXED ACIDS MADE FOR SALE.				
	Total.	Made in establishments engaged primarily in the manufacture of—		Per cent of total contributed by establishments engaged primarily in the manufacture of—	
		Sulphuric, nitric, and mixed acids.	Other products.	Sulphuric, nitric, and mixed acids.	Other products.
Number of establishments reporting:					
1909.....	110	42	68	38.2	61.8
1904.....	.....	32	( <sup>1</sup> )	.....	.....
Sulphuric, nitric, and mixed acids, total value:					
1909.....	\$13,303,644	\$7,567,274	\$5,735,370	56.9	43.1
1904.....	12,150,511	6,955,078	5,195,433	57.2	42.8
Sulphuric—					
Quantity (tons), reduced to 50° Baumé—					
1909.....	1,476,992	855,191	621,801	57.9	42.1
1904.....	900,901	407,614	433,377	51.9	48.1
Value—					
1909.....	\$10,084,759	\$5,629,496	\$4,455,263	55.8	44.2
1904.....	7,942,211	4,286,312	3,055,699	54.0	46.0
Nitric—					
Quantity (tons)—					
1909.....	13,663	4,198	9,465	30.7	69.3
1904.....	23,132	15,153	7,979	65.5	34.5
Value—					
1909.....	\$1,357,098	\$499,303	\$857,795	36.8	63.2
1904.....	2,250,944	1,446,471	804,473	64.3	35.7
Mixed—					
Quantity (tons)—					
1909.....	28,591	22,681	5,910	79.3	20.7
1904.....	32,665	21,406	11,259	65.5	34.5
Value—					
1909.....	\$1,860,787	\$1,438,475	\$422,312	77.3	22.7
1904.....	1,957,356	1,222,295	735,061	62.4	37.6

<sup>1</sup> Figures not available.

Of the total value of sulphuric, nitric, and mixed acids reported as made for sale in 1909 by establishments engaged primarily in the manufacture of other products (\$5,735,370), establishments engaged in the manufacture of other chemicals contributed \$3,989,025, those included in the fertilizer industry, \$923,492, and zinc smelting and refining establishments, \$487,507, the balance being reported by establishments engaged in the manufacture of explosives, mucilage and paste, and paints, in petroleum refining, and in copper smelting.

It will be noted that of the total value of sulphuric, nitric, and mixed acids produced for sale in 1909, less than three-fifths (56.9 per cent) was reported by establishments manufacturing these acids as primary

PRODUCT.	PYRITE CINDER AND NITER CAKE REPORTED BY ESTABLISHMENTS MANUFACTURING SULPHURIC, NITRIC, AND MIXED ACIDS.		
	Total.	By establishments engaged primarily in manufacturing sulphuric, nitric, and mixed acids.	By establishments engaged primarily in the manufacture of other products.
Pyrite cinder:			
Total quantity (tons).....	601,024	155,738	445,286
Reported with value.....	404,318	71,688	332,630
Reported with no value.....	196,706	84,050	112,656
Value of quantity "reported with value".....	\$325,632	\$127,270	\$198,362
Niter cake:			
Total quantity (tons).....	43,301	20,489	22,812
Reported with value.....	27,546	14,061	13,485
Reported with no value.....	15,755	6,428	9,327
Value of quantity "reported with value".....	\$53,698	\$32,651	\$21,042

products, the proportion in 1904 being about the same. The percentages of the total production reported by such establishments in 1909 vary considerably in the case of the different acids, ranging from 79.3 for mixed acids to 30.7 for nitric acid.

In addition to the sulphuric acid made for sale, large quantities are made for use in further processes of manufacture by establishments engaged primarily in the manufacture of other chemicals, fertilizers, and explosives, and in the refining of petroleum. Table 14 presents statistics as to the total production of sulphuric acid, by grades, in 1909, 1904, and 1899, including that consumed in the establishment where produced.

	SULPHURIC ACID PRODUCED (INCLUDING THAT CONSUMED IN THE ESTABLISHMENT WHERE PRODUCED).					
	1909	1904	1899	Per cent of increase. <sup>1</sup>		
				1899-1909	1904-1909	1899-1904
<b>Total production:</b>						
Quantity (tons), as reported.....	2,400,505	1,642,262	1,352,739	77.5	46.2	21.4
Value.....	\$16,779,195	\$15,174,886	\$14,247,185	17.8	10.6	6.5
<b>Reduced to 50° Baumé acid (tons):</b>						
For sale.....	2,748,527	1,869,437	1,548,123	77.5	47.0	20.8
For use in establishment where produced.....	1,476,992	900,992	783,768	83.4	63.9	15.0
50° Baumé—	1,271,535	968,445	764,355	66.4	31.3	26.7
Quantity (tons).....	1,624,178	1,109,141	953,439	70.3	38.9	22.6
Value.....	\$8,494,451	\$8,314,646	\$7,965,832	6.6	2.1	4.4
60° Baumé—	180,900	48,688	17,012	998.6	283.9	186.2
Quantity (tons).....	\$1,089,350	\$581,523	\$246,284	342.3	87.3	136.1
Value.....	558,078	411,165	382,279	46.0	35.7	7.6
Quantity (tons).....	\$6,719,269	\$5,917,699	\$6,036,069	11.3	13.5	-1.9
Value.....	31,340	33,268	.....	.....	136.3	.....
Quantity (tons).....	\$476,135	\$361,018	.....	.....	31.9	.....
Value.....						

<sup>1</sup> A minus sign (—) denotes decrease.

Approximately one-half of the total amount of sulphuric acid made is used in the establishments manufacturing it, the proportion of the total quantity on the basis of 50° acid being 46.3 per cent in 1909, 51.8 per cent in 1904, and 49.4 per cent in 1899. The bulk of the acid used in the establishment where produced is 50° Baumé, or chamber acid. The chamber process is in most general use. The use of the contact process

was reported by 17 establishments. The weight of the platinum used in the contact mass was not in all cases reported, but the quantities reported ranged from a minimum of 257 ounces to a maximum of 1,587 ounces. It is not possible to give the quantity of acid made by the contact and by the chamber processes, respectively, as the production by each process was not separately reported in the case of establishments using both.

Table 15 gives the total production of nitric acid reported by all establishments in 1909, 1904, and 1899, and shows the quantity and value of that made for sale and the quantity consumed in the establishments where produced.

	NITRIC ACID PRODUCED (INCLUDING THAT CONSUMED IN THE ESTABLISHMENT WHERE PRODUCED).					
	1909	1904	1899	Per cent of increase. <sup>1</sup>		
				1899-1909	1904-1909	1899-1904
<b>Total production (tons)...</b>	68,717	54,190	31,542	118.0	26.8	71.8
<b>For sale:</b>						
Quantity (tons).....	13,603	23,132	15,481	-11.7	-40.9	49.4
Value.....	\$1,357,098	\$2,250,944	\$1,454,909	-6.7	-39.7	54.7
<b>For use in establishment where produced (tons)....</b>	55,054	31,058	16,061	242.8	77.3	93.4

<sup>1</sup> A minus sign (—) denotes decrease.

The total production of nitric acid in 1909 was 68,717 tons, as compared with 54,190 tons in 1904, and 31,542 tons in 1899, the increase for the decade being 118 per cent. In 1899 but slightly more than half of the total production (50.9 per cent) was used in the establishments where produced, while in 1909 the proportion was over four-fifths (80.1 per cent).

Mixtures of sulphuric acid and nitric acid are now used to a considerable extent in the manufacture of explosives and other chemicals. The statistics of production were first reported in 1899. The total production for sale was 28,591 tons, valued at \$1,860,787, in 1909; 32,665 tons, valued at \$1,957,356, in 1904; and 21,184 tons, valued at \$1,111,158, in 1899, showing an increase for the decade of 35 per cent in quantity and of 67.4 per cent in value.

Table 16 shows, by states, the detailed statistics of the manufacture of sulphuric, nitric, and mixed acids the products of establishments engaged primarily in in 1909.

PRODUCT.	PRODUCTS OF THE SULPHURIC, NITRIC, AND MIXED ACID INDUSTRY.								
	United States.	California.	Connecticut.	Maryland.	New Jersey.	New York.	Ohio.	Pennsylvania.	All other states.
Total value.....	\$9,884,057	\$1,160,937	\$497,688	\$687,654	\$2,127,637	\$1,393,594	\$417,702	\$624,473	\$2,974,372
Sulphuric, nitric, and mixed acids.....	\$7,567,274	\$1,150,033	\$341,612	\$687,426	\$1,782,767	\$1,110,876	\$321,358	\$494,611	\$1,078,591
Sulphuric:									
Quantity (tons), reduced to 50° Baumé.....	855,101	82,498	26,802	132,760	188,198	90,447	55,553	58,493	220,350
Value.....	\$5,629,495	\$782,106	\$268,580	\$687,426	\$1,228,661	\$693,615	\$314,405	\$494,611	\$1,160,092
50° Baumé—									
Quantity (tons).....	1,362,636	149,152	10,091	132,760	42,689	120,930	32,600	.....	74,414
Value.....	\$2,069,665	\$413,845	\$109,606	\$687,426	\$200,045	\$119,046	\$142,287	.....	\$397,410
60° Baumé—									
Quantity (tons).....	73,073	541	.....	.....	.....	8,346	.....	.....	64,186
Value.....	\$401,734	\$8,267	.....	.....	.....	\$74,086	.....	.....	\$319,384
66° Baumé—									
Quantity (tons).....	267,476	21,780	11,201	.....	97,006	39,390	15,302	38,995	43,802
Value.....	\$3,158,097	\$350,994	\$158,974	.....	\$1,028,616	\$500,483	\$172,118	\$494,611	\$443,301
Nitric:									
Quantity (tons).....	4,198	295	847	.....	1,866	227	.....	.....	963
Value.....	\$499,303	\$38,881	\$73,032	.....	\$247,729	\$20,561	.....	.....	\$113,100
Mixed:									
Quantity (tons).....	22,681	7,056	.....	.....	3,950	6,144	87	.....	5,444
Value.....	\$1,438,475	\$329,046	.....	.....	\$306,377	\$300,700	\$6,953	.....	\$405,399
All other products.....	\$2,316,783	\$10,904	\$156,076	\$228	\$344,870	\$282,718	\$96,344	\$129,862	\$1,295,781

<sup>1</sup> Includes oleum reduced to 50° Baumé.

---

---

# WOOD DISTILLATION

# WOOD DISTILLATION.

**Scope of the industry.**—The establishments making up the industry designated "wood distillation, not including turpentine and rosin" comprise those engaged primarily in the distillation of wood by either the destructive or steam process. The principal products of this industry are wood alcohol, acetate of lime, turpentine, tar, and charcoal; and among the less important products are acetone, formaldehyde, wood ashes, pyroligneous acid, pyrolignite of iron, and wood creosote.

In the North the hardwoods are generally used, the principal products being wood alcohol, acetate of lime, and charcoal. In the South wood distillation is usually confined to pine, and the main products are turpentine, tar, and charcoal. Plants whose principal product is charcoal are not included in this industry, nor establishments making spirits of turpentine from the crude turpentine or gum exuded by the southern pine, these establishments constituting, respectively, the charcoal industry and the turpentine and rosin industry as defined by the Census Bureau.

The statistics cover several establishments which purchase crude wood alcohol as their raw material and by further processes of manufacture turn it into the refined product. This results in a certain amount of duplication in the returns, 7,135,614 gallons of crude alcohol, valued at \$1,784,029, having been purchased in 1909 by these refining establishments. It is fair to assume that most of this alcohol was produced by other establishments in the industry and was included among the products reported by them.

**Comparison with earlier censuses.**—The returns for 1899 were made in such a way that separate totals for the industry can be presented for that census, but the returns for prior censuses can not now be segregated. Table 1 summarizes the statistics of the industry for 1909, 1904, and 1899.

The value of products reported for 1909 exceeded

that for 1899 by \$3,735,975, a relative increase for the decade of 62.3 per cent. The number of wage earners increased from 1,556 in 1899 to 2,721 in 1909, a gain of 74.9 per cent, while the amount paid in wages more than doubled during the decade. The decrease from 1904 to 1909 in the number of proprietors and firm members reported is explained by the decrease in the number of establishments under individual and firm ownership. The cost of materials in 1909 was \$5,875,851, which was equal to 60.3 per cent of the value of products, and the value added by manufacture (value of products less cost of materials) was \$3,861,147.

	NUMBER OR AMOUNT.			PER CENT OF INCREASE. <sup>1</sup>		
	1909	1904	1899	1899-1909	1904-1909	1899-1904
Number of establishments..	120	141	102	17.6	-14.9	38.2
Persons engaged in the industry.....	3,095	2,655	(?)	.....	18.6	.....
Proprietors and firm members.....	56	82	(?)	.....	-31.7	.....
Salaries employees.....	318	301	235	35.3	5.0	28.1
Wage earners (average number).....	2,721	2,272	1,556	74.9	19.8	46.0
Primary horsepower.....	9,854	4,620	(?)	.....	113.3	.....
Capital.....	\$13,017,192	\$10,506,979	\$6,729,127	93.4	23.9	56.1
Expenses.....	8,473,558	6,843,521	4,736,829	78.9	23.8	44.5
Services.....	1,818,059	1,364,314	913,509	99.0	33.3	49.3
Salaries.....	355,211	297,528	213,025	65.7	19.4	39.7
Wages.....	1,462,848	1,066,786	700,484	108.8	37.1	52.3
Materials.....	5,875,851	4,847,770	3,455,015	70.1	21.2	40.3
Miscellaneous.....	779,648	631,437	368,305	111.7	23.5	71.4
Value of products.....	9,736,998	7,813,483	6,001,023	62.3	24.0	30.2
Value added by manufacture (value of products less cost of materials).....	3,861,147	2,965,713	2,546,008	51.7	30.2	16.5

<sup>1</sup> A minus sign (-) denotes decrease. Where percentages are omitted, comparable figures are not available.  
<sup>2</sup> Comparable figures not available.

**Summary, by states.**—Table 2 summarizes the more important statistics for the industry, by states, the states being arranged according to the value of products for 1909. The ranking of the states in this table is their actual ranking among all the states in the industry, although the statistics for some states are omitted in order to avoid disclosing individual operations.

STATE.	Number of establishments: 1909	WAGE EARNERS.				VALUE OF PRODUCTS.				VALUE ADDED BY MANUFACTURE.				PER CENT OF INCREASE. <sup>1</sup>		
		Average number: 1909	Per cent of total: 1909	Rank.		Amount: 1909	Per cent of total: 1909	Rank.		Amount: 1909	Per cent of total: 1909	Rank.		Wage earners (average number): 1904-1909	Value of products: 1904-1909	Value added by manufacture: 1904-1909
				1909	1904			1909	1904			1909	1904			
United States.....	120	2,721	100.0	.....	.....	\$9,736,998	100.0	.....	.....	\$3,861,147	100.0	.....	.....	19.8	24.6	30.2
New York.....	29	593	21.8	3	2	3,401,722	34.9	1	1	883,201	22.8	3	2	21.3	1.3	0.7
Pennsylvania.....	50	933	34.3	1	1	2,960,162	30.4	2	2	1,276,213	33.1	1	1	-25.3	-4.3	-7.8
Michigan.....	12	806	29.6	2	3	2,398,927	24.6	3	3	1,243,578	32.2	2	3	177.0	224.9	221.0
Georgia.....	4	63	2.3	5	4	209,214	2.1	4	0	95,401	2.5	4	7	.....	.....	.....
Florida.....	7	82	3.0	4	6	138,146	1.4	6	5	83,371	2.2	5	5	.....	.....	.....
North Carolina.....	5	51	1.9	6	5	104,241	1.1	7	7	70,334	1.8	6	6	.....	.....	.....
South Carolina.....	3	19	0.7	11	7	51,878	0.5	11	14	33,903	0.9	9	13	.....	.....	.....
All other states.....	10	174	6.4	.....	.....	472,708	4.9	.....	.....	175,146	4.5	.....	.....	.....	.....	.....

<sup>1</sup> A minus sign (-) denotes decrease. Percentage not shown where base is less than 100 for wage earners or less than \$100,000 for value of products or value added by manufacture.

Three states, New York, Pennsylvania, and Michigan, together reported 85.7 per cent of the average number of wage earners in 1909, 90 per cent of the value of products, and 88.1 per cent of the value added by manufacture. Outside of the 3 leading states only 29 establishments were reported, these being distributed among 12 states—Alabama, Georgia, Florida, Louisiana, Missouri, New Jersey, North Carolina, Oregon, South Carolina, Vermont, West Virginia, and Wisconsin. Figures for 1899 for the individual states are not available.

**Persons engaged in the industry.**—Table 3 shows, for 1909, the number of persons engaged in the industry, classified according to occupational status and sex, and in the case of wage earners according to age. It should be borne in mind that the sex and age classification of the average number of wage earners in this and other tables is an estimate obtained by the method described in the Introduction.

CLASS.	PERSONS ENGAGED IN THE INDUSTRY: 1909		
	Total.	Male.	Female.
All classes.....	3,095	3,064	31
Proprietors and officials.....	255	249	6
Proprietors and firm members.....	56	50	6
Salaried officers of corporations.....	73	73	.....
Superintendents and managers.....	126	126	.....
Clerks.....	119	94	25
Wage earners (average number).....	2,721	2,721	.....
16 years of age and over.....	2,721	2,721	.....
Under 16 years of age.....	.....	.....	.....

Of the 3,095 persons engaged in the industry during 1909, 2,721, or 87.9 per cent, were wage earners, 255, or 8.2 per cent, proprietors and officials, and 119, or 3.8 per cent, clerks, this class including other subordinate salaried employees. Of the persons engaged in the industry, 99 per cent were males. No females or children were reported among the wage earners.

**Wage earners employed, by months.**—Table 4 gives the number of wage earners employed in the industry on the 15th (or the nearest representative day) of each month during 1909. The number of wage earners for the months of maximum and minimum employment are shown for seven states in Table 14.

MONTH.	WAGE EARNERS EMPLOYED IN THE INDUSTRY: 1909	
	Number.	Per cent of maximum.
January.....	2,800	91.7
February.....	2,868	93.9
March.....	2,807	91.9
April.....	2,754	90.2
May.....	2,626	86.0
June.....	2,583	84.0
July.....	2,519	82.5
August.....	2,478	81.2
September.....	2,604	85.3
October.....	2,707	88.7
November.....	2,869	94.0
December.....	3,053	100.0

In the industry as a whole the largest number of wage earners employed during any month of 1909 was 3,053, in December, and the smallest number, 2,478, in August, the minimum number being equal to 81.2 per cent of the maximum. In 1904 the maximum number, 2,399, was reported for January, and the minimum number, 2,052, for July, the latter number being equal to 85.5 per cent of the former.

**Prevailing hours of labor.**—In Table 5 the wage earners in the industry have been classified according to the number of hours of labor per week prevailing in the establishments in which they were employed. In making this classification the average number of wage earners employed during the year in each establishment was classified as a total according to the hours prevailing in that establishment, even though a few employees worked a greater or smaller number of hours.

PREVAILING HOURS OF LABOR.	WAGE EARNERS IN THE INDUSTRY: 1909	
	Average number.	Per cent of total.
Total.....	2,721	100.0
48 and under.....	51	1.9
54.....	42	1.5
Between 54 and 60.....	6	0.2
60.....	1,023	37.6
Between 60 and 72.....	653	24.2
72.....	242	8.9
Over 72.....	699	25.7

Of the 2,721 wage earners employed in the industry, 37.6 per cent were in establishments where the prevailing hours were 60 per week, 24.2 per cent where the prevailing hours were between 60 and 72, and 34.6 per cent where they were 72 or over. Only 3.6 per cent of the wage earners worked in establishments where the prevailing hours were less than 60 per week.

**Character of ownership.**—Table 6 presents statistics with respect to the character of ownership of the establishments in the industry.

CHARACTER OF OWNERSHIP.	NUMBER OF ESTABLISHMENTS.		VALUE OF PRODUCTS.	
	1909	1904	1909	1904
Total.....	120	141	\$9,736,998	\$7,813,48
Individual.....	14	15	648,479	378,40
Firm.....	14	26	673,533	897,10
Corporation.....	92	100	8,414,986	6,537,01
Per cent of total.....	100.0	100.0	100.0	100.
Individual.....	11.7	10.6	6.7	4.
Firm.....	11.7	18.4	6.9	11.
Corporation.....	76.7	70.9	86.4	83.

In 1909, of the total number of establishments, 76.7 per cent were under corporate ownership, as compared with 70.9 per cent in 1904. In 1909 the value of products of these establishments represented 86.4 per cent of the total, and in 1904, 83.7 per cent.

**Size of establishments.**—Table 7 presents statistics for 1909 and 1904 for establishments grouped according to the value of their products.

	NUMBER OF ESTABLISHMENTS.		VALUE OF PRODUCTS.	
	1909	1904	1909	1904
Total.....	120	141	\$9,736,998	\$7,813,483
Less than \$5,000.....	8	12	22,670	(1)
\$5,000 and less than \$20,000.....	30	41	392,267	(1)
\$20,000 and less than \$100,000.....	61	76	3,111,998	3,221,869
\$100,000 and over.....	21	12	6,210,063	2,215,792
Per cent of total.....	100.0	100.0	100.0	100.0
Less than \$5,000.....	6.7	8.5	0.2	(1)
\$5,000 and less than \$20,000.....	25.0	29.1	4.0	(1)
\$20,000 and less than \$100,000.....	50.3	53.9	32.0	41.2
\$100,000 and over.....	17.5	8.5	63.8	27.1

<sup>1</sup> Figures can not be shown without disclosing individual operations.

<sup>2</sup> Excluding figures for one establishment with products valued at over \$1,000,000, to avoid disclosure of individual operation.

In 1909, 17.5 per cent of the establishments manufactured products valued at \$100,000 or over, and the value of their products represented 63.8 per cent of the total. Comparative figures for 1904 for establishments of this class can not be given without disclosing individual operations.

The average value of products per establishment increased from \$55,415 in 1904 to \$81,142 in 1909, and the average value added by manufacture, as computed from the figures in Table 1, from \$21,033 to \$32,176. The average number of wage earners per establishment, likewise, shows an increase from 16 in 1904 to 23 in 1909.

**Expenses.**—As stated in the Introduction, the census figures representing expenses do not purport to show the total cost of manufacture, since they take no account of interest or depreciation; hence they can not properly be used for determining profits. Facts of interest can be brought out, however, concerning the relative importance of the different classes of expenses which were reported. Table 1 shows the total reported expenses in 1909 to have been \$8,473,558, distributed as follows: Cost of materials, \$5,875,851, or 69.3 per cent; wages, \$1,462,848, or 17.3 per cent; salaries, \$355,211, or 4.2 per cent; and miscellaneous expenses, made up of advertising, ordinary repairs of buildings and machinery, insurance, traveling expenses, and other sundry expenses, \$779,648, or 9.2 per cent.

**Engines and power.**—Table 8 shows statistics of power used in the industry as reported at the censuses of 1909 and 1904.

The total primary power used in the industry increased from 4,620 horsepower in 1904 to 9,854 horsepower in 1909, or 113.3 per cent. Steam power is by far the most important form of power used in this industry, constituting 91.9 per cent of the total primary power in 1909 and 81 per cent in 1904. Water power and the power of gas engines, on the other hand, each formed a smaller proportion of the total in 1909 than in 1904. Rented electric power was but little used in the industry, even in 1909, but the horse power of electric motors used for distributing power by means of current generated in the same establishment increased from 14 in 1904 to 505 in 1909.

	NUMBER OF ENGINES OR MOTORS.		HORSEPOWER.		PER CENT DISTRIBUTION OF HORSEPOWER.	
	1909	1904	1909	1904	1909	1904
Primary power, total.....	226	205	9,854	4,620	100.0	100.0
Owned.....	224	203	9,779	4,588	99.2	99.3
Steam.....	170	154	9,056	3,744	91.9	81.0
Gas.....	25	13	462	257	4.7	6.2
Water wheels.....	29	35	261	370	2.6	8.0
Water motors.....		1		2	(1)	(1)
Other.....				185		4.0
Rented.....	2	2	75	32	0.8	0.7
Electric.....	2	2	75	12	0.8	0.3
Other.....				20		0.4
Electric motors.....	39	4	580	26	100.0	100.0
Run by current generated by establishment.....	37	2	505	14	87.1	53.8
Run by rented power.....	2	2	75	12	12.9	46.2

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

**Fuel consumed.**—Table 9 shows the quantity of the different kinds of fuel used in the industry in 1909.

	Unit.	Quantity.
Anthracite coal.....	Long tons.....	48,518
Bituminous coal.....	Short tons.....	225,471
Coke.....	Short tons.....	35
Wood.....	Cords.....	859,064
Oil, including gasoline.....	Barrels.....	8
Gas.....	1,000 feet.....	2,288,372

No distinction is made between wood consumed as fuel and that subjected to distillation. At the census of 1909, 859,064 cords of wood were reported as used in the industry during the year, but in some cases the quantity of wood consumed as material in the processes of wood distillation was not reported. In connection with the annual investigation in regard to the forest products of the United States for 1909,<sup>1</sup> the consumption of 1,265,157 cords of wood in the processes of wood distillation was reported. This amount includes 1,149,847 cords of hardwood, the leading states reporting hardwood being Michigan, Pennsylvania, and New York, and 115,310 cords of softwood, used chiefly in Alabama, Florida, and Georgia. In partial explanation of the difference between the figures in the two reports, it should be noted that the statistics covering the consumption of wood as shown in the forest products report in some instances include wood used in charcoal burning, which is not included in the statistics for the wood distillation industry.

In addition to the fuel shown in Table 9, considerable quantities of the products—charcoal, tar, and wood oil—for which there was not a ready market, were also used as fuel.

The amount reported as expended for fuel and rent of power in 1909, including the cost of wood consumed as a material, is shown by states in Table 14. The total amount was \$3,109,377, which represents 52.9 per cent of the cost of all materials.

<sup>1</sup> Forest Products of the United States, 1909, p. 163.

Products.—At the census of 1879 there was reported a production of crude wood alcohol, valued at \$86,274, and 6,593,009 pounds of acetate of lime, valued at \$156,892. At the census of 1889 a production of 1,116,075 gallons of crude wood alcohol, valued at \$688,764, and 26,778,415 pounds of acetate of lime, valued at \$315,430, was reported. At the census of 1899 the production of crude wood alcohol was reported as 4,945,963 gallons, valued at \$1,976,986, and that of acetate of lime as 86,826,000 pounds, valued at \$981,286.

Table 10 shows the quantity and value of the chief products of the wood distillation industry for 1909 and 1904.

PRODUCTS.	WOOD DISTILLATION PRODUCTS.			
	Made by establishments in the wood distillation industry.		Made by establishments engaged primarily in the manufacture of other products.	
	1909	1904	1909	1904
Total value.....	\$0, 736, 998	\$7, 813, 483		
Wood alcohol.....	\$4, 520, 587	\$4, 775, 699	\$341, 680	\$881, 887
Crude.....				
Gallons.....	6, 359, 848	6, 684, 871	412, 852	129, 387
Value.....	\$1, 627, 878	\$2, 161, 813	\$146, 581	\$40, 148
Refined.....				
Gallons.....	6, 276, 071	4, 316, 346	456, 806	1, 600, 807
Value.....	\$2, 901, 709	\$2, 613, 880	\$195, 099	\$811, 739
Acetate of lime.....				
Pounds.....	132, 141, 442	105, 141, 361	9, 336, 854	5, 242, 636
Value.....	\$1, 981, 220	\$1, 474, 982	\$137, 223	\$52, 751
Charcoal.....				
Bushels.....	39, 017, 247	23, 872, 055	934, 988	6, 045, 157
Value.....	\$2, 351, 044	\$1, 197, 973	\$75, 004	\$289, 192
Turpentine.....				
Gallons.....	706, 868	442, 185	18, 310	
Value.....	\$249, 520	\$176, 621	\$7, 482	
All other wood distillation products.....	\$357, 290	\$138, 481		
All other products.....	\$237, 731	\$49, 827		

The total production of crude alcohol, including that reported by establishments not engaged primarily in wood distillation and that which was made and used in the manufacture of refined alcohol, was 9,307,583 gallons, in 1909, as compared with 8,282,286 gallons in 1904, an increase of 1,025,297 gallons, or 12.4 per cent. The total production of refined wood alcohol, including that reported as a subsidiary product by establishments engaged primarily in the manufacture of other products, was 6,732,877 gallons, valued at \$3,096,808, in 1909, as compared with 5,917,153 gallons, valued at \$3,455,625, in 1904, an increase of 13.8 per cent in quantity, but a decrease of 10.4 per cent in value.

From 1904 to 1909 the percentages of increase for several other specified products were as follows: Acetate of lime, 28.2 per cent in quantity and 38.7 per cent in value; charcoal, 33.5 per cent in quantity and 63.2 per cent in value; and turpentine, 64 per cent in quantity and 45.6 per cent in value.

In the group designated "all other wood distillation products" are included tar, acetone, formaldehyde, wood ashes, pyroligneous acid, pyrolignite of iron, wood creosote, and other unspecified products.

Table 11 shows for 1909 the products of the industry as given in the report on Forest Products of the United States.

PRODUCT.	VALUE OF PRODUCTS: 1909
Total value.....	\$8, 328, 484
Wood alcohol, crude:	
Gallons.....	8, 468, 083
Value.....	\$2, 082, 253
Acetate of lime:	
Pounds.....	150, 926, 386
Value.....	\$2, 225, 090
Charcoal:	
Bushels.....	55, 478, 608
Value.....	\$3, 509, 019
Turpentine:	
Gallons.....	682, 702
Value.....	\$243, 491
All other wood distillation products.....	\$205, 830
All other products.....	\$92, 841

The statistics shown in Table 11, taken from the report on Forest Products of the United States, differ somewhat from those given in Table 10 of this report. The primary object of that portion of the inquiry relative to forest products which relates to wood distillation was to ascertain the quantity of hardwoods and of softwoods consumed in these processes, and the statistics cover only the establishments which use wood as their raw material, whereas the census inquiry upon which the present report is mainly based covered both the establishments that made the crude alcohol from wood and those which were engaged wholly in refining crude alcohol. The statistics in Table 10, for instance, show the final output of the establishments during the year, both of crude alcohol and of refined alcohol, while the statistics in the report on forest products cover the production of crude alcohol only. The final product of most of the establishments included in the census reports is crude wood alcohol, which is disposed of to other establishments engaged solely in the refining process. In addition, the charcoal product shown in the report on forest products includes that reported by some charcoal burners, who are not included in the wood distillation industry as defined by the Bureau of the Census.

Table 12 shows, by states, the quantity and value of each of the principal products manufactured in the wood distillation industry in 1909.

PRODUCT AND STATE.	PRODUCTS: 1909	
	Quantity.	Value.
Wood alcohol, refined, gallons.....	6, 276, 071	\$2, 901, 709
Michigan.....	1, 601, 589	684, 713
New York.....	4, 129, 345	2, 058, 844
All other states.....	485, 137	158, 152
Wood alcohol, crude, gallons.....	6, 359, 848	1, 627, 878
New York.....	2, 370, 713	676, 443
Pennsylvania.....	3, 376, 374	797, 019
All other states.....	612, 761	154, 415
Acetate of lime, pounds.....	132, 141, 442	1, 981, 220
Michigan.....	32, 907, 258	467, 476
New York.....	24, 511, 279	372, 045
Pennsylvania.....	69, 488, 589	1, 069, 581
All other states.....	5, 234, 316	71, 818
Charcoal, bushels.....	39, 017, 247	2, 351, 044
Michigan.....	13, 514, 106	868, 006
New York.....	5, 147, 160	287, 106
Pennsylvania.....	16, 357, 598	936, 367
All other states.....	3, 998, 383	260, 181
Turpentine, gallons.....	706, 868	249, 520
Florida.....	174, 206	63, 864
Georgia.....	282, 000	88, 451
North Carolina.....	64, 900	26, 719
South Carolina.....	68, 513	23, 238
All other states.....	137, 249	47, 164

Distillation equipment.—Table 13 shows, by states, the equipment of the wood distillation plants in retorts, ovens, and kilns in 1909.

The aggregate capacity per charge was 24,594 cords, of which that of kilns constituted 84.7 per cent, that

of retorts 11 per cent, and that of ovens 4.4 per cent. Kilns are used chiefly in Michigan and Missouri; ovens in Pennsylvania and New York, with a few in Michigan, Georgia, and North Carolina; and retorts in all the states reporting, with the exception of Missouri.

	United States.	Michi-gan.	New York.	Penn-syl-vania.	All other states.		United States.	Michi-gan.	New York.	Penn-syl-vania.	All other states.
<b>Retorts:</b>						<b>Ovens:</b>					
Total number.....	1,448	101	496	607	244	Total number.....	177	10	29	123	15
Total capacity, cords.....	2,703	675	427	958	643	Total capacity, cords.....	1,080	90	167	791	32
<b>Less than 2 cords per charge—</b>						<b>Less than 5 cords per charge—</b>					
Number.....	1,122		474	508	140	Number.....	34		12	10	12
Capacity.....	990		365	508	117	Capacity.....	84		42	40	2
<b>2, but less than 5 cords—</b>						<b>5 cords and over—</b>					
Number.....	148	31	22	59	36	Number.....	143	10	17	113	3
Capacity.....	388	89	62	118	109	Capacity.....	996	90	125	751	30
<b>5 cords and over—</b>						<b>Kilns:</b>					
Number.....	178	70		40	68	Number.....	310	230	2	6	72
Capacity.....	1,325	576		332	417	Capacity, cords.....	20,811	16,600	18	89	4,104

Detailed state table.—The principal data secured by the census inquiry concerning the industry are presented, by states, in Table 14, which gives detailed statistics for 1909 concerning the number of persons

engaged in the industry, primary horsepower, wage earners on December 15, or the nearest representative day, capital, expenses, value of products, and the value added by manufacture.

WOOD DISTILLATION—DETAILED STATISTICS, BY STATES: 1909.

STATE.	Number of establishments.	PERSONS ENGAGED IN INDUSTRY.							WAGE EARNERS—DEC. 15, OR NEAREST REPRESENTATIVE DAY.						Primary horsepower.
		Total.	Proprietors and firm members.	Salaried officers, superintendents, and managers.	Clerks.		Average number.	Wage earners.		Total.	16 and over.		Under 16.		
					Male.	Female.		Number, 15th day of—			Male.	Female.	Male.	Female.	
								Maximum month.	Minimum month.						
United States.....	120	3,095	56	199	94	25	2,721	De 3,053	Au 2,478	3,114	3,114			9,854	
Florida.....	7	102	2	11	7		82	De 137	My <sup>1</sup> 48	137	137			738	
Georgia.....	4	77	2	5	7		63	Ja <sup>1</sup> 66	Jy 36	66	66			570	
Michigan.....	12	859	1	28	21	3	806	De 955	Jy 737	946	946			5,012	
New York.....	29	668	10	40	17	8	593	Fe 651	Au 501	646	646			599	
North Carolina.....	5	67		10	5	1	51	De 58	Je <sup>1</sup> 44	57	57			75	
Pennsylvania.....	50	1,093	36	85	28	11	933	Ja 1,058	Au 837	1,052	1,052			1,749	
South Carolina.....	3	28		5	3	1	19	De 35	Au 10	35	35			675	
All other states <sup>2</sup> .....	10	201	5	15	6	1	174			175	175			436	

STATE.	Capital.	EXPENSES.										Value of products.	Value added by manufacture (value of products less cost of materials).
		Total.	Services.			Materials.		Miscellaneous.					
			Officials.	Clerks.	Wage earners.	Fuel and rent of power.	Other.	Rent of factory.	Taxes, including internal revenue.	Contract work.	Other.		
United States.....	\$13,017,192	\$8,473,558	\$280,317	\$74,894	\$1,462,848	\$3,109,377	\$2,766,474	\$2,765	\$66,677	\$15,536	\$694,670	\$9,736,998	\$3,861,147
Florida.....	263,925	132,372	9,732	1,780	32,402	10,268	44,507		1,312		32,371	138,146	83,371
Georgia.....	356,392	179,585	13,425	4,150	34,874	643	113,170		1,204		12,119	209,214	95,401
Michigan.....	2,829,750	1,956,220	39,918	23,848	504,151	969,106	186,243		23,226	12,336	197,392	2,398,927	1,243,578
New York.....	3,298,055	3,143,341	65,340	14,162	262,095	604,464	1,914,057	75	14,362		268,780	3,401,722	883,201
North Carolina.....	204,837	87,553	14,140	4,710	15,598	7,256	26,651		513		18,685	104,241	70,334
Pennsylvania.....	5,111,070	2,490,091	112,517	20,515	521,643	1,463,326	220,623	790	22,948	2,200	125,529	2,960,162	1,276,213
South Carolina.....	70,436	41,246	4,700	2,700	8,692	4,325	13,650		140	1,000	6,039	51,878	33,903
All other states <sup>2</sup> .....	882,727	443,150	20,545	3,029	83,393	49,989	247,573	1,900	2,972		33,749	472,708	175,146

<sup>1</sup> Same number reported for one or more other months.

<sup>2</sup> All other states embrace: Alabama, 2 establishments; Louisiana, 2; Missouri, 1; New Jersey, 1; Oregon, 1; Vermont, 1; West Virginia, 1; Wisconsin, 1.

---

---

# COKE

# THE COKE INDUSTRY.

## GENERAL STATISTICS.

**Summary and comparison with earlier censuses.**—The statistics presented in this report are for establishments engaged in the manufacture of "oven coke." They do not cover those making ordinary gas-house coke, which is obtained as a by-product in the manufacture of illuminating gas. Although oven coke was manufactured in the United States for some years

prior to 1849, the census of that year was the first at which statistics for the industry were shown, but the census of 1879 was the first to include statistics for the industry that are comparable with those for more recent censuses. Table 1 summarizes the statistics of the industry for each census from 1879 to 1909, inclusive.

	NUMBER OR AMOUNT.					PER CENT OF INCREASE. <sup>1</sup>				
	1909	1904	1899	1889	1879	1899-1909	1904-1909	1899-1904	1889-1899	1879-1889
Number of establishments.....	315	278	241	( <sup>2</sup> ) 218	( <sup>2</sup> ) 128	30.7	13.3	15.4	10.6	73.0
Persons engaged in the industry.....	31,226	20,440	17,902	( <sup>2</sup> )	( <sup>2</sup> )	73.8	52.8	13.8	.....	.....
Proprietors and firm members.....	101	73	48	( <sup>2</sup> )	( <sup>2</sup> )	38.4	38.4	.....	.....	.....
Salaried employees.....	1,852	1,380	915	( <sup>2</sup> )	( <sup>2</sup> )	102.4	39.6	51.5	( <sup>3</sup> )	( <sup>3</sup> )
Wage earners (average number).....	29,273	18,981	16,999	8,998	3,140	72.2	54.2	11.7	582.4	266.1
Primary horsepower.....	62,602	66,600	34,767	5,095	( <sup>2</sup> )	80.1	-0.1	91.8	109.0	266.1
Capital.....	\$152,321,337	\$90,712,877	\$30,502,679	\$17,462,729	\$4,709,858	317.3	67.9	148.5	109.0	266.1
Expenses.....	\$84,830,245	\$45,327,662	\$29,733,532	\$16,090,785	( <sup>2</sup> )	185.3	87.2	52.4	84.8	.....
Services.....	\$17,526,495	\$10,552,000	\$7,883,032	\$4,186,204	\$1,197,744	122.3	66.1	39.9	88.3	249.5
Salaries.....	\$2,072,150	\$1,247,502	\$797,296	( <sup>2</sup> )	( <sup>2</sup> )	159.9	66.1	56.5	.....	.....
Wages.....	\$15,454,345	\$9,304,498	\$7,085,736	( <sup>2</sup> )	( <sup>2</sup> )	118.1	66.1	31.3	.....	.....
Materials.....	\$64,024,527	\$29,884,532	\$19,655,532	\$11,509,737	\$2,995,441	225.6	114.2	52.0	70.9	284.2
Miscellaneous.....	\$3,288,223	\$4,891,130	\$2,184,998	\$394,784	( <sup>2</sup> )	50.5	-32.8	123.9	453.5	.....
Value of products.....	\$95,696,622	\$51,728,647	\$35,585,445	\$16,498,345	\$5,359,489	168.9	35.0	45.4	115.7	207.8
Value added by manufacture (value of products less cost of materials).....	\$31,672,095	\$21,844,115	\$15,919,913	\$4,988,608	\$2,364,048	98.9	45.0	37.2	219.1	111.0
Coke produced, short tons <sup>4</sup> .....	39,315,065	25,143,288	19,640,798	10,008,169	2,752,475	100.2	56.4	28.0	96.2	263.6

<sup>1</sup> A minus sign (-) denotes decrease. Where percentages are omitted comparable figures are not available.

<sup>2</sup> Comparable figures not available.

<sup>3</sup> Figures not strictly comparable.

<sup>4</sup> Includes 415,472 tons of coke in 1909 and 410,225 tons in 1904 produced by establishments engaged primarily in the manufacture of products other than coke, the value of which is not included in the value of products shown in this table.

Most of the coke ovens are operated in connection with coal mines, but the statistics given in this report relate only to the manufacture of coke. If separate accounts were not kept for the two branches of industry, as was the case in a few instances, estimates were secured for the items pertaining to the production of coke, including an estimate of the quantity and value of the coal used.

Coke is made in beehive ovens and in by-product ovens or retorts. Where beehive ovens are used the cost of materials—chiefly bituminous coal—constitutes a rather large proportion of the total value of products, the process of manufacture itself being relatively simple and inexpensive, but the processes in the manufacture of coke in by-product ovens or retorts are complex, and the apparatus and operation costly. The total cost of the materials used in the manufacture of coke in 1909 was \$64,024,527, which was equal to two-thirds (66.9 per cent) of the total value of products, while the value added by manufacture (that is, the value of products less the cost of materials) was \$31,672,095.

The value of products in 1909 was nearly eighteen times as great as that in 1879. The greatest actual increase in value of products was during the period 1904-1909, when the value increased from \$51,728,647 to \$95,696,622—a gain of \$43,967,975, or 85 per cent. This increase, while due largely to the increase in the quantity of coke produced and higher prices per ton, may be attributed to some extent to the utilization of by-products which has been made possible by the installation of ovens of more modern types. The total cost of materials increased from \$29,884,532 in 1904 to \$64,024,527 in 1909, or 114.2 per cent. During the same period the average number of wage earners increased 54.2 per cent, and the amount paid in wages 66.1 per cent. The quantity of coke produced increased 19,674,267 short tons, or 100.2 per cent, during the decade 1899-1909.

**Summary, by states.**—Table 2 summarizes the more important statistics by states, the states being arranged according to value of products in 1909. Certain states for which data can not be shown separately ranked higher than some of those named in the table.

STATE.	Number of establishments: 1909	WAGE EARNERS.			VALUE OF PRODUCTS.			VALUE ADDED BY MANUFACTURE.			PER CENT OF INCREASE. <sup>1</sup>											
		Average number: 1909	Per cent of total: 1909	Rank.		Amount: 1909	Per cent of total: 1909	Rank.		Amount: 1909	Per cent of total: 1909	Rank.		Wage earners (average number).		Value of products.		Value added by manufacture.				
				1909	1904			1909	1904			1909	1904	1899-1909	1904-1909	1899-1904	1899-1909	1904-1909	1899-1904	1899-1909	1904-1909	1899-1904
United States.....	315	29,273	100.0	.....	.....	\$95,696,622	100.0	.....	.....	\$31,672,095	100.0	.....	.....	72.2	54.2	11.7	168.9	85.0	45.4	69.0	45.0	37.2
Pennsylvania.....	146	15,331	52.4	1	1	51,816,449	54.1	1	1	18,053,996	57.0	1	1	65.2	51.0	9.4	132.5	79.1	29.8	70.3	23.5	31.5
Alabama.....	35	2,580	8.8	3	3	8,842,512	9.2	2	2	2,471,035	7.8	3	2	62.1	19.2	36.0	137.3	43.2	65.7	135.0	13.3	107.0
West Virginia.....	71	4,426	15.1	2	2	7,503,419	7.9	3	3	2,550,940	8.1	2	3	41.4	74.7	-19.1	114.3	81.2	18.3	63.3	67.1	-2.2
Virginia.....	16	1,425	4.9	4	4	2,415,769	2.5	8	4	597,517	1.9	9	6	81.5	30.3	39.4	125.2	28.2	75.7	61.0	-14.8	77.3
Ohio.....	4	246	0.8	14	14	850,615	0.9	13	14	211,005	0.7	14	14	.....	117.7	.....	233.7	228.6	1.6	89.3	-23.9	.....
Tennessee.....	8	250	0.9	13	7	535,685	0.6	15	10	108,185	0.3	15	11	-47.6	-33.7	-21.0	-23.4	-27.7	5.9	-55.4	-45.7	-17.8
All other states.....	35	5,015	17.1	.....	.....	23,622,173	24.7	.....	.....	7,679,411	24.2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

<sup>1</sup> Percentages are based on figures in Table 19. A minus sign (-) denotes decrease. Percentage not shown where base is less than 100 for wage earners or less than \$100,000 for value added by manufacture.

The production of coke was reported for 21 states in 1909; the data for but 6 states can be shown separately, however, without disclosing the operations of individual concerns. Pennsylvania is by far the most important state in the manufacture of coke, reporting 54.1 per cent of the total value of products in 1909.

The number of wage earners employed in the industry in Pennsylvania increased 65.2 per cent during the decade ending with 1909, and the value of products 132.5 per cent. Alabama ranked second in 1909 in value of products. West Virginia, although ranking third in value of products, was second in number of wage earners employed and in value added by manufacture. Of the states for which percentages are shown in the table, Ohio shows the largest percentage of gain during the decade 1899-1909 both in number of wage earners and in value of products, but in value added by manufacture Alabama shows the largest increase—135 per cent.

Persons engaged in the industry.—Table 3 shows, for 1909, the number of persons engaged in the manufacture of coke classified according to occupational status and sex and, in the case of wage earners, according to age also. It should be borne in mind that the sex and age classification of the average number of wage earners in this and other tables is an estimate obtained by the method described in the Introduction.

CLASS.	PERSONS ENGAGED IN THE INDUSTRY: 1909		
	Total.	Male.	Female.
All classes.....	31,226	31,112	114
Proprietors and officials.....	814	807	7
Proprietors and firm members.....	101	96	5
Salaried officers of corporations.....	174	172	2
Superintendents and managers.....	539	539	.....
Clerks.....	1,139	1,037	102
Wage earners (average number).....	29,273	29,268	5
16 years of age and over.....	29,187	29,182	5
Under 16 years of age.....	86	86	.....

The average number of persons engaged in the manufacture of coke during 1909 was 31,226, of whom 29,273, or 93.7 per cent, were wage earners; 814, or 2.6 per cent, proprietors and officials; and 1,139, or 3.6

per cent, clerks, including other subordinate salaried employees. Of the total number of persons engaged in the industry, only 114, or four-tenths of 1 per cent, were females. The nature of the industry is such that but a small percentage of either women or children can be employed advantageously as wage earners.

The average number of wage earners, as reported at the censuses of 1909, 1904, and 1899, is given, by states, in Table 19. The distribution of the average number by sex and age is not shown for the individual states, but Table 20 gives such a distribution of the number employed on December 15, or the nearest representative day.

In order to compare the distribution of the persons engaged in the industry according to occupational status in 1909 with that in 1904, it is necessary to use the classification employed at the earlier census (see Introduction). Such a comparison is made in Table 4.

CLASS.	PERSONS ENGAGED IN THE INDUSTRY.				
	1909		1904		Per cent of increase: 1904-1909
	Number.	Per cent distribution.	Number.	Per cent distribution.	
Total.....	31,226	100.0	20,440	100.0	52.8
Proprietors and firm members.....	101	0.3	73	0.4	33.4
Salaried employees.....	1,852	5.9	1,386	6.8	33.6
Wage earners (average number).....	29,273	93.7	18,981	92.9	54.2

Table 5 shows the average number of wage earners in the industry distributed according to age, and in the case of those 16 years of age or over, according to sex, for 1909, 1904, and 1899.

CLASS.	AVERAGE NUMBER OF WAGE EARNERS IN THE INDUSTRY.					
	1909		1904		1899	
	Number.	Per cent distribution.	Number.	Per cent distribution.	Number.	Per cent distribution.
Total.....	29,273	100.0	18,981	100.0	16,999	100.0
16 years of age and over.....	29,187	99.7	18,915	99.7	16,932	99.6
Male.....	29,182	99.7	18,915	99.7	16,932	99.6
Female.....	5	( <sup>1</sup> )	.....	.....	.....	.....
Under 16 years of age.....	86	0.3	66	0.3	67	0.4

Less than one-tenth of 1 per cent.

Wage earners employed, by months.—Table 6 gives the number of wage earners employed in the coke industry on the 15th (or the nearest representative day) of each month during the year 1909, for the five states in which an average of 500 or more wage earners were employed during the year, for which figures can be shown separately.

The largest number of wage earners employed in the industry during any month of 1909 was 33,094, in

December, and the smallest number 26,461, in April, the minimum number being equal to 80 per cent of the maximum. The industry is not subject to any great seasonal variation, but is considerably affected by fluctuations in the iron and steel industry. In 1904 the maximum number of wage earners, 21,420, was reported for December, and the minimum number, 16,893, for July, the minimum being equal to 78.9 per cent of the maximum.

**Table 6**

WAGE EARNERS EMPLOYED IN THE INDUSTRY: 1909<sup>1</sup>

STATE.	Average number during the year.	Janu-ary.	Febru-ary.	March.	April.	May.	June.	July.	August.	Septem-ber.	October.	Novem-ber.	Decem-ber.
		<b>United States</b> .....	<b>29,273</b>	<b>27,668</b>	<b>27,121</b>	<b>27,003</b>	<b>26,461</b>	<b>27,022</b>	<b>28,301</b>	<b>29,106</b>	<b>29,475</b>	<b>30,852</b>	<b>32,390</b>
Alabama.....	2,580	2,652	2,542	2,640	2,358	2,344	<i>2,254</i>	2,271	2,465	2,752	2,893	2,899	2,887
Colorado.....	893	828	800	796	774	718	824	950	970	961	1,074	1,047	987
Pennsylvania.....	15,331	13,790	13,687	13,581	<i>13,296</i>	14,060	15,321	15,781	15,943	16,483	17,162	17,347	17,521
Virginia.....	1,425	1,473	1,402	1,364	1,334	1,325	1,328	<i>1,309</i>	1,336	1,467	1,533	1,602	1,631
West Virginia.....	4,426	4,523	4,361	4,214	4,267	4,125	4,110	<i>4,069</i>	4,181	4,442	4,763	4,984	5,073

<sup>1</sup> The month of maximum employment for each state is indicated by boldface figures and that of minimum employment by italic figures.

The months of maximum and minimum employment for 1909 and the number of wage earners reported for these months are given in Table 20 for all states for which separate statistics can be shown.

Prevailing hours of labor.—In Table 7 the wage earners in the coke industry have been classified according to the number of hours of labor per week prevailing in the establishments in which they were employed. In making this classification the average number of wage earners employed during the year in each establishment is classified as a total according to the prevailing hours in the establishment, even though a few employees worked a greater or a smaller number of hours.

**Table 7**

AVERAGE NUMBER OF WAGE EARNERS IN THE INDUSTRY: 1909

STATE.	Total.	In establishments with prevailing hours—						
		48 and under.	Be-tween 48 and 54.	54.	Be-tween 54 and 60.	60.	Be-tween 60 and 72.	72 and over.
<b>United States</b> .....	<b>29,273</b>	<b>1,987</b>	<b>359</b>	<b>7,965</b>	<b>149</b>	<b>11,629</b>	<b>3,904</b>	<b>3,280</b>
Alabama.....	2,580	57	15	185	.....	825	1,007	491
Colorado.....	893	.....	.....	.....	.....	893	.....	.....
Pennsylvania.....	15,331	1,508	.....	7,397	100	4,575	658	1,093
Virginia.....	1,425	4	306	.....	33	766	.....	316
West Virginia.....	4,426	21	38	316	16	3,966	.....	69

More than three-fifths (64.3 per cent) of the wage earners engaged in the manufacture of coke in 1909 were in establishments where the prevailing number of hours was 60 or more per week. Only 8 per cent were employed in establishments where the prevailing hours were less than 54 per week. Wage earners in establishments where the prevailing hours were 60 per week constituted 39.7 per cent of the total number. This group was the most important in Virginia and West Virginia, and in Colorado it comprised all

the wage earners reported, but in Pennsylvania the wage earners in establishments where the prevailing hours per week were 54 formed the largest group. A considerable number of wage earners in this state, however, were in establishments which reported 48 hours a week or less, 60 hours a week, and 72 hours or over, respectively, as the prevailing hours of labor, 29.8 per cent of the total number of wage earners being reported in the 60-hour group. In Alabama the greatest number of wage earners, 39 per cent of the total, were employed in establishments which reported more than 60 but less than 72 hours per week as the prevailing hours of labor.

Character of ownership.—Table 8 presents statistics with respect to the character of ownership of the coke establishments in the United States.

**Table 8**

CHARACTER OF OWNERSHIP.	NUMBER OF ESTABLISHMENTS.		VALUE OF PRODUCTS.	
	1909	1904	1909	1904
<b>Total</b> .....	<b>315</b>	<b>278</b>	<b>\$95,696,622</b>	<b>\$51,728,647</b>
Individual.....	21	15	3,153,168	1,965,366
Firm.....	17	15	1,258,047	1,314,195
Corporation.....	1 277	248	1 91,280,407	48,449,086
<b>Per cent of total</b> .....	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>
Individual.....	6.7	5.4	3.3	3.8
Firm.....	5.4	5.4	1.3	2.5
Corporation.....	1 87.9	89.2	1 95.4	93.7

<sup>1</sup> Includes one establishment under cooperative ownership, to avoid disclosure of individual operations.

In 1909, of the total number of plants reported, 87.6 per cent were under corporate ownership, as compared with 89.2 per cent in 1904. The value of products of these establishments (including the one establishment under cooperative ownership in 1909) represented 95.4 per cent of the total value of products in 1909 and 93.7 per cent in 1904.

Table 9 gives statistics with regard to form of ownership for four of the leading states.

STATE.	NUMBER OF ESTABLISHMENTS OWNED BY—			WAGE EARNERS IN ESTABLISHMENTS OWNED BY—			VALUE OF PRODUCTS OF ESTABLISHMENTS OWNED BY—			VALUE ADDED BY MANUFACTURE IN ESTABLISHMENTS OWNED BY—		
	Individuals.	Firms.	Corporations.	Individuals.	Firms.	Corporations.	Individuals.	Firms.	Corporations.	Individuals.	Firms.	Corporations.
United States.....	21	17	277	1,241	562	27,470	\$3,158,168	\$1,258,047	\$91,280,407	\$661,910	\$364,320	\$30,645,844
Alabama.....			35			2,580			8,842,512			2,471,635
Pennsylvania.....	21	15	110	1,241	435	13,605	3,158,168	1,152,408	47,605,873	661,910	333,471	17,058,633
Virginia.....		1	15		(X)	1,428		(X)	2,416,769		(X)	597,317
West Virginia.....		1	70		(X)	4,428		(X)	7,663,419		(X)	2,650,246

NOTE.—In some states, in order to avoid disclosing the returns for individual establishments, the figures for one group have been consolidated with those for establishments under some other form of ownership. In such cases, an (X) is placed in the column from which the figures have been omitted and the figures for the group with which they have been combined are printed in italics. The figures for establishments under corporate ownership include those for one establishment operated by a cooperative association.

In 1909, of the total number of wage earners reported for the industry, 4.2 per cent were employed in establishments under individual ownership, 1.9 per cent in those under firm ownership, and 93.8 per cent in those owned by corporations (including the establishment under cooperative ownership).

The 21 establishments under individual ownership were all reported from Pennsylvania, and of the 17 operated by firms, 15 were reported from that state and 1 each from Virginia and West Virginia.

Size of establishment.—Table 10 presents statistics for 1909 and 1904 for coke establishments grouped according to the value of their products.

In 1909, 5.4 per cent of the coke establishments manufactured products valued at \$1,000,000 or over, as against 1.8 per cent in 1904. While such establishments represented only a comparatively small proportion of the total number at both censuses, they reported 53.1 per cent of the total value of products in 1909 and 38.4 per cent in 1904. The increase in the importance of this class of establishments during the five-year period was in part, but by no means chiefly, due to advance in prices.

VALUE OF PRODUCTS PER ESTABLISHMENT.	NUMBER OF ESTABLISHMENTS.		VALUE OF PRODUCTS.	
	1909	1904	1909	1904
Total.....	315	278	\$95,696,622	\$51,728,647
Less than \$5,000.....	11	25	21,285	64,648
\$5,000 and less than \$20,000.....	40	38	1,262,249	423,706
\$20,000 and less than \$100,000.....	127	115	6,780,743	5,802,067
\$100,000 and less than \$1,000,000.....	120	95	36,845,746	25,580,207
\$1,000,000 and over.....	17	5	50,786,698	19,837,659
Per cent of total.....	100.0	100.0	100.0	100.0
Less than \$5,000.....	3.5	9.0	( <sup>1</sup> )	0.1
\$5,000 and less than \$20,000.....	12.7	13.7	1.3	0.8
\$20,000 and less than \$100,000.....	40.3	41.4	7.1	11.2
\$100,000 and less than \$1,000,000.....	38.1	34.2	38.5	49.5
\$1,000,000 and over.....	5.4	1.8	53.1	38.4

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

The average value of products per establishment increased from \$186,074 in 1904 to \$303,799 in 1909, and the average value added by manufacture, as computed from the figures in Table 1, from \$78,576 to \$100,546. The average number of wage earners per establishment increased from 68.3 in 1904 to 92.9 in 1909.

Table 11 gives, by states, a classification of establishments according to the average number of wage earners employed in 1909.

STATE.	TOTAL.		ESTABLISHMENTS EMPLOYING IN 1909—															
			1 to 5 wage earners.		6 to 20 wage earners.		21 to 50 wage earners.		51 to 100 wage earners.		101 to 250 wage earners.		251 to 500 wage earners.		501 to 1,000 wage earners.		Over 1,000 wage earners.	
	Es-tab-lish-ments.	Wage earners (average number).	Es-tab-lish-ments.	Wage earners.	Es-tab-lish-ments.	Wage earners.	Es-tab-lish-ments.	Wage earners.	Es-tab-lish-ments.	Wage earners.	Es-tab-lish-ments.	Wage earners.	Es-tab-lish-ments.	Wage earners.	Es-tab-lish-ments.	Wage earners.	Es-tab-lish-ments.	Wage earners.
United States.....	315	29,273	37	135	71	909	70	2,415	70	4,778	44	6,863	17	5,937	5	3,022	1	5,214
Alabama.....	35	2,580	1	9	8	109	8	272	10	758	6	902	2	530				
Colorado.....	12	893			3	47	2	55	6	422			1	369				
Pennsylvania.....	146	15,331	24	89	43	656	18	607	26	1,769	25	3,799	9	3,297			1	5,214
Virginia.....	16	1,428	1	4	3	24	3	119	4	265	4	697	1	316				
West Virginia.....	71	4,428	5	17	9	122	32	1,077	19	1,220	4	696			2	1,285		

Of the 315 establishments reporting, 34.3 per cent employed from 1 to 20 wage earners, 44.4 per cent from 21 to 100, and 21.3 per cent more than 100.

Of the total number of wage earners reported, 3.6 per cent were reported by establishments employing from 1 to 20, 24.6 per cent by establishments employing from 21 to 100, 43.7 per cent by establishments employing from 101 to 500, and 28.1 per cent by the six establishments employing more than 500 wage earners.

Expenses.—As stated in the Introduction, the census figures for expenses do not purport to represent the total cost of manufacture, since they take no account of interest or depreciation; hence they can not properly be used for determining profits. Facts of interest can be brought out, however, concerning the relative importance of the different classes of expenses which were reported. Table 1 shows the total expenses for the coke industry in 1909 to have been \$84,839,245, distributed as follows: Cost of materials, \$64,024,527,

or 75.5 per cent; wages, \$15,454,345, or 18.2 per cent; salaries, \$2,072,150, or 2.4 per cent; and miscellaneous expenses, made up of advertising, ordinary repairs of buildings and machinery, insurance, traveling expenses, and other sundry expenses, \$3,288,223, or 3.9 per cent. There are some variations in the proportions for the different classes of expenses in the several states. In the six states shown in Table 20 the proportion of the total expenses represented by the cost of materials ranged from 68.6 per cent in West Virginia to 80 per cent in Tennessee.

**Engines and power.**—Table 12 presents statistics regarding power, as reported at the censuses of 1909, 1904, and 1899.

The total primary power increased from 34,767 horsepower in 1899 to 62,602 in 1909, or 80.1 per cent. In 1909 the power of steam engines constituted 71.2 per cent of the total primary horsepower, as compared with 89.7 per cent in 1904; on the other hand, there was a marked increase between 1904 and 1909 in the relative importance of the power of electric motors operated by purchased current (rented electric power). No rented electric power was reported in 1899, and only a small amount in 1904, but in 1909 this class represented 22 per cent of the total primary horsepower. A very large number of electric motors have

been installed to be operated by current generated by the establishments in which they are used.

**Table 12**

POWER.	NUMBER OF ENGINES OR MOTORS.			HORSEPOWER.			PER CENT DISTRIBUTION OF HORSEPOWER.		
	1909	1904	1899	1909	1904	1899	1909	1904	1899
<b>Primary power, total.....</b>	<b>1,002</b>	<b>726</b>	<b>352</b>	<b>62,602</b>	<b>66,669</b>	<b>34,767</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>
Owned.....	496	699	352	47,963	65,492	34,767	76.6	98.2	100.0
Steam.....	456	686	350	44,591	59,829	29,148	71.2	89.7	83.8
Gas.....	6	4	2	1,212	150	7	1.9	0.2	( <sup>1</sup> )
Water wheels.....	—	8	—	—	178	—	—	0.3	—
Water motors.....	4	1	—	500	10	—	0.8	( <sup>1</sup> )	—
Other.....	—	—	—	1,660	5,315	5,612	2.7	8.0	16.1
Rented.....	506	27	—	14,639	1,187	—	23.4	1.8	—
Electric.....	506	27	—	13,754	1,187	—	22.0	1.8	—
Other.....	—	—	—	885	—	—	1.4	—	—
<b>Electric motors.</b>	<b>1,538</b>	<b>383</b>	<b>68</b>	<b>41,064</b>	<b>10,509</b>	<b>1,462</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>
Run by current generated by establishment.....	1,032	356	68	27,310	9,322	1,462	66.5	88.7	100.0
Run by rented power.....	506	27	—	13,754	1,187	—	33.5	11.3	—

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

Table 13 presents statistics for 1909 with regard to power and fuel used in the coke industry in four of the leading states.

**Table 13**

STATE.	PRIMARY HORSEPOWER.							ELECTRIC HORSEPOWER.		FUEL USED.						
	Number of establishments reporting.	Total horsepower.	Owned by establishments reporting.				Rented.		Total, rented and generated by establishment.	Generated in the establishment reporting.	Coal, bituminous (short tons).	Coke (short tons).	Wood (cords).	Oil, including gasoline (barrels).	Gas (1,000 cubic feet).	
			Total.	Steam engines.	Gas engines.	Water wheels and motors.	Other.	Electric.								Other.
<b>United States.....</b>	<b>138</b>	<b>62,602</b>	<b>47,963</b>	<b>44,591</b>	<b>1,212</b>	<b>500</b>	<b>1,660</b>	<b>13,754</b>	<b>885</b>	<b>41,064</b>	<b>27,310</b>	<b>59,030,005</b>	<b>34,632</b>	<b>84</b>	<b>21</b>	<b>5,615,712</b>
Alabama.....	19	5,766	5,706	5,246	—	—	460	—	60	1,173	1,173	5,156,407	—	—	—	—
Pennsylvania.....	63	26,091	18,777	17,075	2	500	1,200	6,489	825	14,865	8,376	36,886,592	13,668	50	—	348,958
Virginia.....	9	1,760	—	625	—	—	—	1,135	—	1,295	160	2,067,112	—	—	—	—
West Virginia.....	28	5,307	3,981	3,981	—	—	—	1,326	—	5,242	3,916	6,372,577	—	—	—	6,000
All other states.....	20	23,678	18,874	17,064	1,210	—	—	4,804	—	18,489	13,685	8,547,317	20,964	34	21	5,260,754

In 1909 Pennsylvania ranked first with respect to the amount of power used, reporting 26,091 horsepower, or 41.7 per cent of the aggregate for the industry. Steam was the most important form of power in all of the states shown, with the exception of Virginia, where electric power was most largely used.

**Fuel consumed.**—Table 13 shows that 59,030,005 short tons of bituminous coal were consumed in the

manufacture of coke in 1909. These figures, however, do not include 566,539 tons used in establishments engaged primarily in the manufacture of products other than coke. The difference between this total and that shown in Table 14 as charged into the ovens, amounting to 241,607 tons, may be considered as the amount of coal used for fuel in heating boilers, retorts, etc.

**SPECIAL STATISTICS RELATING TO MATERIALS, PRODUCTS, AND EQUIPMENT.**

**Materials used, for the United States as a whole.**—Table 14 shows, for 1909, 1904, and 1899, the quantity and cost of the coal used in the manufacture of coke, including the small amount so used in establishments not assigned to the coke industry. The quantity of coal used in the manufacture of coke is, to a considerable extent, a matter of estimate, as a large proportion of the coal is charged directly into the ovens from the mines without being weighed or measured; in fact,

there are as yet comparatively few establishments in this country where the quantity of coal made into coke is accurately ascertained. Where mining and the manufacture of coke were conducted by the same concern, and separate accounts were not kept, the companies were required to estimate the quantity and value of coal used for coking purposes. In order to avoid a duplicate canvass the United States Geological Survey, which annually collects statistics

of the production of coke, and the Bureau of the Census cooperated in collecting data for the year 1909. The figures for coal used and coke produced are the same, therefore, in the reports of the two bureaus for 1909. The variations in the reports for other census years may be attributed to differences in the methods employed by the two bureaus.

MATERIAL.	1909	1904	1899	PER CENT OF INCREASE. <sup>1</sup>		
				1899-1909	1904-1909	1899-1904
Total cost.....	\$85,388,124	\$31,083,515	\$19,665,532	232.5	110.4	58.1
Coal charged into ovens:						
Total quantity, tons.....	2 59,354,937	3 37,376,251	30,157,829	96.8	58.8	23.9
Cost.....	2 \$62,203,382	3 \$29,559,104	\$18,355,252	238.9	110.4	61.0
Run of mine, tons:						
Unwashed.....	40,594,842	25,165,692	20,844,637	94.7	61.3	20.7
Washed.....	6,007,760	2,902,721	1,457,061	312.1	107.0	99.1
Slack, tons:						
Unwashed.....	6,926,484	4,459,784	5,036,675	37.5	55.3	-11.5
Washed.....	5,825,851	4,848,054	2,818,556	100.7	20.2	72.0
All other materials.....	\$3,184,742	\$1,524,411	\$1,310,280	143.1	108.9	16.3

<sup>1</sup> A minus sign (-) denotes decrease.

<sup>2</sup> Includes 596,539 tons of coal, valued at \$1,363,597, used by establishments engaged primarily in the manufacture of products other than coke.

<sup>3</sup> Includes 596,245 tons of coal, valued at \$1,193,953, used by establishments engaged primarily in the manufacture of products other than coke.

Coal is the only material of much importance. The total amount used in the manufacture of coke in 1909, as reported, was 59,354,937 tons, as compared with 37,376,251 tons in 1904 and 30,157,829 tons in 1899, the increase for the decade being 96.8 per cent. The cost increased much more, relatively, than the quantity. More than two-thirds (68.4 per cent) of the total quantity of coal used for coking in 1909 was run of mine unwashed.

Products, for the United States as a whole.—Table 15 shows the quantity and value of the products of the coke ovens for 1909, 1904, and 1899, the figures including the products of ovens operated by establishments assigned to other industries, as well as of those operated by establishments in the coke industry proper. The figures do not, however, include the products of establishments in the illuminating gas industry, which make coke and various by-products incidentally to the manufacture of gas. In comparing the values of coke shown in the table with the quantities, it should be borne in mind that a great many coke-manufacturing concerns are controlled by large iron and steel companies and that the prices fixed for the coke may in some such cases be on an arbitrary basis not conforming to market prices. Moreover, while the schedule called for the selling value of the product at the works, it was not always possible to obtain this value, and in some instances the amount received at the place of delivery was reported.

The total quantity of oven coke reported for 1909, 39,315,065 short tons, represents an increase of 19,674,267 tons, or 100.2 per cent, over the amount reported in 1899. An average of practically one and one-half tons of coal was used per ton of coke produced in each of the three census years. By reason of the increased use of retort ovens and improvement in the

character of the retorts used, a large gain is shown in the quantity of by-products reported. These by-products consist principally of ammonium sulphate, gas, and tar. Taking into consideration the amount of gas used in the establishments in which it is produced, gas is the most important by-product of the retort ovens. Of the by-products sold, the various ammonia products were the most important, their value having increased from \$1,581,581 in 1904 to \$3,675,771 in 1909—a gain of 132.4 per cent. In calling for the returns of ammonia liquor, the strength was asked for. Ammonium sulphate is preferred as a base for reference, and in 1904 the ammonium products were estimated as the equivalent of 62,633,417 pounds of ammonium sulphate. In 1909 the production of 4,871,014 pounds of anhydrous ammonia was specifically reported, and the balance of the ammonia products were the equivalent of 123,111,197 pounds of ammonium sulphate. The total value of by-products reported increased from \$3,150,485 in 1904 to \$8,112,900 in 1909, or 157.5 per cent.

PRODUCT.	1909	1904	1899
<b>Total value.....</b>	<sup>1</sup> \$98,078,383	<sup>2</sup> \$53,455,108	\$35,585,445
<b>Coke:</b>			
Tons (2,000 pounds).....	39,315,065	25,143,288	19,640,798
Value.....	<sup>3</sup> \$89,965,483	\$50,304,623	\$34,633,418
Made in beehive ovens—			
Tons.....	33,060,421	22,674,902	( <sup>4</sup> )
Value.....	\$69,630,794	\$43,340,661	( <sup>4</sup> )
Made in retort or by-product ovens—			
Tons.....	6,254,644	2,468,386	( <sup>4</sup> )
Value.....	\$20,434,689	\$6,963,962	( <sup>4</sup> )
By-products obtained from retort or by-product ovens:			
Gas made, thousand cubic feet.....	76,590,763	20,174,563	( <sup>4</sup> )
Used in process or wasted, thousand cubic feet.....	60,799,543	15,711,501	( <sup>4</sup> )
Sold—			
Thousand cubic feet.....	15,791,220	4,463,062	1,171,943
Value.....	\$2,609,211	\$843,787	\$225,022
Tar—			
Gallons.....	60,126,006	26,223,323	10,488,733
Value.....	\$1,408,611	\$613,388	\$207,652
Ammonia products.....	\$3,676,771	<sup>6</sup> \$1,681,681	\$511,563
Ammonium sulphate—			
Pounds.....	<sup>6</sup> 123,111,197	31,546,781	11,984,631
Value.....	\$3,227,316	\$818,290	\$330,921
Anhydrous ammonia—			
Pounds.....	4,871,014	( <sup>4</sup> )	( <sup>4</sup> )
Value.....	\$448,455	( <sup>4</sup> )	( <sup>4</sup> )
Ammonia liquor—			
Gallons.....	( <sup>4</sup> )	4,791,468	1,572,235
Value.....	( <sup>4</sup> )	\$763,291	\$180,642
All other.....	\$419,307	\$111,729	\$7,490

<sup>1</sup> Includes products valued at \$2,381,761 reported by establishments engaged primarily in the manufacture of products other than coke, as follows: Retort coke, 415,472 tons, valued at \$1,404,162; tar, 4,393,576 gallons, valued at \$37,639; ammonium sulphate, 9,952,744 pounds, valued at \$235,665; gas sold, 2,160,915,000 cubic feet, valued at \$534,075; and other products to the value of \$60,280.

<sup>2</sup> Includes products valued at \$1,726,461 reported by establishments engaged primarily in the manufacture of products other than coke, viz: Coke made in beehive ovens, 153,622 tons, valued at \$454,888; coke made in retort or by-product ovens, 251,603 tons, valued at \$847,684; tar, 3,149,098 gallons, valued at \$61,552; ammonium sulphate, 5,496,068 pounds, valued at \$136,863; ammonia liquor, 451,789 gallons, valued at \$65,047; gas sold, 680,202,000 cubic feet, valued at \$159,323; and other products to the value of \$504.

<sup>3</sup> In addition, 82,049,683 bushels of gas-house coke to the value of \$3,723,215 were made for sale by establishments engaged primarily in the manufacture of illuminating gas.

<sup>4</sup> Not reported.

<sup>5</sup> Represents 62,633,417 pounds of ammonium sulphate or reduced equivalent in sulphate.

<sup>6</sup> Includes the reduced equivalent of ammonia liquor in sulphate and not comparable with prior censuses.

<sup>7</sup> Reported in part as anhydrous ammonia and in part as ammonium sulphate or reduced equivalents.

Materials, products, and equipment, by states.—Table 16 shows, by states, the total number of ovens, the total amount of coal used, the coke produced, and its value, for 1909, 1904, and 1899. The figures include the data for coke manufactured by establishments engaged primarily in other industries (except the

illuminating gas industry) as well as that made by establishments in the coke industry.

Of the total production of coke in 1909, amounting to 39,315,065 tons, Pennsylvania contributed 24,905,525 tons, or 63.3 per cent, the next states in importance in the output of coke being West Virginia and Alabama.

In the United States as a whole the yield of coke in 1909 was equal in weight to 66.2 per cent of the coal consumed, as compared with 67.3 per cent in 1904 and 65.1 per cent in 1899. The changes from census to census in the yield of coke are affected by changes in the relative importance of the different kinds of coal used. The high grade of coal used for coke in Pennsylvania is indicated by the fact that the yield in that state (67.3 per cent) in 1909 was higher than in any other state for which figures are shown separately, although not so high as that shown for "all other states." Ohio shows a marked increase in the yield of coke from coal during the decade, the percentage being 58.8 in 1899 and 65.4 in 1909. In Alabama, Virginia, and West Virginia, the yield in 1909 was higher than in 1899, but in Pennsylvania and Tennessee it was lower in 1909 than in either of the two preceding census years.

STATE AND CENSUS.	Ovens (number). <sup>2</sup>	Coal used (short tons). <sup>3</sup>	COKE PRODUCED. <sup>1</sup>			
			Amount (short tons).	Yield of coal in coke (per cent).	Value.	Average value per ton.
<b>United States:</b>						
1909.....	103,982	59,354,937	39,315,065	66.2	\$99,965,483	\$2.29
1904.....	77,461	47,376,251	25,143,238	67.3	\$69,304,623	2.06
1899.....	47,811	30,167,829	19,640,798	65.1	\$4,633,418	1.76
<b>Alabama:</b>						
1909.....	10,061	5,080,764	3,085,824	60.7	\$,068,267	2.61
1904.....	7,126	4,027,656	2,335,613	58.0	5,731,329	2.45
1899.....	5,290	3,028,472	1,787,809	59.0	3,634,471	2.03
<b>Ohio:</b>						
1909.....	447	340,735	222,711	65.4	683,155	3.07
1904.....	361	203,032	120,631	59.4	355,524	2.95
1899.....	244	142,678	83,878	58.8	255,129	3.04
<b>Pennsylvania:</b>						
1909.....	54,506	36,983,568	24,905,525	67.3	50,377,035	2.02
1904.....	41,995	23,128,017	16,308,934	70.5	28,700,800	1.76
1899.....	27,156	19,490,030	13,245,594	68.0	22,039,151	1.66
<b>Tennessee:</b>						
1909.....	2,729	493,283	261,808	53.1	667,723	2.55
1904.....	1,774	573,629	324,451	56.6	809,801	2.50
1899.....	1,727	684,821	380,825	55.6	764,890	2.01
<b>Virginia:</b>						
1909.....	5,469	2,000,518	1,347,478	65.4	2,415,769	1.79
1904.....	4,111	1,676,256	1,139,010	67.9	1,832,849	1.65
1899.....	1,588	994,635	618,707	62.2	1,071,284	1.73
<b>West Virginia:</b>						
1909.....	20,283	6,361,759	3,943,948	62.0	7,525,922	1.91
1904.....	14,452	3,746,602	2,355,146	62.9	4,141,032	1.76
1899.....	8,231	3,792,825	2,278,679	60.1	3,470,405	1.52
<b>All other states:</b>						
1909.....	10,487	8,034,310	5,547,771	69.0	20,227,612	3.65
1904.....	7,642	4,020,159	2,550,503	63.7	8,683,288	3.39
1899.....	3,569	2,024,368	1,245,606	61.5	3,398,088	2.73

<sup>1</sup> Includes 566,539 tons of coal in 1909, and 595,245 tons of coal in 1904, used in establishments engaged primarily in manufacturing products other than coke.

<sup>2</sup> Includes 8,311 idle ovens, and 242 ovens reported by establishments engaged primarily in the manufacture of products other than coke in 1909; 14,488 idle ovens, and 1,362 ovens reported by establishments engaged primarily in the manufacture of products other than coke in 1904; and 669 idle ovens in 1899. The number of ovens operated by establishments in other industries in 1899 can not be determined.

<sup>3</sup> Includes 415,472 tons of coke, valued at \$1,464,162, in 1909, and 410,225 tons of coke, valued at \$1,302,572, in 1904, produced in establishments engaged primarily in manufacturing products other than coke.

The average value of coke for the United States as a whole increased from \$1.76 per short ton in 1899 to \$2.29 in 1909; and in each state there was an increase in the average during the decade and during each of the five-year periods, except that in Virginia and Ohio the average was lower in 1904 than in 1899. There is a

considerable difference among the states with respect to the average value of coke per ton.

Table 17 presents, for the United States as a whole, statistics with respect to the number of coke ovens in 1909, 1904, and 1899, and Table 18 shows, for the United States as a whole and for individual states, the number of beehive ovens and of other styles of ovens, respectively, for each year.

CLASS.	COKE OVENS.		
	1909	1904	1899
Ovens in existence at end of year <sup>1</sup> .....	103,982	77,461	47,811
Ovens building at end of year.....	2,950	2,127	( <sup>2</sup> )
Ovens abandoned during year.....	201	178	( <sup>2</sup> )

<sup>1</sup> Includes 8,311 idle ovens and 242 ovens reported by establishments engaged primarily in the manufacture of products other than coke in 1909; 14,488 idle ovens and 1,362 ovens reported by similar establishments in 1904; and 669 idle ovens in 1909.  
<sup>2</sup> Not reported.

Notwithstanding the much larger capacity of the by-product ovens, this type showed a greater percentage of increase in number from 1899 to 1909 than the beehive type. The latter type increased from 46,345 in 1899 to 99,993 in 1909, or 115.8 per cent, as compared with an increase from 1,466 to 3,989, or 172.1 per cent, in by-product ovens during the same period. In 1909 Pennsylvania reported 53.2 per cent of the total number of beehive ovens and 32.5 per cent of the by-product ovens, as compared with 55.2 per cent and 24.8 per cent, respectively, in 1904. No beehive ovens were reported from Maryland, Massachusetts, Michigan, Minnesota, New Jersey, or New York at either census, while the beehive type only was used in 1909 in 12 of the 26 states reporting coke as a product. Colorado, which reported 42 by-product ovens in 1904 and none in 1909, is the only state in which their use has been discontinued.

STATE.	1909 <sup>1</sup>		1904 <sup>2</sup>		1899 <sup>3</sup>	
	Beehive.	By-product and other styles.	Beehive.	By-product and other styles.	Beehive.	By-product and other styles.
<b>United States.....</b>	<b>99,993</b>	<b>3,989</b>	<b>74,966</b>	<b>2,495</b>	<b>46,345</b>	<b>1,466</b>
Alabama.....	9,781	280	6,886	240	4,962	334
Colorado.....	3,846		3,276	42	1,203	40
Georgia.....	350		501		350	
Illinois.....	28	440		24	130	
Indiana.....	46	50			12	
Kansas.....	67		72		86	
Kentucky.....	494		498		300	
Maryland.....		200		200		
Massachusetts.....		400		400		400
Michigan.....		162		120		
Minnesota.....		50		50		
Missouri.....	4				12	
Montana.....	551		315		303	
New Jersey.....		150		100		
New Mexico.....	1,030		284		190	
New York.....		556		410		25
Ohio.....	322	125	281	80	244	
Oklahoma.....	536		280		130	
Pennsylvania.....	53,210	1,296	41,375	620	26,801	355
Tennessee.....	2,729		1,774		1,727	
Utah.....	854		504		104	
Virginia.....	5,469		4,111		1,528	60
Washington.....	235		169		90	
West Virginia.....	20,163	120	14,332	120	7,979	252
Wisconsin.....	228	160	228	80	120	
Wyoming.....			74		74	

<sup>1</sup> Figures include 8,311 idle ovens and 242 ovens reported by establishments engaged primarily in manufacturing products other than coke.

<sup>2</sup> Figures include 14,488 idle ovens and 1,362 ovens—1,070 beehive and 292 by-product—operated by establishments engaged primarily in manufacturing products other than coke.

<sup>3</sup> Figures include 669 idle ovens.

DETAILED STATE TABLES.

The principal data secured for the coke industry are presented in Tables 19 and 20.

Table 19 shows for 1909, 1904, and 1899 the number of establishments, persons engaged in the industry,

horsepower, capital, salaries, wages, cost of materials, value of products, and value added by manufacture.

Table 20 gives more detailed statistics for the industry for 1909 only.

COKE—COMPARATIVE STATISTICS, BY STATES: 1909, 1904, AND 1899.

STATE.	Census.	Number of establishments.	PERSONS ENGAGED IN INDUSTRY.				Primary horsepower.	Capital.	Salaries.	Wages.	Cost of materials.	Value of products.	Value added by manufacture (value of products less cost of materials).
			Total.	Proprietors and firm members.	Salariated employees.	Wage earners (average number).							
Expressed in thousands.													
United States.....	1909	315	31,226	101	1,852	29,273	62,602	\$152,321	\$2,072	\$15,454	\$64,025	\$95,697	\$31,672
	1904	278	20,440	73	1,388	18,981	66,669	90,713	1,248	9,304	29,885	51,729	21,844
	1899	241	17,962	48	915	16,999	34,767	36,503	797	7,086	19,666	35,585	15,919
Alabama.....	1909	35	2,800	.....	.....	220	5,766	17,770	226	1,283	6,371	8,843	2,472
	1904	24	2,272	.....	.....	107	3,075	3,425	96	924	3,097	6,175	2,178
	1899	15	1,637	2	43	1,502	692	3,855	40	536	2,674	3,726	1,062
Ohio.....	1909	4	259	.....	.....	13	246	1,238	18	120	640	851	211
	1904	4	126	.....	.....	12	113	584	13	54	170	259	89
	1899	5	85	.....	.....	14	71	85	19	33	138	255	117
Pennsylvania.....	1909	146	16,219	83	805	15,331	26,091	68,023	943	8,436	33,762	51,816	18,054
	1904	110	10,675	72	740	10,154	44,478	56,839	734	5,173	14,070	28,024	13,945
	1899	89	9,841	40	518	9,283	24,525	20,213	481	4,517	11,678	22,282	10,504
Tennessee.....	1909	8	270	.....	.....	20	250	858	14	87	478	586	108
	1904	9	416	.....	.....	30	377	733	24	129	611	810	199
	1899	8	469	.....	.....	22	477	607	14	128	523	765	242
Virginia.....	1909	16	1,553	5	123	1,425	1,760	6,287	109	543	1,818	2,416	593
	1904	13	1,164	.....	.....	70	1,094	3,467	58	440	1,133	1,885	762
	1899	5	808	.....	.....	23	785	1,252	26	226	677	1,073	396
West Virginia.....	1909	71	4,746	2	318	4,426	5,307	12,821	281	1,064	5,012	7,563	2,551
	1904	74	2,704	.....	.....	231	2,533	8,064	160	1,004	2,647	4,174	1,527
	1899	77	3,340	1	208	3,131	4,055	4,453	127	800	1,967	3,529	1,662
All other states.....	1909	35	5,379	11	353	5,015	22,058	45,324	481	3,321	15,044	23,622	7,678
	1904	44	2,723	.....	.....	178	2,545	17,601	163	1,580	6,298	9,502	3,204
	1899	42	1,762	5	87	1,660	3,461	6,038	90	756	2,009	3,955	1,946

COKE—DETAILED STATISTICS, BY STATES: 1909.

STATE.	Number of establishments.	PERSONS ENGAGED IN INDUSTRY.							WAGE EARNERS—DEC. 15, OR NEAREST REPRESENTATIVE DAY.					Primary horsepower.	
		Total.	Proprietors and firm members.	Salariated officers, superintendents, and managers.	Clerks.		Wage earners.			Total.	16 and over.		Under 16.		
					Male.	Female.	Average number.	Number, 15th day of—			Male.	Female.	Male.		Female.
								Maximum month.	Minimum month.						
United States.....	315	31,226	101	713	1,037	102	29,273	De 33,094	Ap 26,461	33,222	33,119	6	87	62,602	
Alabama.....	35	2,800	.....	83	120	17	2,580	No 2,890	Je 2,254	3,019	2,941	.....	78	5,766	
Ohio.....	4	259	.....	7	4	2	246	Ap 300	Aug 219	240	240	.....	.....	1,238	
Pennsylvania.....	146	16,219	83	364	406	35	15,331	De 17,521	Ap 13,296	17,562	17,558	3	1	26,091	
Tennessee.....	8	270	.....	9	11	.....	250	No 325	Jy 205	322	322	.....	.....	370	
Virginia.....	16	1,553	5	34	86	3	1,425	De 1,631	Jy 1,309	1,631	1,625	.....	6	1,760	
West Virginia.....	71	4,746	2	134	174	10	4,426	De 5,073	Jy 4,069	5,072	5,071	.....	1	5,307	
All other states <sup>1</sup> .....	35	5,379	11	82	236	35	5,015	.....	.....	5,370	5,362	3	11	22,058	

STATE.	Capital.	EXPENSES.										Value of products.	Value added by manufacture (value of products less cost of materials).
		Total.	Services.			Materials.		Miscellaneous.					
			Officials.	Clerks.	Wage earners.	Fuel and rent of power.	Other.	Rent of factory.	Taxes, including internal revenue.	Contract work.	Other.		
United States.....	\$152,321,337	\$84,839,245	\$1,194,756	\$877,394	\$15,454,345	\$60,905,891	\$3,118,636	\$250,011	\$678,827	\$17,929	\$2,440,456	\$95,696,622	\$31,672,695
Alabama.....	17,770,498	8,233,065	133,597	92,697	1,282,594	6,100,824	271,153	10,345	33,831	.....	309,424	8,842,512	2,471,025
Ohio.....	1,238,106	808,352	13,840	4,788	119,852	616,101	23,509	450	2,327	.....	27,485	850,015	211,005
Pennsylvania.....	68,023,289	44,512,169	504,358	348,150	8,435,604	32,485,287	1,277,166	105,353	310,705	17,929	987,617	51,816,440	18,053,996
Tennessee.....	857,614	597,122	9,863	4,504	80,784	468,900	8,540	.....	3,558	.....	14,913	685,685	108,158
Virginia.....	6,286,982	2,648,821	50,650	58,825	542,747	1,728,106	90,146	.....	18,790	.....	157,557	2,415,769	597,517
West Virginia.....	12,820,651	7,306,687	154,532	126,154	1,664,152	4,720,282	292,191	.....	51,203	.....	298,173	7,563,410	2,550,946
All other states <sup>1</sup> .....	45,324,197	20,734,129	237,916	242,276	3,322,612	14,786,881	1,155,981	.....	127,863	.....	701,287	23,622,173	7,679,411

<sup>1</sup> All other states embrace: Colorado, 12 establishments; Georgia, 1; Illinois, 2; Indiana, 1; Kentucky, 4; Maryland, 1; Massachusetts, 1; Minnesota, 1; Montana, 1; New Jersey, 1; New Mexico, 2; New York, 2; Utah, 1; Washington, 3; Wisconsin, 2.

---

---

# GAS, ILLUMINATING AND HEATING

---

---

(635)

# THE MANUFACTURE OF GAS.

## GENERAL STATISTICS.

**Scope of the industry.**—The census classification "gas, illuminating and heating" covers establishments making gas for sale for light, heat, or power, including some establishments operated by municipal governments. It covers the production of gas by various processes, including the destructive distillation of coal, wood, resins, oils, or other carbonaceous substances; the action of steam upon incandescent carbon or carbon-containing substances; the volatilization, or cracking, of petroleum or the petroleum distillates; and the action of water upon substances like calcium carbide.

The production of gas for the exclusive consumption of the same concern is not covered. Many residences, hotels, and mercantile establishments have plants for making acetylene or other gas for heat, light, or power, and many manufacturing and other industrial concerns make gas—usually "producer" gas—in large quantities for use as fuel in their own establishments. The increased use of gas engines for generating power has led to a marked development in such production of gas by establishments for their own consumption.

The gas produced in by-product coke plants, also, except a comparatively small proportion which is sold to gas companies and by them in turn sold to their customers, does not figure in this report. The quantity manufactured by this process is given in Table 15. Blast furnace gas also is not covered by the statistics.

A further class of establishments which is not included in the tables consists of those engaged in selling gas which has been purchased from establishments that manufacture it. The business is merchandising and not manufacture, and the gas they sell has been reported by the establishments that manufacture it. They are noted here only because they own and use in the distribution of the purchased gas, apparatus

and appliances—holders, mains, service pipes, meters, cylinders, etc.—such as in other cases would be owned by the gas manufacturers. Fifty-one such establishments were reported in 1909. The total capital of these establishments was \$15,297,324; the quantity of gas sold by them was 3,273,618,000 cubic feet, having a value of \$3,605,635; and their receipts from rents and sales of lamps and appliances totaled \$19,843, and from all other products \$38,719. In general, however, the concerns covered by the tables distribute the gas which they manufacture directly to the consumer, and a large part of their capital and expenses is connected with the process of distribution.

Establishments in the industry produce not only straight coal gas, straight water gas, carbureted water gas, mixed coal and water gas, oil gas, and acetylene gas, but also as by-products tar, pitch, benzol, hydrocarbons, ammonia water, ammonium sulphate, coke, cyanides, and other products.

Statistics of this industry were secured at the census of 1849, and at each subsequent census except that of 1879. In 1889 it was for the first time made the subject of a special report, which was purely statistical. A second special report was made at the census of 1899 which embraced, besides a presentation and discussion of the statistics which had been collected, a history and description of the industry.

**Comparative summary for the United States.**—Table 1 summarizes the statistics of the gas-manufacturing industry for each census from 1859 to 1909, inclusive, except for 1879, when no statistics were reported for the industry.

The financial figures for 1869 are given in currency, which at that time was worth only about 80 cents, gold, to the dollar. For strict comparison, therefore, these figures should be reduced about 20 per cent.

	NUMBER OR AMOUNT. <sup>1</sup>						PER CENT OF INCREASE. <sup>2</sup>					
	1909	1904	1899	1889	1869	1859	1899-1909	1904-1909	1899-1904	1889-1899	1869-1899 <sup>1</sup>	1859-1869
Number of establishments.....	1,296	1,019	877	742	390	221	47.8	27.2	16.2	18.2	90.3	76.5
Persons engaged in the industry.....	51,007	40,043	28,363	( <sup>3</sup> )	( <sup>3</sup> )	( <sup>3</sup> )	79.8	27.4	41.2	.....	.....	.....
Proprietors and firm members.....	277	71	.....	( <sup>3</sup> )	( <sup>3</sup> )	( <sup>3</sup> )	( <sup>4</sup> )	290.1	.....	.....	.....	.....
Salieried employees.....	13,515	9,400	5,904	( <sup>3</sup> )	( <sup>3</sup> )	( <sup>3</sup> )	128.9	43.7	59.3	.....	.....	.....
Wage earners (average number).....	37,215	30,566	22,459	12,996	8,723	5,730	65.7	21.8	36.1	72.8	( <sup>5</sup> )	( <sup>5</sup> )
Primary horsepower.....	128,350	73,101	31,797	26,475	2,768	( <sup>3</sup> )	303.7	75.6	123.9	20.1	.....	.....
Capital.....	\$915,536,762	\$725,035,204	\$567,000,506	\$258,771,795	\$71,773,694	\$28,848,726	61.5	26.3	27.9	119.1	200.5	148.8
Expenses.....	\$113,500,978	\$92,258,955	\$53,084,174	( <sup>3</sup> )	( <sup>3</sup> )	( <sup>3</sup> )	113.8	23.0	73.8	.....	.....	.....
Services.....	\$33,316,068	\$25,521,016	\$17,709,796	( <sup>3</sup> )	( <sup>3</sup> )	( <sup>3</sup> )	88.1	30.5	44.1	.....	.....	.....
Salaries.....	\$12,385,371	\$8,463,099	\$5,273,500	( <sup>3</sup> )	( <sup>3</sup> )	( <sup>3</sup> )	134.9	46.3	60.5	.....	.....	.....
Wages.....	\$20,930,697	\$17,057,917	\$12,436,296	\$8,499,625	\$6,546,734	\$2,321,536	68.3	22.7	37.2	46.3	29.8	182.0
Materials.....	\$52,427,844	\$37,180,066	\$20,635,356	\$14,037,087	\$10,869,373	\$3,667,630	154.4	41.0	80.4	46.8	29.1	196.4
Miscellaneous.....	\$27,757,066	\$29,557,273	\$14,769,022	\$7,799,385	( <sup>3</sup> )	( <sup>3</sup> )	87.9	-6.1	100.1	89.4	.....	.....
Value of products.....	\$166,814,371	\$125,144,945	\$75,716,693	\$56,987,290	\$32,048,851	\$12,016,353	120.3	33.3	65.3	32.9	77.8	166.7
Value added by manufacture (value of products, less cost of materials).....	\$114,386,527	\$87,964,879	\$55,111,337	\$42,950,203	\$21,179,478	\$8,348,723	107.6	30.0	59.6	28.3	102.8	153.7
Quantity of gas made (1,000 cubic feet).....	150,835,793	112,549,979	67,093,553	36,519,512	( <sup>3</sup> )	( <sup>3</sup> )	124.8	34.0	67.8	83.7	.....	.....

<sup>1</sup> No statistics reported for this industry in 1879.

<sup>2</sup> A minus sign (-) denotes decrease. Where percentages are omitted comparable figures are not available.

<sup>3</sup> Comparable figures not available.

<sup>4</sup> None reported in 1899.

<sup>5</sup> Percentage omitted because figures are not strictly comparable.

The census of 1909 covered 1,296 establishments manufacturing gas, in which 37,215 wage earners were employed. The value of products was \$166,814,371. It should be borne in mind that in most cases this value represents that of the product delivered to the consumer, and that, as already stated, a considerable part of the expenses of the industry are connected with distribution. It is partly for this reason that the cost of materials constitutes a relatively smaller proportion of the total value of products in this industry than in most others. In 1909 the materials cost \$52,427,844, which is equal to 31.4 per cent of the value of products, while the value added by manufacture was \$114,386,527.

While the census statistics of capital are by no means reliable, there can be no doubt that the amount of capital invested is much higher in proportion to value of products in the illuminating-gas industry than in most others, chiefly because of the fact that the investment includes the cost of mains and other distributing apparatus by which the product is delivered to the consumer, often at a very considerable distance from the works.

With the single exception of a decrease from 1904 to 1909 in miscellaneous expenses, in which there is generally more or less variation, each item of statistics in the table shows an increase at every census over the preceding census. The increases from census to census, while varying both in amount and per cent, were generally large. The increase in the quantity of gas made is the most accurate indication of the development of the industry, although such statistics were not secured before 1889. The quantity of gas reported for 1889 was 36,519,512,000 cubic feet, and for 1909, 150,835,793,000 cubic feet, an increase during the 20 years of 114,316,281,000 cubic feet, or 313 per cent. The increase in the value of products during the same time amounted to \$109,827,081, or 192.7 per cent. The difference between these percentages indicates a considerable decrease in the average unit value of gas, especially as of late years the value of products includes a considerable amount representing the value of by-products and of lamps and appliances sold.

Summary, by states.—Table 2 summarizes the more important statistics by states, the states being arranged according to the value of products reported for 1909.

STATE.	Number of establishments: 1909	WAGE EARNERS.			VALUE OF PRODUCTS.			VALUE ADDED BY MANUFACTURE.			PER CENT OF INCREASE. <sup>1</sup>									
		Average number: 1909	Per cent of total.	Rank.	Amount: 1909	Per cent of total.	Rank.	Amount: 1909	Per cent of total.	Rank.	Wage earners (average number).			Value of products.			Value added by manufacture.			
											1899-1909	1904-1909	1899-1904	1899-1909	1904-1909	1899-1904	1899-1909	1904-1909	1899-1904	
United States.	1,296	37,215	100.0		\$166,814,371	100.0		\$114,386,527	100.0		65.7	21.8	36.1	120.3	33.3	65.3	107.6	30.0	58.6	
New York.	141	6,422	17.3	1	42,340,726	25.4	1	27,328,320	23.9	1	10.3	-8.6	30.6	102.4	19.9	68.8	81.6	12.1	61.9	
Illinois.	78	6,301	16.9	2	21,082,100	12.6	2	14,842,416	13.0	2	165.8	112.0	25.0	139.9	31.5	82.4	118.8	20.2	69.4	
Pennsylvania.	99	3,119	8.4	3	15,839,812	9.5	3	11,741,018	10.3	3	-0.8	8.2	-8.3	101.2	46.5	37.3	148.8	53.2	62.4	
Massachusetts.	64	2,292	6.2	4	11,074,354	6.6	4	7,264,220	6.4	4	62.7	24.1	31.1	88.7	37.8	36.9	72.3	47.1	17.1	
New Jersey.	47	1,917	5.2	5	9,836,806	5.9	5	6,982,072	6.1	5	45.2	40.2	3.6	161.1	64.4	69.1	134.1	44.0	62.6	
California.	74	1,666	4.5	7	8,926,544	5.4	6	6,322,715	5.5	6	135.6	96.5	10.0	182.3	64.9	71.2	279.0	49.6	86.6	
Michigan.	55	1,771	4.8	6	6,748,070	4.0	7	4,018,093	4.0	7	172.9	49.4	82.6	204.4	71.1	11.9	162.9	61.3	63.0	
Missouri.	29	941	2.5	9	4,637,544	2.8	8	3,414,089	3.0	8	7	12.8	-48.5	118.9	61.2	-17.0	94.1	61.0	79.3	
Wisconsin.	49	1,063	2.9	8	4,000,981	2.4	9	2,612,366	2.3	9	99.8	16.7	71.2	186.4	37.4	108.4	142.8	24.9	94.4	
Connecticut.	28	926	2.5	11	3,445,961	2.1	10	2,441,021	2.1	11	161.6	44.7	80.8	142.5	34.7	86.0	130.5	40.9	63.0	
Maryland.	18	476	1.3	17	3,223,001	1.9	11	2,503,518	2.3	10	100.8	109.7	-4.2	70.4	61.0	11.0	97.1	68.9	16.7	
Indiana.	53	928	2.5	10	3,147,305	1.9	12	2,045,356	1.8	14	169.1	37.0	64.2	204.4	71.1	77.9	162.9	61.3	63.0	
Ohio.	38	666	1.8	14	3,079,870	1.8	13	2,252,926	2.0	12	-52.1	-70.3	61.2	-21.6	-36.0	22.4	-28.0	-35.0	13.7	
Iowa.	117	806	2.2	13	2,892,646	1.7	14	1,781,364	1.6	15	256.0	72.2	107.1	258.0	67.9	128.7	195.0	47.5	100.7	
Minnesota.	42	848	2.3	12	2,374,281	1.7	15	2,054,449	1.8	13	126.1	47.5	53.3	167.1	41.4	88.9	160.1	45.8	82.7	
Rhode Island.	8	112	0.3	21	1,833,176	1.1	17	1,302,678	1.1	17	-4.2	-10.8	7.4	89.2	16.0	63.1	79.7	20.9	48.7	
Washington.	12	465	1.2	18	1,683,635	1.0	18	1,022,727	0.9	21	330.6	.....	432.9	179.7	90.5	328.0	125.8	89.1	89.1	
Texas.	27	575	1.5	16	1,644,066	1.0	19	1,099,220	1.0	18	.....	250.6	.....	332.6	128.6	89.2	284.3	110.5	82.1	
Colorado.	10	306	0.8	25	1,472,470	0.9	20	836,916	0.7	24	180.7	180.7	.....	181.5	82.9	53.9	109.0	52.0	37.0	
Virginia.	21	378	1.0	24	1,472,384	0.9	21	1,041,607	0.9	20	184.2	41.0	101.5	204.8	50.2	102.9	195.7	49.8	97.4	
Georgia.	15	459	1.2	19	1,425,271	0.9	22	1,057,544	0.9	19	69.4	-4.8	77.9	115.6	34.3	60.5	103.7	37.3	48.4	
Nebraska.	48	400	1.1	22	1,415,002	0.8	23	970,179	0.8	22	37.9	32.4	4.1	169.5	55.2	73.7	148.1	44.3	71.9	
Tennessee.	11	422	1.1	20	1,251,558	0.8	24	924,883	0.8	23	122.1	17.9	64.2	124.1	54.5	45.1	111.7	47.8	43.7	
Louisiana.	5	278	0.7	26	1,091,309	0.7	25	764,670	0.7	25	.....	16.3	.....	139.8	45.3	65.1	96.4	28.4	62.8	
Kentucky.	15	358	1.0	23	1,003,582	0.6	26	689,037	0.6	27	38.4	-7.4	49.5	49.0	4.5	43.2	20.5	-1.1	31.0	
Oregon.	8	260	0.7	27	909,115	0.5	27	708,817	0.6	26	.....	.....	.....	419.4	98.9	161.1	481.1	90.1	205.7	
Alabama.	13	259	0.7	28	687,145	0.4	28	473,063	0.4	28	.....	90.4	.....	194.8	93.5	52.4	159.9	76.5	47.3	
Florida.	12	210	0.6	31	585,398	0.4	29	402,982	0.4	29	.....	.....	.....	244.1	80.3	84.7	212.4	73.0	80.6	
New Hampshire.	14	247	0.7	29	581,395	0.3	30	401,044	0.4	30	28	104.1	73.9	17.4	63.2	19.5	36.5	48.5	26.1	17.8
Maine.	19	216	0.6	30	548,691	0.3	31	338,732	0.3	31	.....	110.0	.....	92.6	23.0	55.8	59.0	7.0	48.6	
North Carolina.	14	151	0.4	33	369,376	0.2	32	245,884	0.2	33	.....	.....	45.2	183.8	65.5	71.5	.....	61.8	.....	
Utah.	3	187	0.4	32	365,856	0.2	33	107,086	0.2	35	.....	.....	.....	128.8	.....	.....	.....	54.7	.....	
Delaware.	5	128	0.3	34	363,769	0.2	34	254,828	0.2	32	.....	.....	.....	82.0	19.3	52.5	71.1	36.4	25.0	
South Carolina.	12	127	0.3	35	333,877	0.2	35	210,828	0.2	34	.....	.....	.....	94.2	70.1	12.2	64.2	64.2	.....	
Vermont.	9	70	0.2	38	278,188	0.2	36	178,545	0.2	36	.....	.....	.....	.....	.....	.....	.....	.....	.....	
South Dakota.	17	198	0.3	36	277,569	0.2	37	158,016	0.1	39	.....	.....	.....	.....	87.8	.....	.....	68.0	.....	
Mississippi.	8	101	0.3	37	265,582	0.2	38	160,814	0.1	37	.....	.....	.....	.....	104.8	.....	.....	.....	.....	
Arkansas.	5	48	0.1	40	218,801	0.1	39	128,510	0.1	41	.....	.....	.....	.....	57.6	-22.1	102.2	27.7	-38.3	
Kansas.	12	36	0.1	42	207,586	0.1	40	150,937	0.1	40	.....	.....	.....	.....	-30.0	-60.2	60.9	-30.7	-60.0	
West Virginia.	4	61	0.2	39	202,531	0.1	41	166,958	0.1	38	.....	.....	.....	.....	.....	28.5	.....	.....	-16.9	
North Dakota.	6	28	0.1	44	198,633	0.1	42	129,801	0.1	42	.....	.....	.....	.....	34.4	4.0	41.5	.....	.....	
Montana.	5	48	0.1	40	189,912	0.1	43	113,170	0.1	43	.....	.....	.....	.....	65.1	.....	.....	.....	.....	
Arizona.	8	20	0.1	45	137,400	0.1	44	90,295	0.1	44	.....	.....	.....	.....	.....	.....	.....	.....	.....	
Oklahoma.	6	38	0.1	41	114,851	0.1	45	71,279	0.1	45	.....	.....	.....	.....	.....	.....	.....	.....	.....	
Idaho.	3	35	0.1	43	113,472	0.1	46	61,035	0.1	46	.....	.....	.....	.....	.....	.....	.....	.....	.....	
Nevada.	3	6	(?)	47	87,263	(?)	47	30,919	(?)	47	.....	.....	.....	.....	.....	.....	.....	.....	.....	
All other states <sup>2</sup> .	6	628	1.7	.....	2,359,899	1.4	.....	1,711,172	1.5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	

<sup>1</sup> Percentages are based on figures in Table 21. A minus sign (-) denotes decrease. Per cent not shown where base is less than 100 for wage earners, or is less than \$100,000 for value of products or value added by manufacture, or where comparative figures can not be given without disclosing individual operations.  
<sup>2</sup> Less than one-tenth of 1 per cent.  
<sup>3</sup> Includes the following, with establishments as indicated: District of Columbia, 3; New Mexico, 2; Wyoming, 1.

In determining the rank of the states, all states are considered, regardless of whether or not they are shown separately in the tables; hence some omissions occur in the several series of numbers indicating rank, as certain states included under "all other states" held a higher rank in some items than some of the states for which separate figures are given.

The industry is well distributed throughout the United States, some establishments being reported for every state. New York is the most important state in the manufacture of gas; in 1909 it reported 25.4 per cent of the total value of products. Illinois, which ranked second, reported about one-eighth of the total value of products, but reported nearly as many wage earners as New York. Pennsylvania, Massachusetts, and New Jersey were third, fourth, and fifth in rank in 1909 with respect to wage earners, value of products, and value added by manufacture. Together, these five leading states reported 53.9 per cent of the wage earners in the industry, 60 per cent of the value of products, and 59.6 per cent of the value added by manufacture.

Most of the states held the same, or practically the same, rank in respect to value added by manufacture in 1909 as in respect to value of products. Colorado was the most conspicuous exception, ranking twen-

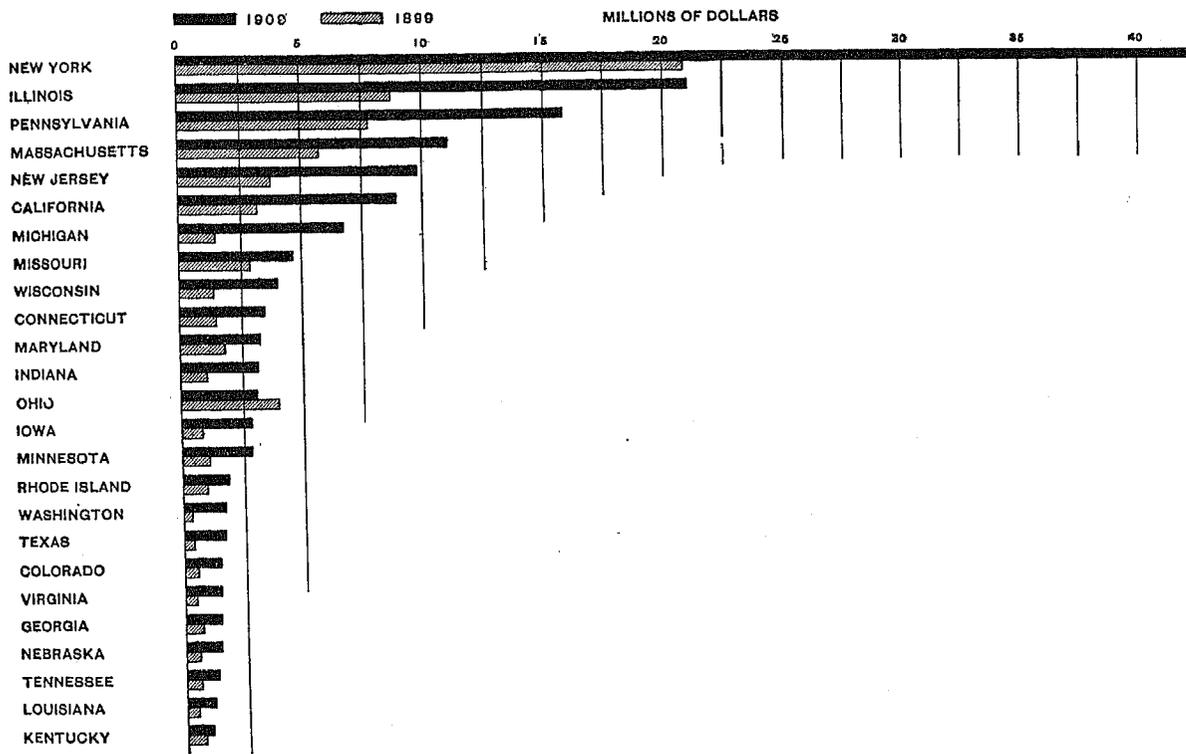
tieth in value of products and twenty-fourth in value added by manufacture.

Remarkable increases in value of products between 1899 and 1909 are shown for the following states: Michigan, 358.1 per cent; Washington, 432.9 per cent; Texas, 332.6 per cent; and Oregon, 419.4 per cent. On the other hand, conspicuous decreases occurred during the decade in Ohio and Kansas, presumably because of the substitution of natural for manufactured gas.

A few of the less important states advanced notably in rank in this industry, as measured by value of products, from 1904 to 1909—Washington, from twenty-sixth place to eighteenth place; Texas, from twenty-fifth to nineteenth; Utah, from thirty-seventh to thirty-third; Vermont, from fortieth to thirty-sixth; and Mississippi, from forty-first to thirty-eighth. Ohio dropped from eighth place in 1904 to thirteenth in 1909; Minnesota, from twelfth to fifteenth; Georgia, from eighteenth to twenty-second; Kentucky, from twentieth to twenty-sixth; Arkansas, from thirty-fourth to thirty-ninth; Kansas, from twenty-seventh to fortieth; and West Virginia, from thirty-eighth to forty-first.

The diagram below shows graphically the value of products reported for the most important states in the industry in 1909 and 1899.

GAS, ILLUMINATING AND HEATING—VALUE OF PRODUCTS, FOR LEADING STATES: 1909 AND 1899.



Persons engaged in the industry.—Table 3 shows, for 1909, the number of persons engaged in the industry, classified according to occupational status, sex, and age. It should be borne in mind that the sex and age classification of the average number of wage earners in this and other tables is an estimate.

The average number of persons engaged in the gas industry during 1909 was 51,007, of whom 37,215, or

73 per cent, were wage earners; 2,986, or 5.9 per cent, proprietors and officials; and 10,806, or 21.2 per cent, clerks. Of the total number of persons engaged in the industry, 49,231, or 96.5 per cent, were males, and 1,776, or 3.5 per cent, females, almost all of the latter being clerks. The average number of wage earners under 16 years of age was only 17. This industry requires, in the manufacturing process, only

a comparatively small number of wage earners, much the larger number, together with most of the clerks, being employed in the distribution service.

CLASS.	PERSONS ENGAGED IN THE INDUSTRY: 1909		
	Total.	Male.	Female.
All classes.....	51,007	49,231	1,776
Proprietors and officials.....	2,986	2,967	19
Proprietors and firm members.....	277	273	4
Salaried officers of corporations.....	900	981	0
Superintendents and managers.....	1,719	1,713	6
Clerks <sup>1</sup> .....	10,806	9,121	1,685
Wage earners (average number).....	37,215	37,143	72
16 years of age and over.....	37,198	37,127	71
Under 16 years of age.....	17	16	1

<sup>1</sup> Includes stenographers and other subordinate salaried employees.

The average number of wage earners in each state for the censuses of 1909, 1904, and 1899 is given in Table 21. The distribution of the average number by sex and age is not shown for the individual states, but Table 22 gives such a distribution for 1909 for the number employed on December 15, or the nearest representative day.

In order to compare the distribution of persons engaged in the industry according to occupational status in 1909 with that in 1904, it is necessary to use the classification employed at the earlier census. (See Introduction.) Such a comparison is made in Table 4. Comparable figures for 1899 are not available. The table shows that salaried employees increased about twice as rapidly as wage earners.

CLASS.	PERSONS ENGAGED IN THE INDUSTRY.				
	1909		1904		Per cent of increase: 1904-1909
	Number.	Per cent distribution.	Number.	Per cent distribution.	
Total.....	51,007	100.0	40,043	100.0	27.4
Proprietors and firm members..	277	0.5	71	0.2	200.1
Salaried employees.....	13,515	26.5	9,406	23.5	43.7
Wage earners (average number).	37,215	73.0	30,566	76.3	21.8

Table 5 shows the average number of wage earners distributed according to age, and in the case of those 16 years of age and over according to sex, for 1909, 1904, and 1899. (See Introduction.)

CLASS.	AVERAGE NUMBER OF WAGE EARNERS IN THE INDUSTRY.					
	1909		1904		1899	
	Number.	Per cent distribution.	Number.	Per cent distribution.	Number.	Per cent distribution.
Total.....	37,215	100.0	30,566	100.0	22,459	100.0
16 years of age and over.....	37,198	100.0	30,557	100.0	22,456	99.9
Male.....	37,127	99.8	30,524	99.9	22,446	99.8
Female.....	71	0.2	33	0.1	10	( <sup>1</sup> )
Under 16 years of age.....	17	( <sup>1</sup> )	9	( <sup>1</sup> )	3	( <sup>1</sup> )

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

Wage earners employed, by months.—Table 6 gives the number of wage earners employed on the 15th (or the nearest representative day) of each month during the year 1909 for the 15 states in which 500 or more wage earners were employed during the year. The District of Columbia, in which an average of more than 500 wage earners were employed in the gas industry in 1909, is omitted from the table, as its inclusion would disclose individual operations.

In the United States as a whole the largest number of wage earners reported for any month of 1909 was 40,412, in June, and the smallest number 32,562, in February, the minimum number being equal to 80.6 per cent of the maximum. In 1904 the maximum number of wage earners, 32,449, was reported in July and the minimum, 28,115, forming 86.6 per cent of the maximum, in February. Although more gas is usually consumed in winter than in summer, most of the work connected with the distributing system is outdoor work and subject to seasonal and weather conditions; therefore the maximum of employment for outside workers, and also for all wage earners combined, occurs during the summer months, when the works and mains are put in repair and extended, and the minimum during the winter, when such work, in a large measure, is impracticable.

STATE.	Average number during the year.	WAGE EARNERS IN THE INDUSTRY.											
		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
United States.....	37,215	<b>33,115</b>	<i>32,562</i>	<b>34,314</b>	<b>37,422</b>	39,456	<b>40,412</b>	40,225	38,486	<b>37,800</b>	38,065	37,566	<b>37,122</b>
California.....	1,666	<b>1,620</b>	<i>1,611</i>	1,605	1,603	<i>1,593</i>	1,662	1,674	1,644	1,701	1,711	1,788	1,781
Connecticut.....	928	<b>749</b>	<i>738</i>	749	916	981	1,062	1,074	1,069	1,039	1,004	968	915
Illinois.....	6,301	<b>5,106</b>	<i>5,018</i>	5,876	6,623	7,129	<b>7,135</b>	7,039	6,869	6,646	6,314	6,074	5,755
Indiana.....	923	<b>799</b>	<i>815</i>	899	911	957	<b>1,012</b>	1,004	968	907	934	901	869
Iowa.....	806	<b>652</b>	<i>654</i>	701	814	877	<b>1,018</b>	970	851	814	839	784	795
Massachusetts.....	2,292	<b>2,079</b>	<i>2,027</i>	2,020	2,188	2,423	<b>2,402</b>	2,541	2,382	2,323	2,395	2,361	2,269
Michigan.....	1,771	<b>1,566</b>	<i>1,538</i>	1,514	1,743	1,838	<b>1,900</b>	1,906	1,738	1,780	1,877	1,874	1,914
Minnesota.....	848	<b>770</b>	<i>790</i>	756	839	956	<b>983</b>	915	878	877	819	804	865
Missouri.....	941	<b>732</b>	<i>799</i>	762	879	973	<b>1,195</b>	1,082	986	992	1,042	980	807
New Jersey.....	1,917	<b>1,864</b>	<i>1,871</i>	1,896	1,932	1,939	<b>1,974</b>	1,955	1,944	1,923	1,910	1,909	1,892
New York.....	6,422	<b>5,769</b>	<i>5,538</i>	5,619	6,313	6,738	<b>6,950</b>	6,881	6,583	6,535	6,736	6,807	6,590
Ohio.....	666	<b>755</b>	<i>780</i>	866	805	802	<b>734</b>	787	484	534	564	586	619
Pennsylvania.....	3,119	<b>2,859</b>	<i>2,784</i>	2,873	3,134	3,281	<b>3,282</b>	3,406	3,195	3,150	3,189	3,156	3,110
Texas.....	575	<b>431</b>	<i>404</i>	520	685	612	<b>606</b>	704	689	589	558	534	470
Wisconsin.....	1,063	<b>928</b>	<i>925</i>	944	1,088	1,117	<b>1,154</b>	1,172	1,144	1,102	1,079	1,066	1,044

NOTE.—The month of maximum employment for each state is shown by boldface figures and that of minimum employment by italic figures.

The months of maximum and minimum employment for 1909, and the number of wage earners reported for these months, are given for 46 states in Table 22.

**Prevailing hours of labor.**—Satisfactory statistics regarding the prevailing hours of labor in establishments manufacturing gas can not be presented. While in most industries the great majority of the wage earners in any given establishment work for the same number of hours weekly, this is by no means generally true in the gas industry. The census schedule did not call for the number of wage earners working a specified number of hours, but called only for the hours generally prevailing in the establishment. The employees known as "gasmen" or "gas makers"—that is, those who work in the manufacturing branch of the business—work more hours per week than the yard and street men, who work in connection with the distributing branch of the business, and who usually form a larger proportion of the total number of wage earners than the gas makers.

The establishments very naturally in most cases reported the prevailing working time of the gas makers—which is usually 72 hours or more per week—as the prevailing time for the establishment, and statistics classifying the total number of wage earners according to the "prevailing" working time reported doubtless exaggerate the actual number of wage earners for whom these were the prevailing hours.

In the United States as a whole there were 474 wage earners employed in establishments which reported 48 hours or less as the "prevailing" working time, 21 in establishments which reported more than 48 but less than 54; 1,049 in establishments which reported 54; 2,716 in establishments which reported more than 54 but less than 60; 5,806 in establishments which reported 60; 5,786 in establishments which reported more than 60 but less than 72; and 21,363 in establishments which reported 72 hours or more per week.

**Character of ownership.**—Table 7 presents data with respect to the character of ownership of the establishments in the gas industry for 1909 and 1904.

CHARACTER OF OWNERSHIP.	NUMBER OF ESTABLISHMENTS.		VALUE OF PRODUCTS.	
	1909	1904	1909	1904
<b>Total</b> .....	1,296	1,019	\$166,814,371	\$125,144,945
Individual.....	43	24	114,851	134,713
Firm.....	27	17	108,123	66,927
Corporation.....	1,091	931	165,108,536	123,788,302
Other.....	130	47	1,482,858	1,154,913
<b>Per cent of total</b> .....	100.0	100.0	100.0	100.0
Individual.....	3.7	2.4	0.1	0.1
Firm.....	2.1	1.7	0.1	0.1
Corporation.....	84.2	91.4	99.0	98.9
Other.....	10.0	4.6	0.9	0.9

The most important distinction shown is that between corporate and all other forms of ownership. In 1909, of the total number of establishments reported for the industry, 84.2 per cent were under corporate

ownership, as compared with 91.4 per cent in 1904. In 1909 these establishments reported 99 per cent of the entire value of products reported. In this industry municipal operation is of greater importance than in any other branch of manufactures. The 130 establishments reported for "other" forms of ownership reported products valued at \$1,482,858. These were practically all municipally owned gas works. The large gas works of Philadelphia, although owned by the city, are operated by a private corporation, and have been classed with corporate enterprises in the table.

Table 8 gives statistics concerning the number of establishments operated under the different forms of ownership, by states. It will be noted that, except for Minnesota, where gas works operated by municipalities outnumbered all others, corporate ownership predominates over all other forms. There were eleven establishments reported under "all other" forms of ownership, eight of which were cooperative associations.

STATE.	NUMBER OF ESTABLISHMENTS OWNED BY—				
	Individuals.	Firms.	Corporations.	Municipalities.	All others.
<b>United States</b> .....	48	27	1,091	119	11
Alabama.....		1	10	2	
Arizona.....			8		
Arkansas.....			5		
California.....	1		10	1	
Colorado.....			27	1	
Connecticut.....			4		
Delaware.....	1		3		
District of Columbia.....			11	1	
Florida.....			12	3	
Georgia.....			3		
Idaho.....	2		73	3	
Illinois.....	1	2	48	1	1
Indiana.....	4	7	7	35	
Iowa.....	1		7	1	
Kansas.....	2	2	15		
Kentucky.....			5		
Louisiana.....	2		16		1
Maine.....	2	1	15		
Maryland.....	1	1	57	4	1
Massachusetts.....		1	53	1	
Michigan.....	1		15	26	
Minnesota.....			8		
Mississippi.....	1	3	23	1	1
Missouri.....			5		
Montana.....	12	2	23	7	4
Nebraska.....			3		
Nevada.....		1	13		
New Hampshire.....			45	1	1
New Jersey.....			2		
New Mexico.....		2	128	3	
New York.....	8		14		
North Carolina.....	1		4	1	
North Dakota.....	2		36		
Ohio.....	1		5		
Oklahoma.....			8		
Oregon.....	1	3	95		
Pennsylvania.....			8		
Rhode Island.....			7	4	
South Carolina.....	1		13	4	
South Dakota.....			10		
Tennessee.....		1	24		
Texas.....	3		3		
Utah.....			9		
Vermont.....			14	6	
Virginia.....	1		12		
Washington.....			3	1	
West Virginia.....			35	12	2
Wisconsin.....			1		
Wyoming.....					

**Establishments classified according to size.**—Table 9 presents statistics for 1909 and 1904 for establishments grouped according to the value of their products.

Gas manufacture is distinctly an urban industry with a purely local market for its product. Therefore the size of the establishment is largely governed by the population of the community in which it is located. The greater part of the value of products of the industry

was reported for establishments having products valued at \$100,000 or more. The value of products for these establishments in 1909 formed 86.8 per cent of the total, as compared with 85.1 per cent in 1904. The 28 establishments having products valued at \$1,000,000 or more reported 57.8 per cent of the total value of products in 1909.

VALUE OF PRODUCTS PER ESTABLISHMENT.	NUMBER OF ESTABLISHMENTS.		VALUE OF PRODUCTS.	
	1909	1904	1909	1904
Total.....	1,296	1,019	\$166,814,371	\$125,144,945
Less than \$5,000.....	356	193	764,347	503,016
\$5,000 and less than \$20,000.....	271	362	4,445,249	4,094,009
\$20,000 and less than \$100,000.....	369	310	16,863,851	14,087,898
\$100,000 and less than \$1,000,000.....	172	124	48,345,467	32,561,811
\$1,000,000 and over.....	28	24	96,395,457	73,898,211
Per cent of total.....	100.0	100.0	100.0	100.0
Less than \$5,000.....	27.5	18.9	0.5	0.4
\$5,000 and less than \$20,000.....	28.6	35.5	2.7	3.3
\$20,000 and less than \$100,000.....	28.5	31.0	10.1	11.3
\$100,000 and less than \$1,000,000.....	13.3	12.2	29.0	26.0
\$1,000,000 and over.....	2.2	2.4	57.8	59.0

A considerable increase in the number of small establishments—those with products valued at less than \$5,000—occurred between 1904 and 1909, which is accounted for in large part by an increase in the number of small acetylene gas plants.

There was a small decrease, from 30 in 1904 to 28.7 in 1909, in the average number of wage earners per establishment, but the average value of products per establishment increased from \$122,812 in 1904 to \$128,715 in 1909, and the average value added by manufacture from \$86,325 to \$88,261.

In some respects, and especially from the standpoint of conditions under which persons who are engaged in manufacturing work, the best classification of establishments to bring out the feature of size is a classification according to the number of wage earners employed. Table 10 gives such a classification of the gas manufacturing establishments in the leading states.

STATE.	TOTAL.		ESTABLISHMENTS EMPLOYING IN 1909—																
			No wage earners.	1 to 5 wage earners.		6 to 20 wage earners.		21 to 50 wage earners.		51 to 100 wage earners.		101 to 250 wage earners.		251 to 500 wage earners.		501 to 1,000 wage earners.		Over 1,000 wage earners.	
	Estab-lish-ments.	Wage earners (average number)	Estab-lish-ments.	Estab-lish-ments.	Wage earners.	Estab-lish-ments.	Wage earners.	Estab-lish-ments.	Wage earners.	Estab-lish-ments.	Wage earners.	Estab-lish-ments.	Wage earners.	Estab-lish-ments.	Wage earners.	Estab-lish-ments.	Wage earners.	Estab-lish-ments.	Wage earners.
United States.....	1,296	37,215	108	631	1,525	308	3,288	110	3,521	70	4,856	45	7,105	13	4,424	7	4,188	4	8,310
California.....	74	1,666	.....	38	106	27	299	3	87	3	252	1	171	2	751	.....	.....	.....	.....
Connecticut.....	28	926	.....	8	17	10	116	3	72	5	287	1	105	1	329	.....	.....	.....	.....
Illinois.....	78	6,301	.....	34	81	20	214	9	272	10	727	4	537	.....	.....	.....	.....	1	4,470
Indiana.....	53	928	.....	29	85	13	144	6	108	4	203	1	208	.....	.....	.....	.....	.....	.....
Iowa.....	117	806	.....	22	74	107	10	97	7	234	3	228	1	140	.....	.....	.....	.....	.....
Massachusetts.....	64	2,292	2	21	40	18	200	7	200	8	525	7	1,048	1	270	.....	.....	.....	.....
Michigan.....	55	1,771	.....	17	61	22	243	9	330	5	388	1	235	.....	1	514	.....	.....	.....
Minnesota.....	42	848	3	33	53	4	54	.....	.....	.....	1	235	.....	.....	1	506	.....	.....	.....
Missouri.....	29	941	3	19	47	5	62	1	50	.....	.....	.....	.....	.....	1	782	.....	.....	.....
New Jersey.....	47	1,917	.....	23	69	17	175	2	81	.....	.....	3	492	1	484	1	616	.....	.....
New York.....	141	6,422	27	56	150	27	285	12	383	5	313	8	1,145	4	1,367	.....	.....	2	2,770
Ohio.....	38	666	2	22	61	9	98	1	24	1	54	3	429	.....	.....	.....	.....	.....	.....
Pennsylvania.....	99	3,119	7	50	124	22	238	12	455	4	243	2	310	.....	.....	1	688	1	1,061
Texas.....	27	875	3	9	32	7	67	4	115	3	206	1	155	.....	.....	.....	.....	.....	.....
Wisconsin.....	49	1,063	.....	27	48	13	159	5	141	3	191	.....	.....	.....	.....	1	524	.....	.....

The gas industry is characterized by the relatively small number of wage earners required to carry on the business, particularly the manufacturing process. Of the 1,296 establishments reported, 8.3 per cent employed no wage earners, 48.7 per cent employed only from 1 to 5 wage earners, and 23.8 per cent from 6 to 20. On the other hand, establishments employing 21 wage earners and over, of which there were only 249, reported a total of 32,404 wage earners, or 87.1 per cent of the total number. There were only 4 establishments reporting over 1,000 wage earners each, but these establishments reported 22.3 per cent of the total number of wage earners.

**Expenses.**—As stated in the Introduction, the census figures for expenses do not purport to represent the total cost of manufacture, since they take no account of depreciation, and for other reasons, and consequently they can not properly be used for determining profits. Facts of interest can be brought out, however, con-

cerning the relative importance of the different classes of expenses which were reported. Table 11 shows in percentages, for 1909, the distribution of these expenses in the leading states.

STATE.	PER CENT OF TOTAL EXPENSES REPORTED: 1909			
	Salaries.	Wages.	Materials.	Miscellaneous expenses.
United States.....	10.9	18.4	46.2	24.5
California.....	12.6	21.6	39.9	26.0
Connecticut.....	12.5	24.3	43.7	19.6
Illinois.....	11.2	21.3	44.6	22.9
Indiana.....	15.4	22.0	47.6	15.0
Iowa.....	11.2	18.6	54.5	15.8
Maryland.....	17.7	14.6	41.6	26.2
Massachusetts.....	7.5	17.7	54.0	20.8
Michigan.....	12.1	24.5	47.6	15.8
Minnesota.....	9.7	16.6	46.7	26.9
Missouri.....	12.1	21.5	41.3	25.2
New Jersey.....	6.9	9.4	31.4	52.3
New York.....	10.4	15.2	52.4	22.0
Ohio.....	8.3	19.8	37.9	34.1
Pennsylvania.....	13.5	16.3	44.6	25.6
Wisconsin.....	10.8	22.1	52.5	14.6

In the United States as a whole 46.2 per cent of the total expenses reported for the gas industry were incurred for materials, 18.4 per cent for wages, 10.9 per cent for salaries, and 24.5 per cent for other purposes. For all industries combined the corresponding proportions were 65.8, 18.6, 5.1, and 10.5 per cent, respectively.

As a general rule, in those states where the proportion shown for the cost of materials is highest, the prices of coal and other fuel used as material are high; on the other hand, in states with a plentiful supply of suitable fuel, the proportion for materials is relatively low. The extremely high percentage of the total expenses shown for miscellaneous expenses in New Jersey, 52.3, was due chiefly to peculiar conditions; most of the miscellaneous expenses reported were designated as for "rent of factory" (see Table 22), an item which usually does not appear at all in the returns. The proportion reported for wages is low in certain states where a good deal of the distributing branch of the business is conducted by separate concerns not covered by the census, or where, on the other hand, the gas manufacturing establishments themselves buy part of their gas from other concerns, especially coke manufacturers. A more detailed analysis of the statistics of expenses is possible from Table 22, which gives the figures in detail for all the states.

**Engines and power.**—The amount of power used in the industry was first reported at the census of 1869. Table 1, which gives data for the gas manufacturing industry as a whole, shows that the total horsepower used increased from 2,768 in 1869 to 128,350 in 1909. Table 12 shows the number of engines or other motors, according to their character, employed in generating power (including electric motors operated by purchased current), and their total horsepower, as reported at the censuses of 1909, 1904, and 1899. It also shows

separately the number and horsepower of electric motors, including those operated by current generated in the establishment.

POWER.	NUMBER OF ENGINES OR MOTORS.			HORSEPOWER.			PER CENT DISTRIBUTION OF HORSEPOWER.		
	1909	1904	1899	1909	1904	1899	1909	1904	1899
<b>Primary power, total</b> .....	3,521	2,360	1,631	128,350	73,101	31,797	100.0	100.0	100.0
<b>Owned</b> .....	3,285	2,307	1,631	125,456	71,222	31,725	97.7	97.4	99.8
Steam.....	2,969	2,142	1,609	115,332	67,482	31,165	89.9	92.3	98.0
Gas.....	281	146	18	7,128	3,211	250	5.6	4.4	0.8
Water wheels.....	20	8	4	2,755	339	33	2.1	0.5	0.1
Water motors.....	15	11	.....	59	20	.....	(1)	(1)	.....
Other.....	.....	.....	.....	182	170	277	0.1	0.2	0.9
<b>Rented</b> .....	236	59	(2)	2,894	1,879	72	2.3	2.6	0.2
Electric.....	236	59	(2)	2,723	1,454	52	2.1	2.0	0.2
Other.....	.....	.....	.....	171	425	20	0.1	0.6	0.1
<b>Electric motors</b> .....	935	232	40	17,336	3,978	271	100.0	100.0	100.0
Run by current generated by establishment.....	699	173	40	14,613	2,524	219	84.3	63.4	80.8
Run by rented power.....	236	59	(2)	2,723	1,454	52	15.7	36.6	19.2

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

<sup>2</sup> Not reported.

The total primary power used in gas manufacturing establishments increased from 31,797 horsepower in 1899 to 128,350 horsepower in 1909, or 303.7 per cent. The power of gas and other internal-combustion engines, that of water wheels, and rented electric power increased many fold during the decade, so that steam power formed a smaller proportion of the total in 1909 than in 1899—89.9 per cent, as compared with 98 per cent. The horsepower of electric motors operated by current generated in the establishment reporting also increased enormously, from only 219 in 1899 to 14,613 in 1909.

Table 13 shows, for 1909, the amount of each of the several kinds of power and of the different kinds of fuel used in the industry in the 15 leading states.

STATE.	Number of establishments reporting.	Total horsepower.	PRIMARY HORSEPOWER.					ELECTRIC HORSEPOWER.		FUEL USED.							
			Owned by establishments reporting.				Rented.		Total, rented and generated in the establishment reporting.	Generated in the establishment reporting.	Coal.		Coke (short tons).	Wood (cords).	Oil, including gasoline (barrels).	Gas (1,000 feet).	
			Total.	Steam engines.	Gas engines.	Water wheels and motors.	Other.	Electric.			Other.	Anthracite (long tons).					Bituminous (short tons).
United States..	973	128,350	125,456	115,332	7,128	2,814	182	2,723	171	17,336	14,613	898,984	4,668,096	759,245	3,722	11,816,282	665,468
California.....	61	7,502	7,084	6,542	539	3	.....	418	.....	6,537	6,119	.....	300	.....	9	2,205,961	600
Connecticut.....	22	4,100	3,995	3,383	12	600	.....	105	.....	1,064	959	33,925	89,977	5,691	7	192,670	1,419
Illinois.....	64	18,385	18,116	17,359	767	.....	.....	257	12	300	73	5,551	437,127	253,479	.....	1,520,486	200
Indiana.....	41	5,845	5,815	5,767	44	.....	.....	5	25	232	247	2,478	180,994	26,750	.....	140,915	13,646
Iowa.....	97	2,043	2,026	1,453	530	42	1	17	.....	84	67	216	94,175	24,234	.....	138,484	2
Massachusetts.....	42	7,371	7,075	7,051	9	15	.....	247	40	1,193	946	109,399	290,835	58,940	3	484,513	.....
Michigan.....	45	6,055	6,018	5,506	512	.....	.....	37	.....	56	19	2,423	426,703	3,192	.....	111,857	.....
Minnesota.....	33	3,538	3,530	1,117	904	1,509	.....	8	.....	314	306	44	97,088	1,266	200	190,502	5,188
Missouri.....	15	3,635	3,595	2,917	678	.....	.....	40	.....	40	.....	3,147	220,558	3,568	.....	283,744	60
New Jersey.....	40	6,717	6,694	6,364	250	.....	80	23	.....	51	28	72,990	179,915	3,425	4	628,280	.....
New York.....	91	30,089	29,467	28,748	99	618	2	588	34	4,567	3,979	485,900	832,970	119,602	120	3,430,773	.....
Ohio.....	28	2,165	2,155	2,113	42	.....	.....	10	.....	10	.....	1,290	311,070	4,313	6	54,127	223,175
Pennsylvania.....	76	9,374	9,238	8,365	871	2	.....	136	.....	469	333	99,297	348,241	79,675	4	948,620	44,268
Texas.....	23	1,060	1,077	1,067	10	.....	.....	2	11	27	25	7,930	31,985	7,322	6	99,624	241,102
Wisconsin.....	44	3,278	3,125	1,659	1,441	25	.....	153	.....	981	828	189,477	26,963	26,963	64	36,856	17,190
All other states.....	251	17,163	16,446	15,921	430	.....	.....	677	40	1,361	684	73,898	936,681	140,822	3,299	1,348,870	58,559

The states which ranked highest with respect to amount of power used in 1909 were New York, Illinois, Pennsylvania, California, Massachusetts, New Jersey, Michigan, and Indiana. The total horsepower reported for these states in 1909 was 91,338, or 71.2 per cent of the aggregate for the United States. Steam was the most important power in all of the states shown separately, with the exception of Minnesota, where water power was the most important. Of the power of gas and other internal-combustion engines, the greatest amount, 1,441 horsepower, was reported for Wisconsin. The greatest amount of water power, 1,509 horsepower, or 53.6 per cent of the total for the country, was reported for Minnesota.

**Fuel consumed.**—The statistics relating to fuel, shown in Table 13, include fuel used for all purposes, both as material for gas making and for boilers and retorts, but the figures for fuel used as material in the gas

making process, which represents by far the greater part of the fuel used in the industry, are shown separately in Table 14. Owing to the lack of an exact standard of comparison between fuels of different kinds, it is difficult to determine with accuracy the comparative importance of the different states from the standpoint of the total consumption of fuel in the manufacture of gas. New York is first in importance undoubtedly, as it leads the other states in the use of anthracite coal, of bituminous coal, and of oil, and is second only to Illinois in the quantity of coke used. Illinois and Pennsylvania report about equal quantities of coal—anthracite and bituminous together—but Illinois uses considerably more coke and oil than Pennsylvania. In California the scarcity of coal suitable for gas making and the large supply of oil are indicated by the fact that oil is practically the only fuel used in the industry.

### SPECIAL STATISTICS OF MATERIALS, PRODUCTS, ETC.

**The United States as a whole.**—The special schedule used in collecting the statistics for the gas industry required a detailed statement of the quantity and cost of the different kinds of fuel used as material, and of the quantity and value of the different products manufactured. Table 14 shows the statistics for the United States for 1909, 1904, and 1899.

Table 14	1909	1904	1899
<b>MATERIALS.</b>			
<b>Total cost</b> .....	\$62,427,844	\$37,180,066	\$20,605,356
<b>Coal used for gas making:</b>			
Tons.....	4,940,598	4,431,774	2,437,237
Cost.....	\$16,304,832	\$14,607,485	\$7,104,472
Average cost per ton.....	\$3.30	\$3.30	\$2.88
<b>Oil used for gas making:<sup>1</sup></b>			
Gallons.....	579,657,152	410,989,564	194,857,296
Cost.....	\$17,345,760	\$15,015,602	\$8,168,057
Average cost per gallon.....	0.03	\$0.04	\$0.04
<b>Coke used for gas making:</b>			
Tons.....	591,919	435,534	217,354
Cost.....	\$2,667,706	\$1,602,762	\$726,736
Average cost per ton.....	\$4.51	\$3.68	\$3.34
<b>Gas purchased:</b>			
Cubic feet (thousands).....	16,769,705	2,696,571	( <sup>2</sup> )
Cost.....	\$5,416,601	\$937,252	( <sup>2</sup> )
Average cost per thousand cubic feet.....	\$0.32	\$0.35	.....
<b>Fuel for boilers and retorts.....</b>	\$2,369,131	\$2,298,168	\$1,082,844
<b>All other materials.....</b>	\$3,323,824	\$2,718,797	\$3,462,647
<b>PRODUCTS.</b>			
<b>Total value</b> .....	\$166,814,371	\$125,144,945	\$75,716,693
<b>Gas:</b>			
Cubic feet (thousands).....	150,835,793	112,549,979	67,093,553
Value.....	\$138,616,309	\$112,062,568	\$69,432,582
Average value per thousand cubic feet.....	\$0.92	\$1.00	\$1.03
<b>Straight coal—</b>			
Cubic feet (thousands).....	19,985,253	12,093,034	( <sup>3</sup> )
Value.....	\$18,065,841	\$12,868,604	( <sup>3</sup> )
Average value per thousand cubic feet.....	\$0.90	\$1.01	.....
<b>Straight water—</b>			
Cubic feet (thousands).....	1,726,082	715,550	( <sup>3</sup> )
Value.....	\$1,289,031	\$832,440	( <sup>3</sup> )
Average value per thousand cubic feet.....	\$0.75	\$1.16	.....
<b>Carbureted water—</b>			
Cubic feet (thousands).....	79,418,486	54,687,418	( <sup>3</sup> )
Value.....	\$69,513,749	\$48,071,180	( <sup>3</sup> )
Average value per thousand cubic feet.....	\$0.88	\$0.88	.....
<b>Mixed coal and water—</b>			
Cubic feet (thousands).....	40,775,283	40,980,414	( <sup>3</sup> )
Value.....	\$36,963,543	\$45,605,263	( <sup>3</sup> )
Average value per thousand cubic feet.....	\$0.91	\$1.11	.....

Table 14—Continued.

	1909	1904	1899
<b>PRODUCTS—continued.</b>			
<b>Gas—Continued.</b>			
<b>Oil—</b>			
Cubic feet (thousands).....	8,688,860	3,441,352	( <sup>3</sup> )
Value.....	\$12,111,458	\$5,141,460	( <sup>3</sup> )
Average value per thousand cubic feet.....	\$1.30	\$1.49	.....
<b>Acetylene—</b>			
Cubic feet (thousands).....	25,186	7,881	( <sup>3</sup> )
Value.....	\$361,348	\$104,267	( <sup>3</sup> )
Average value per thousand cubic feet.....	\$14.35	\$13.23	.....
<b>All other—</b>			
Cubic feet (thousands).....	216,643	24,330	( <sup>3</sup> )
Value.....	\$320,330	\$39,854	( <sup>3</sup> )
Average value per thousand cubic feet.....	\$1.48	\$1.62	.....
<b>Coke (for sale):</b>			
Bushels.....	82,040,693	89,146,434	
Value.....	\$5,723,215	\$5,195,461	
Average value per bushel.....	\$0.07	\$0.06	
<b>Tar (for sale):</b>			
Gallons.....	78,339,880	67,515,421	\$4,283,204
Value.....	\$1,875,540	\$2,064,343	
Average value per gallon.....	\$0.02	\$0.03	
<b>All other products.....</b>	\$13,556,008	\$972,992	
<b>Receipts from rents and sales of lamps and appliances.....</b>	\$7,043,390	\$4,240,581	\$2,000,007

<sup>1</sup> Does not include \$4,013,885 paid for lamps and appliances.

<sup>2</sup> Includes for 1909, 253,837 gallons of benzol, costing \$27,543.

<sup>3</sup> Comparable figures not available.

<sup>4</sup> In addition, products of gas manufacture to the value of \$261,802 were produced commercially by establishments engaged primarily in the manufacture of products other than those covered by the industry designation. These products were 27,558,000 cubic feet of coal gas, valued at \$20,419; 13,070,000 cubic feet of acetylene gas, valued at \$224,618; 44,347 bushels of coke, valued at \$3,399; 38,370 gallons of tar, valued at \$1,372; and receipts from the sale of lamps and appliances to the amount of \$2,994.

<sup>5</sup> In addition, 13,813,058 gallons were produced for which no value was reported.

<sup>6</sup> Includes 37,277,864 gallons of ammonia liquor, valued at \$725,702, and 1,054,220 pounds of hydrocarbons, valued at \$44,509. In addition, 12,442,356 gallons of ammonia liquor and 100,090 pounds of hydrocarbons were produced for which no value was reported.

The statistics for the gas industry presented in Table 14 cover only those establishments which made gas as their main product. The coal, oil, and coke reported in this table represent only those materials used in gas making, and do not include those used for power purposes or for heating retorts, the cost of which is shown separately. The ton of 2,000 pounds is used for showing quantities of coal and coke used.

The cost of materials aggregated \$52,427,844 in 1909, as compared with \$20,605,356 in 1899, an in-

crease of 154.4 per cent. Oil is, and has been for several censuses, the principal material used in respect to value, with coal second in importance.

The value of products aggregated \$166,814,371 in 1909, as compared with \$75,716,693 in 1899, an increase of 120.3 per cent. About three-fourths of this increase represents that in the value of the gas itself.

The amount of gas produced was 150,835,793,000 cubic feet in 1909, as compared with 67,093,553,000 in 1899, an increase of 124.8 per cent. Carbureted water gas is the kind most largely manufactured; it increased from 54,687,418,000 cubic feet in 1904 to 79,418,486,000 in 1909, a gain of 45.2 per cent. In 1909 it constituted 52.7 per cent of the total production; in 1904, 48.6 per cent. Mixed coal and water gas was the next in importance, with 40,775,283,000 cubic feet in 1909, as compared with 40,980,414,000 in 1904, a decrease of one-half of 1 per cent. Straight coal gas increased from 12,693,034,000 cubic feet in 1904 to 19,985,253,000 in 1909, a gain of 57.5 per cent.

The greatest percentages of increase in quantity are for acetylene gas, oil gas, and straight water gas, in the order named, although the quantities of each of these kinds are still comparatively small. Acetylene gas increased 219.6 per cent from 1904 to 1909; oil gas, 152.5 per cent; and straight water gas, 141.2 per cent.

There was a decrease of 8 per cent in the production of coke for sale between 1904 and 1909, but the production of tar for sale increased 16 per cent. These figures do not include coke and tar made and consumed in the same establishment.

In addition to the products of establishments classified as engaged in the gas industry, certain establishments engaged primarily in the manufacture of other products did some commercial gas business in 1909. If their output be added (but without including the output of coke ovens), the figures for straight coal gas become 20,012,811,000 cubic feet, valued at \$18,095,260; for acetylene gas, 38,256,000 cubic feet, valued at \$585,966; for coke, 82,094,030 bushels, valued at \$5,726,614; and for tar, 78,378,250 gallons, valued at \$1,876,921. The large production of gas by establishments in other industries which consume the product themselves is not here included.

Statistics of the gas made in coke establishments are shown in detail in the special report on "Coke," as follows:

	1909	1904
By-products obtained from retort or by-product coke ovens—		
Gas made, cubic feet (thousands).....	76,590,763	18,761,101
Used in process or wasted, cubic feet (thousands)	60,799,543	14,878,301
Sold—		
Cubic feet (thousands).....	15,791,220	3,882,800
Value.....	\$2,609,211	\$684,464

The following products were made in establishments in the gas industry proper and consumed by them in

their own operations. These products are not included in Table 14.

	1909	1904
Coke..... bushels.....	49,550,153	46,561,185
Tar..... gallons.....	31,530,178	14,772,878
Gas..... cubic feet (thousands).....	1,730,563	1,363,757
Benzene and benzol..... gallons.....	302,994	.....

Table 14 also shows, for each census, the average cost of each of the four classes of materials specified and the average value of each of the different kinds of gas and other products.

There was some increase between 1899 and 1909 in the average cost per ton of coal used for gas making, but this is possibly attributable in part to the erection of new gas plants at points distant from the coal producing regions. The average value of oil consumed by gas works was the same in 1899 and 1904, but declined slightly between 1904 and 1909, this decrease doubtless being due partly to the greatly increased production of crude oil in the United States and to the use for gas purposes of large quantities of oil derived from the cheap new crude oils of Oklahoma, Texas, California, and other states. Nearly three-tenths of the oil used for gas making in the United States in 1909 was used in New York and more than one-sixth was used in California.

In the United States as a whole there was in 1909 no very great difference in the average value per thousand cubic feet of straight coal gas, carbureted water gas, and mixed coal and water gas, the three most important classes. The average value of straight water gas, however, was materially lower than that for the other four classes, while, on the other hand, the average value of oil gas, which is a comparatively important class, was materially higher, and that of acetylene gas, much higher.

For the United States as a whole the average value per thousand cubic feet of all gas made by establishments in the gas industry was \$1.03 in 1899, \$1 in 1904, and \$0.92 in 1909. This decrease in average value can not be attributed to changes in the relative importance of different classes of gas. On the contrary, the production of oil gas and acetylene gas, which are more valuable than the other kinds, though still comparatively small, has increased more rapidly than the production of the other varieties. On the other hand, it does not necessarily follow from this decrease in average value that there has been a general reduction in the rates charged to consumers. In many cases gas companies charge a lower rate for gas used for cooking, heating, or power than for that used for lighting. If, under such circumstances, in the case of a given company the consumption of gas for heating, cooking, and power should increase more rapidly than the consumption for lighting, there might be a reduction in the average price or value of all gas made by the company without any change whatever in rates. There are wide varia-



Marked differences appear among the states with respect to the relative importance of coal and oil, respectively, as materials for gas making. Thus in Illinois the amount spent for oil was slightly less than that spent for coal and coke combined, in Pennsylvania it was only slightly greater, and in New York it was considerably greater, while in California there was virtually no expenditure for coal and coke for gas making. On the other hand, in Massachusetts the expenditure for coal and coke was more than double that for oil, and in Michigan it was over six times as great.

Table 18 shows the quantity and value of all gas and of the different kinds of gas manufactured in 1909, by states, and also the quantity and value of coke, tar, and other by-products manufactured for sale as such (not including such products manufactured for consumption in the same establishment), together with the amounts received from rents and sales of lamps and appliances.

The ranking of the leading states with respect to the production of gas of all kinds combined is, in general,

approximately the same as the ranking with respect to value of products of the gas industry, as shown in Table 2. In New York in 1909 the production amounted to 45,768,354,000 cubic feet, or 30.3 per cent of the total for the United States. The production in Illinois constituted 12.7 per cent of the total and that in Pennsylvania 9.4 per cent, while no other state contributed as much as one-fifteenth of the total output.

Marked differences appear among the states with respect to the relative importance of the different kinds of gas made. For example, in New York about three-fourths of all the gas made in 1909 was carbureted water gas, while in New Jersey only about one-sixth was of that class, and in California almost nine-tenths of the total was oil gas.

The states have quite a different rank with respect to the production of coke for sale from that which they occupy with respect to the production of gas. This is due to the differences among the states with respect to the kind of gas made.

GAS, ILLUMINATING AND HEATING—PRODUCTS, BY STATES: 1909.

Table 18		PRODUCT AND STATE.		PRODUCT AND STATE.	
	Quantity.	Value.		Quantity.	Value.
	1,000 cubic feet.			1,000 cubic feet.	
<b>Gas, total</b> .....	<b>150,835,793</b>	<b>\$138,615,309</b>	<b>Straight coal gas—Continued.</b>		
Alabama.....	463,031	509,777	Virginia.....	305,253	\$352,159
Arizona.....	93,179	133,845	Wisconsin.....	1,559,326	1,375,043
Arkansas.....	162,552	170,366	All other states.....	1,787,502	2,200,453
California.....	8,094,478	8,721,212	<b>Straight water gas.....</b>	<b>1,728,082</b>	<b>1,289,031</b>
Colorado.....	1,330,279	1,205,842	Illinois.....	452,952	193,458
Connecticut.....	3,168,309	3,125,898	Iowa.....	110,311	99,683
Delaware.....	298,495	328,536	Minnesota.....	803,854	723,836
Florida.....	324,382	497,487	Missouri.....	45,287	45,287
Georgia.....	1,152,037	1,292,439	All other states.....	313,648	226,817
Illinois.....	19,201,680	16,836,776	<b>Carbureted water gas.....</b>	<b>79,418,484</b>	<b>69,513,749</b>
Indiana.....	3,033,449	2,682,773	California.....	1,050,302	780,332
Iowa.....	2,284,423	2,470,463	Connecticut.....	2,175,286	2,137,531
Kansas.....	48,474	201,448	Illinois.....	15,460,046	13,109,036
Kentucky.....	1,043,986	800,549	Iowa.....	1,251,707	1,292,437
Louisiana.....	787,837	1,002,831	Louisiana.....	752,666	831,625
Maine.....	345,445	437,776	Maryland.....	2,120,168	2,878,773
Maryland.....	2,204,735	3,002,053	Massachusetts.....	3,750,702	3,015,064
Massachusetts.....	9,816,558	8,269,244	Nebraska.....	976,046	1,150,758
Michigan.....	4,361,946	4,525,653	New Jersey.....	1,266,268	1,149,698
Minnesota.....	2,985,239	2,668,938	New York.....	34,759,676	26,704,625
Mississippi.....	154,041	155,305	Pennsylvania.....	11,239,646	11,430,176
Missouri.....	4,603,225	4,277,271	All other states.....	4,609,975	4,994,624
Montana.....	84,032	139,105	<b>Mixed coal and water gas.....</b>	<b>40,775,283</b>	<b>36,953,543</b>
Nebraska.....	1,042,283	1,279,054	Colorado.....	1,264,815	1,092,216
Nevada.....	35,115	67,283	Connecticut.....	483,689	477,125
New Hampshire.....	404,958	504,374	Georgia.....	880,203	897,227
New Jersey.....	7,507,053	7,852,422	Illinois.....	2,170,685	1,990,149
New York.....	45,768,354	34,851,585	Indiana.....	1,986,189	1,645,258
North Carolina.....	222,955	330,558	Iowa.....	470,184	491,263
North Dakota.....	102,840	164,263	Kentucky.....	487,956	426,810
Ohio.....	3,100,638	2,401,451	Massachusetts.....	4,175,576	3,634,267
Oklahoma.....	89,237	106,785	Michigan.....	2,455,033	2,534,314
Oregon.....	865,528	887,866	Minnesota.....	1,732,159	1,435,275
Pennsylvania.....	14,204,588	14,508,134	Missouri.....	4,232,490	3,674,190
Rhode Island.....	1,808,530	1,697,254	New Jersey.....	5,911,754	6,174,969
South Carolina.....	207,967	292,014	New York.....	4,603,866	3,490,211
South Dakota.....	182,451	236,067	Ohio.....	1,690,784	1,204,911
Tennessee.....	1,049,074	1,074,972	Pennsylvania.....	813,647	739,931
Texas.....	1,097,115	1,442,119	Rhode Island.....	1,388,288	1,230,621
Vermont.....	184,364	238,361	Texas.....	375,479	454,395
Virginia.....	1,262,806	1,201,055	Virginia.....	902,865	827,161
Washington.....	1,183,492	1,315,082	Washington.....	1,017,591	1,154,787
West Virginia.....	181,439	186,153	All other states.....	3,726,132	3,502,463
Wisconsin.....	2,082,344	1,958,197	<b>Oil gas.....</b>	<b>8,688,860</b>	<b>12,111,458</b>
All other states.....	2,732,840	2,540,724	Arizona.....	93,179	133,845
<b>Straight coal gas.....</b>	<b>19,985,253</b>	<b>\$18,065,841</b>	California.....	6,732,394	7,700,007
Connecticut.....	491,170	467,538	Illinois.....	79,873	374,352
Illinois.....	1,026,142	1,134,545	Massachusetts.....	62,088	133,639
Indiana.....	404,086	442,601	Missouri.....	49,296	215,570
Iowa.....	336,361	356,510	New Jersey.....	82,504	210,651
Kentucky.....	402,282	258,536	New York.....	134,167	322,873
Massachusetts.....	1,320,895	1,456,114	Ohio.....	49,606	238,905
Michigan.....	1,646,760	1,654,190	Oregon.....	849,728	849,885
Minnesota.....	360,977	363,379	Pennsylvania.....	76,756	301,769
Missouri.....	214,844	262,720	Tennessee.....	20,052	123,707
New Jersey.....	244,947	297,357	Texas.....	66,001	196,005
New York.....	6,258,297	4,267,355	All other states.....	389,534	1,309,585
Ohio.....	1,232,399	825,561			
Pennsylvania.....	2,073,819	2,025,189			
Tennessee.....	320,194	326,561			

GAS, ILLUMINATING AND HEATING—PRODUCTS, BY STATES: 1909—Continued.

Table 18— Cont.	PRODUCT AND STATE.	Quantity.	Value.	PRODUCT AND STATE.	Quantity.	Value.
		<i>1,000 cubic feet.</i>			<i>1,000 cubic feet.</i>	
<b>Acetylene gas.</b>		25,186	\$361,348	<b>Ammonia liquors (16-ounce basis).</b>	2 49,720,220	\$725,702
Connecticut		1,056	16,409	Colorado	1,508,004	12,225
Illinois		925	13,051	Connecticut	473,977	15,226
Indiana		571	7,803	Georgia	602,438	11,207
Iowa		1,261	15,616	Illinois	3,047,713	38,194
Kansas		723	9,779	Indiana	1,721,038	15,114
Maine		616	11,274	Kentucky	650,645	17,002
Maryland		430	6,455	Massachusetts	4,731,440	56,067
Massachusetts		1,317	20,160	Michigan	4,431,762	19,595
Minnesota		1,029	10,108	Minnesota	1,320,146	12,123
Missouri		354	5,564	Missouri	5,699,177	52,583
Nebraska		1,722	25,370	New Jersey	1,078,478	14,310
New Jersey		1,282	19,717	New York	8,273,880	184,692
New York		3,488	48,837	Ohio	4,565,012	69,607
Ohio		570	10,060	Pennsylvania	2,065,176	58,007
Pennsylvania		720	11,009	Rhode Island	1,393,920	6,745
South Carolina		559	8,520	Tennessee	581,875	6,180
Texas		246	4,274	Virginia	815,922	4,617
Wisconsin		363	4,063	Wisconsin	1,002,588	35,481
All other states		7,954	104,219	All other states	5,096,039	27,226
<b>All other gas.</b>		216,643	320,339	<b>Hydrocarbons.</b>	<i>Pounds.</i>	
Illinois		10,907	16,155	California	2 1,154,319	44,509
Iowa		86,002	130,785	Connecticut	38,506	1,563
Minnesota		34,843	48,304	Illinois	10,207	1,132
Nebraska		22,830	33,791	Iowa	120,240	7,908
New York		8,860	17,659	Massachusetts	15,749	964
South Dakota		6,618	10,456	Missouri	93,021	3,464
Texas		3,840	4,800	Montana	08,017	3,176
Virginia		3,503	5,543	New Jersey	12,462	1,959
Wisconsin		33,254	42,770	New York	82,177	8,259
All other states		5,980	10,076	Ohio	318,312	7,436
				Pennsylvania	77,102	2,312
<b>Coal (for sale).</b>		<i>Bushels.</i>		Tennessee	79,112	4,578
Alabama		82,049,683	5,723,215	Texas	34,272	1,361
Colorado		1,086,810	67,213	All other states	24,025	828
Connecticut		1,999,902	72,730		171,217	4,064
Georgia		1,289,912	91,133	<b>Receipts from rents and sales of lamps and appliances.</b>		7,043,390
Illinois		1,085,075	69,096	Alabama		92,843
Indiana		6,255,414	401,518	Arkansas		33,344
Iowa		2,987,700	181,503	California		103,007
Kentucky		1,190,752	112,715	Colorado		160,521
Massachusetts		1,807,447	125,782	Connecticut		173,859
Michigan		7,888,201	545,719	Delaware		21,802
Minnesota		7,443,914	528,047	Florida		80,558
Missouri		1,375,287	127,572	Georgia		39,341
New York		2,041,075	120,903	Illinois		1,310,626
Ohio		17,500,858	1,163,599	Indiana		299,484
Pennsylvania		7,688,438	387,780	Iowa		262,675
Rhode Island		6,187,861	603,116	Kentucky		32,545
Tennessee		847,859	77,916	Louisiana		69,193
Virginia		1,021,807	34,103	Maine		62,448
Washington		1,217,684	91,442	Maryland		135,694
Wisconsin		831,179	67,908	Massachusetts		273,152
All other states		3,932,758	207,424	Michigan		501,477
		0,295,021	496,976	Mississippi		52,173
				Missouri		85,822
<b>Tar.</b>		<i>Gallons.</i>		Nebraska		107,052
Colorado		92,152,938	1,875,549	New Hampshire		25,148
Connecticut		662,859	21,051	New Jersey		456,963
Georgia		1,459,298	36,859	New York		1,035,926
Illinois		943,925	22,239	Ohio		81,971
Indiana		14,394,777	232,557	Pennsylvania		403,551
Iowa		2,005,219	53,620	Rhode Island		35,598
Kentucky		1,311,971	28,107	South Dakota		40,169
Maryland		1,101,928	27,695	Tennessee		137,532
Masachusetts		1,139,874	25,002	Texas		120,874
Michigan		5,756,264	152,908	Vermont		27,760
Minnesota		4,257,126	113,477	Virginia		61,462
Missouri		2,428,999	49,461	Washington		222,427
New Jersey		4,021,330	88,499	Wisconsin		297,517
New York		1,808,414	39,741	All other states		180,484
Ohio		21,744,268	312,749			
Pennsylvania		4,105,981	110,224			
Tennessee		8,216,207	217,747			
Virginia		897,654	24,419			
Washington		922,975	22,923			
Wisconsin		1,356,631	64,345			
All other states		2,243,196	57,390			
		10,744,033	174,446			

<sup>1</sup> Includes 13,813,058 gallons for which no value was reported.

<sup>2</sup> Includes 12,442,356 gallons for which no value was reported.

<sup>3</sup> Includes 100,099 pounds for which no value was reported.

Table 19 presents statistics as to the mileage of gas mains of establishments in the gas industry proper, and as to the number of stoves and heaters connected with the mains.

The states have quite a different rank with respect to the mileage of gas mains from that which they occupy with respect to the production of gas. Thus, while New York and Illinois, respectively, ranked first and second in 1909 as to both of these items, the production of gas in New York was much more than twice as great as in Illinois, while the mileage of mains re-

ported from New York exceeded that reported from Illinois by less than 30 per cent. California ranked fifth in 1909 in the production of gas, but ranked third in mileage of gas mains. The relative length of mains required to distribute a given quantity of gas depends, of course, upon the density of the population served and the consumption per capita. Where there is a large consumption of gas for heat and power, the length of mains is likely to be less in proportion to the output of gas than where the gas is chiefly consumed for lighting.

**Table 19**

STATE.	Miles of mains.	Number of gas stoves and heaters connected with mains.
<b>Total</b> .....	45,119	3,603,435
Alabama.....	298	17,354
California.....	3,613	183,897
Colorado.....	553	60,459
Connecticut.....	1,074	68,936
Delaware.....	119	7,104
Florida.....	197	20,550
Georgia.....	395	36,221
Illinois.....	5,187	437,447
Indiana.....	1,518	97,998
Iowa.....	1,390	82,282
Kentucky.....	360	19,085
Louisiana.....	344	20,432
Maine.....	199	6,002
Maryland.....	766	71,825
Massachusetts.....	3,301	168,442
Michigan.....	1,837	185,218
Minnesota.....	793	22,736
Mississippi.....	134	7,661
Missouri.....	1,100	119,592
Montana.....	491	49,199
Nebraska.....	251	21,965
New Hampshire.....	3,003	26,552
New Jersey.....	6,687	1,114,126
New York.....	153	5,230
North Carolina.....	2,048	15,951
Ohio.....	337	22,924
Oregon.....	3,529	410,243
Pennsylvania.....	616	17,228
Rhode Island.....	136	6,024
South Carolina.....	144	6,635
South Dakota.....	418	20,567
Tennessee.....	662	45,190
Texas.....	126	8,943
Vermont.....	395	27,065
Virginia.....	669	33,750
Washington.....	1,177	91,208
Wisconsin.....	1,109	35,394
All other states.....		

Table 20 presents, for 1909 and 1899, by states, the average value per thousand cubic feet of gas of all kinds combined made by establishments classified as engaged in the gas industry. The comparability of the figures for the different states is slightly affected by differences in the proportions of the several kinds of gas manufactured, but it is much more affected by differences in local conditions as to cost of materials, methods of distribution, the uses to which gas is put, the density of the population served, and the like. In some states gas manufacturing companies buy part of the gas which they distribute from producers of natural gas or from operators of by-product coke ovens, but, on the other hand, there are some companies covered by the statistics which do not distribute gas to the consumer but deliver it to other concerns for that purpose, in which case, of course, the value reported is materially lower than the price ultimately paid by the consumer.

The most conspicuous fact shown by the table is the decline in the average value per thousand cubic feet in most of the states. In 38 of the 44 states listed there was some decline between 1899 and 1909, and in a number of these states the fall was very great. As already indicated, these reductions in average value do

not necessarily represent corresponding reductions in the rates charged for gas under given conditions.

The conspicuous increase in the average value of manufactured gas shown for Kansas is due chiefly to the fact that during the decade natural gas was substituted for artificial gas in the greater part of the state, so that the plants returned for 1909 were few, distant from sources of materials, and in small places. The conditions in West Virginia, where the average value also showed a considerable advance, are somewhat similar to those in Kansas. The increase in average value shown for Pennsylvania is attributable, at least in part, to the fact that the gas supplied to the city of Philadelphia for street and other municipal lighting was not assigned a value in the report for 1899, although the quantity was included, while in 1909 both the quantity and the value of such gas were reported. The only other states in which the average value of gas reported was higher in 1909 than in 1899 were Delaware and Maryland.

**Table 20**

STATE.	AVERAGE VALUE OF GAS PRODUCED PER THOUSAND CUBIC FEET.	
	1909	1899
<b>United States</b> .....	\$0.92	\$1.03
Alabama.....	1.10	1.62
Arizona.....	1.44	2.41
Arkansas.....	1.10	1.94
California.....	1.05	1.72
Colorado.....	0.91	1.27
Connecticut.....	0.99	1.21
Delaware.....	1.10	0.92
Florida.....	1.53	1.98
Georgia.....	1.12	1.24
Illinois.....	0.88	0.90
Indiana.....	0.94	1.15
Iowa.....	1.08	1.36
Kansas.....	4.16	1.67
Kentucky.....	0.77	1.29
Louisiana.....	1.27	2.10
Maine.....	1.27	1.50
Maryland.....	1.36	1.25
Massachusetts.....	0.89	1.15
Michigan.....	1.04	1.09
Minnesota.....	0.89	1.30
Mississippi.....	1.19	2.02
Missouri.....	0.93	0.97
Montana.....	1.66	2.29
Nebraska.....	1.23	1.45
Nevada.....	1.92	4.50
New Hampshire.....	1.25	1.41
New Jersey.....	1.05	1.21
New York.....	0.76	0.96
North Carolina.....	1.48	2.39
North Dakota.....	1.60	2.03
Ohio.....	0.77	0.95
Oklahoma.....	1.20	2.22
Oregon.....	1.03	0.83
Pennsylvania.....	1.02	0.83
Rhode Island.....	0.94	1.15
South Carolina.....	1.41	1.54
South Dakota.....	1.45	1.84
Tennessee.....	1.02	1.38
Texas.....	1.31	1.85
Vermont.....	1.29	1.82
Virginia.....	1.02	1.08
Washington.....	1.14	1.86
West Virginia.....	1.03	0.86
Wisconsin.....	0.94	1.01
All other states.....	0.93	1.12

## DETAILED STATE TABLES.

The principal statistics secured by the census inquiry concerning gas manufacture are presented by states in Tables 21 and 22, Table 21 showing for 1909, 1904, and 1899, the number of establishments, number of persons engaged in the industry, primary horsepower, capital invested, salaries, wages, cost of materials, value of products, and value added by manufacture, and Table 22 giving more detailed statistics for 1909.

GAS, ILLUMINATING AND HEATING—COMPARATIVE STATISTICS, BY STATES: 1909, 1904, AND 1899.

Table 21	STATE.	Census.	PERSONS ENGAGED IN INDUSTRY.				Primary horsepower.	Capital.	Salaries.	Wages.	Cost of materials.	Value of products.	Value added by manufacture (value of products less cost of materials).	
			Total.	Proprietors and firm members.	Salariated employees.	Wage earners (average number).								
	United States.....	1909 1904 1899	1,296 1,019 877	51,097 40,043 28,363	277 71 .....	13,515 9,406 5,904	37,215 30,566 22,459	128,350 73,101 31,797	\$915,537 725,035 567,001	\$12,385 8,464 5,273	\$20,931 17,058 12,436	\$52,428 37,180 20,605	\$166,814 125,145 75,717	\$114,388 87,863 56,112
	Alabama.....	1909 1904 1899	13 13 11	403 193 115	4 ..... .....	140 57 40	259 136 75	599 1,370 1,124	4,730 926 1,121	74 38 31	133 52 32	214 87 51	687 355 233	473 268 182
	Arizona.....	1909 1904 1899	8 3 3	33 10 10	..... ..... .....	13 3 6	20 7 4	153 14 21	578 128 70	12 3 2	20 6 3	47 8 8	137 31 18	90 23 10
	Arkansas.....	1909 1904 1899	5 10 7	71 147 57	..... 1 .....	23 29 23	48 117 34	189 405 107	1,051 1,438 829	16 23 16	24 51 22	90 72 38	219 281 139	129 209 101
	California.....	1909 1904 1899	74 53 41	2,538 1,303 910	1 1 .....	871 454 203	1,666 848 707	7,502 3,606 1,101	47,075 31,286 20,487	824 301 229	1,408 650 407	2,604 1,184 896	8,927 5,412 3,162	6,323 4,228 2,286
	Colorado.....	1909 1904 1899	10 8 5	416 247 137	..... ..... .....	110 138 28	306 100 109	648 333 225	9,539 6,307 1,773	90 91 27	191 98 54	636 237 123	1,472 805 523	836 543 400
	Connecticut.....	1909 1904 1899	28 26 21	1,211 849 488	..... 1 .....	285 208 134	926 640 354	4,100 2,237 796	16,016 11,036 7,006	266 190 117	557 330 231	1,005 826 302	3,446 2,558 1,421	2,441 1,732 1,059
	Delaware.....	1909 1904 1899	5 4 4	154 118 88	1 2 .....	25 40 21	128 76 67	333 105 76	3,416 708 772	27 32 18	76 52 32	109 118 51	364 305 200	285 187 149
	Florida.....	1909 1904 1899	12 11 11	273 120 75	..... ..... .....	63 34 28	210 95 47	746 522 108	3,551 1,348 1,156	70 26 16	113 35 24	182 81 41	585 314 170	403 233 129
	Georgia.....	1909 1904 1899	15 12 12	604 570 346	..... ..... .....	145 88 75	459 482 271	689 587 307	7,075 5,832 4,209	123 74 56	206 201 142	368 291 142	1,425 1,061 661	1,057 770 519
	Illinois.....	1909 1904 1899	78 64 53	8,020 4,069 3,188	2 10 .....	1,717 1,095 827	6,301 2,964 2,371	18,385 5,700 3,377	131,790 97,119 76,816	1,567 1,344 770	2,967 1,695 1,306	6,210 4,519 1,991	21,052 16,008 8,774	14,842 11,436 6,783
	Indiana.....	1909 1904 1899	53 43 39	1,390 826 488	9 3 .....	453 202 146	928 621 340	5,845 1,855 654	23,550 11,972 7,746	356 172 89	508 289 172	571 256 .....	3,147 1,839 1,034	2,045 1,268 778
	Iowa.....	1909 1904 1899	117 60 26	1,151 636 316	40 4 .....	305 164 90	806 498 226	2,043 970 379	15,784 8,315 4,130	228 139 70	380 254 118	1,111 624 204	2,893 1,832 808	1,732 1,208 604
	Kansas.....	1909 1904 1899	12 22 17	50 201 135	8 10 .....	6 63 50	26 218 85	275 1,727 154	257 2,022 1,415	6 45 26	22 95 49	57 221 107	208 523 325	302 218 .....
	Kentucky.....	1909 1904 1899	15 17 17	500 509 339	..... ..... .....	114 92 60	380 417 279	991 792 343	5,789 5,391 4,496	93 95 51	206 192 122	315 264 139	1,004 961 671	689 697 532
	Louisiana.....	1909 1904 1899	5 4 3	374 317 95	..... ..... .....	96 78 34	278 239 61	650 152 139	6,138 2,195 1,707	81 64 37	95 145 41	337 104 71	1,091 751 455	754 587 384
	Maine.....	1909 1904 1899	19 15 9	284 156 108	2 ..... .....	66 56 47	216 100 61	349 171 511	2,665 2,058 1,420	58 38 29	120 63 38	212 129 73	549 444 285	337 315 212
	Maryland.....	1909 1904 1899	18 12 11	817 416 321	4 1 .....	337 188 84	476 227 237	1,555 1,361 469	26,954 21,227 18,554	207 177 85	220 128 137	629 458 481	3,223 1,994 1,797	2,594 1,536 1,316
	Massachusetts.....	1909 1904 1899	64 64 68	2,800 2,225 1,843	3 ..... .....	505 378 434	2,292 1,847 1,409	7,371 5,444 4,212	52,984 33,174 30,933	529 425 420	1,250 3,007 1,632	3,810 3,007 1,632	11,074 8,036 5,869	7,284 4,039 4,217
	Michigan.....	1909 1904 1899	55 46 38	2,435 1,670 885	2 3 .....	662 380 227	1,771 1,287 658	6,055 2,379 502	33,259 19,712 16,205	540 200 142	1,096 575 294	2,129 1,120 298	6,748 3,866 1,473	4,019 2,746 1,175
	Minnesota.....	1909 1904 1899	42 16 11	1,018 666 433	1 5 .....	169 86 58	848 575 375	3,538 1,338 832	13,821 11,390 8,900	171 79 48	292 265 169	820 624 304	2,874 2,033 1,076	2,054 1,409 772
	Mississippi.....	1909 1904 1899	8 5 5	139 79 35	..... ..... .....	38 24 11	101 55 24	148 111 55	661 305 422	25 12 9	39 24 17	86 39 17	256 125 82	170 86 65

Expressed in thousands.

GAS, ILLUMINATING AND HEATING—COMPARATIVE STATISTICS, BY STATES: 1909, 1904, AND 1899—Continued.

Table 21—Continued.

STATE.	Census.	Number of establishments.	PERSONS ENGAGED IN INDUSTRY.				Primary horse-power.	Capital.	Salaries.	Wages.	Cost of materials.	Value of products.	Value added by manufacture (value of products less cost of materials).
			Total.	Proprietors and firm members.	Salaried employees.	Wage earners (average number).							
Missouri.....	1909	29	1,403	32	430	941	3,635	33,929	357	636	1,223	4,638	3,415
	1904	28	2,411	.....	585	1,826	3,050	43,647	236	898	1,778	5,585	3,807
	1899	25	984	.....	150	834	1,298	33,504	112	464	756	2,877	2,121
Nebraska.....	1909	48	542	25	117	400	1,015	\$10,047	\$124	\$209	\$445	\$1,415	\$970
	1904	25	386	14	70	302	1,461	6,979	59	142	240	912	672
	1899	9	329	.....	39	290	1,063	6,856	37	80	134	525	391
New Hampshire.....	1909	14	301	2	52	247	220	2,215	46	106	180	581	401
	1904	13	177	.....	35	142	265	1,700	28	73	168	486	318
	1899	13	156	.....	35	121	163	1,519	25	60	86	356	270
New Jersey.....	1909	47	2,904	.....	887	1,017	6,717	15,667	630	853	2,855	9,837	6,982
	1904	38	2,153	.....	786	1,367	2,835	37,596	536	728	1,524	6,372	4,848
	1899	34	1,667	.....	347	1,320	1,479	38,872	272	684	786	3,768	2,982
New York.....	1909	141	9,221	15	2,784	6,422	30,089	278,607	2,982	4,384	15,018	42,347	27,329
	1904	100	8,755	5	1,721	7,022	15,997	224,341	1,859	4,636	10,940	35,315	24,375
	1899	101	6,705	.....	1,324	5,381	6,333	171,379	1,320	3,677	5,867	20,918	15,051
North Carolina.....	1909	14	201	.....	50	151	308	1,772	39	62	123	369	246
	1904	12	145	1	40	104	309	515	20	38	71	223	152
	1899	10	66	.....	19	47	68	683	15	14	37	130	93
North Dakota.....	1909	6	49	1	20	28	52	861	18	13	78	199	121
	1904	4	23	1	12	10	1,825	432	11	6	34	102	68
Ohio.....	1909	38	862	2	194	666	2,165	11,969	181	431	827	3,080	2,253
	1904	58	2,666	.....	427	2,239	2,052	25,081	366	1,083	1,347	4,812	3,465
	1899	73	1,672	.....	283	1,389	1,387	25,017	277	602	885	3,931	3,046
Oklahoma.....	1909	6	50	1	20	38	181	382	12	21	44	115	71
	1904	5	29	.....	14	15	18	1,232	7	8	14	40	26
Oregon.....	1909	8	357	.....	97	260	1,483	3,578	85	194	200	909	709
	1904	5	50	.....	18	32	202	2,473	23	31	84	457	373
	1899	5	43	.....	15	28	16	1,533	14	19	53	175	122
Pennsylvania.....	1909	99	4,584	13	1,452	3,130	9,374	61,887	1,239	1,501	4,099	15,840	11,741
	1904	90	3,653	3	1,068	2,585	6,582	57,064	846	1,478	3,143	10,809	7,666
	1899	89	3,721	.....	577	3,144	3,091	47,313	457	1,506	3,151	7,871	4,720
Rhode Island.....	1909	8	487	.....	75	412	719	7,110	118	303	530	1,833	1,303
	1904	6	524	.....	62	462	652	5,793	80	303	502	1,580	1,078
	1899	6	475	.....	45	430	353	5,664	50	249	244	969	725
South Carolina.....	1909	12	163	1	35	127	207	1,431	34	52	114	334	220
	1904	4	124	.....	16	108	43	1,153	11	31	59	193	134
	1899	4	127	.....	23	104	33	901	12	80	38	172	134
South Dakota.....	1909	17	144	.....	36	108	318	1,317	26	64	120	278	158
	1904	7	61	.....	14	47	115	654	9	26	48	148	100
Tennessee.....	1909	11	530	4	104	422	613	9,370	98	164	357	1,282	925
	1904	11	412	4	50	368	624	2,185	58	127	204	830	626
	1899	14	267	.....	49	218	234	2,304	41	65	135	872	437
Texas.....	1909	27	746	3	168	575	1,090	6,202	138	288	545	1,644	1,099
	1904	19	246	1	81	164	325	2,231	78	103	197	719	522
	1899	11	112	.....	41	71	130	1,764	46	46	94	380	286
Utah.....	1909	3	201	.....	34	167	291	4,162	36	108	168	366	198
	1904	3	48	.....	7	41	217	852	7	22	32	160	128
Vermont.....	1909	9	108	.....	38	70	153	1,479	20	43	100	278	178
	1904	6	46	.....	17	29	187	459	13	13	38	129	91
	1899	7	28	.....	13	15	67	477	7	8	20	71	51
Virginia.....	1909	21	494	1	115	378	1,116	4,868	95	217	431	1,472	1,041
	1904	19	350	1	81	268	357	2,747	64	136	285	980	695
	1899	12	186	.....	53	133	206	2,025	42	85	131	483	352
Washington.....	1909	12	675	.....	210	465	1,479	13,978	200	273	661	1,684	1,023
	1904	7	197	.....	89	108	454	7,533	74	78	149	602	453
	1899	6	118	.....	37	81	13	1,621	26	42	77	316	239
West Virginia.....	1909	4	78	.....	17	61	45	331	12	47	36	203	167
	1904	7	101	.....	15	86	58	676	12	44	60	158	98
	1899	8	106	.....	26	80	60	567	10	40	33	151	118
Wisconsin.....	1909	49	1,505	100	342	1,063	3,278	25,452	285	583	1,389	4,001	2,612
	1904	33	1,184	.....	273	911	2,859	18,869	221	464	819	2,911	2,092
	1899	25	655	.....	123	532	681	7,375	89	268	321	1,397	1,076
All other states.....	1909	17	812	.....	95	717	1,640	11,670	167	476	812	2,728	1,916
	1904	11	576	.....	68	508	1,466	6,744	128	333	690	2,038	1,368
	1899	16	526	.....	79	447	480	6,544	131	242	452	1,479	1,027

<sup>1</sup> Figures can not be shown without disclosing individual operations.

<sup>2</sup> Excluding statistics for one establishment in Indian Territory.

STATE.	Number of establishments.	PERSONS ENGAGED IN INDUSTRY.										WAGE EARNERS—DEC. 15, OR NEAREST REPRESENTATIVE DAY.					Primary horse-power.
		Total.	Proprietors and firm members.	Salaried officers, superintendents, and managers.	Clerks.		Average number.	Wage earners.		Total.	16 and over.		Under 16.				
					Male.	Female.		Number, 15th day of—			Male.	Female.	Male.	Female.			
								Maximum month.	Minimum month.								
1 United States.....	1,296	51,007	277	2,709	9,121	1,685	37,215	Je	40,412	Fe	32,502	37,396	37,308	71	16	1	123,350
2 Alabama.....	13	403	4	40	90	10	259	Au	202	Fe	215	268	268				59
3 Arizona.....	8	33		6	5	2	20	Ja <sup>1</sup>	20	Fe <sup>1</sup>	19	20	20				13
4 Arkansas.....	5	71		7	9	7	48	Ap	55	Ja	42	43	43				159
5 California.....	74	2,533	1	169	612	90	1,666	Ne	1,786	My	1,593	1,783	1,783				7,502
6 Colorado.....	10	416		23	65	22	300	De	346	Ap	207	340	346				646
7 Connecticut.....	28	1,211		78	145	62	926	Au	1,069	Fe	738	916	909	3	4		4,100
8 Delaware.....	5	154	1	8	12	5	128	Au	156	Ja <sup>1</sup>	117	123	123				33
9 Florida.....	12	273		26	32	5	210	De	239	Ap	181	240	240				74
10 Georgia.....	15	604		36	91	18	459	Oc	482	Ja	443	404	404				629
11 Idaho.....	3	45		4	4	2	35	Je	57	Fe	24	32	32				27
12 Illinois.....	78	8,020	2	269	1,315	133	6,301	Je	7,135	Fe	5,018	5,785	5,785				18,353
13 Indiana.....	53	1,300	9	101	274	78	923	Je	1,012	Ja	799	974	973	1			5,845
14 Iowa.....	117	1,151	40	111	156	38	806	Jy	970	Ja	652	799	796	1	1	1	2,043
15 Kansas.....	12	50	8	4	1	1	30	Ap	38	Ja <sup>1</sup>	35	37	37				276
16 Kentucky.....	15	500		49	37	28	386	Je	407	So	370	392	390	2			991
17 Louisiana.....	5	374		9	82	5	278	My	305	Fe	229	264	264				650
18 Maine.....	10	284	2	24	30	12	216	Je	327	Mh	143	186	180				349
19 Maryland.....	18	817	4	40	265	32	476	My	603	Fe	336	415	415				1,555
20 Massachusetts.....	64	2,800	3	190	188	127	2,292	Jy	2,541	Mh	2,020	2,239	2,226	13			7,371
21 Michigan.....	55	2,435	2	152	318	192	1,771	De	1,974	Mh	1,514	1,974	1,969	4	1		6,653
22 Minnesota.....	42	1,018	1	32	114	23	848	Je	963	Mh	756	805	805				3,533
23 Mississippi.....	8	139		14	20	4	101	Oc	110	Au	90	102	102				145
24 Missouri.....	29	1,403	32	56	239	135	941	Je	1,195	Ja	732	873	872		1		3,535
25 Montana.....	5	93		5	5	2	43	Jy	62	Fe	36	50	50				129
26 Nebraska.....	48	542	25	35	73	9	400	Oc	451	Ja	340	439	439				1,015
27 Nevada.....	3	13		3	3	1	6	Ja <sup>2</sup>	6	Jy <sup>2</sup>	6	6	6				83
28 New Hampshire.....	14	301	2	20	25	7	247	Jy	323	Ja	191	305	305				220
29 New Jersey.....	47	2,804		139	709	39	1,917	Je	1,974	Ja	1,864	1,891	1,890	10			6,717
30 New York.....	141	9,221	15	308	2,102	224	6,422	Je	6,950	Fe	5,538	6,043	6,043				30,089
31 North Carolina.....	14	201		25	18	7	151	Jy	172	So	138	150	150				308
32 North Dakota.....	6	49	1	10	7	3	28	My	32	Fe	23	28	28				62
33 Ohio.....	33	862	2	62	99	33	660	Mh	866	Jy <sup>1</sup>	483	858	858				2,165
34 Oklahoma.....	6	69	1	7	10	3	38	Ja <sup>1</sup>	38	Fe <sup>1</sup>	37	38	38				181
35 Oregon.....	8	357		12	58	27	260	De	282	Au	236	282	282				1,483
36 Pennsylvania.....	99	4,584	13	208	1,146	98	3,119	Jy	3,406	Fe	2,784	3,136	3,125	11			9,374
37 Rhode Island.....	8	487		21	43	11	412	Au	445	Fe	369	403	387	16			719
38 South Carolina.....	12	163	1	11	20	4	127	De	143	Jy <sup>1</sup>	115	143	143				207
39 South Dakota.....	17	144		17	9	10	108	Jy	160	Ja <sup>1</sup>	78	102	102				318
40 Tennessee.....	11	530	4	24	67	13	422	De	514	Fe	373	515	515				613
41 Texas.....	27	746	3	56	95	17	575	Jy	704	Fe	404	473	473				1,090
42 Utah.....	3	201		6	27	1	167	Jy	261	Fe	115	138	138				291
43 Vermont.....	9	108		14	14	10	70	My	97	Mh	60	62	62				153
44 Virginia.....	21	494	1	38	69	8	378	Jy	418	Je	338	381	380		1		1,116
45 Washington.....	12	675		33	153	24	465	My	523	Oc	403	522	522				1,479
46 West Virginia.....	4	78		7	10		61	Ja <sup>1</sup>	62	Je	57	61	61				45
47 Wisconsin.....	49	1,503	100	84	165	93	1,063	Jy	1,172	Fe	925	1,042	1,033	9			3,278
48 All other states <sup>2</sup> .....	6	691		23	30	10	628					648	648				1,401

<sup>1</sup> Same number reported for one or more other months.

<sup>2</sup> Same number reported throughout the year.

THE MANUFACTURE OF GAS.

653

DETAILED STATISTICS, BY STATES: 1909.

Capital.	EXPENSES.										Value of products.	Value added by manufacture (value of products less cost of materials).
	Total.	Services.			Materials.		Miscellaneous.					
		Officials.	Clerks.	Wage earners.	Fuel and rent of power.	Other.	Rent of factory.	Taxes, including internal revenue.	Contract work.	Other.		
1 \$915,536,762	\$113,500,978	\$4,715,385	\$7,000,986	\$20,930,697	\$39,196,031	\$13,231,813	\$6,247,558	\$7,836,275	\$114,570	\$13,558,668	\$166,814,371	\$114,386,527
2 4,729,503	557,160	35,354	38,593	133,344	141,910	72,172	.....	34,809	278	100,640	687,145	473,063
3 577,982	101,117	7,562	7,765	19,658	40,626	6,579	.....	4,558	.....	17,469	137,400	90,295
4 1,651,308	157,320	9,103	7,288	24,371	53,781	36,000	.....	8,036	.....	17,541	218,891	128,510
5 47,074,650	6,530,387	311,713	512,005	1,407,704	2,288,476	815,353	6,487	324,840	207	1,363,602	8,926,544	6,322,715
6 9,538,549	1,171,043	25,617	63,955	190,512	111,907	523,647	.....	69,432	.....	185,973	1,472,470	836,916
7 16,016,124	2,297,645	127,122	159,016	557,271	827,511	177,429	34,950	114,015	19,394	280,937	3,445,061	2,441,021
8 3,415,823	273,934	15,920	11,200	76,214	71,630	37,285	.....	7,271	112	54,286	363,769	254,838
9 3,550,624	418,380	40,435	29,761	113,207	118,990	63,426	.....	15,368	3,000	34,103	585,398	402,982
10 7,074,534	881,199	46,609	76,002	205,623	310,552	57,175	.....	75,000	5,215	105,023	1,425,271	1,057,544
11 625,651	104,738	6,115	4,007	26,596	34,874	17,563	.....	2,444	.....	13,079	113,472	61,035
12 131,789,940	13,938,452	631,984	935,387	2,907,342	5,394,978	814,700	580,035	926,147	3,725	1,684,148	21,452,100	14,842,416
13 23,550,122	2,313,572	162,488	193,987	598,318	840,317	261,063	1	83,584	12,654	245,620	3,147,305	2,045,385
14 15,783,512	2,040,600	114,660	113,402	379,738	838,056	272,026	324	105,896	30	215,408	2,892,646	1,781,364
15 257,064	88,411	4,770	1,080	22,069	40,888	15,761	.....	1,046	.....	576	2,221	207,586
16 5,788,607	777,987	62,265	31,080	205,730	261,298	53,247	25,000	47,090	175	92,102	1,003,582	689,037
17 6,137,630	621,220	18,726	62,228	94,023	218,859	117,780	.....	65,741	.....	43,203	1,091,309	754,070
18 2,004,690	450,309	31,000	27,003	120,172	133,260	78,699	.....	19,983	5,146	35,040	548,691	336,732
19 20,953,046	1,512,742	50,191	216,905	220,158	595,490	125,993	.....	207,921	.....	188,084	3,223,001	2,593,518
20 62,983,671	7,053,666	323,861	205,199	1,250,007	2,770,366	1,039,768	10	707,108	27,421	729,825	11,074,354	7,264,220
21 33,258,917	4,472,212	244,820	294,086	1,096,124	1,448,684	680,433	840	308,202	7,584	390,830	6,745,070	4,618,933
22 13,820,881	1,755,256	57,012	113,962	292,212	787,471	32,361	.....	156,860	1,000	314,369	2,874,281	2,054,449
23 660,874	189,732	14,179	11,112	39,119	55,572	27,196	.....	8,808	.....	30,746	255,582	169,814
24 33,928,814	2,962,194	108,164	248,747	695,548	1,116,126	107,326	3,196	329,606	69	419,419	4,637,544	3,414,089
25 1,041,030	153,086	7,825	5,466	41,183	60,317	16,425	.....	5,474	1,107	15,260	189,912	113,170
26 10,047,410	968,462	66,964	57,058	209,003	317,484	127,330	525	109,102	1,005	79,982	1,415,002	970,179
27 235,659	53,976	3,300	1,740	8,060	35,067	1,277	.....	1,711	.....	2,821	67,263	30,919
28 2,214,529	412,116	23,355	22,798	105,891	150,357	29,994	175	18,922	1,628	58,996	581,395	401,044
29 15,666,761	9,092,466	182,279	447,263	858,129	1,830,013	1,024,721	3,030,581	386,965	485	437,030	9,836,806	6,982,072
30 278,006,545	28,659,181	983,886	1,997,932	4,363,632	10,600,770	4,417,636	11,063	2,549,473	3,194	3,730,095	42,346,725	27,328,320
31 1,771,505	273,260	24,188	15,181	62,324	99,055	24,436	.....	9,808	.....	38,268	369,375	245,884
32 800,894	132,823	11,747	5,919	13,162	56,983	20,840	500	6,156	2,767	14,740	198,633	120,801
33 11,969,337	2,182,051	96,435	84,123	431,305	741,935	84,809	363,695	175,832	10,862	193,055	3,079,670	2,252,926
34 382,131	90,444	6,482	5,105	20,700	40,630	2,942	.....	4,452	.....	10,133	114,851	71,279
35 3,578,110	714,524	22,706	62,752	194,176	183,560	16,738	.....	39,349	1,000	194,243	909,115	708,817
36 61,856,506	9,188,766	264,796	974,689	1,500,850	2,997,543	1,101,051	1,287,642	62,836	3,276	996,083	15,839,612	11,741,018
37 7,109,560	1,159,644	64,216	53,370	302,664	456,477	74,021	.....	89,010	.....	119,886	1,833,176	1,302,678
38 1,431,202	250,050	23,959	9,920	51,638	94,605	20,044	12	11,379	.....	39,093	333,877	219,828
39 1,317,421	239,914	15,418	10,106	63,716	78,357	41,196	.....	5,776	.....	25,345	277,569	158,016
40 9,369,945	809,700	45,079	52,503	163,958	235,839	120,836	450	85,535	.....	105,600	1,281,558	924,883
41 6,202,454	1,154,599	84,065	53,625	288,307	372,048	172,789	750	70,285	50	112,680	1,644,066	1,099,229
42 4,162,259	351,673	13,970	22,500	108,139	111,746	56,423	.....	8,763	.....	30,132	365,855	197,696
43 1,478,518	192,438	11,684	8,028	43,200	66,408	33,185	60	9,079	.....	20,785	278,138	178,545
44 4,867,894	822,399	43,806	50,808	216,780	351,374	70,503	150	19,947	.....	60,031	1,472,384	1,041,507
45 13,978,035	1,373,586	63,140	136,977	273,260	450,266	210,642	.....	166,823	.....	72,478	1,683,635	1,022,727
46 331,386	96,568	5,436	6,200	46,688	25,729	9,844	.....	600	.....	2,001	202,531	166,858
47 25,452,035	2,643,391	115,213	170,171	583,306	797,312	591,303	.....	221,987	2,620	161,479	4,000,981	2,612,366
48 9,872,451	1,816,685	85,751	54,143	399,977	629,625	19,072	207	147,777	.....	480,133	2,359,869	1,711,172

\* All other states embrace: District of Columbia, 3 establishments; New Mexico, 2; Wyoming, 1.

---

---

# PETROLEUM REFINING

---

---

(655)

# PETROLEUM REFINING.

## GENERAL STATISTICS.

**Scope of the industry.**—This industry includes only such establishments as are engaged primarily in the refining of crude petroleum by distillation. Establishments which purchase refined or partly refined petroleum products and compound them with vegetable, animal, or mineral oils, or other substances, in order to produce a special composition are, therefore, excluded.

**Comparison with earlier censuses.**—Although crude petroleum was utilized commercially in the United States prior to 1879, the statistics for the petroleum refining industry given in the census reports prior to

that time are not comparable with those for the later censuses. In 1859, 78 establishments were reported with products valued at \$6,397,680, and in 1869 there were 170 establishments reported, with products valued at \$26,942,287.

Table 1 summarizes the statistics of the industry for each census from 1879 to 1909, inclusive. It should be noted that although the statistics for the industry cover all the crude petroleum refineries in the country they do not show the total number of these refineries because several of them are sometimes reported as a single establishment. (See Introduction.)

	NUMBER OR AMOUNT.					PER CENT OF INCREASE. <sup>1</sup>				
	1909	1904	1899	1889	1879	1899-1909	1904-1909	1899-1904	1889-1899	1879-1889
Number of establishments.....	147	98	87	94	86	119.4	50.0	46.3	-28.7	9.3
Persons engaged in the industry.....	16,640	18,768	13,447	(?)	(?)	23.7	-11.3	39.6	.....	.....
Proprietors and firm members.....	42	24	47	(?)	(?)	-10.6	75.0	-48.9	.....	.....
Salaried employees.....	2,669	1,974	1,201	(?)	(?)	122.2	35.2	64.4	.....	.....
Wage earners (average number).....	13,929	16,770	12,199	11,403	9,869	14.2	-16.9	37.5	(?)	(?)
Primary horsepower.....	90,268	46,019	36,127	32,536	(?)	149.9	96.2	27.4	11.0	.....
Capital.....	\$181,916,205	\$136,280,541	\$95,327,892	\$77,416,296	\$27,325,746	90.8	33.5	43.0	23.1	183.3
Expenses.....	\$222,477,636	\$157,398,153	\$114,713,679	\$76,977,469	(?)	93.9	41.3	37.2	49.0	.....
Services.....	\$13,758,945	\$12,713,432	\$8,528,487	\$6,989,478	\$4,331,572	61.3	8.2	49.1	22.0	59.5
Salaries.....	\$3,928,867	\$2,724,055	\$1,811,400	(?)	(?)	116.9	44.2	50.4	.....	.....
Wages.....	\$9,830,078	\$9,989,377	\$6,717,087	(?)	(?)	46.3	-1.6	48.7	.....	.....
Materials.....	\$199,273,402	\$139,387,213	\$102,859,341	\$67,918,723	\$34,999,101	93.7	43.0	35.5	51.4	94.1
Miscellaneous.....	\$9,445,289	\$5,287,508	\$3,330,851	\$2,069,268	(?)	183.6	78.3	59.0	61.0	.....
Value of products.....	\$236,997,659	\$175,005,320	\$123,929,384	\$85,001,198	\$43,705,218	91.2	35.4	41.2	45.8	94.5
Value added by manufacture (value of products less cost of materials).....	\$37,724,257	\$35,618,107	\$21,070,043	\$17,082,475	\$8,706,117	79.0	5.9	69.0	23.3	96.2
Crude petroleum treated (barrels).....	120,775,439	66,982,862	52,011,005	30,692,629	17,417,455	132.2	80.3	28.8	69.6	76.0

<sup>1</sup> A minus sign (—) denotes decrease. Where percentages are omitted, comparable figures are not available.  
<sup>2</sup> Comparable figures not available. <sup>3</sup> Figures not strictly comparable.

The industry advanced steadily during the 30 years covered by Table 1, the amount of petroleum refined in 1909 being almost seven times as great, and the cost of materials and value of products each being over five times as great as in 1879. The increase in the number of wage earners was comparatively slight, 41.1 per cent during the 30-year period. At the census of 1909 one of the largest companies in the United States made separate reports for their box, cooperage, and tin shops, which at prior censuses had been included with the reports for the refineries. This has considerably affected the number of wage earners shown for the industry in 1909 as compared with those for prior censuses. During the decade 1899-1909 the average number of wage earners increased from 12,199 to

13,929, or 14.2 per cent; while the value of products increased from \$123,929,384 to \$236,997,659, or 91.2 per cent; and the value added by manufacture from \$21,070,043 to \$37,724,257, or 79 per cent. At each census the cost of materials constituted a very large part of the expenses reported for the industry. In 1909 this cost amounted to 84.1 per cent of the total value of products as compared with 79.6 per cent in 1904, 83 per cent in 1899, 79.9 per cent in 1889, and 80.1 per cent in 1879.

**Comparative summary, by states.**—Table 2 summarizes the more important statistics of the industry for the three states for which figures for 1909, 1904, and 1899 can be given without disclosing individual operations.

(657)

**Table 2**

STATE.	Census.	Number of establishments.	PERSONS ENGAGED IN INDUSTRY.				Primary horse power.	Capital.	Salaries.	Wages.	Cost of materials.	Value of products.	Value added by manufacture (value of products less cost of materials).
			Total.	Proprietors and firm members.	Salaried employees.	Wage earners (average number).							
United States .....	1909	147	16,640	42	2,669	13,929	90,268	\$181,916	\$3,929	\$9,830	\$199,273	\$236,998	\$37,725
	1904	98	18,768	24	1,974	16,770	46,019	136,281	2,724	9,989	139,387	175,005	35,618
	1899	67	13,447	47	1,201	12,199	36,127	95,328	1,811	6,717	102,859	123,929	21,070
California.....	1909	29	1,146	4	212	930	5,630	13,881	367	801	13,898	17,878	3,660
	1904	19	840	.....	162	678	1,283	5,453	212	477	4,131	5,749	1,618
	1899	4	72	.....	19	53	180	478	40	42	400	608	208
Ohio.....	1909	10	2,039	.....	380	1,659	4,324	11,152	412	1,028	8,145	10,754	2,609
	1904	12	2,116	.....	216	1,000	4,386	10,385	266	1,054	7,662	10,940	3,267
	1899	9	1,227	2	217	1,008	2,491	10,913	234	552	6,177	8,307	2,220
Pennsylvania.....	1909	41	3,423	36	487	2,900	35,212	38,000	768	1,861	47,440	53,088	5,643
	1904	43	4,657	22	408	4,227	11,600	32,847	557	2,371	38,922	47,400	8,538
	1899	38	3,616	40	277	3,299	13,328	26,581	403	1,682	27,514	34,978	7,464
All other states.....	1909	67	10,032	2	1,590	8,440	45,102	117,893	2,362	6,140	129,790	155,278	25,488
	1904	24	11,155	2	1,188	9,965	28,741	87,596	1,689	6,087	88,672	110,847	22,175
	1899	16	8,532	5	688	7,839	20,128	57,356	1,134	4,441	68,078	79,856	11,778

Separate figures for 1909 only are given in Table 22 for each of the three states shown in Table 2, and also for Kansas and Oklahoma. The statistics for the remaining states can not be shown separately without disclosing individual operations, but the following table shows for 1909, 1904, and 1899 the rank of each state in number of wage earners, value of products, and value added by manufacture.

**Table 3**

STATE.	RANK OF STATE IN--								
	Average number of wage earners.			Value of products.			Value added by manufacture.		
	1909	1904	1899	1909	1904	1899	1909	1904	1899
New Jersey.....	1	2	2	1	2	2	1	2	4
Pennsylvania.....	2	1	1	2	1	1	2	1	1
New York.....	3	3	3	3	3	3	6	3	2
Texas.....	5	6	10	4	7	9	4	6	10
California.....	6	7	9	5	6	8	5	7	7
Indiana.....	7	4	4	6	4	4	3	4	3
Ohio.....	4	5	5	7	5	5	7	5	5
Illinois.....	10	.....	.....	8	.....	.....	8	.....	.....
Missouri.....	15	.....	.....	9	.....	.....	11	.....	.....
Kansas.....	8	10	11	10	9	11	9	10	11
Maryland.....	11	8	6	11	8	6	12	8	6
West Virginia.....	12	9	7	12	10	7	14	11	8
Kentucky.....	9	.....	.....	13	.....	.....	10	.....	.....
Oklahoma.....	13	.....	.....	14	.....	.....	13	.....	.....
Colorado.....	14	11	8	15	11	10	15	9	9
Louisiana.....	16	13	.....	16	13	.....	16	13	.....
Wyoming.....	.....	12	.....	.....	12	.....	.....	12	.....
Michigan.....	.....	.....	12	.....	.....	12	.....	.....	12

As measured by average number of wage earners, value of products, and value added by manufacture, New Jersey ranked first in the petroleum refining industry at the census of 1909; Pennsylvania and New York second and third, respectively, in average number of wage earners and value of products; while Indiana ranked third in value added by manufacture. The table shows considerable change in the relative rank in value of products of the states at the several censuses, Texas advancing from ninth place to fourth, and California from eighth to fifth during the decade 1899-1909, while during the same period Indiana fell from fourth place to sixth, and Ohio from fifth to seventh.

Persons engaged in the industry.—Table 4 shows, for 1909, the number of persons engaged in the petroleum refining industry, classified according to occupational status and sex, and in the case of wage earners, according to age also. It should be borne in mind that the sex and age classification of the average number of wage earners in this and other tables is an estimate obtained by the method described in the Introduction.

**Table 4**

CLASS.	PERSONS ENGAGED IN THE INDUSTRY: 1909		
	Total.	Male.	Female.
All classes.....	16,640	16,251	389
Proprietors and officials.....	671	661	10
Proprietors and firm members.....	42	37	5
Salaried officers of corporations.....	211	207	4
Superintendents and managers.....	418	417	1
Clerks.....	2,040	1,820	220
Wage earners (average number).....	13,929	13,770	159
16 years of age and over.....	13,886	13,727	159
Under 16 years of age.....	43	43	.....

The average number of persons engaged in the petroleum refining industry during 1909 was 16,640, of whom 13,929, or 83.7 per cent, were wage earners; 671, or 4 per cent, proprietors and officials; and 2,040, or 12.3 per cent, clerks, this class including other subordinate salaried employees. Of the total number of persons engaged in the industry, 16,251, or 97.7 per cent, were males and 389, or 2.3 per cent, were females. Only 389 women were employed, and of these, 220 were clerks and 159, wage earners. The average number of wage earners under 16 years of age was only 43. The average number of wage earners for California, Ohio, and Pennsylvania for 1909, 1904, and 1899 is given in Table 2.

The average number distributed by sex and age is not shown for the individual states, but Table 22 gives such a distribution of the number employed on December 15, or the nearest representative day.

In order to compare the distribution of the persons engaged in the industry in 1909 according to occupational status with that in 1904 it is necessary to use the classification employed at the earlier census. (See Introduction.) Such a comparison is made in Table 5.

CLASS.	PERSONS ENGAGED IN THE INDUSTRY.				
	1909		1904		Percent of increase, <sup>1</sup> 1904-1909
	Amount.	Per cent distribution.	Amount.	Per cent distribution.	
Total.....	16,840	100.0	18,768	100.0	-11.3
Proprietors and firm members.....	42	0.3	24	0.1	75.0
Salaried employes.....	2,669	16.0	1,974	10.5	35.2
Wage earners (average number).....	13,929	83.7	16,770	89.4	-16.9

<sup>1</sup> A minus sign (-) denotes decrease.

Although wage earners at both censuses represented more than 80 per cent of the total number of persons engaged in the industry, their number decreased 16.9 per cent from 1904 to 1909, while salaried employees shows an increase of 35.2 per cent for the five years.

Table 6 shows the average number of wage earners in the industry distributed according to age, and in the case of those 16 years of age and over, according to sex, for 1909, 1904, and 1899. The number of women and children employed was so small that figures relative to increases and decreases have little significance.

CLASS.	AVERAGE NUMBER OF WAGE EARNERS IN THE INDUSTRY.					
	1909		1904		1899	
	Num-ber.	Per cent distribution.	Num-ber.	Per cent distribution.	Num-ber.	Per cent distribution.
Total.....	13,929	100.0	16,770	100.0	12,199	100.0
16 years of age and over.....	13,886	99.7	16,358	97.4	12,001	98.4
Male.....	13,727	98.5	16,256	96.9	11,935	97.8
Female.....	159	1.1	82	0.5	66	0.5
Under 16 years of age.....	43	0.3	432	2.6	198	1.6

Wage earners employed, by months.—Table 7 gives the number of wage earners employed in the industry on the 15th (or the nearest representative day) of each month during the year 1909 for the six states in which an average of 500 or more wage earners were employed.

STATE.	Average number during the year.	WAGE EARNERS EMPLOYED IN THE INDUSTRY: 1909 <sup>1</sup>											
		Janu-ary.	Febru-ary.	March.	April.	May.	June.	July.	August.	Septem-ber.	Octo-ber.	Novem-ber.	Decem-ber.
United States.....	13,929	13,319	13,079	12,952	13,076	13,206	13,817	14,156	14,221	14,434	15,032	15,249	14,805
California.....	930	882	880	862	913	952	965	938	931	966	963	974	939
New Jersey.....	2,906	2,794	2,839	2,823	2,908	2,929	2,860	2,953	2,946	2,926	2,897	3,048	2,951
New York.....	1,932	1,877	1,828	1,779	1,798	1,981	2,050	2,074	1,993	1,952	1,952	2,095	1,949
Ohio.....	1,659	1,628	1,608	1,616	1,549	1,600	1,534	1,546	1,534	1,655	1,905	1,943	1,891
Pennsylvania.....	2,900	2,685	2,628	2,535	2,547	2,757	2,947	2,936	3,124	3,361	3,320	3,320	3,297
Texas.....	1,281	1,277	1,167	1,193	1,144	1,102	1,206	1,356	1,434	1,358	1,473	1,348	1,308

<sup>1</sup> The month of maximum employment for each state is indicated by boldface figures and that of minimum employment by italic figures.

The industry is not subject to very great seasonal changes. The largest number of wage earners employed in the industry during any month in 1909 was 15,249, in November, and the smallest number, 12,952, in March, the minimum number being equal to 84.9 per cent of the maximum. In 1904 the maximum number, 17,621, was shown for June, and the minimum number, 15,067, for December, the latter number being equal to 85.5 per cent of the former.

Prevailing hours of labor.—In Table 8 the wage earners in the industry have been classified according to the number of hours of labor per week prevailing in the establishments in which they were employed. In making this classification the average number of wage earners employed during the year in each establishment was classified as a total according to the hours prevailing in that establishment, even though a few employees worked a greater or smaller number of hours.

Practically all (99.7 per cent) of the wage earners employed in the industry in 1909 were in establishments where the prevailing number of hours were 54 or more per week. Of the seven groups shown in

Table 8, by far the largest was that made up of the wage earners in establishments where the prevailing hours were 54 per week, such wage earners constituting 62.2 per cent of the total number. This group was the most important, likewise, in all but two of the states for which figures are given. In Texas the wage earners in establishments where the prevailing hours per week were 72 or over formed the largest group, while in Ohio 60 hours per week was the most common working time.

STATE.	AVERAGE NUMBER OF WAGE EARNERS IN THE INDUSTRY: 1909							
	Total.	In establishments with prevailing hours—						
		48 and under.	Be-tween 48 and 54.	54.	Be-tween 54 and 60.	60.	Be-tween 60 and 72.	72 and over.
United States.....	13,929	43	.....	8,670	61	1,894	673	2,588
California.....	930	25	.....	485	31	18	64	307
New Jersey.....	2,906	.....	.....	2,328	.....	100	.....	478
New York.....	1,932	.....	.....	1,904	.....	.....	.....	28
Ohio.....	1,659	.....	.....	480	30	1,122	19	8
Pennsylvania.....	2,900	.....	.....	1,596	.....	418	270	616
Texas.....	1,281	.....	.....	467	.....	.....	206	608

Character of ownership.—Table 9 presents statistics with respect to the character of ownership of the establishments in the petroleum refining industry.

CHARACTER OF OWNERSHIP.	NUMBER OF ESTABLISHMENTS.		VALUE OF PRODUCTS.	
	1909	1904	1909	1904
Total.....	147	98	\$236,997,659	\$175,005,320
Individual.....	4	8	1,922,431	2,646,390
Firm.....	12	17	2,535,259	12,810,428
Corporation.....	131	83	232,539,969	169,548,502
Per cent of total.....	100.0	100.0	100.0	100.0
Individual.....	2.7	8.2	0.8	1.5
Firm.....	8.2	17.1	1.1	11.6
Corporation.....	89.1	84.7	98.1	96.9

<sup>1</sup> Includes one establishment under "other" ownership.

This table shows the great and increasing extent to which the industry is dominated by establishments under corporate ownership. Corporations controlled 89.1 per cent of the establishments in the industry, and reported 98.1 per cent of the total value of products in 1909, as compared with 84.7 per cent and 96.9 per cent, respectively, in 1904.

Of the total number of wage earners in the industry, 99, or seven-tenths of 1 per cent, were employed in establishments under individual ownership; 152, or 1.1 per cent, by establishments under firm ownership; and 13,678, or 98.2 per cent, by establishments under corporate ownership.

Establishments under ownership other than corporate were reported from only three states, California, Pennsylvania, and Oklahoma, Pennsylvania being the only state in which such establishments were of importance. Of the 41 establishments in Pennsylvania, 4 were under individual ownership, 9 under firm ownership, and 28 under corporate ownership; those under individual ownership gave employment to an average of 99 wage earners, or 3.4 per cent of

the total number for the industry and reported products valued at \$1,922,431, or 3.6 per cent of the total, while establishments under firm ownership gave employment to an average of 141 wage earners, or 4.9 per cent of the total, and reported products valued at \$2,456,523, or 4.6 per cent of the total.

Size of establishments.—Table 10 presents statistics for 1909 and 1904 for establishments grouped according to the value of their products.

VALUE OF PRODUCTS PER ESTABLISHMENT.	NUMBER OF ESTABLISHMENTS.		VALUE OF PRODUCTS.	
	1909	1904	1909	1904
Total.....	147	98	\$236,997,659	\$175,005,320
Less than \$5,000.....	1	3	11,112	11,112
\$5,000 and less than \$20,000.....	15	6	1,206,158	76,683
\$20,000 and less than \$100,000.....	25	19	1,524,305	978,661
\$100,000 and less than \$1,000,000.....	71	51	26,505,548	19,389,349
\$1,000,000 and over.....	35	19	208,671,648	154,549,485
Per cent of total.....	100.0	100.0	100.0	100.0
Less than \$5,000.....	0.7	3.1	( <sup>1</sup> )	( <sup>2</sup> )
\$5,000 and less than \$20,000.....	10.2	6.1	10.1	( <sup>2</sup> )
\$20,000 and less than \$100,000.....	17.0	19.4	0.6	0.6
\$100,000 and less than \$1,000,000.....	48.3	52.0	11.2	11.1
\$1,000,000 and over.....	23.8	19.4	88.0	88.3

<sup>1</sup> Includes the group "less than \$5,000." <sup>2</sup> Less than one-tenth of 1 per cent.

More than 99 per cent of the value of products of the industry both in 1909 and 1904 was reported by establishments with products to the value of at least \$100,000, and nearly 90 per cent at each census was reported by establishments having products to the value of \$1,000,000 or over. The gain of this latter class of establishments in value of products was more than 35 per cent. Establishments with products of less than \$100,000 in value constituted nearly 30 per cent of the total number at both censuses.

Table 11 classifies the establishments in the leading states in the petroleum refining industry according to the number of wage earners employed.

STATE.	ESTABLISHMENTS EMPLOYING IN 1909—																	
	TOTAL.		1 to 5 wage earners.		6 to 20 wage earners.		21 to 50 wage earners.		51 to 100 wage earners.		101 to 250 wage earners.		251 to 500 wage earners.		501 to 1,000 wage earners.		Over 1,000 wage earners.	
	Es-tab-lish-ments.	Wage earners (average number).	Es-tab-lish-ments.	Wage earners.	Es-tab-lish-ments.	Wage earners.	Es-tab-lish-ments.	Wage earners.	Es-tab-lish-ments.	Wage earners.	Es-tab-lish-ments.	Wage earners.	Es-tab-lish-ments.	Wage earners.	Es-tab-lish-ments.	Wage earners.	Es-tab-lish-ments.	Wage earners.
United States.....	147	13,929	24	71	51	647	32	985	11	845	11	1,804	12	4,481	4	2,620	2	2,486
California.....	29	930	6	16	18	211	3	76				2	627					
New Jersey.....	6	2,906							2	184			2	852	1	548	1	1,322
New York.....	7	1,932	1	4							1	205	3	1,129	1	568		
Ohio.....	10	1,659			2	27	3	28	1	97	2	248	1	480	1	708		
Pennsylvania.....	41	2,900	3	12	13	183	18	578	2	115	3	559	1	289			1	1,164
Texas.....	8	1,281			2	28			2	153	2	308	2	792				

Of the 147 establishments reported in 1909, 51 per cent employed from 1 to 20 wage earners each; 29.3 per cent from 21 to 100; and 15.6 per cent from 101 to 500. There were only 6 establishments that employed more than 500 wage earners. Of the total number of wage earners, 5.2 per cent worked in estab-

lishments employing from 1 to 20 wage earners; 13 per cent in those employing from 21 to 100; 45.2 per cent in those employing from 101 to 500; and 36.7 per cent in those employing more than 500.

Expenses.—As stated in the Introduction, the census figures representing expenses do not purport to show

the total cost of manufacture, since they take no account of interest or depreciation; hence they can not properly be used for determining profits. Facts of interest can be brought out, however, concerning the relative importance of the different classes of expenses which were reported. Table 1 shows the total expenses in the establishments of the industry in 1909 to have been \$222,477,636, distributed as follows: Cost of materials, \$199,273,402, or 89.6 per cent; wages \$9,830,078, or 4.4 per cent; salaries, \$3,928,867, or 1.8 per cent; and miscellaneous expenses, made up of advertising, ordinary repairs of buildings and machinery, insurance, traveling expenses, and other sundry expenses, \$9,445,289, or 4.2 per cent.

**Engines and power.**—Table 12 shows statistics of power as reported at the censuses of 1909, 1904, and 1899.

The total primary power used in the industry increased from 36,127 horsepower in 1899 to 90,268 horsepower in 1909, or 149.9 per cent during the decade. In 1909, as in 1904 and 1899, steam was the principal source of power, though gas and other internal-combustion engines were relatively more important in this industry than in most of the other industries in the United States. Little purchased electric current was used at either census, but between 1899 and

1909 there was an increase from 925 to 8,808 in the horsepower of motors run by current generated in the establishments reporting.

POWER.	NUMBER OF ENGINES OR MOTORS.			HORSEPOWER.			PER CENT DISTRIBUTION OF HORSEPOWER.		
	1909	1904	1899	1909	1904	1899	1909	1904	1899
<b>Primary power, total</b> .....	2,142	1,143	892	90,268	46,019	36,127	100.0	100.0	100.0
Owned.....	2,138	1,129	892	89,955	45,809	36,127	99.7	99.7	100.0
Steam.....	2,039	1,072	864	83,707	43,480	30,568	92.7	94.5	84.6
Gas.....	98	57	28	5,870	2,059	709	6.5	4.5	2.0
Other.....				378	330	4,850	0.4	0.7	13.4
Rented.....	4	14		313	150		0.3	0.3	
Electric.....	4	14		28	150		(1)	0.3	
Other.....				285			0.3		
<b>Electric motors</b> .....	511	238	69	8,808	3,468	925	100.0	100.0	100.0
Run by current generated by establishments.....	507	224	69	8,780	3,318	925	99.7	95.7	100.0
Run by rented power.....	4	14		28	150		0.3	4.3	

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

Table 13 shows, for 1909, the amount of the several kinds of power and of the different kinds of fuel used in each of the leading states.

STATE.	PRIMARY HORSEPOWER.								ELECTRIC HORSEPOWER.		FUEL USED.				
	Number of establishments reporting.	Total horsepower.	Owned by establishments reporting.				Rented.		Total rented and generated by establishment.	Generated in the establishment reporting.	Coal.		Coke (short tons).	Oil, including gasoline (barrels).	Gas (1,000 feet).
			Total.	Steam engines.	Gas engines.	Other.	Electric.	Other.			Anthracite (long tons).	Bituminous (short tons).			
<b>United States</b> .....	130	90,268	89,955	83,707	5,870	378	28	285	8,808	8,780	1,347,519	1,264,841	99,595	3,473,758	7,519,859
California.....	25	5,630	5,542	5,422	120		13	75	799	789				1,286,666	
New Jersey.....	6	23,902	23,902	23,677	225				2,294	2,294	898,157	4,523	89,312	137,429	6,588
New York.....	7	5,081	5,081	4,991	90			10	977	977	129,863	133,966	8,323	44,710	167,478
Ohio.....	9	4,324	4,324	3,864	410	50			138	138				32,507	519,690
Pennsylvania.....	40	35,212	35,212	30,394	4,490	328			3,725	3,725	316,138	453,106		84,017	4,527,475
Texas.....	7	6,208	6,193	6,158	35		15		392	377				1,133,516	
All other states.....	36	9,901	9,701	9,201	500			200	483	483	3,361	425,157	1,960	774,913	2,298,648

**Fuel consumed.**—Since the chief method of refining petroleum is that of distillation, the use of a large amount of fuel is necessary, not only to produce the heat used in the distillation, but in the generation of power. Naturally a large portion of the fuel used for both heat and power is gas or oil, since in most sections of the country where oil abounds natural gas is obtainable and is utilized. Of the 3,473,758 barrels of oil reported as used for fuel in the refineries in 1909, 1,286,666 barrels, or 37 per cent of the total, was

reported by California, while of the total quantity of gas reported (7,519,859,000 cubic feet), 4,527,475,000 cubic feet, or 60.2 per cent of the total, was reported by Pennsylvania. Coal, also, was largely used as fuel in the industry. There were 1,347,519 tons of anthracite coal consumed, the largest amount, 898,157 tons, or 66.7 per cent of the total, being reported by New Jersey, while of the 1,264,841 tons of bituminous coal used, 453,106 tons, or 35.8 per cent of the total, was reported by Pennsylvania.

## SPECIAL DATA RELATING TO MATERIALS, PRODUCTS, AND EQUIPMENT.

**Materials.**—Table 14 shows statistics of the materials used in the industry in 1909.

MATERIAL.	Quantity (barrels).	Cost.
<b>Total</b> .....		<b>\$199,273,402</b>
Crude petroleum, total.....	120,775,439	152,307,040
Mid-Continent (Kansas and Oklahoma).....	42,895,051	41,959,100
Illinois.....	26,236,883	36,218,407
Appalachian.....	24,508,218	47,545,138
California.....	13,481,885	10,108,541
Lima-Indiana.....	8,083,096	11,455,764
Gulf (Texas and Louisiana).....	5,262,664	4,669,486
Colorado.....	307,642	350,604
Sulphuric acid, caustic soda, sulphur, and pyrites.....		4,003,198
Coopers' and carpenters' materials, barrels, and other wooden packages.....		8,937,421
Tinners' materials, tin cans, iron barrels and materials therefor, and other metal packages.....		8,037,467
All other materials.....		25,088,276

Of the seven fields from which crude petroleum was secured during 1909, the largest producer was the Mid-Continent field, from which 42,895,051 barrels, or 35.5 per cent of the total output of the country, were obtained in 1909. The Illinois field was next in importance, furnishing 21.7 per cent of the total, while the Appalachian field furnished 20.4 per cent and the California field 11.2 per cent.

The total quantity of crude petroleum produced in 1909, according to the statistics of the census, was 171,559,394 barrels, its value at the well being \$117,696,529. In that year 120,775,439 barrels of crude petroleum was used as material in the refineries, being equal to 70.4 per cent of the total production.

The cost per barrel of crude petroleum from the different fields, as computed from Table 14, varies considerably, ranging from 75 cents in California and 98 cents in the Mid-Continent fields to \$1.38 in Illinois and \$1.94 in Pennsylvania. This variation is due largely to differences in the chemical composition of the oil and its physical freedom from foreign substances. The average cost per barrel for the entire country was \$1.26.

At censuses previous to 1909 only the quantity and cost of crude petroleum for the country as a whole and the cost of the other materials used was reported. These totals for 1909, 1904, and 1899, together with the percentages of increase from 1899 to 1909, are given in the following table:

	1909	1904	1899	Percent of increase: 1899-1909
<b>Total cost</b> .....	<b>\$199,273,402</b>	<b>\$139,387,213</b>	<b>\$102,859,341</b>	<b>93.7</b>
Crude petroleum:				
Barrels (42 gallons).....	120,775,439	66,982,862	52,011,005	132.2
Cost.....	\$152,307,040	\$107,487,091	\$80,424,207	89.4
Fuel and power.....	\$8,376,383	\$5,139,934	\$3,120,441	168.4
Acids <sup>1</sup> .....	4,003,198	2,304,635	1,735,782	130.6
Coopers' and carpenters' materials, barrels, and other wooden packages.....	8,937,421			
Tinners' materials, tin cans, iron barrels and materials therefor, and other metal packages.....	8,037,467	17,870,348	11,151,733	52.2
All other materials.....	17,611,893	6,585,205	6,427,178	174.0

<sup>1</sup> In 1909, 48,580 tons of sulphuric acid, and in 1904, 49,379 tons, were made in the establishments where used. The quantity thus made was not reported for 1899.

The total cost of all materials used in the industry increased 93.7 per cent during the decade ending with 1909. The cost of crude petroleum alone increased 89.4 per cent, while the quantity used showed a gain of 132.2 per cent, thus indicating that there was a considerable decrease in the average cost per barrel. This is, no doubt, occasioned by the fact that the inferior western oils comprised a much larger proportion of the total amount used in 1909.

**Products.**—Table 16 shows the quantities and values of the different products reported for 1909, 1904, and 1899, also the percentages of increase from 1899 to 1909.

PRODUCT.	1909	1904	1899	Percent of increase: 1899-1909
<b>Total value</b> .....	<b>\$236,997,659</b>	<b>\$175,005,320</b>	<b>\$123,929,384</b>	<b>91.2</b>
Oils:				
Illuminating—				
Barrels (50 gallons).....	33,495,798	27,135,094	25,171,289	33.1
Value.....	\$94,547,010	\$91,306,434	\$74,694,297	26.6
Fuel oil (including gas oil)—				
Barrels (50 gallons).....	34,034,577	7,209,428	6,095,224	458.4
Value.....	\$36,462,883	\$9,205,301	\$7,550,664	352.9
Lubricating—				
Barrels (50 gallons).....	10,745,885	6,208,251	3,408,918	216.2
Value.....	\$38,884,236	\$23,553,091	\$10,897,214	256.8
Paraffin—				
Barrels.....	3,230,230	1,644,400	1,606,783	101.6
Value.....	\$9,473,975	\$6,210,270	\$7,087,037	137.6
Reduced—				
Barrels.....	2,564,812	2,783,148	676,163	279.3
Value.....	\$4,994,843	\$6,068,360	\$1,660,287	199.2
Neutral—				
Barrels.....	614,884	504,042	608,185	1.1
Value.....	\$2,255,924	\$1,942,153	\$2,256,626	( <sup>2</sup> )
Cylinder—				
Barrels.....	1,587,579	1,366,661	517,787	206.6
Value.....	\$9,482,568	\$9,332,209	\$2,984,264	217.8
All other—				
Barrels.....	2,730,380			
Value.....	\$12,676,926			
Naphtha and gasoline (including gas naphtha)—				
Barrels (50 gallons).....	10,806,550	5,811,289	5,615,554	92.4
Value.....	\$30,771,959	\$21,314,837	\$15,991,742	143.7
Paraffin wax:				
Barrels (50 gallons).....	946,830	794,068	774,924	22.2
Value.....	\$9,388,812	\$10,007,274	\$7,701,149	20.5
Oil asphaltum:				
Tons (2,000 pounds).....	233,328	( <sup>3</sup> )	( <sup>3</sup> )	
Value.....	\$2,724,752	( <sup>3</sup> )	( <sup>3</sup> )	
Residuum or tar:				
Barrels (50 gallons).....	1,787,008	3,187,921	596,615	199.5
Value.....	\$2,215,623	\$3,138,361	\$688,455	221.8
Greases (lubricating, etc.):				
Barrels (50 gallons).....	138,302	202,439	572,140	-75.8
Value.....	\$1,567,647	\$1,394,130	\$2,454,617	-38.1
Coke and black naphtha.....	\$507,695	\$149,653	\$176,281	188.0
Sludge acid:				
Tons (2,000 pounds).....	133,215	165,104	( <sup>1</sup> )	
Value.....	\$402,295	\$400,480	( <sup>1</sup> )	
All other products.....	\$10,524,747	\$14,475,669	\$3,684,065	185.6

<sup>1</sup> A minus sign (—) denotes decrease.

<sup>2</sup> Decrease of less than one-tenth of 1 per cent.

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

The combined value of illuminating oils, naphtha and gasoline, lubricating oils, and fuel oil was \$209,666,088, or 88.5 per cent of the total value of products of the industry. Illuminating oil was by far the most important product in 1909 as measured by value, but was second in respect to quantity. Fuel oils, of which 34,034,577 barrels were reported, ranked first in quantity and fourth in value. Naphtha and gasoline ranked second in value and third in quantity.

Most of the products showed large percentages of increase from 1899 to 1909 both in quantity and in value. The largest gain was in the case of fuel oil, which increased 27,939,353 barrels, or 458.4 per cent

in quantity, and \$28,912,219, or 382.9 per cent, in value during the decade. The production of lubricating oils increased 215.2 per cent in quantity and 256.8 per cent in value. At censuses previous to 1909 all the different lubricating oils were included under the four kinds of such oils named in the table. At the census of 1909, however, lubricating oils not properly belonging to either of the four classes named were grouped together under the separate classification "all other" lubricating oils.

Illuminating oils, fuel oil, reduced lubricating oil, and paraffin wax show a greater percentage of increase in quantity than in value, but in the case of naphtha and gasoline and of paraffin lubricating oil the value increased much more than the quantity. Grease was

the only product of the industry for which a decrease was shown in quantity. The value of distillates and of separated acid produced is included in the total for "all other products."

It is impossible to give statistics by states concerning the quantity of crude petroleum obtained from different fields or for the quantities of the different products without disclosing the operations of individual establishments. Table 17, however, shows for the United States and for the leading states, what proportion of the crude oil used in the petroleum refineries in 1909 was obtained from each of the several producing fields, and also the ratio (expressed in percentages) between the quantity of crude oil used and the respective quantities of the principal products.

**Table 17**

STATE.	PER CENT OF CRUDE PETROLEUM OBTAINED FROM THE FIELDS OF—							PER CENT PRINCIPAL PRODUCTS ARE OF TOTAL PETROLEUM USED.						
	Pennsylvania, including Kentucky.	Lima-Indiana.	Illinois.	Mid-Continent (Kansas and Oklahoma).	Gulf (Texas and Louisiana).	Colorado.	California.	Illuminating oils.	Fuel oils.	Residuum or tar.	Lubricating oils.	Naphtha and gasoline.	Paraffin wax.	Greases.
United States.....	20.3	6.7	21.7	35.5	4.4	0.3	11.2	33.0	33.5	1.8	10.6	10.7	0.9	0.1
California.....				100.0			100.0	15.3	34.7	1.1	1.6	5.6		0.1
Kansas.....								20.6	60.7	0.5	2.4	11.4	0.1	0.1
Ohio.....	5.3	49.9	44.8					29.7	31.0	2.5	13.4	13.3	1.3	0.4
Oklahoma.....			28.8	100.0				27.1	45.2	4.8	1.4	13.8		
Pennsylvania.....	58.7			12.0	5.6			47.1	14.7	0.2	17.0	11.2	1.8	0.1

In the United States the quantity of illuminating oils obtained was equal to 33 per cent of the quantity of crude petroleum used; that of fuel oil, to 33.5 per cent; that of lubricating oil, to 10.6 per cent; that of naphtha and gasoline, to 10.7 per cent; and that of other products, to 2.8 per cent. The table shows considerable variation in the proportion of the different products obtained from the oil used by refineries in the various states. For instance, the refineries in California, which used oil solely from the California field, obtained illuminating oil equal to 15.3 per cent of the quantity of crude oil; fuel oil, 34.7 per cent, and lubricating oil, 1.6 per cent; while for the refineries of Pennsylvania, using principally oil from Pennsylvania and

Illinois, the ratios were: Illuminating oil, 47.1 per cent; fuel oil, 14.7 per cent; and lubricating oil, 17 per cent.

Exports of petroleum products.—Table 18 shows for 1880, 1890, and for each year from 1900 to 1910, inclusive, the production of crude petroleum in the country, and the quantity and value of the several petroleum products exported. In order to present figures showing the total production of crude petroleum for years corresponding with those given for exports in Table 18, it was necessary to obtain the same from the reports of the United States Geological Survey, which bureau secures annual statistics of such products.

**Table 18**

EXPORTS OF PETROLEUM PRODUCTS.<sup>1</sup>

YEAR ENDING DECEMBER 31—	Total production of crude petroleum (barrels, 42 gallons).	Refined or manufactured.										Residuum tar, pitch, and all other from which light bodies have been distilled.	Paraffin and paraffin wax (value).	
		Total.		Crude oil, including all natural oils without regard to gravity.		Naphthas, benzene, gasoline, etc.		Illuminating oil.		Lubricating and heavy paraffin oil.				
		Barrels (50 gallons).	Value.	Barrels (50 gallons).	Value.	Barrels (50 gallons).	Value.	Barrels (50 gallons).	Value.	Barrels (50 gallons).	Value.			
1910.....	209,556,048	30,049,839	\$94,107,022	3,602,223	\$5,404,253	2,013,908	\$8,407,102	18,804,941	\$55,042,368	3,276,651	\$20,921,103	2,352,116	\$3,732,196	\$7,329,143
1909.....	183,170,874	31,382,057	\$103,838,590	3,406,755	\$6,027,588	1,375,173	\$7,799,094	20,928,021	\$7,814,400	3,232,792	\$20,016,107	2,439,326	\$4,180,495	\$7,608,024
1908.....	178,527,355	30,948,052	\$108,815,455	2,983,800	\$6,519,849	877,741	\$4,542,551	22,580,097	\$7,988,256	2,955,380	\$18,971,436	1,551,034	\$2,793,363	\$6,922,638
1907.....	166,095,335	25,893,279	\$91,383,064	2,526,031	\$6,333,715	692,710	\$3,676,206	18,118,480	\$9,635,208	3,040,557	\$19,210,353	1,515,495	\$2,527,582	\$10,209,448
1906.....	126,493,936	25,395,552	\$85,738,866	2,960,906	\$7,731,226	550,899	\$2,488,401	17,565,482	\$4,858,312	3,025,370	\$18,689,622	1,292,895	\$1,971,305	\$8,462,504
1905.....	134,717,580	24,410,272	\$79,640,929	2,523,703	\$6,085,592	499,788	\$2,214,009	16,629,008	\$4,900,649	2,274,604	\$14,312,383	1,414,558	\$2,127,698	\$7,872,771
1904.....	117,080,960	20,442,325	\$80,624,207	2,223,530	\$6,350,682	568,399	\$2,321,714	15,227,103	\$8,384,273	1,793,762	\$12,393,382	688,082	\$1,174,156	\$8,272,556
1903.....	100,461,337	18,733,945	\$72,628,530	2,530,234	\$6,782,136	259,463	\$1,518,541	13,836,744	\$5,355,668	1,912,439	\$12,690,065	185,065	\$282,128	\$9,388,450
1902.....	88,766,916	21,284,672	\$85,507,143	2,904,674	\$6,331,011	393,653	\$1,892,771	15,576,020	\$4,079,055	1,644,010	\$10,872,154	769,315	\$922,152	\$7,959,991
1901.....	69,389,194	21,576,050	\$72,784,886	2,540,160	\$6,037,344	433,695	\$1,741,543	16,544,440	\$3,490,713	1,505,828	\$10,280,103	551,927	\$1,254,983	\$8,185,518
1900.....	63,620,529	19,737,120	\$74,493,707	2,763,223	\$7,340,749	371,410	\$1,681,201	14,783,269	\$4,602,872	1,424,227	\$9,933,548	395,000	\$45,337	\$8,905,518
1890.....	45,822,672	13,876,597	\$52,270,953	1,931,453	\$6,535,499	240,253	\$1,017,468	39,826,056	\$641,811	4,766,850	\$36,012	81,905	\$2,920,262	
1880.....	26,286,123	6,935,788	\$4,505,645	734,962	\$2,772,400	302,302	\$1,344,529	5,722,611	\$29,047,908	112,360	\$1,141,825	63,553	\$198,983	( <sup>2</sup> )

<sup>1</sup> Compiled from reports on Commerce and Finance, Bureau of Foreign and Domestic Commerce, Department of Commerce.

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

Exports of petroleum products have, with a few exceptions, increased each year. Nearly two-thirds of the total amount of petroleum products exported in 1910 consisted of illuminating oils. The grouping of the products shown in Table 18 does not correspond exactly with the grouping given in Table 17, but, taken in conjunction with Table 16, it nevertheless affords a fair comparison of production with exports. It is impracticable to determine what proportion of the total petroleum products are exported, but Table 19 gives, for 1909, 1904, and 1899, the percentage that the exports formed of the total output of each of the three main groups of products.

CENSUS YEAR.	PER CENT EXPORTED OF TOTAL PRODUCTION.		
	Naptha, benzine, gasoline, etc.	Illuminat-ing oils.	Lubricat-ing and heavy paraffin oil.
1909.....	12.7	62.5	30.1
1904.....	8.6	56.1	28.5
1899.....	6.4	57.6	40.7

**Equipment.**—In addition to the statistics of materials and products, the special schedule used for the

petroleum industry called for information in regard to the equipment of the different refineries. The statistics on this subject are summarized in Table 20.

	1909	1904	1899
Stills, number.....	2,305	1,007	1,774
Heated by steam—			
Number.....	451	282	290
Capacity (barrels, 42 gallons).....	424,564	(1)	(1)
Heated by superheated steam—			
Number.....	16	15	25
Capacity (barrels, 42 gallons).....	6,200	(1)	(1)
Heated by fire—			
Number.....	1,928	1,610	1,488
Capacity (barrels, 42 gallons).....	1,650,534	(1)	(1)
Agitators, number.....	529	374	327
Chilling houses for paraffin, number.....	79	67	48
Hydraulic or other presses, number.....	357	311	510
Storage tanks for crude petroleum:			
Number.....	678	304	276
Capacity, gallons.....	242,590,505	245,760,403	(1)
Storage tanks for refined petroleum:			
Number.....	6,476	3,575	2,860
Capacity, gallons.....	1,041,027,444	576,458,825	(1)
Cooper shops, number.....	53	64	48
Tin shops, number.....	14	17	13

<sup>1</sup> Not reported.

DETAILED STATE TABLE.

The principal statistics secured by the census inquiry concerning petroleum refining for 1909 are presented, by states, in Table 21.

PETROLEUM, REFINING—DETAILED STATISTICS, BY STATES: 1909.

STATE.	Number of establishments.	PERSONS ENGAGED IN INDUSTRY.							WAGE EARNERS—DEC. 15, OR NEAREST REPRESENTATIVE DAY.				Pri-mary horse-power.		
		Total.	Pro-prietors and firm members.	Sala-ried officers, super-intend-ents, and man-agers.	Clerks.		Wage earners.			Total.	16 and over.			Under 16.	
					Male.	Fe-male.	Average number.	Number, 15th day of—			Male.	Fe-male.		Male.	Fe-male.
								Maximum month.	Minimum month.						
United States.....	147	16,640	42	629	1,820	220	13,929	No 15,249	Mh 12,952	14,873	14,057	170	46	.....	90,248
California.....	29	1,146	4	66	119	27	930	No 974	Mh 862	948	947	1	.....	.....	5,630
Kansas.....	18	404	.....	51	69	20	324	No 348	Ja 300	360	350	3	.....	.....	1,150
Ohio.....	10	2,039	.....	42	293	45	1,659	No 1,943	My 1,500	1,800	1,860	18	6	.....	4,324
Oklahoma.....	9	129	.....	20	31	1	75	Oc 92	My 63	.....	91	.....	.....	.....	231
Pennsylvania.....	41	3,423	36	123	323	41	2,900	Oc 3,381	Mh 2,635	3,310	3,278	13	10	.....	85,212
All other states <sup>1</sup> .....	40	9,439	.....	327	985	86	8,041	.....	.....	8,274	8,119	135	20	.....	43,721

STATE.	Capital.	EXPENSES.										Value of products.	Value added by manu-facture (value of products less cost of materials).
		Total.	Services.			Materials.		Miscellaneous.					
			Officials.	Clerks.	Wage earners.	Fuel and rent of power.	Other.	Rent of factory.	Taxes, includ-ing in-ternal revenue.	Con-tract work.	Other.		
United States.....	\$181,816,205	\$222,477,636	\$2,010,791	\$1,918,076	\$9,830,078	\$8,378,383	\$190,897,019	\$56,518	\$875,884	\$119,610	\$8,393,277	\$236,997,659	\$37,724,257
California.....	13,880,700	15,812,573	211,843	155,643	800,504	1,150,787	12,716,934	20,400	62,137	280	604,039	17,878,006	3,980,285
Kansas.....	5,020,765	3,379,341	83,602	61,639	186,463	111,793	2,704,917	264	20,568	.....	210,035	4,077,255	1,260,515
Ohio.....	11,152,443	10,042,159	156,675	255,175	1,028,304	522,595	7,621,988	9,436	100,092	4,025	343,809	10,783,738	2,609,155
Oklahoma.....	1,056,682	887,617	30,796	25,993	54,011	31,176	544,297	250	3,070	2,184	195,240	1,055,011	479,538
Pennsylvania.....	38,989,633	51,476,176	418,130	350,228	1,811,405	1,803,713	45,636,603	12,323	55,520	5,767	1,332,489	53,088,199	5,647,883
All other states <sup>1</sup> .....	111,815,922	140,879,770	1,100,745	1,069,400	5,890,391	4,726,319	121,072,280	13,839	633,897	107,354	5,647,515	150,145,480	23,746,881

<sup>1</sup> All other states embrace: Colorado, 4 establishments; Illinois, 7; Indiana, 1; Kentucky, 1; Louisiana, 2; Maryland, 2; Missouri, 1; New Jersey, 6; New York, 7; Texas, 8; West Virginia, 1.

---

---

SOAP

# THE SOAP INDUSTRY.

## GENERAL STATISTICS.

**Scope of the industry.**—The statistics presented in this report relate to establishments engaged primarily in the manufacture of soaps and cleansing preparations of the various kinds, and glycerin. In addition to the soap manufactured in establishments classified as in the soap industry, considerable quantities of these products were reported by establishments engaged primarily in the manufacture of chemicals, grease and tallow, cottonseed oil, and "oil, not elsewhere specified." The soap products of these latter establishments are shown in Table 17. Separate reports were secured for the soap departments of the important slaughtering and meat-packing plants, such departments being treated as individual establishments in the soap industry.

Table 1 presents a summary of the statistics for the soap industry for 1909 and 1904.

	1909	1904	Per cent of increase: 1904-1909
Number of establishments	420	436	-3.7
Persons engaged in the industry	18,393	14,501	26.8
Proprietors and firm members	329	399	-17.5
Salaried employees	5,055	3,058	65.6
Wage earners (average number)	12,899	11,044	17.7
Primary horsepower	28,360	20,228	40.2
Capital	\$71,951,109	\$54,816,301	31.3
Expenses	\$98,226,337	\$62,117,002	58.1
Services	11,732,431	8,265,248	41.9
Salaries	5,505,549	3,502,572	57.2
Wages	6,226,882	4,762,676	30.7
Materials	72,179,418	43,625,608	65.5
Miscellaneous	14,314,438	10,226,146	40.0
Value of products	111,357,777	68,274,700	63.1
Value added by manufacture (value of products less cost of materials)	39,178,359	24,649,092	58.9

<sup>1</sup> A minus sign (-) denotes decrease.

Over 18,000 persons were engaged in the soap industry in 1909, practically 13,000 of this number being wage earners. Proprietors and firm members were comparatively few. The 420 establishments in the industry together reported products to the value of \$111,357,777, and expenses amounting to \$98,226,337. The figures for 1909 in the table show the following increases over those for 1904: In persons engaged in the industry, 26.8 per cent; in wage earners, 17.7 per cent; in value of products, 63.1 per cent; and in expenses, 58.1 per cent. There was a decrease of 17.5 per cent in the number of proprietors and firm members and of 3.7 per cent in the number of establishments.

At censuses prior to 1904 the statistics relating to the manufacture of soap were combined under one head with those relating to the production of candles. In

Table 2 is presented a summary of the statistics for the two industries combined for each census from 1859 to 1909, inclusive. The financial figures for 1869 are given in currency, which at that time was worth only about 80 cents, gold, to the dollar. For strict comparison, therefore, these figures should be reduced about 20 per cent.

	SOAP AND CANDLE INDUSTRIES COMBINED.					
	Number of establishments.	Wage earners (average number).	Wages.	Cost of materials.	Value of products.	Value added by manufacture.
1909	436	13,538	\$6,473,172	\$74,355,520	\$114,488,298	\$40,132,778
1904	453	11,860	5,056,611	40,536,823	72,164,062	25,627,289
1899	558	9,487	3,754,767	33,143,230	53,231,017	20,087,787
1889	578	7,821	3,416,854	28,687,412	43,600,285	14,912,873
1879	629	5,289	2,219,513	19,907,444	26,552,627	6,645,183
1869	618	4,471	1,944,331	15,268,847	22,624,612	7,355,765
1859	620	3,464	1,129,678	13,413,609	19,611,374	6,197,755

Although the number of establishments decreased between 1859 and 1909, the combined industry has shown a constant and decided increase in importance from census to census. It should be noted, however, that this development was due largely to the growing importance of the soap-making branch of the industry. The manufacture of candles as a distinct industry or in connection with soap making is becoming less important, since large quantities are now made by establishments engaged primarily in refining petroleum.

**Summary, by states.**—Table 3 gives the more important statistics for the soap industry, by states, the states being arranged according to the value of products reported for 1909. Some states for which data can not be shown separately ranked higher than some named in the table.

The soap industry is fairly well distributed throughout the United States, establishments being reported from 35 states and from the District of Columbia. Notwithstanding the number of states reporting the manufacture of soap, the industry is largely centralized, the 4 leading states in 1909, New York, Illinois, Ohio, and New Jersey, together reporting 65.6 per cent of the total number of wage earners, 67 per cent of the value of products, and 66.8 per cent of the value added by manufacture. New York is the most important state in the industry, ranking first at the census of 1909 in number of establishments, average number of wage earners, value of products, and value added by manufacture. In 1909 this state reported soap products to

the value of \$23,582,977, or 21.2 per cent of the total for the United States. Between 1904 and 1909 the value of products in New York increased 76 per cent, and the number of wage earners 23.9 per cent. Although Illinois fell from first rank in value of products in 1904 to second place in 1909, it nevertheless

reported a gain of 42.6 per cent in that item for the five-year period. A slightly larger gain (44.8 per cent) was reported for Ohio, which held third rank at both censuses. The largest relative increase in value of products reported by any state for the period 1904-1909 was 240.3 per cent by New Jersey.

**Table 3**

STATE.	Number of establishments: 1909	WAGE EARNERS.				VALUE OF PRODUCTS.				VALUE ADDED BY MANUFACTURE.				PER CENT OF INCREASE. <sup>1</sup>		
		Average number: 1909	Per cent of total: 1909	Rank.		Amount: 1909	Per cent of total: 1909	Rank.		Amount: 1909	Per cent of total: 1909	Rank.		Wage earners (average number): 1904-1909	Value of products: 1904-1909	Value added by manufacture: 1904-1909
				1909	1904			1909	1904			1909	1904			
United States.....	420	12,999	100.0	.....	.....	\$111,357,777	100.0	.....	.....	\$39,178,359	100.0	.....	.....	17.7	63.1	68.4
New York.....	67	2,976	22.9	1	1	23,582,977	21.2	1	2	7,970,595	20.3	1	1	23.9	70.0	58.7
Illinois.....	34	2,188	16.8	2	2	20,180,799	18.2	2	1	6,232,639	15.9	3	2	14.0	42.6	23.5
Ohio.....	44	1,774	13.6	3	3	17,077,308	15.3	4	3	5,416,278	13.8	4	3	.....	44.8	56.5
New Jersey.....	21	1,599	12.3	4	5	13,673,942	12.3	4	5	6,589,776	16.8	2	5	158.3	240.3	233.7
Pennsylvania.....	59	1,197	9.2	5	4	9,124,356	8.2	5	4	3,177,553	8.1	5	4	1.1	31.1	9.4
Missouri.....	10	554	4.3	6	6	4,719,352	4.2	7	7	1,694,653	4.2	8	6	1.1	51.0	34.0
Massachusetts.....	33	458	3.5	8	7	4,282,566	3.8	8	7	1,905,908	4.9	6	7	0.7	70.3	32.7
Wisconsin.....	16	213	1.6	10	12	1,610,688	1.5	9	11	700,783	1.8	10	11	13.9	60.8	90.0
California.....	23	166	1.3	12	8	1,576,021	1.4	10	8	469,509	1.2	12	9	-24.5	-1.5	-13.5
Connecticut.....	9	260	2.0	9	9	1,527,736	1.4	11	9	795,730	2.0	9	8	28.1	44.0	25.8
Iowa.....	9	150	1.2	13	13	1,382,022	1.2	12	10	471,545	1.2	11	10	9.5	36.3	16.8
Rhode Island.....	9	168	1.3	11	11	1,248,489	1.1	13	12	309,844	0.8	13	13	-12.5	44.1	10.0
Indiana.....	11	126	1.0	14	10	812,683	0.7	15	14	261,164	0.7	15	14	-37.0	23.4	0.8
Michigan.....	8	68	0.5	18	14	535,804	0.5	17	13	181,885	0.5	16	12	-48.1	-38.0	-33.9
Texas.....	5	80	0.6	16	18	387,817	0.3	19	10	94,412	0.2	19	17	.....	138.0	.....
Georgia.....	3	74	0.6	17	21	330,368	0.3	20	21	75,957	0.2	20	21	.....	.....	.....
Tennessee.....	5	45	0.3	21	15	222,160	0.2	21	15	67,566	0.1	23	15	-59.1	-51.4	-55.8
Oregon.....	4	34	0.3	22	20	203,753	0.2	22	20	63,978	0.2	22	20	.....	47.8	.....
Maryland.....	3	46	0.4	20	16	193,437	0.2	23	17	67,593	0.2	21	16	.....	-24.0	38.3
Louisiana.....	5	26	0.2	23	17	132,188	0.1	24	18	43,217	0.1	24	19	.....	-22.4	.....
Colorado.....	3	7	0.1	26	19	50,094	0.1	27	16	28,027	0.1	27	18	.....	-81.1	.....
New Hampshire.....	3	1	( <sup>2</sup> )	30	25	11,500	( <sup>2</sup> )	31	20	4,076	( <sup>2</sup> )	33	28	.....	.....	.....
All other states.....	31	789	6.1	.....	.....	8,491,717	7.6	.....	.....	2,005,611	6.0	.....	.....	.....	.....	.....

<sup>1</sup> Percentages are based on figures in Table 20. A minus sign (-) denotes decrease. Percentage not shown where base is less than 100 for wage earners, or less than \$100,000 for value of products or value added by manufacture.  
<sup>2</sup> Less than one-tenth of 1 per cent.

**Persons engaged in the industry.**—Table 4 shows for 1909 the number of persons engaged in the industry, classified according to occupational status and sex, and in the case of wage earners according to age also. It should be borne in mind that the sex and age classification of the average number of wage earners in this and other tables is an estimate obtained by the method described in the Introduction.

**Table 4**

CLASS.	PERSONS ENGAGED IN THE INDUSTRY: 1909		
	Total.	Male.	Female.
All classes.....	18,393	13,780	4,613
Proprietors and officials.....	963	925	38
Proprietors and firm members.....	329	306	23
Salaried officers of corporations.....	274	265	9
Superintendents and managers.....	360	354	6
Clerks.....	4,431	3,209	1,162
Wage earners (average number).....	12,999	9,586	3,413
16 years of age and over.....	12,664	9,429	3,235
Under 16 years of age.....	335	157	178

The average number of persons engaged in the soap industry during 1909 was 18,393, of whom 12,999, or 70.7 per cent, were wage earners, 963, or 5.2 per cent,

proprietors and officials, and 4,431, or 24.1 per cent, were clerks, this class including other subordinate salaried employees. Of the total number of persons engaged in the industry, 74.9 per cent were males and 25.1 per cent were females; less than 2 per cent of the total were children.

The average number of wage earners for each state, as reported at the censuses of 1909, 1904, and 1899, is given in Table 20. The distribution of the average number by sex and age is not shown for the individual states, but Table 21 gives such a distribution of the number employed on December 15, or the nearest representative day. Female wage earners were reported as employed in 27 states; the largest number reported for any state was 680 for New York, and the next largest number, 597, for Illinois. Wage earners under 16 years of age were reported from 17 states, the largest number, 131, being reported from Illinois.

In order to compare the distribution of the persons engaged in the industry according to occupational status in 1909 with that in 1904, it is necessary to use the classification employed at the earlier census. (See Introduction.) Such a comparison is made in Table 5.

**Table 5**

PERSONS ENGAGED IN THE INDUSTRY.

CLASS.	1909		1904		Per cent of increase: 1904-1909
	Number.	Per cent distribution.	Number.	Per cent distribution.	
Total.....	18,393	100.0	14,501	100.0	28.8
Proprietors and firm members.....	329	1.8	399	2.8	-17.5
Salaried employees.....	5,065	27.5	3,053	21.1	65.6
Wage earners (average number).....	12,999	70.7	11,044	76.2	17.7
16 years of age and over.....	12,664	68.9	10,709	73.9	18.3
Male.....	9,429	51.3	7,512	51.8	25.5
Female.....	3,235	17.6	3,197	22.0	1.2
Under 16 years of age.....	335	1.9	335	2.3	-0.3

<sup>1</sup> A minus sign (-) denotes decrease.

During the five-year period 1904-1909, the number of salaried employees increased at a much higher

rate than that of either of the other classes of those engaged in the industry, the proportion which they formed of the total increasing from 21.1 per cent to 27.5 per cent. The proportion represented by wage earners, on the other hand, decreased from 76.2 per cent to 70.7 per cent. The proportion which male wage earners 16 years of age and over formed of the total wage earners increased from 68 to 72.5 per cent, while the proportion represented by female wage earners decreased from 28.9 per cent to 24.9 per cent.

**Wage earners employed, by months.**—Table 6 gives the number of wage earners employed in the industry on the 15th (or the nearest representative day) of each month during the year 1909 for the six states in which an average of 500 or more wage earners were employed during the year.

**Table 6**

WAGE EARNERS EMPLOYED IN THE INDUSTRY: 1909<sup>1</sup>

STATE.	Average number during the year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
		<b>United States.....</b>	<b>12,999</b>	<b>12,337</b>	<b>12,671</b>	<b>12,885</b>	<b>12,843</b>	<b>12,478</b>	<b>12,653</b>	<b>13,001</b>	<b>13,105</b>	<b>13,250</b>	<b>13,475</b>
Illinois.....	2,188	2,093	2,149	2,213	2,140	2,076	2,121	2,192	2,235	2,190	2,248	2,303	2,286
Missouri.....	554	527	545	554	577	555	568	571	549	544	559	574	552
New Jersey.....	1,590	1,387	1,602	1,599	1,620	1,531	1,531	1,578	1,618	1,677	1,713	1,724	1,709
New York.....	2,976	2,895	2,896	2,935	2,949	2,908	2,842	3,004	3,033	3,052	3,050	3,083	3,072
Ohio.....	1,774	1,687	1,707	1,705	1,679	1,623	1,724	1,750	1,786	1,851	1,887	1,931	1,953
Pennsylvania.....	1,197	1,172	1,190	1,193	1,197	1,190	1,194	1,206	1,218	1,226	1,225	1,180	1,173

<sup>1</sup> The month of maximum employment for each state is indicated by boldface figures and that of minimum employment by italic figures.

The largest number of wage earners employed in the industry during any month of 1909 was 13,650, in December, and the smallest number, 12,337, in January, the minimum number being equal to 90.4 per cent of the maximum. In 1904 the maximum number, 11,515, was reported for November, and the minimum number, 10,661, for July, the latter number being equal to 92.6 per cent of the former.

**Prevailing hours of labor.**—In Table 7 the wage earners in soap factories have been classified according to the number of hours of labor per week prevailing in the establishments in which they were employed. In making this classification the average number of wage earners employed during the year in each establishment was classified as a total according to the hours prevailing in that establishment, even though a few employees worked a greater or smaller number of hours.

**Table 7**

AVERAGE NUMBER OF WAGE EARNERS IN THE INDUSTRY: 1909

STATE.	Total.	In establishments with prevailing hours—						
		48 and under.	Between 48 and 54.	54.	Between 54 and 60.	60.	Between 60 and 72.	72 and over.
<b>United States.....</b>	<b>12,999</b>	<b>635</b>	<b>1,786</b>	<b>1,998</b>	<b>3,849</b>	<b>4,708</b>	<b>23</b>	<b>2</b>
Illinois.....	2,188	8	95	19	49	2,015	.....	.....
Missouri.....	554	2	46	310	41	155	.....	.....
New Jersey.....	1,590	3	1,101	202	188	105	.....	.....
New York.....	2,976	20	315	1,152	753	796	.....	.....
Ohio.....	1,774	9	.....	30	1,209	526	.....	.....
Pennsylvania.....	1,197	520	16	19	396	235	11	.....

More than one-third (36.2 per cent) of the wage earners employed in the industry in 1909 were in establishments where the prevailing number of hours was 60 per week; 45 per cent were employed in establishments where the prevailing hours were 54 but less than 60 per week; and 18.6 per cent were employed in establishments where the prevailing hours were less than 54 per week. There were but 25 reported as employed in establishments where the prevailing hours were more than 60 per week. In Illinois practically all the wage earners were employed 60 hours per week. In Missouri and New York, the most common working time was 54 hours per week; in Ohio, 54 to 60 hours; in New Jersey, 48 to 54 hours; and in Pennsylvania, 48 hours and under.

**Character of ownership.**—Table 8 presents statistics with respect to the character of ownership of establishments in the soap industry.

**Table 8**

CHARACTER OF OWNERSHIP.	NUMBER OF ESTABLISHMENTS.		VALUE OF PRODUCTS.	
	1909	1904	1909	1904
<b>Total.....</b>	<b>420</b>	<b>436</b>	<b>\$111,357,777</b>	<b>\$68,274,700</b>
Individual.....	142	146	5,302,283	4,120,996
Firm.....	77	108	12,117,797	15,487,080
Corporation.....	201	182	93,937,697	48,666,624
<b>Per cent of total.....</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>
Individual.....	33.8	33.5	4.8	6.0
Firm.....	18.3	24.8	10.9	22.7
Corporation.....	47.9	41.7	84.4	71.3

In 1909, of the total number of establishments reported for the industry, 47.9 per cent were under

corporate ownership, as compared with 41.7 per cent in 1904. While corporations thus controlled less than one-half of the total number of establishments, the value of the products of these establishments represented 84.4 per cent of the total value of products for the industry in 1909 and 71.3 per cent in 1904.

Table 9 gives statistics for soap factories classified according to form of ownership for each state in which

an average of more than 500 wage earners were employed in 1909.

In 1909, of the total number of wage earners reported for the soap industry, 81.6 per cent were employed in establishments reported as under corporate ownership, 12.2 per cent in establishments under firm ownership, and 6.2 per cent in establishments owned by individuals.

**Table 9**

STATE.	NUMBER OF ESTABLISHMENTS OWNED BY—			WAGE EARNERS IN ESTABLISHMENTS OWNED BY—			VALUE OF PRODUCTS OF ESTABLISHMENTS OWNED BY—			VALUE ADDED BY MANUFACTURE IN ESTABLISHMENTS OWNED BY—		
	Individuals.	Firms.	Corporations.	Individuals.	Firms.	Corporations.	Individuals.	Firms.	Corporations.	Individuals.	Firms.	Corporations.
United States.....	142	77	201	801	1,591	10,607	\$5,302,283	\$12,117,797	\$93,937,697	\$2,037,007	\$4,327,143	\$32,814,894
Illinois.....	4	6	24	8	50	2,130	23,267	342,506	19,815,020	10,012	147,836	6,073,831
Missouri.....	1	1	8	(X)	(X)	564	(X)	4,719,352	(X)	(X)	(X)	1,694,531
New Jersey.....	6	2	13	112	(X)	1,487	833,295	(X)	12,840,647	511,030	(X)	6,073,746
New York.....	27	9	31	423	310	2,243	2,932,231	1,942,807	18,707,939	963,718	711,531	6,285,346
Ohio.....	11	6	27	56	20	1,698	233,367	104,227	16,739,714	79,515	32,545	5,304,216
Pennsylvania.....	30	19	10	166	910	181	612,948	7,727,616	783,792	207,438	2,699,210	270,966

NOTE.—In some states, in order to avoid disclosing the returns for individual establishments, the figures for one group have been consolidated with those for establishments under some other form of ownership. In such cases an (X) is placed in the column from which the figures have been omitted and the figures for the group with which they have been combined are printed in italics.

There was considerable variation in the relative importance of the establishments operated by individuals, by firms, and by corporations, respectively, in the different states. Thus in New York, the principal soap-producing state, corporations controlled 46.3 per cent of the total number of establishments, gave employment to 75.4 per cent of the wage earners, and reported 79.3 per cent of the total value of products. In Pennsylvania, on the other hand, corporations operated 16.9 per cent of the establishments, employed 15.1 per cent of the wage earners, and contributed only 8.6 per cent of the total value of products.

Size of establishments.—Table 10 presents statistics for 1909 and 1904 for establishments grouped according to the value of their products.

In 1909, 5.2 per cent of the establishments manufactured products valued at \$1,000,000 or over, as against 3 per cent in 1904. While such establishments represented a comparatively small proportion of the total number at both censuses, they reported 69.1 per cent of the total value of products in 1909 and 55.9 per cent in 1904.

**Table 10**

VALUE OF PRODUCTS PER ESTABLISHMENT.	NUMBER OF ESTABLISHMENTS.		VALUE OF PRODUCTS.	
	1909	1904	1909	1904
Total.....	420	436	\$111,357,777	\$68,274,700
Less than \$5,000.....	104	101	253,674	242,459
\$5,000 and less than \$20,000.....	102	103	1,089,754	1,145,823
\$20,000 and less than \$100,000.....	110	140	5,362,089	5,924,974
\$100,000 and less than \$1,000,000..	82	79	27,740,013	22,814,932
\$1,000,000 and over.....	22	13	70,911,647	33,146,453
Per cent of total.....	100.0	100.0	100.0	100.0
Less than \$5,000.....	24.8	23.2	0.2	0.4
\$5,000 and less than \$20,000.....	24.3	23.6	1.0	1.7
\$20,000 and less than \$100,000.....	26.2	32.1	4.8	8.7
\$100,000 and less than \$1,000,000..	19.5	18.1	24.9	33.4
\$1,000,000 and over.....	5.2	3.0	69.1	55.9

The average value of products per establishment increased from \$156,593 in 1904 to \$265,138 in 1909, and the average value added by manufacture, as computed from the figures in Table 1, from \$56,535 to \$93,282. The average number of wage earners per establishment increased from 25.3 in 1904 to 30.9 in 1909.

Table 11 classifies the establishments in the six leading states according to the number of wage earners employed.

**Table 11**

STATE.	TOTAL.		ESTABLISHMENTS EMPLOYING IN 1909—																
			No wage earners.		1 to 5 wage earners.		6 to 20 wage earners.		21 to 50 wage earners.		51 to 100 wage earners.		101 to 250 wage earners.		251 to 500 wage earners.		501 to 1,000 wage earners.		Over 1,000 wage earners.
	Es-tab-lish-ments.	Wage earners (average number).	Es-tab-lish-ments.	Es-tab-lish-ments.	Wage earners.	Es-tab-lish-ments.	Wage earners.	Es-tab-lish-ments.	Wage earners.	Es-tab-lish-ments.	Wage earners.	Es-tab-lish-ments.	Wage earners.	Es-tab-lish-ments.	Wage earners.	Es-tab-lish-ments.	Wage earners.	Es-tab-lish-ments.	Wage earners.
United States..	420	12,999	50	199	480	86	931	38	1,283	17	1,125	18	2,822	6	1,706	5	3,550	1	1,100
Illinois.....	34	2,188	1	17	42	5	41	5	165	1	58	2	322	1	287	2	1,293		
Missouri.....	10	654	1	4	6			3	117			1	124	1	307				
New Jersey.....	21	1,599	3	6	11	4	47	2	87	3	195	2	290			1	969		
New York.....	67	2,976	8	28	70	15	156	7	192	1	69	5	777	2	610			1	1,100
Ohio.....	44	1,774	6	16	34	11	113	5	167	3	194	1	223	1	265	1	778		
Pennsylvania.....	59	1,197	4	42	119	7	78	2	86	1	100	2	304			1	510		

Of the 420 establishments reported in 1909, 11.9 per cent employed no wage earners; 67.9 per cent employed from 1 to 20; 13.1 per cent employed from 21 to 100; and 7.1 per cent employed more than 100. There were only 12 establishments that employed more than 250 wage earners, and of these only 1 establishment employed over 1,000.

Of the total number of wage earners reported, 10.9 per cent were reported by establishments employing from 1 to 20, 18.5 per cent by establishments employing 21 to 100, and 70.6 per cent by establishments employing more than 100.

**Expenses.**—As stated in the Introduction, the census figures representing expenses do not purport to show the total cost of manufacture, since they take no account of interest or depreciation; hence they can not properly be used for determining profits. Facts of interest can be brought out, however, concerning the relative importance of the different classes of expense which were reported. Table 1 shows the total expenses in 1909 to have been \$98,226,337, distributed as follows: Cost of materials, \$72,179,418, or 73.5 per cent; wages, \$6,226,882, or 6.3 per cent; salaries, \$5,505,549, or 5.6 per cent; and miscellaneous expenses, made up of advertising, ordinary repairs of buildings and machinery, insurance, traveling expenses, and other sundry expenses, \$14,314,488, or 14.6 per cent. Naturally there are variations in the proportions of total expenses in the several states, owing to differences in the amount of expenditures for advertising and in the kinds of soap produced, the better kinds requiring more expensive materials and probably a higher paid class of labor. The cost of tallow, grease, and other fats and oils constitute the principal item of expense in the cost of materials in this industry.

**Engines and power.**—Table 12 shows statistics of power used in the soap industry as reported at the censuses of 1909 and 1904.

POWER.	NUMBER OF ENGINES OR MOTORS.		HORSEPOWER.		PER CENT DISTRIBUTION OF HORSEPOWER.	
	1909	1904	1909	1904	1909	1904
Primary power, total...	696	524	28,360	20,228	100.0	100.0
Owned.....	465	468	25,038	18,691	88.3	93.4
Steam.....	446	454	24,498	18,747	86.4	92.7
Gas.....	14	11	245	88	0.9	0.4
Water wheels.....	5	3	255	53	0.9	0.3
Other.....			40	3	0.1	0.1
Rented.....	231	56	3,322	1,337	11.7	6.6
Electric.....	231	56	1,974	517	7.0	2.6
Other.....			1,348	820	4.8	4.1
Electric motors.....	1,196	357	12,839	4,410	100.0	100.0
Run by current generated by establishment.....	965	301	10,865	3,893	84.6	88.3
Run by rented power.....	231	56	1,974	517	15.4	11.7

The total primary power used in the soap factories increased from 20,228 horsepower in 1904 to 28,360 horsepower in 1909, or 40.2 per cent. Although steam power increased practically one-third from 1904 to 1909, the proportion which it formed of the total primary power decreased from 92.7 per cent in 1904 to 86.4 per cent in 1909. Rented electric power shows a considerable increase, and its proportion of the total primary power increased from 2.6 per cent in 1904 to 7 per cent in 1909. The horsepower of electric motors used for distributing power by means of current generated in the establishments in the industry also shows a marked increase.

Table 13 shows, for 1909, the amount of the several kinds of power and of the different kinds of fuel used in six of the leading states.

STATE.	PRIMARY HORSEPOWER.							ELECTRIC HORSEPOWER.		FUEL USED.							
	Number of establishments reporting.	Total horsepower.	Owned by establishments reporting.				Rented.		Total rented and generated by establishment.	Generated in the establishment reporting.	Coal.		Coke (short tons).	Wood (cords).	Oil, including gasoline (barrels).	Gas (1,000 feet).	
			Total.	Steam engines.	Gas engines.	Water wheels and motors.	Other.	Electric.			Other.	Anthracite (long tons).					Bituminous (short tons).
United States.....	317	28,360	25,038	24,498	245	255	40	1,974	1,348	12,839	10,865	55,528	461,206	1,389	1,665	69,347	57,385
Illinois.....	26	5,155	3,199	3,194	5			744	1,212	1,481	737	21	113,638				3,318
Missouri.....	8	954	855	855				90		281	182		26,114				2
New Jersey.....	16	2,761	2,720	2,720				37	4	1,863	1,826		27,240	81		1	360
New York.....	49	5,873	5,284	5,277	7			548	41	4,535	4,037		22,441	80			2,049
Ohio.....	38	3,579	3,501	3,472	29			78		2,298	2,220		426	115,220	1,145		35,887
Pennsylvania.....	41	2,598	2,549	2,463	86			44	5	134	90		4,729	24,063	5	87	14,353
All other states.....	139	7,440	6,930	6,517	118	255	40	424	86	2,197	1,773		74,037	78	1,482	69,330	1,416

In 1909 New York, Illinois, and Ohio together reported 51.5 per cent of the total power used in the industry. Steam was the most important form of power in all of the leading states.

**Fuel consumed.**—Bituminous coal was the principal fuel used in the soap industry, 461,206 short tons

being consumed in 1909. Gas and oil were also used to some extent, the largest quantity of the former being reported from Ohio. The largest quantity of anthracite coal, 27,240 long tons, or nearly one-half the total for the industry, was reported for New Jersey.

## SPECIAL STATISTICS RELATING TO MATERIALS AND PRODUCTS.

**Materials.**—Table 14 shows statistics for the principal materials used in the industry in 1909 and 1904.

MATERIAL.	1909	1904	Per cent of increase: <sup>1</sup> 1904-1909
Total cost.....	\$72,179,418	\$43,625,608	65.5
Tallow, grease, and other fats:			
Pounds.....	413,969,787	475,618,277	-13.0
Cost.....	\$23,341,905	\$19,723,311	18.3
Coconut and palm-kernel oil:			
Gallons.....	11,856,337	6,833,132	73.5
Cost.....	\$5,875,294	\$2,692,034	118.2
Cottonseed oil:			
Gallons.....	24,221,712	13,276,066	82.4
Cost.....	\$9,718,988	\$3,882,087	150.3
Rosin:			
Pounds.....	207,296,447	168,107,246	23.3
Cost.....	\$4,362,412	\$2,734,848	59.5
Foots:			
Pounds.....	94,050,892	59,761,740	57.4
Cost.....	\$2,453,609	\$1,222,082	100.6
Caustic soda:			
Tons (2,000 pounds).....	52,172	71,551	-27.1
Cost.....	\$2,212,232	\$2,843,088	-22.2
Soda ash:			
Tons (2,000 pounds).....	121,016	53,777	125.0
Cost.....	\$2,281,787	\$1,011,694	125.5
All other materials.....	\$21,933,191	\$9,513,764	130.5

<sup>1</sup> A minus sign (-) denotes decrease.

Each of the materials for which separate statistics are given in Table 14 shows an increase in cost, with the exception of caustic soda, and all but tallow, grease, and other fats and caustic soda show an increase in quantity. The cost of "all other materials" increased 130.5 per cent. The relatively large amount shown for this item is due to the fact that it includes the cost of the principal materials used in the manufacture of cottolene, a secondary product manufactured to a considerable extent by establishments in the soap industry in 1909. It also includes the cost of a considerable proportion of the ingredients used in producing the materials listed in Table 15, as well as the cost of boxes and other containers.

In addition to the materials purchased, as shown in Table 14, considerable quantities of similar materials were produced by establishments in the soap industry and used by these establishments in further processes of manufacture. Table 15 shows the quantities of such materials for 1909 and 1904.

MATERIAL.	MATERIALS MADE IN ESTABLISHMENTS WHERE USED.	
	1909	1904
Red oil.....gallons..	3,175,795	1,149,346
Tallow.....pounds..	17,709,219	10,613,271
Cottonseed oil.....gallons..	2,422,843	920,410
Caustic lye, 30° Baumé.....gallons..	15,931,639	9,568,522
Sodium silicate.....pounds..	37,466,246	1,597,886
Glycerin.....pounds..	5,816,279	3,433,359

The cost of the cotton seed from which the 2,422,843 gallons of cottonseed oil given in Table 15 were manu-

factured was included under the cost of "all other materials" shown in Table 14. Combining the quantity of cottonseed oil shown in Tables 14 and 15 gives a total of 26,644,555 gallons used in the industry in 1909.

Table 16 shows, by states, for 1909 and 1904, the quantity, and for 1909 the cost, of the principal materials for the leading states.

MATERIAL AND STATE.	MATERIALS.		
	1909	1904	
	Cost.	Quantity.	Quantity.
<b>Tallow, grease, and other fats</b> .....	\$23,341,905	<i>Pounds.</i> 413,969,787	<i>Pounds.</i> 475,618,277
Illinois.....	3,225,011	54,540,522	79,134,570
Massachusetts.....	902,042	16,897,002	19,268,452
Missouri.....	809,791	10,979,666	12,831,419
New Jersey.....	2,392,220	41,593,627	35,132,333
New York.....	5,843,905	98,033,852	105,415,189
Ohio.....	3,762,205	76,370,410	108,964,668
Pennsylvania.....	2,394,339	38,897,770	35,546,631
<b>Coconut and palm-kernel oil</b> .....	5,875,294	<i>Gallons.</i> 11,856,337	<i>Gallons.</i> 6,833,132
Illinois.....	1,084,613	2,174,700	1,009,939
Massachusetts.....	130,314	285,024	175,723
New Jersey.....	188,637	337,076	126,336
New York.....	883,258	1,749,124	812,344
Ohio.....	804,037	1,796,117	813,114
Pennsylvania.....	775,400	1,658,454	946,672
<b>Cottonseed oil</b> .....	9,718,988	<i>Gallons.</i> 24,221,712	<i>Gallons.</i> 13,276,066
Illinois.....	576,624	1,565,800	8,356,680
Massachusetts.....	42,697	111,141	95,845
New Jersey.....	791,147	2,060,885	122,999
New York.....	1,703,923	4,237,007	1,786,255
Pennsylvania.....	128,419	307,699	185,859
<b>Rosin</b> .....	4,362,412	<i>Pounds.</i> 207,296,447	<i>Pounds.</i> 168,107,246
Illinois.....	423,829	18,272,898	18,667,593
Massachusetts.....	159,872	7,106,905	4,968,066
Missouri.....	154,351	9,031,412	11,743,615
New Jersey.....	548,945	22,692,182	5,399,857
New York.....	939,230	43,642,205	34,527,616
Ohio.....	508,105	23,173,091	36,323,331
Pennsylvania.....	876,322	41,587,292	20,596,420
<b>Foots</b> .....	2,453,609	<i>Pounds.</i> 94,050,892	<i>Pounds.</i> 59,761,740
Illinois.....	511,007	21,493,551	13,367,007
Massachusetts.....	118,600	2,028,144	556,547
New York.....	429,004	9,825,800	3,495,053
Ohio.....	226,459	13,658,630	5,954,539
Pennsylvania.....	112,180	1,808,744	1,338,303
<b>Caustic soda</b> .....	2,212,232	<i>Tons (2,000 pounds).</i> 52,172	<i>Tons (2,000 pounds).</i> 71,551
Illinois.....	335,312	8,022	10,136
Massachusetts.....	110,422	2,397	1,722
New Jersey.....	213,253	5,030	6,536
New York.....	449,716	11,006	13,623
Ohio.....	103,316	2,368	19,311
Pennsylvania.....	352,475	8,708	7,877
<b>Soda ash</b> .....	2,281,787	<i>Tons (2,000 pounds).</i> 121,016	<i>Tons (2,000 pounds).</i> 53,777
Illinois.....	288,647	15,640	9,715
Massachusetts.....	47,503	2,603	1,174
New Jersey.....	312,329	17,434	329
New York.....	463,152	24,958	12,643
Ohio.....	458,876	25,128	4,078
Pennsylvania.....	50,216	2,608	3,445

**Products.**—As previously explained, considerable quantities of soap and other products similar to those made in soap factories were reported by establishments engaged primarily in other industries. Table 17 shows the total quantity and value of all soap products and of glycerin reported as manufactured in 1909 and in 1904 by establishments in the industry and also by establishments in other lines of manufacture.

**Table 17**

PRODUCT.	Year.	TOTAL.		MADE IN ESTABLISHMENTS ASSIGNED TO THE SOAP INDUSTRY.		MADE IN ESTABLISHMENTS ENGAGED PRIMARILY IN THE MANUFACTURE OF OTHER PRODUCTS.	
		Quantity (pounds).	Value.	Quantity (pounds).	Value.	Quantity (pounds).	Value.
<b>Total</b> .....	<b>1909</b> <b>1904</b>		<b>\$120,417,470</b> <b>72,110,023</b>		<b>\$111,357,777</b> <b>68,274,700</b>		<b>\$9,059,693</b> <b>3,835,323</b>
Hard soap.....	1909 1904	1,767,165,321 1,386,610,444	89,829,834 58,027,406	1,736,740,466 1,355,358,649	88,550,830 56,878,486	30,424,855 31,251,705	1,279,004 1,148,920
Soft soap.....	1909 1904	80,036,670 43,899,255	1,269,187 761,081	44,052,615 33,613,416	943,676 667,064	15,984,055 10,285,839	325,511 94,017
Glycerin.....	1909 1904	81,905,915 47,537,658	11,752,562 5,401,520	139,689,300 27,690,661	5,713,558 2,958,115	42,216,615 19,876,907	6,039,004 2,443,405
Special soap articles.....	1909 1904		731,823 554,881		731,823 554,881		
All other products.....	1909 1904		16,834,064 7,365,135		15,417,890 7,216,154		1,416,174 148,981

<sup>1</sup> Does not include 5,597,519 pounds, for which no value was reported.

<sup>2</sup> Does not include 25,319 pounds, for which no value was reported.

The total value of products for the industry in 1909 was \$111,357,777, which includes products other than soap to the value of \$15,417,890. These products consisted principally of food preparations, patent medicines and compounds, chemicals, coffee and spices, and grease and tallow. During the five-year period 1904-1909 the total quantity of hard soaps, including that produced by establishments in the soap industry and as subsidiary products by establishments in other industries, increased 27.4 per cent, and in value 54.8 per cent. The quantity of soft soap increased 36.8 per cent, and the value 66.8 per cent.

In the manufacture of soap considerable quantities of glycerin are liberated of which the manufacturers appear to have imperfect record. The quantity recovered is subject to great variation, dependent not only on the character of the stock used and its treatment in the kettle, but also on the efficiency of the method of recovery employed. In the reports received for 1909, in addition to the quantity of glycerin reported among the products of the industry, it was estimated that 5,622,838 pounds were recovered for which no value was reported. It has been noted (see Table 15) that the quantity of glycerin made for use in the same establishment was 5,816,279 pounds, and Table 17 shows a production of 81,905,915 pounds for which value is reported. It would appear, therefore, that the total production of glycerin in all the manufacturing establishments in 1909, including those in the chemical and other industries, was 93,345,032 pounds. This amount represents an increase of 42,374,015 pounds, or 83.1 per cent over the amount reported in 1904; it should be stated, however, that this increase in the quantity reported is due, in part, to a more thorough canvass of the industry at the later census.

The schedule for the census of 1909 called for the quantity and value of the different classes of hard soap

made during the year. Some of the principal manufacturers could not furnish separate values for the different classes, and there was some confusion due to the fact that the distinction between the different kinds is not clearly marked. The quantities of the different kinds manufactured in 1909 and 1904 are shown for all establishments in the industry in Table 18.

**Table 18**

KIND.	QUANTITY (POUNDS).	
	1909	1904
Hard soaps:		
Tallow.....	859,297,507	846,753,798
Olefin.....	32,832,647	29,363,376
Foats.....	151,063,102	37,904,003
Toilet.....	93,823,149	130,225,417
Powdered, sold as such.....	275,745,585	120,624,998
All other hard soaps.....	323,978,476	190,457,037

Table 19 shows the quantities and values of products of the industry for 1909, and the quantities for 1904.

**Table 19**

PRODUCT AND STATE.	1909		1904
	Value.	Pounds.	Pounds.
<b>Hard soap</b> .....	<b>\$88,550,830</b>	<b>1,736,740,466</b>	<b>1,355,358,649</b>
Illinois.....	13,050,220	253,639,401	197,983,351
Massachusetts.....	3,529,453	64,114,050	36,988,239
Missouri.....	4,329,484	92,637,278	69,708,685
New Jersey.....	9,711,659	192,386,889	70,825,669
New York.....	15,094,061	373,529,337	297,377,794
Ohio.....	14,589,331	255,943,442	268,786,287
Pennsylvania.....	8,190,448	167,427,971	140,668,525
<b>Soft soap</b> .....	<b>943,676</b>	<b>44,052,615</b>	<b>33,613,416</b>
Illinois.....	200,521	7,554,416	567,153
Massachusetts.....	157,866	3,859,144	6,598,116
New Jersey.....	82,614	1,051,919	(1)
New York.....	171,702	14,607,378	16,427,585
Ohio.....	36,449	1,268,533	1,123,100
Pennsylvania.....	120,609	9,690,079	4,202,132
<b>Glycerin</b> .....	<b>5,713,558</b>	<b>139,689,300</b>	<b>27,660,661</b>
Illinois.....	876,871	6,256,607	3,721,609
Massachusetts.....	144,112	1,143,760	1,356,557
New Jersey.....	635,007	4,765,712	(1)
New York.....	1,212,606	7,913,424	3,432,515
Ohio.....	1,751,070	10,208,289	8,843,638

<sup>1</sup> Figures omitted to avoid disclosure of individual operations.  
<sup>2</sup> In addition, 5,597,519 pounds were reported for which no value was reported.

**DETAILED STATE TABLES.**

The principal data secured concerning soap factories are presented by states in Tables 20 and 21.

Table 20 shows, for 1909, 1904, and 1899, the number of establishments, number of persons engaged in

the industry, primary horsepower, capital invested, salaries, wages, cost of materials, value of products, and value added by manufacture. Table 21 gives more detailed statistics for 1909 only.

## SOAP—COMPARATIVE STATISTICS, BY STATES: 1909, 1904, AND 1899.

STATE.	Census.	Number of establishments.	PERSONS ENGAGED IN INDUSTRY.				Primary horse-power.	Capital.	Salaries.	Wages.	Cost of materials.	Value of products.	Value added by manufacture (value of products less cost of materials).
			Total.	Proprietors and firm members.	Salaried employees.	Wage earners (average number).							
Expressed in thousands.													
United States.....	1909	420	18,393	329	5,065	12,999	28,360	\$71,951	\$5,506	\$6,227	\$72,179	\$11,358	\$39,179
	1904	436	14,501	399	3,058	11,044	20,228	54,810	3,503	4,763	43,626	66,275	24,449
	1899	558	12,812	587	2,738	9,487	17,514	38,008	2,777	3,765	33,143	53,231	20,088
California.....	1909	23	261	27	68	166	477	1,312	111	115	1,117	1,576	469
	1904	27	319	35	64	220	614	1,409	87	135	1,000	1,600	531
	1899	35	341	44	53	244	.....	1,403	60	117	1,108	1,565	497
Colorado.....	1909	3	13	1	5	7	89	79	7	5	22	50	28
	1904	4	41	4	10	27	85	137	15	16	190	264	74
	1899	3	62	2	10	50	.....	205	17	26	170	242	72
Connecticut.....	1909	9	376	6	110	260	540	671	116	131	732	1,528	796
	1904	14	200	15	42	203	810	965	73	96	428	1,061	633
	1899	16	205	14	36	155	.....	550	28	62	334	941	607
Georgia.....	1909	3	108	.....	34	74	123	731	41	23	254	330	76
	1904	3	28	3	8	17	37	49	7	5	47	65	18
Illinois.....	1909	34	3,408	20	1,200	2,188	5,155	11,694	1,356	1,053	13,048	20,181	6,233
	1904	34	2,497	24	568	1,905	3,510	7,604	640	887	9,345	14,157	4,812
	1899	39	1,987	38	393	1,556	.....	6,520	453	560	6,033	9,436	3,403
Indiana.....	1909	11	185	4	55	126	306	510	63	54	552	813	261
	1904	15	244	11	33	200	559	430	35	71	396	659	263
	1899	13	159	10	22	121	.....	360	24	44	337	526	189
Iowa.....	1909	9	246	6	90	150	270	813	106	58	910	1,382	472
	1904	7	176	4	35	137	185	478	42	62	610	1,014	404
	1899	12	152	14	33	105	.....	317	30	38	407	601	194
Louisiana.....	1909	5	40	6	8	26	16	116	8	10	80	132	43
	1904	4	62	2	12	48	80	139	13	22	105	170	65
	1899	4	52	2	13	37	.....	147	15	25	118	136	68
Maryland.....	1909	3	67	8	13	46	165	133	9	16	126	193	67
	1904	4	96	2	22	72	165	170	21	22	148	254	106
	1899	6	161	2	32	127	.....	209	28	54	169	238	117
Massachusetts.....	1909	38	647	27	162	458	1,379	2,570	232	227	2,377	4,233	1,906
	1904	36	636	43	138	455	950	1,614	184	205	1,472	2,515	1,043
	1899	61	741	69	149	523	.....	1,762	150	234	1,600	2,490	831
Michigan.....	1909	8	100	7	25	68	882	551	22	37	354	538	182
	1904	11	178	6	41	131	477	659	42	55	497	800	303
	1899	12	178	9	47	122	.....	565	32	49	472	708	234
Missouri.....	1909	10	838	3	281	554	954	2,650	233	272	3,055	4,719	1,664
	1904	10	706	8	150	548	745	1,844	206	237	1,871	3,113	1,242
	1899	19	732	20	153	559	.....	2,202	210	232	2,456	3,451	995
New Hampshire.....	1909	3	4	3	.....	1	20	8	.....	1	7	12	5
	1904	7	12	7	.....	5	18	9	.....	2	4	10	6
	1899	13	30	15	1	14	.....	25	1	6	14	34	20
New Jersey.....	1909	21	2,301	10	602	1,599	2,761	8,306	881	790	7,084	13,074	6,590
	1904	14	775	8	143	619	625	1,710	120	287	2,043	4,018	1,975
	1899	17	733	16	177	540	.....	1,724	214	208	1,313	2,408	1,035
New York.....	1909	67	3,924	50	898	2,976	5,873	16,708	820	1,436	15,612	23,583	7,971
	1904	67	3,287	69	816	2,402	4,270	10,603	697	1,043	8,411	13,402	4,991
	1899	91	2,859	97	742	2,020	.....	7,670	577	821	7,554	12,834	4,980
Ohio.....	1909	44	2,280	25	481	1,774	3,579	12,732	573	827	11,601	17,077	5,416
	1904	43	2,323	21	523	1,774	3,166	17,985	743	681	8,305	11,791	3,395
	1899	55	1,840	53	360	1,427	.....	7,650	390	572	5,049	8,150	3,101
Oregon.....	1909	4	40	2	4	34	277	156	5	26	140	204	64
	1904	3	33	3	6	24	31	110	9	10	86	138	52
	1899	5	43	3	13	27	.....	89	14	9	83	128	45
Pennsylvania.....	1909	59	1,746	74	475	1,197	2,598	5,428	344	550	5,047	9,124	3,177
	1904	60	1,460	71	205	1,184	2,152	4,411	253	499	4,054	6,959	2,955
	1899	60	1,055	78	166	811	.....	2,984	153	296	2,093	3,613	1,520
Rhode Island.....	1909	9	251	5	78	168	402	459	87	70	630	1,248	369
	1904	8	222	10	20	192	194	363	31	69	585	866	281
	1899	10	238	11	61	166	.....	398	85	63	550	938	338
Tennessee.....	1909	5	69	4	20	45	105	161	17	14	165	222	57
	1904	4	152	4	38	110	180	329	30	29	328	457	129
	1899	6	212	8	37	167	.....	326	31	53	414	546	132
Texas.....	1909	5	114	3	31	80	146	154	34	22	293	388	95
	1904	8	48	7	6	35	79	134	7	16	89	163	74
	1899	7	44	6	5	33	.....	72	2	13	77	113	36
Wisconsin.....	1909	16	324	19	92	213	487	812	68	89	910	1,611	701
	1904	16	238	13	38	187	313	586	52	73	633	1,002	369
	1899	15	287	13	75	199	.....	724	92	76	725	1,096	371
All other states.....	1909	31	1,051	19	243	789	1,696	4,882	364	389	5,885	8,492	2,697
	1904	37	708	29	130	549	953	2,769	137	241	2,820	3,797	977
	1899	50	701	57	160	484	.....	2,052	165	197	1,758	2,911	1,153

1 Includes "candles."

2 Figures can not be shown without disclosing individual operations.

# THE SOAP INDUSTRY.

675

## SOAP—DETAILED STATISTICS, BY STATES: 1909.

STATE.	Number of establishments.	PERSONS ENGAGED IN INDUSTRY.							WAGE EARNERS—DEC. 15, OR NEAREST REPRESENTATIVE DAY.				Primary horsepower.		
		Total.	Proprietors and firm members.	Salaried officers, superintendents, and managers.	Clerks.		Average number.	Wage earners.		Total.	16 and over.			Under 16.	
					Male.	Female.		Number, 15th day of—			Male.	Female.		Male.	Female.
								Maximum month.	Minimum month.						
<b>United States...</b>	<b>420</b>	<b>18,393</b>	<b>329</b>	<b>634</b>	<b>3,269</b>	<b>1,162</b>	<b>12,999</b>	<b>De 13,650</b>	<b>Ja 12,337</b>	<b>13,784</b>	<b>9,998</b>	<b>3,431</b>	<b>167</b>	<b>188</b>	<b>28,360</b>
California.....	23	261	27	15	45	8	166	No 177	Jy 158	171	138	33	.....	.....	477
Colorado.....	3	13	1	2	2	1	7	Fe <sup>1</sup> 10	De 0	9	9	.....	.....	.....	89
Connecticut.....	9	376	6	11	70	29	260	De 302	My 237	302	183	103	4	12	540
Georgia.....	3	108	.....	8	23	3	74	Se 88	No 63	72	65	7	.....	.....	123
Illinois.....	34	3,408	20	75	908	217	2,188	No 2,303	My 2,075	2,399	1,671	597	44	87	5,155
Indiana.....	11	185	4	11	32	12	126	Jy 143	Ap 114	124	81	37	3	3	366
Iowa.....	9	240	6	19	61	10	150	Oc 158	Fe 142	151	101	41	3	6	270
Louisiana.....	5	40	6	4	3	1	26	Ja <sup>1</sup> 27	Jy <sup>1</sup> 23	27	26	.....	.....	.....	16
Maryland.....	3	67	8	5	5	3	46	Je 50	Fe 43	47	41	6	.....	.....	165
Massachusetts.....	38	647	27	37	89	36	458	Oc 489	Je 430	478	359	111	1	7	1,379
Michigan.....	8	100	7	6	13	6	68	No 71	My <sup>1</sup> 66	69	56	8	5	.....	882
Missouri.....	10	838	3	20	231	30	554	Ap 577	Ja 527	564	426	123	1	14	954
New Hampshire.....	3	4	3	.....	.....	.....	1	Ja <sup>1</sup> 1	Jy <sup>2</sup> 1	1	1	.....	.....	.....	20
New Jersey.....	21	2,301	10	57	409	226	1,599	No 1,724	Ja 1,387	1,708	1,134	532	34	8	2,761
New York.....	67	3,924	50	157	482	259	2,976	No 3,083	Je 2,642	3,075	2,393	680	2	.....	5,873
Ohio.....	44	2,280	25	87	323	71	1,774	De 1,953	My 1,628	1,962	1,451	476	16	19	3,570
Oregon.....	4	40	2	3	.....	1	34	Mh 36	Se 31	33	31	2	.....	.....	277
Pennsylvania.....	59	1,746	74	27	252	196	1,197	Se 1,226	Ja 1,172	1,174	821	312	27	14	2,598
Rhode Island.....	9	251	5	9	63	6	168	So 175	Ja <sup>1</sup> 164	168	119	39	5	5	402
Tennessee.....	5	69	4	7	11	2	45	Oc 52	Ja 39	41	28	12	1	.....	105
Texas.....	5	114	3	4	25	2	80	De 123	Se 57	101	71	20	6	4	146
Wisconsin.....	16	324	19	14	58	20	213	No 229	Ja 183	216	159	52	.....	.....	487
All other states <sup>2</sup> .....	31	1,051	19	56	164	23	789	.....	.....	892	634	240	14	4	1,696

STATE.	Capital.	EXPENSES.										Value of products.	Value added by manufacture (value of products less cost of materials).
		Total.	Services.			Materials.		Miscellaneous.					
			Officials.	Clerks.	Wage earners.	Fuel and rent of power.	Other.	Rent of factory.	Taxes, including internal revenue.	Contract work.	Other.		
<b>United States....</b>	<b>\$71,951,109</b>	<b>\$98,226,337</b>	<b>\$1,652,393</b>	<b>\$3,853,156</b>	<b>\$6,226,882</b>	<b>\$1,265,851</b>	<b>\$70,913,567</b>	<b>\$226,745</b>	<b>\$314,258</b>	<b>\$119,609</b>	<b>\$13,653,876</b>	<b>\$111,357,777</b>	<b>\$39,178,359</b>
California.....	1,312,239	1,458,731	34,800	76,301	115,336	14,980	1,101,532	4,072	7,151	.....	104,559	1,576,021	459,509
Colorado.....	78,968	46,575	4,397	2,760	5,031	644	21,423	160	739	.....	11,401	50,094	28,027
Connecticut.....	970,872	1,343,490	44,110	72,001	130,888	10,693	721,913	1,080	4,495	.....	358,910	1,527,736	795,730
Georgia.....	731,002	387,184	18,070	23,317	23,118	7,375	247,036	.....	1,933	.....	66,335	330,368	75,957
Illinois.....	11,693,653	18,835,398	219,102	1,136,533	1,052,608	262,319	13,685,841	28,660	49,811	19,468	2,381,056	20,180,799	6,232,639
Indiana.....	515,782	781,954	20,240	42,945	54,136	11,719	539,800	2,975	3,250	.....	106,889	812,683	261,164
Iowa.....	812,831	1,186,195	20,300	79,826	58,466	9,868	900,009	180	3,430	2,348	105,168	1,382,022	471,545
Louisiana.....	116,379	118,995	4,773	3,220	9,755	1,554	87,417	1,600	442	.....	10,234	132,188	43,217
Maryland.....	133,269	167,862	4,780	4,056	15,924	3,852	121,992	1,072	804	.....	15,382	193,437	67,593
Massachusetts.....	2,569,777	3,629,441	99,538	132,431	226,824	56,280	2,320,318	14,510	25,087	.....	753,853	4,282,566	1,905,968
Michigan.....	550,882	483,008	6,960	15,066	37,374	7,816	346,103	1,708	2,936	.....	65,645	535,804	181,885
Missouri.....	2,658,565	4,063,899	60,583	171,954	271,640	38,111	3,016,588	6,028	8,940	90,000	400,055	4,719,352	1,664,653
New Hampshire.....	8,345	8,690	.....	.....	750	100	7,324	150	41	.....	325	11,500	4,076
New Jersey.....	8,306,346	11,796,074	342,131	538,739	796,156	110,328	6,973,838	4,210	38,504	.....	2,992,168	13,673,942	6,589,770
New York.....	16,708,332	20,156,635	295,507	533,777	1,435,571	290,146	15,322,236	116,323	62,814	6,825	2,093,436	23,582,977	7,970,595
Ohio.....	12,731,616	14,050,747	186,625	386,553	826,561	222,034	11,438,996	17,279	57,390	843	914,466	17,077,308	5,416,278
Oregon.....	156,151	186,914	4,200	600	25,591	1,408	138,367	3,000	1,186	.....	12,562	203,753	63,978
Pennsylvania.....	5,427,998	8,397,948	55,988	287,566	555,829	64,977	5,881,826	13,858	14,266	.....	1,522,738	9,124,356	3,177,553
Rhode Island.....	458,635	1,184,119	22,510	64,616	70,276	15,533	923,112	.....	4,515	.....	83,557	1,248,489	309,844
Tennessee.....	160,986	216,309	5,650	10,853	13,878	2,158	162,436	38	1,161	.....	20,135	222,160	57,566
Texas.....	153,615	419,896	10,690	23,761	21,614	7,861	285,544	840	1,518	125	67,913	387,817	94,412
Wisconsin.....	811,649	1,480,231	26,025	42,212	89,166	11,549	898,356	4,782	4,078	.....	404,063	1,610,688	700,783
All other states <sup>2</sup> .....	4,883,217	7,826,372	150,414	204,069	390,390	115,146	5,770,960	4,200	19,167	.....	1,163,026	8,491,717	2,665,611

<sup>1</sup> Same number reported for one or more other months.  
<sup>2</sup> Same number reported throughout the year.  
<sup>3</sup> All other states embrace: Arizona, 1 establishment; District of Columbia, 1; Kansas, 6; Kentucky, 5; Maine, 1; Minnesota, 6; Montana, 1; Nebraska, 2; Nevada, 1; North Carolina, 1; Utah, 1; Vermont, 2; Virginia, 1; Washington, 2.