IRON AND STEEL

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By Story B. Ladd.

This report presents the statistics of the iron and steel industry for the census of manufactures of 1905. The period covered is the calendar year 1904, or the business year of the establishment reporting which most nearly conforms to this, and ends before January 1, 1905.

In drawing comparisons between the figures of the different censuses it should be borne in mind that the interval between the present census and that of 1900 is but one-half of that for prior census periods.

It should also be specially noted that the iron and steel industry in 1904 was seriously affected by the general business depression which began in the first half of 1903 and continued until August and September, 1904. The iron and steel production during the year 1904 was in many lines less than in 1903 and 1902, the increased production resulting from the revival in the fall of the year not being sufficient to offset the losses during the earlier months. On the other hand, each of the prior censuses from 1870 to 1900, inclusive, which is presented in this report in comparison with 1905, was for a year of industrial activity and prosperity, a year of advancement and growth. The census of 1870 was taken for a year of increasing production, the crest of which, measured by pig iron production, was reached in 1873; the crest of the wave of increase of 1880 was reached in 1883; 1890 was at the summit of a period of business activity and growth; and the period of increasing production witnessed in 1900 did not receive a check until 1903. Likewise, the iron and steel production for the calendar year 1905 was abnormally and phenomenally large and the industry uniformly prosperous. The Census report therefore presents under cover of 1905, which was an active and prosperous year, the statistics for a year of partial depression and curtailment, in comparison with prior census years of growth and prosperity.

The statistics relate only to establishments which operate blast furnaces, steel works and rolling mills, and forges and bloomeries. Establishments manufacturing iron blooms, billets, and hammered bar iron direct from iron ore or from pig iron, scrap iron, or steel are classified as forges and bloomeries only when the products are made for sale and not for consumption in a rolling mill department of the producing plant. In the early years of the iron and steel industry the forges and bloomeries were an important feature, but they have been steadily declining, and at the census of 1905 the few remaining bloomeries are included in the statistics for steel works and rolling mills except when shown separately for comparative purposes with former years.

The blast furnace products include all kinds of pig iron, spiegeleisen, ferromanganese, and ferrosilicon, whether cast or used in a molten condition in Bessemer converters, open-hearth furnaces, cupolas, etc., and castings made direct from the furnace. The products of steel works and rolling mills embrace steel ingots and direct steel castings and all hot rolled or forged iron or steel. Many mills carry the manufacture of the primary rolling mill products through to more highly finished forms, such as nails, spikes, bolts, nuts, and wire, and in some cases products of this kind constitute the bulk of the output of the establishment. In such cases the statistics presented are those of the primary rolling mill products, the enhanced value due to the further manufacture into more highly finished forms being handled as a separate factor. The gross ton (2,240 pounds) is used throughout the report except for coke, which is in short tons (2,000 pounds).

At the census of 1880 the capital and labor employed in mining iron ore and coal, in coke making, quarrying limestone, charcoal burning, etc., were included in the capital invested and labor employed in the production of pig iron where the mines, ovens, quarries, or kilns were owned or operated by the blast furnace establishments. The cost of materials reported was nevertheless, apparently, the cost at the furnace, and hence the figures of cost for 1880 involve a duplication to this extent. The statistics for 1890, 1900, and 1905 for the blast furnace industry relate only to the manufacture of pig iron, and do not, as a rule, include details for any of these related industries.

The industry is discussed under the following heads:

The iron and steel industry as a whole.
The electrothermic metallurgy of iron and steel.
Blast furnaces.
Steel works and rolling mills.
Forges and bloomeries.

THE IRON AND STEEL INDUSTRY.

Table 1 shows the general statistics for the iron and steel industry as a whole for the census years 1870 to 1905, with the percentage of increase or decrease for each period. In 1870 active establishments were not separated from idle, but for each of the later years only active establishments are included.

TABLE 1.—IRON AND STEEL—COMPARATIVE SUMMARY, WITH PER CENT OF INCREASE: 1870 TO 1905.

	CENSUS.					PER CENT OF INCREASE.			
	1905[1]	1900	1890	1880	1870	1900 to 1905	1890 to 1900	1880 to 1890	1870 to 1880
Number of establishments	[2] 606	[2] 669	719	792	[3] 808	[4] 9.4	[4] 7.0	[4] 9.2	[4] 2.0
Capital	[5] $948,689,840	[5] $590,530,484	[5] $414,044,844	$209,904,965	$121,772,074	60.7	42.6	97.3	72.4
Salaried officials, clerks, etc., number	16,566	9,217	[6] 4,325	(7)	(7)	79.7	113.1	.....	.....
Salaries	$20,758,412	$11,741,788	[6] $6,462,236	(7)	(7)	76.8	81.7	.....	.....
Wage-earners, average number	242,740	222,607	171,181	140,798	77,555	9.0	30.0	21.6	81.5
Total wages	$141,439,906	$120,836,338	$89,273,956	$55,451,510	$40,514,981	17.1	35.4	61.0	36.9
Men 16 years and over	239,383	219,635	168,943	133,023	75,037	9.0	30.0	27.0	77.3
Wages	$140,545,610	$120,157,007	$88,840,642	(7)	(7)	17.0	35.3	.....	.....
Women 16 years and over	1,455	1,071	58	45	82	35.9	1,746.6	28.9	45.1
Wages	$441,967	$266,888	$17,106	(7)	(7)	65.6	1,460.2	.....	.....
Children under 16 years	1,902	1,901	2,180	7,730	2,436	0.1	[4] 12.8	[4] 71.8	217.3
Wages	$452,329	$412,443	$416,208	(7)	(7)	9.7	[4] 0.9	.....	.....
Miscellaneous expenses	$47,164,970	$32,274,100	$18,214,948	(8)	(8)	46.1	77.2	.....	.....
Cost of materials used	$620,171,881	$522,431,701	$327,272,845	$191,271,150	$135,526,132	18.7	59.6	71.1	41.1
Value of products [9]	$905,854,152	$804,034,918	$478,687,519	$296,557,685	$207,208,696	12.7	68.0	61.4	43.1
Tons of product [10]	34,844,933	29,507,860	16,264,478	6,486,733	3,263,585	18.1	81.4	150.7	98.8

[1] Exclusive of the statistics of 6 establishments engaged primarily in the manufacture of other products. These establishments made 4,184 tons of steel castings, valued at $347,264.
[2] Includes 1 penal institution, the statistics for which are not included in the detailed summary.
[3] Includes idle establishments which were not reported separately in 1870.
[4] Decrease.
[5] Includes value of rented property—1905, $12,106,619; 1900, $16,968,821; 1890, $8,273,058.
[6] Includes proprietors and firm members, with their salaries; number only reported in 1900 and 1905, but not included in this table.
[7] Not reported separately.
[8] Not reported.
[9] Includes value of miscellaneous products for which tonnage was not reported.
[10] Gross tons of 2,240 pounds.

In 1870 the United States had a population of 38,558,371, and the iron and steel industry a product of 3,263,585 tons, or an average of 0.0846 of a ton of product per unit of population. In 1880 the iron and steel tonnage per unit of population had increased to 0.1293 of a ton; in 1890 it was 0.2584 of a ton; in 1900, 0.3883 of a ton; and in 1904, on the basis of the estimate of population of continental United States, it was 0.4288 of a ton. Thus the iron and steel industry not only keeps pace with the growth in population, but shows an increase per unit of population during the decade of 1870 to 1880 of 52.8 per cent; for the decade ending in 1890, of 99.8 per cent; for the decade ending in 1900, of 50.3 per cent; and for the five years 1900 to 1905, of 10.7 per cent.

The number of establishments has steadily decreased at each succeeding census, falling from 808 in 1870 to 606 in 1905, while the capital invested has increased nearly sevenfold and the value of products more than threefold. This shows strikingly the concentration that has marked the development of the industry during this period of thirty-five years. To a small extent the decrease in number of establishments in 1905, as compared with 1900, is due to the fact that in a few cases one report was made for two or more plants under the same ownership and within the same municipality, whereas in 1900 separate reports were made for the different plants.

It will be noted that the increase in capital is apparently out of proportion to the growth of the industry in other particulars. The reported capital invested in 1905 exceeds that of 1900 by $358,159,356, or 60.7 per cent; whereas the increase in wage-earners, wages paid, cost of materials, and value and quantity of products all fall within a range of from 9 to 19 per cent. This difference is in part explained by the depression in the iron and steel industry prevailing during the early part of the census year, which restricted production, labor, and operating expense. The capital invested in 1870 shows an average per ton of product of $37.31; in 1880 it was $32.36; in 1890, $25.46; and in 1900, $20.01. At the present census the invested capital as reported shows an average of $27.23 per ton of product. Manifestly, if the law of progress deduced from these returns holds true—namely, a steady advance in the earning power of capital from decade to decade through the use of improved appliances and methods—the capital invested per ton of product should, with full production, be less than that of former years, whereas it exceeds that of 1900 and 1890. The large increase in capital is due in part to the fact that, in the case of some of the corporations, the capital reported as invested in land, buildings, machinery, etc., and live capital, is stock capital as carried on their books, this being the only thing possible to report under the circumstances. But in the case of a corporation formed by the aggregation of a number of plants which have been turned over to the new company for stock considerations, such book accounts necessarily represent more than actual cash investments.

Attention is called to the fact that the number of children employed is substantially the same as in 1900 (except by one) and has not increased with the growth of this industry. In 1890 the average number of children under 16 years employed was 1.3 per cent of all wage-earners; in 1900 they constituted nine-tenths of 1 per cent; and in 1905 they formed eight-tenths of 1 per cent. The 1880 and 1870 figures include children

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employed in coal mining, etc., in conjunction with blast furnace operations, and hence are not comparable.

Table 2 shows the leading statistics of the iron and steel industry for 1905, by states, in comparison with like statistics of the states or territories for 1880, 1890, and 1900. In the census years of 1900 and 1905 there were no territories which produced pig iron, steel, or rolling mill products.

As these statistics are the combined statistics for blast furnace establishments and steel works and rolling mills, which are separately considered in later tables, it is necessary to group under "all other states" such states as have establishments owned by less than three organizations in either branch of the industry, in order that the operations of individual establishments may not be deducible by comparison of the different tables.

TABLE 2.—IRON AND STEEL—COMPARATIVE SUMMARY, BY STATES: 1880 TO 1905.

STATE.	Census.	Number of establishments.	Capital.	SALARIED OFFICIALS, CLERKS, ETC.		WAGE-EARNERS AND WAGES.		Miscellaneous expenses.	Cost of materials used.	Value of products.
				Number.	Salaries.	Average number.	Wages.			
United States	1905	606	[1]$948,689,840	16,566	$20,758,412	242,740	$141,439,906	$47,164,970	$920,171,881	[2]$905,854,152
	1900	669	[1]590,530,484	9,217	11,741,788	222,607	120,836,338	32,274,100	522,431,701	804,034,918
	1890	719	[1]414,044,844	[3]4,325	[3]6,462,236	171,181	89,273,956	18,214,948	327,272,845	478,687,519
	1880	792	209,904,965	(4)	(4)	140,798	55,451,510	(5)	191,271,150	296,557,685
Alabama	1905	29	29,153,289	427	543,954	8,590	3,447,889	789,989	16,047,423	24,687,359
	1900	25	16,091,479	182	292,861	7,238	2,454,401	896,126	10,062,094	17,392,483
	1890	35	17,987,583	193	319,044	5,685	2,202,964	1,089,690	7,425,344	12,544,227
	1880	8	2,757,196	.....	.....	1,626	571,713	.....	601,073	1,452,856
California	1905	4	1,110,192	35	53,073	773	492,390	84,933	778,970	1,489,012
	1900	3	1,499,162	18	22,250	555	327,184	18,944	506,834	900,854
	1890	4	4,656,611	38	56,549	1,114	693,300	208,088	1,938,333	3,097,155
	1880	1	1,000,000	.....	.....	319	177,722	.....	535,500	780,000
Connecticut [6]	1890	13	2,189,521	41	55,784	649	362,405	96,123	1,324,078	2,037,618
	1880	17	2,557,000	.....	.....	685	331,184	.....	1,341,225	1,998,698
Delaware	1905	5	6,279,585	91	102,952	1,055	412,003	144,785	939,506	1,597,309
	1900	6	4,207,079	81	132,677	1,490	705,366	140,054	1,635,762	3,159,641
	1890	7	2,558,865	53	78,061	1,637	765,158	43,201	1,549,539	2,608,670
	1880	8	1,341,469	.....	.....	867	344,476	.....	1,214,050	2,347,177
Georgia [7]	1900	3	666,916	18	13,295	194	48,391	8,300	237,421	391,599
	1890	5	908,243	18	23,125	339	89,045	52,770	321,728	471,757
	1880	9	973,800	.....	.....	1,303	185,489	.....	631,707	990,850
Illinois	1905	27	58,595,150	1,350	1,785,118	18,358	11,468,957	4,340,951	57,055,185	87,352,761
	1900	26	43,356,239	780	926,091	16,642	9,640,716	3,208,240	41,729,261	60,303,144
	1890	24	34,689,919	179	269,308	8,685	5,220,883	793,128	30,039,674	39,011,051
	1880	16	5,795,620	.....	.....	5,253	2,508,718	.....	14,977,145	20,545,289
Indiana	1905	21	22,985,691	323	369,962	7,215	4,071,593	606,398	10,905,822	16,920,326
	1900	27	14,994,210	205	266,764	7,579	4,243,831	376,844	12,438,754	19,338,481
	1890	15	4,099,095	69	103,013	2,648	1,151,148	171,548	3,075,056	4,742,760
	1880	12	2,283,000	.....	.....	2,048	864,921	.....	3,293,073	4,551,403
Kentucky [6]	1890	9	2,310,655	48	63,689	1,435	670,489	115,645	1,703,144	2,725,603
	1880	18	4,610,035	.....	.....	4,095	1,344,400	.....	3,223,799	5,090,029
Maryland [7]	1900	9	3,765,003	55	77,147	2,138	1,029,753	508,298	6,888,916	8,739,405
	1890	10	4,217,574	25	24,358	1,247	371,993	46,077	2,217,173	2,869,208
	1880	18	4,402,125	.....	.....	2,763	905,090	.....	2,888,574	4,470,050
Massachusetts [6]	1890	15	9,005,555	127	182,964	5,210	2,469,075	208,262	6,951,018	11,201,149
	1880	24	6,163,408	.....	.....	6,513	2,576,539	.....	6,657,232	10,288,921
Michigan	1905	16	6,080,677	135	155,700	2,157	1,114,289	366,760	4,904,315	7,355,652
	1900	10	3,934,050	72	95,076	1,972	941,091	277,827	3,770,213	5,902,058
	1890	19	6,696,541	82	139,756	1,427	756,361	369,163	4,135,991	5,829,843
	1880	15	3,342,386	.....	.....	3,089	922,597	.....	3,279,420	4,591,613
Missouri [6]	1890	9	3,495,913	45	65,802	1,269	655,099	175,924	2,079,254	3,237,542
	1880	12	5,698,600	.....	.....	3,139	734,575	.....	3,249,558	4,660,530
New Jersey	1905	21	51,794,677	598	848,487	9,108	4,458,728	1,639,915	15,330,455	23,667,483
	1900	25	20,336,609	332	497,245	8,288	3,892,941	1,146,984	16,310,425	24,381,699
	1890	28	11,697,362	146	238,183	5,150	2,546,791	639,351	7,031,046	11,018,575
	1880	37	8,764,050	.....	.....	4,792	1,808,448	.....	6,556,283	10,341,896
New York	1905	29	64,041,775	685	958,482	9,085	5,554,401	1,445,398	19,633,602	29,862,136
	1900	30	13,292,346	238	377,988	5,418	3,062,711	503,558	7,676,155	13,858,553
	1890	44	16,282,435	186	301,843	6,848	3,303,811	877,541	10,424,852	15,849,537
	1880	74	19,752,471	.....	.....	11,444	4,099,451	.....	13,395,229	22,219,219
Ohio	1905	90	131,262,446	2,139	2,499,295	33,190	22,128,625	5,925,771	110,686,497	152,859,124
	1900	107	86,477,552	1,231	1,592,501	33,677	19,730,469	4,400,859	91,329,307	138,935,256
	1890	101	37,642,887	620	864,528	23,546	13,262,141	2,293,068	44,551,301	65,206,828
	1880	103	22,807,606	.....	.....	20,071	8,265,070	.....	23,997,915	34,918,360

[1] Includes value of rented property—1905, $12,106,619; 1900, $16,963,821; 1890, $8,273,058.
[2] Exclusive of steel castings to the value of $347,264, made by establishments engaged primarily in the manufacture of other products.
[3] Includes proprietors and firm members, with their salaries; number only reported in 1900 and 1905, but not included in this table.
[4] Not reported separately.
[5] Not reported.
[6] Included in "all other states", in 1900 and 1905.
[7] Included in "all other states" in 1905.

TABLE 2.—IRON AND STEEL—COMPARATIVE SUMMARY, BY STATES: 1880 TO 1905—Continued.

STATE.	Census.	Number of establishments.	Capital.	SALARIED OFFICIALS, CLERKS, ETC.		WAGE-EARNERS AND WAGES.		Miscellaneous expenses.	Cost of materials used.	Value of products.
				Number.	Salaries.	Average number.	Wages.			
Pennsylvania	1905	251	472,547,945	9,020	11,171,732	124,771	73,070,358	26,504,604	324,196,900	471,228,844
	1900	291	321,985,659	5,068	6,184,780	110,864	61,908,405	17,845,789	283,142,785	434,445,200
	1890	311	226,294,407	2,099	3,129,515	92,473	49,550,665	9,764,737	180,220,237	264,571,624
	1880	321	102,956,223	.....	.....	57,952	25,095,850	.....	92,267,030	145,576,268
Tennessee [1]	1900	16	5,432,665	96	118,244	1,979	539,304	226,365	3,404,154	5,080,624
	1890	15	4,613,355	85	118,446	1,472	657,075	276,869	2,943,671	4,247,868
	1880	29	2,862,826	.....	.....	3,077	659,773	.....	1,376,059	2,274,203
Texas [2]	1900	3	379,215	14	9,160	248	42,661	8,229	90,439	172,468
	1880	1	40,000	.....	.....	140	27,720	.....	23,580	36,000
Virginia	1905	13	5,279,954	106	148,671	2,103	728,186	285,734	3,538,839	4,859,386
	1900	20	6,941,696	150	208,669	3,097	980,587	248,314	5,498,672	8,341,888
	1890	21	6,330,993	100	145,908	3,010	1,117,452	373,749	4,404,452	6,326,084
	1880	21	2,294,713	.....	.....	2,522	665,432	.....	1,496,151	2,585,999
West Virginia [1]	1900	11	8,202,910	105	129,477	4,467	2,293,524	225,165	10,422,322	16,514,212
	1890	12	6,458,924	76	103,445	3,757	1,734,764	147,432	7,906,036	10,556,865
	1880	16	3,712,616	.....	.....	4,121	1,541,816	.....	3,484,625	6,054,032
Wisconsin	1905	14	6,237,505	172	218,729	2,397	1,381,553	437,906	6,751,966	10,453,750
	1900	12	5,918,320	91	115,449	1,921	1,216,850	361,571	5,410,066	8,905,226
	1890	9	6,461,531	30	50,754	1,890	981,787	175,405	4,613,753	6,501,761
	1880	8	2,768,218	.....	.....	2,153	1,004,931	.....	3,830,667	6,580,391
All other states	[3] 1905	86	93,320,954	1,485	1,902,257	23,938	13,110,934	4,591,826	48,802,401	73,521,010
	[4] 1900	45	33,049,365	481	682,114	14,840	7,778,153	1,872,633	21,878,121	37,272,127
	[5] 1890	13	5,446,875	65	128,161	1,690	711,550	297,177	2,417,165	4,031,794
	[6] 1880	24	3,021,603	.....	.....	2,826	815,595	.....	2,951,255	4,203,901

[1] Included in "all other states" in 1905.
[2] Included in "all other states" in 1890 and 1905.
[3] Includes establishments distributed as follows: Colorado, 2; Connecticut, 9; Georgia, 5; Kansas, 1; Kentucky, 9; Maine, 1; Maryland, 9; Massachusetts, 6; Minnesota, 1; Missouri, 6; Oregon, 1; Rhode Island, 4; Tennessee, 15; Texas, 1; Washington, 1; West Virginia, 15.
[4] Includes establishments distributed as follows: Colorado, 3; Connecticut, 8; Kansas, 1; Kentucky, 8; Maine, 1; Massachusetts, 8; Minnesota, 3; Missouri, 7; North Carolina, 2; Oregon, 1; Rhode Island, 1; Washington, 1; Wyoming, 1.
[5] Includes establishments distributed as follows: Colorado, 2; Iowa, 1; Maine, 2; Minnesota, 1; New Hampshire, 1; North Carolina, 1; Oregon, 1; Rhode Island, 1; Texas, 1; Washington, 1; Wyoming, 1.
[6] Includes establishments distributed as follows: Colorado, 1; District of Columbia, 1; Kansas, 2; Maine, 3; Nebraska, 1; New Hampshire, 2; North Carolina, 9; Oregon, 1; Rhode Island, 1; Vermont, 2; Wyoming, 1.

Pennsylvania, Ohio, and Illinois were the leading states in 1905, as well as in 1900 and 1890. Pennsylvania produced 52 per cent of the value of all iron and steel products in 1905, as against 54 per cent in 1900, and 55.3 per cent in 1890; Ohio, 16.9 per cent in 1905, 17.3 per cent in 1900, and 13.6 per cent in 1890; and Illinois, 9.6 per cent in 1905, 7.5 per cent in 1900, and 8.1 per cent in 1890. The next state in rank, New York, produced 3.3 per cent of the products.

Of the capital invested in the iron and steel industry, Pennsylvania reported 49.8 per cent in 1905 and 54.5 per cent in 1900; Ohio, 13.8 per cent in 1905 and 14.6 per cent in 1900; and Illinois, 6.2 per cent in 1905 and 7.3 per cent in 1900.

Pennsylvania employed 51.4 per cent of all wage-earners in the industry in 1905 and 49.8 per cent in 1900; Ohio, 13.7 per cent in 1905 and 15.1 per cent in 1900; and Illinois, 7.6 per cent in 1905 and 7.5 per cent in 1900. In the matter of wages, Pennsylvania contributed 51.7 per cent of all wages in 1905 and 51.2 per cent in 1900; Ohio, 15.6 per cent in 1905 and 16.3 per cent in 1900; Illinois, 8.1 per cent in 1905 and 8 per cent in 1900. In cost of materials used Pennsylvania's share of the total was 52.3 per cent in 1905 and 54.2 per cent in 1900; that of Ohio, 17.8 per cent in 1905 and 17.5 per cent in 1900; and that of Illinois, 9.3 per cent in 1905 and 8 per cent in 1900.

As a combination of the statistics of these 3 leading states was made in prior reports, a like presentation will be given. The combined capital invested at the census of 1905 was $662,405,541, or 69.8 per cent of the total capital, compared with $451,819,450, or 76.5 per cent of the total in 1900; with $298,627,213, or 72.1 per cent, in 1890; and with $131,559,449, or 62.7 per cent, in 1880. The average number of wage-earners employed in 1905 was 176,319, or 72.6 per cent of the total number, compared with 161,183, or 72.4 per cent, in 1900; with 124,704, or 72.8 per cent, in 1890; and with 83,276, or 59.1 per cent, in 1880. The wages paid in 1905 aggregated $106,667,940, or 75.4 per cent of the total amount, compared with $91,279,590, or 75.5 per cent, in 1900; with $68,033,689, or 76.2 per cent, in 1890; and with $35,869,638, or 64.7 per cent, in 1880. The cost of materials in 1905 aggregated $492,538,582, or 79.4 per cent of the total, compared with $416,201,353, or 79.7 per cent, in 1900; with $254,811,212, or 77.9 per cent, in 1890; and with $131,242,090, or 68.6 per cent, in 1880. The value of the products aggregated $711,440,729, or 78.5 per cent of the total in 1905, compared with $633,683,600, or 78.8 per cent, in 1900; with $368,789,503, or 77 per cent, in 1890; and with $201,039,917, or 67.8 per cent, in 1880.

The state of New York ranked fourth in the value of all iron and steel products in 1905, whereas in 1900 it was eighth; Alabama was fifth, instead of sixth as in 1900; New Jersey was sixth, whereas in 1900 it was fourth; West Virginia, seventh (same in 1900); Indiana,

eighth (fifth in 1900); Maryland, ninth (eleventh in 1900); Massachusetts, tenth (ninth in 1900); Wisconsin, eleventh (tenth in 1900); Colorado, twelfth; Michigan, thirteenth (fourteenth in 1900); Kentucky, fourteenth (thirteenth in 1900); and Connecticut, fifteenth. None of the other states exceeded $5,000,000 in value of iron and steel products.

An increase in value of products is shown for all states given in detail except for Delaware, Indiana, New Jersey, and Virginia. Delaware shows a decrease in products of 49.4 per cent, with a decrease in materials used, wage-earners, and wages paid, accompanied by a very considerable increase in capital; Indiana shows a decrease in products of 12.5 per cent, and a decrease in cost of materials, wage-earners, and wages paid, likewise accompanied by an increase in capital; New Jersey shows a decrease of 2.9 per cent in value of products, with a decrease in cost of materials, and an increase in wage-earners, wages paid, and capital; and Virginia shows a decrease of 41.7 per cent in value of products, with a decrease in cost of materials, wage-earners, wages paid, and capital.

COMPARATIVE PRODUCTION BY STATES.

Table 3 shows the production of all forms of iron and steel, by states, from 1870 to 1905, and the rank of each producing state in quantity of products, for each census.

TABLE 3.—IRON AND STEEL—QUANTITY OF CLASSIFIED PRODUCTS, BY STATES, WITH RANK OF STATES: 1870 TO 1905.

STATE.	RANK.					QUANTITY (TONS).				
	1905	1900	1890	1880	1870	1905	1900	1890	1880	1870
United States						134,844,933	29,507,860	16,264,478	6,486,733	3,263,585
Pennsylvania	1	1	1	1	1	17,555,031	15,290,711	8,622,745	3,229,168	1,640,007
Ohio	2	2	2	2	2	6,521,213	5,297,191	2,210,296	830,483	401,579
Illinois	3	3	3	4	15	3,318,495	2,954,876	1,479,754	373,185	23,001
Alabama	4	4	4	15	20	1,736,580	1,303,595	864,120	56,237	6,304
New York	5	6	5	3	3	1,178,911	475,635	530,100	534,196	400,229
West Virginia	6	5	6	7	10	653,999	541,106	347,506	131,685	64,587
Maryland	7	8	15	12	5	609,047	468,558	109,088	99,048	85,200
Indiana	8	9	14	13	11	446,458	425,946	113,090	85,819	57,275
New Jersey	9	12	9	5	4	423,739	292,154	270,929	217,732	102,912
Wisconsin	10	10	10	6	12	387,625	404,827	258,784	159,763	37,709
Michigan	11	15	11	8	8	326,087	221,860	239,656	127,426	77,392
Tennessee	12	11	8	14	14	322,830	387,649	282,625	68,839	30,629
Virginia	13	7	7	16	13	312,691	469,060	325,722	49,752	33,782
Colorado	14	14	20	27		268,621	232,815	30,207	4,018	
Kentucky	15	13	16	11	7	201,898	255,875	83,357	110,492	77,439
Massachusetts	16	16	12	9	9	147,347	140,532	141,965	126,179	76,916
Connecticut	17	18	19	17	16	105,934	54,365	44,627	33,983	22,594
Missouri	18	17	13	10	6	103,735	100,001	114,945	112,284	84,723
Georgia	19	22	21	18	18	84,070	21,505	27,633	31,386	8,602
Delaware	20	19	17	19	19	31,851	53,025	52,176	30,284	7,417
California	21	21	18	21	22	31,045	25,419	50,667	12,500	2,679
Rhode Island	22	26	23	24	21	25,961	5,618	11,613	7,263	3,942
Minnesota	23	20	30			20,769	42,528	2,290		
Oregon	24	28	26	28		18,000	4,505	7,510	2,857	
Washington	25	27	28			5,760	5,000	4,274		
Texas	26	24	25	30		4,669	9,789	7,991	1,250	
Maine	27	29	22	22	17	2,567	2,750	12,500	9,702	15,302
North Carolina		23	29	31	23		11,543	3,015	392	1,608
Wyoming		25	24	23			9,422	8,308	8,741	
New Hampshire			27	25				5,938	7,123	
Iowa			31					1,056		
Kansas				20					17,013	
Vermont				26	24				5,911	1,362
Nebraska				29					1,786	
District of Columbia				32					236	
South Carolina					25					395

[1] Exclusive of 4,184 tons of steel castings made by establishments engaged primarily in the manufacture of other products.

In 1905, 27 states figure as producers, as against 29 in 1900, no products being reported from North Carolina and Wyoming. Production has increased in all states with the exception of Wisconsin, Tennessee, Virginia, Kentucky, Delaware, Minnesota, Texas, and Maine.

Pennsylvania, Ohio, Illinois, and Alabama hold the first four ranking positions, as they did in 1900 and 1890, and produced as a whole 29,131,319 tons, or 83.6 per cent of the total production, compared with 84.2 per cent in 1900, 81 per cent in 1890, 69.2 per cent in 1880, and 63.5 per cent in 1870. Pennsylvania increased its output 14.8 per cent over 1900, and produced 50.4 per cent of the total products in 1905, 51.8 per cent in 1900, 53 per cent in 1890, 49.8 per cent in 1880, and 50.3 per cent in 1870. The product of Ohio shows an increase of 23.1 per cent over 1900, and forms 18.7 per cent of the total in 1905, compared with 18 per cent in 1900, 13.6 per cent in 1890, 12.8 per cent in 1880, and 12.3 per cent in 1870.

The product of Illinois in 1905 increased 12.3 per cent over that of 1900, and constituted 9.5 per cent of

the total, as compared with 10 per cent in 1900, 9.1 per cent in 1890, 5.8 per cent in 1880, and seven-tenths of 1 per cent in 1870. Alabama produced 33.2 per cent more iron and steel products in 1905 than in 1900, and they constituted 5 per cent of the total, as against 4.4 per cent in 1900, 5.3 per cent in 1890, nine-tenths of 1 per cent in 1880, and two-tenths of 1 per cent in 1870.

New York advanced in 1905 to fifth place, and shows an increase of 147.9 per cent over its product of 1900. It produced 3.4 per cent of the total in 1905 and 1.6 per cent in 1900.

West Virginia, although showing a large increase (20.9 per cent) in product over 1900, was outstripped by New York, and moved back to sixth place.

Maryland increased its output 30 per cent over 1900; Indiana, 4.8 per cent; and New Jersey, 45 per cent. Wisconsin shows a loss of 4.2 per cent; Michigan, a gain of 47 per cent; Tennessee, a decrease of 16.7 per cent; Virginia, a decrease of 33.3 per cent—dropping from seventh to thirteenth place; Colorado, an increase of 15.4 per cent; Kentucky, a decrease of 21.1 per cent; Massachusetts, an increase of 4.8 per cent; Connecticut, an increase of 94.9 per cent; and Missouri, an increase of 3.7 per cent. Of the states producing smaller amounts, Georgia shows a relatively large gain of 290.9 per cent, and Rhode Island and Oregon show products approximately fourfold those of 1900.

CAPITAL.

Table 4 presents the capital invested in the active and idle establishments of the iron and steel industry for the census years from 1880 to 1905, inclusive. The capital invested in rented property is included. Plants in course of construction are not included.

TABLE 4.—*Iron and steel—active and idle establishments—capital: 1880 to 1905.*

	Census.	Number of establishments.	CAPITAL.		
			Total.	Buildings, machinery, tools, and implements.	Land, cash, and sundries.
Total	1905	759	[1] $992,774,034	$570,808,117	$421,965,917
	1900	763	[1] 608,898,516	300,365,655	308,532,861
	1890	838	[1] 426,413,902	209,382,875	217,031,027
	1880	992	228,844,953	121,414,777	107,430,176
Active	1905	606	948,689,840	536,999,569	411,690,271
	1900	669	590,530,484	287,669,533	302,860,951
	1890	719	414,044,844	200,197,208	213,847,636
	1880	792	209,904,965	112,320,428	97,584,537
Idle	1905	153	44,084,194	33,808,548	10,275,646
	1900	94	18,368,032	12,696,122	5,671,910
	1890	119	12,369,058	9,185,667	3,183,391
	1880	200	18,939,988	9,094,349	9,845,639

[1] Includes value of rented property—1905, $13,103,239; 1900, $17,245,416; 1890, $8,291,058.

In 1905 the capital invested in idle establishments was 4.4 per cent of the total, as compared with 3 per cent in 1900, 2.9 per cent in 1890, and 8.3 per cent in 1880. Of the number of establishments, 20.2 per cent were idle in 1905, compared with 12.3 per cent in 1900, 14.2 per cent in 1890, and 20.2 per cent in 1880.

The distribution of the invested capital between blast furnace establishments, steel works and rolling mills, and forges and bloomeries for the several census years, with the percentage each is of the total capital, 1880 to 1905, inclusive, is shown in Table 5.

TABLE 5.—IRON AND STEEL—ACTIVE AND IDLE ESTABLISHMENTS—CAPITAL, BY BRANCHES: 1880 TO 1905.

	Census.	TOTAL.		BLAST FURNACES.		STEEL WORKS AND ROLLING MILLS.		FORGES AND BLOOMERIES.		PER CENT OF TOTAL.		
		Number of establishments.	Capital.[1]	Number of establishments.	Capital.	Number of establishments.	Capital.	Number of establishments.	Capital.	Blast furnaces.	Steel works and rolling mills.	Forges and bloomeries.
Total	1905	759	$992,774,034	265	$262,395,742	487	$730,121,653	7	$256,639	26.4	73.6	(2)
	1900	763	608,898,516	273	158,352,558	476	449,926,470	14	619,488	26.0	73.9	0.1
	1890	838	426,413,902	377	141,067,408	429	284,271,524	32	1,074,970	33.1	66.7	0.2
	1880	992	228,844,953	483	103,926,245	391	120,522,745	118	4,395,963	45.4	52.7	1.9
Active	1905	606	948,689,840	191	239,559,194	409	708,908,534	6	222,112	25.3	74.7	(2)
	1900	669	590,530,484	224	148,226,113	438	441,795,983	7	508,388	25.1	74.8	0.1
	1890	719	414,044,844	304	134,608,543	395	278,559,831	20	876,470	32.5	67.3	0.2
	1880	792	209,904,965	341	89,531,362	358	116,458,390	93	3,915,213	42.6	55.5	1.9
Idle	1905	153	44,084,194	74	22,836,548	78	21,213,119	1	34,527	51.8	48.1	0.1
	1900	94	18,368,032	49	10,126,445	38	8,130,487	7	111,100	55.1	44.3	0.6
	1890	119	12,369,058	73	6,458,865	34	5,711,693	12	198,500	52.2	46.2	1.6
	1880	200	18,939,988	142	14,394,883	33	4,064,355	25	480,750	76.0	21.5	2.5

[1] Includes value of rented property as follows: Blast furnaces—1905, $4,165,283; 1900, $5,087,881; 1890, $5,061,058. Steel works and rolling mills—1905, $9,018,456; 1900, $11,888,815; 1890, $3,230,000. Forges and bloomeries—1905, $9,500; 1900, $236,000.
[2] Less than one-tenth of 1 per cent.

For comparative purposes the capital invested in 1905 in forges and bloomeries is shown in detail, as well as the capital pertaining to blast furnaces, distinct from that invested in steel works and rolling mills; but in the other tables, except as especially noted, statistics for the few existing forges and bloomeries are embodied in the statistics for steel works and rolling mills. The forges and bloomeries as reported both for 1905 and the former years comprise only establishments which manufacture for sale hammered blooms,

bars, etc., and do not include establishments which have rolling mill equipments and consume in their own works the charcoal blooms or bars made.

In comparing capital for 1880 with that of the later years, it should be remembered that the former includes capital invested by iron and steel establishments in mining and in other operations.

The capital invested in steel works and rolling mills has increased, as a rule, faster than the capital invested in blast furnaces, the increase of capital in blast furnaces showing a slight relative increase from 1900 to 1905 over that for steel works and rolling mills, while the capital invested in forges and bloomeries has rapidly decreased. Thus from 1880 to 1890 the total capital invested in steel works and rolling mills increased 135.9 per cent; in blast furnaces, 35.7 per cent; and in forges and bloomeries it decreased 75.5 per cent. From 1890 to 1900 capital of steel works and rolling mills increased 58.3 per cent; that of blast furnaces, 12.3 per cent; and that of forges and bloomeries decreased 42.4 per cent. From 1900 to 1905 capital of steel works and rolling mills increased 62.3 per cent; that of blast furnaces, 65.7 per cent; and that of forges and bloomeries decreased 58.6 per cent.

The average investment in blast furnaces and in steel works and rolling mills per establishment has increased heavily since 1890, as shown by the following tabular statement:

CENSUS.	Blast furnaces.	Steel works and rolling mills.	Forges and bloomeries.
1905	$990,173	$1,499,223	$36,663
1900	580,046	945,224	44,249
1890	374,184	662,638	33,593

In the fifteen-year period the average amount of capital per establishment for blast furnaces and steel works and rolling mills has more than doubled.

Table 6 is a comparative summary, by states, of the capital invested in active and idle establishments from 1880 to 1905.

TABLE 6.—IRON AND STEEL—ACTIVE AND IDLE ESTABLISHMENTS—CAPITAL, BY STATES: 1880 TO 1905.

STATE.	Census.	TOTAL.		ACTIVE.		IDLE.	
		Number of establishments.	Capital.	Number of establishments.	Capital.	Number of establishments.	Capital.
United States	1905	759	[1] $992,774,034	606	$948,689,840	153	$44,084,194
	1900	763	[1] 608,898,516	669	590,530,484	94	18,368,032
	1890	838	[1] 426,413,902	719	414,044,844	119	12,369,058
	1880	992	228,844,953	792	209,904,965	200	18,939,988
Alabama	1905	40	32,377,747	29	29,153,289	11	3,224,458
	1900	35	18,292,468	25	16,091,479	10	2,200,989
	1890	38	18,284,976	35	17,987,583	3	297,393
	1880	13	3,156,196	8	2,757,196	5	399,000
California	1905	4	1,110,192	4	1,110,192	.....	.....
	1900	4	1,514,162	3	1,499,162	1	15,000
	1890	4	4,656,611	4	4,656,611	.....	.....
	1880	1	1,000,000	1	1,000,000	.....	.....
Connecticut [2]	1890	15	2,317,821	13	2,189,521	2	128,300
	1880	19	2,682,000	17	2,557,000	2	125,000
Delaware	1905	6	6,405,585	5	6,279,585	1	126,000
	1900	6	4,207,079	6	4,207,079	.....	.....
	1890	9	2,960,722	7	2,558,865	2	401,857
	1880	9	1,431,469	8	1,341,469	1	90,000
Georgia [3]	1900	5	1,218,216	3	666,916	2	551,300
	1890	6	951,243	5	908,243	1	43,000
	1880	14	1,135,900	9	973,800	5	162,100
Illinois	1905	29	59,392,825	27	58,595,150	2	797,675
	1900	27	43,370,239	26	43,356,239	1	14,000
	1890	28	35,203,169	24	34,689,919	4	513,250
	1880	20	6,285,620	16	5,795,620	4	490,000
Indiana	1905	34	26,643,104	21	22,985,691	13	3,657,413
	1900	29	15,594,210	27	14,994,210	2	600,000
	1890	18	4,387,095	15	4,099,095	3	288,000
	1880	12	2,283,000	12	2,283,000	.....	.....
Kentucky [2]	1890	13	2,690,655	9	2,310,655	4	380,000
	1880	29	5,493,035	18	4,610,035	11	883,000
Maryland [3]	1900	12	4,012,937	9	3,765,003	3	247,934
	1890	13	4,602,574	10	4,217,574	3	385,000
	1880	23	4,962,125	18	4,402,125	5	560,000
Massachusetts [2]	1890	16	9,068,555	15	9,005,555	1	63,000
	1880	30	6,738,408	24	6,163,408	6	575,000
Michigan	1905	16	6,080,677	16	6,080,677	.....	.....
	1900	16	4,623,031	10	3,934,050	6	688,981
	1890	25	7,070,241	19	6,696,541	6	373,700
	1880	21	4,155,386	15	3,342,386	6	813,000

[1] Includes value of rented property—1905, $13,193,239; 1900, $17,245,416; 1890, $8,201,058.
[2] Included in "all other states" in 1905 and 1900.
[3] Included in "all other states" in 1905.

TABLE 6.—IRON AND STEEL—ACTIVE AND IDLE ESTABLISHMENTS—CAPITAL, BY STATES: 1880 TO 1905—Continued.

STATE.	Census.	TOTAL.		ACTIVE.		IDLE.	
		Number of establishments.	Capital.	Number of establishments.	Capital.	Number of establishments.	Capital.
Minnesota [1]	1900	5	2,163,582	3	713,806	2	1,449,776
	1880	1	150,000	.....	.....	1	150,000
Missouri [2]	1890	13	5,890,428	9	3,495,913	4	2,394,515
	1880	20	8,803,100	12	5,698,600	8	3,104,500
New Jersey	1905	28	53,808,280	21	51,794,677	7	2,013,603
	1900	30	21,011,152	25	20,336,609	5	674,543
	1890	37	12,649,162	28	11,697,362	9	951,800
	1880	40	9,099,050	37	8,764,050	3	335,000
New York	1905	38	67,163,295	29	64,041,775	9	3,121,520
	1900	37	16,008,878	30	13,292,346	7	2,716,532
	1890	55	17,330,190	44	16,282,435	11	1,047,755
	1880	89	21,543,221	74	19,752,471	15	1,790,750
Ohio	1905	111	136,032,358	90	131,262,446	21	4,769,912
	1900	109	86,557,552	107	86,477,552	2	80,000
	1890	117	39,839,900	101	37,642,887	16	2,197,013
	1880	133	25,052,294	103	22,807,606	30	2,244,688
Pennsylvania	1905	301	490,328,837	251	472,547,945	50	17,780,892
	1900	320	326,053,204	291	321,985,659	29	4,067,545
	1890	341	227,626,582	311	226,294,407	30	1,332,175
	1880	362	106,564,223	321	102,956,223	41	3,608,000
Tennessee [3]	1900	19	5,883,315	16	5,432,665	3	450,650
	1890	18	4,869,855	15	4,613,355	3	256,500
	1880	43	3,681,776	29	2,862,826	14	818,950
Texas [1]	1900	4	653,215	3	379,215	1	274,000
	1880	1	40,000	1	40,000	.....	.....
Virginia	1905	27	8,060,779	13	5,279,954	14	2,780,825
	1900	29	8,236,858	20	6,941,696	9	1,295,162
	1890	30	6,584,793	21	6,330,993	9	253,800
	1880	43	3,829,713	21	2,294,713	22	1,535,000
West Virginia [3]	1900	12	8,333,445	11	8,202,910	1	130,535
	1890	13	6,488,924	12	6,458,924	1	30,000
	1880	19	3,873,616	16	3,712,616	3	161,000
Wisconsin	1905	18	7,785,330	14	6,237,505	4	1,547,825
	1900	13	7,238,654	12	5,918,329	1	1,320,325
	1890	10	6,468,031	9	6,461,531	1	6,500
	1880	9	2,843,218	8	2,768,218	1	75,000
All other states	[4] 1905	107	97,585,025	86	93,320,954	21	4,264,071
	[5] 1900	51	33,926,319	42	32,335,559	9	1,590,760
	[6] 1890	19	6,472,375	13	5,446,875	6	1,025,500
	[7] 1880	41	4,041,603	24	3,021,603	17	1,020,000

[1] Included in "all other states" in 1905 and 1890.
[2] Included in "all other states" in 1905 and 1900.
[3] Included in "all other states" in 1905.
[4] Includes establishments distributed as follows: Colorado, 2; Connecticut, 9; Georgia, 5; Kansas, 1; Kentucky, 13; Maine, 1; Maryland, 10; Massachusetts, 8; Minnesota, 2; Missouri, 7; North Carolina, 2; Oregon, 2; Rhode Island, 4; Tennessee, 18; Texas, 4; Washington, 2; West Virginia, 16; Wyoming, 1.
[5] Includes establishments distributed as follows: Colorado, 3; Connecticut, 11; Kansas, 1; Kentucky, 10; Maine, 2; Massachusetts, 8; Missouri, 7; North Carolina, 3; Oregon, 2; Rhode Island, 1; Washington, 2; Wyoming, 1.
[6] Includes establishments distributed as follows: Colorado, 3; Iowa, 1; Kansas, 1; Maine, 2; Minnesota, 2; New Hampshire, 1; North Carolina, 1; Oregon, 1; Rhode Island, 1; Texas, 5; Washington, 1; Wyoming, 1.
[7] Includes establishments distributed as follows: Colorado, 1; District of Columbia, 1; Kansas, 2; Maine, 3; Nebraska, 1; New Hampshire, 2; North Carolina, 20; Oregon, 1; Rhode Island, 3; Utah, 3; Vermont, 4; Wyoming, 1.

MISCELLANEOUS EXPENSES.

In taking the census of 1880 reports of miscellaneous expenses, including expenditures for taxes, rent of offices, interest, insurance, advertising, etc., were not secured. At the census of 1890 they were reported, but the miscellaneous expenses chargeable to the mining of ore and coal, the quarrying of limestone, the making of coke or charcoal, and railroad operations, when these were in conjunction with blast furnace operations, were included as well, so that these expenses do not represent those of the iron and steel industry proper.

At the census of 1900 and the present census efforts were made to secure as nearly as possible the miscellaneous expenses chargeable to the operations of the iron and steel departments. The expense of the sales department and amounts expended as commissions on orders has not been included.

The miscellaneous expenses in 1905 constituted 5.7 per cent of all expense reported, compared with 4.7 per cent in 1900 and 4.1 per cent in 1890.

WAGE-EARNERS.

Table 7 shows the average number of wage-earners employed in the iron and steel industry and its several branches for 1880 and subsequent census years and the percentages of men, women, and children employed.

TABLE 7.—IRON AND STEEL—WAGE-EARNERS (MEN, WOMEN, AND CHILDREN), WITH PER CENT OF TOTAL, BY BRANCHES: 1880 TO 1905.

CLASS.	Census.	AVERAGE NUMBER.				PER CENT OF TOTAL.		
		Total.	Men 16 years and over.	Women 16 years and over.	Children under 16 years.	Men.	Women.	Children.
Total	1905	242,740	239,383	1,455	1,902	98.6	0.6	0.8
	1900	222,607	219,635	1,071	1,901	98.7	0.5	0.8
	1890	171,181	168,943	58	2,180	98.7	(1)	1.3
	1880	140,798	133,023	45	7,730	94.5	(1)	5.5
Blast furnaces	1905	35,178	35,093	4	81	99.8	(1)	0.2
	1900	39,358	39,261	6	91	99.8	(1)	0.2
	1890	33,415	33,341	.....	74	99.8	.....	0.2
	1880	41,695	40,503	9	1,183	97.2	(1)	2.8
Steel works and rolling mills	1905	207,394	204,222	1,451	1,821	98.4	0.7	0.9
	1900	183,023	180,148	1,065	1,810	98.4	0.6	1.0
	1890	137,295	135,134	58	2,103	98.5	(1)	1.5
	1880	96,164	89,645	33	6,486	93.2	(1)	6.8
Forges and bloomeries	1905	68	68	.....	.....	100.0	.....	.....
	1900	226	226	.....	.....	100.0	.....	.....
	1890	471	468	.....	3	99.4	.....	0.6
	1880	2,639	2,875	3	61	97.8	0.1	2.1

[1] Less than one-tenth of 1 per cent.

At the census of 1905 the labor employed by blast furnaces constituted 14.5 per cent of the total; that employed by steel works and rolling mills, 85.5 per cent; and that employed by forges and bloomeries was, in comparison, a negligible quantity. In 1900 blast furnace establishments employed 17.7 per cent of all labor; steel works and rolling mills, 82.2 per cent; and forges and bloomeries, one-tenth of 1 per cent. In 1890 blast furnaces employed 19.5 per cent of the total; steel works and rolling mills, 80.2 per cent; and forges and bloomeries, three-tenths of 1 per cent. In 1880 blast furnace labor was 29.6 per cent of the total; that of steel works and rolling mills, 68.3 per cent; and that of forges and bloomeries, 2.1 per cent. It will be seen that the average number of wage-earners employed in the steel works and rolling mill branch of the industry has constituted in each successive year a larger proportion of the total, increasing from 68.3 per cent in 1880 to 85.5 per cent of all labor in 1905; that the wage-earners employed in the blast furnace branch have fluctuated in number, but constitute a smaller portion of the total, decreasing from 29.6 per cent in 1880 to 14.5 per cent in 1905; and that the labor employed in forges and bloomeries has rapidly decreased.

The women and children employed as wage-earners are practically all in steel works and rolling mills. The women employed are distributed, in the order of numbers, in New Jersey, Pennsylvania, Illinois, Ohio, Massachusetts, New York, Connecticut, Indiana, Maryland, Kentucky, and California. The main increase in number, 1900 to 1905, has been in the states of New Jersey, Illinois, Ohio, Connecticut, and New York. The total number of children employed remained substantially the same, the decreases in certain states counterbalancing the increase in others. The principal increases in number of children employed, 1900 to 1905, have been—in Alabama, from 24 to 181; in Pennsylvania, from 1,082 to 1,236; in Maryland, from 23 to 75; in Ohio, from 43 to 72; in Kentucky, from 15 to 35; and in Delaware, from 9 to 27. New Jersey and New York reported 65 and 18, respectively, in 1900, and none employed in 1905. Illinois shows a decrease from 193 to 13; Indiana, from 80 to 3; West Virginia, from 140 to 84; and Missouri, from 15 to 4.

MATERIALS USED.

The statistics with respect to the materials used in the iron and steel industry—blast furnaces, steel works and rolling mills, and forges and bloomeries—for the census years 1880, 1890, 1900, and 1905 are given in Tables 8, 9, and 10, which follow. In taking the census of 1900, as well as that of 1905, an effort was made to obtain the cost of materials used, f. o. b. cars at point of shipment, in order that the amount paid for freight charges might be definitely ascertained. This proved futile, however, as some establishments reported cost of materials f. o. b. works, while others reported the cost at point of shipment and the total amount paid as freight as a separate item, and still others reported partly one way and partly the other. At the census of 1890, as well as in that of 1880, the cost reported for materials used was the cost at the works. When freight charges for 1905 are not combined in the cost reported, the amount is shown in the detailed tables at the end of this report, as a separate item.

Table 8 shows the quantity and cost of fuel used in blast furnaces, steel works and rolling mills, and forges and bloomeries in 1880, 1890, 1900, and 1905, by kinds. In the case of steel works and rolling mills in 1905, owing to an effort to secure a segregation of fuel used for power from that used for heating and melting purposes, the value of the fuel used for power was reported, but not the kind and quantity of fuel so used.

TABLE 8.—IRON AND STEEL—FUEL CONSUMED, BY KIND, QUANTITY, AND COST, BY BRANCHES: 1880 TO 1905.

KIND	Census.	TOTAL.		BLAST FURNACES.		STEEL WORKS AND ROLLING MILLS.		FORGES AND BLOOMERIES.	
		Quantity.	Cost.	Quantity.	Cost.	Quantity.	Cost.	Quantity.	Cost.
Total cost	1905	.....	$98,095,303	.....	$62,902,342	.....	$35,175,341	.....	$17,620
	1900	.....	66,652,344	.....	44,221,702	.....	22,342,390	.....	88,252
	1890	.....	55,561,749	.....	37,884,383	.....	17,397,434	.....	279,932
	1880	.....	35,969,873	.....	21,917,002	.....	13,202,597	.....	850,274
		Long tons.		*Long tons.*		*Long tons.*		*Long tons.*	
Anthracite coal and culm	1905	791,762	2,605,041	560,637	1,812,779	231,125	792,262	.....	.....
	1900	1,830,582	3,518,113	886,564	2,297,419	944,018	1,220,694	.....	.....
	1890	2,655,280	6,654,420	1,796,854	5,165,761	858,071	1,487,713	355	946
	1880	2,966,517	9,889,037	2,334,984	8,012,755	631,229	1,875,062	304	1,220
Bituminous coal and slack	1905	7,856,733	15,708,931	801,640	1,340,997	7,054,099	14,365,633	994	2,301
	1900	11,777,834	15,783,887	832,235	1,101,312	10,944,046	14,679,804	1,553	2,771
	1890	5,110,187	10,426,030	491,971	759,522	4,617,055	9,663,208	1,161	3,300
	1880	5,052,727	12,610,440	939,065	2,095,887	4,112,222	10,510,255	1,440	4,298
		Short tons.		*Short tons.*		*Short tons.*		*Short tons.*	
Coke	1905	20,378,452	59,136,419	19,739,676	57,127,027	638,747	2,009,295	29	97
	1900	17,388,116	40,991,400	16,461,533	38,976,770	926,516	2,014,390	67	240
	1890	9,632,390	28,752,972	9,237,935	27,435,780	393,051	1,311,588	1,404	5,604
	1880	2,277,555	8,743,382	2,128,255	8,129,240	142,605	582,901	6,695	31,241
		Bushels.		*Bushels.*		*Bushels.*		*Bushels.*	
Charcoal	1905	40,930,272	2,837,590	37,796,739	2,538,452	2,968,784	283,916	164,749	15,222
	1900	35,209,887	2,101,787	31,421,585	1,846,201	2,250,022	170,345	1,538,280	85,241
	1890	74,499,202	5,037,175	67,672,156	4,523,320	2,770,611	243,773	4,056,435	270,082
	1880	69,592,691	4,726,114	53,909,828	3,679,120	2,667,902	234,379	13,014,361	812,615
		Barrels.				*Barrels.*		*Barrels.*	
Oil used for fuel	1905	633,813	908,154	.....	.....	633,813	908,154	.....	.....
	1900	1,302,615	1,158,748	.....	.....	1,302,615	1,158,748	.....	.....
	1890	1,859,138	1,124,206	.....	.....	1,859,138	1,124,206	.....	.....
	1880	853	900	.....	.....	.....	.....	853	900
Fuel used for power	1905	.....	12,433,414	.....	(1)	.....	12,433,414	.....	(1)
Natural gas	1905	.....	4,465,754	.....	[2]83,087	.....	4,382,667	.....	.....
	1900	.....	3,098,409	.....	.....	.....	3,098,409	.....	.....
	1890	.....	3,566,946	.....	.....	.....	3,566,946	.....	.....
	1880	.....	.....	.....	.....	.....	.....	.....	.....

[1] Not reported separately.

[2] For steam raising.

The cost of fuel used for power, as reported for steel works and rolling mills, amounted to $12,433,414. As this fuel is not distributed by kinds, either as to quantities or values, no comparisons of 1905 with the former years can properly be made, so far as the fuel consumed by steel works and rolling mills or the total fuel consumption by kinds is concerned. The total cost of the fuel consumed shows an increase of 47.2 per cent for 1905 over 1900, as compared with an increase of 20 per cent for 1900, and 54.5 per cent for 1890. The fuel consumed by blast furnaces shows an increase of 42.2 per cent in 1905, as against 16.7 per cent in 1900, and 72.9 per cent in 1890. The fuel cost for steel works and rolling mills shows an increase of 57.4 per cent in 1905, as against 28.4 per cent in 1900, and 31.8 per cent in 1890. Forges and bloomeries, on the other hand, show a decrease of 80 per cent in 1905, 68.5 per cent in 1900, and 67.1 per cent in 1890.

The fuel consumed in the pig iron industry at different census years is comparable by kinds, and the statistics show that the increase is in coke consumption, the use of bituminous coal and anthracite coal both showing a decrease. Anthracite coal and culm has decreased steadily, at the rate of 23 per cent in 1890, as compared with 1880; 50.7 per cent in 1900, as compared with 1890; and 36.8 per cent in 1905, as compared with 1900. Bituminous coal and slack shows a decrease in 1905, as compared with 1900 and 1880, though the amount consumed in 1890 was materially less, as reported, than in the preceding and later years. The consumption of coke shows a steady and heavy increase, namely, 334.1 per cent in 1890, 78.2 per cent in 1900, and 19.9 per cent in 1905.

The consumption of charcoal shows an increase of 20.3 per cent in 1905 over 1900; a decrease in 1900 of 53.6 per cent over 1890; and an increase of 25.5 per cent in 1890 over 1880. These changes are in keeping with the increase of the charcoal pig iron product from 1880 to 1890, the decrease in 1900, and the increase shown in 1905.

Table 9 shows the quantity and cost of iron ore, mill cinder, and fluxing material consumed in the manufacture of iron and steel in the several census years, 1880 to 1905.

TABLE 9.—IRON AND STEEL—QUANTITY AND COST OF IRON ORE, MILL CINDER, AND FLUXING MATERIAL CONSUMED, BY BRANCHES: 1880 TO 1905.

	Census.	TOTAL.		BLAST FURNACES.		STEEL WORKS AND ROLLING MILLS.		FORGES AND BLOOMERIES.	
		Tons.	Cost.	Tons.	Cost.	Tons.	Cost.	Tons.	Cost.
Total	1905	40,784,786	$114,070,455	40,234,791	$111,673,663	549,995	$2,396,792	.....	.....
	1900	34,649,109	76,089,080	34,302,799	74,740,271	340,028	1,326,395	6,282	$22,414
	1890	21,725,699	74,254,942	21,189,708	70,789,216	519,199	3,355,139	16,792	110,587
	1880	10,029,379	39,974,700	9,624,894	36,663,281	333,405	2,779,879	71,080	531,540
Iron ore	1905	30,592,180	103,346,823	30,042,185	100,950,631	549,995	2,396,792	.....	.....
	1900	25,722,090	67,257,063	25,375,780	65,908,254	340,028	1,326,395	6,282	22,414
	1890	15,558,412	66,971,256	15,022,421	63,505,530	519,199	3,355,139	16,792	110,587
	1880	6,883,667	36,516,697	6,479,182	33,205,278	333,405	2,779,879	71,080	531,540
Mill cinder, scrap, etc.	1905	1,865,385	3,830,961	1,865,385	3,830,961	.....	.....	.....	.....
	1900	1,600,313	3,772,385	1,600,313	3,772,385	.....	.....	.....	.....
	1890	1,145,599	3,086,808	1,145,599	3,086,808	.....	.....	.....	.....
	1880	316,114	910,667	316,114	910,667	.....	.....	.....	.....
Fluxing material	1905	8,327,221	6,892,671	8,327,221	6,892,671	.....	.....	.....	.....
	1900	7,326,706	5,059,632	7,326,706	5,059,632	.....	.....	.....	.....
	1890	5,021,688	4,196,878	5,021,688	4,196,878	.....	.....	.....	.....
	1880	2,829,598	2,547,336	2,829,598	2,547,336	.....	.....	.....	.....

The consumption of iron ore increased 18.9 per cent in 1905 over 1900, as compared with an increase of 65.3 per cent shown in 1900 and an increase of 126 per cent in 1890. The relatively small amount used in steel works and rolling mills, it will be observed, showed a large decrease in 1900, largely due to decrease in the number of active puddling furnaces. The decrease in the amount of iron ore consumed by steel works and rolling mills has been more than regained through the general growth of the industry, the amount consumed in 1905 slightly exceeding that used in 1890. No consumption of iron ore is reported by the forges and bloomeries manufacturing blooms and bars for sale. The iron ore consumed shows an average cost of $3.38 per ton in 1905, as compared with $2.61 in 1900, $4.30 in 1890, and $5.30 in 1880.

The mill cinder, scrap, etc., is that which is purchased by the reporting establishments and does not include such material when made and consumed by the same establishment. The amount shows a steady increase, and an average cost in 1905 of $2.05 per ton, as compared with $2.36 in 1900, $2.69 in 1890, and $2.88 in 1880.

The quantity of fluxing material used shows an increase of 13.7 per cent from 1900 to 1905, 45.9 per cent from 1890 to 1900, and 77.5 per cent from 1880 to 1890. The average cost per ton was 83 cents in 1905, 69 cents in 1900, 84 cents in 1890, and 90 cents in 1880.

Table 10 shows the quantity and cost of pig iron, scrap iron and steel, and all forms of iron and steel purchased and consumed by steel works and rolling mills and forges and bloomeries in 1880, 1890, 1900, and 1905. The scrap iron and steel embraces only purchased material, and does not include scrap produced by iron and steel plants and consumed by the producing establishment.

TABLE 10.—IRON AND STEEL—QUANTITY AND COST OF IRON AND STEEL USED AS MATERIAL: 1880 TO 1905.

KIND.	1905		1900		1890		1880	
	Tons.	Cost.	Tons.	Cost.	Tons.	Cost.	Tons.	Cost.
Total	22,762,901	$366,454,993	18,551,442	$321,146,512	8,735,762	$179,288,771	3,811,289	$113,424,247
Pig iron, spiegeleisen, ferromanganese, and all other pig iron	12,191,228	172,101,436	10,411,281	151,064,348	5,854,252	105,492,718	2,395,333	62,814,151
Old iron or steel rails, and other scrap iron or steel	5,124,277	67,601,248	4,126,980	66,852,621	1,747,591	36,460,815	1,206,818	37,908,350
Purchased hammered iron ore blooms pig or scrap blooms, and imported Swedish billets and bars	81,969	1,781,126	32,720	1,150,575	49,867	2,329,138	92,261	5,993,145
Purchased muck or scrap bar	205,951	5,066,732	161,329	4,535,939	209,534	6,252,594	47,995	2,369,544
Purchased iron or steel ingots, blooms, billets, tin plate bars, sheet bars, or slabs (except imported Swedish billets and bars)	4,632,257	103,420,970	3,682,407	92,123,412	874,518	28,753,506	68,882	4,339,657
Purchased wire rods	161,914	4,774,383	136,725	5,419,617	(1)	(1)	(1)	(1)
Purchased iron or steel skelp	259,643	7,331,935	(1)	(1)	(1)	(1)	(1)	(1)
All other iron or steel	105,662	4,377,163	(1)	(1)	(1)	(1)	(1)	(1)

[1] Not reported separately.

Every kind of iron and steel material purchased shows an increase for the period 1900 to 1905: Pig iron, an increase of 17.1 per cent; scrap iron and steel, 24.2 per cent; hammered scrap blooms and imported Swedish billets and bars, 150.5 per cent; muck or scrap bar, 27.7 per cent; ingots, blooms, billets, etc., not including Swedish billets, etc., 25.8 per cent; and wire rods (purchased), 18.4 per cent. Iron and steel material as a whole increased 22.7 per cent in quantity and 14.1 per cent in value.

PRODUCTION OF IRON AND STEEL.

Table 11 shows the total production of all kinds of iron and steel, by census years, with the percentage of increase or decrease.

TABLE 11.—IRON AND STEEL—QUANTITY OF CLASSIFIED PRODUCTS, WITH PER CENT OF INCREASE, BY BRANCHES: 1880 TO 1905.

	QUANTITY (TONS).				PER CENT OF INCREASE.		
	1905	1900	1890	1880	1900 to 1905	1890 to 1900	1880 to 1890
Total	[1] 34,844,933	29,507,860	16,264,478	6,486,733	18.1	81.4	150.8
Blast furnaces	16,628,294	14,452,234	8,845,185	3,375,912	15.1	63.4	162.0
Steel works and rolling mills	[1] 18,211,013	15,040,129	7,388,244	3,046,038	21.1	103.6	142.6
Forges and bloomeries	5,626	15,497	31,049	64,783	[2] 63.7	[2] 50.1	[2] 52.1

[1] Exclusive of 4,184 tons of steel castings made by establishments engaged primarily in the manufacture of other products. [2] Decrease.

The blast furnace products include spiegeleisen, ferromanganese, ferrosilicon, and castings made direct from the blast furnace. Likewise, there is included in the products of steel works and rolling mills the quantity of steel ingots produced for sale. It should be remembered that duplications are necessarily involved, inasmuch as the blast furnace products enter as material into the output of the steel works and rolling mills, and of the forges and bloomeries, and many steel works and rolling mills produce for sale partially finished products, such as muck and scrap bar, billets, slabs, sheet bars, tin plate bars, etc., which figure as material purchased in the reports of other establishments when they are rolled into finished forms. In many instances there is even a second and a third duplication. However, as similar methods of tabulation were employed in previous censuses, the totals are directly comparable.

NUMBER, EQUIPMENT, AND CAPACITY OF IRON AND STEEL ESTABLISHMENTS.

Table 12 shows the number of blast furnaces, steel works and rolling mills, and forges and bloomeries, both active and idle, in the United States in 1905, compared with 1900, 1890, and 1880, and the equipment and capacity of the same.

TABLE 12.—*Iron and steel—active and idle establishments—number, equipment, and capacity: 1880 to 1905.*

	1905	1900	1890	1880
Blast furnaces:				
Number of establishments	265	273	377	483
Number of completed furnaces	435	399	559	681
Total daily capacity, tons of pig iron	87,498	58,569	37,889	17,186
Steel works and rolling mills:				
Number of establishments	[1] 518	476	429	391
Total daily capacity, finished rolled and forged products, tons, double turn	[1] 115,210	90,122	41,576	19,730
Bessemer steel establishments, included above	49	42	51	11
Bessemer steel converters, number	103	91	97	24
Total daily capacity, tons of ingots, double turn	45,427	38,420	19,285	3,988
Open-hearth steel establishments, included above	126	96	58	25
Open-hearth furnaces, number	515	331	129	37
Total daily capacity, tons of ingots, double turn	35,457	19,030	3,608	738
Acid furnaces, number	159	152	.....	.....
Total daily capacity, tons of ingots, double turn	7,750	6,419	.....	.....
Basic furnaces, number	356	179	.....	.....
Total daily capacity, tons of ingots, double turn	27,707	12,611	.....	.....
Crucible steel establishments, included above	49	40	47	37
Number of pots which can be used at a heat	2,939	2,619	2,606	2,691
Forges and bloomeries:				
Number of establishments	7	14	32	118
Total daily capacity, tons of blooms, billets, and bars, double turn	92	143	263	464

[1] Includes 31 establishments other than steel works and rolling mills. (See Table 13.)

Table 12 includes the establishments classified as "other than steel works and rolling mills," which are given in detail in Table 13.

A concentration of the pig iron industry has continued, as shown by the decrease in number of establishments for each successive census, but the completed furnaces in 1905 show an increase of 36 in number, though at each prior census there was a marked decrease, due chiefly to the dismantling of stacks which were badly located and not equipped for competition with the large modern furnaces. The daily capacity of the furnaces, however, has rapidly increased, the increase being 49.4 per cent from 1900 to 1905, as compared with a decade increase of 54.6 per cent for 1900, and 120.5 per cent for 1890; and in average capacity per furnace there is shown a steady increase from 25 tons per day in 1880 to 68 tons in 1890, 147 tons in 1900, and 201 tons in 1905. The pig iron product for 1905 was 52.1 per cent of the yearly capacity (365 days) of all completed furnaces, as compared with 67.6 per cent in 1900, 64 per cent in 1890, and 53.8 per cent in 1880.

The steel works and rolling mills show an increase in number, and in fact the number of plants is in excess of the number of establishments reported; for, as before explained, in some cases the operations of two or more mills, when under one ownership and within the same municipality or district, are covered by one report. The capacity in finished rolled and forged products of all steel works and rolling mills increased 110.7 per cent for the decade ending 1890, 116.8 per cent for 1900, and 27.6 per cent for the five-year period 1900 to 1905. The average daily capacity per establishment in finished rolled and forged products, double turn, increased from 50 tons in 1880 to 97 tons in 1890, 189 tons in 1900, and 222 tons in 1905.

The tonnage of rolled, forged, and other classified products amounted in 1905 to 52.8 per cent of the yearly capacity of all steel works and rolling mills, computed on the basis of 300 working days, double turn, as compared with 55.6 per cent in 1900, 59.2 per cent in 1890, and 51.5 per cent in 1880.

The output of Bessemer steel, ingots and castings, for 1905, in like manner was 57 per cent of the capacity of all converters for the year (300 days), double turn, as compared with 65.3 per cent in 1900, 62.5 per cent in 1890, and 73.5 per cent in 1880. And the open-hearth

steel products, ingots and castings, was 54.7 per cent of the yearly capacity (300 days) of all open-hearth steel furnaces, on double turn, as compared with 53.3 per cent in 1900. The acid open-hearth furnace product in 1905 was 32.5 per cent of the furnace capacity, as compared with 46.2 per cent in 1900; and the basic open-hearth product was 60.9 per cent of the furnace capacity, against 56.9 per cent in 1900. The crucible steel establishments show a substantial increase in number and in pot capacity.

The establishments referred to as "other than steel works and rolling mills," and which have rolling mill facilities or steel making conveniencies, are given in Table 13. The table shows the number of establishments, the character of the products manufactured, and the equipment and daily capacity, by states.

TABLE 13.—IRON AND STEEL—ESTABLISHMENTS, OTHER THAN STEEL WORKS AND ROLLING MILLS, HAVING STEEL WORKS OR ROLLING MILL EQUIPMENT: 1905.

STATE.	Industry.	Total number of establishments.	STEEL WORKS.														ROLLING MILLS.	
			Bessemer or modified Bessemer.			Open-hearth.							Crucible.			Miscellaneous.			
			Number of establishments.	Converters.		Number of establishments.	Total.		Acid.		Basic.		Number of establishments.	Number of pots.	Daily capacity (tons).	Number of establishments.	Daily capacity (tons).	Number of establishments.	Daily capacity (tons).
				Number.	Daily capacity (tons).		Number of furnaces.	Daily capacity (tons).	Number of furnaces.	Daily capacity (tons).	Number of furnaces.	Daily capacity (tons).							
Total		31	8	11	1,675	6	8	155	6	125	2	30	6	266	24.5	2	10.5	12	825
California	Shipbuilding, iron and steel	1	1	1	8														
Connecticut	Cutlery and edge tools	1														1	3.5	1	14
Delaware	Coppersmithing and sheet iron working	1																1	10
Illinois	Agricultural implements, 2; cars, steam railroad, not including operations of railroad companies, 2; foundry and machine shop products, 2; saws, 1; and wire, 1.	8	2	5	1,627	1	1	10			1	10	2	96	12.0			5	625
Indiana	Agricultural implements, 1; and foundry and machine shop products, 1.	2											1	16	0.5	1	7.0		
Massachusetts	Electrical machinery, apparatus, and supplies, 1; and foundry and machine shop products, 1.	2				1	3	45	3	45			1	100	4.0				
Minnesota	Foundry and machine shop products	1	1	1	4														
New Jersey	Files	1											1	30	5.0				
New York	Agricultural implements	1																1	51
Ohio	Foundry and machine shop products, 2; and iron and steel, bolts, nuts, washers, and rivets (rolling mill department idle), 1.	3	1	1	8	1	1	20			1	20						1	80
Oregon	Foundry and machine shop products	1	1	1	4														
Pennsylvania	Foundry and machine shop products, 5; and tools, not elsewhere specified, 2.	7	1	1	20	3	3	80	3	80								3	45
Virginia	Shipbuilding, iron and steel	1	1	1	4														
Wisconsin	Electrical machinery, apparatus, and supplies	1											1	24	3.0				

IRON AND STEEL INDUSTRY, BY GEOGRAPHIC DIVISIONS.

Table 14 presents the leading statistics, by geographic divisions for the census years 1880 to 1905, for the industry as a whole and for blast furnaces, and steel works and rolling mills, with forges and bloomeries combined with the latter for comparative purposes.

The New England states include Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut; the Middle states, New York, New Jersey, Pennsylvania, and Delaware; the Southern states, Maryland, Virginia, District of Columbia, West Virginia, North Carolina, Georgia, Alabama, Kentucky, Tennessee, and Texas; and the Western states, Ohio, Indiana, Illinois, Michigan, Wisconsin, Minnesota, Iowa, Missouri, Nebraska, Kansas, Colorado, Wyoming, Oregon, Washington, and California. All of these states produced iron and steel during one or more of the years covered by the table. The states of New Hampshire, Vermont, North Carolina, Iowa, Nebraska, and Wyoming, and the District of Columbia, do not appear as producers in 1905.

The forges and bloomeries, combined with steel works and rolling mills in the above table, include establishments distributed at the several censuses as follows: In 1905, 6 establishments, of which 5 were in the Middle states and 1 in the Southern states; in 1900, 7 establishments, of which 6 were in the Middle states and 1 in the Southern states; in 1890, 20 establishments, of which 19 were in the Middle states and 1 in the Southern states; and in 1880, 93 establishments, of which 1 was in New England, 53 in the Middle states, 36 in the Southern states, and 3 in the Western states.

Each of the geographic divisions shows a gain, whether measured by investment of capital, by wage-earners employed, or by tonnage or value of products. A decrease in number of establishments is found in all of the divisions except in New England, where there is an increase of 2.

In connection with Table 14 there is presented Table 15, which shows the per cent of increase of the several items of inquiry for the industry as a whole and the two branches thereof, by geographic divisions, for each census year, 1880 to 1905; also Table 16, which shows the per cent of the total capital and products, value and quantity, by geographic divisions, for each census year.

TABLE 14.—IRON AND STEEL—COMPARATIVE SUMMARY, BY BRANCHES AND GEOGRAPHIC DIVISIONS: 1880 TO 1905.

DIVISION.	Census.	Number of establishments.	Capital.	Salaried officials, clerks, etc.		Wage-earners and wages.		Miscellaneous expenses.	Cost of materials used.	Value of products.	Tons of products.
				Number.	Salaries.	Average number.	Wages.				
		TOTAL.									
United States	1905	606	[1] $948,689,840	16,566	$20,758,412	242,740	$141,439,906	$47,164,970	$620,171,881	[2] $905,854,152	[2] 34,844,933
	1900	669	[1] 590,530,484	9,217	11,741,788	222,607	120,836,338	32,274,100	522,431,701	804,034,918	29,507,860
	1890	719	[1] 414,044,844	[3] 4,325	[3] 6,462,236	171,181	89,273,956	18,214,948	327,272,845	478,687,519	16,264,478
	1880	792	209,904,965	(4)	(4)	140,798	55,451,510	(5)	191,271,150	296,557,685	6,486,733
New England states	1905	20	28,108,576	579	612,293	8,262	4,547,682	1,357,606	10,642,371	18,965,450	281,809
	1900	18	21,778,391	187	305,046	8,248	4,515,060	1,224,618	10,141,357	18,303,510	203,265
	1890	32	13,224,150	199	297,157	6,645	3,224,318	413,578	9,286,050	15,105,441	216,643
	1880	49	10,490,408	(4)	(4)	8,654	3,357,911	(5)	9,518,570	14,558,627	190,161
Middle states	1905	306	594,663,982	10,394	13,081,653	144,019	83,495,490	29,734,702	360,100,463	526,355,772	19,189,532
	1900	352	359,821,693	5,719	7,192,690	126,060	69,569,423	19,636,385	308,765,127	475,845,093	16,111,525
	1890	396	256,833,069	2,484	3,747,602	106,108	56,166,425	11,324,830	199,225,674	294,048,406	9,475,941
	1880	439	132,814,213	(4)	(4)	75,055	31,348,225	(5)	113,432,592	180,484,560	4,011,380
Southern states	1905	96	66,448,061	1,096	1,355,797	22,593	10,639,628	2,791,143	50,272,050	71,028,747	3,925,784
	1900	97	46,089,040	719	989,800	21,890	8,560,814	2,299,084	41,133,966	53,771,161	3,468,680
	1890	109	43,051,652	550	806,415	17,051	6,863,185	2,110,129	27,047,767	39,982,152	2,051,057
	1880	130	21,912,311	(4)	(4)	19,728	5,916,868	(5)	13,739,624	23,006,074	549,317
Western states	1905	184	259,469,221	4,497	5,708,669	67,866	42,757,706	13,281,519	199,156,997	289,504,183	11,447,808
	1900	202	162,841,360	2,592	3,254,252	66,409	38,191,041	9,114,013	162,391,251	246,115,154	9,724,390
	1890	188	160,935,973	1,092	1,611,062	41,377	23,020,028	4,366,411	91,713,354	129,551,520	4,520,837
	1880	174	44,688,033	(4)	(4)	37,361	14,828,506	(5)	54,580,364	78,508,424	1,735,875
		BLAST FURNACES.									
United States	1905	191	$239,559,194	2,236	$2,897,917	35,178	$18,947,913	$9,791,139	$178,967,449	$231,889,126	16,628,294
	1900	224	148,226,113	1,763	2,308,420	39,358	18,500,462	7,463,234	131,536,424	206,823,202	14,452,234
	1890	304	134,608,543	1,068	1,611,687	33,415	14,614,458	6,342,675	110,098,615	145,643,153	8,845,185
	1880	341	89,531,362	(4)	(4)	41,695	12,655,428	(5)	58,619,742	89,315,569	3,375,912
New England states	1905	3	418,787	8	15,000	83	39,800	24,287	308,405	451,448	16,267
	1900	2	323,234	7	9,500	69	27,414	21,940	201,885	330,375	13,487
	1890	7	1,751,253	18	24,547	198	76,034	110,073	634,052	886,438	30,057
	1880	10	1,974,000	(4)	(4)	855	288,959	(5)	677,862	1,042,896	27,640
Middle states	1905	79	129,017,064	999	1,314,816	16,200	9,295,861	5,079,628	95,636,218	119,691,515	8,601,174
	1900	95	81,328,706	704	912,961	17,697	8,062,622	3,648,228	69,590,971	109,167,847	7,263,098
	1890	140	68,896,144	422	674,974	17,662	7,905,567	3,163,843	63,115,306	82,650,533	4,782,932
	1880	179	53,909,265	(4)	(4)	17,152	6,021,406	(5)	36,330,367	55,818,738	2,143,833
Southern states	1905	53	35,747,617	579	674,190	9,211	3,647,488	1,281,121	24,214,762	32,821,888	2,728,258
	1900	64	27,010,584	441	597,267	10,747	3,193,014	1,443,414	21,150,098	33,576,226	2,604,510
	1890	73	29,974,471	332	499,120	7,932	2,317,158	1,578,512	15,410,982	22,494,870	1,638,022
	1880	59	11,890,907	(4)	(4)	9,486	2,186,855	(5)	4,452,864	7,709,050	312,890
Western states	1905	56	73,475,726	650	893,911	9,684	5,064,764	3,406,103	58,808,064	78,924,275	5,282,595
	1900	63	39,563,589	611	788,692	10,845	6,317,412	2,349,652	40,593,470	63,748,754	4,571,139
	1890	84	33,986,675	296	413,046	7,623	3,715,699	1,490,247	30,938,275	39,611,312	2,393,574
	1880	93	21,697,190	(4)	(4)	14,202	4,158,208	(5)	17,158,649	24,684,885	891,549
		STEEL WORKS AND ROLLING MILLS, AND FORGES AND BLOOMERIES.									
United States	1905	415	$709,130,646	14,330	$17,860,495	207,562	$122,491,993	$37,373,831	$441,204,432	[2] $673,965,026	[2] 18,216,639
	1900	445	442,304,371	7,454	9,433,368	183,249	102,335,876	24,810,866	390,895,277	597,211,716	15,055,626
	1890	415	279,436,301	3,257	4,850,549	137,766	74,659,498	11,872,273	217,174,230	333,044,366	7,419,293
	1880	451	120,373,603	(4)	(4)	99,103	42,796,082	(5)	132,651,408	207,242,116	3,110,821
New England states	1905	17	27,689,789	571	597,293	8,179	4,507,282	1,333,319	10,333,966	18,514,002	265,542
	1900	16	21,455,157	180	295,546	8,179	4,487,646	1,202,678	9,939,472	17,973,135	189,778
	1890	25	11,472,897	181	272,610	6,447	3,148,284	303,505	8,651,998	14,219,003	185,986
	1889	39	8,516,408	(4)	(4)	7,799	3,068,952	(5)	8,840,708	13,515,731	162,521
Middle states	1905	227	464,746,918	9,395	11,766,837	127,819	74,199,629	24,655,074	264,464,245	406,664,257	10,588,358
	1900	257	278,492,987	5,015	6,279,729	108,363	60,606,801	15,988,157	239,174,156	366,677,246	8,848,427
	1890	250	187,936,925	2,062	3,072,628	88,446	48,260,858	8,160,987	136,110,368	211,397,873	4,693,009
	1880	260	78,844,948	(4)	(4)	57,903	25,326,819	(5)	77,102,225	124,665,822	1,867,547
Southern states	1905	43	30,700,444	517	681,607	13,382	6,992,140	1,510,022	26,057,288	38,206,859	1,197,526
	1900	33	19,078,456	278	392,533	11,143	5,367,800	855,670	19,983,868	30,194,935	864,170
	1890	36	13,077,181	218	307,295	9,119	3,946,027	531,617	11,636,785	17,487,282	413,035
	1880	71	10,021,404	(4)	(4)	10,242	3,730,013	(5)	9,286,760	15,237,024	236,427
Western states	1905	128	185,993,495	3,847	4,814,758	58,182	36,792,942	9,875,416	140,348,933	210,579,908	6,165,213
	1900	139	123,277,771	1,981	2,465,560	55,504	31,873,629	6,764,361	121,797,781	182,366,400	5,153,251
	1890	104	66,949,298	796	1,198,016	33,754	19,304,329	2,876,164	60,775,079	89,940,208	2,127,263
	1880	81	22,990,843	(4)	(4)	23,159	10,670,298	(5)	37,421,715	53,823,539	844,326

[1] Includes value of rented property—1905, $12,106,619; 1900, $16,968,821; 1890, $8,273,058.
[2] Exclusive of 4,184 tons of steel castings, valued at $347,264, made by establishments engaged *primarily* in the manufacture of other products.
[3] Includes proprietors and *firm members*, with their salaries; number only reported in 1900 and 1905, but not included in this table.
[4] Not reported separately.
[5] Not reported.

TABLE 15.—IRON AND STEEL—PER CENT OF INCREASE IN PRINCIPAL

	DIVISION.	Intercensal period.	PER CENT OF INCREASE.								
			Total.								
			Capital.	Salaried officials, clerks, etc.		Wage-earners and wages.		Miscellaneous expenses.	Cost of materials used.	Value of products.	Tons of products.
				Number.	Salaries.	Average number.	Wages.				
1	United States	1900 to 1905	60.7	79.7	76.8	9.0	17.1	46.1	18.7	12.7	18.1
2		1890 to 1900	42.6	113.1	81.7	30.0	35.4	77.2	59.6	68.0	81.4
3		1880 to 1890	97.3	.....	.....	21.6	61.0	.....	71.1	61.4	150.7
4	New England states	1900 to 1905	29.1	209.6	100.7	0.2	0.7	10.9	4.9	3.6	38.6
5		1890 to 1900	64.7	[1]6.0	2.7	24.1	40.0	196.1	9.2	21.2	[1]6.2
6		1880 to 1890	26.1	.....	.....	[1]23.2	[1]4.0	.....	[1]2.4	3.8	13.9
7	Middle states	1900 to 1905	65.3	81.7	81.9	14.2	20.0	51.4	16.6	10.6	19.1
8		1890 to 1900	40.1	130.2	91.9	18.8	23.9	73.4	55.0	61.8	70.0
9		1880 to 1890	93.4	.....	.....	41.4	79.2	.....	75.6	62.9	136.2
10	Southern states	1900 to 1905	44.2	52.4	37.0	3.2	24.3	21.4	22.2	11.4	13.2
11		1890 to 1900	7.1	30.7	22.7	28.4	24.7	9.0	52.1	59.5	69.1
12		1880 to 1890	96.2	.....	.....	[1]13.6	16.0	.....	96.9	73.8	273.4
13	Western states	1900 to 1905	59.3	73.5	75.4	2.2	12.0	45.7	22.6	17.6	17.7
14		1890 to 1900	61.3	137.4	102.0	60.5	65.9	108.7	77.1	90.0	115.1
15		1880 to 1890	126.0	.....	.....	10.7	55.2	.....	68.0	65.0	160.4

[1] Decrease.

ITEMS, BY BRANCHES AND GEOGRAPHIC DIVISIONS: 1880 TO 1905.

PER CENT OF INCREASE—continued.																		
Blast furnaces.									Steel works and rolling mills, and forges and bloomeries.									
Capital.	Salaried officials, clerks, etc.		Wage-earners and wages.		Miscellaneous expenses.	Cost of materials used.	Value of products.	Tons of products.	Capital.	Salaried officials, clerks, etc.		Wage-earners and wages.		Miscellaneous expenses.	Cost of materials used.	Value of products.	Tons of products.	
	Number.	Salaries.	Average number.	Wages.						Number.	Salaries.	Average number.	Wages.					
61.6	26.8	25.5	[1]10.6	2.4	31.2	36.1	12.1	15.1	60.3	92.3	89.3	13.3	19.7	50.6	12.9	12.9	21.0	1
10.1	65.1	43.2	17.8	26.6	17.7	19.5	42.0	63.4	58.3	128.9	94.5	33.0	37.1	109.0	80.0	79.3	102.9	2
50.3	.....	.....	[1]19.9	15.5	.....	87.8	63.1	162.0	132.1	.....	.....	39.0	74.5	.....	63.7	60.7	138.5	3
29.6	14.3	57.9	20.3	45.2	10.7	52.8	36.6	20.6	29.1	217.2	102.1	.....	0.4	10.9	4.0	3.0	39.9	4
[1]81.5	[1]61.1	[1]61.3	[1]65.2	[1]64.0	[1]80.1	[1]68.2	[1]62.7	[1]56.0	87.0	[1]0.6	8.4	26.9	42.5	296.3	14.9	26.4	2.0	5
[1]11.3	.....	.....	[1]76.8	[1]73.7	.....	[1]6.5	[1]15.0	10.9	34.7	.....	.....	[1]17.4	2.6	.....	[1]2.1	5.2	14.4	6
59.7	41.9	44.0	[1]8.5	3.7	39.2	37.4	9.6	18.4	66.9	87.3	87.4	18.0	22.4	54.2	10.6	10.9	19.7	7
18.0	66.8	35.3	0.2	13.4	15.3	10.3	32.1	51.9	48.2	143.2	104.4	22.5	25.6	95.9	75.7	73.5	88.5	8
27.7	.....	.....	3.0	31.3	.....	73.7	48.1	123.1	138.4	.....	.....	52.7	90.6	.....	76.5	69.6	151.3	9
32.3	31.3	12.9	[1]14.3	14.2	[1]11.2	14.5	[1]2.2	4.8	60.9	86.0	73.6	20.1	30.3	76.5	30.4	26.5	38.6	10
[1]9.9	32.8	19.7	35.5	9.5	[1]8.6	37.2	49.3	59.0	45.9	27.5	27.7	22.2	36.0	61.0	71.7	72.7	109.2	11
151.4	.....	.....	[1]16.4	33.4	.....	246.1	189.5	423.5	30.5	.....	.....	[1]11.0	5.8	.....	25.3	14.8	74.7	12
85.7	6.4	13.3	[1]10.7	[1]5.6	45.0	44.9	23.8	15.6	50.9	94.2	95.3	4.7	15.4	46.0	15.2	15.5	19.6	13
16.4	106.4	90.9	42.3	70.0	57.7	31.2	60.9	91.0	84.1	148.9	105.8	64.6	65.1	135.2	100.4	102.8	142.2	14
56.6	.....	.....	[1]46.3	[1]10.6	.....	80.3	60.5	168.5	191.2	.....	.....	45.7	80.9	.....	62.4	67.1	151.9	15

TABLE 16.—IRON AND STEEL—PER CENT OF TOTAL CAPITAL AND PRODUCTS, BY BRANCHES AND GEOGRAPHIC DIVISIONS: 1880 TO 1905.

DIVISION.	Census.	PER CENT OF TOTAL.								
		Capital.			Products.					
					Value.			Tons.		
		Total.	Blast furnaces.	Steel works and rolling mills, and forges and bloomeries.	Total.	Blast furnaces.	Steel works and rolling mills, and forges and bloomeries.	Total.	Blast furnaces.	Steel works and rolling mills, and forges and bloomeries.
United States		100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
New England states	1905	3.0	0.2	3.9	2.1	0.2	2.8	0.8	0.1	1.5
	1900	3.7	0.2	4.8	2.3	0.2	3.0	0.7	0.1	1.3
	1890	3.2	1.3	4.1	3.1	0.6	4.3	1.3	0.3	2.5
	1880	5.0	2.2	7.1	4.9	1.2	6.5	2.9	0.8	5.3
Middle states	1905	62.7	54.2	65.6	58.1	51.6	60.3	55.1	51.7	58.1
	1900	60.9	54.9	63.0	59.2	52.8	61.4	54.6	50.3	58.8
	1890	62.0	51.2	67.2	61.4	56.8	63.5	58.3	54.1	63.2
	1880	63.3	60.3	65.5	60.9	62.5	60.2	61.8	63.5	60.0
Southern states	1905	7.0	14.9	4.3	7.8	14.2	5.7	11.3	16.4	6.6
	1900	7.8	18.2	4.3	7.9	16.2	5.1	11.7	18.0	5.7
	1890	10.4	22.3	4.7	8.4	15.4	5.2	12.6	18.5	5.6
	1880	10.4	13.3	8.3	7.7	8.7	7.3	8.5	9.3	7.6
Western states	1905	27.3	30.7	26.2	32.0	34.0	31.2	32.8	31.8	33.8
	1900	27.6	26.7	27.9	30.6	30.8	30.5	33.0	31.6	34.2
	1890	24.4	25.2	24.0	27.1	27.2	27.0	27.8	27.1	28.7
	1880	21.3	24.2	19.1	26.5	27.6	26.0	26.8	26.4	27.1

At each census the Middle states or division has ranked first; the Western, second; the Southern, third; and the New England, fourth, with respect to capital, average number of wage-earners, and products, whether measured by value or quantity, in the industry as a whole and in each of the branches; excepting that in 1900 the New England states ranked third in capital invested in steel works, rolling mills, forges and bloomeries, and the Southern, fourth; and in 1890 the Southern ranked second in average number of wage-earners and the Western, third.

In the matter of absolute increase in the principal items for the census period 1900 to 1905, the geographic divisions rank in the same order, the increase in capital ranging from an increase of $234,842,289 in the Middle states, as deduced from Table 14, to an increase of $6,330,185 in the New England states; and in products, from an increase of $50,510,679 in value and 3,078,007 tons in quantity in the Middle states to an increase of $661,940 in value and 78,544 tons in quantity in the New England states.

The rates of increase and the proportions of the totals of capital and products presented in Tables 15 and 16, respectively, have varied, however, very materially. For the period 1880 to 1890 capital increased at the greatest rate in the Western division, with the Southern second in this respect, and the Middle third. In the case of products the Southern division showed the greatest rate of increase, with the Western second and the Middle third. The growth in the Southern division during the period was chiefly in the pig iron industry, and the ratio of increase therein largely exceeded that of the other divisions. In the steel works and rolling mills branch of the industry, including forges and bloomeries, the rates of increase in the Middle and Western divisions were approximately the same and much greater than in the Southern division. During this census period the increase in New England was small and confined to the steel works and rolling mills; blast furnaces showing a decrease for all items except in tonnage of pig iron.

For the census period 1890 to 1900 the proportionate increase in capital was largest in the New England states and all in the steel works and rolling mills section. The Western division was next, and had the largest increase in products in the industry as a whole and in both of its branches, followed by the Middle division and then by the Southern.

For the census period 1900 to 1905, ignoring the New England division, which shows large proportionate increase in tonnage of products though the quantity is small, the Middle division shows the greatest rate of increase both in capital and in tonnage of products, followed by the Western and then by the Southern; while the Western division leads in this respect in value of products. In each case the rate of increase is greatest in the steel works and rolling mills branch of the industry. It will be seen by reference to Table 16 that during the twenty-five years since 1880 the proportionate share of the total capital invested has largely increased for the Western division for both branches of the industry; in the Southern division it has increased for blast furnaces and decreased for steel works and rolling mills and the industry as a whole; and in the Middle division it is practically unchanged for steel works and rolling mills and has

decreased for blast furnaces and the industry as a whole. In the matter of products the proportionate share of the Western division has increased in value and quantity for the industry as a whole and in both departments; the Southern division has increased its proportionate share of blast furnace products and for the industry as a whole, with a decrease in the proportion of the products of steel works and rolling mills; while the Middle division shows a material proportionate decrease in the tonnage and value of products for blast furnaces and the industry as a whole, with a small decrease in the proportionate share of the tons of products of steel works and rolling mills and a slight increase in value. In general, Tables 15 and 16 show for the quarter of a century a more rapid growth in the Western and Southern states, and in the case of the former group a material increase in relative importance.

The following tabular statement shows the percentage of the products both as to value and quantity, contributed by the two branches of the industry, by geographic divisions, for each census from 1880 to 1905:

Per cent of total value and quantity of products, by branches and geographic divisions: 1880 to 1905.

DIVISION.	Census.	VALUE.		TONS.	
		Blast furnaces.	Steel works and rolling mills, and forges and bloomeries.	Blast furnaces.	Steel works and rolling mills, and forges and bloomeries.
United States	1905	25.6	74.4	47.7	52.3
	1900	25.7	74.3	49.0	51.0
	1890	30.4	69.6	54.4	45.6
	1880	30.1	69.9	52.0	48.0
New England states	1905	2.4	97.6	5.8	94.2
	1900	1.8	98.2	6.6	93.4
	1890	5.9	94.1	14.2	85.8
	1880	7.2	92.8	14.5	85.5
Middle states	1905	22.7	77.3	44.8	55.2
	1900	22.9	77.1	45.1	54.9
	1890	28.1	71.9	50.5	49.5
	1880	30.9	69.1	53.4	46.6
Southern states	1905	46.2	53.8	69.5	30.5
	1900	52.7	47.3	75.1	24.9
	1890	56.3	43.7	79.9	20.1
	1880	33.8	66.2	57.0	43.0
Western states	1905	27.3	72.7	46.1	53.9
	1900	25.9	74.1	47.0	53.0
	1890	30.6	69.4	52.9	47.1
	1880	31.4	68.6	51.4	48.6

For the United States as a whole the products of the steel works and rolling mills constitute approximately three-fourths of the total in value and the blast furnace products one-fourth, and there has been in the main an increase in the proportionate share for steel works and rolling mills with each census. The same may also be said of the Middle and Western states. In the Southern states the blast furnace products form nearly one-half of the total in value and more than two-thirds in tonnage. In 1890, as compared with 1880, there was a very heavy increase in the blast furnace industry in the Southern states, as compared with steel works and rolling mills, since which time the products of the steel works and rolling mills have been gaining on the blast furnaces. In the New England states the blast furnace products form but a small part of the combined total.

The New England states.—In the New England states there is shown a substantial increase in capital since 1900, practically all in steel works and rolling mills; likewise, large increases for the decades ending in 1900 and 1890.

The products of the steel works and rolling mills have increased with each census, and the proportionate share of the total for the United States has slightly increased in tonnage since 1900, although slightly decreasing in proportionate value.

The pig iron product is all charcoal pig.

The 17 establishments in the New England states in 1905 engaged in the manufacture of steel or of rolled iron or steel products do not include 3 establishments otherwise classified, and whose products were all consumed in construction of machinery, etc. The capital invested in the active establishments includes $325,000 of rented property in 1905 and $115,000 of rented property in 1890.

Since the census of 1900 the New England states have become steel producers. There are 9 establishments in Massachusetts, Rhode Island, and Connecticut having steel making equipments, including 2 establishments in Massachusetts otherwise classified, 1 as "foundry and machine shop products," and 1 as "electrical machinery," and 1 in Connecticut classified as "cutlery and edge tools;" but not including 1 governmental establishment. The steel equipment of these establishments includes 3 converters of a daily capacity of 208 tons, including 1 Clapp-Griffiths and 2 Tropenas converters (the Government establishment has 1 Tropenas converter) and 20 open-hearth steel furnaces of 1,095 tons daily capacity, of which 10, of 365 tons daily capacity, are acid, and 10, of 730 tons daily capacity, are basic. Of the open-hearth furnaces, 3 acid furnaces, of 45 tons daily capacity, are in the "otherwise classified" industries. The tabulated steel output of the New England states in 1905 was 300 tons of Bessemer steel ingots; 168,928 tons of open-hearth steel ingots, of which 33,774 tons were acid and 135,154 tons were basic; 2,446 tons of open-hearth steel castings; and 4,778 tons of crucible steel. The total product was 176,452 tons of steel, of a value of $3,963,006.

The Middle states.—The Middle states show a decrease of 46 in the number of establishments, with an increase of $234,842,289, or 65.3 per cent, in capital since 1900, the largest in amount and per cent of any of the divisions for this period. The increase is relatively a little the larger in steel works and rolling mills.

The total number of active blast furnace establishments in the Middle states in 1905 was 79, compared

with 95 in 1900, 140 in 1890, and 179 in 1880. The capital invested includes rented property valued at $2,116,480 in 1905, $3,165,181 in 1900, and $2,210,000 in 1890. The reduction in number of wage-earners employed in the blast furnace industry is due to improvements in equipment, chiefly in the use of pig casting machines and in improved charging and ore handling devices. Of the pig product, 32,704 tons were charcoal pig iron and 8,568,470, mineral fuel pig.

In addition to the 227 establishments in the Middle states that produced steel ingots or castings or rolled iron and steel in 1905, there were 10 establishments otherwise classified. The distribution and equipment of the latter are shown in Table 13. The capital invested in active establishments includes $7,741,886 of rented property in 1905, $10,564,736 in 1900, and $978,000 in 1890.

The Southern states.—The Southern states show a decrease of 11 blast furnace establishments and an increase of 10 steel works and rolling mills, making a net decrease of 1. The increase in the number of wage-earners is relatively small, owing to the fact that in the Southern states the blast furnace branch forms a relatively larger part of the iron and steel industry than in the other divisions, and the improvements in blast furnace equipment have materially reduced the number of wage-earners required.

The capital reported for the furnace establishments in the Southern states includes rented property of the value of $251,500 in 1905, $460,500 in 1900, and $783,000 in 1890.

The steel works and rolling mills in the Southern states do not include 1 establishment classified as "shipbuilding, iron and steel," and having a Tropenas converter, the steel product being used in their works. There is included in invested capital for steel works and rolling mills the value of rented property as follows: $714,000 in 1905, $957,313 in 1900, and $500,000 in 1890.

The steel production of the Southern states in 1905 amounted to 841,671 tons, of a value of $15,302,150. This comprised 607,343 tons of Bessemer steel (606,166 tons of ingots and 1,177 castings), 233,152 tons of basic open-hearth steel ingots, 570 tons of basic open-hearth steel castings, 6 tons of crucible steel ingots, and 600 tons of crucible steel castings. The 10 establishments in the Southern states which are equipped for steel making have 10 Bessemer converters of a daily capacity of 4,460 tons and 21 open-hearth steel furnaces of a daily capacity of 1,496 tons. Of the open-hearth furnaces, 20 are basic and 1 acid. The figures do not include the equipment of 1 establishment otherwise classified, nor one 2-gross ton Tropenas steel converter at the Naval Gun Factory, Washington, District of Columbia.

The Western states.—The value of the rented property included in the amount of capital reported for the Western states was $957,753 in 1905, $1,821,091 in 1900, and $3,687,058 in 1890. The value of the rented property was distributed as follows: In blast furnaces, $790,303 in 1905, $1,271,200 in 1900, and $2,068,058 in 1890; and in steel works and rolling mills, $167,450 in 1905, $549,891 in 1900, and $1,619,000 in 1890.

There were also 17 establishments otherwise classified in the Western states in 1905 which were provided with equipments for the making of steel or rolled iron and steel products for their own use. Four of these establishments reported the manufacture of 3,608 tons of steel as partial products. The distribution and classification of these is given in Table 13.

THE ELECTROTHERMIC METALLURGY OF IRON AND STEEL.

In addition to the iron and steel products which have been considered, certain of the ferroalloys—ferrochrome, ferrosilicon, etc.—were produced by the Electric Smelting and Aluminum Company (The Cowles Company) of Lockport, N. Y., and the Willson Aluminum Company with plants at Holcombs Rock, Va., and Glen Ferris, W. Va. These products are used in the steel industry as steel hardening materials. The statistics relating to these products can not be reported separately, and they are therefore consolidated with those of like products of the electric furnace, such as calcium carbide, carborundum, etc., and reported under the group of "substances produced by the aid of electricity," Group VIII of the report on chemicals.

Except in the ferro products above referred to, the electric furnace does not figure in the census of 1905 as a producing agent in the iron and steel industry. It is likely, however, to become an important feature of the iron and steel metallurgy of the future.

The Héroult furnace has been operated at La Praz, France, and at Kortfors, Sweden, since 1900, and over 5,000 tons of steel have been produced. Extensive tests of the manufacture of pig iron in the Héroult furnace were made during the last year at Sault Ste. Marie, Ontario, under the auspices of a commission appointed by the Canadian government. The Kjellin furnace has been operated at Gysingen, near Stockholm, Sweden, since 1901, and several thousand tons of high grade steel have been produced. The Keller furnace has been operated quite extensively at the works of Keller, Leleux & Co., at Livet and at Kerrousse, France. The Stassano furnace has produced steel in the government gun foundry at Turin, Italy.

Since the close of the canvass for the manufacturing census of 1905 there has been considerable activity in the field of electric smelting. The Héroult electric steel refining process, in a 50-ton per day furnace, has been installed at the works of the Holcomb Steel Company, Syracuse, N. Y., and an electric induction steel furnace (Colby) at the works of Henry Disston & Sons, Philadelphia.

The Virginia Electrolytic Company at Holcombs Rock, Va., an offshoot of the Willson Aluminum Company, now makes ferroalloys and metallic silicon, the Willson Aluminum Company at Glen Ferris, Va., making principally ferrochrome. Considerable quantities of the ferroalloys have also been made in the Niagara Research Laboratories, Niagara Falls, N. Y., and an outcome of this work is the formation in 1907 of the Electro Metallurgical Company for making low carbon ferroalloys at Niagara Falls. The Titanium Manufacturing Company is also erecting works at Niagara Falls for making ferrotitanium.

As a result of the experimental work in iron smelting at Sault Ste. Marie, the Noble Electric Steel Company is erecting a Héroult electric furnace plant for reduction of iron ore at Héroult-on-the-Pitt, Shasta county, Cal. At Newmire, Colo., reduction works have been started by the Vanadium Alloys Company for the production of vanadate of iron and ferrovanadium.

The salient features of the several types of electric furnaces which have been used commercially are as follows:

The Héroult electric furnace, as used for the experimental smelting of iron ore at Sault Ste. Marie, Ontario, consists of a short cylindrical stack having a carbon-lined crucible hearth connected with one circuit terminal, and a massive carbon electrode adjustably suspended from above and extending down into the furnace chamber. The carbon electrode used was 16 by 16 inches by 6 feet long and the furnace chamber was approximately 30 inches in diameter.

The Héroult furnace, as used for steel making, is of the tilting open-hearth type. Two massive electrodes, carried by vertically adjustable supports which are attached to the furnace structure, pass through the roof of the furnace. The current passes from one electrode through an air gap to the slag, through this to the underlying molten metal, thence through the latter and back through the slag and the air gap to the other electrode. It thus forms two arc fields between the slag and the respective electrodes. The intensity of the current is controlled by regulating the gap between the electrodes and the slag.

The Kjellin furnace, as operated at Gysingen, Sweden, is of the induction type, using a primary alternating current of 90 amperes and 3,000 volts and developing in the charge, which is in an annular pocket, a current of 3,000 amperes at 7 volts. In its present form the furnace permits of tipping for pouring the charge. The product is an exceptionally pure steel akin to crucible steel.

The Keller furnace for ore smelting is of the resistance type, and consists in general of two or more shafts connected at the bottom by a lateral canal, which widens out midway between the shafts to form a reservoir, or hearth, for the molten metal. Each shaft has a massive carbon electrode extending down from above, and the charge is fed progressively into the shafts around the electrodes. The molten metal is tapped from the reservoir, or hearth, and the slag is tapped from each shaft at a higher level than the reservoir tap. Certain structural features govern the starting of the furnace. The resistance of the charge develops its heat of fusion, and the reduced metal, flowing along the canal, conducts the current from one shaft to the other.

The Stassano furnace is of the arc type, a 3-phase alternating current being distributed to 3 electrodes which pass into the furnace radially and at an angle inclined slightly downward, and nearly meet in the center above the charge, which is not in circuit. The furnace, its hearth being of a crucible form, stands with its vertical axis inclined about 7 degrees from the vertical, and when in operation the whole furnace is rotated to mix the charge and subject all parts thereof to a uniform heat.

Certain results, as given in the report of the Canadian commission on the electric smelting of iron ores, are as follows: Pig iron (gray iron) to the amount of 11,989 pounds was produced from magnetite ore (55.85 Fe), with charcoal as the reducing agent and limestone and sand as flux, at the rate of 9.92 short tons of pig per 1,000 electric horsepower days. The power used was 221.34 electric horsepower (mean amperes, 4,987; mean volts on furnace, 36.03) and the length of the run was sixty-five hours and thirty minutes. It is stated by Doctor Héroult that an output of 12 tons of pig iron per day may be obtained with 1,000 electric horsepower. On a run on roasted pyrrhotite (45.80 Fe), with charcoal and limestone as above, there was produced 7,336 pounds of ferronickel pig at the rate of 7.038 short tons per 1,000 electric horsepower days. The power used was 222.05 electric horsepower (mean amperes, 5,000; mean volts on furnace, 36.05) and the length of the run was fifty-six hours and twenty-nine minutes.

A description of the Héroult electric steel process, as introduced at the works of Richard Lindenberg, Remscheid, Germany, is given in the Iron Age of August 30, 1906. The plant consists of a 2-ton Wellman open-hearth furnace, in which the raw material, principally scrap, is melted down, and the process is so conducted that the steel is overoxidized. The steel is then transferred to the Héroult electric furnace. The quantity charged is about 2 tons, and the steel is purified in the electric furnace by the addition of scale or ore, and thus the elements in the metals, such as silicon, carbon, manganese, and phosphorus, are oxidized; sulphur, however, is not so affected. The slag is cast off by tilting the furnace. Then a neutral slag is formed by additions of lime and sand, under which deoxidation is carried on by means of carbon. The yield is on an average 92.5 per cent in the form of hammered blooms.

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The phosphorus contents of the steel has averaged 0.005 per cent and the sulphur, 0.012 per cent.

Experience has shown that with a 2-ton furnace the cost of steel can be reduced to 120 marks ($30) per ton, and it is estimated that with a 10-ton furnace it can be brought down to 90 marks ($22.50) per ton. With the 2-ton furnace the requirement of electric power is 360 kilowatts per ton of steel, and with a 10-ton furnace only 150 kilowatts will be required.

In a paper by S. E. Ibbotson, of Sheffield, read at the joint meeting of the Iron and Steel Institute and of the American Institute of Mining Engineers, in London, July, 1906, on the operations of the Kjellin electric steel furnace, it was stated that there was produced during the year ending May 31, 1906, at Gysingen, Sweden, 950 tons of tool steel and special steel ingots from a furnace giving 2,240 pounds of steel per tap. The bulk of the steel was made from charges composed of 80 per cent Swedish pig iron and 20 per cent steel scrap, the percentage of carbon being regulated by the addition of briquettes. The average time per charge for white iron and scrap charges was five and one-half hours and the electrical energy consumed was 886 kilowatt hours per ton. When briquettes were added, the average time per charge was seven and one-eighth hours and the electrical energy consumed was 1,128 kilowatt hours per ton.

In the line of special steels there has been produced tungsten steel (including permanent magnet steel), chromium steel, nickel steel, nickel-chromium steel, self-hardening steel, and high-speed tool steel.

A 736-kw, or approximately 1,000 electric horsepower tilting Kjellin furnace for steel manufacture has lately (1907) been completed at the Roechling iron and steel works in Voelklingen, Germany. It has a capacity of 24 tons of steel, 15 tons being poured at the end of the run, the balance remaining in the furnace for the next run. The following extract from a recent publication is of interest in this connection:[1]

An interesting and quite novel feature of the same plant is a fourth induction furnace now in course of construction. It has a capacity of 150 tons, but is not intended for steel making and refining proper, but will be used as a mixer and reservoir to keep the hot molten metal, which is tapped from the ordinary metallurgical furnaces and which is to be refined in the electric furnace, in molten condition. From this reservoir molten metal is to be run into the electric furnace right after the completion of a run, so as to maintain as much as possible continuity of operation.

In this connection it is interesting to give a summary of electric induction furnaces installed for commercial operation. In this country we have a Colby induction furnace at the Disston Steel Works in Philadelphia. In Europe the following Kjellin induction furnaces have been installed:

Gysingen, Sweden: 150 kw., 955 kg. (2,100 pounds). This is the original Kjellin furnace.

Gurtnellen, Switzerland: International Calcium Co., 320 kw.

Voelklingen, Germany: Roechling Works. Of the following four furnaces the first three are in operation, the fourth in course of construction: First, 50 to 75 kw., capacity 50 to 60 kg. (110 to 130 pounds); second, 110 to 120 kw., capacity 300 kg. (660 pounds); third, 736 kw., pour 15 tons (15,000 kg., or 33,000 pounds); fourth, a 150-ton mixer to keep the metal molten.

Essen, Germany: Krupp Works, 746 kw.

Sheffield, England: Vickers, Sons & Maxim, 200 kg.

Araga, Spain: 200 kw.

There are further in course of construction a 300 to 400 kw. furnace at Guldsmedshyttan, Sweden, and another furnace of the same capacity at Poldihutte.

From the above figures for the furnaces at Gysingen and Voelklingen the following interesting figures on the relation between capacity of furnace and required electric capacity are derived:

Capacity in kg. steel	50 to 60	300	955	15,000
Electric power in kw	50 to 73	110 to 120	150	736
Approximate ratio of kw. to kg	1-1	1-3	1-6	1-20

These figures are very instructive in showing in a general way how the electric power required per unit of output decreases with increasing capacity of the furnace.

From the foregoing it appears that pig iron can not be produced by electric smelting, along the lines heretofore tried, on a commercial scale to compete with blast furnace production, except under conditions of very cheap electric current and high-priced coke. The Canadian commission reported as their conclusion that, with electric energy at $10 per electric horsepower per year and coke at $7 per ton, the cost of production is approximately the same as the cost of producing pig iron in a modern blast furnace. But this is a cost figure for electric energy that has not been reached except under peculiarly favorable conditions. The utilization of the blast furnace gases in large gas engine plants for the generation of electric power will undoubtedly give comparatively cheap power for electrometallurgic work in the iron and steel industry.

For the production of the ferroalloys the electric furnace has decided advantages over the blast furnace, on account of the high temperature readily attainable. For the production of crucible and high-grade steels the work done in electric furnaces indicates that they will be more and more used and that the electric steel product will be an important feature of the industry in coming years.

BLAST FURNACES.

The statistics concerning the production of pig iron, presented herewith, show the industry according to kind of fuel used, and also by grade of product, as well as for the industry as a whole.

The term "pig iron," used in its broadest sense, includes all ferro products of the blast furnaces, whether run into pigs or used in a molten state in Bessemer converters or open-hearth furnaces. As a matter of fact more than one-third of the pig iron produced is used in a molten state. Pig iron is

[1] Electrochemical and Metallurgical Industry, May, 1907, page 173.

classified according to the kind of fuel used; bituminous pig iron being iron made with bituminous fuel—that is, with coke, or coke and bituminous coal mixed; anthracite pig iron being iron made with anthracite coal, alone or mixed with coke; and charcoal pig iron being iron made with charcoal as fuel. Some charcoal and coke pig iron, made with a mixed fuel of charcoal and coke, was reported in 1900, but none was reported in 1905. The statistics are first presented for the entire industry, and then for the two general groups: mineral fuel—including all pig iron made with bituminous coal, coke, or anthracite coal—and charcoal fuel.

The blast furnace product is also classified or graded according to the use for which it is adapted, or the character of the iron, namely, Bessemer, low-phosphorus, malleable Bessemer, basic, foundry, and forge; and also spiegeleisen, ferromanganese, ferrosilicon, etc.

The active blast furnace establishments were in operation on an average 9.12 months in 1905, compared with 10.16 months in 1900, 9.23 months in 1890, and 8 months in 1880.

The production of all kinds of pig iron in the United States for the census year 1905 amounted to 16,628,294 tons, of a reported value of $228,977,535, compared with 14,452,234 tons, valued at $206,579,400, in 1900. The increase in tonnage was 2,176,060 tons, or 15.1 per cent.

Table 17 shows the growth of the blast furnace industry from 1870 to 1905, by census periods.

TABLE 17.—BLAST FURNACES—COMPARATIVE SUMMARY, WITH PER CENT OF INCREASE: 1870 TO 1905.

	CENSUS.					PER CENT OF INCREASE.			
	1905 [1]	1900 [1]	1890	1880	1870 [2]	1900 to 1905	1890 to 1900	1880 to 1890	1870 to 1880
Number of establishments	191	224	304	341	386	[3] 14.7	[3] 26.3	[3] 10.8	[3] 11.7
Capital	[4] $239,559,194	[4] $148,226,113	[4] $134,608,543	$89,531,362	$56,145,326	61.6	10.1	50.3	59.5
Salaried officials, clerks, etc., number	2,236	1,763	[5] 1,068	(6)	(6)	26.8	65.1	.....	.....
Salaries	$2,897,917	$2,308,420	[5] $1,611,687	(6)	(6)	25.5	43.2	.....	.....
Wage-earners, average number	35,178	39,358	33,415	41,695	27,554	[3] 10.6	17.8	[3] 19.9	51.3
Total wages	$18,947,913	$18,500,462	$14,614,458	$12,655,428	$12,475,250	2.4	26.6	15.5	1.5
Men 16 years and over	35,093	39,261	33,341	40,503	26,962	[3] 10.6	17.8	[3] 17.7	50.2
Wages	$18,929,782	$18,480,649	$14,600,658	(6)	(6)	2.4	26.6	.....	.....
Women 16 years and over	4	6	(7)	9	54	[3] 33.3	.....	.....	[3] 83.3
Wages	$954	$1,352	(7)	(6)	(6)	[3] 29.4	.....	.....	.....
Children under 16 years	81	91	74	1,183	538	[3] 11.0	23.0	[3] 93.7	119.9
Wages	$17,177	$18,461	$13,800	(6)	(6)	[3] 7.0	33.8	.....	.....
Miscellaneous expenses	$9,791,139	$7,463,234	$6,342,675	(7)	(7)	31.2	17.7	.....	.....
Cost of materials used	$178,967,449	$131,536,424	$110,098,615	$58,619,742	$45,498,017	36.1	19.5	87.8	28.8
Value of products [8]	$231,889,126	$206,823,202	$145,643,153	$89,315,569	$69,640,498	12.1	42.0	63.1	28.3
Tons of pig iron	16,628,294	14,452,234	8,845,185	3,375,912	1,832,876	15.1	63.4	162.0	84.2

[1] Includes 1 penal institution, the statistics for which are not included in the detailed summary.
[2] Includes idle establishments, which were not reported separately in 1870.
[3] Decrease.
[4] Includes value of rented property—1905, $3,158,283; 1900, $4,896,881; 1890, $5,061,058.
[5] Includes proprietors and firm members with their salaries; number only reported in 1900 and 1905, but not included in this table.
[6] Not reported separately.
[7] Not reported.
[8] Includes value of miscellaneous products for which tonnage was not reported.

A decrease in the number of establishments shown at each census will be noted, together with an increase in capital, operating expenses, and products. In 1905, as compared with 1900, there was a decrease of 33 active establishments, with an increase of $91,333,081 in reported capital. Accompanying the increase in production from 1900 to 1905 there is a decrease of 4,180 in the average number of wage-earners employed, there being 35,178 wage-earners reported in 1905, as compared with 39,358 in 1900. In 1890 the pig iron product showed an average for the year of 265 tons per wage-earner; while in 1900, through the use of larger furnaces, improvements in labor saving devices, etc., the pig iron product per wage-earner had risen to 367 tons. This gain in industrial economy continues, the last census showing an average pig iron product for the year of 473 tons per wage-earner, an increase of 28.9 per cent over 1900. As the number of wage-earners reported for 1880, as well as the amount of wages paid, includes a large number of employees engaged in mining and other operations, no comparisons can be made with that year.

The improvements in equipments and methods has resulted in the steady lowering of the labor item in the cost of production, as shown by the following tabular statement:

Relation of capital and specified items of expense to products.

	1905	1900	1890
Capital, per ton of product	$14.41	$10.26	$15.22
Expense, per ton of product	12.66	11.06	15.00
Salaries	0.17	0.16	0.18
Wages	1.14	1.28	1.65
Miscellaneous expenses	0.59	0.52	0.72
Cost of materials used	10.76	9.10	12.45
Value of all products, per ton of pig iron product	13.95	14.31	16.47

Materials cost $47,431,025 more in 1905 than in 1900, and the average cost of materials per ton of product shows an advance of $1.66 per ton of pig iron over that in 1900, although it is $1.69 per ton of product less than it was in 1890. Miscellaneous expenses, in like manner, show an advance of $2,327,905, and an increase of 7 cents per ton of pig iron product over 1900, but a decline of 13 cents per ton from 1890. The labor cost per ton of pig iron was reduced from $1.65 per ton in 1890 to $1.28 in 1900, a decrease of 22.4 per cent, and a further drop to $1.14 per ton in 1905, or 10.9 per cent.

The reduction in the number of wage-earners employed in the blast furnace industry has been chiefly due to the use of pig casting machines in place of sand casting, and to improvements in charging devices and in ore handling machines for stocking and charging.

The value of the products at the census of 1905 exceeded that in 1900 by $25,065,924, although the average value per ton of pig iron shows a decline of 36 cents. As these values of products include some by-products, they are not to be taken for net pig iron values, which will be considered later.

Table 18 is a comparative summary, by states, of the leading statistics of the pig iron industry for the censuses from 1880 to 1905, inclusive.

In 1905 there were blast furnaces in 23 states, but the furnaces in 3 of these states—North Carolina, Oregon, and Washington—were idle. In 1900 there were blast furnaces in 23 states (in the same states as in 1905), those in 2 states—Washington and Oregon—being idle. In 1890, 24 states produced pig iron, and 1 state—Minnesota—had an idle furnace, and in 1880 there were 22 producing states and 2 states and 1 territory—Minnesota, North Carolina, and Utah—in which the furnaces were idle. Pennsylvania is still far in advance of the other states as a producer of pig iron; Ohio, Illinois, and Alabama follow, as at the last census, in the order named. New York, which ranked seventh in 1900, has advanced to fifth place.

All of the states for which individual figures are given in the foregoing table, except Tennessee and Virginia, show an increase in the value of products from 1900 to 1905; and of the states included under "all other states," Colorado, Connecticut, Maryland, and Massachusetts reported increases in pig iron production. No pig iron product was reported from North Carolina at this census.

The decrease in Tennessee amounted to $1,265,166, or 27 per cent, and in Virginia to $3,161,791, or 48.6 per cent of the output of 1900. There were 13 idle blast furnace establishments reported in Virginia for 1905, and 7 in 1900. Of the 3 states for which detailed statistics were given in 1900 but not in 1905—Maryland, Texas, and West Virginia—Maryland and West Virginia report substantial increases and Texas a relatively large decrease. The decrease in the latter state was due to the fact that 2 blast furnaces which were active in 1900 were idle in 1905. The Texas product for 1905 was solely that of a furnace owned and operated by the state.

As before noted, the wage-earners employed in the manufacture of pig iron were less in number in 1905 than in 1900, although they received a larger average wage and turned out a much larger product.

In the early years practically all pig iron was sand cast, requiring a large amount of labor for handling the same. Now, however, more than one-third is delivered in a molten state to the mixers, converters and furnaces of steel plants, and one-fourth is machine cast.

Less than 40 per cent is represented by sand, chill, or direct castings. These changes in practice account in part for the decrease in blast furnace labor. In addition, the improvements in mechanical charging and in conveniences and methods for handling the slag have reduced the number of men required for a furnace crew.

The following states show fewer wage-earners in 1905 than in 1900, with an increase in the value of products: Alabama, Illinois, Ohio, Pennsylvania, and Wisconsin. The state of Illinois is most marked in this particular, the wage-earners and wages paid showing a decrease of 36.5 and 35.8 per cent, respectively, while the value of products show a large increase. As the quantity rather than the value of products manufactured is the best gauge of progress, a tabular statement is presented herewith showing the number of tons of pig iron produced per wage-earner and the average wage per ton of pig iron produced, for 1890, 1900, and 1905.

	Pig iron, tons per wage-earner.			Average wage per ton of pig iron.		
	1905	1900	1890	1905	1900	1890
United States	473	367	265	$1.14	$1.28	$1.65

This shows an increase in the number of tons of pig iron product per wage-earner of 38.5 per cent from 1890 to 1900, and of 28.9 per cent from 1900 to 1905; while the labor cost per ton of pig iron decreased 22.4 per cent from 1890 to 1900 and 10.9 per cent from 1900 to 1905.

The reduction in the labor factor through the improvements in equipment, as might be expected, is balanced by a coordinate increase in the capital invested. The investment in buildings, machinery, tools, and implements in 1905 in active establishments averaged $8.24 per ton of pig iron produced, as compared with $5.48 per ton in 1900, an increase of 50.4 per cent; and in the 5 leading states noted in the above statement this same item shows a corresponding increase.

TABLE 18.—BLAST FURNACES—COMPARATIVE SUMMARY, BY STATES: 1880 TO 1905.

STATE.	Census.	Number of establishments.	Capital.	SALARIED OFFICIALS, CLERKS, ETC.		WAGE-EARNERS AND WAGES.		Miscellaneous expenses.	Cost of materials used.	Value of products.
				Number.	Salaries.	Average number.	Wages.			
United States	1905	191	[1] $239,559,194	2,236	$2,897,917	35,178	$18,947,913	$9,791,139	$178,967,449	$231,889,126
	1900	224	[1] 148,226,113	1,763	2,308,420	39,358	18,500,462	7,463,234	131,536,424	206,823,202
	1890	304	[1] 134,608,543	[2] 1,068	[2] 1,611,687	33,415	14,614,458	6,342,675	110,098,615	145,643,153
	1880	341	89,531,362	(3)	(3)	41,695	12,655,428	(4)	58,619,742	89,315,569
Alabama	1905	19	19,325,778	262	320,643	4,954	1,939,208	445,152	11,012,233	16,645,793
	1900	19	11,690,184	148	237,313	5,034	1,382,017	788,389	7,610,270	13,487,769
	1890	28	15,778,786	150	262,396	3,989	1,521,304	932,227	6,493,884	10,315,691
	1880	7	2,707,196	.....	.....	1,566	553,713	.....	575,673	1,405,356
Connecticut [5]	1890	5	940,092	12	16,247	117	50,634	39,496	412,743	574,438
	1880	6	1,172,000	.....	.....	139	65,974	.....	471,467	644,911
Georgia	1905	4	1,158,151	41	44,838	303	112,698	37,536	720,836	943,204
	1900	3	666,916	18	13,295	194	48,391	8,360	237,421	391,599
	1890	4	748,845	15	19,175	254	45,501	52,770	237,836	339,422
	1880	5	712,000	.....	.....	754	77,415	.....	241,796	466,890
Illinois	1905	4	14,263,055	83	100,661	1,910	1,397,969	958,945	19,005,423	27,330,836
	1900	4	10,683,913	210	294,524	3,010	2,176,274	691,724	11,707,965	15,153,646
	1890	5	9,855,274	11	23,115	1,420	896,630	215,252	8,088,153	10,138,310
	1880	3	950,000	.....	.....	498	185,054	.....	1,762,609	2,391,856
Kentucky [5]	1890	4	826,199	16	17,038	262	88,482	49,655	461,608	665,763
	1880	9	2,098,035	.....	.....	1,890	429,988	.....	801,410	1,248,652
Maryland [6]	1900	3	1,388,000	14	17,148	659	302,068	147,634	2,562,412	3,072,746
	1890	5	3,108,222	9	7,530	630	143,812	23,830	1,316,559	1,632,004
	1880	12	2,197,125	.....	.....	1,443	339,978	.....	956,806	1,700,339
Michigan	1905	11	4,383,106	97	109,596	1,139	587,724	203,657	3,104,136	4,643,538
	1900	7	2,029,713	44	64,451	513	216,030	131,047	1,404,924	2,327,153
	1890	15	5,259,001	57	95,312	675	321,022	271,067	2,935,233	3,982,278
	1880	13	2,671,386	.....	.....	2,164	561,870	.....	2,091,224	3,145,062
Missouri [5]	1890	5	1,883,470	27	37,763	627	261,203	73,138	1,247,688	1,716,983
	1880	4	2,460,000	.....	.....	1,185	227,111	.....	1,685,124	2,275,017
New Jersey	1905	5	5,414,051	32	43,715	774	370,751	191,355	2,940,780	3,601,511
	1900	9	2,474,639	50	44,888	589	292,213	90,619	1,987,594	2,546,215
	1890	8	3,131,306	15	22,386	640	240,152	129,384	1,679,937	2,228,724
	1880	12	3,644,500	.....	.....	1,174	365,639	.....	2,488,670	3,428,747
New York	1905	9	15,188,910	76	157,145	1,559	1,161,179	308,332	6,373,563	8,634,737
	1900	9	4,003,641	45	81,221	1,033	632,393	288,587	3,508,100	5,046,145
	1890	16	6,443,208	52	91,181	1,410	581,107	349,788	4,212,888	5,182,606
	1880	30	8,836,471	.....	.....	2,518	902,929	.....	4,166,622	6,816,241
Ohio	1905	33	43,856,382	395	568,258	5,434	3,471,083	1,812,570	32,476,727	40,862,451
	1900	43	23,296,130	286	342,271	6,039	3,286,644	1,266,259	23,543,473	40,306,637
	1890	46	11,750,497	167	200,800	4,057	1,856,237	740,283	15,696,665	19,800,268
	1880	62	13,002,586	.....	.....	8,944	2,725,157	.....	9,149,620	13,038,193
Pennsylvania	1905	65	109,314,103	891	1,113,956	13,867	7,763,931	4,579,941	86,321,875	107,455,267
	1900	77	74,850,426	609	786,852	16,075	8,038,016	3,269,022	64,095,277	101,575,487
	1890	116	59,321,570	355	561,407	15,612	7,084,308	2,684,671	57,222,481	75,239,203
	1880	137	41,488,294	.....	.....	13,460	4,752,838	.....	29,675,075	45,573,750
Tennessee	1905	13	5,939,783	128	127,831	1,358	545,861	205,303	2,609,157	3,428,049
	1900	13	5,303,695	81	103,258	1,763	438,929	214,267	3,168,581	4,693,215
	1890	11	3,685,806	64	87,616	1,012	438,376	185,574	2,460,882	3,366,464
	1880	9	1,422,626	.....	.....	1,579	261,897	.....	489,440	840,022
Texas [7]	1900	3	379,215	14	9,160	248	42,661	8,229	90,439	172,468
	1880	1	40,000	.....	.....	140	27,720	.....	23,580	36,000
Virginia	1905	10	3,157,268	69	81,865	1,081	346,471	175,308	2,717,051	3,343,427
	1900	16	5,027,752	116	146,764	1,594	528,567	160,399	4,374,316	6,505,118
	1890	15	4,156,206	60	80,207	1,268	478,105	273,278	2,820,167	3,925,481
	1880	8	1,391,500	.....	.....	1,221	255,986	.....	205,548	440,635
West Virginia [6]	1900	3	1,080,553	24	21,051	492	227,235	58,787	1,693,042	3,119,301
	1890	4	1,446,082	13	16,758	411	182,175	59,143	1,503,847	2,009,505
	1880	8	1,322,425	.....	.....	893	240,158	.....	1,158,611	1,631,096
Wisconsin	1905	4	2,649,011	39	62,859	482	257,024	160,576	2,250,807	3,074,712
	1900	5	1,891,765	26	41,825	551	307,733	109,478	2,015,134	2,900,237
	1890	8	3,546,340	16	30,154	595	276,887	175,405	2,378,036	3,114,892
	1880	7	2,068,218	.....	.....	853	357,354	.....	2,101,393	3,295,835
All other states	[8] 1905	14	14,909,596	123	166,550	2,317	994,014	712,464	9,434,861	11,925,601
	[9] 1900	10	3,460,171	78	104,399	1,564	581,291	230,553	3,537,476	5,465,366
	[10] 1890	9	2,727,579	29	42,512	436	149,123	87,714	940,658	1,411,121
	[11] 1880	8	1,357,000	.....	.....	1,274	324,647	.....	575,074	936,913

[1] Includes value of rented property—1905, $3,158,283; 1900, $4,896,881; 1890, $5,061,058.
[2] Includes proprietors and firm members, with their salaries; number only reported in 1900 and 1905, but not included in this table.
[3] Not reported separately.
[4] Not reported.
[5] Included in "all other states" in 1900 and 1905.
[6] Included in "all other states" in 1905.
[7] Included in "all other states" in 1890 and 1905.
[8] Includes establishments distributed as follows: Colorado, 1; Connecticut, 2; Kentucky, 1; Maryland, 2; Massachusetts, 1; Minnesota, 1; Missouri, 2; Texas, 1; West Virginia, 3.
[9] Includes establishments distributed as follows: Colorado, 1; Connecticut, 1; Kentucky, 2; Massachusetts, 1; Minnesota, 1; Missouri, 2; North Carolina, 2.
[10] Includes establishments distributed as follows: Colorado, 1; Indiana, 2; Maine, 1; Massachusetts, 1; North Carolina, 1; Oregon, 1; Texas, 1; Washington, 1.
[11] Includes establishments distributed as follows: Indiana, 3; Maine, 1; Massachusetts, 2; Oregon, 1; Vermont, 1.

CAPITAL.

Table 19 shows the number of active and idle blast furnace establishments in the United States in 1880, 1890, 1900, and 1905, and the capital invested.

TABLE 19.—*Blast furnaces—active and idle establishments—capital: 1880 to 1905.*

	Census.	Number of establishments.	CAPITAL.		
			Total.	Buildings, machinery, tools, and implements.	Land, cash, and sundries.
Total	1905	265	[1] $262,395,742	$153,591,699	$108,804,043
	1900	273	[1] 158,352,558	86,103,804	72,248,754
	1890	377	[1] 141,067,408	75,931,198	65,136,210
	1880	483	103,926,245	47,545,631	56,380,614
Active	1905	191	239,559,194	136,960,688	102,598,506
	1900	224	148,226,113	79,235,189	68,990,924
	1890	304	134,608,543	71,236,048	63,372,495
	1880	341	89,531,362	41,268,481	48,262,881
Idle	1905	74	22,836,548	16,631,011	6,205,537
	1900	49	10,126,445	6,868,615	3,257,830
	1890	73	6,458,865	4,695,150	1,763,715
	1880	142	14,394,883	6,277,150	8,117,733

[1] Includes value of rented property—1905, $4,165,283; 1900, $5,087,881; 1890, $5,061,058.

The decrease in the number of all establishments in 1905 from that in 1900 was 8, and from that in 1890, 112. At the census of 1905 there were 74 idle establishments, a relatively larger number than at any census since 1880, but the idle plants were, as a rule, minor ones, as shown by the fact that though they constituted 27.9 per cent of all establishments, the capital invested in them formed only 8.7 per cent of the total.

The increase in capital is very large, being $104,043,184 in 1905, or 65.7 per cent, as compared with 1900; whereas for the decade 1890 to 1900 the increase was $17,285,150, or 12.3 per cent, and for the period 1880 to 1890 the increase was $37,141,163, or 35.7 per cent.

MATERIALS USED.

Table 20 shows in detail the quantities and cost of materials consumed by blast furnaces for each census year beginning with 1880. In 1900 and 1905 the cost of the materials as reported separately by items does not in all cases include freight. Freight not included in the cost of materials, as reported by items, is included under "all other materials." In 1880 and 1890 the cost reported for each material was the total cost at the point of consumption.

TABLE 20.—BLAST FURNACES—MATERIALS USED, BY KIND, QUANTITY, AND COST, WITH PER CENT OF INCREASE: 1880 TO 1905.

KIND.	CENSUS.								PER CENT OF INCREASE.					
	1905		1900		1890		1880		1900 to 1905		1890 to 1900		1880 to 1890	
	Tons.	Cost.	Tons.	Cost.	Tons.	Cost.	Tons.	Cost.	Tons.	Cost.	Tons.	Cost.	Tons.	Cost.
Total	.....	$178,967,449	.....	$131,536,424	.....	$110,098,615	.....	$58,619,742	.....	36.1	.....	19.5	.....	87.8
Domestic iron ore	29,212,267	96,210,908	24,621,397	61,800,805	14,048,571	57,607,945	6,479,182	33,205,278	18.6	55.7	75.3	7.3	116.8	73.5
Foreign iron ore, including manganese ore	829,918	4,739,123	754,383	4,107,449	973,850	5,897,585	(1)	(1)	10.0	15.4	[2] 22.5	[2] 30.4	.....	.....
Fluxing materials	8,327,221	6,892,671	7,326,706	5,059,632	5,021,688	4,196,878	2,829,598	2,547,336	13.7	36.2	45.9	20.6	77.5	64.8
Anthracite coal and culm	560,637	1,812,779	886,564	2,297,419	1,796,854	5,165,761	2,334,984	8,012,755	[2] 36.8	[2] 21.1	[2] 50.7	[2] 55.5	[2] 23.0	[2] 35.5
Bituminous coal and slack	801,640	1,340,997	832,235	1,101,312	491,971	759,522	939,065	2,095,887	[2] 3.7	21.8	69.2	45.0	[2] 47.6	[2] 63.8
Coke	[3] 19,739,676	57,127,027	[3] 16,461,533	38,976,770	[3] 9,237,935	27,435,780	[3] 2,128,255	8,129,240	19.9	46.6	78.2	42.1	334.1	237.5
Charcoal	[4] 37,796,739	2,538,452	[4] 31,421,585	1,846,201	[4] 67,672,156	4,523,320	[4] 53,909,828	3,679,120	20.3	37.5	[2] 53.6	[2] 59.2	25.5	22.9
Mill cinder and scrap, etc.	1,865,385	3,830,961	1,600,313	3,772,385	1,145,599	3,086,808	316,114	910,667	16.6	1.6	39.7	22.2	262.4	239.0
All other materials	.....	4,474,531	.....	12,574,451	.....	1,425,016	.....	39,459	.....	[2] 64.4	.....	782.4	.....	3,511.4

[1] Domestic and foreign ore were not reported separately in 1880. [2] Decrease. [3] Short tons. [4] Bushels.

One-half of the foreign ore consumed was used by Maryland furnaces, 46 per cent by furnaces in Pennsylvania, and the remainder by Illinois, New Jersey, Virginia, and Kentucky furnaces. Small amounts only were reported for the last 2 states.

In addition to iron ore there was consumed 1,865,385 tons of mill cinder, scrap, scale, etc., not including runner or other scrap produced by the furnaces reporting. There was thus a total of 31,907,570 tons of constituent material, an increase of 4,931,477 tons over the amount reported for 1900, or 18.3 per cent. From this material there was made in 1905, 16,628,294 tons of pig iron, compared with 14,452,234 tons of pig iron made from 26,976,093 tons of like material in 1900; 8,845,185 tons of pig iron, from 16,168,020 tons of material in 1890; and 3,375,912 tons of pig iron, from 6,795,296 tons of all material in 1880. The percentages of pig iron extraction from iron making material were—in 1905, 52.1 per cent; in 1900, 53.6 per cent; in 1890, 54.7 per cent; and in 1880, 49.7 per cent.

In 1890 Mr. John Birkinbine, special agent in charge of the collection of iron ore statistics for the Eleventh Census, estimated the yield of metal in the blast furnace from foreign iron ore, mill cinder, rolling mill scale, zinc residuum, etc., at about 57 per cent, and the same factor was used by Mr. William G. Gray,

expert special agent for the Twelfth Census, in computing the product derived from all material other than domestic iron ore. Following the same line of deduction, the metal yield from foreign iron ore, and mill cinder, scrap, scale, etc., is estimated for 1905 as 1,536,323 tons, and when this is deducted from the total pig iron product, 15,091,971 tons of pig iron remain as the product from domestic iron ores, or an average yield of metal from domestic iron ore of 51.7 per cent, compared with 53.2 per cent for 1900, 54.4 per cent for 1890, and approximately 48.9 per cent for 1880.

As explained in the report of the Twelfth Census on pig iron production, no statistics of the consumption of foreign iron ore by blast furnaces in 1880 being available, the consumption was estimated from the imports.

PRODUCTS.

The production of pig iron according to the kind of fuel used, and the percentage of total production by fuels for each census year since and including 1880 are shown in Table 21. The production of spiegeleisen, ferromanganese, and direct castings is included.

TABLE 21.—BLAST FURNACES—PRODUCTION OF PIG IRON, INCLUDING DIRECT CASTINGS, CLASSIFIED ACCORDING TO KIND OF FUEL USED, WITH PER CENT OF TOTAL: 1880 TO 1905.

	QUANTITY (TONS).				PER CENT OF TOTAL.			
	1905	1900	1890	1880[1]	1905	1900	1890	1880
Total	16,628,294	14,452,234	8,845,185	3,375,912	100.0	100.0	100.0	100.0
Mixed anthracite coal and coke pig iron	1,274,721	1,796,000	1,690,394	638,027	7.7	12.4	19.1	18.9
Coke and bituminous coal pig iron	14,909,029	12,253,818	6,265,865	1,354,958	89.6	84.8	70.8	40.1
Charcoal pig iron	414,171	303,567	593,492	388,677	2.5	2.1	6.7	11.5
Anthracite coal pig iron	30,373	45,857	295,434	994,250	0.2	0.3	3.4	29.5
Mixed charcoal and coke pig iron	.....	52,992	.....	.....	.....	0.4	.....	.....

[1] The 4,229 tons of direct castings shown in the report for blast furnaces, 1880, have been distributed among the several kinds of pig iron; hence the quantities of pig iron do not agree with the data shown in the report for the Tenth Census.

The production of pig iron with mixed anthracite coal and coke for fuel is less than it was in 1900 by 521,279 tons, and the quantity in 1900, though slightly greater in amount than the 1890 product, was proportionately less than that of 1890 and 1880. The great increase continues to be in bituminous fuel pig iron; that is, in pig iron made with coke alone or with mixed coke and bituminous coal, a mixed fuel of coke and bituminous coal being used to some extent in Ohio and Kentucky.

The increase in coke and bituminous coal pig iron, chiefly coke, for the five-year period since the 1900 census was 2,655,211 tons, or 21.7 per cent; and for the decade from 1890 to 1900 it was 5,987,953 tons, or 95.6 per cent.

Charcoal pig iron shows an increase of 110,604 tons, or 36.4 per cent, over 1900, and it constitutes a slightly larger per cent of the entire product than it did in 1900. The larger part of the increase was in Michigan. In 1900 there was a heavy drop in the production of charcoal pig iron.

Pig iron made with anthracite coal continues to show a heavy decline, and the use of such coal in the production of pig iron is gradually being abandoned. No pig iron made with mixed charcoal and coke fuel was reported at this census.

Table 22 shows in detail the quantity and value of the pig iron made in the United States in 1880, 1890, 1900, and 1905, according to the kind of fuel used, the pig iron product including spiegeleisen, ferromanganese, and direct castings.

TABLE 22.—BLAST FURNACES—QUANTITY AND VALUE OF PRODUCTS, CLASSIFIED ACCORDING TO KIND OF FUEL USED, WITH PER CENT OF INCREASE: 1880 TO 1905.

KIND.	CENSUS.								PER CENT OF INCREASE.					
	1905		1900		1890		1880[1]		1900 to 1905		1890 to 1900		1880 to 1890	
	Tons.	Value.	Tons.	Value.	Tons.	Value.	Tons.	Value.	Tons.	Value.	Tons.	Value.	Tons.	Value.
Aggregate	.....	$231,889,126	.....	$206,823,202	.....	$145,643,153	.....	$89,315,569	.....	12.1	.....	42.0	.....	63.1
Total pig iron	16,628,294	228,977,535	14,452,234	206,579,400	8,845,185	145,612,983	3,375,912	88,204,010	15.1	10.8	63.4	41.9	162.0	65.1
Mixed anthracite coal and coke pig iron	1,274,721	17,712,934	1,796,000	26,066,003	1,690,394	28,195,996	638,027	16,627,291	[2]29.0	[2]32.0	6.2	[2]7.6	164.9	69.6
Coke and bituminous coal pig iron	14,909,029	203,814,049	12,253,818	173,763,091	6,265,865	100,687,256	1,354,958	35,513,233	21.7	17.3	95.6	72.6	362.4	183.5
Charcoal pig iron	414,171	7,059,504	303,567	5,338,739	593,492	11,957,710	388,677	12,488,744	36.4	32.2	[2]48.9	[2]55.4	52.7	[2]4.3
Anthracite coal pig iron	30,373	391,048	45,857	612,702	295,434	4,772,021	994,250	23,574,742	[2]33.8	[2]36.2	[2]84.5	[2]87.2	[2]70.3	[2]79.8
Mixed charcoal and coke pig iron	.....	.....	52,992	798,865	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
All other products	.....	2,911,591	.....	243,802	.....	30,170	.....	1,111,559	.....	1,094.2	.....	708.1	.....	[2]97.3

[1] The 4,229 tons of direct castings shown in the report for blast furnaces, 1880, have been distributed among the several kinds of pig iron; hence the quantities of pig iron do not agree with the data shown in the report for the Tenth Census.
[2] Decrease.

The spiegeleisen product for the census year amounted to 169,630 tons (see Table 24), and the ferromanganese, to 58,018 tons (the latter including a small amount of ferrophosphorus)—a total of 227,648 tons, valued at $6,084,247, or an average of $26.73 per ton. In 1900 the spiegeleisen product was 163,672 tons and the ferromanganese 51,878 tons, giving a total of 215,550 tons, which was valued at $5,871,955, or an average value per ton of $27.24. This shows for the five-year period an increase in the spiegeleisen product of 3.6 per cent, in ferromanganese 11.8 per cent, and in the combined product an increase of 5.6 per cent in quantity and of 3.6 per cent in value. Of the spiegeleisen and ferromanganese product, 44,203 tons, of a value of $881,307, were made with mixed anthracite coal and coke fuel, and 183,445 tons, of a value of $5,202,940, with coke or coke and bituminous fuel. Spiegeleisen was made in Colorado, Illinois, New Jersey, and Pennsylvania, and ferromanganese, in Pennsylvania. The ferrophosphorus product was from Tennessee.

Direct castings were produced by establishments located in Alabama, Georgia, Illinois, New York, Ohio, Pennsylvania, and Tennessee, to the amount of 9,469 tons, valued at $131,700, an average of $13.91 per ton. This is an increase of 32.9 per cent in quantity and 50.2 per cent in value over 1900. Pig iron used for direct castings was all made with coke or coke and bituminous coal for fuel.

Products other than pig iron amounted to $2,911,591. Of this amount, $338,941 was reported under the heading of "amount received for custom work and repairing," and $2,572,650 for miscellaneous products under the general heading "all other products, including castings made in foundries, granulated slag, cement from furnace slag, slag sold for ballast, etc." In 1900 the value of these miscellaneous products was $99,940. The increase was due to a large extent to the utilization of furnace slag in the manufacture of cement.

Table 23 shows the pig iron product by tonnage, value, and average value per ton, for 1880, 1890, 1900, and 1905, and the total number of completed furnaces for all establishments, whether active or idle, for the same years, by states. Direct castings, spiegeleisen, ferromanganese, and ferrosilicon are included, but not the value of miscellaneous products or the amount received for custom work and repairing.

As in 1900, the highest average values per ton for pig iron are reported for Massachusetts and Connecticut, but details can not be given, as there was but 1 establishment producing pig iron in the former state and 2 in the latter. The product of both states was charcoal pig iron. Colorado comes next, followed by Michigan, which latter state has an average value per ton of $17.09. Nine-tenths of the pig iron product of Michigan was charcoal pig iron.

TABLE 23.—*Blast furnaces—quantity and value of all kinds of pig iron, with average value per ton, by states: 1880 to 1905.*

STATE.	Census.	Number of completed furnaces.	Tons.	Value.	Average value per ton.
United States	1905	435	16,628,294	$228,977,535	$13.77
	1900	399	14,452,234	206,579,400	14.29
	1890	559	8,845,185	145,612,983	16.46
	1880	681	3,375,912	88,204,010	26.13
Alabama	1905	49	1,471,378	16,614,577	11.29
	1900	45	1,203,277	13,487,709	11.21
	1890	48	817,508	10,315,691	12.62
	1880	15	55,657	1,402,156	25.19
Connecticut [1]	1890	9	19,871	574,438	28.91
	1880	8	16,767	644,911	38.46
Georgia	1905	4	74,504	904,950	12.15
	1900	5	21,505	386,271	17.96
	1890	5	25,099	339,422	13.52
	1880	10	20,624	457,490	22.18
Illinois	1905	21	1,660,610	25,508,271	15.36
	1900	17	1,469,530	15,033,696	10.23
	1890	15	666,676	10,136,960	15.21
	1880	10	85,239	2,391,850	28.06
Kentucky [1]	1890	6	39,534	665,763	16.84
	1880	22	51,882	1,240,152	23.90
Maryland [2]	1900	7	241,172	3,060,870	12.69
	1890	14	86,282	1,632,004	18.91
	1880	22	53,271	1,668,164	31.31
Michigan	1905	11	270,933	4,630,183	17.09
	1900	13	141,377	2,327,153	16.46
	1890	26	203,417	3,982,278	19.58
	1880	27	106,774	3,123,245	29.25
Missouri [1]	1890	8	90,205	1,716,983	19.03
	1880	17	84,866	2,196,780	25.89
New Jersey	1905	13	262,308	3,600,144	13.72
	1900	11	150,002	2,521,066	16.81
	1890	18	129,500	2,228,724	17.21
	1880	20	140,548	3,410,663	24.27
New York	1905	22	609,588	8,411,946	13.80
	1900	19	334,512	5,042,550	15.07
	1890	37	307,446	5,182,606	16.86
	1880	57	279,793	6,697,349	23.94
Ohio	1905	65	2,987,787	40,705,777	13.62
	1900	53	2,559,694	40,308,758	15.75
	1890	71	1,203,142	19,800,203	16.46
	1880	103	489,921	12,908,286	26.35
Pennsylvania	1905	157	7,729,278	107,395,757	13.89
	1900	148	6,778,584	101,555,787	14.98
	1890	221	4,345,986	75,212,758	17.31
	1880	269	1,723,492	44,940,028	26.08
Tennessee	1905	22	303,624	3,426,932	11.29
	1900	19	374,249	4,693,215	12.54
	1890	19	264,187	3,366,464	12.74
	1880	21	42,744	824,932	19.30
Texas [3]	1900	4	9,789	172,468	17.62
	1880	1	1,250	36,000	28.80
Virginia	1905	26	279,103	3,333,273	11.94
	1900	26	428,117	6,505,218	15.19
	1890	31	278,899	3,925,481	14.07
	1880	31	15,988	429,695	26.88
West Virginia [1]	1890	5	115,508	2,009,505	17.40
	1880	11	71,473	1,624,296	22.73
Wisconsin	1905	6	189,141	2,761,107	14.60
	1900	6	217,451	2,899,912	13.34
	1890	10	192,092	3,114,892	16.22
	1880	14	105,609	3,293,635	31.19
All other states	[4] 1905	39	790,040	11,684,618	14.79
	[5] 1900	26	522,975	8,584,667	16.42
	[6] 1890	16	59,833	1,408,811	23.55
	[7] 1880	23	30,014	914,378	30.46

[1] Included in "all other states" in 1900 and 1905.
[2] Included in "all other states" in 1905.
[3] Included in "all other states" in 1890 and 1905.
[4] Includes states as follows: Colorado, Connecticut, Kentucky, Maryland, Massachusetts, Minnesota, Missouri, Texas, West Virginia.
[5] Includes states as follows: Colorado, Connecticut, Kentucky, Massachusetts, Minnesota, Missouri, North Carolina, West Virginia.
[6] Includes states as follows: Colorado, Indiana, Maine, Massachusetts, North Carolina, Oregon, Texas, Washington.
[7] Includes states as follows: Indiana, Maine, Massachusetts, Oregon, Vermont.

In 1900 the highest value reported for pig iron that could be given in detail was for Georgia, $17.96 per ton, and most of the product was made with charcoal fuel; but at this census the average value for that state is $12.15 per ton, and nearly 60 per cent of the product of the state is made with mineral fuel. Alabama and Tennessee show the lowest average value per ton, $11.29, this being a slight advance for Alabama over the average reported in 1900, which was $11.21, and a decline for Tennessee of $1.25 per ton from the average of 1900. Pennsylvania shows an average value of $13.89 per ton, as against $14.98 for 1900; and Ohio, $13.62 per ton, as against $15.75 for 1900.

Illinois shows a large advance in the average value per ton since 1900, but the average for 1900 is so out of balance with the other states that the figures are open to question.

The average value for the country at large was $13.77 in 1905, $14.29 in 1900, $16.46 in 1890, and $26.13 in 1880. The states showing an average value in 1905 below the general average for the United States are New Jersey, West Virginia, Ohio, Minnesota, Georgia, Virginia, Tennessee, and Alabama; and the states ranging above the general average are New York, Missouri, Pennsylvania, Maryland, Texas, Wisconsin, Illinois, Colorado, Kentucky, Michigan, Connecticut, and Massachusetts.

Table 24 shows the production of pig iron by grades and by states for 1900 and 1905. Statistics by grades were not taken prior to 1900. Low-phosphorus pig iron is below 0.04 per cent in phosphorus and Bessemer pig iron contains from 0.04 to 0.10 per cent. In 1900 both grades were included under Bessemer.

Statistics relating to malleable Bessemer pig iron were not reported separately in 1900. At that census the producers of malleable Bessemer in some cases reported it in the Bessemer class, in other cases as foundry, and in other cases in the class of white and mottled and miscellaneous grades.

Malleable Bessemer pig iron as a classified grade first appears in the reports of the American Iron and Steel Association for the calendar year 1900, the amount reported being 173,413 tons. An increase to 256,532 tons was shown in 1901 and to 311,458 tons in 1902. The rate of growth indicates that the production for the calendar year covered by the census of 1900 was something less than 125,000 tons. Malleable Bessemer, so called, is a Bessemer pig iron low in silicon, and is used for casting purposes.

TABLE 24.—BLAST FURNACES—QUANTITY OF PIG IRON, BY GRADES, WITH NUMBER OF ESTABLISHMENTS REPORTING, BY STATES: 1905 AND 1900.

STATE.	Census.	Total production (tons).	BESSEMER.		LOW-PHOSPHORUS.		MALLEABLE BESSEMER.		BASIC.		FOUNDRY.	
			Number of establishments reporting.	Tons.	Number of establishments reporting.	Tons.	Number of establishments reporting.	Tons.	Number of establishments reporting.	Tons.	Number of establishments reporting.	Tons.
United States	1905	16,628,294	65	8,894,584	10	192,795	25	316,964	32	2,553,940	128	3,679,243
	1900	14,452,234	86	8,475,530		(1)		(1)	27	937,439	154	3,514,743
Alabama	1905	1,471,378							3	300,784	18	1,026,969
	1900	1,203,277							2	89,746	19	883,208
Colorado	1905	119,874	1	112,318								
	1900	112,843	1	109,443								
Connecticut	1905	12,753									2	12,753
	1900	10,457									1	10,457
Georgia	1905	74,504									4	57,077
	1900	21,505									3	18,870
Illinois	1905	1,660,610	3	1,424,030			1	31,588	1	52,658	1	105,835
	1900	1,469,530	3	1,320,287							2	94,008
Kentucky	1905	32,432										
	1900	126,566	1	21,825					1	500	2	73,407
Maryland	1905	293,481	1	292,642							1	839
	1900	241,172	1	218,691							2	5,056
Massachusetts	1905	3,514									1	3,514
	1900	3,030									1	3,030
Michigan	1905	270,933	2	3,520			1	5,787			11	261,626
	1900	141,377									7	136,741
Minnesota	1905	20,769	1	2,070			1	18,699				
	1900	29,269	1	22,070					1	20	1	6,879
Missouri	1905	33,481							2	24,082	1	9,399
	1900	40,975							2	13,041	2	25,881
New Jersey	1905	262,308					1	984	2	112,635	4	102,339
	1900	150,002	2	25,575							4	61,840
New York	1905	609,588	3	225,414	1	26,851	2	34,848	1	4,669	4	275,104
	1900	334,512									9	291,993
North Carolina[2]	1900	11,543	1	1,846							1	7,789
Ohio	1905	2,987,787	23	2,120,643			12	127,330	4	206,458	18	441,227
	1900	2,559,694	28	1,862,136					4	93,700	20	305,004
Pennsylvania	1905	7,729,278	28	4,457,613	8	139,763	4	12,497	17	1,827,121	37	796,740
	1900	6,778,584	41	4,617,969					13	666,589	45	856,472
Tennessee	1905	303,624			1	26,181					12	247,368
	1900	374,249	1	11,648					1	802	13	287,655
Texas	1905	4,669									1	3,933
	1900	9,789									3	6,191
Virginia	1905	279,103							2	25,533	9	219,322
	1900	428,117							3	72,981	14	304,466
West Virginia	1905	269,067	2	219,023			1	50,044				
	1900	188,292	3	188,292								
Wisconsin	1905	189,141	1	37,311			2	35,187			4	115,198
	1900	217,451	3	75,748							5	135,796

[1] Not reported separately in 1900.

[2] No production in 1905.

TABLE 24.—BLAST FURNACES—QUANTITY OF PIG IRON, BY GRADES, WITH NUMBER OF ESTABLISHMENTS REPORTING, BY STATES: 1905 AND 1900—Continued.

STATE.	Census.	FORGE.		WHITE AND MOTTLED AND MISCELLANEOUS GRADES.		FERROSILICON.		SPIEGELEISEN.		FERROMANGANESE.		DIRECT CASTINGS.	
		Number of establishments reporting.	Tons.	Number of establishments reporting.	Tons.	Number of establishments reporting.	Tons.	Number of establishments reporting.	Tons.	Number of establishments reporting.	Tons.	Number of establishments reporting.	Tons.
United States	1905	65	601,956	55	99,084	3	52,611	9	169,630	4	58,018	18	9,469
	1900	102	1,057,616	99	208,323	7	35,910	11	163,672	3	51,878	24	7,123
Alabama	1905	15	115,455	16	27,838							1	332
	1900	15	171,298	14	56,561							7	2,464
Colorado	1905							1	7,556				
	1900							1	3,400				
Connecticut	1905												
	1900												
Georgia	1905	1	8,668	1	8,700							1	59
	1900	1	1,593	1	1,042								
Illinois	1905	1	1,411					1	44,408			1	680
	1900	1	7,500					1	47,688			1	47
Kentucky	1905					1	32,432						
	1900	1	20,218	2	3,856	1	6,700						
Maryland	1905												
	1900	1	1,400	1	400			1	15,625				
Massachusetts	1905												
	1900												
Michigan	1905												
	1900			1	4,636								
Minnesota	1905												
	1900			1	300								
Missouri	1905												
	1900	1	2,000	1	43							1	10
New Jersey	1905	3	32,831	3	2,277			1	11,242				
	1900	4	34,634	5	6,079			2	21,824			1	50
New York	1905	3	34,403	2	7,989							1	310
	1900	4	38,699	5	3,416					1	404		
North Carolina[1]	1900	1	1,439	1	469								
Ohio	1905	8	66,729	5	3,777	1	16,494					5	5,129
	1900	17	246,487	9	33,347	4	19,020						
Pennsylvania	1905	23	313,301	16	12,121	1	3,685	6	106,424	3	57,072	8	2,941
	1900	35	446,328	32	50,077	2	10,190	6	[2] 75,135	2	51,474	12	4,350
Tennessee	1905	7	24,957	6	4,154					1	[3] 946	1	18
	1900	8	54,182	9	19,962								
Texas	1905	1	279	1	457								
	1900	1	42	2	3,556								
Virginia	1905	3	3,922	4	30,326								
	1900	11	28,061	12	21,807							2	202
West Virginia	1905												
	1900												
Wisconsin	1905			1	1,445								
	1900	1	3,135	3	2,772								

[1] No production in 1905.

[2] Includes 355 tons of silico-spiegel.

[3] Ferrophosphorus.

The percentage which each grade formed of the total in 1900 and 1905 is shown by the following statement:

GRADE.	PER CENT OF TOTAL PIG IRON PRODUCTION.	
	1905	1900
Bessemer	53.5	58.6
Low-phosphorus	1.2	
Malleable Bessemer	1.9	.....
Basic	15.4	6.5
Foundry	22.1	24.3
Forge	3.6	7.3
White and mottled, and miscellaneous grades	0.6	1.4
Ferrosilicon	0.3	0.2
Spiegeleisen	1.0	1.1
Ferromanganese	0.3	0.4
Direct castings	0.1	0.1

Bessemer and low-phosphorus combined constituted 54.7 per cent of the total pig iron production of 1905, as compared with 58.6 per cent of 1900, when low-phosphorus was reported under Bessemer. The combined product was 9,087,379 tons, an increase of 611,849 tons over 1900, or 7.2 per cent.

Basic pig iron shows the heavy increase of 172.4 per cent. Its proportion of the total pig iron product increased from 6.5 per cent in 1900 to 15.4 per cent in 1905.

Foundry, forge, and the white and mottled and miscellaneous grades form smaller proportions of the total production than in 1900; in quantity, foundry pig iron has increased but 164,500 tons, or 4.7 per cent, while the amount of forge pig iron is 455,660 tons less than in 1900, or a decrease of 43.1 per cent, and the white and mottled and miscellaneous grades show a decrease of 109,239 tons, or 52.4 per cent. Ferrosilicon shows an increase of 46.5 per cent; spiegeleisen, 3.6 per cent; ferromanganese, 11.8 per cent; and direct castings, 32.9 per cent.

Iron for steel making—comprising Bessemer, low-phosphorus, basic, ferrosilicon, spiegeleisen, and ferromanganese—aggregated 11,921,578 tons, an increase of 2,257,149 tons, or 23.4 per cent over the production of like grades in 1900; while iron for use in puddling furnaces, namely, forge, and white and mottled iron, aggregated 701,040 tons, a decrease of 44.6 per cent. In 1900 pig iron for steel making was a little over seven times that made for use in puddling furnaces, and now it is seventeen times in quantity.

Pennsylvania produced one-half of the Bessemer (50.1 per cent); nearly three-fourths of the low-phosphorus (72.5 per cent); nearly three-fourths of the basic (71.5 per cent); over one-fifth of the foundry (21.7 per cent); more than one-half of the forge (52 per cent); over three-fifths of the spiegeleisen (62.7 per cent); all of the ferromanganese; nearly one-third of the direct castings (31.1 per cent); and relatively small amounts of the remaining grades—namely, malleable Bessemer, 3.9 per cent; white and mottled, and miscellaneous grades, 12.2 per cent; and ferrosilicon, 7 per cent.

Ohio, which was second in total products, was second in the production of Bessemer pig iron (23.8 per cent) and first in malleable Bessemer (40.2 per cent) and in direct castings (54.2 per cent). In basic pig iron Ohio, keeping pace with the large general growth of this grade, has increased from 93,700 tons in 1900 to 206,458 in 1905, or 120.3 per cent, but is now exceeded in basic iron product by Alabama as well as Pennsylvania, and hence ranks third. In direct castings Ohio ranks first, with 54.2 per cent, and in ferrosilicon second, with 31.4 per cent. More than one-half of the ferrosilicon product is reported from Kentucky. Illinois, as in 1900, is the third in the production of Bessemer pig (16 per cent) and second in spiegeleisen (26.2 per cent). Alabama did not produce any Bessemer, but is first in foundry iron (27.9 per cent) and second in basic (11.8 per cent) and in forge (19.2 per cent). The increase in basic pig iron in Alabama over its 1900 production, 235.2 per cent, is relatively the largest for any state that produced basic pig iron in 1900. Eleven states produced Bessemer and low-phosphorus pig iron in 1905 and 12 in 1900; Kentucky, New Jersey, and North Carolina reporting Bessemer pig in 1900 but none in 1905, and Michigan and New York reporting Bessemer in 1905 but not in 1900. Basic pig iron was made in 8 states; malleable Bessemer, in 9; foundry pig, in 16; forge pig, in 10; white and mottled and miscellaneous grades, in 10; spiegeleisen, in 4; ferromanganese and ferrophosphorus each, in 1; ferrosilicon, in 3; and direct castings were made in 7 states.

The production of direct castings and spiegeleisen and ferromanganese, by kind of fuel used, is shown in Table 25.

TABLE 25.—BLAST FURNACES—QUANTITY AND VALUE OF DIRECT CASTINGS, AND SPIEGELEISEN AND FERROMANGANESE, CLASSIFIED ACCORDING TO KIND OF FUEL USED: 1905 AND 1900.

	Census.	TOTAL.		DIRECT CASTINGS.		SPIEGELEISEN AND FERROMANGANESE.	
		Tons.	Value.	Tons.	Value.	Tons.	Value.
Total	1905	[1] 237,117	$6,215,947	9,469	$131,760	[1] 227,648	$6,084,247
	1900	222,673	5,959,617	7,123	87,662	215,550	5,871,955
Mixed anthracite coal and coke	1905	44,203	881,307	(2)	.....	44,203	881,307
	1900	44,293	953,489	1,080	20,830	43,213	932,659
Coke and bituminous coal	1905	192,914	5,334,640	9,469	131,760	183,445	5,202,940
	1900	178,370	5,006,007	6,633	66,711	172,337	4,939,296
Charcoal	1905	(2)	.....	(2)	.....	(2)	.....
	1900	10	121	10	121	.....	.....

[1] Includes 946 tons of ferrophosphorus.

[2] None reported.

The major part of the pig iron product was made by establishments controlling steel works and rolling mills and for consumption therein. Of the 191 active blast furnace establishments, there were 52, or 27.2 per cent, which reported production of pig iron for consumption in steel works and rolling mills, foundries, etc., controlled by the reporting company. The pig iron product of these establishments amounted to 10,909,371 tons, of which 9,926,545 tons (valued at $138,867,586), or 59.7 per cent of the total tonnage produced by all establishments, was for consumption in steel works and rolling mills under the control of the same company.

The following tabular statement shows the distribution of the pig iron tonnage:

Pig iron production, distributed by classes of establishments and by states: 1905.

STATE.	PIG IRON PRODUCTION.							
	Total.		By companies controlling steel works, rolling mills, foundries, etc.				By all other companies.	
	Number of establishments.	Tons.	Number of establishments.	Total tons.	For consumption in establishments controlled by producing company (tons).	For sale (tons).	Number of establishments.	For sale (tons).
Total	191	16,628,294	52	10,909,371	9,926,545	982,826	139	5,718,923
Ohio	33	2,987,787	12	1,944,524	1,751,730	192,794	21	1,043,263
Pennsylvania	65	7,729,278	26	6,326,215	5,573,898	752,317	39	1,403,063
All other states	93	5,911,229	14	2,638,632	2,600,917	37,715	79	3,272,597

The quantity of pig iron consumed by the steel works and rolling mills was 12,191,228 tons. Hence the pig iron consumed by companies operating steel works and rolling mills and producing their own pig iron constituted 81.4 per cent of the total pig iron so consumed and only 2,264,683 tons, or less than one-fifth, of the pig iron consumed by steel works and rolling mills was by companies not operating blast furnaces. The distribution of the pig iron product can be summarized as follows:

	Tons.
Total production	16,628,294
Consumption by steel works and rolling mills	12,191,228
Production for consumption in establishments controlled by producing company	9,926,545
Purchased from independent establishments	2,264,683
Balance available for foundries, other industries, etc.	4,437,066

Along with the development of the Bessemer and open-hearth steel processes there has resulted the practice of retaining the blast furnace metal in molten condition. For some years it has been the practice to pour the molten blast metal for use in steel manufacture into a large vessel known as a mixer or receiver. By thus mixing the tappings from several blast furnaces, the high silicon or sulphur, for example, in the metal from one furnace is compensated for by low silicon or sulphur in the iron from another, and, along with a certain amount of purification due to chemical action, produces a metal of uniform composition. Mixers capable of holding 600 tons or more of metal are now in use. They are properly, however, an adjunct of the steel plant and not of the blast furnace. The charges of metal are generally transported in large truck ladles from the blast furnace to the mixer, and often for considerable distances, without any material loss of heat.

Casting machines have also been extensively introduced and to a small extent the practice of chill casting or casting on an iron floor.

The following tabular statement shows the quantities of metal handled by the several methods, by states:

Quantity of metal, classified according to method of handling, by states: 1905.

	UNITED STATES.			OHIO.		PENNSYLVANIA.		ALL OTHER STATES.	
	Number of establishments.	Tons.	Per cent of total.	Number of establishments.	Tons.	Number of establishments.	Tons.	Number of establishments.	Tons.
Total	191	16,628,294	100.0	33	2,987,787	65	7,729,278	93	5,911,229
Sand cast	166	6,083,513	36.6	30	1,361,161	49	1,490,312	87	3,232,040
Delivered in molten condition to Bessemer converters, open-hearth furnaces, etc	25	5,898,744	35.5	7	1,105,159	11	3,579,501	7	1,214,084
Machine cast	37	4,307,108	25.9	7	516,338	21	2,376,870	9	1,413,900
Chill cast	8	329,460	2.0	.....	.....	4	279,654	4	49,806
Direct castings	17	9,469	(1)	5	5,129	8	2,941	4	1,399

[1] Less than one-tenth of 1 per cent.

EQUIPMENT AND PRODUCTION.

Table 26 shows, by states, ranked according to production at the census of 1905, the total number of active and idle furnaces for 1880, 1890, 1900, and 1905, with the production and the per cent of the total production.

TABLE 26.—BLAST FURNACES—NUMBER OF ACTIVE AND IDLE FURNACES AND PRODUCTION OF PIG IRON, WITH PER CENT OF TOTAL, BY STATES, RANKED ACCORDING TO QUANTITY OF PRODUCT: 1880 TO 1905.

STATE.	Census.	Completed furnaces.	PRODUCTION OF PIG IRON.		Rank.
			Tons.	Per cent of total.	
United States	1905	435	[1] 16,628,294	100.0	.....
	1900	399	[1] 14,452,234	100.0	.....
	1890	559	[1] 8,845,185	100.0	.....
	1880	681	[1] 3,375,912	100.0	.....
Pennsylvania	1905	157	7,729,278	46.5	1
	1900	148	6,778,584	46.9	1
	1890	221	4,345,986	49.1	1
	1880	269	1,723,492	51.1	1
Ohio	1905	65	2,987,787	18.0	2
	1900	53	2,559,694	17.7	2
	1890	71	1,203,142	13.6	2
	1880	103	489,921	14.5	2
Illinois	1905	21	1,660,610	10.0	3
	1900	17	1,469,530	10.2	3
	1890	15	666,676	7.5	4
	1880	10	85,239	2.5	7
Alabama	1905	49	1,471,378	8.9	4
	1900	45	1,203,277	8.3	4
	1890	48	817,508	9.2	3
	1880	15	55,657	1.6	10
New York	1905	22	609,588	3.7	5
	1900	19	334,512	2.3	7
	1890	37	307,446	3.5	5
	1880	57	279,793	8.3	3
Tennessee	1905	22	303,624	1.8	6
	1900	19	374,249	2.6	6
	1890	19	264,187	3.0	7
	1880	21	42,744	1.3	13
Maryland	1905	6	293,481	1.8	7
	1900	7	241,172	1.7	8
	1890	14	86,282	1.0	13
	1880	22	53,271	1.6	11
Virginia	1905	26	279,103	1.7	8
	1900	26	428,117	2.9	5
	1890	31	278,899	3.2	6
	1880	31	15,988	0.5	17
Michigan	1905	11	270,933	1.6	9
	1900	13	141,377	1.0	12
	1890	26	203,417	2.3	8
	1880	27	106,774	3.2	5
West Virginia	1905	4	269,067	1.6	10
	1900	3	188,292	1.3	10
	1890	5	115,508	1.3	11
	1880	11	71,473	2.1	9
New Jersey	1905	13	262,308	1.6	11
	1900	11	150,002	1.0	11
	1890	18	129,500	1.5	10
	1880	20	140,548	4.2	4
Wisconsin	1905	6	189,141	1.1	12
	1900	6	217,451	1.5	9
	1890	10	192,092	2.2	9
	1880	14	105,609	3.1	6
Colorado	1905	5	119,874	0.7	13
	1900	2	112,843	0.8	14
	1890	2	11,562	0.1	18
Georgia	1905	4	74,504	0.4	14
	1900	5	21,505	0.1	17
	1890	5	25,099	0.3	15
	1880	10	20,624	0.6	14
Missouri	1905	2	33,481	0.2	15
	1900	2	40,975	0.3	15
	1890	8	99,205	1.0	12
	1880	17	84,866	2.5	8
Kentucky	1905	8	32,432	0.2	16
	1900	6	126,566	0.9	13
	1890	6	39,534	0.5	14
	1880	22	51,882	1.5	12
Minnesota	1905	1	20,769	0.1	17
	1900	1	29,269	0.2	16
	1890	1	.....	.....	.....
	1880	1	.....	.....	.....
Connecticut	1905	3	12,753	0.1	18
	1900	5	10,467	0.1	19
	1890	9	19,871	0.2	16
	1880	8	16,767	0.5	15
Texas	1905	4	4,669	(2)	19
	1900	4	9,789	0.1	20
	1890	3	7,991	0.1	19
	1880	1	1,260	(2)	21
Massachusetts	1905	2	3,514	(2)	20
	1900	3	3,030	(2)	21
	1890	4	7,482	0.1	21
	1880	6	8,521	0.2	18
North Carolina	1905	2	.....	.....	.....
	1900	2	11,543	0.1	18
	1890	1	3,015	(2)	24
	1880	7	.....	.....	.....
Oregon	1905	1	.....	.....	.....
	1900	1	.....	.....	.....
	1890	1	7,510	0.1	20
	1880	1	2,857	0.1	19
Washington	1905	1	.....	.....	.....
	1900	1	.....	.....	.....
	1890	1	4,274	(2)	22
Indiana	1890	2	14,696	0.2	17
	1880	4	16,283	0.5	16
Maine	1890	1	3,303	(2)	23
	1880	1	1,799	0.1	20
Vermont	1880	1	554	(2)	22
Utah	1880	2	.....	.....	.....

[1] Includes castings made direct from furnace, as follows: 1905, 9,469 tons; 1900, 7,123 tons; 1890, 5,417 tons; 1880, 3,776 tons.

[2] Less than one-tenth of 1 per cent.

During the twenty-five years covered by the statistics the production increased from 3,375,912 tons to 16,628,294 tons, while the number of furnaces decreased from 681 to 435 during the period, a loss of 246, or 36.1 per cent. This condition is the result of an increase in the capacity of the stacks, for in 1880 the average daily capacity per stack was 25 tons; in 1890, 68 tons; in 1900, 147 tons; and in 1905, 201 tons.

There has been an increase of 36 stacks since 1900—12 in Ohio; 9 in Pennsylvania; 4 each in Alabama and Illinois; 3 each in Colorado, New York, and Tennessee; 2 each in Kentucky and New Jersey; and 1 in West Virginia. A decrease is shown in Michigan and Connecticut of 2 each, and in Georgia, Maryland, and Massachusetts of 1 each.

The 4 states of Pennsylvania, Ohio, Illinois, and Alabama produced, all told, 13,849,053 tons, or 83.3 per cent of all pig iron in 1905; 83.1 per cent of the total pig iron production in 1900; 79.5 per cent in 1890; and 69.7 per cent in 1880. Of the remaining states, New York has nearly doubled its production, and Michigan, West Virginia, New Jersey, and Georgia show relatively large gains. Pennsylvania, Ohio, Illinois, and Alabama retain the same rank as in 1900. New York has advanced from seventh place to fifth, Tennessee remains sixth, and Maryland advances to seventh, while Virginia recedes from fifth to eighth.

The furnaces in North Carolina, Oregon, and Washington—2 in the former state and 1 in each of the other states—were idle in 1905. North Carolina, however, was a producer in 1900. The furnaces in Indiana, Maine, Vermont, and Utah were long since abandoned and dismantled.

Table 27 shows the number of active and idle furnaces, by states, for the census years 1900 and 1905.

TABLE 27.—BLAST FURNACES—NUMBER OF ACTIVE AND IDLE FURNACES, BY STATES: 1905 AND 1900.

STATE.	AGGREGATE.		ACTIVE.		IDLE.					
					Total.		In active establishments.		In idle establishments.	
	1905	1900	1905	1900	1905	1900	1905	1900	1905	1900
United States	435	399	318	326	117	73	26	18	91	55
Alabama	49	45	34	36	15	9	4	1	11	8
Colorado	5	2	3	2	2	.....	2	.....	.....	.....
Connecticut	3	5	3	1	.....	4	.....	1	.....	3
Georgia	4	5	4	3	.....	2	.....	.....	.....	2
Illinois	21	17	21	16	.....	1	.....	1	.....	.....
Kentucky	8	6	3	5	5	1	.....	.....	5	1
Maryland	6	7	4	6	2	1	1	.....	1	1
Massachusetts	2	3	1	1	1	2	1	2	.....	.....
Michigan	11	13	11	7	.....	6	.....	.....	.....	6
Minnesota	1	1	1	1	.....	.....	.....	.....	.....	.....
Missouri	2	2	2	2	.....	.....	.....	.....	.....	.....
New Jersey	13	11	8	10	5	1	.....	.....	5	1
New York	22	19	15	11	7	8	.....	1	7	7
North Carolina	2	2	.....	2	2	.....	.....	.....	2	.....
Ohio	65	53	52	50	13	3	1	1	12	2
Oregon	1	1	.....	.....	1	1	.....	.....	1	1
Pennsylvania	157	148	120	127	37	21	11	9	26	12
Tennessee	22	19	15	15	7	4	4	2	3	2
Texas	4	4	1	3	3	1	.....	.....	3	1
Virginia	26	26	11	19	15	7	2	.....	13	7
Washington	1	1	.....	.....	1	1	.....	.....	1	1
West Virginia	4	3	4	3	.....	.....	.....	.....	.....	.....
Wisconsin	6	6	5	6	1	.....	.....	.....	1	.....

Since 1900 an increase of 43 stacks appears in certain states and a decrease of 7 stacks in other states. Of the total number of furnaces, more than one-fourth were idle. The largest number of idle stacks in any one state was in Pennsylvania—37—nearly one-fourth of the total number in the state. In Virginia more than one-half of the stacks were idle; in Alabama, nearly one-third; in Ohio, one-fifth; and in Tennessee, nearly one-third. The capacity, however, of the idle stacks is a much smaller part of the blast furnace capacity of the country than their relative numbers would indicate. The 344 furnaces owned by the active establishments, comprising 318 furnaces which were active sometime during the year, and 26 which were idle throughout the year, have a total daily capacity of 78,230 tons, or an average daily capacity of 227 tons per stack; while the 91 furnaces of the establishments idle throughout the year have an aggregate daily capacity of 9,268 tons, or an average of 102 tons per stack. Of the furnaces of idle establishments, 18 were charcoal furnaces, with an aggregate daily capacity of 666 tons, or an average of 37 tons. The idle furnaces of the active establishments are as a rule the smaller furnaces, and below the average in capacity. If, however, the 26 idle furnaces owned by active establishments are given the average capacity of all furnaces owned by the active establishments—227 tons—and their capacity as thus estimated is added to that of the

idle establishments, we obtain a little over 15,000 tons as the total daily capacity of all idle furnaces, or between one-sixth and one-fifth of the total furnace capacity.

Table 28 shows, according to the kind of fuel used, the total number of blast furnaces in the United States for the census years 1880, 1890, 1900, and 1905, whether active or idle, and their daily capacity in gross tons, by states.

TABLE 28.—BLAST FURNACES—NUMBER AND CAPACITY OF COMPLETED FURNACES, CLASSIFIED ACCORDING TO KIND OF FUEL USED, BY STATES: 1880 TO 1905.

STATE.	Census.	TOTAL.		COKE AND BITUMINOUS COAL FURNACES.		ANTHRACITE AND MIXED ANTHRACITE AND COKE FURNACES.		CHARCOAL FURNACES.	
		Number.	Daily capacity (tons).	Number.	Daily capacity (tons).	Number.	Daily capacity (tons).	Number.	Daily capacity (tons).
United States	1905	435	87,498	306	76,249	74	8,709	55	2,540
	1900	[1] 399	58,569	[1] 240	46,577	93	9,311	66	2,681
	1890	559	37,889	249	25,162	170	9,349	140	3,378
	1880	681	17,186	199	7,473	231	6,761	251	2,952
Alabama	1905	49	7,665	43	7,355	.....	.....	6	310
	1900	45	6,103	37	5,743	.....	.....	8	360
	1890	48	3,783	34	3,242	.....	.....	14	541
	1880	15	303	5	161	.....	.....	10	142
Colorado	1905	5	1,600	5	1,600	.....	.....	.....	.....
	1900	2	400	2	400	.....	.....	.....	.....
	1890	2	196	2	196	.....	.....	.....	.....
Connecticut	1905	3	46	.....	.....	.....	.....	3	46
	1900	5	75	.....	.....	.....	.....	5	75
	1890	9	115	.....	.....	.....	.....	9	115
	1880	8	81	.....	.....	.....	.....	8	81
Georgia	1905	4	300	1	150	.....	.....	3	150
	1900	5	300	2	185	.....	.....	3	115
	1890	5	231	2	156	.....	.....	3	75
	1880	10	129	2	67	.....	.....	8	62
Illinois	1905	21	6,752	21	6,752	.....	.....	.....	.....
	1900	17	4,408	17	4,408	.....	.....	.....	.....
	1890	15	2,475	15	2,475	.....	.....	.....	.....
	1880	10	538	10	538	.....	.....	.....	.....
Indiana	1890	2	54	2	54	.....	.....	.....	.....
	1880	4	65	3	52	.....	.....	1	13
Kentucky	1905	8	675	8	675	.....	.....	.....	.....
	1900	6	525	6	525	.....	.....	.....	.....
	1890	6	288	5	273	.....	.....	1	15
	1880	22	350	4	167	.....	.....	18	183
Maine	1890	1	16	.....	.....	.....	.....	1	16
	1880	1	16	.....	.....	.....	.....	1	16
Maryland	1905	6	1,270	5	1,250	.....	.....	1	20
	1900	7	1,080	5	1,030	.....	.....	2	50
	1890	14	637	4	470	3	67	7	100
	1880	22	251	4	51	5	99	13	101
Massachusetts	1905	2	24	.....	.....	.....	.....	2	24
	1900	3	40	.....	.....	.....	.....	3	40
	1890	4	49	.....	.....	.....	.....	4	49
	1880	6	72	.....	.....	1	25	5	47
Michigan	1905	11	1,137	1	250	.....	.....	10	887
	1900	13	930	.....	.....	.....	.....	13	930
	1890	26	1,086	.....	.....	.....	.....	26	1,086
	1880	27	754	.....	.....	2	121	25	633
Minnesota	1905	1	225	1	225	.....	.....	.....	.....
	1900	1	75	1	75	.....	.....	.....	.....
	1890	1	134	1	134	.....	.....	.....	.....
	1880	1	36	.....	.....	.....	.....	1	36
Missouri	1905	2	225	1	150	.....	.....	1	75
	1900	2	200	1	150	.....	.....	1	50
	1890	8	491	5	384	.....	.....	3	107
	1880	17	669	8	447	.....	.....	9	222
New Jersey	1905	13	1,647	4	930	9	717	.....	.....
	1900	11	817	1	55	10	762	.....	.....
	1890	18	827	.....	.....	18	827	.....	.....
	1880	20	617	.....	.....	20	617	.....	.....
New York	1905	22	3,940	10	2,920	8	795	4	225
	1900	19	2,580	4	850	13	1,700	2	30
	1890	37	1,883	4	616	24	1,119	9	148
	1880	57	1,477	.....	.....	42	1,323	15	154
North Carolina	1905	2	62	2	62	.....	.....	.....	.....
	1900	2	62	2	62	.....	.....	.....	.....
	1890	1	13	.....	.....	.....	.....	1	13
	1880	7	35	.....	.....	.....	.....	7	35

[1] Includes 5 mixed charcoal and coke furnaces of a daily capacity of 350 tons.

TABLE 28.—BLAST FURNACES—NUMBER AND CAPACITY OF COMPLETED FURNACES, CLASSIFIED ACCORDING TO KIND OF FUEL USED, BY STATES: 1880 TO 1905—Continued.

STATE.	Census.	TOTAL.		COKE AND BITUMINOUS COAL FURNACES.		ANTHRACITE AND MIXED ANTHRACITE AND COKE FURNACES.		CHARCOAL FURNACES.	
		Number.	Daily capacity (tons).	Number.	Daily capacity (tons).	Number.	Daily capacity (tons).	Number.	Daily capacity (tons).
Ohio	1905	65	16,734	59	16,645			6	89
	1900	53	10,500	47	10,360			6	140
	1890	71	5,101	60	4,981			11	120
	1880	103	2,858	70	2,470			33	388
Oregon	1905	1	50					1	50
	1900	1	50					1	50
	1890	1	38					1	38
	1880	1	11					1	11
Pennsylvania	1905	157	37,845	95	30,601	57	7,197	5	47
	1900	148	24,070	70	17,119	70	6,849	8	102
	1890	221	17,047	81	9,551	125	7,336	15	160
	1880	269	7,580	75	2,953	158	4,411	36	216
Tennessee	1905	22	2,352	19	2,174			3	178
	1900	[1] 19	2,270	[1] 16	1,955			3	315
	1890	19	990	12	818			7	172
	1880	21	346	5	199			16	147
Texas	1905	4	210					4	210
	1900	4	175					4	175
	1890	3	116					3	116
	1880	1	9					1	9
Utah	1880	2	16					2	16
Vermont	1880	1	10					1	10
Virginia	1905	26	2,619	22	2,550			4	69
	1900	26	2,374	21	2,280			5	94
	1890	31	1,071	13	928			18	143
	1880	31	256	7	109			24	147
Washington	1905	1	35					1	35
	1900	1	35					1	35
	1890	1	27					1	27
West Virginia	1905	4	1,125	4	1,125				
	1900	3	750	3	750				
	1890	5	469	5	469				
	1880	11	285	6	259			5	26
Wisconsin	1905	6	960	5	835			1	125
	1900	6	750	5	630			1	120
	1890	10	752	4	415			6	337
	1880	14	422			3	165	11	257

[1] Includes 5 mixed charcoal and coke furnaces of a daily capacity of 350 tons.

For the first time since 1880 there appears an increase in the total number of blast furnaces, the number having increased from 399 to 435 since 1900. With each former census the decrease in number of stacks was large, accompanied by an increase both in aggregate capacity and in average capacity per stack. But during the period from 1900 to 1905 the number of stacks increased 9 per cent, the aggregate capacity 49.4 per cent, and the average capacity 36.7 per cent. The gain was in coke furnaces. Charcoal furnaces decreased in number, with a slight increase in the average daily capacity; and the anthracite and mixed anthracite and coke furnaces decreased considerably both in number and in aggregate capacity. In 1900, 5 furnaces in Tennessee, of a daily capacity of 350 tons, were operated with mixed charcoal and coke fuel. No furnaces operated with mixed charcoal and coke fuel were reported in 1905.

The growth in the size of furnaces is shown by the following presentation of the average daily capacity of furnaces for the different fuels and for the different census years:

	AVERAGE DAILY CAPACITY IN TONS.			
	1905	1900	1890	1880
All furnaces	201	147	68	25
Coke and bituminous coal furnaces	249	194	101	38
Anthracite and mixed anthracite and coke furnaces	118	100	55	29
Charcoal furnaces	46	41	24	12

The changes going on in furnace equipment—that is, the decrease in the number of anthracite and charcoal furnaces and the increase of the coke furnaces—is readily seen by reference to the table. New York alone shows an increase in charcoal furnaces. New

Jersey, New York, and Pennsylvania, the only states having anthracite and mixed anthracite and coke furnaces in 1900, all show reduced numbers in 1905.

Pennsylvania shows an increase of 25 bituminous (coke) furnaces since 1900, with an increase in average daily capacity per stack from 245 tons in 1900 to 322 tons in 1905. Ohio has an increase of 12 stacks, with an increase in average daily capacity from 220 tons in 1900 to 282 tons in 1905. New York shows an increase of 6 stacks, and an increase in average daily capacity of from 212 tons in 1900 to 292 tons in 1905. Alabama shows an increase of 6 stacks, with an increase in average daily capacity from 155 tons in 1900 to 171 tons in 1905. Illinois has gained 4 stacks, and increased the average daily capacity of its furnaces from 259 tons in 1900 to 322 tons in 1905. Similar gains are shown for Colorado, New Jersey, Kentucky, Michigan, Virginia, and West Virginia; the state of Michigan for the first time reporting a bituminous fuel furnace.

There are reported 31 furnaces of a daily capacity rating of 500 tons or more, distributed as follows: Pennsylvania 21, with an aggregate daily capacity of 11,700 tons; Ohio 7, with an aggregate daily capacity of 3,500 tons; Illinois 2, of 500 tons each; and New York 1, of 600 tons. The largest furnaces are Stacks J and K of the Edgar Thomson group of the Carnegie Steel Company, each of 650 tons rating.

In the presentation of statistics for the census of 1900 mention was made of the production of 901 gross tons of pig iron in a single day in June, 1902, by Furnace E of the Edgar Thomson group of the Carnegie Steel Company, at Bessemer, Pa. This output was exceeded by the same furnace on March 30, 1905, when it produced 918 gross tons of Bessemer pig iron. This is, up to the present time, the world's record for the largest output by a single furnace in twenty-four hours.

At the time of taking the present census the world's record for the longest run was held by Furnace H of the Edgar Thomson group, which was blown in on March 13, 1894, and blown out on June 20, 1903, a run of 3,386 days, during which period it was banked once for thirty-five days. The output of the furnace for the run was 1,256,193 gross tons of pig iron, an average of 374.9 tons per day for the 3,351 days of operating time. The record has since been surpassed by Shoenberger Furnace No. 2, Pittsburg, Pa., of the American Steel and Wire Company, which was blown out on August 1, 1906, after having been in blast for 3,427 days. During this time it was banked twelve times for an aggregate of sixty-six days.

The record for the largest output on a single lining is held by the Duquesne Furnace No. 1 of the Carnegie Steel Company, which produced 1,287,381 gross tons on an unbroken run of 2,024 days—an average of 636.1 tons per day.

Slag pits.—The schedule for the present census contained, for the first time, inquiries in regard to the number of granulated slag pits in use, their capacity, and the purposes for which the granulated slag is used; also the extent of manufacture of cement from slag by blast furnace establishments.

The use of granulated slag pits was reported by 31 establishments, distributed as follows: Pennsylvania, 15; Ohio, 14; Illinois, 1; and New York, 1. These establishments had in the aggregate 47 slag pits, with an annual capacity of 3,338,200 tons. Four of the establishments, located, 1 in Illinois, 2 in Ohio, and 1 in Pennsylvania, reported the use of slag for cement manufacture by the producing company, the cement plants having an annual capacity in excess of 5,000,000 barrels. In addition, 2 establishments reported the sale of slag to cement works. The bulk of the granulated slag is used for filling and railroad ballast.

PIG IRON EXPORTED.

In collecting the statistics for the census of 1900 an inquiry was made as to the amount of pig iron exported by blast furnace establishments, but this inquiry was omitted in taking the census of 1905. The total quantity reported as exported direct by blast furnace establishments in 1900 was 166,625 tons, which was less than 1.2 per cent of the total production. The total amount of pig iron exported in 1901, according to the reports of the Secretary of the Treasury, was 255,253 tons; in 1902 it had declined to 54,704 tons; it was still less in 1903 and 1904; and in 1905 it was only 56,971 tons, or less than three-tenths of 1 per cent of the total production.

POWER.

The blast furnace establishments in operation in 1904 reported in power equipment 1,555 steam engines, with an aggregate of 762,382 horsepower; 2 gas and gasoline engines, having 3,757 horsepower; 2 water wheels, of 680 horsepower; 1,370 electric motors of 52,471 horsepower; miscellaneous power appliances of 6,320 horsepower; and 139 electric horsepower rented. These aggregate 825,749 horsepower, as compared with 505,965 horsepower reported at the census of 1900, an increase of 63.2 per cent. In addition, penal institution in Texas reported 5 steam engines with 550 horsepower.

The use of waterpower was reported by 2 active establishments in Connecticut, 1 in Georgia, 2 in Michigan, and 4 in Pennsylvania, and by 1 idle establishment in North Carolina and 1 in Virginia. With the exception of 2 active establishments in Pennsylvania and 1 idle in Virginia, all those which reported water power have steampower equipment also.

The idle blast furnace establishments reported 2 steam engines of 89,465 horsepower, 2 water whe

of 82 horsepower, and 2 electric motors of 78 horsepower—a total of 89,625 horsepower.

The 1,372 electric motors of 52,549 horsepower capacity owned by the active and idle establishments represent secondary power, as they are run by current generated by the establishments reporting. The primary power of all establishments is therefore 863,375 horsepower. This shows an average power equipment of 1,985 horsepower per stack, and of 9.9 horsepower per ton of stack capacity.

In 1900 the corresponding average power equipment per stack was 1,312 horsepower, and per ton of stack capacity it was 8.9 horsepower.

The size of steam engines used (active establishments) has increased from an average of 381 horsepower in 1900 to 489 horsepower in 1905.

THE MANUFACTURE OF PIG IRON WITH MINERAL FUEL.

In 1880 nearly one-half of the pig iron product was made with anthracite fuel—either anthracite alone or anthracite coal and coke mixed. During the following decade bituminous coal and coke forged ahead and outstripped anthracite fuel, and at the present time pig iron made with bituminous fuel constitutes nearly nine-tenths of the total production.

In 1905 the production of anthracite pig iron was but 30,373 tons, and that of pig iron made with mixed anthracite coal and coke had declined from 1,796,000 tons in 1900 to 1,274,721 tons in 1905, a decrease of 29 per cent.

The increase in coke and bituminous coal pig iron, which was very heavy from 1890 to 1900, has continued, and during the period 1900 to 1905 the increase amounted to 2,655,211 tons, or 21.7 per cent. Bituminous pig iron exceeded anthracite in 1905 by 13,603,935 tons.

Table 29 shows the leading statistics of the manufacture of pig iron with mineral fuel for the census years of 1880, 1890, 1900, and 1905.

TABLE 29.—BLAST FURNACES, MINERAL FUEL—COMPARATIVE SUMMARY, WITH PER CENT OF INCREASE: 1880 TO 1905.

	CENSUS.				PER CENT OF INCREASE.		
	1905	1900	1890	1880	1900 to 1905	1890 to 1900	1880 to 1890
Number of establishments	160	188	221	225	[1] 14.9	[1] 14.9	1.8
Capital	[2] $228,895,148	[2] $140,703,112	[2] $116,982,231	$70,262,615	62.7	20.3	66.5
Salaried officials, clerks, etc., number	2,031	1,580	[3] 809	(4)	28.5	95.3	.....
Salaries	$2,630,547	$2,104,170	[3] $1,258,596	(4)	25.0	67.2	.....
Wage-earners, average number	32,873	37,425	30,148	25,025	[1] 12.2	24.1	20.5
Total wages	$17,970,879	$17,849,770	$13,418,450	$8,554,152	0.7	33.0	56.9
Men 16 years and over	32,799	37,338	30,083	(4)	[1] 12.2	24.1	.....
Wages	$17,954,249	$17,830,986	$13,406,085	(4)	0.7	33.0	.....
Women 16 years and over	4	6	.....	(4)	[1] 33.3	.....	.....
Wages	$954	$1,352	.....	(4)	[1] 29.4	.....	.....
Children under 16 years	70	81	65	(4)	[1] 13.6	24.6	.....
Wages	$15,676	$17,432	$12,365	(4)	[1] 10.1	41.0	.....
Miscellaneous expenses	$9,396,115	$7,181,322	$5,330,720	(4)	30.8	34.7	.....
Cost of materials used	$173,885,724	$127,706,216	$101,719,465	$51,254,711	36.2	25.5	98.5
Value of products	$224,433,959	$200,676,934	$133,685,378	$76,739,573	11.8	50.1	74.2
Tons of pig iron	16,214,123	14,095,675	8,251,693	2,987,235	15.0	70.8	176.2

[1] Decrease.
[2] Includes value of rented property—1905, $2,528,000; 1900, $4,623,081; 1890, $4,807,470.
[3] Includes proprietors and firm members, with their salaries; number only reported in 1900 and 1905, but not included in this table.
[4] Not reported separately.
[5] Not reported.

The number of establishments shows a decrease for each census year, while the capital investment and production shows a constant increase; though, as before explained, through the more general installation of labor saving equipments, the increased production is secured with a considerably less number of wage-earners. The number of active establishments has decreased 28 in number from 1900 to 1905, while the capital invested has increased $88,192,036, or 62.7 per cent. The decrease in number of wage-earners was 4,552, or 12.2 per cent.

In 1890 the yearly pig iron product per wage-earner was 274 tons; in 1900, 377 tons; and at the census of 1905 this average shows a further increase to 493 tons.

The following tabular statement shows, per ton of pig iron produced with mineral fuel, the capital investment, cost of production as shown by the items reported, and value of all products, for 1890, 1900, and 1905:

	1905	1900	1890
Capital	$14.12	$9.98	$14.18
Expenses	12.58	10.99	14.75
Salaries	0.16	0.15	0.15
Wages paid	1.11	1.27	1.63
Miscellaneous expenses	0.58	0.51	0.64
Cost of materials used	10.73	9.06	12.33
Products, value per ton	13.84	14.24	16.20

It will be observed that executive and superintendence expense, as represented by salaries paid and miscellaneous expense, varies comparatively little per ton of product, while the labor item decreases with each

census. The fluctuations in the cost of production are due chiefly to fluctuations in the cost of materials.

In 1890 and 1900 the labor cost of producing a ton of mineral fuel pig iron, as represented by the amount of wages paid at the blast furnaces, was between 11 and 12 per cent of the cost represented by the above items, while in 1905 it was a trifle less than 9 per cent.

Table 30 is a comparative summary, by states, of the leading statistics of establishments manufacturing pig iron with mineral fuel, for 1880, 1890, 1900, and 1905.

TABLE 30.—BLAST FURNACES, MINERAL FUEL—COMPARATIVE SUMMARY, BY STATES: 1880 TO 1905.

STATE.	Census.	Number of establishments.	Capital.	SALARIED OFFICIALS, CLERKS, ETC.		WAGE-EARNERS AND WAGES.		Miscellaneous expenses.	Cost of materials used.	Value of products.
				Number.	Salaries.	Average number.	Wages.			
United States	1905	160	[1] $228,895,148	2,031	$2,630,547	32,873	$17,970,879	$9,396,115	$173,885,724	$224,433,959
	1900	188	[1] 140,703,112	1,580	2,104,170	37,425	17,849,770	7,181,322	127,706,216	200,676,934
	1890	221	[1] 116,982,231	[2] 809	[2] 1,258,596	30,148	13,418,450	5,330,720	101,719,465	133,685,378
	1880	225	70,262,615	(3)	( )	25,025	8,554,152	(4)	51,254,711	76,739,573
Alabama [5]	1900	15	10,512,495	123	203,564	4,804	1,306,929	753,119	7,110,092	12,645,970
	1890	17	12,466,870	103	183,874	3,364	1,305,835	(3)	5,194,859	8,390,604
	1880	2	955,800	.....	.....	300	60,257	.....	233,353	554,162
Illinois	1905	4	14,263,055	83	100,661	1,910	1,397,969	958,945	19,005,423	27,330,836
	1900	4	10,683,913	210	294,524	3,010	2,176,274	691,724	11,707,965	15,153,646
	1890	5	9,855,274	11	23,115	1,420	896,030	(3)	8,088,153	10,138,310
	1880	3	950,000	.....	.....	498	185,054	.....	1,762,609	2,391,850
Missouri [6]	1890	3	1,262,475	10	16,343	383	156,020	(3)	900,319	1,191,502
	1880	2	2,050,000	.....	.....	479	169,111	.....	1,410,124	1,765,017
New Jersey	1905	5	5,414,051	32	43,715	774	370,751	191,355	2,940,780	3,601,511
	1900	9	2,474,639	50	44,888	589	292,213	90,619	1,987,594	2,546,215
	1890	8	3,131,366	15	22,386	640	240,152	(3)	1,679,937	2,228,724
	1880	12	3,644,500	.....	.....	1,174	365,639	.....	2,488,670	3,428,747
New York	1905	8	14,514,587	70	147,832	1,473	1,098,135	281,734	5,978,098	8,152,445
	1900	7	3,781,141	41	77,549	998	620,983	283,351	3,371,684	4,860,154
	1890	13	5,850,119	47	84,381	1,338	550,018	(3)	3,964,464	4,850,543
	1880	22	8,059,384	.....	.....	2,050	762,210	.....	3,712,160	6,009,097
Ohio [6]	1900	39	22,823,130	266	333,281	5,882	3,257,644	1,242,779	23,438,764	40,191,687
	1890	37	10,985,403	138	176,115	3,801	1,795,576	(3)	15,387,430	19,355,162
	1880	45	10,022,586	.....	.....	5,514	1,752,741	.....	8,233,013	11,646,754
Pennsylvania	1905	61	109,098,701	883	1,104,691	13,838	7,753,725	4,575,234	86,274,037	107,380,293
	1900	74	74,675,948	604	780,412	15,999	8,015,784	3,263,669	64,016,952	101,455,104
	1890	105	58,494,262	341	545,070	15,411	7,047,156	(3)	56,922,660	74,837,755
	1880	116	39,048,294	.....	.....	11,975	4,368,562	.....	29,087,348	44,385,123
Tennessee [5]	1900	8	3,906,879	53	73,206	1,484	347,907	191,324	2,564,970	3,856,913
	1890	7	2,827,085	44	60,106	811	357,883	(3)	2,018,044	2,702,548
	1880	3	810,626	.....	.....	623	145,867	.....	393,685	640,957
Virginia [5]	1900	15	4,958,992	115	144,654	1,575	523,367	158,768	4,352,605	6,459,970
	1890	10	3,874,606	49	71,177	1,167	456,001	(3)	2,720,195	3,755,651
	1880	1	500,000	.....	.....	200	94,781	.....	76,179	178,920
West Virginia [5]	1900	3	1,080,553	24	21,051	492	227,235	58,787	1,603,042	3,119,301
	1890	4	1,446,082	13	16,758	411	182,175	(3)	1,503,847	2,009,505
	1880	6	1,254,425	.....	.....	608	211,484	.....	1,131,176	1,583,896
Wisconsin [5]	1900	4	1,361,096	19	29,485	469	259,131	96,355	1,667,762	2,369,087
	1890	3	2,284,509	8	12,294	328	147,154	(3)	1,294,123	1,620,117
	1880	1	600,000	.....	.....	235	115,537	.....	1,198,670	1,688,655
All other states	[7] 1905	82	85,604,754	963	1,233,648	14,878	7,350,299	3,388,847	59,687,386	77,968,874
	[8] 1900	10	4,444,326	75	101,556	2,123	822,303	350,827	5,794,786	8,018,287
	[9] 1890	9	4,504,180	30	46,977	1,074	284,450	(3)	2,045,434	2,604,957
	[10] 1880	12	2,367,000	.....	.....	1,369	322,909	.....	1,527,724	2,466,395

[1] Includes value of rented property—1905, $2,598,600; 1900, $4,623,081; 1890, $4,807,470.
[2] Includes proprietors and firm members, with their salaries; number only reported in 1900 and 1905, but not included in this table.
[3] Not reported separately.
[4] Not reported.
[5] Included in "all other states" in 1905.
[6] Included in "all other states" in 1900 and 1905.
[7] Includes establishments distributed as follows: Alabama, 17; Colorado, 1; Georgia 1; Kentucky, 1; Maryland, 1; Michigan, 1; Minnesota, 1; Missouri, 1; Ohio, 31; Tennessee, 12; Virginia, 9; West Virginia, 3; Wisconsin, 3.
[8] Includes establishments distributed as follows: Colorado, 1; Georgia, 1; Kentucky, 2; Maryland, 2; Minnesota, 1; Missouri, 1; North Carolina, 2.
[9] Includes establishments distributed as follows: Colorado, 1; Georgia, 2; Indiana, 2; Kentucky, 2; Maryland, 2.
[10] Includes establishments distributed as follows: Georgia, 2; Indiana, 2; Kentucky, 3; Maryland, 4; Massachusetts, 1.

The necessity of including in the group of "all other states" such states as have establishments owned by less than three organizations in either the mineral-fuel branch or the charcoal-fuel branch of the blast furnace industry, in order that the operations of individual organizations may not be disclosed by comparison of the different tables, requires the inclusion under "all other states" of a number of the leading states; notably Ohio and Alabama, which are the second and fourth ranking states, respectively, in the mineral fuel industry, as well as West Virginia, Tennessee, Virginia, and Wisconsin, which rank sixth, eighth, ninth, and tenth, respectively.

Pig iron was produced with mineral fuel in 17 states in 1905. The number is the same as in 1900, Michigan, which did not produce mineral fuel pig iron in 1900,

appearing as a producer in 1905 and replacing North Carolina, whose furnaces, active in 1900, were idle in 1905. There were 16 states that produced mineral fuel pig iron in 1890 and 1880. All of the states for which product value is given in detail show an increase. The largest relative increase in value of product for the period 1900 to 1905 appears in Illinois and the next in New York; the per cent of increase was 80.4 in the former state and 67.8 in the latter. Next in order comes New Jersey, with an increase in value of products of 41.4 per cent, followed by Alabama, which showed a large increase.

It should be noted, however, that the statistics of Illinois for 1900 show an average value per ton of pig iron made with mineral fuel of $10.23 (see Table 34), which is $3.99 per ton less than the average value for the United States, and $4.74 per ton less than the average for Pennsylvania. It is probable that the low average value per ton for pig iron in Illinois in 1900 was due to a misunderstanding of the scope of the census inquiry and to errors in reporting values. If we estimate the value of the Illinois pig iron product for 1900 on the basis of the average value for the United States, $14.22 per ton, we have $20,896,717, instead of $15,033,696, as the value of the pig iron product made with mineral fuel.

The decrease in the number of wage-earners in the blast furnace industry in general has heretofore been noted.

The total value of all products reported by blast furnace establishments in 1905 was $231,889,126, of which amount the mineral fuel furnaces contributed $224,433,959, or 96.8 per cent, compared with 97 per cent in 1900, 91.8 per cent in 1890, and 85.9 per cent in 1880. The state of Pennsylvania produced nearly one-half of the mineral fuel pig iron, and over five-sixths of the entire product was from Pennsylvania, Ohio, Illinois, and Alabama.

Capital.—Table 31 shows the capital invested in blast furnace establishments equipped for the manufacture of mineral fuel pig iron, whether active or idle, for the census years 1880, 1890, 1900, and 1905.

TABLE 31.—*Blast furnaces, mineral fuel—active and idle establishments—capital: 1880 to 1905.*

	Census.	Number of establishments.	CAPITAL.		
			Total.	Buildings, machinery, tools, and implements.	Land, cash, and sundries.
Total	1905	216	[1] $249,101,969	$148,287,198	$100,814,771
	1900	207	[1] 146,556,052	80,989,287	65,566,765
	1890	261	[1] 121,393,241	67,102,965	54,290,276
	1880	271	76,095,698	40,503,972	35,591,726
Active	1905	160	228,895,148	133,280,465	95,614,683
	1900	188	140,703,112	76,415,732	64,287,380
	1890	221	116,982,231	63,798,965	53,183,266
	1880	225	70,262,615	36,605,322	33,657,293
Idle	1905	56	20,206,821	15,006,733	5,200,088
	1900	19	5,852,940	4,573,555	1,279,385
	1890	40	4,411,010	3,304,000	1,107,010
	1880	46	5,833,083	3,898,650	1,934,433

[1] Includes value of rented property—1905, $3,359,600; 1900, $4,763,381; 1890, $4,807,470.

The total capital invested in the mineral fuel branch of the blast furnace industry constitutes 94.9 per cent of the capital in the entire industry, as compared with 92.6 per cent in 1900. In 1890 the percentage was 86.1.

Materials used.—Table 32 shows in detail the quantity and cost of the materials used by the mineral fuel blast furnaces in the manufacture of pig iron in 1880, 1890, 1900, and 1905.

TABLE 32.—BLAST FURNACES, MINERAL FUEL—MATERIALS USED, BY KIND, QUANTITY, AND COST: 1880 TO 1905.

KIND.	1905		1900		1890		1880	
	Tons.	Cost.	Tons.	Cost.	Tons.	Cost.	Tons.	Cost.
Total	.....	$173,885,724	.....	$127,706,216	.....	$101,719,465	.....	$51,254,711
Domestic iron ore	28,393,506	94,173,650	23,916,749	60,595,698	12,886,878	54,006,644	5,642,529	29,689,049
Foreign iron ore	829,918	4,739,123	754,383	4,107,449	965,741	5,860,349	(1)	(1)
Fluxing material	8,256,325	6,821,558	7,223,136	4,980,465	4,885,153	4,038,709	2,727,216	2,446,767
Anthracite coal and culm	560,637	1,812,779	886,564	2,297,419	1,796,854	5,165,761	2,334,984	8,012,755
Bituminous coal and slack	796,113	1,323,646	831,429	1,099,810	491,971	759,522	939,065	2,095,887
Coke	[2] 19,739,671	57,126,997	[2] 16,396,455	38,774,819	[2] 9,237,935	27,435,780	[2] 2,128,255	8,129,240
Mill cinder, scrap, etc.	1,864,836	3,828,916	1,599,364	3,769,161	1,144,974	3,084,391	302,136	841,451
All other materials	.....	4,059,055	.....	12,081,395	.....	1,368,309	.....	38,962

[1] Domestic and foreign ore were not reported separately in 1880.

[2] Short tons.

The consumption of domestic iron ore shows an increase of 4,476,757 tons, or 18.7 per cent; foreign iron ore, an increase of 75,535 tons, or 10 per cent; and mill cinder and scrap reported as purchased—that is, not including runner or other scrap produced by the furnace reporting—an increase of 265,472 tons, or 16.6 per cent. The iron constituent materials in the aggregate amounted to 31,088,260 tons, an increase of 4,817,764 tons over 1900, or 18.3 per cent.

The increase in fluxing material was 1,033,189 tons, or 14.3 per cent. The consumption of anthracite coal and culm fell off 325,927 tons from 1900, or 36.8 per

cent, and the consumption of bituminous coal and slack shows a slight decrease, while coke presents an increase of 3,343,216 short tons, or 20.4 per cent.

The fuels in the aggregate show an increase of 2,623,771 long tons, or 16 per cent, while the increase in the pig iron tonnage was 15 per cent.

The average consumption of constituent materials (ore, mill cinder, and scrap, not including runner or other scrap produced by the furnace reporting), flux, and fuel in producing a ton of mineral fuel pig iron is shown in the following tabular statement, for 1880, 1890, 1900, and 1905:

Materials consumed per ton of pig iron—mineral fuel.

MATERIAL.	POUNDS.			
	1905	1900	1890	1880
Total	7,800	7,666	7,946	10,156
Ore	4,037	3,921	3,760	4,231
Limestone	1,141	1,147	1,326	2,045
Fuel	2,622	2,598	2,860	3,880
Mill cinder, scrap, etc., purchased, not included in total	258	254	312	227

In the fuel consumption given above the amount used for steam purposes is necessarily included, but the amount so used is not relatively large. Excluding mill cinder and scrap, which, as it was only reported where purchased, does not represent all of that class of material used, the per cent that each class of material is of the total for each census year is as follows:

MATERIAL.	PER CENT OF TOTAL.			
	1905	1900	1890	1880
Total	100.0	100.0	100.0	100.0
Ore	51.8	51.1	47.3	41.7
Limestone	14.6	15.0	16.7	20.1
Fuel	33.6	33.9	36.0	38.2

In comparison with the above the following tabular statement is given, showing the average consumption of ore, flux, and coke per ton of pig iron, by certain large furnaces of a daily capacity of approximately 500 tons or more, in Ohio and Pennsylvania. These furnaces produced over 5,000,000 tons of pig iron in 1905.

MATERIAL.	Pounds.	Per cent of total.
Total	7,087	100.0
Ore	3,874	54.7
Limestone	986	13.9
Coke	2,227	31.4

Products.—Table 33 shows the pig iron product of mineral fuel furnaces for 1880, 1890, 1900, and 1905, classified according to the fuel used. The production of spiegeleisen and ferromanganese and direct castings is included.

TABLE 33.—BLAST FURNACES, MINERAL FUEL—PRODUCTS, BY QUANTITY AND VALUE, CLASSIFIED ACCORDING TO KIND OF FUEL USED: 1880 TO 1905.

KIND.	1905		1900		1890		1880	
	Tons.	Value.	Tons.	Value.	Tons.	Value.	Tons.	Value.
Aggregate	.....	$224,433,959	.....	$200,676,934	.....	$133,685,378	.....	$76,739,573
Total pig iron	16,214,123	221,918,031	14,095,675	200,441,796	8,251,693	133,655,273	2,987,235	75,715,266
Coke and bituminous coal pig iron	14,909,029	203,814,049	12,253,818	173,763,091	6,265,865	100,687,256	1,354,958	35,513,233
Mixed anthracite coal and coke pig iron	1,274,721	17,712,934	1,796,000	26,066,003	1,690,394	28,195,996	638,027	16,627,291
Anthracite coal pig iron	30,373	391,048	45,857	612,702	295,434	4,772,021	994,250	23,574,742
All other products	.....	2,515,928	.....	235,138	.....	30,105	.....	1,024,307

Pig iron made with mixed anthracite coal and coke declined 521,279 tons from 1900 to 1905, or 29 per cent. The gain is all in bituminous pig iron, which increased in quantity 2,655,211 tons, or 21.7 per cent, and in value $30,050,958, or 17.3 per cent. The production of pig iron with anthracite coal alone has practically ceased; the last trace of it appears in the small product of 30,373 tons. The quantity of pig iron made with mixed anthracite and coke fuel is a little less than twice the quantity produced in 1880, and bituminous pig iron, chiefly coke, has increased more than tenfold. The amount reported for "all other products," aggregating $2,515,928 in 1905, includes castings made in foundries by blast furnace establishments, granulated slag, slag used for ballast, cement from furnace slag, as well as receipts for custom work and repairing. The last mentioned item was $324,996. Castings produced direct from furnace, as well as spiegeleisen and ferromanganese, are included in the pig iron product.

The average value of coke and bituminous coal pig iron was $13.67 per ton in 1905, $14.18 in 1900, $16.07 in 1890, and $26.21 in 1880; for mixed anthracite and coke pig iron the average price was $13.90 per ton in 1905, $14.51 in 1900, $16.68 in 1890, and $26.06 in 1880; and for pig iron made with anthracite coal alone, $12.87 per ton in 1905, $13.36 in 1900, $16.15 in 1890, and $23.71 in 1880.

Table 34 shows, by states, the production, value, and average value per ton of all kinds of mineral fuel pig iron for 1880, 1890, 1900, and 1905, and the number of completed furnaces for each of the years.

TABLE 34.—*Blast furnaces, mineral fuel—quantity and value of pig iron, with average value per ton, by states: 1880 to 1905.*

STATE.	Census.	Number of completed furnaces.	Tons.	Value.	Average value per ton.
United States	1905	380	[1] 16,214,123	[1] $221,918,031	$13.69
	1900	325	[2] 14,095,675	[2] 200,441,796	14.22
	1890	419	8,251,693	133,655,273	16.20
	1880	430	[3] 2,987,235	[3] 75,715,266	25.35
Alabama [4]	1900	35	1,153,674	12,645,970	10.96
	1890	34	720,197	8,390,604	11.65
	1880	5	24,296	551,162	22.69
Illinois	1905	21	1,660,610	25,508,271	15.36
	1900	17	1,469,530	15,033,696	10.23
	1890	15	666,676	10,136,960	15.21
	1880	10	85,239	2,391,850	28.06
Missouri [5]	1890	5	60,079	1,191,502	19.83
	1880	8	67,800	1,686,780	24.88
New Jersey	1905	13	262,308	3,600,144	13.72
	1900	11	150,002	2,521,066	16.81
	1890	18	129,500	2,228,724	17.21
	1880	20	140,548	3,410,663	24.27
New York	1905	18	579,420	7,929,654	13.69
	1900	17	327,069	4,856,559	14.85
	1890	28	293,205	4,850,543	16.54
	1880	42	266,616	5,894,405	22.62
Ohio [4]	1900	47	2,552,643	40,155,408	15.73
	1890	60	1,183,030	19,355,162	16.36
	1880	70	442,578	11,525,927	26.04
Pennsylvania	1905	152	7,726,742	107,320,783	13.89
	1900	139	6,774,243	101,435,404	14.97
	1890	206	4,330,470	74,811,310	17.28
	1880	233	1,692,992	43,760,395	25.85
Tennessee [4]	1900	11	318,716	3,856,913	12.10
	1890	12	218,339	2,702,548	12.38
	1880	5	36,963	637,757	17.25
Virginia [4]	1900	21	426,501	6,459,970	15.15
	1890	13	271,831	3,755,651	13.82
	1880	7	7,515	168,120	22.37
West Virginia [5]	1890	5	115,508	2,009,505	17.40
	1880	6	70,298	1,580,096	22.48
Wisconsin [4]	1900	5	182,291	2,369,362	13.00
	1890	4	107,981	1,620,117	15.00
	1880	3	60,306	1,688,548	28.00
All other states	[6] 1905	176	5,985,043	77,559,179	12.96
	[7] 1900	22	741,006	11,107,448	14.99
	[8] 1890	19	154,877	2,602,647	16.80
	[9] 1880	21	98,084	2,419,563	24.67

[1] Includes 9,469 tons of direct castings, valued at $131,700, and 227,648 tons of spiegeleisen and ferromanganese, valued at $6,084,247.
[2] Includes 7,113 tons of direct castings, valued at $87,541, and 215,550 tons of spiegeleisen and ferromanganese, valued at $5,871,955.
[3] Includes 3,508 tons of direct castings, valued at $131,248.
[4] Included in "all other states" in 1905.
[5] Included in "all other states" in 1900 and 1905.
[6] Includes states as follows: Alabama, Colorado, Georgia, Kentucky, Maryland, Michigan, Minnesota, Missouri, Ohio, Tennessee, Virginia, West Virginia, Wisconsin.
[7] Includes states as follows: Colorado, Georgia, Kentucky, Maryland, Minnesota, Missouri, North Carolina, West Virginia.
[8] Includes states as follows: Colorado, Georgia, Indiana, Kentucky, Maryland.
[9] Includes states as follows: Georgia, Indiana, Kentucky, Maryland, Massachusetts.

The highest value per ton of mineral fuel pig iron reported was for Colorado, and the lowest for Georgia. For the states reported in detail the highest value per ton was for Illinois. The values for New York, West Virginia, New Jersey, Ohio, and Pennsylvania conform very closely to the averages for the country at large.

The only states showing an increase in the average value per ton are Alabama, Illinois, and Wisconsin, the apparent increase in the latter two states being large. But attention has already been called to probable error in the 1900 figures for Illinois.

DRY-AIR BLAST.

The most important improvement of late years in the blast furnace industry, and by some claimed not to be equaled by any improvement since Neilson's invention of the hot blast, is the Gayley dry-air blast, installed at the Isabella furnaces of the Carnegie Steel Company.

It had long been suspected that the moisture of the air, varying from day to day, between day and night, and even from hour to hour, was a prime cause of the irregular workings of a blast furnace, and the extent of the part played by moisture is strikingly shown by the comparative tests with dry-air blast and natural blast made at the aforesaid furnaces. The desiccation of the air is effected by passing it through a refrigerating chamber before it goes to the blowing engines and stoves. The furnace takes approximately 40,000 cubic feet of air per minute, and to handle this amount a refrigerating chamber of about 44,000 cubic feet capacity is used, filled with coils of 2-inch pipe, through which circulates the cold brine. This chamber has 90,000 feet of pipe, or over 17 miles. The moisture is deposited on the coils as ice and frost, and is periodically removed, after clearing the coils of the cold brine, by washing them down with a hose. The chamber is divided into four sections, one of which is cleared of ice each day.

When the plant was visited on a clear day in July in 1906, there was being removed 4.59 grains of moisture per cubic foot of air. At the rate of 40,000 cubic feet of air per minute, this is equivalent to 4,534 gallons of water per twenty-four hours, or a little over 18 tons of water, which, if running on natural air, would have gone into the furnace to consume heat energy.

When it is considered that the humidity of the air varies from half a grain per cubic foot on a cold, clear day in winter to 8 or even 9 grains on a muggy day in summer, the fluctuating character of this disturbing element can be readily appreciated.

The economies effected by the use of the dry-air blast are—reduction in fuel consumed per unit of pig iron of some 20 per cent; increase in the capacity of the furnace; reduction in iron ore waste (dust); and control over silicon range.

There is also, incidentally, a saving in power, as the combined power required for the desiccating plant and blowing engine when running on dry-blast is less than that consumed by the blowing engine when running with natural air. This difference is due to the fact that with dry-blast the blowing engine receives its air at 20° temperature and much condensed in volume, and the blast pressure required is less, the furnace being run with 13.5 pounds on dry-blast as against 15 pounds or more with natural air.

The following comparative statement shows the operations of the Isabella furnaces, Nos. 1 and 3, under dry air and natural air:

FURNACE.	Date.	Average daily product (gross tons).	Average amount of coke used per ton of pig iron (pounds).	Number of revolutions of blowing engine per minute.	Average temperature of hot blast (degrees).
No. 1:					
Dry air	November, 1904	447	1,816	96	854
No. 3:					
Natural air	November, 1904	386	2,279	111	750
No. 1:					
Dry air	January 1 to January 10, 1905.	428	1,825	96	869
Natural air	January 15 to January 31, 1905.	414	2,340	111	771
No. 3:					
Dry air	January 15 to January 31, 1905.	432	1,811	96	802
Natural air	January 1 to January 10, 1905.	410	2,351	111	716

This shows for the month of November a saving of 20.3 per cent in coke consumption per ton of pig iron, with an increase of 15.8 per cent in output, through the use of the dry-blast.

In January there is shown a saving of 22 per cent in coke per ton of pig iron, with an increase of 3.4 per cent in output for one furnace, and a saving of 23 per cent in coke and an increase of 5.4 per cent in output for the other furnace, through the use of the dry-blast.

Average gas analyses are given as follows:

	CO (per cent).	CO_2 (per cent).	Temperature (degrees).
Without dry-blast	22.3	13.0	538
With dry-blast	19.9	16.0	376

The reduction of 162 degrees in gas temperature is due to greater concentration of heat in the hearth and the greater weight of burden heated by the gas.

The following is a statement of the normal charge with natural air and with dry-air blast:

CHARGE.	Natural air.	Dry-air blast.
Ore:		
Pounds	20,000	24,000
Per cent of charge	55.9	60.0
Limestone:		
Pounds	5,600	5,800
Per cent of charge	15.6	14.5
Coke:		
Pounds	10,200	10,200
Per cent of charge	28.5	25.5

THE MANUFACTURE OF CHARCOAL PIG IRON.

The leading statistics of the manufacture of charcoal pig iron are shown in Table 35 for the census years 1880, 1890, 1900, and 1905.

TABLE 35.—BLAST FURNACES, CHARCOAL—COMPARATIVE SUMMARY, WITH PER CENT OF INCREASE: 1880 TO 1905.

	CENSUS.				PER CENT OF INCREASE.		
	1905	1900	1890	1880	1900 to 1905	1890 to 1900	1880 to 1890
Number of establishments	33	32	83	116	3.1	[1] 61.4	[1] 28.4
Capital	[2] $10,664,046	[2] $6,155,839	[2] $17,626,312	$19,268,747	73.2	[1] 65.1	[1] 8.5
Salaried officials, clerks, etc., number	205	153	[3] 259	(4)	34.0	[1] 40.9	.....
Salaries	$267,370	$173,420	[3] $353,091	(4)	54.2	[1] 50.9	.....
Wage-earners, average number	2,305	1,623	3,267	16,670	42.0	[1] 50.3	[1] 80.4
Total wages	$977,034	$562,420	$1,196,008	$4,101,276	73.7	[1] 53.0	[1] 70.8
Men 16 years and over	2,294	1,617	3,258	(4)	41.9	[1] 50.4	.....
Wages	$975,533	$561,963	$1,194,573	(4)	73.6	[1] 53.0	.....
Children under 16 years	11	6	9	(4)	83.3	[1] 33.3	.....
Wages	$1,501	$457	$1,435	(4)	228.4	[1] 68.2	.....
Miscellaneous expenses	$395,024	$260,766	$1,011,955	(5)	51.5	[1] 74.2	.....
Cost of materials used	$5,081,725	$3,250,664	$8,379,150	$7,365,031	56.3	[1] 61.2	13.8
Value of products	$7,455,167	$5,344,515	$11,957,775	$12,575,996	39.5	[1] 55.3	[1] 4.9
Tons of pig iron	414,171	303,567	593,492	388,677	36.4	[1] 48.9	52.7

[1] Decrease.
[2] Includes value of rented property—1905, $629,683; 1900, $273,800; 1890, $253,588.
[3] Includes proprietors and firm members, with their salaries; number only reported in 1900 and 1905, but not included in this table.
[4] Not reported separately.
[5] Not reported.

The product for 1905 shows an advance over that for 1900, but it is not up to the product of 1890 and is less by 14,408 tons than the average for the years 1880, 1890, and 1900. In 1854 the charcoal pig iron product was 305,623 tons, and it constituted over one-half of the pig iron product of the country, whereas now, after the progress of half a century, it forms less than one-fortieth of the total product.

The capital investment, cost of production as shown by the items reported, and value of products per ton of pig iron for the charcoal industry is shown by the following tabular statement for the years 1890, 1900, and 1905:

	1905	1900	1890
Capital	$25.75	$20.28	$29.70
Expenses	16.23	13.99	18.43
Salaries	0.65	0.57	0.59
Wages paid	2.36	1.85	2.02
Miscellaneous expenses	0.95	0.86	1.70
Cost of materials used	12.27	10.71	14.12
Products	18.00	17.61	20.15

The labor item in 1890 constituted 11 per cent of the total cost per ton; in 1900, 13.2 per cent; and in 1905, 14.5 per cent. In this respect the charcoal pig iron industry differs from the mineral fuel branch, where the item of labor shows a reduction, on account of the general use of large furnaces and improved appliances for charging, machine casting, and for handling material economically.

The same states, 14 in number, that appeared as producers of charcoal pig iron in 1900 were also producers in 1905. Michigan continues to be the heaviest producer. In 1905 all of its charcoal furnaces were active, and the value of products was nearly double that of 1900 and considerably in excess of 1890. Wisconsin, Georgia, New York, and Alabama, in the order named, follow Michigan as producers of charcoal pig iron, though the Michigan charcoal iron product was nearly seven and a half times that of any other state.

Capital.—Table 36 shows the capital investment in all charcoal blast furnace establishments, active and idle, for the census years 1880, 1890, 1900, and 1905.

There has been a decrease of 11 in the number of establishments from 1900 to 1905, though the decrease is not relatively as large as that for the former census periods. The capital investment has increased 27.5 per cent. The active and idle establishments reported, all told, 55 completed charcoal stacks in 1905 of a total daily capacity of 2,540 tons, of which 20, having a capacity of 692 tons, were idle throughout the year.

TABLE 36.—*Blast furnaces, charcoal—active and idle establishments—capital: 1880 to 1905.*

	Census.	Number of establishments.	CAPITAL.		
			Total.	Buildings, machinery, tools, and implements.	Land, cash, and sundries.
Total	1905	51	[1] $13,293,773	$5,304,501	$7,989,272
	1900	62	[1] 10,429,344	4,454,086	5,975,258
	1890	116	[1] 19,674,167	8,828,233	10,845,934
	1880	212	27,830,547	7,041,659	20,788,888
Active	1905	33	10,664,046	3,680,223	6,983,823
	1900	32	6,155,839	2,159,026	3,996,813
	1890	83	17,626,312	7,437,083	10,189,229
	1880	116	19,268,747	4,663,159	14,605,588
Idle	1905	18	2,629,727	1,624,278	1,005,449
	1900	30	4,273,505	2,295,060	1,978,445
	1890	33	2,047,855	1,391,150	656,705
	1880	96	8,561,800	2,378,500	6,183,300

[1] Includes value of rented property—1905, $805,683; 1900, $324,500; 1890, $253,588.

Materials used.—Table 37 presents in detail the materials used in the manufacture of charcoal pig iron for each census beginning with 1880.

The consumption of iron ore, all domestic, increased 221,014 tons, or 37 per cent.

The increase in the consumption of charcoal was 11,038,382 bushels, the percentage of increase, 37.7 per cent, corresponding to that of the ore consumption. The consumption of flux, however, as reported shows a very small increase in quantity, less than 1 per cent, and consequently a much reduced consumption per ton of product.

TABLE 37.—BLAST FURNACES, CHARCOAL—MATERIALS USED, BY KIND, QUANTITY, AND COST: 1880 TO 1905.

KIND.	1905		1900		1890		1880	
	Tons.	Cost.	Tons.	Cost.	Tons.	Cost.	Tons.	Cost.
Total	.....	$5,245,263	.....	$3,250,664	.....	$8,379,150	.....	$7,365,031
Domestic iron ore	818,761	2,037,258	597,747	1,000,282	1,161,693	3,601,301	836,653	3,515,629
Foreign iron ore	(1)	(1)	(1)	(1)	8,109	37,236	(2)	(2)
Fluxing material	70,896	71,113	70,446	55,298	136,526	158,169	102,381	100,569
Charcoal [3]	[4] 40,309,894	[4] 2,710,754	29,271,512	1,744,892	67,672,156	4,523,320	53,903,228	3,678,658
Mill cinder, scrap, etc	549	2,045	949	3,224	625	2,417	13,979	69,216
All other materials	.....	424,093	.....	386,968	.....	56,707	.....	959

[1] None reported.
[2] Domestic and foreign ores were not reported separately in 1880.
[3] Quantities in bushels.
[4] Includes 2,486,700 bushels of charcoal and its value, the cost of stumpage and labor being reported as expense in other tables.

Products.—Table 38 shows the quantity and value of the charcoal pig iron product for the census years 1880, 1890, 1900, and 1905. No spiegeleisen, ferro-manganese, or direct castings were reported as produced with charcoal fuel in 1905.

TABLE 38.—BLAST FURNACES, CHARCOAL—PRODUCTS, BY KIND, QUANTITY, AND VALUE: 1880 TO 1905.

KIND.	1905		1900		1890		1880	
	Tons.	Value.	Tons.	Value.	Tons.	Value.	Tons.	Value.
Aggregate	.....	$7,455,167	.....	$5,344,515	.....	$11,957,775	.....	$12,575,996
Total	[1] 414,171	[1] 7,059,504	[1] 303,567	[1] 5,338,739	593,492	11,957,710	388,677	12,488,744
Charcoal pig iron:								
Hot or warm blast charcoal pig iron	[1] 414,171	[1] 7,059,504	[1] 291,499	[1] 5,061,822	560,594	11,243,119	317,542	10,090,244
Cold-blast charcoal pig iron	(2)	(2)	12,068	276,917	32,898	714,591	71,135	2,398,500
All other products	.....	395,663	.....	5,776	.....	65	.....	87,252

[1] Includes product of 1 penal institution.

[2] Not reported separately.

At the census of 1900 and prior censuses a report of the amounts of charcoal pig iron produced with hot or warm blast and with cold-blast, respectively, was called for, but as very little cold-blast charcoal pig iron is now made, this inquiry was dropped in making the canvass for the census of 1905. In 1900 only 4 per cent of the charcoal pig iron was made with cold-blast.

The increase in the quantity of charcoal pig iron product in 1905 over 1900 was 110,604 tons, or 36.4 per cent; and in value, exclusive of all other products, it was $1,720,765, or 32.2 per cent.

Table 39 shows the number of completed furnaces and the quantity, value, and average price per ton of charcoal pig iron for 1880, 1890, 1900, and 1905.

TABLE 39.—*Blast furnaces, charcoal—quantity and value of pig iron, with average value per ton: 1880 to 1905.*

STATE.	Census.	Number of completed furnaces.	Tons.	Value.	Average value per ton.
United States	1905	55	414,171	$7,059,504	$17.04
	1900	66	[1] 303,567	[1] 5,338,739	17.59
	1890	140	593,492	11,957,710	20.15
	1880	251	[2] 388,677	[2] 12,488,744	32.13

[1] Includes 10 tons of direct castings, valued at $121.
[2] Includes 300 tons of direct castings, valued at $14,988.

The average value per ton for charcoal pig iron is $17.04, compared with $17.59 in 1900.

At the census of 1900 the manufacture of pig iron with mixed charcoal and coke fuel was reported by 6 establishments—4 in Tennessee, which used this mixed fuel exclusively; 1 charcoal furnace in Ohio; and 1 coke furnace in Georgia, which made small quantities of pig iron with this fuel.

The manufacture of pig iron with mixed charcoal and coke has now been abandoned, and of the establishments above referred to, 4 made coke pig iron in 1905, 1 made charcoal iron, and 1 was idle.

STEEL WORKS AND ROLLING MILLS.

Table 40 shows the leading statistics for steel works and rolling mills for each census year, 1870 to 1905.

The number of active steel works and rolling mills from which separate reports were received shows a decrease of 23 from the number in 1900. In some cases, however, two or more plants under one and the same ownership and within the same municipality are covered by one report in 1905, and thus figure as one establishment, where in 1900 separate reports were made for the different plants. The number of establishments as here reported means the number of reports received and tabulated.

TABLE 40.—STEEL WORKS AND ROLLING MILLS—COMPARATIVE SUMMARY, WITH PER CENT OF INCREASE: 1870 TO 1905.

	CENSUS.					PER CENT OF INCREASE.			
	1905 [1]	1900	1890	1880	1870 [2]	1900 to 1905	1890 to 1900	1880 to 1890	1870 to 1880
Number of establishments	415	438	395	358	340	[3] 5.3	10.9	10.3	5.3
Capital	[4] $709,130,646	[4] $441,795,983	[4] $278,559,831	$116,458,390	$61,120,015	60.5	58.6	139.2	90.5
Salaried officials, clerks, etc., number	14,330	7,442	[5] 3,242	(6)	(6)	92.6	129.5	.....	.....
Salaries	$17,860,495	$9,421,868	[5] $4,833,240	(6)	(6)	89.6	94.9	.....	.....
Wage-earners, average number	207,562	183,023	137,295	96,164	47,099	13.4	33.3	42.8	104.2
Total wages	$122,491,993	$102,238,692	$74,460,433	$41,880,687	$26,843,767	19.8	37.3	77.8	56.0
Men 16 years and over	204,290	180,148	135,134	89,645	45,256	13.4	33.3	50.7	98.1
Wages	$121,615,828	$101,579,174	$74,041,279	(6)	(6)	19.7	37.2	.....	.....
Women 16 years and over	1,451	1,065	58	33	26	36.2	1,736.2	75.8	26.9
Wages	$441,013	$265,536	$17,106	(6)	(6)	66.1	1,452.3	.....	.....
Children under 16 years	1,821	1,810	2,103	6,486	1,817	0.6	[3] 13.9	[3] 67.6	257.0
Wages	$435,152	$393,982	$402,048	(6)	(6)	10.4	[3] 2.0	.....	.....
Miscellaneous expenses	$37,373,831	$24,795,663	$11,817,593	(7)	(7)	50.7	109.8	.....	.....
Cost of materials used	$441,204,432	$390,568,117	$216,269,022	$130,104,493	$84,342,649	13.0	80.6	66.2	54.3
Value of products	$673,965,026	$596,689,284	$331,860,872	$203,274,042	$129,921,144	13.0	79.8	63.3	56.5
Tons of products	18,216,639	15,040,129	7,388,244	3,046,038	1,331,773	21.1	103.6	142.6	128.7

[1] Exclusive of the statistics of 6 establishments engaged primarily in the manufacture of other products. These establishments made 4,184 tons of steel castings, valued at $347,264.
[2] Includes idle establishments which were not reported separately in 1870.
[3] Decrease.
[4] Includes value of rented property—1905, $8,948,336; 1900, $11,835,940; 1890, $3,212,000.
[5] Includes proprietors and firm members, with their salaries; number only reported in 1900 and 1905, but not included in this table.
[6] Not reported separately.
[7] Not reported.

Certain manufacturers in other lines of industry have equipments for the manufacture of steel or rolled material for use in their own establishments in the production of machinery or other constructions. Establishments of this kind reported as partial products in 1905, 4,184 tons of direct steel castings, of a value of $347,264, and these figures must be added to the above table in order to find the total products of steel works and rolling mills. Where a separate report for the steel or rolling mill section of such an establishment was not obtainable, the iron or steel products of this section do not figure in these tables, but enter into the report of the active operations of the establishment, which is classified according to the nature of the finished products. The steel making and rolling mill equipments of such establishments are shown in the tables which give the equipment of all establishments.

Table 41 shows the statistics, by states, of the active establishments which produced steel ingots or castings and hot-rolled iron and steel for 1880, 1890, 1900, and 1905.

TABLE 41.—STEEL WORKS AND ROLLING MILLS—COMPARATIVE SUMMARY, BY STATES: 1880 TO 1905.

STATE.	Census.	Number of establishments.	Capital.	SALARIED OFFICIALS, CLERKS, ETC.		WAGE-EARNERS AND WAGES.		Miscellaneous expenses.	Cost of materials used.	Value of products.
				Number.	Salaries.	Average number.	Wages.			
United States	1905	415	[1] $709,130,646	14,330	$17,860,495	207,562	$122,491,993	$37,373,831	$441,204,432	[2] $673,965,026
	1900	438	[1] 441,795,983	7,442	9,421,868	183,023	102,238,692	24,795,663	390,568,117	596,689,284
	1890	395	[1] 278,559,831	[3] 3,242	[3] 4,833,240	137,295	74,460,433	11,817,593	216,269,022	331,860,872
	1880	358	116,458,390	(4)	(4)	96,164	41,880,687	(5)	130,104,493	203,274,042
Alabama	1905	10	9,827,511	165	223,311	3,636	1,508,681	344,837	5,035,190	8,041,566
	1900	6	4,401,295	34	55,548	2,204	1,072,384	107,737	2,451,824	3,904,714
	1890	7	2,208,797	43	56,648	1,696	681,660	157,463	931,460	2,228,536
	1880	1	50,000	.....	.....	60	18,000	.....	25,400	47,500
California	1905	4	1,110,192	35	53,073	773	492,390	84,933	778,970	1,489,012
	1900	3	1,499,162	18	22,250	555	327,184	18,944	506,834	900,854
	1890	4	4,656,611	38	56,549	1,114	693,300	208,088	1,938,333	3,097,155
	1880	1	1,000,000	.....	.....	319	177,722	.....	535,500	780,000
Connecticut	1905	7	8,888,583	137	178,033	2,989	1,586,715	470,393	2,626,931	5,150,675
	1900	7	4,792,902	72	107,775	1,785	939,243	188,313	2,198,682	4,066,836
	1890	8	1,249,429	29	39,537	532	311,771	56,627	911,335	1,463,180
	1880	11	1,385,000	.....	.....	546	265,210	.....	869,758	1,353,787
Delaware	1905	5	6,279,585	91	102,952	1,055	412,003	144,785	939,506	1,597,309
	1900	6	4,207,079	81	132,677	1,490	705,366	140,054	1,635,762	3,159,641
	1890	7	2,558,865	53	78,061	1,637	765,158	43,201	1,549,539	2,608,670
	1880	8	1,341,469	.....	.....	867	344,476	.....	1,214,050	2,347,177
Illinois	1905	23	44,332,095	1,267	1,684,457	16,448	10,070,988	3,382,006	38,649,762	60,021,925
	1900	22	32,672,326	570	631,567	13,632	7,464,442	2,516,516	30,021,296	45,149,498
	1890	19	24,834,645	168	246,193	7,265	4,324,853	577,876	21,951,521	28,872,741
	1880	13	4,845,620	.....	.....	4,755	2,323,664	.....	13,214,536	18,153,439

[1] Includes value of rented property—1905, $8,948,336; 1900, $11,835,940; 1890, $3,212,000.
[2] Exclusive of steel castings to the value of $347,264 made by establishments engaged primarily in the manufacture of other products.
[3] Includes proprietors and firm members, with their salaries; number only reported in 1900 and 1905, but not included in this table.
[4] Not reported separately.
[5] Not reported.

TABLE 41.—STEEL WORKS AND ROLLING MILLS—COMPARATIVE SUMMARY, BY STATES: 1880 TO 1905—Continued.

STATE.	Census.	Number of establishments.	Capital.	SALARIED OFFICIALS, CLERKS, ETC.		WAGE-EARNERS AND WAGES.		Miscellaneous expenses.	Cost of materials used.	Value of products.
				Number.	Salaries.	Average number.	Wages.			
Indiana	1905	21	$22,985,691	323	$369,962	7,215	$4,071,593	$606,398	$10,905,822	$16,920,326
	1900	27	14,994,210	205	266,764	7,579	4,243,831	376,844	12,438,754	19,338,481
	1890	13	3,888,254	63	95,013	2,581	1,120,779	169,435	2,889,615	4,505,536
	1880	9	1,828,000	.....	.....	1,740	810,081	.....	2,957,467	4,090,868
Kentucky	1905	8	4,716,080	71	78,211	2,149	1,272,114	244,871	4,216,751	6,167,542
	1900	6	3,134,287	73	91,669	1,766	949,047	120,818	3,116,331	5,004,572
	1890	5	1,484,456	32	46,651	1,173	582,007	65,990	1,241,536	2,059,840
	1880	9	2,512,000	.....	.....	2,205	914,412	.....	2,422,389	3,841,377
Maryland	1905	7	4,706,185	117	138,727	1,534	811,128	284,926	6,582,085	8,106,920
	1900	5	2,047,314	40	58,499	1,419	703,445	351,622	4,260,326	5,540,179
	1890	4	1,071,352	16	16,828	557	194,181	20,747	766,849	1,062,204
	1880	5	2,145,000	.....	.....	1,253	546,974	.....	1,829,042	2,550,051
Massachusetts	1905	5	14,348,448	395	364,585	4,544	2,593,235	717,910	6,901,763	11,947,731
	1900	7	13,608,604	93	155,217	6,099	3,401,995	989,570	7,490,732	13,412,379
	1890	14	8,344,394	122	175,664	5,168	2,454,035	169,937	6,786,610	10,981,649
	1880	21	5,526,408	.....	.....	6,115	2,399,975	.....	6,486,372	9,973,911
Michigan	1905	5	1,697,571	38	46,104	1,018	526,565	163,103	1,800,179	2,712,114
	1900	3	1,904,337	28	30,625	1,459	725,061	146,780	2,365,289	3,574,905
	1890	4	1,437,540	25	44,444	752	435,339	98,096	1,200,758	1,847,565
	1880	2	671,000	.....	.....	925	360,727	.....	1,188,196	1,446,551
Missouri	1905	4	3,672,268	61	88,798	1,349	928,303	172,013	1,588,494	2,999,438
	1900	5	2,195,309	52	81,566	1,604	881,917	72,378	1,605,392	3,200,230
	1890	4	1,612,443	18	28,039	642	393,896	102,786	831,566	1,520,559
	1880	5	3,020,000	.....	.....	1,789	447,464	.....	1,412,934	2,185,513
New Jersey	1905	16	46,380,626	566	804,772	8,334	4,087,977	1,448,560	12,389,675	20,065,972
	1900	16	17,861,970	282	452,357	7,699	3,600,728	1,056,365	14,322,831	21,835,484
	1890	19	8,525,996	129	212,812	4,498	2,301,592	504,967	5,326,401	8,756,431
	1880	18	5,005,550	.....	.....	3,495	1,412,622	.....	3,914,970	6,704,054
New York	1905	20	48,852,865	609	801,337	7,526	4,393,222	1,137,066	13,260,039	21,227,399
	1900	20	9,243,471	191	293,867	4,344	2,410,275	211,984	4,093,932	8,697,995
	1890	19	9,321,793	127	199,862	5,291	2,672,454	486,805	5,932,461	10,310,088
	1880	24	8,702,000	.....	.....	7,437	2,725,191	.....	8,264,186	13,924,622
Ohio	1905	57	87,406,064	1,744	1,931,037	27,756	18,657,542	4,113,201	78,209,770	111,996,673
	1900	64	63,181,422	945	1,250,230	27,638	16,443,825	3,134,600	67,785,834	98,568,619
	1890	55	25,892,390	453	663,638	19,489	11,405,904	1,552,785	28,854,636	45,406,560
	1880	41	9,805,020	.....	.....	11,127	5,539,913	.....	14,848,295	21,880,167
Pennsylvania	1905	186	363,233,842	8,129	10,057,776	110,904	65,306,427	21,924,663	237,875,025	363,773,577
	1900	209	247,001,768	4,450	5,390,828	94,664	53,817,488	14,573,593	218,860,649	332,588,174
	1890	186	166,691,801	1,738	2,564,584	76,609	42,356,589	7,072,834	122,530,544	188,714,190
	1880	158	60,489,929	.....	.....	43,832	20,099,576	.....	61,564,150	98,445,709
Tennessee[1]	1900	3	129,570	15	14,986	216	100,375	12,158	235,573	387,409
	1890	4	927,549	21	30,830	460	218,699	91,295	492,789	881,404
	1880	5	1,401,000	.....	.....	1,350	376,786	.....	859,965	1,369,400
Virginia	1905	3	2,122,686	37	66,806	1,022	381,715	110,426	821,788	1,515,959
	1900	4	1,913,944	34	61,905	1,503	452,020	87,915	1,124,356	1,836,670
	1890	6	2,174,787	40	65,701	1,742	639,347	100,471	1,584,285	2,400,603
	1880	5	838,000	.....	.....	1,134	352,539	.....	1,199,698	1,986,416
West Virginia	1905	12	8,716,170	107	142,342	4,409	2,813,319	492,683	8,742,471	13,454,802
	1900	8	7,122,357	81	108,426	3,975	2,066,289	166,378	8,729,280	13,394,911
	1890	8	5,012,842	63	86,687	3,346	1,552,589	88,289	6,402,189	8,547,360
	1880	8	2,390,191	.....	.....	3,228	1,301,658	.....	2,326,014	4,422,936
Wisconsin[2]	1905	10	3,588,494	133	155,870	1,915	1,124,529	277,330	4,501,159	7,379,038
	1900	7	4,026,564	65	73,624	1,370	909,117	252,093	3,394,932	6,004,989
	1880	1	700,000	.....	.....	1,300	647,577	.....	1,729,274	3,284,556
All other states	[3] 1905	12	26,265,690	305	572,342	2,986	1,453,547	1,253,727	5,379,052	9,397,039
	[4] 1900	10	5,858,092	113	141,488	2,022	1,024,660	271,001	3,929,508	6,122,744
	[5] 1890	9	6,665,887	64	125,499	2,743	1,356,280	249,901	4,146,595	6,596,601
	[6] 1880	13	2,802,203	.....	.....	2,687	816,120	.....	3,242,297	4,486,008

[1] Included in "all other states" in 1905.
[2] Included in "all other states" in 1890.
[3] Includes establishments distributed as follows: Colorado, 1; Georgia, 1; Kansas, 1; Maine, 1; Oregon, 1; Rhode Island, 4; Tennessee, 2; Washington, 1.
[4] Includes establishments distributed as follows: Colorado, 2; Kansas, 1; Maine, 1; Minnesota, 2; Oregon, 1; Rhode Island, 1; Washington, 1; Wyoming, 1.
[5] Includes establishments distributed as follows: Colorado, 1; Georgia, 1; Iowa, 1; Maine, 1; Minnesota, 1; New Hampshire, 1; Rhode Island, 1; Wisconsin, 1; Wyoming, 1.
[6] Includes establishments distributed as follows: Colorado, 1; District of Columbia, 1; Georgia, 1; Kansas, 2; Maine, 2; Nebraska, 1; New Hampshire, 2; Rhode Island, 1; Vermont, 1; Wyoming, 1.

There were 26 states reporting in 1905, compared with 27 states in 1900 and 1890, and 29 in 1880. Minnesota has 2 establishments, of which 1 was idle in 1905 and the other produced steel castings which were consumed by the establishment in manufactures. The rolling mill in Wyoming was idle in 1905. Georgia has resumed the manufacture of rolled iron and steel products. There were 27 states, all told, making steel and rolling mill products, including Minnesota, which manufactured a small amount of steel in an establishment otherwise classified.

Pennsylvania continues to produce more than one-half of the cast steel and rolled iron and steel products, its output in 1905 constituting 54 per cent of the total value, compared with 55.7 per cent in 1900, with 56.9 per cent in 1890, and with 48.4 per cent in 1880. This

state reports over one-half of the capital and one-half of all employees and expenses pertaining to the industry. Its present share of the steel making and rolling mill industry is even greater than its share of the blast furnace branch, and exceeds by over $30,000,000 the total product of steel works and rolling mills for the entire country in 1890.

Ohio ranks second, with an increase of 13.6 per cent; Illinois third, with an increase of 32.9 per cent, and New York fourth, with an increase of 144 per cent. A decrease in the value of products, compared with 1900, appears in Delaware, Indiana, Massachusetts, Michigan, Missouri, New Jersey, and Virginia.

CAPITAL.

The capital invested in steel works and rolling mill establishments, active and idle, for 1880 to 1905, is shown in Table 42.

TABLE 42.—*Steel works and rolling mills—active and idle establishments—capital: 1880 to 1905.*

	Census.	Number of establishments.	CAPITAL.		
			Total.	Buildings, machinery, tools, and implements.	Land, cash, and sundries.
Total	1905	494	[1]$730,378,292	$417,216,418	$313,161,874
	1900	476	[1]449,926,470	214,025,431	235,901,039
	1890	429	[1]284,271,524	132,989,177	151,282,347
	1880	391	120,522,745	71,567,596	48,955,149
Active	1905	415	709,130,646	400,038,881	309,091,765
	1900	438	441,795,983	208,249,924	233,546,059
	1890	395	278,559,831	128,623,160	149,936,671
	1880	358	116,458,390	69,033,147	47,425,243
Idle	1905	79	21,247,646	17,177,537	4,070,109
	1900	38	8,130,487	5,775,507	2,354,980
	1890	34	5,711,693	4,366,017	1,345,676
	1880	33	4,064,355	2,534,449	1,529,906

[1] Includes value of rented property—1905, $9,027,956; 1900, $11,888,815; 1890, $3,230,000.

The capital invested in steel works and rolling mills constitutes 73.6 per cent of that employed in the iron and steel industries; substantially the same proportion as in 1900, when it represented 73.9 per cent of the aggregate capital.

The increase in the total capital invested in steel works and rolling mills from 1900 to 1905 was $280,451,822, or 62.3 per cent, as compared with the increase for the decade from 1890 to 1900 of $165,654,946, or 58.3 per cent. Of the aggregate capital reported in 1905, 97.1 per cent was invested in active establishments and 2.9 per cent in idle, as compared with an investment of 98.2 per cent of the total capital in 1900 in active establishments, and 1.8 per cent in idle. Of the total capital in 1905, 57.1 per cent was in buildings, machinery, tools, and implements and 42.9 per cent in lands, cash, and sundries; compared with 47.6 per cent in the former and 52.4 per cent in the latter in 1900. The increase of investment in equipment is thus shown to have been relatively much greater than the investment in land and active capital.

The idle establishments, 79 in number, were located in the following states: Alabama, 2; Delaware, 1; Illinois, 2; Indiana, 13; Kentucky, 1; Massachusetts, 2; Minnesota, 1; Missouri, 1; New Jersey, 2; New York, 5; Ohio, 10; Pennsylvania, 33; Virginia, 1; West Virginia, 1; Wisconsin, 3; and Wyoming, 1. The capital invested in idle establishments shows an increase of $13,117,159 over that in 1900.

The 7 forges and bloomeries, 6 active and 1 idle, which are included with the steel works and rolling mills, but are not equipped with hot rolls, are all that is left of a once large industry. They have a reported capital of $256,639, of which $70,681 is for buildings, machinery, tools, and implements, and $185,958 for land, cash, and sundries.

MATERIALS USED.

Table 43 shows the quantity and cost of the principal materials used by steel works and rolling mills in 1880, 1890, 1900, and 1905, and the percentage of increase, both in tonnage and value.

The statistics for 1900 showed a decline in the use of iron ore by rolling mills, due chiefly to the dismantling of puddling furnaces, but the returns for 1905 show an increase which a little more than makes up this decrease. The consumption of pig iron, spiegeleisen, and ferromanganese has increased 1,780,947 tons; old iron or steel rails and other scrap iron and steel, 1,010,990 tons; purchased hammered iron-ore blooms, pig or scrap blooms, and imported Swedish billets and bars, 49,249 tons; purchased muck bar or scrap bar, 44,622 tons; purchased iron or steel ingots, blooms, billets, tin-plate bars, sheet bars, or slabs, 949,850 tons; and purchased wire rods, 25,189 tons.

At the census of 1900 the total amount and kind of fuel consumed was reported, but no separation was made between fuel used for power and that used for melting and heating purposes. In making the canvass for the present census an inquiry was made of the cost of fuel used for power. As the character of the fuel reported as used for power purposes does not appear in the returns, the total amount of fuel by kinds can not be given, and hence no comparison can be made between 1905 and 1900 of the consumption of fuel by kinds, but only of the cost of all fuel used. This shows an increase since 1900 of $12,850,571, or 57.5 per cent.

TABLE 43.—STEEL WORKS AND ROLLING MILLS—MATERIALS USED, BY KIND, QUANTITY, AND COST, WITH PER CENT OF INCREASE: 1880 TO 1905.

KIND.	CENSUS.								PER CENT OF INCREASE.					
	1905		1900		1890		1880		1900 to 1905		1890 to 1900		1880 to 1890	
	Tons.	Cost.	Tons.	Cost.	Tons.	Cost.	Tons.	Cost.	Tons.	Cost.	Tons.	Cost.	Tons.	Cost.
Aggregate	.....	$441,204,432	.....	$390,568,117	.....	$216,269,022	.....	$130,104,493	.....	13.0	.....	80.6	.....	66.2
Iron ore	549,995	2,396,792	340,028	1,326,395	519,199	3,355,139	333,405	2,779,879	61.7	80.7	[1] 34.5	[1] 60.5	55.7	20.7
Pig iron, spiegeleisen, ferromanganese, and all other pig iron	12,191,228	172,101,436	10,410,281	151,042,348	5,846,906	105,346,851	2,361,304	61,868,776	17.1	13.9	78.0	43.4	147.6	70.3
Old iron or steel rails, and other scrap iron and steel	5,124,277	67,601,248	4,113,287	66,670,855	1,726,162	36,101,038	1,198,842	37,692,774	24.6	1.4	138.3	84.7	44.0	[1] 4.2
Purchased hammered iron-ore blooms, pig or scrap blooms, and imported Swedish billets and bars	81,969	1,781,126	32,720	1,150,575	49,867	2,329,138	92,261	5,993,145	150.5	54.8	[1] 34.4	[1] 50.6	[1] 46.0	[1] 61.1
Purchased muck or scrap bar	205,951	5,066,732	161,329	4,535,939	209,534	6,252,594	47,995	2,369,544	27.7	11.7	[1] 23.0	[1] 27.5	336.6	163.9
Purchased iron or steel ingots, blooms, billets, tinplate bars, sheet bars or slabs—except imported Swedish billets and bars	4,632,257	103,420,970	3,682,407	92,123,412	874,518	28,753,506	68,882	4,339,057	25.8	12.3	321.1	220.4	1,169.6	562.7
Purchased wire rods	161,914	4,774,383	136,725	5,419,617	(2)	(2)	(2)	(2)	18.4	[1] 11.9	.....	.....	.....	.....
Fuel, total cost	.....	35,192,961	.....	22,342,390	.....	17,397,434	.....	13,202,597	.....	57.5	.....	28.4	.....	31.8
Anthracite coal and culm	231,125	792,262	944,018	1,220,694	858,071	1,487,713	631,229	1,875,062	.....	.....	10.0	[1] 17.9	35.9	[1] 20.7
Bituminous coal and slack	7,055,093	14,367,934	10,944,046	14,679,804	4,617,055	9,663,208	4,112,222	10,510,255	.....	.....	137.0	51.9	12.3	[1] 8.1
Coke	[3] 638,776	2,009,392	[3] 926,516	2,014,390	[3] 393,051	1,311,588	[3] 142,605	582,901	.....	.....	135.7	53.6	175.6	125.0
Charcoal	[4] 3,133,533	299,138	[4] 2,250,622	170,345	[4] 2,770,611	243,773	[4] 2,667,902	234,379	.....	.....	[1] 18.8	[1] 30.1	3.8	4.0
Natural gas used as fuel	.....	4,382,667	.....	3,098,409	.....	3,566,946	.....	.....	.....	41.4	.....	[1] 13.1	.....	.....
Oil used as fuel	[5] 633,813	908,154	[5] 1,302,615	1,158,748	[5] 1,859,138	1,124,206	.....	.....	.....	.....	[1] 29.9	3.1	.....	.....
Fuel used for power	.....	12,433,414	.....	(2)	.....	(2)	.....	.....	.....	.....	.....	.....	.....	.....
All other materials	.....	48,868,784	.....	45,956,586	.....	16,733,322	.....	1,858,721	.....	6.3	.....	174.6	.....	800.3

[1] Decrease. [2] Not reported separately. [3] Short tons. [4] Bushels. [5] Barrels.

The use of oil as fuel in 1905 by steel works and rolling mills, in whole or in part, was reported by 16 states. Illinois was the largest user. Natural gas was used in 5 states, and by 109 establishments, distributed as follows: Pennsylvania, 69; Ohio, 22; Indiana, 9; West Virginia, 8; and Kentucky, 1. The cost of natural gas used as fuel in 1905 shows an increase of $1,284,258, or 41.4 per cent. In 1900 natural gas was used by 92 establishments and in 1890 by 85. The establishments using natural gas show an increase of 8 in Pennsylvania, 14 in Ohio, 3 in West Virginia, and a decrease of 8 in Indiana. The cost of natural gas consumed in Pennsylvania in 1905 shows an increase of $773,737, or 29.7 per cent, over 1900; in Ohio it shows an increase of $523,943, or 407.8 per cent; in West Virginia, an increase of $124,914, or 165 per cent; and in Kentucky, an increase of $20,949, or 611.1 per cent; while in Indiana the decrease is $159,285, or 56.3 per cent.

PRODUCTS.

Table 44 shows the quantity and value of the leading products reported by the steel works and rolling mills for 1880, 1890, 1900, and 1905.

TABLE 44.—STEEL WORKS AND ROLLING MILLS—PRODUCTS, BY KIND, QUANTITY, AND VALUE: 1880 TO 1905.

KIND.	1905		1900		1890		1880	
	Tons.	Value.	Tons.	Value.	Tons.	Value.	Tons.	Value.
Total	.....	$673,965,026	.....	$596,689,284	.....	$331,860,872	.....	$203,274,042
Rails: [1]								
Iron	900	20,700	880	31,180	13,715	622,224	416,890	20,978,697
Steel	2,193,705	58,236,050	2,250,457	46,501,979	1,853,862	60,272,575	670,161	37,892,075
Bessemer	2,065,024	54,627,488	(2)	(2)	1,853,862	60,272,575	662,032	37,408,625
Open-hearth	128,681	3,608,562	(2)	(2)	(3)	(3)	8,129	483,450
Splice bars, including all patent splices and rail joints	174,055	5,663,052	(2)	(2)	(2)	(2)	(2)	(2)
Iron and steel bars and rods, not including sheet or tinplate bars or wire rods	2,442,810	84,069,122	2,493,159	100,597,221	1,572,347	68,567,415	874,144	56,696,679
Iron and steel wire rods	1,792,704	52,995,031	916,587	35,529,529	(2)	(2)	(2)	(2)
Structural shapes:								
Iron	4,475	145,200	27,091	1,051,556	122,792	6,941,474	86,438	5,520,719
Bessemer steel	331,671	11,089,170	263,800	8,381,717	85,440	4,529,411	497	63,060
Open-hearth steel	618,391	21,496,531	566,092	19,928,249	68,123	3,992,074	71	8,800
Iron and steel hoops, bands, and cotton ties	337,223	12,760,010	[4] 1,195,189	[4] 49,159,747	[5] 546,203	[5] 23,628,849	[5] 201,039	[5] 13,979,893
Iron and steel skelp	1,557,690	46,780,202	.....	.....	.....	.....	.....	.....
Iron and steel rolled car axles	631	26,138	2,229	88,841	2,232	127,500	2,348	179,154
Iron and steel hammered car axles	82,954	2,849,691	100,377	4,394,096	52,184	2,935,451	19,539	1,600,104
Iron and steel muck and scrap bar produced for sale	150,926	3,940,998	203,681	5,940,587	252,089	7,411,748	57,562	2,440,941
Iron and steel boiler and other plates and sheets, except nail and tack plate, black plates or sheets for tinning, and armor plate	1,856,469	77,802,001	1,488,066	68,109,223	652,693	39,359,094	262,063	22,432,202

[1] Rails renewed or rerolled included under "all other products."
[2] Not reported separately.
[3] None reported.
[4] Includes skelp.
[5] Hoops and skelp only.

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TABLE 44.—STEEL WORKS AND ROLLING MILLS—PRODUCTS, BY KIND, QUANTITY, AND VALUE: 1880 TO 1905—Cont'd.

KIND.	1905		1900		1890		1880	
	Tons.	Value.	Tons.	Value.	Tons.	Value.	Tons.	Value.
Iron and steel nail plate	67,857	1,826,756	81,101	2,466,340	(1)	(1)	(1)	(1)
Iron and steel tack plate	18,744	635,320	16,563	650,218	(1)	(1)	(1)	(1)
Black plates or sheets for tinning:								
Iron	64,111	2,809,936	(2)	(2)	(1)	(1)	(1)	(1)
Bessemer steel	353,027	18,271,625	355,077	18,673,312	(1)	(1)	(1)	(1)
Open-hearth steel	86,887	4,215,518	38,937	2,294,494	(1)	(1)	(1)	(1)
Iron and steel armor plate and gun forgings	22,839	9,560,816	15,302	7,526,479	(1)	(1)	(1)	(1)
Iron and steel rolled blooms, slabs, billets, tin-plate bars, and sheet bars produced for sale	4,823,585	109,611,104	4,172,286	96,321,887	(1)	(1)	(1)	(1)
Steel ingots produced for sale	196,404	3,985,310	103,707	2,781,145	(1)	(1)	(1)	(1)
Direct steel castings	[3] 287,325	[3] 20,600,136	177,156	14,609,893	(1)	(1)	(1)	(1)
All other products	.....	124,574,609	.....	111,651,591	.....	113,473,057	.....	41,481,718

[1] Not reported separately. [2] None reported.
[3] Exclusive of 4,184 tons of steel castings, valued at $347,264, made by establishments engaged primarily in the manufacture of other products.

The above table gives the chief products comparable for the different census years. The products shown in detail aggregate 17,291,328 tons at the census of 1905, as compared with 14,467,737 tons for 1900. The total classified product of steel works and rolling mills in 1905 was 18,216,639 tons, as shown by Table 45, compared with 15,040,129 tons in 1900 (an increase of 21.1 per cent), and with 7,388,244 tons in 1890 and 3,046,038 tons in 1880.

Table 45 is a detailed summary of the products for 1905.

TABLE 45.—*Steel works and rolling mills—detailed summary of products: 1905.*

KIND.	Tons.	Value.
Products, aggregate value	.....	$673,965,026
Rolled, forged, and other classified products, total	18,216,639	584,209,439
Direct steel castings, total	[1] 287,325	[1] 20,600,136
Bessemer steel castings, including steel castings made in Clapp-Griffiths, Robert-Bessemer, and other converters	13,653	1,597,944
Open-hearth steel castings	269,561	18,560,238
Acid	182,330	12,964,150
Basic	87,231	5,596,088
Crucible and other kinds of steel castings	4,111	441,954
Rolled iron and steel—		
Rails, total	2,194,605	58,256,750
Iron	900	20,700
Steel	2,193,705	58,236,050
Bessemer steel	2,065,024	54,627,488
Open-hearth steel	128,681	3,608,562
Renewed or rerolled rails	99,530	2,480,328
Splice bars, including all patent splices and rail joints	174,055	5,663,052
Iron and steel bars and rods, not including sheet or tin-plate bars or wire rods	2,442,810	84,069,122
Iron and steel wire rods	1,792,704	52,995,031
Structural shapes, including light and heavy shapes, total	954,537	32,730,901
Iron	4,475	145,200
Steel	950,062	32,585,701
Bessemer steel	331,671	11,089,170
Open-hearth steel	618,391	21,496,531
Iron and steel hoops, bands, and cotton ties	337,223	12,760,010
Iron and steel skelp	1,557,690	46,780,202
Iron and steel car axles	83,585	2,875,829
Muck and scrap bar, produced for sale	150,926	3,940,998
Iron and steel boiler and other plates and sheets, except nail and tack plate, black plates for tinning, and armor plate	1,856,469	77,802,001
Iron and steel nail plate	67,857	1,826,756
Iron and steel tack plate	18,744	635,320
Black plates or sheets for tinning, total	504,025	25,297,079
Iron	64,111	2,809,936
Steel	439,914	22,487,143
Bessemer steel	353,027	18,271,625
Open-hearth steel	86,887	4,215,518
Iron and steel armor plate and gun forgings	22,839	9,560,816
Iron and steel rolled blooms, slabs, billets, tin-plate bars, and sheet bars, produced for sale	4,823,585	109,611,104
All other rolled iron and steel products	377,665	16,743,727
Steel ingots, produced for sale	196,404	3,985,310
All other forged, cast, or other iron and steel products, not including cut nails, wire nails, bolts, nuts, rivets, spikes, washers, etc	274,061	15,684,967

[1] Exclusive of 4,184 tons of steel castings, valued at $347,264, made by establishments engaged primarily in the manufacture of other products.

TABLE 45.—*Steel works and rolling mills—detailed summary of products: 1905*—Continued.

KIND.	Tons.	Value.
Products—Continued.		
Iron and steel scrap sold	877,177	$11,079,831
Amount received for custom work and repairing	.....	58,137,817
Miscellaneous products, not rolled, total	.....	20,447,939
Gray iron and malleable castings, including cast-iron pipe	[1] 46,644	2,569,792
Ordnance	1,594	988,804
Machinery, etc	.....	1,269,675
Copper rods	[1] 1,406	463,057
Copper wire	[1] 25,966	7,252,917
Total value of all other than iron or steel products, including amount received for custom work and repairing	.....	7,903,694
Steel ingots, manufactured for consumption or sale, total	13,379,083	240,284,576
Bessemer steel ingots, including steel ingots made in Clapp-Griffiths, Robert-Bessemer, Bookwalter, or other converters	7,754,488	132,951,636
Open-hearth steel ingots	5,548,396	101,762,469
Acid	573,475	12,967,630
Basic	4,974,921	88,794,839
Crucible steel ingots	76,199	5,570,471
Miscellaneous products, not rolled, value previously included, total	.....	137,971,340
Cut nails and cut spikes, total	[2] 1,311,549	2,394,108
Iron	[2] 206,615	400,846
Steel	[2] 960,670	1,732,064
Combined iron and steel	[2] 144,264	261,198
Iron and steel wire nails	[2] 9,061,512	17,495,362
Iron and steel wire	[1] 624,298	30,992,672
Other wire products	[1] 339,121	19,063,409
Iron and steel bolts, nuts, rivets, forged spikes, washers, etc	[3] 621,165,317	13,854,635
Iron and steel wrought pipe or tubes	849,047	43,985,728
Iron and steel seamless-drawn, clinched, brazed, etc., pipe or tubes	[3] 46,224,320	2,290,234
Iron and steel springs, car, carriage, furniture, and all other	22,022	1,708,632
Horse and mule shoes	68,594	5,483,137
Stamped ware	.....	292,923
Shovels, spades, scoops, etc	.....	410,500

[1] Short tons [2] Kegs of 100 pounds. [3] Pounds.

Iron and steel rails.—The total production of iron and steel rails was 2,194,605 tons, as compared with 2,251,337 tons in 1900, a slight decrease in tonnage. This does not include rails renewed or rerolled. Bessemer steel rails amounted to 2,065,024 tons and open-hearth steel rails to 128,681 tons. In 1900 the open-hearth steel rails made did not exceed 1,500 tons and in 1890 no open-hearth steel rails were made.

The average value of steel rails, as obtained from these reports, was $26.55 per ton in 1905, $20.66 per ton in 1900, $32.51 per ton in 1890, and $56.54 per ton in 1880. It should be stated that the Census report of

1900 was for the fiscal year ending June 30, 1900, or the business year of the establishment nearest conforming thereto. During the year 1899 there was a very wide fluctuation in prices for Bessemer steel rails, the average monthly prices, as reported by the American Iron and Steel Association, ranging from $18.50 per ton in January, 1899, to $35 per ton in December, and resulting in an average for the year of $28.12. The values as reported by the different producers in 1900 show a like wide range, from less than $18 per ton for Illinois to nearly $30 per ton for Ohio, and result in a low average for the country at large. Since the early part of 1901 the quoted price for steel rails at the mills, as reported by the American Iron and Steel Association, has been uniform at $28 per ton.

In 1905 steel rails were produced by 14 establishments. Bessemer steel rails were made by 12 establishments and open-hearth steel rails by 5.

In addition there were 8 establishments which did not manufacture new rails, but which renewed or rerolled rails, making 22 establishments in the aggregate that rolled rails. Two of the establishments that manufactured rails also rerolled or renewed rails. The total amount renewed or rerolled was 104,429 tons, of which 99,530 tons were reported as of a value of $2,480,328 and 4,899 tons were rerolled on toll.

Pennsylvania produced 812,691 tons of rolled rails, chiefly Bessemer, a little less than three-eighths of the entire product; in 1900 its production was over one-half of the total. Illinois ranks second, its production being all Bessemer. New York is third and Maryland fourth, with Bessemer steel rails in each case; Alabama, not a producer of steel rails in 1900, is fifth, its rail product being of open-hearth steel; and Ohio sixth, with all Bessemer steel rails. Only 900 tons of iron rails were reported.

Splice bars.—Splice bars, including all patent splices and rail joints, to the extent of 174,055 tons were reported at the census of 1905, of an average value of $32.54 per ton. In 1900 these products were not specifically reported but were included under miscellaneous rolled products, and their value was included in that for "all other products." Pennsylvania made more than one-half of this class of products, 93,043 tons, and Illinois, with 54,978 tons, was the second largest producer.

Bars and rods.—The production of iron and steel bars and rods, not including wire rods, shows a slight decrease in quantity from 1900, namely, 2 per cent, and a decrease of 16.4 per cent in value. The average value in 1905 was $34.41 per ton; in 1900 it was $40.35 per ton; in 1890, $43.61 per ton; and in 1880, $64.86 per ton. In the figures given for 1890 and 1880 only the quantity and value of bars and rods manufactured for sale were given. In 1900 and for the present census the quantity and value are given of all bars and rods made, whether sold as products or consumed by the establishment in the manufacture of other products. The increased value given to bars and rods when manufactured into bolts, nuts, etc., by the rolling mill establishment has been included under "all other products."

The average value shows a decline of 14.7 per cent from the average for 1900. This is in harmony with the general decline in the average value per ton of all classified products of steel works and rolling mills, which fell from $33.94 in 1900 to $32.08 in 1905, or 5.5 per cent. Products in this group were made in all states having rolling mills except Georgia, Kansas, and West Virginia. Of the leading states, Pennsylvania made 1,166,234 tons, nearly one-half of the total amount, of an average value of $34.66 per ton; Ohio, Indiana, and Illinois produced, respectively, 274,191 tons, 212,421 tons, and 145,527 tons; the average value per ton in these states, in the order named, being $31.63, $31.62, and $32.52.

Wire rods.—Wire rods show the heaviest increase of any of the groups of products, the increase in tonnage being 876,172 tons, or 95.6 per cent, and in value, $17,465,502, or 49.2 per cent. The average value in 1905 was $29.96 per ton, and in 1900, $38.76.

The manufacture of wire rods is reported by 11 states—Pennsylvania, Ohio, Illinois, Massachusetts, Indiana, Kentucky, Colorado, New York, New Jersey, Alabama, and Rhode Island. Of the leading states, Pennsylvania turned out 596,892 tons, of an average value of $28.36 per ton. With two exceptions the output of the other states was in each state the product of less than 3 establishments.

Structural shapes.—Structural shapes in the aggregate have increased from 856,983 tons in 1900 to 954,537 tons in 1905, or 11.4 per cent. The average value for all shapes has remained substantially the same, $34.26 per ton in 1900 and $34.29 per ton in 1905. Iron shapes in 1905 averaged $32.45 per ton; Bessemer steel, $33.43 per ton; and open-hearth steel, $34.76 per ton. Iron shapes were reported from California and Pennsylvania. Bessemer steel structural shapes were reported for Pennsylvania, Illinois, Ohio, and Wisconsin, in the order named as to quantity of product, and open-hearth steel shapes from Pennsylvania, New Jersey, Indiana, Wisconsin, New York, Colorado, Ohio, and Alabama. Pennsylvania produced more than six-tenths of the total quantity of steel structural shapes, or 822,618 tons, of which 546,440 tons were open-hearth steel; New Jersey was the next largest producer, followed by Illinois, and then by Ohio.

Iron and steel hoops, bands, cotton ties, and skelp.—The production of hoops, bands, cotton ties, and skelp in 1905 amounted to 1,894,913 tons, of a value of $59,540,212, an increase from 1900 of 699,724 tons, or 58.5 per cent, in quantity and of $10,380,465, or 21.1 per cent, in value. The production of skelp, the chief item of this group, amounted in 1905 to 1,557,690

tons, and hoops, bands, and cotton ties to 337,223 tons. In 1900 the production of skelp was not reported separately. The average value of all products of this group in 1905 was $31.42 per ton, compared with $41.13 per ton for 1900. The average value for skelp in 1905 was $30.03 per ton.

Hoops, bands, and cotton ties were reported in 1905 from Pennsylvania, Ohio, Illinois, Georgia, Massachusetts, and Alabama; Pennsylvania produced 200,461 tons; Ohio, 102,823 tons; and the other 4 states, the remaining 33,939 tons. Skelp was produced by Pennsylvania to the extent of 1,058,588 tons, or two-thirds of the product of the country. Ohio made 211,624 tons; West Virginia, 192,644 tons; and Illinois, Connecticut, and New York produced the remaining 94,834 tons.

Car axles.—In 1905 only 631 tons of rolled car axles were reported, whereas in 1900 the production amounted to 2,229 tons.[1] Iron and steel hammered car axles were reported from Pennsylvania, Michigan, Illinois, California, and Ohio in 1905 to the extent of 82,954 tons, of an average value of $34.35 per ton. In 1900, 100,377 tons of hammered car axles, of an average value of $43.78 per ton, were manufactured by Pennsylvania, Missouri, Michigan, Virginia, Alabama, New Jersey, and Delaware. Pennsylvania produced 88.5 per cent of the hammered car axles in 1905, compared with 78.9 per cent in 1900.

Muck and scrap bar produced for sale.—The muck and scrap bar shown in the table does not include that made and consumed by the producing establishments in the manufacture of more highly finished rolled products. Muck or scrap bar, to be marketed as such, was reported from Pennsylvania, Ohio, Indiana, and Delaware to the extent of 150,926 tons; more than two-thirds of this was from Pennsylvania, and one-fifth from Ohio. The average value of the product was $26.11 per ton at the census of 1905, and in 1900 it was $29.16 per ton.

Boiler and other plates and sheets, except nail and tack plates, black plates or sheets for tinning, and armor plate.—The production of iron and steel boiler and other plates, exclusive of nail and tack plates, black plates or sheets for tinning, and armor plate (which are reported separately), was reported by 13 states and shows an increase of 368,403 tons, or 24.8 per cent, in quantity and of $9,692,778, or 14.2 per cent, in value. The average value per ton was $41.91 at the census of 1905, $45.77 in 1900, $60.30 in 1890, and $85.60 in 1880. The bulk of the output was reported by Pennsylvania, which manufactured 1,297,086 tons, over two-thirds of the total, at an average value of $40.43 per ton; and from Ohio, which made 364,790 tons, one-fifth of the total, at an average value of $43.94 per ton. Other producing states were Illinois, the product being by less than three establishments; West Virginia, with 34,036 tons; Kentucky, 33,921 tons; Indiana, 23,947 tons; and in a lesser degree, Delaware, Missouri, Alabama, Connecticut, New York, New Jersey, and Maryland.

Nail and tack plate.—Nail plate was reported in 1905 by 10 states to the extent of 67,857 tons, of an average value of $26.92 per ton, compared with 81,101 tons in 1900, of an average value of $30.41 per ton. This shows a decrease in quantity of 16.3 per cent. More than one-half of the amount, namely, 37,162 tons, of an average value of $25.42 per ton, was made in Pennsylvania. West Virginia was the next in rank. Other states making nail plate were Colorado, Kentucky, Illinois, Ohio, Massachusetts, Indiana, California, and Virginia, named in the order of amount of product.

Tack plates were reported by 4 states—West Virginia, Massachusetts, Pennsylvania, and California. The average value for the 18,744 tons made was $33.89, compared with an average value of $39.26 for the 16,563 tons made in 1900. The increase in quantity was 13.2 per cent.

Black plates or sheets for tinning.—Prior to the stimulus given the tin and terne plate industry in this country by the tariff act of 1890, very few black plates or sheets for tinning were produced. In 1900 the total production as reported was 394,014 tons, of a value of $20,967,806, an average value of $53.22 per ton. At the census of 1905 the total amount was 504,025 tons, of a value of $25,297,079, an average of $50.19 per ton. This is an increase of 27.9 per cent in quantity over 1900, and of 20.6 per cent in total value of product. In 1900 there were 44 active black plate establishments. No iron black plates were reported by any of the establishments. The Bessemer black plates, constituting more than nine-tenths of the total production, averaged in 1900, $52.59 per ton and the open-hearth black plates, $58.93 per ton.

At the present census returns were made of black plates by 35 active establishments. Iron black plates were made by 6 establishments, Bessemer steel black plates by 25 establishments, and open-hearth steel black plates by 17 establishments.

Bessemer steel black plates show a slight decrease in quantity, while open-hearth steel black plates have more than doubled. The average value in 1905 for iron black plates was $43.83 per ton; for Bessemer steel, $51.76; and for open-hearth steel, $48.52—or for all grades, as before stated, $50.19 per ton.

The value per ton for open-hearth steel plates appears considerably less than for Bessemer steel, owing to the low valuation given in certain reports. The 12 establishments in Pennsylvania and Ohio producing open-hearth steel black plates, which made nearly one-half of the total product, show an average value per ton of $52.64. Pennsylvania,

[1] Error in Twelfth Census report consisting of the tabulation as "rolled car axles" of 1,592 tons of hammered car axles, of a value of $98,861, in New Jersey, and 52,518 tons of hammered car axles, of a value of $2,569,349, in Pennsylvania, has been corrected.

with 34,665 tons of iron black plates, more than one-half of the total amount, ranked first; it was followed by Ohio and West Virginia. Pennsylvania was also first in the production of Bessemer steel black plates, making 213,904 tons, nearly two-thirds of the total, followed by Indiana, Ohio, West Virginia, and Kentucky. In the manufacture of open-hearth steel black plates Illinois was first, followed by Ohio, Pennsylvania, Maryland, West Virginia, and Indiana.

Armor plate and gun forgings.—The product reported under armor plate and gun forgings is from 4 establishments—3 in Pennsylvania and 1 in New Jersey—a relatively small amount of gun forgings being reported. There is shown an increase in the total products of this group of 7,537 tons, or 49.3 per cent, in quantity and of $2,034,337, or 27 per cent, in value. The product in 1905 was of an average value per ton of $418.62, as compared with an average value per ton in 1900 of $491.86.

Rolled blooms, slabs, billets, tin-plate bars, and sheet bars produced for sale.—Much the larger part of this group appears again in the material of other rolling mills. The figures are comparable with those of 1900 only, as prior thereto the products of this group were not reported separately. The products show an increase of 651,299 tons in quantity, or 15.6 per cent, over those of 1900, and an increase of 13.8 per cent in value. At the census of 1905 the average value per ton was $22.72 and in 1900 it was $23.09.

The manufacture of these products for sale was reported by 12 states. Pennsylvania produced 2,582,848 tons, valued at $22.54 per ton, more than one-half of the total amount, and Ohio, 1,803,873 tons, valued at $22.37 per ton. Illinois reported 298,805 tons, and the remaining 138,059 tons were from Alabama, Kentucky, Indiana, Maryland, Connecticut, Colorado, Massachusetts, Rhode Island, and Delaware, the last 4 states marketing very small amounts.

Steel ingots produced for sale.—The total production of steel ingots was 13,379,083 tons, valued at $240,284,576. This is the total quantity of steel ingots made both for consumption by the producing establishments and for sale. Of this quantity, 196,404 tons, or less than 1.5 per cent, were produced for sale, the average value thereof being $20.29 per ton, as compared with an average value of $26.82 per ton in 1900. Much the larger part of the steel ingots sold becomes material for rolling mills purchasing steel ingots, though some of the ingots go to establishments manufacturing heavy forgings.

Of the ingots produced for sale, West Virginia and Pennsylvania reported all but 3 per cent. The production of steel ingots will be considered at length in subsequent tables.

Direct steel castings.—Direct steel castings to the amount of 287,325 tons and valued at $20,600,136, or an average value of $71.70 per ton, were reported in 1905. This is an increase of 62.2 per cent over the quantity reported in 1900, which was 177,156 tons, valued at $14,609,893, or an average of $82.47 per ton. Pennsylvania, with 26 establishments, produced 114,411 tons of direct steel castings, valued at $8,041,419, or an average of $70.29 per ton; Illinois, with 7 establishments, 56,038 tons, valued at $4,148,259, or an average of $74.03 per ton; New York, with 5 establishments, 35,605 tons, valued at $1,991,778, or an average of $55.94 per ton; Ohio, with 8 establishments, 35,156 tons, valued at $2,308,178, or an average of $65.66 per ton; New Jersey, with 4 establishments, 11,656 tons, valued at $1,406,317, or an average of $120.65 per ton; Wisconsin, with 8 establishments, 9,215 tons, valued at $848,230, or an average of $92.05 per ton; and Indiana, with 3 establishments, 8,709 tons, valued at $498,447, or an average of $57.23 per ton. Direct steel castings to the extent of 790 tons, not included in the above, were reported by 1 establishment in Indiana, classified as "foundry and machine shop products." The remaining 16,535 tons, valued at $1,357,508, were produced by 12 establishments distributed through the states of Missouri, Michigan, Connecticut, Alabama, Delaware, Tennessee, California, Colorado, and Rhode Island, named in the order of their production.

Direct steel castings are further shown in later tables.

Miscellaneous rolled products.—In 1905, 377,665 tons of miscellaneous rolled products were reported, comprising locomotive and car wheel tires, rolled blanks suitable for drawing into seamless tubes, flats, socket iron and steel, etc. The value of these was $16,743,727, an average per ton of $44.33. Pennsylvania produced 253,330 tons of these miscellaneous products; New York, 47,445 tons; Ohio, 33,825 tons; and New Jersey, 12,514 tons. Other material producers were Michigan, Connecticut, Kentucky, and California. No other state produced over 600 tons.

Miscellaneous forged, cast, or other iron and steel products.—The total production of forged, cast, or other miscellaneous iron and steel products, not otherwise specifically classified, amounted to 274,061 tons, of a value of $15,684,967, an average of $57.23 per ton. Included therein are light and heavy forgings, and miscellaneous iron and steel products, not rolled, and the product of the few remaining forges and bloomeries. The latter amounted to 5,626 tons, valued at $157,505, an average of $28 per ton.

Total production of steel castings and of rolled and forged iron and steel, by states.—Table 46 shows the total production by steel works and rolling mills of all kinds of rolled and forged iron and steel, including steel ingots produced for sale and direct steel castings, in 1880, 1890, 1900, and 1905, by states.

TABLE 46.—STEEL WORKS AND ROLLING MILLS—QUANTITY OF CLASSIFIED PRODUCTS, WITH PER CENT OF TOTAL, BY STATES: 1880 TO 1905.

STATE.	QUANTITY (TONS).				PER CENT OF TOTAL.			
	1905	1900	1890	1880	1905	1900	1890	1880
United States	18,216,639	15,040,129	7,388,244	3,046,038	100.0	100.0	100.0	100.0
Alabama	265,202	100,318	46,612	580	1.5	0.7	0.6	(1)
California	31,045	25,419	50,667	12,500	0.2	0.2	0.7	0.4
Colorado	148,747	119,972	18,646	4,018	0.8	0.8	0.3	0.1
Connecticut	93,181	43,908	24,756	17,216	0.5	0.3	0.3	0.6
Delaware	31,851	53,025	52,176	30,284	0.2	0.4	0.7	1.0
District of Columbia	.....	.....	.....	236	.....	.....	.....	(1)
Georgia	9,566	.....	2,534	10,269	0.1	.....	(1)	0.3
Illinois	1,657,885	1,485,346	813,079	287,946	9.1	9.9	11.0	9.5
Indiana	446,458	425,946	98,394	69,536	2.5	2.8	1.3	2.3
Iowa	.....	.....	1,056	.....	.....	.....	(1)	.....
Kansas	(2)	(2)	.....	17,013	.....	.....	.....	0.6
Kentucky	169,466	129,309	43,823	58,610	0.9	0.9	0.6	1.9
Maine	2,567	2,750	9,196	7,903	(1)	(1)	0.1	0.3
Maryland	315,566	223,306	18,055	42,508	1.7	1.5	0.3	1.4
Massachusetts	143,833	137,502	134,483	117,620	0.8	0.9	1.8	3.9
Michigan	55,154	80,483	36,239	20,652	0.3	0.5	0.5	0.7
Minnesota	.....	13,259	2,290	.....	.....	0.1	(1)	.....
Missouri	70,254	59,026	24,739	23,846	0.4	0.4	0.3	0.8
Nebraska	.....	.....	.....	1,786	.....	.....	.....	(1)
New Hampshire	.....	.....	5,938	7,123	.....	.....	0.1	0.2
New Jersey	161,431	142,152	140,425	73,765	0.9	0.9	1.9	2.4
New York	599,323	137,981	214,310	226,084	3.1	0.9	2.9	7.4
Ohio	3,533,426	2,737,497	1,007,154	340,562	19.4	18.2	13.6	11.2
Oregon	18,000	4,505	.....	.....	0.1	(1)	.....	.....
Pennsylvania	9,825,753	8,503,852	4,259,800	1,483,736	53.9	56.5	57.7	48.7
Rhode Island	25,961	5,618	11,613	7,262	0.1	(1)	0.2	0.2
Tennessee	19,206	13,400	18,438	25,112	0.1	0.1	0.3	0.8
Vermont	.....	.....	.....	5,357	.....	.....	.....	0.2
Virginia	33,588	40,943	46,823	31,407	0.2	0.3	0.6	1.0
Washington	5,760	5,000	.....	.....	(1)	(1)	.....	.....
West Virginia	384,932	352,814	231,998	60,212	2.1	2.4	3.2	2.0
Wisconsin	198,484	187,376	66,692	54,154	1.1	1.2	0.9	1.8
Wyoming	.....	9,422	8,308	8,741	.....	0.1	0.1	0.3

[1] Less than one-tenth of 1 per cent.
[2] The single rolling mill in this state was active in 1905 and 1900, but was engaged exclusively on custom work.

The production of steel works and rolling mills in 1905 shows an increase of 3,176,510 gross tons, or 21.1 per cent over the production of 1900, an average of 4.2 per cent per year; compared with an increase of 7,651,885 tons in 1900 over 1890, an average of 10.4 per cent per year, and with an increase of 4,342,206 tons in 1890 over 1880, an average of 14.3 per cent per year. Pennsylvania made more than one-half of the total production in 1905, 1900, and 1890, and nearly one-half in 1880. The maximum percentage of the total products was in 1890 and has since gradually decreased. Ohio made nearly one-fifth of the production in 1905, and its proportion of the total has shown a steady increase.

The states of Delaware, Maine, Michigan, and Virginia show a reduction in output for 1905 compared with 1900, and Minnesota and Wyoming, which were producers in 1900, had no production in 1905. Kansas does not appear as a producer in 1905 and 1900. Its single rolling mill was in operation in both years, but was employed on custom work and repairing. The heaviest relative growth was in New York and Alabama, the products of the former showing for 1905 an increase of 312.6 per cent over 1900, and of the latter state, an increase of 164.4 per cent.

MISCELLANEOUS SECONDARY PRODUCTS.

The production of cut nails and spikes, wire, wire nails, bolts, nuts, rivets, forged spikes, washers, wrought pipes or tubes, horse and mule shoes, springs, etc., when made by steel works or rolling mills, represents the manufacture into more highly finished forms of nail plate, wire rods, bars, skelp, or other rolling mill products already reported. The added value due to this higher finishing has been carried to "all other products," as before stated, the quantities and value of the nail plate, wire rods, skelp, etc., so used, being reported under their respective groups as rolling mill products.

Table 47 shows, for 1905, the quantity and value of the leading products of this group manufactured by rolling mills and the value of those manufactured by other establishments, together with the number of establishments producing each kind.

Nails.—There was reported in 1905 by rolling mills 1,311,549 kegs of cut nails and cut spikes, of a value of $2,394,108, an average value of $1.83 per keg, and 9,061,512 kegs of wire nails, of a value of $17,495,362, an average value of $1.93 per keg. Altogether 34 rolling mills reported the manufacture of nails, 17 of which made cut nails and spikes and 21, wire nails. The total nail product of rolling mills, 10,373,061 kegs, was valued at $19,889,470, an average value of $1.92 per keg.

The manufacture of iron and steel nails and spikes, cut and wrought, including wire nails, was reported by 83 establishments not equipped with hot rolls, the

value of their products amounting to $12,940,726. The total value of all iron and steel nails and spikes, cut and wrought, including wire nails, was $32,830,196. This was the output of 117 establishments.

The production of nails by establishments other than rolling mills comprises the product of 76 establishments, classified as "iron and steel, nails and spikes, cut and wrought, including wire nails, not made in rolling mills or steel works," amounting to $8,922,896, and the wire nail product of 7 establishments, classified as "wire," which made wire nails of the value of $4,017,830, or a total value of $12,940,726.

TABLE 47.—STEEL WORKS AND ROLLING MILLS—PRINCIPAL IRON AND STEEL MISCELLANEOUS SECONDARY PRODUCTS OF ROLLING MILLS AND ESTABLISHMENTS OTHER THAN ROLLING MILLS: 1905.

KIND.	TOTAL.		ROLLING MILLS.			ESTABLISHMENTS OTHER THAN ROLLING MILLS.	
	Number of establishments.	Value.	Number of establishments.	Quantity.	Value.	Number of establishments.	Value.
Nails and spikes, total	117	$32,830,196	34	[1] 10,373,061	$19,889,470	83	$12,940,726
Cut nails and cut spikes			17	[1] 1,311,549	2,394,108		(2)
Iron			8	[1] 206,615	400,846		(2)
Steel			16	[1] 960,670	1,732,064		(2)
Combined iron and steel			11	[1] 144,264	261,198		(2)
Wire nails			21	[1] 9,061,512	17,495,362		(2)
Iron and steel wire and wire products of wire-drawing mills, not including wire nails, total	41	65,858,594	25	[3] 963,419	50,056,081	16	15,802,513
Wire			25	[3] 624,298	30,992,672		(2)
Other wire products			12	[3] 339,121	19,063,409		(2)
Iron and steel bolts, nuts, rivets, forged spikes, washers, etc.	118	28,138,607	30	[4] 277,306	13,854,635	88	14,283,972
Iron and steel wrought pipe or tubes	27	59,527,178	14	[4] 849,047	43,985,728	13	15,541,450
Iron and steel seamless-drawn, clinched, brazed, etc., pipe or tubes	23	4,149,696	8	[4] 20,636	2,290,234	15	1,859,462
Horse and mule shoes	19	6,282,118	11	[4] 68,594	5,483,137	8	798,981
Iron and steel springs, car, carriage, furniture, etc.	61	7,449,468	9	[4] 22,022	1,708,632	52	5,740,836

[1] Kegs. [2] Not reported separately. [3] Short tons. [4] Tons.

The products of the establishments included in the industry classified as "iron and steel, nails and spikes, cut and wrought, including wire nails, not made in rolling mills or steel works" were in detail as follows:

Total	$8,922,896
Wire nails	2,787,159
Horse nails	2,345,762
Tacks and small nails	1,664,161
Shoe tacks and shoe nails	988,144
Cut nails	218,056
Spikes, etc	72,285
Miscellaneous products	847,329

The value of the wire nails made by these establishments ($2,787,159), combined with that of the wire nail products of the classified "wire" industry ($4,017,830), makes a total of $6,804,989 as the value of the wire nails made by establishments other than rolling mills, and this combined with the wire nail product of the rolling mills gives a total of $24,300,351 as the value of all iron and steel wire nails. The total production of cut nails and spikes, not including tacks and small nails, amounted to $2,684,449.

The quantity made by establishments other than rolling mills was not reported, but estimated on the basis of $1.83 per keg for cut nails and spikes and $1.93 per keg for wire nails—the average values for rolling mills—the cut and wire nail product of these establishments (not including wrought nails, tacks, and small nails) would be 3,684,557 kegs. The total product was thus approximately 14,057,000 kegs.

The total nail product by kinds, so far as it can be itemized, is as follows:

KIND.	Quantity (kegs).	Value.
Total		$32,830,196
Wire nails	12,587,000	24,300,351
Cut nails and cut spikes	1,470,000	2,684,449
Horse nails		2,345,762
Tacks and small nails		1,664,161
Shoe tacks and shoe nails		988,144
Miscellaneous products		847,329

Rolling mill establishments making cut and wire nails were distributed as follows: Pennsylvania, 13; Illinois, 3; Indiana, Massachusetts, Ohio, and West Virginia, 2 each; and Alabama, California, Colorado, Connecticut, Kentucky, New York, Rhode Island, Virginia, 1 each. The other establishments making these are distributed as follows: Massachusetts, 37 (including 1 wire-drawing mill); Pennsylvania, 8; New York, 7; Illinois, 10 (including 4 wire-drawing mills); Ohio, 5; Connecticut, 4; Wisconsin, 3; Indiana, 4 (including 2 wire-drawing mills); Maryland, 2; and New Hampshire, Rhode Island, and West Virginia, 1 each.

In 1900, 4,603,010 kegs of iron and steel wire nails were reported as the product of 11 establishments which rolled rods and drew wire, as compared with 9,061,512 kegs by 21 establishments in 1905. This is an increase of 90.9 per cent in number of establishments and of 96.9 per cent in quantity of product.

The decline in the cut nail industry, which started in 1886, has continued. In 1900 cut nails were manufactured by 23 rolling mill establishments to the amount of 1,689,143 kegs, whereas in 1905 there were 17 producing establishments, with a product of

1,311,549 kegs, a decrease of 26.1 per cent in number of establishments and 22.4 per cent in output.

Wire.—In 1905 there were 25 rolling mill establishments making wire rods, which drew iron and steel wire, of which establishments 12 manufactured therefrom wire products, principally fencing and netting. The wire, reported as such, amounted to 624,298 short tons, valued at $30,992,672, an average price of $49.64 per short ton, and the wire products to 339,121 short tons, valued at $19,063,409, or $56.21 per short ton. The two combined give an iron and steel wire production, not including wire nails, of 963,419 short tons, valued at $50,056,081. If the weight of the 9,061,512 kegs of wire nails is added thereto, 1,416,495 short tons is obtained as the total quantity of iron and steel wire and wire products of all kinds made by rolling mills. The combined value of these products was $67,551,443.

In 1900 the iron and steel wire product reported by rolling mills and steel works (not including wire nails) was 579,595 gross tons, valued at $35,283,688, or an average value of $60.88 per gross ton, which is equivalent to 649,146 short tons, of an average value of $54.35 per ton.

In addition to the wire products of the rolling mills, iron and steel wire was drawn from purchased wire rods in 1905 by 16 establishments in the industry classified as "wire." The value of the iron and steel wire products of these establishments was $17,362,395, distributed as follows:

Total	$17,362,395
Wire, as such	5,148,731
Barb wire	3,851,136
Wire nails	4,017,830
Field fencing	2,914,802
Poultry netting	505,797
Hay and bale ties	248,277
Other wire products	675,822

There occurs in the above a duplication of $1,559,882 on account of wire purchased, after deducting which $15,802,513 remains as the value of the wire and wire products made by wire drawing mills from purchased wire rods.

The quantity of the wire and wire products produced by wire drawing establishments does not appear, but on the basis of an average value of $50 per ton, approximately that of the rolling mill products, the product of the wire drawing establishments, other than rolling mills, would appear to be approximately 316,000 short tons, which, added to the wire products of the rolling mills, 1,416,494 short tons, gives an approximate total of 1,732,000 short tons of wire products, of a value of $83,353,956, as the output of all establishments.

In addition to the above, wire nails, valued at $2,787,159, were made by establishments in the industry classified as "iron and steel, nails and spikes, cut and wrought, including wire nails, not made in rolling mills or steel works." Some of these nails were made from purchased wire, and some from purchased wire rods drawn by the establishments. As the amount of wire drawn by these establishments can not be determined, it is not included in the above statement.

The following tabular statement shows the production of the wire industry as a whole for 1900 and 1905:

Wire manufactured—comparative summary: 1905 and 1900.

	1905	1900	Per cent of increase.
Aggregate value	$83,353,956	$52,871,387	57.7
Rolling mills:			
Total wire and wire products—			
Short tons	1,416,494	879,296	61.1
Value	$67,551,443	$47,728,784	41.5
Total wire and wire products, not including wire nails—			
Short tons	963,419	649,146	48.4
Value	$50,056,081	$35,283,688	41.9
Iron and steel wire—			
Short tons	624,298	.....	.....
Value	$30,992,672	.....	.....
Iron and steel wire products, not including wire nails—			
Short tons	339,121	.....	.....
Value	$19,063,409	.....	.....
Wire nails—			
Short tons	453,075	230,150	96.9
Value	$17,495,362	$12,445,096	40.6
Establishments in "wire" industry:			
Total iron and steel wire and wire products, made from purchased wire rods	$15,802,513	$5,142,603	207.3

The rolling mills producing wire and wire products in 1905 were distributed as follows: 8 in Pennsylvania, 3 in New Jersey, 2 each in Illinois, Indiana, New York, and Ohio; and 1 each in Alabama, Colorado, Connecticut, Kentucky, Massachusetts, and Rhode Island. Of the establishments otherwise classified which draw iron and steel wire from purchased wire rods in 1905, 4 were in Illinois, 4 in Massachusetts, 3 in Pennsylvania, 2 in Indiana, 2 in New Jersey, and 1 in New York.

The state of Pennsylvania produced 189,121 short tons of wire, valued at $7,847,348, and 149,102 short tons of "other wire products," valued at $6,562,460, or 35.1 per cent of the wire and wire products, not including wire nails manufactured by rolling mills; Ohio, Illinois, and Massachusetts were the next in rank as producers. Nearly 80 per cent of the iron and steel wire and wire products of mills which used purchased wire rods, was from the state of Illinois, and if the wire industry is considered as a whole, without regard to whether mills roll their rods or purchase them, this state easily ranks second.

Bolts, nuts, rivets, forged spikes, washers, etc.—The manufacture of bolts, nuts, rivets, forged spikes, washers, etc., was reported by 30 rolling mill establishments in 1905, to the extent of 277,306 tons, valued at $13,854,635, or at an average value of $49.96 per ton. Products of this class, valued at $14,283,972, were made by 88 establishments other than rolling

mills. On the basis of the average price per ton of the manufactures of the rolling mills ($49.96) an estimate of 285,908 tons is obtained as the quantity of this product. The total quantity for all bolts, nuts, rivets, forged spikes, etc., was on this basis over 560,000 tons.

The rolling mills reporting these products comprised 10 in Pennsylvania, 3 each in Illinois and Virginia, 2 each in California and Ohio, and 1 each in Colorado, Connecticut, Delaware, Indiana, Kentucky, Massachusetts, Missouri, New Jersey, New York, and Wisconsin. Pennsylvania reported more than one-half and Illinois nearly one-fifth of those produced by rolling mills.

Wrought pipe.—The manufacture of wrought pipe or tubes was reported by 14 rolling mill establishments, of which 9 were in Pennsylvania, 2 in Ohio, and 1 each in Illinois, New York, and West Virginia. The production, 849,047 tons, valued at $43,985,728, averaged in value $51.81 per ton. In addition wrought pipe of the value of $15,541,450 was produced by 13 establishments which purchased skelp. These 13 establishments appear in the industry classified as "iron and steel pipe, wrought," the total value of the products of which are $17,400,912, consisting of the wrought pipe product made from purchased skelp, just referred to, and seamless drawn, clinched, brazed, riveted, and other pipe or tubes, valued at $1,859,462. On the basis of the average value per ton of wrought pipe shown by the rolling mill product, the wrought pipe made from purchased skelp by establishments other than rolling mills represents in quantity nearly 300,000 tons, and makes with the rolling mill product a total of approximately 1,150,000 tons, valued at $59,527,178.

Seamless-drawn, clinched, brazed, etc., pipe or tubes.—Eight rolling mill establishments located in Pennsylvania, Ohio, and Michigan reported the manufacture of 20,636 tons of seamless drawn, clinched, brazed, etc., pipe or tubes of a value of $2,290,234, or an average of $110.98 per ton. In the industry classified as "iron and steel pipe, wrought," there were reported by 15 establishments products of a like character aggregating $1,859,462, making a total of $4,149,696.

Horse and mule shoes.—The manufacture of horse and mule shoes was reported by 11 rolling mill establishments and by 8 establishments otherwise classified. Of the former, 2 each were located in New York, Pennsylvania, and Virginia, and 1 each in Delaware, Illinois, New Jersey, Rhode Island, and Wisconsin. The product of the rolling mills aggregated 68,594 tons, valued at $5,483,137, or $79.94 per gross ton. Of the establishments other than rolling mills, which manufacture horse and mule shoes, 3 were located in Pennsylvania, and 1 each in Connecticut, Massachusetts, Minnesota, New Jersey, and New York. The product of the establishments, not rolling mills, is of a value of $798,981; and estimated on the basis of the value reported for the rolling mill horse and mule shoe product, it is equivalent to about 10,000 tons. This combined with the rolling mill product gives a total product of 78,594 tons. The New York rolling mill establishments produced the largest amount of horse and mule shoes, and Pennsylvania ranked second. These 2 states produced more than one-half of the rolling mill product.

Springs.—Car, carriage, furniture, and other springs were made by 9 steel works and rolling mill establishments to the amount of 22,022 tons, valued at $1,708,632, an average value of $77.59 per ton. Of these steel works and rolling mills, 2 each were located in Michigan and Pennsylvania, and 1 each in California, Connecticut, Illinois, Massachusetts, and New Jersey.

The greater part of the iron and steel springs for cars, carriages, etc., was made by establishments otherwise classified. Of the latter, there were 52, reporting products valued at $5,740,836. Less than 23 per cent of this class of products was from establishments which made or rolled their own steel.

The other miscellaneous iron and steel products specifically reported by steel works and rolling mills will be found in Table 45. It is not possible to show the total product of cast iron pipe or gray iron and malleable castings, as the greater part of the same is included in the reports of establishments classified under "foundry and machine shop products," and can not be segregated.

The manufacture of 1,594 tons of ordnance, valued at $988,804, was reported by steel works and rolling mills, and products valued at $557,903 by establishments classified as "ordnance and ordnance stores," making a total value of $1,546,707.

The rolling mill establishments reported stamped ware valued at $292,923, which should be combined with the product of establishments making stamped ware as a specialty. They reported machinery manufactured to the extent of $1,269,675, which is a by-product for "foundry and machine shop products," and shovels, spades, scoops, etc., valued at $410,500, a by-product for "tools, not elsewhere specified."

The manufacture of copper rods was reported by 3 establishments classified as steel works and rolling mills, which were located in Illinois, Massachusetts, and Pennsylvania; and copper wire by 3 establishments located in Illinois, Massachusetts, and New Jersey.

EQUIPMENT.

Table 48 shows the equipment and capacity of the steel works and rolling mills in 1905, as compared with 1900, 1890, and 1880.

TABLE 48.—*Steel works and rolling mills—active and idle establishments—number, equipment, and capacity: 1880 to 1905.*

	1905	1900	1890	1880
Steel works and rolling mills:				
Number of establishments	[1] 518	476	429	391
Total daily capacity, finished, rolled, and forged products, tons, double turn	[1] 115,210	90,122	41,576	19,730
Bessemer establishments, included above	49	42	51	11
Bessemer converters—				
Number	103	91	97	24
Total daily capacity, tons of ingots, double turn	45,427	38,420	19,285	3,988
Open-hearth steel establishments, included above	126	96	58	25
Open-hearth furnaces—				
Number	515	331	129	37
Total daily capacity, tons of ingots, double turn	35,457	19,030	3,608	738
Acid furnaces—				
Number	159	152	(2)	(2)
Daily capacity, tons of ingots, double turn	7,750	6,419	(2)	(2)
Basic furnaces—				
Number	356	179	(2)	(2)
Daily capacity, tons of ingots, double turn	27,707	12,611	(2)	(2)
Crucible steel establishments, included above	49	40	47	37
Crucible pots which can be used at a heat	2,939	2,619	2,606	2,691

[1] Exclusive of forges and bloomeries but including 31 establishments other than steel works and rolling mills. (See Table 13.)
[2] Not reported.

This comprises both active and idle establishments and includes those otherwise classified. The number of establishments shows an increase of 42, or 8.8 per cent, and their daily capacity of finished rolled and forged products, an increase of 25,088 tons, or 27.8 per cent. Establishments having Bessemer converters have increased 7 in number and 12 in number of converters, while the open-hearth steel establishments have gained 30 in number and 184 in number of furnaces, 7 of the latter being acid furnaces and 177 basic. Crucible establishments have increased slightly in number and considerably in equipment. Equipment for the production of steel by other or miscellaneous processes was reported by 6 establishments, including 1 establishment otherwise classified. Of the total number of active and idle establishments classified under steel works and rolling mills, 93 were equipped both for the production of steel and for the manufacture of hot rolled iron and steel products; 74, for the production of steel ingots and castings only; and 320, for the production of hot rolled iron and steel products only. There were thus 167 establishments equipped for steel production and 413 for the manufacture of hot rolled iron and steel products.

Of the total number of establishments in 1900, 42 were equipped for the manufacture of Bessemer steel, with 91 converters; 96, for the manufacture of open-hearth steel, with 331 furnaces; 40, for the manufacture of crucible steel, with 2,619 pots; and 11, for the manufacture of steel by miscellaneous processes. There were in 1900, 425 establishments equipped for the manufacture of hot rolled iron and steel products, while 51 were not so equipped. In 1890, 299 produced rolled iron and steel, but not steel ingots or castings, and 130 were equipped for the production of steel.

STEEL PRODUCTION.

The following tables present, by states, the production of steel ingots and direct steel castings reported at the census of 1905 and former census years.

Table 49 shows the total production of all kinds of steel ingots and castings, by states, 1880 to 1905.

TABLE 49.—STEEL WORKS—QUANTITY OF STEEL INGOTS AND DIRECT STEEL CASTINGS, BY STATES: 1880 TO 1905.

STATE.	TOTAL (TONS).				BESSEMER STEEL (TONS).			
	1905	1900	1890	1880	1905	1900	1890	1880
United States	[1] 13,670,592	10,685,000	4,174,652	1,027,381	7,768,915	7,532,028	3,617,198	879,650
Alabama	227,899	48,191	268	.....	1,177	.....	.....	.....
California	579	(2)	7,550	.....	.....	(2)	.....	.....
Colorado	188,828	129,306	16,029	.....	103,625	129,306	16,029	.....
Connecticut [3]	47,307	2,197	1,556	1,964	.....	.....	.....	.....
Delaware	868	.....	.....	.....	868	.....	.....	.....
Illinois	1,555,198	1,460,710	779,956	227,293	1,193,548	1,211,115	777,478	226,352
Indiana	81,589	51,967	1,116	.....	.....	.....	.....	.....
Kentucky	89,610	74,737	.....	312	89,610	74,737	.....	.....
Maryland	309,481	255,070	893	.....	302,481	251,320	.....	.....
Massachusetts	109,025	51,552	26,272	8,585	.....	.....	14,065	.....
Michigan	2,500	4,575	4,855	.....	2,500	2,300	3,214	.....
Minnesota	147	10,392	.....	.....	147	50	.....	.....
Missouri	7,131	9,600	.....	7,508	.....	.....	.....	7,508
New Hampshire	.....	.....	3,304	4,037	.....	.....	.....	.....
New Jersey	68,288	62,832	21,149	10,663	4,177	.....	.....	.....
New York	474,258	23,232	101,769	77,451	363,063	.....	94,109	75,143
Ohio	2,529,997	1,812,829	395,574	96,324	2,049,153	1,697,353	340,266	73,938
Oregon	231	.....	.....	.....	231	.....	.....	.....
Pennsylvania	7,733,640	6,431,297	2,652,920	586,994	3,442,312	3,911,127	2,210,730	496,709
Rhode Island	20,120	.....	.....	.....	300	.....	.....	.....
Tennessee	606	146	134	3,571	.....	.....	.....	.....
Vermont	.....	.....	.....	2,679	.....	.....	.....	.....
West Virginia	214,075	254,070	161,307	.....	214,075	254,070	161,307	.....
Wisconsin	9,215	2,297	.....	.....	1,648	650	.....	.....

[1] Includes 4,184 tons of steel castings made by establishments engaged primarily in the manufacture of other products.
[2] California produced a small quantity of Tropenas steel castings in 1900, which was included in the statistics for the iron and steel shipbuilding industry.
[3] Connecticut produced a small quantity of Tropenas steel castings in 1900, but this production is not included in the figures given for this state.

TABLE 49.—STEEL WORKS—QUANTITY OF STEEL INGOTS AND DIRECT STEEL CASTINGS, BY STATES: 1880 TO 1905—Continued.

STATE.	OPEN-HEARTH STEEL (TONS).				CRUCIBLE STEEL (TONS).				MISCELLANEOUS STEEL (TONS).			
	1905	1900	1890	1880	1905	1900	1890	1880	1905	1900	1890	1880
United States	5,820,397	3,044,356	480,035	75,269	80,059	104,393	73,882	68,037	1,221	4,223	3,537	4,425
Alabama	226,722	48,191	268	.....	.....	.....	.....	.....	.....	.....	.....	.....
California	579	.....	7,550	.....	.....	.....	.....	.....	.....	.....	.....	.....
Colorado	85,203	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Connecticut	46,507	802	.....	.....	800	1,395	1,556	1,889	.....	.....	.....	75
Delaware	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Illinois	361,650	249,313	2,081	825	.....	282	397	116	.....	.....	.....	.....
Indiana	80,799	51,953	893	.....	.....	14	223	.....	790	.....	.....	.....
Kentucky	.....	.....	.....	245	.....	.....	.....	67	.....	.....	.....	.....
Maryland	7,000	2,250	.....	.....	.....	1,500	893	.....	.....	.....	.....	.....
Massachusetts	105,047	51,552	11,732	8,460	3,978	.....	475	125	.....	.....	.....	.....
Michigan	.....	2,275	.....	.....	.....	.....	1,641	.....	.....	.....	.....	.....
Minnesota	.....	10,342	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Missouri	7,131	9,600	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
New Hampshire	.....	.....	3,304	4,037	.....	.....	.....	.....	.....	.....	.....	.....
New Jersey	57,606	49,912	13,887	402	6,505	9,600	6,637	9,368	.....	3,320	625	893
New York	104,898	14,371	1,161	.....	6,297	8,861	6,499	2,308	.....	.....	.....	.....
Ohio	480,844	114,926	55,308	22,064	.....	550	.....	322	.....	.....	.....	.....
Oregon	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Pennsylvania	4,230,657	2,437,918	383,851	32,986	60,240	81,349	55,427	53,842	431	903	2,912	3,457
Rhode Island	19,820	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Tennessee	.....	94	.....	3,571	606	52	134	.....	.....	.....	.....	.....
Vermont	.....	.....	.....	2,679	.....	.....	.....	.....	.....	.....	.....	.....
West Virginia	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Wisconsin	5,934	857	.....	.....	1,633	790	.....	.....	.....	.....	.....	.....

The growth of steel production has been the heaviest of any portion of the iron and steel industry. The increase in the steel production in 1905 was 2,985,592 tons over that of 1900, or 27.9 per cent. This is an average increase of nearly 600,000 tons per year. The product for 1900 shows a gain over that of 1890 of 6,510,348 tons, or 155.9 per cent, an average increase of about 650,000 tons per year; and the product of 1890 shows a gain over that of 1880 of 3,147,271 tons, or 306.3 per cent, an average increase of nearly 315,000 tons per year.

The following tabular statement shows the proportion of the total that Bessemer steel, open-hearth steel, and crucible and miscellaneous steels, respectively, formed for the several census years:

KIND.	PER CENT OF TOTAL STEEL PRODUCTION.			
	1905	1900	1890	1880
Total	100.0	100.0	100.0	100.0
Bessemer steel	56.8	70.5	86.6	85.6
Open-hearth steel	42.6	28.5	11.5	7.3
Acid	5.5	8.3	.....	.....
Basic	37.1	20.2	.....	.....
Crucible and miscellaneous steel	0.6	1.0	1.9	7.1

When compared with other branches of the iron and steel industry, the growth is particularly noticeable. The increase in the steel tonnage for the last five years, as above noted, was 27.9 per cent; whereas the increase in the tonnage of pig iron was 15.1 per cent, and of all rolling mill products, 21.1 per cent.

The increase in Bessemer steel since 1900 has been relatively small—236,887 tons, or 3.1 per cent; whereas open-hearth steel has increased 2,776,041 tons, or 91.2 per cent. For the decade from 1890 to 1900, Bessemer steel increased 3,914,830 tons, or 108.2 per cent, and open-hearth steel, 2,564,321 tons, or 534.2 per cent; whereas for the decade from 1880 to 1890, Bessemer steel increased 2,737,548 tons, or 311.2 per cent, and open-hearth steel, 404,766 tons, or 537.8 per cent. Crucible and miscellaneous steels show a slight decrease.

Pennsylvania contributed 56.6 per cent of the total steel product in 1905, 60.2 per cent in 1900, 63.5 per cent in 1890, and 57.1 per cent in 1880. Ohio made 18.5 per cent in 1905, 17 per cent in 1900, 9.5 per cent in 1890, and 9.4 per cent in 1880. Illinois, ranking third in the production of steel, made 11.4 per cent in 1905, 13.7 per cent in 1900, 18.7 per cent in 1890, and 22.1 per cent in 1880. These 3 states combined produced 86.5 per cent of the total in 1905, 90.8 per cent in 1900, 91.7 per cent in 1890, and 88.6 per cent in 1880. A large increase appears in a number of the other states, notably in Alabama and New York. Delaware, Rhode Island, and Oregon appear as steel producers for the first time in 1905.

Table 50 shows the daily capacity of all steel plants, active and idle, on double turn, together with the production of steel ingots and castings, by states, for 1905.

TABLE 50.—STEEL WORKS—CAPACITY OF PLANTS AND QUANTITY AND VALUE OF STEEL INGOTS AND CASTINGS, BY STATES: 1905.

STATE OR GROUP OF STATES.	DAILY CAPACITY (TONS).			INGOTS AND CASTINGS.					
	Total.	Active.	Idle.	Total.		Ingots.		Castings.	
				Tons.	Value.	Tons.	Value.	Tons.	Value.
United States	81,751	78,346	3,405	[1] 13,670,592	[1] $261,231,976	13,379,083	$240,284,576	[1] 291,509	[1] $20,947,400
Alabama	1,935	1,890	45	227,809	4,487,289	226,152	4,435,080	1,747	52,209
California, Colorado, Missouri, Oregon, and Washington	2,796	2,792	4	196,769	4,004,533	188,464	3,398,805	8,305	605,728
Connecticut	380	380	.....	47,307	1,203,092	44,861	881,542	2,446	321,550
Delaware, Rhode Island, and Massachusetts	1,458	1,442	16	130,013	2,862,935	128,665	2,701,828	1,348	161,107
Illinois	9,382	9,382	.....	1,555,198	32,742,473	1,499,160	28,594,214	56,038	4,148,259
Indiana	638	498	140	81,589	1,845,603	72,090	1,290,156	9,499	555,447
Kentucky and Maryland	2,950	2,800	150	399,091	6,921,982	399,091	6,921,982	.....	.....
Michigan, Minnesota, and Wisconsin	403	103	300	11,862	1,080,870	.....	.....	11,862	1,080,870
New Jersey	922	922	.....	68,288	3,009,268	56,632	1,602,951	11,656	1,406,317
New York	3,243	2,313	930	474,258	11,456,512	438,653	9,464,734	35,605	1,991,778
Ohio	14,401	13,780	621	2,529,997	42,949,759	2,492,401	40,462,006	37,596	2,487,753
Pennsylvania	41,971	40,772	1,199	7,733,640	144,774,781	7,618,833	136,680,399	114,807	8,094,382
Tennessee, Virginia, and West Virginia	1,272	1,272	.....	214,681	3,892,879	214,081	3,850,879	600	42,000

[1] Includes 4,184 tons of steel castings, valued at $347,264, made by establishments engaged primarily in the manufacture of other products.

Computed from the daily capacity, on a basis of three hundred working days for the year, the total yearly capacity of the active establishments is about 23,500,000 tons. The production was thus approximately 58 per cent of the capacity of the active establishments. In 1900 it was estimated as 66.3 per cent of the total capacity of active establishments. Steel ingots constituted 97.9 per cent of the production and castings 2.1 per cent. In 1900 ingots formed 98.3 per cent and castings 1.7 per cent of the steel production. The average value per ton of all ingots and castings was $19.11 in 1905 and $19.89 in 1900.

Table 51 presents, for 1905, the statistics of the production of steel ingots, by states, certain states being grouped, as in the other tables, to avoid disclosing individual operations.

TABLE 51.—STEEL WORKS—QUANTITY AND VALUE OF STEEL INGOTS, BY KIND AND STATES: 1905.

STATE OR GROUP OF STATES.	AGGREGATE.		BESSEMER.		OPEN-HEARTH.						CRUCIBLE.	
					Total.		Acid.		Basic.			
	Tons.	Value.	Tons.	Value.	Tons.	Value.	Tons.	Value.	Tons.	Value.	Tons.	Value.
United States	13,379,083	$240,284,576	7,754,488	$132,951,636	5,548,396	$101,762,469	573,475	$12,967,630	4,974,921	$88,794,839	76,199	$5,570,471
Alabama	226,152	4,435,080	.....	.....	226,152	4,435,080	.....	.....	226,152	4,435,080	.....	.....
Colorado, Illinois, New Jersey, New York, and Tennessee	2,182,915	43,061,904	1,657,253	32,022,549	513,774	10,039,554	7,886	186,649	505,888	9,852,905	11,888	999,801
Connecticut, Massachusetts, and Rhode Island	173,526	3,583,370	.....	.....	168,928	3,353,475	33,774	698,964	135,154	2,654,511	4,598	229,895
Indiana, Kentucky, Maryland, and West Virginia	685,256	12,061,817	606,166	10,626,661	79,090	1,435,156	.....	.....	79,090	1,435,156	.....	.....
Ohio	2,492,401	40,462,006	2,049,153	33,081,692	443,248	7,380,314	43,326	695,351	399,922	6,684,963	.....	.....
Pennsylvania	7,618,833	136,680,399	3,441,916	57,220,734	4,117,204	75,118,890	488,489	11,386,666	3,628,715	63,732,224	59,713	4,340,775

Of the total ingot production, 58 per cent was Bessemer, 41.5 per cent open-hearth, and six-tenths of 1 per cent crucible; whereas in 1900, 71.6 per cent was Bessemer, 27.4 per cent open-hearth, and 1 per cent crucible. The average value for all ingots was $17.96 per ton; for Bessemer ingots, $17.15 per ton; for open-hearth ingots, $18.34 per ton; and for crucible steel ingots, $73.10 per ton. In 1900 the average values were—for all ingots, $18.84 per ton; for Bessemer, $17.51; for open-hearth, $20.44; and for crucible steel, $72.33.

Table 52 presents, for 1905, the statistics relating to direct steel castings. Those made by miscellaneous steel furnaces, amounting to 431 tons, are combined with the crucible steel castings.

TABLE 52.—STEEL WORKS—QUANTITY AND VALUE OF STEEL CASTINGS, BY KIND AND STATES: 1905.

STATE OR GROUP OF STATES.	TOTAL.		BESSEMER.		OPEN-HEARTH.		CRUCIBLE AND MISCELLANEOUS.	
	Tons.	Value.	Tons.	Value.	Tons.	Value.	Tons.	Value.
United States	[1] 291,509	[1] $20,947,400	14,427	$1,690,629	272,001	$18,739,813	5,081	$516,958
Alabama, California, Colorado, Oregon, Tennessee, and Missouri	10,652	699,937	1,517	56,644	8,535	601,293	600	42,000
Connecticut, Massachusetts, Delaware, New Jersey, New York, and Rhode Island	51,055	3,880,752	7,488	1,185,228	42,467	2,607,770	1,100	87,754
Illinois, Indiana, Michigan, Minnesota, and Wisconsin	77,399	5,784,576	5,026	395,794	69,950	5,153,571	2,423	235,211
Ohio	37,596	2,487,753	.....	.....	37,596	2,487,753	.....	.....
Pennsylvania	114,807	8,094,382	396	52,963	113,453	7,889,426	958	151,993

[1] Includes 4,184 tons of steel castings, valued at $347,264, made by establishments engaged primarily in the manufacture of other products.

Of the total amount, 93.3 per cent was made of open-hearth steel, 4.9 per cent of Bessemer, and 1.7 per cent of crucible and miscellaneous steel. In 1900, 93.4 per cent was open-hearth, 2.1 per cent Bessemer, and 4.4 per cent crucible and miscellaneous. The average value per ton of all castings was $71.86; of Bessemer castings, $117.19; of open-hearth castings, $68.90; and of those made of crucible and miscellaneous steels, $101.74. The value of direct steel castings reported shows a wide range—from $26 per ton in certain sections to $175 per ton in others. In 1900 the average value per ton of all castings was $82.47; of Bessemer castings, $85.74; of open-hearth castings, $78.56; and of crucible and miscellaneous steels, $163.09.

Bessemer steel.—The production of Bessemer steel ingots and castings, and the equipment of all establishments, active and idle, for such production, is shown, for 1905, in Table 53.

TABLE 53.—BESSEMER STEEL WORKS—NUMBER, EQUIPMENT, AND CAPACITY OF ESTABLISHMENTS, AND QUANTITY AND VALUE OF INGOTS AND CASTINGS, BY STATES: 1905.

STATE OR GROUP OF STATES.	NUMBER OF ESTABLISHMENTS.			CONVERTERS.				INGOTS AND CASTINGS.					
				Active.		Idle.		Total.		Ingots.		Castings.	
	Total.	Active.	Idle.	Number.	Daily capacity. (tons).	Number.	Daily capacity. (tons).	Tons.	Value.	Tons.	Value.	Tons.	Value.
United States	[1] 49	44	5	92	43,123	11	2,304	7,768,915	$134,642,265	7,754,488	$132,951,636	[2] 14,427	[2] $1,690,629
California, Colorado, Illinois, and Oregon	7	7	.....	15	9,239	.....	.....	1,297,404	24,851,836	1,296,333	24,804,149	1,071	47,687
Kentucky, Alabama, Maryland, Virginia, and West Virginia	6	6	.....	11	4,464	.....	.....	607,343	10,656,086	606,166	10,626,661	1,177	29,425
Michigan, Minnesota, and Wisconsin	5	4	1	6	60	2	300	4,295	375,326	.....	.....	4,295	375,326
New York, New Jersey, Delaware, Rhode Island, and Massachusetts	9	8	1	18	1,593	3	800	368,408	8,403,628	360,920	7,218,400	7,488	1,185,228
Ohio	8	7	1	13	10,838	2	550	2,049,153	33,081,692	2,049,153	33,081,692	.....	.....
Pennsylvania	14	12	2	29	16,929	4	654	3,442,312	57,273,697	3,441,916	57,220,734	396	52,963

[1] Including 8 establishments other than steel works. (See Table 13.)
[2] Includes 774 tons of steel castings, valued at $92,685, made by establishments engaged primarily in the manufacture of other products.

The above table does not include 2 converters of the Tropenas type in Government establishments. It does, however, include the Bessemer equipment of the establishments otherwise classified (see Table 13).

Table 54 shows, for 1905, the equipment of all Bessemer steel works with the types of converters and the daily capacity, by states.

TABLE 54.—BESSEMER STEEL WORKS—NUMBER, KIND, AND CAPACITY OF CONVERTERS, BY STATES: 1905.

STATE.	TOTAL.			BESSEMER.			TROPENAS.			OTHER KINDS.		
	Number of establishments.	Number of converters.	Daily capacity (tons).	Number of establishments.	Number of converters.	Daily capacity (tons).	Number of establishments.	Number of converters.	Daily capacity (tons).	Number of establishments.	Number of converters.	Daily capacity (tons).
United States	[1] 51	105	45,432	30	72	44,979	10	15	100	11	18	353
Alabama	1	1	500	1	1	500						
California	1	1	8				1	1	8			
Colorado	1	2	2,000	1	2	2,000						
Delaware	1	3	30							1	[2] 3	30
District of Columbia	1	1	1				1	1	1			
Illinois	4	11	7,227	3	8	7,200	1	3	27			
Kentucky	1	2	500	1	2	500						
Maryland	1	3	2,200	1	3	2,200						
Massachusetts	2	2	204				1	1	4	1	[3] 1	200
Michigan	1	2	18							1	[4] 2	18
Minnesota	1	1	4				1	1	4			
New Jersey	3	6	45							3	[5] 6	45
New York	3	9	2,110	2	7	2,090	1	2	20			
Ohio	8	15	11,388	7	14	11,380				1	[4] 1	8
Oregon	1	1	4							1	[6] 1	4
Pennsylvania	14	33	17,583	11	29	17,549	2	3	24	1	[2] 1	10
Rhode Island	1	2	8				1	2	8			
Virginia	1	1	4				1	1	4			
West Virginia	2	4	1,260	2	4	1,260						
Wisconsin	3	5	338	1	2	300				2	[7] 3	38

[1] Includes 8 establishments other than steel works (see Table 13) and 2 Government institutions (District of Columbia and Massachusetts) having 2 Tropenas converters.
[2] Bookwalter.
[3] Clapp-Griffiths.
[4] Robert-Bessemer.
[5] Two Evans-Wills converters of 16 tons daily capacity, 3 top-blown converters of 9 tons daily capacity, and 1 special converter of 20 tons daily capacity.
[6] Top-blown.
[7] Special.

In 1880 the usual capacity of the standard Bessemer converter was 5 tons, and in 1890 converters of 10 to 12 tons were in use. In 1900 the capacity of a number of converters had further increased to 15 tons, and at one establishment 20-ton converters had been installed. This capacity has not been exceeded.

Nineteen states report plants equipped with converters. The total production of steel ingots and castings in 1905 amounted to 7,768,915 tons, valued at $134,642,265, as compared with 7,532,028 tons in 1900, of a value of $132,113,984, an increase of 3.1 per cent in tonnage and of 1.9 per cent in value. The ingot product of 1905 amounted to 7,754,488 tons, of a value of $132,951,636, an average value of $17.15, compared with 7,528,267 tons in 1900, valued at $131,791,519, or $17.51 per ton. The castings amounted in 1905 to 14,427 tons, of a value of $1,690,629, an average value of $117.19 per ton, as compared with 3,761 tons in 1900, valued at $322,465, or $85.74 per ton. This is an increase for ingots of 3 per cent in tonnage and for castings, of 283.6 per cent. Pennsylvania produced 44.3 per cent of the total products of Bessemer ingots and castings in 1905, compared with 51.9 per cent in 1900; and Ohio, 26.4 per cent, compared with 22.5 per cent.

The states of Pennsylvania, Ohio, Illinois, and New York produced 90.8 per cent of all Bessemer steel ingots and castings in 1905; no other state produced over 4 per cent. Over 60 per cent of the Bessemer steel castings was produced by the state of New York. The next states in rank were New Jersey, Michigan, Wisconsin, Alabama, Delaware, and Illinois, in the order named. No other state produced over 400 tons of direct Bessemer steel castings.

Included in the foregoing is the product of all converters, whether of the standard Bessemer or other type. The product of the Tropenas and of converters other than standard Bessemer amounted to 11,834 tons of castings, of a value of $1,596,476, making an average value of $134.90 per ton. The tonnage and value of castings made by the establishments before referred to as otherwise classified are not of course included unless these were sold as products.

Of the Bessemer steel castings made by other than standard Bessemer converters, New Jersey produced 35.6 per cent; Michigan, 21.5 per cent; New York, 14.5 per cent; and Wisconsin, 14 per cent. No other state produced over 7.4 per cent.

Open-hearth steel.—The production and value of all open-hearth steel ingots and castings, acid and basic, is shown, for 1905, in Table 55, by states, together with the number of establishments, both active and idle, equipped with open-hearth furnaces.

TABLE 55.—OPEN-HEARTH STEEL WORKS—NUMBER OF ESTABLISHMENTS AND FURNACES, AND QUANTITY AND VALUE OF STEEL PRODUCED, BY STATES: 1905.

STATE OR GROUP OF STATES.	NUMBER OF ESTABLISHMENTS.			NUMBER OF FURNACES.			STEEL (INGOTS AND CASTINGS).					
							Total.		Acid.		Basic.	
	Total.	Active.	Idle.	Total.	Active.	Idle.	Tons.	Value.	Tons.	Value.	Tons.	Value.
United States	126	110	16	515	489	26	[1] 5,820,397	[1] $120,502,282	755,805	$25,931,780	[1] 5,064,592	[1] $94,570,502
Alabama	5	4	1	19	18	1	226,722	4,457,864	.....	.....	226,722	4,457,864
California, Colorado, Missouri, and Wisconsin	6	6	.....	15	15	.....	98,847	2,602,584	6,513	603,868	92,334	1,998,716
Connecticut, Massachusetts, Rhode Island, Delaware, Maryland, Kentucky, and Tennessee	12	10	2	33	28	5	178,374	3,820,029	36,220	1,020,514	142,154	2,799,511
Illinois	9	9	.....	38	38	.....	361,650	9,819,919	23,356	1,730,527	338,294	8,089,392
Indiana	6	4	2	12	9	3	80,799	1,788,603	8,709	498,447	72,090	1,290,156
New Jersey	5	5	.....	13	13	.....	57,606	1,793,496	14,422	785,315	43,184	1,008,181
New York	8	6	2	21	17	4	104,898	3,343,408	19,077	954,092	85,821	2,389,316
Ohio	15	12	3	46	43	3	480,844	9,868,067	55,837	1,428,511	425,007	8,439,556
Pennsylvania	60	54	6	318	308	10	4,230,657	83,008,316	591,671	18,910,506	3,638,986	64,097,810

[1] Includes 2,440 tons of steel castings, valued at $170,575, made by establishments engaged primarily in the manufacture of other products.

The production of open-hearth steel ingots and castings in 1905 was 5,820,397 tons, as compared with 3,044,356 tons in 1900, 480,035 tons in 1890, and 75,269 tons in 1880. This shows an increase of 91.2 per cent for the five-year period from 1900 to 1905, compared with 534.2 per cent for the decade ending 1900, and 537.8 for that ending in 1890.

In 1900 there were 96 establishments equipped with 331 open-hearth furnaces, of which 82 establishments, having 307 furnaces, were active, and 14 establishments, with 24 furnaces, were idle. In 1905, 126 establishments report 515 open-hearth furnaces, an increase of over 30 per cent in number of establishments, and of 55.6 per cent in number of furnaces. In 1880 the open-hearth furnaces ranged from 7 to 10 tons capacity per heat; in 1890 many furnaces handled from 20 to 30 tons; and in 1900 a large number of furnaces of 50-ton capacity were in use. In 1905 there were reported 6 open-hearth furnaces of a capacity of 60 tons at a heat, and 169 of a capacity of 50 tons.

The 489 active furnaces in 1905 show an average product for the year of 11,903 tons per furnace, whereas in 1900 the 307 active furnaces had an average product of 9,916 tons per furnace for the year.

In 1905, 87 per cent of the open-hearth steel was made in basic furnaces and 13 per cent in acid, compared with a production in 1900 of 70.7 per cent basic steel and 29.3 per cent acid steel. In fact, the production of acid open-hearth steel declined from 890,521 tons in 1900 to 755,805 tons in 1905, or a decrease of 15.1 per cent, and basic open-hearth steel advanced from 2,153,835 tons in 1900 to 5,064,592 tons in 1905, an increase of 135.1 per cent.

The average value per ton of all open-hearth steel made in 1905 was $20.70, acid steel being $34.31 per ton, and basic $18.67 per ton. In 1900 the average value of all open-hearth steel was $23.60 per ton; of acid steel, $31.83 per ton; and of basic, $20.20 per ton.

Acid open-hearth steel was made in 11 states. Pennsylvania produced 78.3 per cent of the total product, compared with 77.6 per cent in 1900; Ohio, 7.4 per cent, compared with 5.9 per cent in 1900; Illinois, 3.1 per cent, compared with 3.9 per cent in 1900.

Basic open-hearth steel was made in 13 states in 1905. Pennsylvania produced 71.9 per cent, as compared with 81.1 per cent of the total production in 1900; Ohio, 8.4 per cent, compared with 2.9 per cent in 1900; and Illinois, 6.7 per cent, compared with 10 per cent in 1900.

Acid steel only was produced by 46 active open-hearth establishments, basic steel only by 40 establishments, and both acid and basic steel by 19 establishments. In the case of 5 active establishments having open-hearth furnaces, no open-hearth steel was reported. In 1900, 36 of the active establishments produced acid steel only; 19, basic steel; and 17, both acid and basic. In 1905, 46 of the open-hearth establishments produced ingots only; 44, castings only; and 15, both ingots and castings. In 1900, 38 establishments made ingots alone; 32, castings alone; and 12, both ingots and castings.

Table 56 presents in detail, for 1905, by states or groups of states, the production and value of acid and basic steel ingots and castings.

TABLE 56.—OPEN-HEARTH STEEL WORKS—QUANTITY AND VALUE OF INGOTS AND CASTINGS, BY KIND AND STATES: 1905.

STATE OR GROUP OF STATES.	Number of producing establishments.	ACID AND BASIC.					
		Total.		Ingots.		Castings.	
		Tons.	Value.	Tons.	Value.	Tons.	Value.
United States	100	[1] 5,820,397	[1] $120,502,282	5,548,396	$101,762,469	[1] 272,001	[1] $18,739,813
Connecticut, Massachusetts, and Rhode Island	6	171,374	3,675,025	168,928	3,353,475	2,446	321,550
Maryland and New Jersey	4	64,606	1,938,496	58,037	1,339,196	6,569	599,300
Missouri, Wisconsin, Colorado, and California	5	98,847	2,602,584	84,948	1,496,742	13,899	1,105,842
Alabama	4	226,722	4,457,864	226,152	4,435,080	570	22,784
Illinois	8	361,650	9,819,919	306,343	5,692,128	55,307	4,127,791
Indiana	4	80,799	1,788,603	72,090	1,290,156	8,709	498,447
New York	6	104,898	3,343,408	71,446	1,656,488	33,452	1,686,920
Ohio	12	480,844	9,868,067	443,248	7,380,314	37,596	2,487,753
Pennsylvania	51	4,230,657	83,008,316	4,117,204	75,118,890	113,453	7,889,426

STATE OR GROUP OF STATES.	Number of producing establishments.	ACID.					
		Total.		Ingots.		Castings.	
		Tons.	Value.	Tons.	Value.	Tons.	Value.
United States	100	755,805	$25,931,780	573,475	$12,967,630	182,330	$12,964,150
Connecticut, Massachusetts, and Rhode Island	6	36,220	1,020,514	33,774	698,964	2,446	321,550
Maryland and New Jersey	4	14,422	785,315	7,853	186,015	6,569	599,300
Missouri, Wisconsin, Colorado, and California	5	6,513	603,868	.....	.....	6,513	603,868
Alabama	4	.....	.....	.....	.....	.....	.....
Illinois	8	23,356	1,730,527	33	634	23,323	1,729,893
Indiana	4	8,709	498,447	.....	.....	8,709	498,447
New York	6	19,077	954,092	.....	.....	19,077	954,092
Ohio	12	55,847	1,428,511	43,336	695,351	12,511	733,160
Pennsylvania	51	591,671	18,910,506	488,489	11,386,666	103,182	7,523,840

STATE OR GROUP OF STATES	Number of producing establishments.	BASIC.					
		Total.		Ingots.		Castings.	
		Tons.	Value.	Tons.	Value.	Tons.	Value.
United States	100	[1] 5,064,592	[1] $94,570,502	4,974,921	$88,794,839	[1] 89,671	[1] $5,775,663
Connecticut, Massachusetts, and Rhode Island	6	135,154	2,654,511	135,154	2,654,511	.....	.....
Maryland and New Jersey	4	50,184	1,153,181	50,184	1,153,181	.....	.....
Missouri, Wisconsin, Colorado, and California	5	92,334	1,998,716	84,948	1,496,742	7,386	501,974
Alabama	4	226,722	4,457,864	226,152	4,435,080	570	22,784
Illinois	8	338,294	8,089,392	306,310	5,691,494	31,984	2,397,898
Indiana	4	72,090	1,290,156	72,090	1,290,156	.....	.....
New York	6	85,821	2,389,316	71,446	1,656,488	14,375	732,828
Ohio	12	425,007	8,439,556	399,922	6,684,963	25,085	1,754,593
Pennsylvania	51	3,638,986	64,097,810	3,628,715	63,732,224	10,271	365,586

[1] Includes 2,440 tons of steel castings, valued at $179,575, made by establishments engaged primarily in the manufacture of other products.

Of the total open-hearth steel production, 95.3 per cent was ingots and 4.7 per cent castings; 87 per cent was made in basic furnaces and 13 per cent in acid. Of the ingots, 89.7 per cent were basic and 10.3 per cent acid; while of the castings, 67 per cent were of acid steel and 33 per cent basic.

The average value of the ingots was $18.34 per ton; of the basic ingots, $17.85 per ton; and of the acid, $22.61 per ton. The average value of the castings was $68.90 per ton; of the acid castings, $71.10 per ton; and of the basic, $64.41 per ton. Pennsylvania made 72.7 per cent of all open-hearth steel, and the average value of its contribution was $19.62 per ton; 74.2 per cent of all ingots, their average value being $18.25 per ton; 72.9 per cent of the basic ingots, at $17.56 per ton; 85.2 per cent of the acid ingots, at $23.31 per ton; and 41.7 per cent of all castings, at $69.54 per ton—56.6 per cent of the acid at $72.92 per ton, and 11.5 per cent of the basic at $35.59 per ton.

Ohio was second in the production of all open-hearth steel, making 8.3 per cent, at $20.52 per ton; second in the production of ingots, making 8 per cent, at $16.65 per ton; 8 per cent of the basic ingots, at $16.72 per ton; and 7.6 per cent of the acid ingots, at $16.05 per ton; and third in castings, making 13.8 per cent, at $66.17 per ton.

Illinois was third in all open-hearth steel, making 6.2 per cent, at $27.15 per ton; third in ingots, making 5.5 per cent, nearly all basic ingots (and 6.2 per cent of the total basic), at $18.58 per ton; and second in castings, making 20.3 per cent, at $74.63 per ton.

Alabama was fourth in all open-hearth steel production, making 3.9 per cent, at $19.66 per ton; fourth in the production of ingots, its output constituting 4.1

per cent of all ingots and 4.5 per cent of all basic ingots, at $19.61 per ton; it produced also a relatively small amount of basic castings.

These 4 states—Pennsylvania, Ohio, Illinois, and Alabama—made 5,299,873 tons of open-hearth steel, or 91.1 per cent of the total amount; 5,092,947 tons of ingots, or 91.8 per cent of the total; and 206,926 tons of castings, or 76.1 per cent of the total.

There were 54 establishments which made open-hearth steel castings in 1905, 35 made acid castings only, 12 basic castings only, and 7 made both acid and basic. The establishments which made steel castings only and no steel ingots were equipped with 56 acid open-hearth furnaces and with 31 basic furnaces. Of the 44 establishments which made open-hearth castings in 1900, 39 made acid castings only, 4 basic castings only, and 1 both acid and basic. The establishments which produced steel castings only in 1900 were equipped with 51 acid and 9 basic furnaces.

The average value per ton of all open-hearth steel castings was $68.90 in 1905 and $78.56 in 1900. Acid castings had an average value of $71.10 per ton in 1905, and basic an average value of $64.41. Pennsylvania produced 41.7 per cent of the total output in 1905, of an average value of $69.54 per ton, as compared with 41.2 per cent of the total output, of an average value of $81.43, in 1900. Pennsylvania made 56.6 per cent of the acid castings, of an average value of $72.92 per ton in 1905, and 50.2 per cent, of a value of $83.27, in 1900.

Illinois ranked second in the manufacture of all steel castings, Ohio third, and New York fourth. In output of acid castings, Illinois was second, New York third, and Ohio fourth; and of basic, Illinois was first, Ohio second, New York third, and Pennsylvania fourth. In 1900 basic steel castings were made in only 3 states—Illinois, Missouri, and Pennsylvania; in 1905 they are reported by 7 states—the 3 mentioned above and Alabama, Colorado, New York, and Ohio.

Table 57 shows the number and capacity of the open-hearth furnaces, acid and basic, in active and idle establishments, including those "otherwise classified" (see Table 13), by states. In order to show the heavy increase in the basic open-hearth furnace equipment since the Twelfth Census, the statistics are presented for both 1900 and 1905.

TABLE 57.—OPEN-HEARTH STEEL WORKS—NUMBER AND DAILY CAPACITY OF ACID AND BASIC FURNACES, BY STATES: 1905 AND 1900.

STATE.	Census.	Number of establishments.	TOTAL OPEN-HEARTH FURNACES.						ACID FURNACES.						BASIC FURNACES.					
			Total.		Active.		Idle.		Total.		Active.		Idle.		Total.		Active.		Idle.	
			Number.	Daily capacity (tons).	Number.	Daily capacity (tons).	Number.	Daily capacity (tons).	Number.	Daily capacity (tons).	Number.	Daily capacity (tons).	Number.	Daily capacity (tons).	Number.	Daily capacity (tons).	Number.	Daily capacity (tons).	Number.	Daily capacity (tons).
United States	[1] 1905	126	515	35,457	489	34,398	26	1,059	159	7,750	148	7,466	11	284	356	27,707	341	26,932	15	775
	1900	96	331	19,030	307	18,245	24	785	152	6,419	139	6,094	13	325	179	12,611	168	12,151	11	460
Alabama	1905	5	19	1,435	18	1,390	1	45	.....	.....	.....	.....	.....	.....	19	1,435	18	1,390	1	45
	1900	3	13	1,150	12	1,120	1	30	.....	.....	.....	.....	.....	.....	13	1,150	12	1,120	1	30
California	1905	1	1	20	1	20	.....	.....	1	20	1	20	.....	.....	.....	.....	.....	.....	.....	.....
	1900	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Colorado	1905	1	6	600	6	600	.....	.....	.....	.....	.....	.....	.....	.....	6	600	6	600	.....	.....
	1900	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Connecticut	1905	3	6	370	6	370	.....	.....	3	140	3	140	.....	.....	3	230	3	230	.....	.....
	1900	1	1	10	1	10	.....	.....	1	10	1	10	.....	.....	.....	.....	.....	.....	.....	.....
Delaware	1905	1	5	460	5	460	.....	.....	1	100	1	100	.....	.....	4	360	4	360	.....	.....
	1900	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Illinois	1905	9	38	2,131	38	2,131	.....	.....	5	237	5	237	.....	.....	33	1,894	33	1,894	.....	.....
	1900	6	26	1,578	24	1,498	2	80	6	303	4	223	2	80	20	1,275	20	1,275	.....	.....
Indiana	1905	6	12	624	9	484	3	140	6	104	5	84	1	20	6	520	4	400	2	120
	1900	5	8	333	8	333	.....	.....	5	203	5	203	.....	.....	3	130	3	130	.....	.....
Kentucky	1905	1	3	150	.....	.....	3	150	3	150	.....	.....	3	150	.....	.....	.....	.....	.....	.....
	1900	2	5	214	.....	.....	5	214	1	14	.....	.....	1	14	4	200	.....	.....	4	200
Maryland	1905	1	2	100	2	100	.....	.....	.....	.....	.....	.....	.....	.....	2	100	2	100	.....	.....
	1900	1	1	30	1	30	.....	.....	1	30	1	30	.....	.....	.....	.....	.....	.....	.....	.....
Massachusetts	1905	4	14	650	12	635	2	15	9	240	7	225	2	15	5	410	5	410	.....	.....
	1900	3	10	576	10	576	.....	.....	8	440	8	440	.....	.....	2	136	2	136	.....	.....
Michigan	1905	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	1900	1	1	30	1	30	.....	.....	1	30	1	30	.....	.....	.....	.....	.....	.....	.....	.....
Minnesota	1905	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	1900	2	4	140	3	100	1	40	1	40	.....	.....	1	40	3	100	3	100	.....	.....
Missouri	1905	1	5	160	5	160	.....	.....	.....	.....	.....	.....	.....	.....	5	160	5	160	.....	.....
	1900	1	3	42	3	42	.....	.....	.....	.....	.....	.....	.....	.....	3	42	3	42	.....	.....
New Jersey	1905	5	13	825	13	825	.....	.....	4	267	4	267	.....	.....	9	558	9	558	.....	.....
	1900	4	9	335	7	310	2	25	6	225	5	210	1	15	3	110	2	100	1	10
New York	1905	8	21	1,095	17	965	4	130	6	226	6	226	.....	.....	15	869	11	739	4	130
	1900	6	12	350	8	190	4	160	7	126	5	86	2	40	5	224	3	104	2	120

[1] Includes 6 establishments other than steel works. (See Table 13.)

TABLE 57.—OPEN-HEARTH STEEL WORKS—NUMBER AND DAILY CAPACITY OF ACID AND BASIC FURNACES, BY STATES: 1905 AND 1900—Continued.

STATE.	Census.	Number of establishments.	TOTAL OPEN-HEARTH FURNACES.						ACID FURNACES.						BASIC FURNACES.					
			Total.		Active.		Idle.		Total.		Active.		Idle.		Total.		Active.		Idle.	
			Number.	Daily capacity (tons).	Number.	Daily capacity (tons).	Number.	Daily capacity (tons).	Number.	Daily capacity (tons).	Number.	Daily capacity (tons).	Number.	Daily capacity (tons).	Number.	Daily capacity (tons).	Number.	Daily capacity (tons).	Number.	Daily capacity (tons).
Ohio	1905	15	46	3,012	43	2,942	3	70	12	608	9	538	3	70	34	2,404	34	2,404	.....	.....
	1900	8	29	1,272	27	1,218	2	54	15	532	13	478	2	54	14	740	14	740	.....	.....
Pennsylvania	1905	60	318	23,704	308	23,195	10	509	105	5,627	103	5,598	2	29	213	18,077	205	17,597	8	480
	1900	49	205	12,925	199	12,745	6	180	96	4,421	93	4,341	3	80	109	8,504	106	8,404	3	100
Rhode Island	1905	1	2	90	2	90	.....	.....	.....	.....	.....	.....	.....	.....	2	90	2	90	.....	.....
	1900	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Tennessee	1905	1	1	6	1	6	.....	.....	1	6	1	6	.....	.....	.....	.....	.....	.....	.....	.....
	1900	1	1	6	1	6	.....	.....	1	6	1	6	.....	.....	.....	.....	.....	.....	.....	.....
Wisconsin	1905	3	3	25	3	25	.....	.....	3	25	3	25	.....	.....	.....	.....	.....	.....	.....	.....
	1900	3	3	39	2	37	1	2	3	39	2	37	1	2	.....	.....	.....	.....	.....	.....

The number of establishments having open-hearth furnace equipment increased 31.3 per cent, the number of furnaces 55.6 per cent, and the furnace capacity 86.3 per cent. The growth has been chiefly in the basic furnaces, which increased in number 98.9 per cent and in capacity 119.7 per cent. In 1905 the average daily capacity per furnace (double turn) for all furnaces was 68.8 tons; for acid furnaces, 48.7 tons; and for basic furnaces, 77.8 tons; compared with corresponding figures for 1900 of 57.5 tons, 42.2 tons, and 70.5 tons, respectively. The basic furnaces in 1905 constituted 69.1 per cent of the total number and 78.1 per cent of the total capacity; in 1900 they formed 54.1 per cent of the total number and 66.3 per cent of the total capacity.

Crucible and miscellaneous steels.—Table 58 shows the equipment, capacity, and production of the crucible steel works, by states, for 1905. Some of the states are grouped, in order not to disclose individual operations.

TABLE 58.—CRUCIBLE STEEL WORKS—NUMBER, EQUIPMENT, AND CAPACITY OF ESTABLISHMENTS, AND QUANTITY AND VALUE OF INGOTS AND CASTINGS, BY STATES: 1905.

STATE OR GROUP OF STATES.	NUMBER OF ESTABLISHMENTS.			NUMBER OF POTS THAT CAN BE USED AT A HEAT.			DAILY CAPACITY (TONS).			INGOTS AND CASTINGS.					
										Total.		Ingots.		Castings.	
	Total.	Active.	Idle.	Total.	Active.	Idle.	Total.	Active.	Idle.	Tons.	Value.	Tons.	Value.	Tons.	Value.
United States	[1] 49	[1] 44	5	2,939	2,723	216	759	717	42	80,059	$5,958,572	76,199	$5,570,471	[2] 3,860	[2] $388,101
Connecticut, Massachusetts, and New York	6	5	1	301	277	24	51	50	1	11,075	839,995	10,885	819,741	190	20,254
Indiana, Illinois, Ohio, Tennessee, and Wisconsin	13	11	2	280	220	60	35	30	5	2,239	221,411	6	1,200	2,233	220,211
New Jersey	4	4	.....	248	248	.....	52	52	.....	6,505	476,255	5,595	408,755	910	67,500
Pennsylvania	26	24	2	2,110	1,978	132	621	585	36	60,240	4,420,911	59,713	4,340,775	527	80,136

[1] Includes 6 establishments other than steel works. (See Table 13.)
[2] Includes 180 tons of steel castings, valued at $18,004, made by establishments engaged primarily in the manufacture of other products.

In 1880 the production of crucible steel amounted to 68,037 tons; in 1890, to 73,882 tons; in 1900, to 104,393 tons; and in 1905, to 80,059 tons. In 1880 there were 37 establishments, located in 9 states; in 1890, 47, located in 11 states; in 1900, 40, located in 10 states; and in 1905, 49, located in 10 states.

In 1905 the average value per ton of all crucible steel was $74.43. Of the total amount, 95.2 per cent were ingots of an average value of $73.10 per ton, and 4.8 per cent castings of an average value of $100.54 per ton. For 1900 the average value of all crucible steel was $74.46 per ton; of ingots, $72.33 per ton; and castings, $133.53. In 1900 ingots constituted 96.5 per cent and castings 3.5 per cent of all crucible steel.

Pennsylvania made about three-fourths of all crucible steel, and New Jersey, New York, and Massachusetts were next, in the order named. Wisconsin was the largest producer of crucible steel castings.

In 1900 there was reported a total of 2,619 pots that could be used at a heat, with a daily capacity of 525.5 tons.

The production of steel by other or miscellaneous processes is comparatively small. In 1880 there was reported 4,425 tons by miscellaneous processes from Connecticut, New Jersey, and Pennsylvania; in 1890, 3,537 tons from New Jersey and Pennsylvania; and in 1900, 4,223 tons from New Jersey and Pennsylvania. In 1905 steel made by miscellaneous processes was reported for Pennsylvania to the amount of 431 tons.

FORGES AND BLOOMERIES.

The statistics of the few remaining forges and bloomeries which manufacture for sale hammered charcoal blooms, billets, and bars direct from iron ore and hammered charcoal blooms, billets, and bars from pig iron and from scrap iron and steel, have been included for 1905 in those for steel works and rolling mills, but are here presented in detached form for comparison with former years. Establishments which consume in their own works the charcoal blooms or bars are not included.

Table 59 shows the leading statistics for forges and bloomeries for the census years 1870 to 1905.

TABLE 59.—*Forges and bloomeries—comparative summary: 1870 to 1905.*

	1905	1900	1890	1880	1870[1]
Number of establishments	6	7	20	93	82
Capital	[2] $222,112	[2] $508,388	$876,470	$3,915,213	$4,506,733
Salaried officials, clerks, etc., number	6	12	[3] 15	(4)	(4)
Salaries	$4,935	$11,500	[3] $17,309	(4)	(4)
Wage-earners, average number	68	226	471	2,939	2,902
Total wages	$33,355	$97,184	$199,065	$915,395	$195,964
Men 16 years and over	68	226	468	2,875	2,819
Wages	$33,355	$97,184	$198,705	(4)	(4)
Women 16 years and over				3	2
Wages				(4)	(4)
Children under 16 years			3	61	81
Wages			$360	(4)	(4)
Miscellaneous expenses	$14,049	$15,203	$54,680	(5)	(5)
Cost of materials used	$100,233	$327,160	$905,208	$2,546,915	$5,685,466
Value of products [6]	$158,612	$522,432	$1,183,494	$3,968,074	$7,647,054
Tons of products	5,626	15,497	31,049	64,783	98,936

[1] Includes idle establishments which were not reported separately in 1870.
[2] Includes value of rented property—1905, $9,500; 1900, $236,000. No rented property reported for previous censuses.
[3] Includes proprietors and firm members, with their salaries; number only reported in 1900 and 1905, but not included in this table.
[4] Not reported separately.
[5] Not reported.
[6] Includes value of miscellaneous products for which tonnage was not reported.

In 1880 there were 93 active establishments manufacturing hammered blooms, bars, etc., located in Missouri, New Jersey, New York, Pennsylvania, Georgia, North Carolina, Tennessee, and Virginia. In 1890 the number had declined to 20, located in New York, Pennsylvania, Maryland, and New Jersey; and in 1900 was further reduced to 7, located in New York, Pennsylvania, and Maryland. In 1905 there were only 6 active establishments, of which 5 were located in Pennsylvania and 1 in Maryland.

Since 1900 a decrease is shown of $286,276, or 56.3 per cent, in capital invested; of 69.9 per cent in number of wage-earners employed; of 69.3 per cent in the cost of materials; of 69.6 per cent in the value of products; and of 63.7 per cent in the tonnage.

The capital invested in active and idle forges and bloomeries in 1905, 1900, 1890, and 1880 is shown in Table 60.

TABLE 60.—*Forges and bloomeries—active and idle establishments—capital: 1880 to 1905.*

	Census.	Number of establishments.	CAPITAL. Total.	Buildings, machinery, tools, and implements.	Land, cash, and sundries.
Total	1905	7	[1] $256,639	$70,681	$185,958
	1900	14	[1] 619,488	236,420	383,068
	1890	32	1,074,970	462,500	612,470
	1880	118	4,395,963	2,301,550	2,094,413
Active	1905	6	222,112	37,154	184,958
	1900	7	508,388	184,420	323,968
	1890	20	876,470	338,000	538,470
	1880	93	3,915,213	2,018,800	1,896,413
Idle	1905	1	34,527	33,527	1,000
	1900	7	111,100	52,000	59,100
	1890	12	198,500	124,500	74,000
	1880	25	480,750	282,750	198,000

[1] Includes value of rented property—1905, $9,500; 1900, $236,000. No rented property reported for previous censuses.

The idle establishment in 1905 was in the state of New York. The materials and quantities and cost are shown in detail for 1880, 1890, 1900, and 1905 in Table 61.

TABLE 61.—FORGES AND BLOOMERIES—MATERIALS USED, BY KIND, QUANTITY, AND COST: 1880 TO 1905.

KIND.	1905		1900		1890		1880	
	Tons.	Cost.	Tons.	Cost.	Tons.	Cost.	Tons.	Cost.
Total	.....	$100,233	.....	$327,160	.....	$905,208	.....	$2,546,915
Iron ore	.....	.....	6,282	22,414	16,792	110,587	71,080	531,540
Pig iron	50	1,097	1,000	22,000	7,346	145,867	34,029	945,375
Old or scrap iron and steel	5,544	78,149	13,693	181,766	21,429	359,777	7,976	215,576
Charcoal	[1] 164,749	15,222	[1] 1,538,280	85,241	[1] 4,056,435	270,082	[1] 13,014,361	812,615
Anthracite coal and culm	.....	.....	.....	.....	355	946	304	1,220
Bituminous coal and slack	994	2,301	1,553	2,771	1,161	3,300	1,440	4,298
Coke	[2] 29	97	[2] 67	240	[2] 1,404	5,604	[2] 6,695	31,241
All other materials	.....	3,367	.....	12,728	.....	9,045	.....	5,050

[1] Bushels. [2] Short tons.

Table 62 shows the quantity and value of the products for 1880, 1890, 1900, and 1905. In 1880 and 1890 the cost of materials reported included all freight charges, whereas in 1900 and 1905 this was not always the case. Where freight is not included in the cost of materials it has been added to "all other materials."

The 1905 product was all blooms, billets, etc., nearly all of which were made from scrap iron and steel.

The blooms, billets, etc., had an average value of $28 per ton in 1905, compared with $32.63 per ton in 1900, $36.17 in 1890, and $68.31 in 1880.

TABLE 62.—FORGES AND BLOOMERIES—PRODUCTS, BY KIND, QUANTITY, AND VALUE: 1880 TO 1905.

KIND.	1905		1900		1890		1880	
	Tons.	Value.	Tons.	Value.	Tons.	Value.	Tons.	Value.
Total	.....	$158,612	.....	$522,432	.....	$1,183,494	.....	$3,968,074
Blooms and bar iron direct from iron ore	.....	.....	3,142	114,413	8,346	356,843	33,601	1,812,380
Blooms, billets, etc., from pig iron and scrap iron and steel	5,626	157,505	12,355	403,194	22,704	821,168	31,182	2,129,933
All other products	.....	1,107	.....	4,825	.....	5,483	.....	25,761

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TABLE 63.—BLAST FURNACES—DETAILED

		United States.	Alabama.	Georgia.	Illinois.	Michigan.
1	Number of establishments	190	19	4	4	11
2	Capital, total	$236,145,529	$19,325,778	$1,158,151	$14,263,055	$4,253,403
3	Land	$17,310,397	$1,289,655	$113,070	$1,801,500	$246,002
4	Buildings	$66,611,341	$5,831,477	$532,000	$3,212,352	$589,347
5	Machinery, tools, and implements	$67,804,248	$7,400,894	$103,207	$3,611,514	$1,112,702
6	Cash and sundries	$84,419,543	$4,803,752	$409,874	$5,637,689	$2,305,262
7	Rented property, total	$3,158,283				$129,703
8	Land	$787,184				$73,484
9	Buildings	$2,171,219				$51,219
10	Machinery, tools, and implements	$199,880				$5,000
11	Proprietors and firm members	26				
	Salaried officials, clerks, etc.:					
12	Total number	2,231	262	41	83	97
13	Total salaries	$2,890,897	$320,643	$44,838	$100,661	$109,596
	Officers of corporations—					
14	Number	249	46	7	7	3
15	Salaries	$683,704	$100,095	$15,977	$22,500	$8,200
	General superintendents, managers, clerks, etc.—					
16	Total number	1,982	216	34	76	94
17	Total salaries	$2,207,193	$220,548	$28,861	$78,161	$101,396
	Men—					
18	Number	1,922	216	33	75	91
19	Salaries	$2,177,422	$220,548	$28,446	$77,761	$100,336
	Women—					
20	Number	60		1	1	3
21	Salaries	$29,771		$415	$400	$1,060
	Wage-earners, including pieceworkers, and total wages:					
22	Greatest number employed at any one time during the year	47,361	6,595	434	2,542	1,517
23	Least number employed at any one time during the year	27,206	3,861	192	1,496	1,163
24	Average number	35,078	4,954	303	1,910	1,139
25	Total wages	$18,934,513	$1,939,208	$112,698	$1,397,969	$587,724
	Men 16 years and over—					
26	Average number	34,993	4,944	297	1,910	1,139
27	Wages	$18,916,382	$1,937,827	$111,690	$1,397,969	$587,724
	Women 16 years and over—					
28	Average number	4				
29	Wages	$954				
	Children under 16 years—					
30	Average number	81	10	6		
31	Wages	$17,177	$1,381	$1,008		
	Average number of wage-earners, including pieceworkers, employed during each month:					
	Men 16 years and over—					
32	January	32,846	5,359	351	1,335	902
33	February	35,319	5,043	345	1,816	1,158
34	March	36,762	5,028	346	2,139	1,194
35	April	37,002	5,078	326	2,247	1,296
36	May	37,084	5,268	321	2,114	1,337
37	June	35,070	5,258	230	1,982	1,336
38	July	33,130	4,936	214	1,866	1,067
39	August	32,791	4,589	214	1,954	1,052
40	September	33,333	4,661	212	2,029	1,100
41	October	33,892	4,613	383	1,915	1,109
42	November	35,203	4,712	310	1,816	1,071
43	December	37,484	4,783	312	1,707	1,046
	Women 16 years and over—					
44	January	4				
45	February	4				
46	March	4				
47	April	4				
48	May	4				
49	June	4				
50	July	4				
51	August	4				
52	September	4				
53	October	4				
54	November	4				
55	December	4				
	Children under 16 years—					
56	January	75	8	7		
57	February	76	8	10		
58	March	90	10	12		
59	April	90	10	8		
60	May	91	14	8		
61	June	84	11			
62	July	84	10			
63	August	79	9			
64	September	73	11			
65	October	76	10	9		
66	November	76	9	10		
67	December	78	10	8		
68	Miscellaneous expenses, total	$9,788,139	$445,152	$37,536	$958,945	$203,657
69	Rent of works	$242,415				$7,530
70	Taxes	$742,221	$59,785	$6,214	$13,410	$49,045
71	Rent of offices, interest, insurance, and all other sundry expenses not hitherto included	$8,795,632	$385,367	$31,322	$945,535	$144,582
72	Contract work	$7,871				$2,500
73	Materials used, total cost	$178,941,918	$11,012,233	$720,836	$19,005,423	$3,104,136
	Iron ore—					
	Domestic—					
74	Tons	29,202,944	3,614,109	156,499	2,897,494	524,013
75	Cost	$96,206,246	$3,464,655	$256,459	$9,567,879	$1,414,942
	Foreign—					
76	Tons	829,918			18,487	
77	Cost	$4,739,123			$207,018	
	Mill cinder, scrap, etc.—					
78	Tons	1,865,385	5,662		174,737	100
79	Cost	$3,830,961	$15,682		$627,984	$1,000
	Fluxing materials—					
80	Tons	8,325,209	681,742	38,808	792,994	39,612
81	Cost	$6,888,647	$361,929	$24,503	$581,763	$37,213

[1] The figures for the various items in this table do not agree with the corresponding figures for 1905 in all other tables, because the figures for a blast furnace in Texas, operated by a penal institution, have been excluded. This institution reported $255,382 invested as capital; 5 salaried employees who were paid $7,020; 100 wage-earners who received $13,400; miscellaneous expenses, $3,000; materials costing $25,531; and 4,669 tons of charcoal pig iron, valued at $66,419, as products. The furnace has a daily capacity of 50 tons.

SUMMARY, BY STATES: 1905.[1]

New Jersey.	New York.	Ohio.	Pennsylvania.	Tennessee.	Virginia.	Wisconsin.	All other states.[2]	
5	9	33	65	13	10	4	13	1
$5,414,051	$14,644,730	$43,195,782	$107,741,803	$5,688,283	$3,157,268	$2,649,011	$14,654,214	2
$142,944	$1,411,647	$3,252,111	$6,575,146	$905,885	$455,000	$475,228	$642,209	3
$3,369,319	$4,243,122	$11,284,563	$30,663,936	$2,022,368	$1,102,883	$840,000	$2,919,974	4
$847,785	$2,418,989	$13,817,776	$20,638,673	$761,537	$726,279	$123,688	$7,241,114	5
$1,054,003	$6,570,972	$14,841,332	$40,864,048	$1,998,493	$873,105	$1,210,095	$3,850,917	6
.....	$544,180	$660,600	$1,572,300	$251,500	.....	.....	.....	7
.....	$139,300	$315,600	$188,800	$70,000	.....	.....	.....	8
.....	$375,000	$260,000	$1,395,000	$180,000	.....	.....	.....	9
.....	$29,880	$85,000	$78,500	$1,500	.....	.....	.....	10
1	.....	.....	24	.....	.....	.....	1	11
32	76	395	891	128	69	39	118	12
$43,715	$157,145	$568,258	$1,113,956	$127,831	$81,865	$62,859	$159,530	13
1	13	47	65	21	20	5	14	14
$2,274	$73,810	$146,565	$183,632	$46,956	$28,175	$19,500	$36,020	15
31	63	348	826	107	49	34	104	16
$41,441	$83,335	$421,693	$930,324	$80,875	$53,690	$43,359	$123,510	17
30	62	335	796	103	47	33	101	18
$41,321	$82,997	$414,251	$915,208	$79,775	$52,490	$42,699	$121,590	19
1	1	13	30	4	2	1	3	20
$120	$338	$7,442	$15,116	$1,100	$1,200	$660	$1,920	21
974	2,127	7,817	18,138	2,103	1,384	679	3,051	22
711	1,380	3,409	11,170	1,272	1,013	246	1,293	23
774	1,559	5,434	13,867	1,358	1,081	482	2,217	24
$370,751	$1,161,179	$3,471,083	$7,763,931	$545,861	$346,471	$257,024	$980,614	25
774	1,558	5,431	13,836	1,336	1,074	482	2,212	26
$370,751	$1,160,975	$3,470,333	$7,755,189	$541,914	$344,865	$257,024	$980,121	27
.....	1	3	.....	.....	.....	.....	.....	28
.....	$204	$750	.....	.....	.....	.....	.....	29
.....	.....	.....	31	22	7	.....	5	30
.....	.....	.....	$8,742	$3,947	$1,600	.....	$493	31
809	1,398	4,886	13,236	1,416	1,222	452	1,480	32
765	1,412	5,660	14,382	1,460	1,211	469	1,598	33
761	1,389	6,261	14,674	1,410	1,218	530	1,812	34
815	1,393	6,365	14,417	1,351	1,200	567	1,947	35
777	1,393	6,125	14,405	1,331	1,158	570	2,285	36
705	1,525	5,326	13,448	1,366	1,157	450	2,287	37
771	1,615	4,474	13,050	1,279	1,102	420	2,336	38
757	1,606	4,595	13,152	1,206	933	330	2,403	39
753	1,495	5,107	13,148	1,179	887	360	2,402	40
780	1,624	5,118	13,306	1,202	876	476	2,490	41
777	1,863	5,339	13,817	1,295	909	547	2,747	42
818	1,983	5,916	14,997	1,537	1,015	613	2,757	43
.....	1	3	.....	.....	.....	.....	.....	44
.....	1	3	.....	.....	.....	.....	.....	45
.....	1	3	.....	.....	.....	.....	.....	46
.....	1	3	.....	.....	.....	.....	.....	47
.....	1	3	.....	.....	.....	.....	.....	48
.....	1	3	.....	.....	.....	.....	.....	49
.....	1	3	.....	.....	.....	.....	.....	50
.....	1	3	.....	.....	.....	.....	.....	51
.....	1	3	.....	.....	.....	.....	.....	52
.....	1	3	.....	.....	.....	.....	.....	53
.....	1	3	.....	.....	.....	.....	.....	54
.....	1	3	.....	.....	.....	.....	.....	55
.....	.....	.....	28	24	6	.....	2	56
.....	.....	.....	28	23	6	.....	1	57
.....	.....	.....	28	28	6	.....	6	58
.....	.....	.....	28	26	8	.....	10	59
.....	.....	.....	30	24	9	.....	6	60
.....	.....	.....	33	28	7	.....	5	61
.....	.....	.....	36	22	7	.....	9	62
.....	.....	.....	36	17	8	.....	9	63
.....	.....	.....	34	17	7	.....	4	64
.....	.....	.....	31	18	6	.....	2	65
.....	.....	.....	29	18	7	.....	3	66
.....	.....	.....	31	19	7	.....	3	67
$191,355	$308,332	$1,812,570	$4,579,941	$205,303	$175,308	$160,576	$709,464	68
.....	$37,400	$41,640	$147,432	$8,413	.....	.....	.....	69
$12,314	$32,139	$174,775	$281,627	$22,786	$18,192	$25,683	$46,251	70
$179,041	$238,793	$1,596,155	$4,150,882	$169,031	$156,818	$134,893	$663,213	71
.....	.....	.....	.....	$5,073	$298	.....	.....	72
$2,940,780	$6,373,563	$32,476,727	$86,321,875	$2,609,157	$2,717,051	$2,250,807	$9,409,330	73
440,516	1,122,754	5,266,473	12,537,891	688,807	668,168	344,127	942,093	74
$1,147,332	$3,398,229	$18,881,573	$51,563,986	$862,635	$1,228,906	$936,605	$3,483,045	75
11,641	.....	.....	381,699	.....	465	.....	417,626	76
$48,109	.....	.....	$2,817,839	.....	$2,456	.....	$1,663,701	77
74,958	27,790	328,841	1,161,063	4,986	.....	9,409	77,839	78
$170,355	$58,306	$604,526	$2,169,422	$10,952	.....	$20,695	$152,039	79
174,679	306,479	1,464,057	3,842,184	182,423	329,444	67,605	405,182	80
$140,246	$266,472	$1,348,409	$3,356,725	$97,887	$186,594	$50,432	$436,474	81

[2] Includes establishments distributed as follows: Colorado, 1; Connecticut, 2; Kentucky, 1; Maryland, 2; Massachusetts, 1; Minnesota, 1; Missouri, 2; West Virginia, 3.

TABLE 63.—BLAST FURNACES—DETAILED

		United States.	Alabama.	Georgia.	Illinois.	Michigan.
	Materials used—Continued.					
	Fuel—					
	Anthracite coal and culm—					
82	Tons	560,637				1,955
83	Cost	$1,812,779				$4,964
	Bituminous coal, used raw, and slack—					
84	Tons	801,640	117,154		13,976	446
85	Cost	$1,340,997	$154,991		$25,560	$1,114
	Coke—					
86	Short tons	19,739,671	2,402,082	68,514	1,925,578	33,667
87	Cost	$57,126,997	$5,904,058	$194,320	$7,871,710	$84,058
	Charcoal—					
88	Bushels	37,273,569	3,299,007	3,746,757		19,809,118
89	Cost	$2,521,887	$217,540	$224,586		$1,362,330
90	Natural gas for steam raising, cost	$83,087			$440	
91	Rent of power and heat	$2,442		$2,575	$29,572	$30,784
92	Mill supplies	$1,476,067	$320,414	$18,393	$93,497	$19,950
93	All other materials	$2,218,049	$405,242			$147,781
94	Freight	$694,636	$167,722			
95	Products, aggregate value	$231,822,707	$16,645,793	$943,204	$27,330,836	$4,643,538
	Pig iron—					
96	Total tons	16,623,625	1,471,378	74,504	1,660,610	270,933
97	Total value	$228,911,116	$16,614,577	$904,950	$25,508,271	$4,630,183
	Coke and bituminous coal—					
98	Tons	14,716,115	1,441,337	43,578	1,615,522	27,041
99	Value	$198,479,409	$16,178,583	$450,242	$24,574,535	$324,492
	Mixed anthracite coal and coke—					
100	Tons	1,230,518				
101	Value	$16,831,627				
	Anthracite—					
102	Tons	30,373				
103	Value	$391,048				
	Charcoal—					
104	Tons	409,502	29,709	30,867		243,892
105	Value	$6,993,085	$432,674	$454,052		$4,305,691
	Castings produced direct from furnace—					
106	Tons	9,469	332	59	680	
107	Value	$131,700	$3,320	$656	$12,580	
	Spiegeleisen and ferromanganese—					
108	Tons	227,648			44,408	
109	Value	$6,084,247			[1]$921,156	
110	All other products, value	$2,572,650	$31,216	$35,397	$1,822,565	$13,355
111	Amount received for custom work and repairing	$338,941		$2,857		
	Pig iron (including spiegeleisen, ferromanganese, etc.) consumed in rolling mills, steel works, or foundries controlled by the producer:					
112	Tons	9,926,545	185,309		1,423,897	38
113	Value	$138,867,586	$1,896,724		$21,965,968	$592
	Pig iron, classified by grades:					
114	Total tons	16,623,625	1,471,378	74,504	1,660,610	270,933
115	Total value	$228,911,116	$16,614,577	$904,950	$25,508,271	$4,630,183
	Bessemer—					
116	Tons	8,894,584			1,424,030	3,520
117	Value	$123,766,565			$21,948,085	$83,712
	Low-phosphorus—					
118	Tons	192,795				
119	Value	$3,111,470				
	Malleable Bessemer—					
120	Tons	316,964			31,588	5,787
121	Value	$4,322,380			$422,232	$69,444
	Basic—					
122	Tons	2,553,940	300,784		52,658	
123	Value	$35,089,846	$4,089,234		$771,489	
	Foundry—					
124	Tons	3,675,310	1,026,969	57,077	105,835	261,626
125	Value	$47,001,758	$11,082,565	$739,445	$1,415,014	$4,477,027
	Forge—					
126	Tons	601,677	115,455	8,668	1,411	
127	Value	$7,348,339	$1,106,791	$78,328	$17,715	
	White and mottled and miscellaneous grades and direct castings—					
128	Tons	108,096	28,170	8,759	680	
129	Value	$1,343,811	$335,987	$87,177	$12,580	
	Spiegeleisen—					
130	Tons	169,630			44,408	
131	Value	$3,655,449			$921,156	
	Ferromanganese—					
132	Tons	[2]58,018				
133	Value	$2,428,798				
	Ferrosilicon—					
134	Tons	52,611				
135	Value	$842,700				
136	Pig iron, total tons	16,623,625	1,471,378	74,504	1,660,610	270,933
137	Sand cast, tons	6,078,844	1,222,337	74,445	216,312	270,933
138	Machine cast, tons	4,307,108	75,705		782,646	
139	Chill cast, tons	329,460	6,892			
140	Delivered molten to converters or furnaces, tons	5,898,744	166,112		660,972	
141	Direct castings, tons	9,469	332	59	680	
	Furnaces in active establishments:					
	Completed—					
142	Number	343	38	4	21	11
143	Daily capacity, tons	78,180	6,395	300	6,752	1,137
	Completed during the census year—					
144	Number	17				2
145	Daily capacity, tons	6,085				325
	Idle during entire year—					
146	Number	26	4			
147	Daily capacity, tons	4,296	700			
	In course of construction—					
148	Number	4				
149	Daily capacity, tons	1,375				
	Dismantled or abandoned during the year—					
150	Number	4				
151	Daily capacity, tons	1,035				

[1] The figures for the various items in this table do not agree with the corresponding figures for 1905 in all other tables, because the figures for a blast furnace in Texas, operated by a penal institution, have been excluded. This institution reported $255,382 invested as capital; 5 salaried employees who were paid $7,020; 100 wage-earners who received $13,400; miscellaneous expenses, $3,000; materials costing $25,531; and 4,669 tons of charcoal pig iron, valued at $66,419, as products. The furnace has a daily capacity of 50 tons.

SUMMARY, BY STATES: 1905[1]—Continued.

New Jersey.	New York.	Ohio.	Pennsylvania.	Tennessee.	Virginia.	Wisconsin.	All other states.	
45,909	13,535	.....	498,731	.....	.....	.....	507	82
$147,927	$57,620	.....	$1,599,655	.....	.....	.....	$2,613	83
491	21,984	197,241	300,043	27,289	14,621	9,007	99,388	84
$1,337	$45,959	$342,137	$466,806	$40,443	$34,930	$31,828	$195,892	85
314,588	700,407	3,432,965	8,713,116	533,341	467,706	177,690	970,017	86
$1,172,456	$2,263,641	$10,548,220	$22,728,319	$1,372,339	$1,176,650	$790,509	$3,020,717	87
.....	2,731,514	103,813	410,610	390,000	116,814	2,787,528	3,878,408	88
.....	$196,438	$6,184	$27,225	$19,500	$7,441	$199,836	$260,807	89
.....	.....	$47,665	$35,422	.....	.....	.....	.....	90
.....	.....	$2,002	.....	.....	.....	.....	.....	91
$25,800	$40,876	$230,413	$697,089	$21,263	$34,205	$7,568	$35,508	92
$32,868	$46,022	$256,561	$856,966	$70,813	$45,869	$213,334	$158,534	93
$54,350	.....	$209,037	$2,421	$113,325	.....	.....	.....	94
$3,601,511	$8,634,737	$40,862,451	$107,455,267	$3,428,049	$3,343,427	$3,074,712	$11,859,182	95
262,308	609,588	2,987,787	7,729,278	303,624	279,103	189,141	785,371	96
$3,600,144	$8,411,946	$40,705,777	$107,395,757	$3,426,932	$3,333,273	$2,761,107	$11,618,199	97
156,153	543,157	2,982,020	6,432,017	300,460	278,352	156,395	740,173	98
$2,046,510	$7,383,287	$40,620,186	$87,247,988	$3,338,898	$3,315,249	$2,334,239	$10,665,200	99
94,913	35,953	.....	1,097,915	.....	.....	.....	1,737	100
$1,306,310	$540,181	.....	$14,960,818	.....	.....	.....	$24,318	101
.....	.....	.....	30,373	.....	.....	.....	.....	102
.....	.....	.....	$391,048	.....	.....	.....	.....	103
.....	30,168	638	2,536	2,200	751	32,836	35,905	104
.....	$482,292	$16,060	$74,974	$52,800	$18,024	$426,868	$729,650	105
.....	310	5,129	2,941	18	.....	.....	.....	106
.....	$6,186	$69,531	$39,193	$234	.....	.....	.....	107
11,242	.....	.....	163,496	946	.....	.....	7,556	108
$247,324	.....	.....	$4,681,736	$35,000	.....	.....	$199,031	109
$1,367	$222,791	$22,282	$45,092	$1,117	$10,154	$313,605	$53,709	110
.....	.....	$134,392	$14,418	.....	.....	.....	$187,274	111
.....	248,950	1,751,730	5,573,898	120	1,022	81,625	659,956	112
.....	$3,410,112	$23,624,236	$77,087,537	$1,200	$21,184	$1,252,192	$9,607,841	113
262,308	609,588	2,987,787	7,729,278	303,624	279,103	189,141	785,371	114
$3,600,144	$8,411,946	$40,705,777	$107,395,757	$3,426,932	$3,333,273	$2,761,107	$11,618,199	115
.....	225,414	2,120,643	4,457,613	.....	.....	37,311	626,053	116
.....	$3,042,853	$28,806,353	$60,282,818	.....	.....	$578,320	$9,024,424	117
.....	26,851	.....	139,763	26,181	.....	.....	.....	118
.....	$423,348	.....	$2,299,771	$388,351	.....	.....	.....	119
984	34,848	127,330	12,497	.....	.....	35,187	68,743	120
$14,775	$471,568	$1,698,753	$168,864	.....	.....	$546,190	$930,554	121
112,635	4,669	206,458	1,827,121	.....	25,533	.....	24,082	122
$1,491,513	$57,896	$3,053,037	$24,991,886	.....	$297,483	.....	$337,308	123
102,339	275,104	441,227	796,740	247,368	219,322	115,198	26,505	124
$1,396,030	$3,748,643	$5,952,476	$10,623,103	$2,701,646	$2,645,262	$1,617,812	$602,735	125
32,831	34,403	66,729	313,301	24,957	3,922	.....	.....	126
$422,100	$528,790	$825,616	$4,067,734	$257,090	$44,175	.....	.....	127
2,277	8,299	8,906	15,062	4,172	30,326	1,445	.....	128
$28,402	$138,848	$135,744	$195,090	$44,845	$346,353	$18,785	.....	129
11,242	.....	.....	106,424	.....	.....	.....	7,556	130
$247,324	.....	.....	$2,287,938	.....	.....	.....	$199,031	131
.....	.....	.....	57,072	946	.....	.....	.....	132
.....	.....	.....	$2,393,798	$35,000	.....	.....	.....	133
.....	.....	16,494	3,685	.....	.....	.....	32,432	134
.....	.....	$233,798	$84,755	.....	.....	.....	$524,147	135
262,308	609,588	2,987,787	7,729,278	303,624	279,103	189,141	785,371	136
119,651	382,235	1,361,161	1,490,312	303,606	255,540	189,141	193,171	137
142,657	95,346	516,338	2,376,870	.....	.....	.....	317,546	138
.....	4,669	.....	279,654	.....	23,563	.....	14,682	139
.....	127,028	1,105,159	3,579,501	.....	.....	.....	259,972	140
.....	310	5,129	2,941	18	.....	.....	.....	141
8	15	53	131	19	13	5	25	142
1,287	3,420	15,887	34,200	1,902	1,395	860	4,645	143
.....	.....	7	7	.....	.....	.....	1	144
.....	.....	2,875	2,825	.....	.....	.....	60	145
.....	.....	.....	3	.....	.....	.....	1	146
.....	.....	.....	975	.....	.....	.....	400	147
.....	.....	1	11	4	2	.....	4	148
.....	.....	75	1,950	414	245	.....	912	149
.....	.....	4	.....	.....	.....	.....	.....	150
.....	.....	1,035	.....	.....	.....	.....	.....	151

[2] Includes 946 tons of ferrophosphorus.

TABLE 63.—BLAST FURNACES—DETAILED

		United States.	Alabama.	Georgia.	Illinois.	Michigan.
	Power:					
152	Number of establishments reporting	189	19	4	4	11
153	Total horsepower	825,749	101,635	3,285	50,378	8,360
	Owned—					
	Engines—					
	Steam—					
154	Number	1,555	163	13	62	48
155	Horsepower	762,382	100,253	2,920	45,243	6,706
	Gas and gasoline—					
156	Number	27	.....	2	.....	2
157	Horsepower	3,757	.....	40	.....	400
	Water wheels—					
158	Number	21	.....	1	.....	12
159	Horsepower	680	.....	20	.....	385
	Electric motors—					
160	Number	1,370	15	4	142	28
161	Horsepower	52,471	587	305	4,891	869
162	Other power, horsepower	6,320	700	.....	200	.....
	Rented—					
	Electric motors—					
163	Number	14	7	.....	7	.....
164	Horsepower	139	95	.....	44	.....
165	Furnished to other establishments, horsepower	160	.....	.....	.....	.....

[1] The figures for the various items in this table do not agree with the corresponding figures for 1905 in all other tables, because the figures for a blast furnace in Texas, operated by a penal institution, have been excluded. This institution reported $255,382 invested as capital; 5 salaried employees who were paid $7,020; 100

TABLE 64.—BLAST FURNACES—IDLE ESTABLISHMENTS—CAPITAL,

		United States.	Alabama.	Kentucky.	Maryland.	New Jersey.
1	Number of establishments	74	9	3	1	5
2	Capital, total	$21,829,548	$2,966,458	$512,000	$176,000	$1,468,500
3	Land	$3,328,133	$542,975	$25,000	$1,000	$550,500
4	Buildings	$10,072,070	$883,520	$375,000	$150,000	$423,000
5	Machinery, tools, and implements	$5,717,941	$1,168,958	$62,000	$25,000	$350,000
6	Cash and sundries	$2,711,404	$371,005	$50,000	.....	$145,000
7	Rented property, total	$1,007,000	$103,000	$145,000	.....	.....
8	Land	$166,000	$11,000	$20,000	.....	.....
9	Buildings	$671,000	$82,000	$100,000	.....	.....
10	Machinery, tools, and implements	$170,000	$10,000	$25,000	.....	.....
	Furnaces:					
11	Number	91	11	5	1	5
12	Daily capacity, tons	9,268	1,270	495	50	360
	Power:					
13	Number of establishments reporting	72	9	3	1	5
14	Total horsepower	89,625	11,830	4,594	50	2,643
	Owned—					
	Engines, steam—					
15	Number	250	38	7	1	15
16	Horsepower	89,465	11,830	4,594	50	2,565
	Water wheels—					
17	Number	2	.....	.....	.....	.....
18	Horsepower	82	.....	.....	.....	.....
	Electric motors—					
19	Number	2	.....	.....	.....	2
20	Horsepower	78	.....	.....	.....	78

TABLE 65.—STEEL WORKS AND ROLLING MILLS—

		United States.	Alabama.	California.	Connecticut.	Delaware.	Illinois.	Indiana.	Kentucky.
1	Number of establishments	[2] 415	10	4	7	5	23	21	8
2	Capital, total	$700,182,310	$9,718,511	$1,110,192	$8,888,583	$6,279,585	$44,275,595	$22,985,691	$4,716,080
3	Land	$59,852,769	$470,600	$238,190	$829,221	$1,176,000	$6,691,465	$1,746,411	$346,751
4	Buildings	$115,074,703	$1,073,497	$74,000	$1,977,906	$2,177,000	$5,759,389	$2,951,909	$483,587
5	Machinery, tools, and implements	$279,542,942	$6,022,293	$584,231	$3,567,617	$2,222,665	$17,135,537	$12,581,622	$2,654,664
6	Cash and sundries	$245,711,896	$2,152,121	$213,771	$2,513,839	$703,920	$14,689,204	$5,705,749	$1,231,078
7	Rented property, total	$8,948,336	$109,000	.....	.....	.....	$56,500	.....	.....
8	Land	$3,527,100	$18,500	.....	.....	.....	$51,000	.....	.....
9	Buildings	$3,391,747	$60,500	.....	.....	.....	$5,500	.....	.....
10	Machinery, tools, and implements	$2,029,489	$30,000	.....	.....	.....	.....	.....	.....
11	Proprietors and firm members	64	.....	.....	.....	.....	3	.....	.....
	Salaried officials, clerks, etc.:								
12	Total number	14,330	165	35	137	91	1,267	323	71
13	Total salaries	$17,860,495	$223,311	$53,073	$178,033	$102,952	$1,684,457	$369,962	$78,211
	Officers of corporations—								
14	Number	711	14	5	22	12	42	27	21
15	Salaries	$2,931,254	$53,102	$20,585	$82,808	$38,933	$234,565	$81,998	$32,395
	General superintendents, managers, clerks, etc.—								
16	Total number	13,619	151	30	115	79	1,225	296	50
17	Total salaries	$14,929,241	$170,209	$32,488	$95,225	$64,019	$1,449,892	$287,964	$45,816
	Men—								
18	Number	12,648	147	24	87	72	1,113	273	42
19	Salaries	$14,361,500	$167,809	$29,568	$83,071	$61,599	$1,379,071	$275,914	$43,172
	Women—								
20	Number	971	4	6	28	7	112	23	8
21	Salaries	$567,741	$2,400	$2,920	$12,154	$2,420	$70,821	$12,050	$2,644
	Wage-earners, including pieceworkers, and total wages:								
22	Greatest number employed at any one time during the year.	256,135	5,099	913	3,361	1,702	21,611	9,298	2,917
23	Least number employed at any one time during the year.	157,316	3,104	675	2,412	1,248	11,941	5,711	1,357
24	Average number	207,562	3,636	773	2,989	1,055	16,448	7,215	2,149
25	Total wages	$122,491,993	$1,508,681	$492,390	$1,586,715	$412,003	$10,070,988	$4,671,593	$1,272,114
	Men 16 years and over—								
26	Average number	204,290	3,455	759	2,910	1,028	16,196	7,156	2,107
27	Wages	$121,615,828	$1,476,337	$487,590	$1,563,707	$407,903	$9,998,908	$4,658,790	$1,265,414

[1] Includes establishments distributed as follows: Colorado, 1; Georgia, 1; Kansas, 1; Maine, 1; Oregon, 1; Rhode Island, 4; Tennessee, 2; Washington, 1.

SUMMARY, BY STATES: 1905[1]—Continued.

New Jersey.	New York.	Ohio.	Pennsylvania.	Tennessee.	Virginia.	Wisconsin.	All other states.	
5	9	33	64	13	10	4	13	152
10,755	43,614	180,671	330,062	21,083	12,465	6,151	57,290	153
26	63	280	582	111	43	36	128	154
10,645	35,880	167,665	298,567	21,009	12,465	5,875	55,154	155
.....	16	1	2	2	.....	.....	2	156
.....	3,200	25	72	2	.....	.....	18	157
.....	.....	.....	4	.....	.....	.....	4	158
.....	.....	.....	145	.....	.....	.....	130	159
6	89	328	661	3	.....	23	71	160
110	4,534	12,931	25,908	72	.....	276	1,988	161
.....	.....	50	5,370	.....	.....	.....	.....	162
.....	.....	.....	.....	.....	.....	.....	.....	163
.....	.....	.....	.....	.....	.....	.....	.....	164
.....	.....	.....	.....	60	.....	.....	100	165

wage-earners who received $13,400; miscellaneous expenses, $3,000; materials costing $25,531; and 4,669 tons of charcoal pig iron, valued at $66,419, as products. The furnace has a daily capacity of 50 tons.

EQUIPMENT AND CAPACITY, AND POWER, BY STATES: 1905.

New York.	North Carolina.	Ohio.	Oregon.	Pennsylvania.	Tennessee.	Texas.	Virginia.	Washington.	Wisconsin.	
4	2	11	1	17	3	3	13	1	1	1
$1,821,493	$186,571	$708,193	$686,403	$8,998,905	$758,000	$726,200	$2,630,825	$40,000	$150,000	2
$280,000	$17,269	$191,500	$148,449	$1,033,240	$213,000	$95,500	$215,700	$10,000	$4,000	3
$1,170,148	$140,235	$239,000	$363,930	$4,381,014	$375,000	$231,000	$1,290,223	$10,000	$40,000	4
$225,000	$29,067	$276,657	$174,024	$2,285,633	$170,000	$217,700	$707,902	$20,000	$6,000	5
$146,345	.....	$1,036	.....	$1,299,018	.....	$182,000	$417,000	.....	$100,000	6
$90,000	.....	$419,000	.....	$250,000	.....	.....	.....	.....	.....	7
$25,000	.....	$104,000	.....	$6,000	.....	.....	.....	.....	.....	8
$60,000	.....	$229,000	.....	$200,000	.....	.....	.....	.....	.....	9
$5,000	.....	$86,000	.....	$44,000	.....	.....	.....	.....	.....	10
7	2	12	1	26	3	3	13	1	1	11
520	62	847	50	3,645	450	160	1,224	35	100	12
4	2	11	1	16	2	3	13	1	1	13
8,650	474	11,735	760	32,269	2,940	1,600	11,230	150	700	14
23	2	27	5	77	8	8	35	2	2	15
8,650	467	11,735	760	32,269	2,940	1,600	11,155	150	700	16
.....	1	.....	.....	.....	.....	.....	1	.....	.....	17
.....	7	.....	.....	.....	.....	.....	75	.....	.....	18
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	19
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	20

DETAILED SUMMARY, BY STATES: 1905.

Maryland.	Massachusetts.	Michigan.	Missouri.	New Jersey.	New York.	Ohio.	Pennsylvania.	Virginia.	West Virginia.	Wisconsin.	All other states.[1]	
7	5	5	4	16	20	57	186	3	12	10	12	1
$4,111,185	$14,348,448	$1,697,571	$3,672,268	$46,280,626	$48,852,365	$87,406,064	$355,592,456	$2,112,686	$8,716,170	$3,489,544	$25,928,690	2
$35,400	$597,885	$159,100	$236,445	$4,525,683	$2,786,183	$7,305,011	$29,685,311	$910,634	$708,000	$551,528	$792,951	3
$676,081	$1,359,162	$205,000	$447,233	$5,135,750	$12,824,687	$13,895,429	$58,327,930	$194,247	$1,033,342	$456,521	$5,122,033	4
$1,776,938	$6,829,951	$581,409	$2,070,769	$13,717,359	$22,990,395	$42,696,146	$123,912,761	$288,582	$3,077,142	$1,237,194	$15,595,667	5
$1,622,766	$5,561,450	$752,062	$917,821	$22,901,834	$10,251,100	$23,509,478	$143,666,454	$719,223	$2,937,686	$1,244,301	$4,418,039	6
$595,000	.....	.....	.....	$100,000	$500	.....	$7,641,386	$10,000	.....	$98,950	$337,000	7
$198,000	.....	.....	.....	$75,000	$500	.....	$2,991,950	$10,000	.....	$56,150	$126,000	8
$397,000	.....	.....	.....	$25,000	.....	.....	$2,805,947	.....	.....	$42,800	$55,000	9
.....	.....	.....	.....	.....	.....	.....	$1,843,489	.....	.....	.....	$156,000	10
4	.....	.....	.....	1	7	.....	49	.....	.....	.....	.....	11
117	395	38	61	566	609	1,744	8,129	37	107	133	305	12
$138,727	$364,585	$46,104	$88,798	$804,772	$801,337	$1,931,037	$10,057,776	$66,806	$142,342	$155,870	$572,342	13
8	8	3	7	35	42	57	339	8	17	9	35	14
$22,290	$15,550	$6,400	$27,420	$136,194	$228,482	$175,903	$1,520,295	$21,240	$35,913	$28,181	$169,000	15
109	387	35	54	531	567	1,687	7,790	29	90	124	270	16
$116,437	$349,035	$39,704	$61,378	$668,578	$572,855	$1,755,134	$8,537,481	$45,566	$106,429	$127,689	$403,342	17
108	373	30	51	480	520	1,587	7,269	29	83	120	240	18
$115,537	$343,172	$36,887	$59,278	$632,019	$545,361	$1,706,925	$8,226,636	$45,566	$103,462	$125,843	$380,610	19
1	14	5	3	51	47	100	521	.....	7	4	30	20
$900	$5,863	$2,817	$2,100	$36,559	$27,494	$48,209	$310,845	.....	$2,967	$1,846	$22,732	21
1,880	5,261	1,664	1,919	10,019	9,234	34,882	132,930	1,233	5,496	2,314	4,402	22
984	3,714	464	907	7,352	5,472	19,418	85,814	732	2,723	1,830	1,458	23
1,534	4,544	1,018	1,349	8,334	7,526	27,756	110,904	1,022	4,409	1,915	2,986	24
$811,128	$2,593,235	$526,565	$928,303	$4,087,977	$4,393,222	$18,657,542	$65,306,427	$381,715	$2,813,319	$1,124,529	$1,453,547	25
1,444	4,411	1,018	1,345	7,947	7,448	27,480	109,391	1,019	4,325	1,913	2,938	26
$793,528	$2,536,075	$526,565	$927,403	$3,967,243	$4,370,821	$18,577,904	$64,927,930	$381,168	$2,780,487	$1,123,999	$1,444,056	27

[1] Includes 6 forges and bloomeries distributed as follows: Maryland, 1; Pennsylvania, 5.

TABLE 65.—STEEL WORKS AND ROLLING MILLS—

		United States.	Alabama.	California.	Connecticut.	Delaware.	Illinois.	Indiana.	Kentucky.
	Wage-earners, including pieceworkers, and total wages—Continued.								
	Women 16 years and over—								
28	Average number	1,451	.....	4	70	.....	239	56	7
29	Wages	$441,013	.....	$2,000	$20,800	.....	$69,346	$12,203	$1,800
	Children under 16 years—								
30	Average number	1,821	181	10	9	27	13	3	35
31	Wages	$435,152	$32,344	$2,800	$2,208	$4,100	$2,734	$600	$4,900
	Average number of wage-earners, including pieceworkers, employed during each month:								
	Men 16 years and over—								
32	January	187,948	2,846	733	2,594	1,381	12,352	7,905	2,629
33	February	201,809	3,622	761	2,540	1,389	16,146	7,685	2,512
34	March	211,829	3,314	783	2,822	1,475	18,101	8,419	2,131
35	April	216,337	3,518	762	2,855	1,540	18,125	8,339	2,285
36	May	216,923	3,324	749	2,814	1,535	17,736	8,356	2,361
37	June	208,966	3,157	787	2,989	1,379	17,039	7,329	2,313
38	July	187,476	3,035	787	3,180	1,246	15,965	5,776	1,098
39	August	193,050	3,177	751	2,890	775	15,366	6,142	1,503
40	September	197,246	3,196	798	3,100	403	15,196	6,310	1,985
41	October	205,441	3,734	764	2,927	401	16,281	6,260	2,296
42	November	208,931	4,235	721	3,119	397	16,069	6,194	2,044
43	December	215,524	4,302	712	3,090	415	15,976	7,157	2,127
	Women 16 years and over—								
44	January	1,530	.....	4	69	.....	223	66	49
45	February	1,532	.....	4	68	.....	233	72	35
46	March	1,432	.....	4	52	.....	240	66	.....
47	April	1,433	.....	5	54	.....	243	65	.....
48	May	1,426	.....	4	50	.....	233	61	.....
49	June	1,460	.....	4	85	.....	233	52	.....
50	July	1,373	.....	4	84	.....	226	48	.....
51	August	1,368	.....	4	80	.....	233	49	.....
52	September	1,398	.....	4	80	.....	237	48	.....
53	October	1,398	.....	4	76	.....	249	49	.....
54	November	1,472	.....	4	74	.....	248	49	.....
55	December	1,590	.....	3	68	.....	270	47	.....
	Children under 16 years—								
56	January	1,741	182	7	9	53	12	3	41
57	February	1,795	200	8	8	55	13	3	31
58	March	1,793	187	8	7	50	16	3	6
59	April	1,875	190	9	7	55	17	3	16
60	May	1,830	167	9	7	56	17	3	25
61	June	1,878	172	8	11	30	9	3	62
62	July	1,677	170	14	11	25	8	3	62
63	August	1,752	176	10	10	.....	14	3	20
64	September	1,781	170	13	10	.....	11	3	15
65	October	1,877	173	15	10	.....	13	3	62
66	November	1,896	185	12	9	.....	14	3	50
67	December	1,907	200	7	9	.....	12	3	30
68	Miscellaneous expenses, total	$37,373,831	$344,837	$84,933	$470,393	$144,785	$3,382,006	$606,398	$244,871
69	Rent of works	$519,722	$4,058	.....	.....	$420	$8,205	.....	.....
70	Taxes	$2,096,368	$22,105	$5,902	$16,685	$10,594	$212,670	$44,780	$17,793
71	Rent of offices, interest, insurance, and all other sundry expenses not hitherto included.	$34,642,178	$318,674	$67,031	$453,708	$133,771	$3,156,831	$541,789	$227,078
72	Contract work	$115,563	.....	$12,000	.....	.....	$4,300	$19,829	.....
73	Materials used, total cost	$441,204,432	$5,035,190	$778,970	$2,626,931	$939,506	$38,649,762	$10,905,822	$4,216,751
	Iron ore—								
	Domestic—								
74	Tons	546,262	7,273	.....	651	844	7,311	12,792	1,803
75	Cost	$2,372,739	$34,046	.....	$3,785	$3,801	$38,051	$45,770	$8,261
	Foreign—								
76	Tons	3,733	.....	.....	.....	.....	.....	.....	.....
77	Cost	$24,053	.....	.....	.....	.....	.....	.....	.....
	Pig iron, spiegeleisen, ferromanganese, and all other pig iron—								
78	Tons	12,191,228	236,469	610	32,017	3,962	1,446,299	74,208	103,004
79	Cost	$172,101,436	$2,582,662	$15,263	$515,208	$56,809	$19,282,069	$1,106,183	$1,393,951
	Old iron or steel rails, and other scrap iron and steel, not including that consumed in Bessemer converters or open-hearth furnaces—								
80	Tons	1,616,068	13,126	27,866	23,061	21,933	164,927	226,548	33,788
81	Cost	$21,977,102	$165,338	$397,693	$274,732	$249,289	$2,249,757	$2,776,496	$428,926
	Scrap iron and scrap steel (cast or wrought)—								
	Used in standard or modified Bessemer converters—								
82	Tons	534,916	.....	.....	.....	.....	99,418	.....	.....
83	Cost	$6,290,542	.....	.....	.....	.....	$1,081,684	.....	.....
	Used in acid open-hearth steel furnaces—								
84	Tons	562,963	.....	564	655	.....	18,041	2,941	.....
85	Cost	$8,617,039	.....	$4,235	$23,820	.....	$340,586	$34,218	.....
	Used in basic open-hearth steel furnaces—								
86	Tons	2,410,330	7,274	.....	25,368	.....	217,147	43,346	.....
87	Cost	$30,716,565	$93,651	.....	$298,099	.....	$2,530,365	$458,802	.....
	Purchased hammered iron-ore blooms, pig or scrap blooms, and imported Swedish billets and bars—								
88	Tons	81,969	29	.....	.....	25	.....	48,291	3,000
89	Cost	$1,781,126	$581	.....	.....	$750	.....	$854,786	$60,000
	Purchased muck or scrap bar—								
90	Tons	205,951	.....	.....	500	.....	443	6,347	.....
91	Cost	$5,066,732	.....	.....	$17,500	.....	$10,137	$138,922	.....
	Purchased iron or steel skelp—								
92	Tons	259,643	.....	.....	.....	.....	.....	.....	.....
93	Cost	$7,331,935	.....	.....	.....	.....	.....	.....	.....
	Purchased iron or steel ingots, blooms, billets, tin-plate bars, sheet bars, or slabs, except imported Swedish billets and bars—								
94	Tons	4,632,257	51,150	10,000	29,734	12,641	220,129	132,229	28,123
95	Cost	$103,420,970	$1,027,711	$257,513	$732,367	$306,578	$5,332,908	$3,180,469	$988,113
	Purchased wire rods—								
96	Tons	161,914	.....	.....	.....	.....	6,312	357	14,834
97	Cost	$4,774,383	.....	.....	.....	.....	$195,672	$11,067	$396,892
	All other iron or steel—								
98	Tons	105,662	.....	.....	.....	.....	23,878	5,146	.....
99	Cost	$4,377,163	.....	.....	.....	.....	$933,909	$159,364	.....

DETAILED SUMMARY, BY STATES: 1905—Continued.

Maryland.	Massachusetts.	Michigan.	Missouri.	New Jersey.	New York.	Ohio.	Pennsylvania.	Virginia.	West Virginia.	Wisconsin.	All other states.	
15	114	.....	.....	387	78	204	277	.....	.....	.....	.....	28
$3,965	$51,858	.....	.....	$120,734	$22,401	$59,357	$76,549	.....	.....	.....	.....	29
75	19	.....	4	.....	.....	72	1,236	3	84	2	48	30
$13,635	$5,302	.....	$900	.....	.....	$26,281	$301,948	$547	$32,832	$530	$9,491	31
1,581	4,672	871	1,100	8,104	7,628	24,533	101,194	839	2,995	1,971	2,020	32
1,543	4,723	896	1,273	7,916	7,530	27,027	107,507	932	3,458	2,002	2,347	33
1,481	4,765	884	1,361	7,941	8,019	29,177	111,652	992	3,797	2,101	2,614	34
1,480	4,592	913	1,310	8,078	7,877	29,903	114,198	944	4,361	2,141	3,116	35
1,542	4,515	1,403	1,380	8,274	7,581	29,870	114,587	1,126	4,586	2,034	3,150	36
1,551	4,165	1,331	1,371	8,131	7,672	27,691	111,158	1,058	4,672	2,017	3,156	37
1,292	3,653	1,137	1,122	7,817	6,395	23,370	101,641	940	4,275	1,744	3,003	38
1,245	3,827	1,242	1,090	7,773	6,426	25,226	105,679	977	4,409	1,695	2,857	39
1,421	4,066	968	1,403	7,718	6,747	26,743	107,240	1,077	4,581	1,631	2,663	40
1,425	4,290	1,005	1,622	7,653	7,659	27,570	110,615	1,146	4,717	1,658	3,418	41
1,279	4,647	862	1,566	7,869	7,804	28,260	112,569	1,138	5,030	1,751	3,377	42
1,488	5,017	704	1,542	8,090	8,038	30,390	114,652	1,059	5,019	2,211	3,535	43
13	106	.....	.....	376	74	226	324	.....	.....	.....	.....	44
11	114	.....	.....	409	75	211	300	.....	.....	.....	.....	45
11	119	.....	.....	391	75	211	263	.....	.....	.....	.....	46
19	120	.....	.....	376	75	214	262	.....	.....	.....	.....	47
21	119	.....	.....	370	75	217	276	.....	.....	.....	.....	48
20	117	.....	.....	388	75	220	266	.....	.....	.....	.....	49
18	119	.....	.....	395	75	183	221	.....	.....	.....	.....	50
15	104	.....	.....	401	72	183	227	.....	.....	.....	.....	51
15	104	.....	.....	385	72	177	276	.....	.....	.....	.....	52
12	104	.....	.....	382	73	174	275	.....	.....	.....	.....	53
14	109	.....	.....	380	88	217	289	.....	.....	.....	.....	54
11	133	.....	.....	391	107	215	345	.....	.....	.....	.....	55
69	13	.....	2	.....	.....	103	1,156	3	52	1	35	56
67	16	.....	3	.....	.....	96	1,183	3	62	1	46	57
53	14	.....	4	.....	.....	96	1,223	3	70	1	52	58
72	17	.....	2	.....	.....	87	1,254	3	87	1	55	59
83	18	.....	5	.....	.....	83	1,259	3	92	1	52	60
97	19	.....	5	.....	.....	77	1,228	3	103	2	49	61
96	19	.....	4	.....	.....	39	1,086	3	93	3	41	62
92	21	.....	4	.....	.....	39	1,217	3	101	3	39	63
78	23	.....	5	.....	.....	49	1,275	3	86	3	37	64
70	24	.....	5	.....	.....	66	1,291	3	81	3	58	65
62	24	.....	4	.....	.....	57	1,321	3	92	3	57	66
61	20	.....	5	.....	.....	72	1,339	3	89	2	55	67
$284,926	$717,910	$163,103	$172,013	$1,448,560	$1,137,066	$4,113,201	$21,924,663	$110,426	$492,683	$277,330	$1,253,727	68
$44,304	$10,710	$6,150	.....	$7,457	$12,973	$180	$401,985	$3,060	.....	$5,020	$15,200	69
$10,335	$83,419	$14,220	$17,952	$64,686	$88,138	$361,858	$896,279	$11,787	$24,486	$32,183	$160,496	70
$230,287	$623,781	$82,511	$154,061	$1,376,417	$1,035,955	$3,744,181	$20,614,169	$95,579	$468,197	$240,127	$1,078,031	71
.....	.....	$60,222	.....	.....	.....	$6,982	$12,230	.....	.....	.....	.....	72
$6,582,085	$6,901,763	$1,800,179	$1,588,494	$12,389,675	$13,260,039	$78,209,770	$237,875,025	$821,788	$8,742,471	$4,501,159	$5,379,052	73
1,275	3,670	.....	.....	5,150	33,358	48,239	419,503	652	1,855	150	1,736	74
$7,331	$6,132	.....	.....	$24,404	$110,282	$211,533	$1,860,761	$3,547	$8,346	$1,038	$5,651	75
.....	.....	.....	.....	7	.....	41	3,685	.....	.....	.....	.....	76
.....	.....	.....	.....	$112	.....	$743	$23,198	.....	.....	.....	.....	77
343,424	37,807	3,450	7,500	42,497	506,902	2,393,614	6,559,417	8,276	239,862	3,627	148,283	78
$5,045,144	$635,486	$72,420	$112,334	$751,980	$6,800,549	$33,040,901	$94,997,864	$116,130	$3,335,635	$83,518	$2,157,240	79
32,000	13,748	23,000	67,685	23,651	76,216	224,040	474,298	28,104	3,033	78,765	60,279	80
$456,042	$186,879	$454,074	$845,286	$376,564	$1,114,062	$2,950,764	$6,524,973	$529,411	$42,674	$1,144,288	$809,854	81
8,192	.....	.....	.....	3,529	32,554	136,205	227,859	.....	18,843	.....	8,316	82
$109,610	.....	.....	.....	$35,789	$431,237	$1,667,667	$2,709,622	.....	$155,143	.....	$99,790	83
.....	15,656	.....	.....	12,888	.....	40,833	463,960	.....	.....	4,123	3,302	84
.....	$245,213	.....	.....	$221,770	.....	$536,630	$7,094,833	.....	.....	$59,600	$56,134	85
7,335	41,894	.....	500	25,137	48,215	234,889	1,705,702	.....	.....	.....	53,523	86
$88,008	$476,118	.....	$7,816	$290,523	$636,135	$2,912,834	$22,244,963	.....	.....	.....	$679,251	87
.....	132	.....	.....	3,210	379	.....	23,242	.....	.....	3,652	9	88
.....	$5,476	.....	.....	$65,100	$31,615	.....	$674,443	.....	.....	$87,655	$720	89
.....	.....	.....	.....	9,195	2,922	15,000	171,471	.....	61	.....	12	90
.....	.....	.....	.....	$179,318	$111,874	$300,090	$4,307,001	.....	$1,530	.....	$360	91
.....	.....	173	.....	.....	.....	10,192	249,278	.....	.....	.....	.....	92
.....	.....	$10,904	.....	.....	.....	$315,343	$7,005,688	.....	.....	.....	.....	93
10,042	42,249	37,416	12,735	82,171	21,510	1,044,744	2,540,033	2,933	207,986	132,968	13,464	94
$251,050	$1,025,792	$1,095,973	$324,750	$2,478,191	$533,506	$23,307,225	$55,371,727	$74,017	$4,114,141	$2,687,757	$331,182	95
.....	871	.....	.....	19,764	.....	92,246	27,530	.....	.....	.....	.....	96
.....	$35,346	.....	.....	$771,983	.....	$2,563,171	$800,252	.....	.....	.....	.....	97
.....	.....	.....	.....	.....	.....	31,509	45,329	.....	.....	.....	.....	98
.....	.....	.....	.....	.....	.....	$1,395,142	$1,888,748	.....	.....	.....	.....	99

TABLE 65.—STEEL WORKS AND ROLLING MILLS—

		United States.	Alabama.	California.	Connecticut.	Delaware.	Illinois.	Indiana.	Kentucky.
	Material used—Continued.								
	Fuel—								
	Anthracite coal and culm—								
100	Tons	231,125	.....	.....	25,938	1,444	1,002	.....	.....
101	Cost	$792,262	.....	.....	$102,125	$5,262	$4,068	.....	.....
	Bituminous coal and slack—								
102	Tons	7,055,093	167,747	119	38,978	30,304	1,101,073	347,352	186,633
103	Cost	$14,367,934	$254,697	$428	$131,020	$93,468	$2,036,615	$810,017	$287,185
	Coke—								
104	Short tons	638,776	539	660	218	1,646	73,401	130	13,634
105	Cost	$2,009,392	$1,365	$6,600	$1,308	$6,107	$303,092	$515	$41,756
	Charcoal—								
106	Bushels	3,133,533	.....	.....	2,786	8,930	.....	.....	140,000
107	Cost	$299,138	.....	.....	$408	$926	.....	.....	$10,500
108	Natural gas used for fuel, cost	$4,382,667	.....	.....	.....	.....	.....	$123,567	$24,377
	Oil used for fuel—								
109	Barrels	633,813	.....	84,582	4,400	1,000	167,888	780	.....
110	Cost	$908,154	.....	$46,956	$7,637	$1,536	$286,926	$1,555	.....
111	Fuel used for power, cost	$12,433,414	$250,001	$7,319	$159,413	$27,628	$682,981	$401,009	$19,539
112	Rent of power and heat	$193,705	.....	$3,160	.....	.....	$4,768	.....	.....
113	Mill supplies	$6,182,266	$375,535	$7,057	$51,178	$10,166	$353,943	$168,347	$35,085
114	All other materials	$30,257,520	$216,951	$22,806	$278,921	$171,294	$2,988,585	$532,606	$491,150
115	Freight	$526,195	$32,652	$10,000	$29,410	$5,802	$3,646	$102,129	$31,016
116	Products, aggregate value	$673,965,026	$8,041,566	$1,489,012	$5,150,675	$1,597,309	$60,021,925	$16,920,326	$6,167,542
	Rolled, forged, and other classified products—								
117	Total tons	18,216,639	265,202	31,045	93,181	31,851	1,657,885	446,458	169,466
118	Total value	$584,299,439	$7,840,061	$1,115,101	$4,085,473	$1,408,456	$52,809,666	$15,430,164	$5,901,428
	Iron and steel scrap sold—								
119	Tons	877,177	3,000	.....	.....	2,193	64,910	14,539	2,270
120	Value	$11,079,831	$30,000	.....	.....	$25,623	$782,196	$157,181	$23,982
121	Amount received for custom work and repairing on rolled, forged, and other classified products.	$58,137,817	$150,000	$142,711	$747,279	$83,841	$5,117,240	$1,295,082	$235,307
122	Miscellaneous products, not rolled, including amount received for custom work and repairing.	$20,447,939	$21,505	$231,200	$317,923	$79,389	$1,312,823	$37,899	$6,825
	Equipment and capacity of active establishments:								
	Rolling mills—								
123	Total daily capacity, double turn, of rolled iron and steel, tons.	105,591	1,810	167	1,005	260	10,117	2,302	1,150
	Bessemer or modified Bessemer steel converters—								
124	Number	81	1	.....	.....	3	6	.....	2
125	Total daily capacity of ingots or castings, double turn, tons.	41,448	500	.....	.....	30	5,600	.....	500
	Open-hearth steel furnaces—								
126	Total number	481	18	1	6	5	37	9	.....
127	Total daily capacity of ingots or castings, double turn, tons.	34,243	1,390	20	370	460	2,121	484	.....
	Acid furnaces—								
128	Number	142	.....	1	3	1	5	5	.....
129	Daily capacity, double turn, tons	7,341	.....	20	140	100	237	84	.....
	Basic furnaces—								
130	Number	339	18	.....	3	4	32	4	.....
131	Daily capacity, double turn, tons	26,902	1,390	.....	230	360	1,884	400	.....
	Crucible steel furnaces—								
132	Crucible steel melting furnaces, number	146	.....	.....	1	.....	.....	.....	.....
133	Crucible steel pots that can be used at a heat, number.	2,457	.....	.....	24	.....	.....	.....	.....
134	Total daily capacity of ingots or castings, double turn, tons.	693	.....	.....	7	.....	.....	.....	.....
	Blister, German, and miscellaneous steel furnaces—								
135	Cementing, converting, or other furnaces, number	36	.....	.....	.....	.....	8	1	.....
136	Total daily capacity of blister, German, and miscellaneous steel, double turn, tons.	98	.....	.....	.....	.....	12	7	.....
	Power:								
137	Number of establishments reporting	413	10	4	7	5	23	21	8
138	Total horsepower	1,896,759	61,282	2,633	18,353	10,820	134,907	49,176	27,373
	Owned—								
	Engines—								
	Steam—								
139	Number	5,746	129	15	59	54	272	197	94
140	Horsepower	1,610,612	56,757	2,438	17,795	10,310	110,105	48,104	26,965
	Gas and gasoline—								
141	Number	53	.....	.....	.....	.....	.....	4	.....
142	Horsepower	11,806	.....	.....	.....	.....	.....	400	.....
	Water wheels—								
143	Number	54	.....	.....	.....	.....	.....	.....	.....
144	Horsepower	4,732	.....	.....	.....	.....	.....	.....	.....
	Water motors—								
145	Number	5	.....	.....	.....	.....	.....	.....	.....
146	Horsepower	63	.....	.....	.....	.....	.....	.....	.....
	Electric motors—								
147	Number	12,183	116	1	33	24	1,274	46	17
148	Horsepower	247,460	4,525	15	558	510	23,599	672	408
149	Other power, horsepower	7,868	.....	.....	.....	.....	700	.....	.....
	Rented—								
	Electric motors—								
150	Number	501	.....	12	.....	.....	123	.....	.....
151	Horsepower	6,798	.....	180	.....	.....	503	.....	.....
152	Other kind, horsepower	7,420	.....	.....	.....	.....	.....	.....	.....
153	Furnished to other establishments, horsepower	2,744	.....	.....	.....	.....	.....	.....	.....

DETAILED SUMMARY, BY STATES: 1905—Continued.

Maryland.	Massachusetts.	Michigan.	Missouri.	New Jersey.	New York.	Ohio.	Pennsylvania.	Virginia.	West Virginia.	Wisconsin.	All other states.	
.....	2,224	20	.....	9,597	44,135	216	146,524	.....	.....	25	.....	100
.....	$12,658	$100	.....	$39,301	$190,653	$844	$437,051	.....	.....	$200	.....	101
29,158	89,593	41,083	55,743	221,632	124,005	861,383	3,499,237	19,846	94,032	28,417	118,758	102
$64,113	$437,285	$108,028	$161,817	$674,565	$367,494	$1,561,708	$6,850,784	$50,522	$125,146	$87,850	$265,192	103
15,905	1,716	.....	.....	6,068	38,490	172,660	262,748	2,066	32,967	1,867	14,061	104
$56,463	$8,767	.....	.....	$28,770	$123,588	$531,313	$659,624	$5,170	$91,081	$7,188	$46,685	105
114,649	70,068	.....	.....	802	13,246	10,540	2,770,662	.....	.....	1,850	.....	106
$9,940	$7,875	.....	.....	$101	$1,844	$1,015	$266,159	.....	.....	$370	.....	107
.....	.....	.....	.....	.....	.....	$652,439	$3,381,641	.....	$200,643	.....	.....	108
1,038	10,848	.....	7,048	60,620	71,780	44,398	111,279	.....	.....	29,872	38,280	109
$1,707	$22,926	.....	$6,343	$53,479	$114,662	$67,924	$177,759	.....	.....	$58,386	$60,358	110
$243,140	$424,492	$27,256	$29,292	$235,400	$766,453	$2,166,350	$6,385,687	$3,680	$175,127	$184,232	$345,015	111
$2,250	.....	.....	.....	$1,800	$12,847	$9,298	$149,693	$8,012	.....	$1,937	.....	112
$28,984	$109,216	$20,401	$28,227	$275,508	$140,555	$957,422	$3,284,134	$8,611	$129,621	$29,298	$168,978	113
$216,803	$3,262,102	$10,023	$72,629	$5,877,378	$1,686,073	$3,059,414	$10,573,531	$23,288	$363,318	$65,342	$345,306	114
$1,500	.....	$1,000	.....	$7,639	$86,610	.....	$204,889	.....	$66	$2,500	$7,336	115
$8,106,929	$11,947,731	$2,712,114	$2,999,438	$20,065,972	$21,227,399	$111,996,673	$363,773,577	$1,515,959	$13,454,802	$7,379,038	$9,397,039	116
315,566	143,833	55,154	70,254	161,431	569,323	3,533,426	9,825,753	33,588	384,932	108,484	229,807	117
$7,862,789	$5,416,746	$2,327,260	$2,839,487	$9,576,226	$18,216,002	$101,233,039	$320,466,565	$1,248,192	$11,243,473	$7,072,205	$8,207,106	118
17,388	4,911	1,084	.....	5,149	9,415	171,175	542,257	.....	36,248	2,092	546	119
$244,140	$46,215	$13,322	.....	$74,901	$130,505	$2,031,598	$7,040,285	.....	$445,720	$27,196	$6,967	120
.....	$5,562,731	$369,091	$150,179	$4,329,975	$2,259,821	$8,385,564	$26,246,654	$229,271	$1,762,609	$37,201	$1,033,261	121
.....	$922,039	$2,441	$9,772	$6,084,870	$621,071	$346,472	$10,020,073	$38,496	$3,000	$242,436	$149,705	122
2,140	1,002	465	345	1,028	3,981	19,901	52,466	399	2,221	1,358	3,474	123
3	1	2	.....	6	6	12	28	.....	4	3	4	124
2,200	200	18	.....	45	1,310	10,830	16,909	.....	1,260	38	2,008	125
2	9	.....	5	13	17	42	305	.....	.....	3	9	126
100	590	.....	160	825	965	2,922	23,115	.....	.....	25	696	127
.....	4	.....	.....	4	6	9	100	.....	.....	3	1	128
.....	180	.....	.....	267	226	538	5,518	.....	.....	25	6	129
2	5	.....	5	9	11	33	205	.....	.....	.....	8	130
100	410	.....	160	558	739	2,384	17,597	.....	.....	.....	690	131
.....	.....	.....	.....	6	13	.....	96	.....	.....	29	1	132
.....	.....	.....	.....	218	153	.....	1,978	.....	.....	76	8	133
.....	.....	.....	.....	47	37	.....	585	.....	.....	15	2	134
.....	8	.....	.....	.....	1	.....	18	.....	.....	.....	.....	135
.....	15	.....	.....	.....	1	.....	63	.....	.....	.....	.....	136
7	5	5	4	16	20	55	186	3	12	10	12	137
18,368	32,371	4,749	5,499	35,613	100,291	341,282	949,915	2,927	34,822	12,681	53,694	138
49	92	31	22	152	171	747	3,323	7	140	35	157	139
16,135	27,705	4,030	4,412	30,641	59,764	302,757	799,323	645	34,250	10,995	46,881	140
.....	.....	.....	1	.....	10	2	36	.....	.....	.....	.....	141
.....	.....	.....	80	.....	8,300	30	2,996	.....	.....	.....	.....	142
.....	10	.....	.....	7	5	2	7	23	.....	.....	.....	143
.....	505	.....	.....	760	750	185	300	2,232	.....	.....	.....	144
.....	.....	.....	1	.....	1	3	.....	.....	.....	.....	.....	145
.....	.....	.....	50	.....	1	12	.....	.....	.....	.....	.....	146
74	104	4	52	214	1,185	1,743	6,788	1	46	148	313	147
2,233	4,161	119	807	3,987	30,861	37,120	129,092	50	572	1,558	6,613	148
.....	.....	.....	150	75	15	526	6,202	.....	.....	.....	200	149
.....	.....	.....	.....	8	30	54	268	.....	.....	6	.....	150
.....	.....	.....	.....	150	450	652	4,732	.....	.....	131	.....	151
.....	.....	.....	.....	.....	150	.....	7,270	.....	.....	.....	.....	152
.....	.....	.....	.....	.....	.....	390	1,207	.....	.....	60	1,087	153

TABLE 66.—STEEL WORKS AND ROLLING MILLS—IDLE ESTABLISHMENTS—

		United States.	Alabama.	Delaware.	Illinois.	Indiana.	Kentucky.	Massachusetts.
1	Number of establishments	79	2	1	2	13	1	2
2	Capital, total	$21,168,026	$155,000	$126,000	$797,675	$3,657,413	$35,000	$529,912
3	Land	$2,702,322	$60,000	$9,000	$105,300	$368,000	$5,000	$330,000
4	Buildings	$3,928,564	$22,500	$12,000	$113,700	$718,000	$10,000	$75,000
5	Machinery, tools, and implements	$13,215,373	$72,500	$100,000	$578,675	$2,506,205	$20,000	$124,912
6	Cash and sundries	$1,321,767		$5,000		$65,208		
7	Rented property, total	$79,620						
8	Land	$46,020						
9	Buildings	$11,000						
10	Machinery, tools, and implements	$22,600						
	Equipment and capacity:							
	Rolling mills—							
11	Completed, number	74	1	1	2	11		1
12	Total daily capacity, double turn, of rolled iron and steel, tons.	8,794	40	70	240	664		60
	Bessemer, or modified Bessemer steel converters—							
13	Number	11						
14	Total daily capacity of ingots, double turn, tons	2,304						
	Open-hearth steel furnaces—							
15	Total number	26	1			3	3	2
16	Total daily capacity of ingots, double turn, tons	1,059	45			140	150	15
	Acid furnaces—							
17	Number	11				1	3	2
18	Daily capacity of ingots, double turn, tons.	284				20	150	15
	Basic furnaces—							
19	Number	15	1			2		
20	Daily capacity of ingots, double turn, tons.	775	45			120		
	Crucible, blister, German and miscellaneous steel furnaces—							
21	Number	28						6
22	Crucible steel pots, number	216						24
23	Total daily capacity of crucible and other ingots, double turn, tons.	42						1
	Power:							
24	Number of establishments reporting	73	2	1	2	11	1	2
25	Total horsepower	95,241	400	855	2,275	15,203	300	1,640
	Owned—							
	Engines—							
	Steam—							
26	Number	467	3	11	14	73	2	9
27	Horsepower	91,130	400	855	2,275	14,519	300	1,400
	Gas and gasoline—							
28	Number	2				2		
29	Horsepower	325				325		
	Water wheels—							
30	Number	8						
31	Horsepower	440						
	Electric motors—							
32	Number	157				31		7
33	Horsepower	3,196				359		240
34	Other kind, horsepower	150						

CAPITAL, EQUIPMENT AND CAPACITY, AND POWER, BY STATES: 1905.

Minnesota.	Missouri.	New Jersey.	New York.	Ohio.	Pennsylvania.	Virginia.	West Virginia.	Wisconsin.	Wyoming.	
1	1	2	5	10	33	1	1	3	1	1
$253,194	$132,650	$545,103	$1,210,027	$3,639,219	$8,455,867	$150,000	$36,500	$1,397,825	$46,641	2
$38,000	$65,000	$37,071	$111,000	$348,511	$1,123,680	$25,000	$2,500	$73,500	$760	3
$64,717	$35,000	$123,258	$263,000	$791,054	$1,282,396	$95,000	$4,000	$304,089	$13,950	4
$150,477	$25,000	$384,774	$836,027	$2,342,559	$4,962,077	$30,000	$30,000	$1,020,236	$31,931	5
.....	$7,650	.....	.....	$156,195	$1,087,714	.....	.....	.....	.....	6
.....	.....	.....	.....	$3,500	$76,120	.....	.....	.....	.....	7
.....	.....	.....	.....	$3,500	$42,520	.....	.....	.....	.....	8
.....	.....	.....	.....	.....	$11,000	.....	.....	.....	.....	9
.....	.....	.....	.....	.....	$22,600	.....	.....	.....	.....	10
1	1	2	4	14	31	1	1	2	1	11
160	100	665	1,040	1,138	3,917	65	200	360	75	12
.....	.....	.....	3	2	4	.....	.....	2	.....	13
.....	.....	.....	800	550	654	.....	.....	300	.....	14
.....	.....	.....	4	3	10	.....	.....	.....	.....	15
.....	.....	.....	130	70	509	.....	.....	.....	.....	16
.....	.....	.....	.....	3	2	.....	.....	.....	.....	17
.....	.....	.....	.....	70	29	.....	.....	.....	.....	18
.....	.....	.....	4	.....	8	.....	.....	.....	.....	19
.....	.....	.....	130	.....	480	.....	.....	.....	.....	20
.....	.....	.....	.....	12	4	.....	.....	6	.....	21
.....	.....	.....	.....	24	132	.....	.....	36	.....	22
.....	.....	.....	.....	1	36	.....	.....	4	.....	23
1	1	2	5	9	31	1	1	2	1	24
1,340	375	2,568	11,750	10,778	42,777	600	400	2,980	1,000	25
10	3	8	46	75	191	4	1	7	10	26
1,100	375	1,850	11,550	10,539	41,137	600	400	2,830	1,000	27
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	28
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	29
.....	.....	.....	.....	.....	8	.....	.....	.....	.....	30
.....	.....	.....	.....	.....	440	.....	.....	.....	.....	31
14	.....	35	10	18	30	.....	.....	12	.....	32
240	.....	718	200	239	1,050	.....	.....	150	.....	33
.....	.....	.....	.....	.....	150	.....	.....	.....	.....	34

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TIN AND TERNE PLATE

TIN AND TERNE PLATE.

By Story B. Ladd.

A full history of the tin and terne plate industry both abroad and in this country, with an account of the process of manufacture, appeared in the report on the industry for the Twelfth Census. Prior to 1890 the production of tin and terne plate in the United States was of slight importance. Since that date the industry has grown rapidly, as is shown by the increase in production from about 2,236,000 pounds of tin and terne plates in 1891 to over 849,000,000 pounds in 1900 and to over 1,000,000,000 pounds in 1905. As the statistics relating to the manufacture of tin and terne plate as a separate industry were first collected at the census of 1900, comparisons can only be made between 1900 and 1905.

The manufacture of black plates and the subsequent dipping of the plates to coat them with tin or terne metal are, as a rule, accomplished in one and the same establishment, without, in many cases, any distinction being made between labor and expense chargeable to the manufacture of the black plates and that pertaining to the tin and terne dipping. The industry should be treated as an entirety, but for comparative purposes it is desirable to follow the plan of presentation employed at the Twelfth Census. Moreover, as the manufacture of black plates is a rolling mill operation, it is important that the statistics relating thereto be included in those for the industry classified as "steel works and rolling mills." Therefore separate reports were requested for the black plate manufacture and for the tin and terne dipping industry. Where these reports could not be made from book accounts, an apportionment of capital, labor, and expense was accepted, the rolling mill report being credited with the black plate product at the market values and the tin and terne plate dipping report being charged with the same as material used.

In the case of rolling mills making other products than black plates it is impossible to segregate the capital, wage-earners, wages, cost of materials, etc., chargeable to the production of black plates from that pertaining to other products, and hence the statistics include all labor and expense items of such establishments, as well as the value of all products.

THE COMBINED INDUSTRY—TIN AND TERNE DIPPING AND BLACK PLATE.

Table 1 is a comparative summary of the general statistics of the active establishments engaged in the tin and terne dipping and black plate industries for the census years 1900 and 1905.

Table 1.—COMBINED INDUSTRY—COMPARATIVE SUMMARY, WITH PER CENT OF INCREASE: 1905 AND 1900.

	1905			1900			Per cent of increase.		
	Total.	Tin and terne dipping industry.	Black plate industry.	Total.	Tin and terne dipping industry.	Black plate industry.	Total.	Tin and terne dipping industry.	Black plate industry.
Number of establishments	[1] 44	36	35	[1] 66	57	44	33.3	[2] 36.8	[2] 20.5
Capital	[3] $32,457,487	$10,891,239	$21,566,248	[3] $27,488,302	$6,790,047	$20,698,255	18.1	60.4	4.2
Salaried officials, clerks, etc., number	861	284	577	726	333	393	18.6	[2] 14.7	46.8
Salaries	$936,682	$309,554	$627,128	$818,015	$291,323	$526,692	14.5	6.3	19.1
Wage-earners, average number	17,164	4,847	12,317	14,826	3,671	11,155	15.8	32.0	10.4
Total wages	$10,559,723	$2,383,070	$8,176,653	$10,288,061	$1,889,917	$8,398,144	2.6	26.1	[2] 2.6
Men 16 years and over	16,379	4,212	12,167	13,798	3,014	10,784	18.7	39.7	12.8
Wages	$10,338,370	$2,193,062	$8,145,308	$9,996,839	$1,711,475	$8,285,364	3.4	28.1	[2] 1.7
Women 16 years and over	608	579	29	688	625	63	[2] 11.6	[2] 7.4	[2] 54.0
Wages	$185,371	$179,917	$5,454	$193,834	$172,568	$21,266	[2] 4.4	4.3	[2] 74.4
Children under 16 years	177	56	121	340	32	308	[2] 47.9	75.0	[2] 60.7
Wages	$35,982	$10,091	$25,891	$97,388	$5,874	$91,514	[2] 63.1	71.8	[2] 71.7
Miscellaneous expenses	$1,815,288	$389,873	$1,425,415	$505,128	$236,456	$268,672	259.4	64.9	430.5
Cost of materials used	[4] $49,016,487	$31,375,714	$17,640,773	[4] $45,004,716	$26,728,150	$18,276,566	8.9	17.4	[2] 3.5
Value of products	[4] $65,679,117	$35,283,360	$30,395,757	[4] $61,912,619	$31,892,011	$30,020,608	6.1	10.6	1.2

[1] Includes 27 establishments in 1905 and 35 in 1900 which manufactured black plates as well as tin and terne plates; 9 in 1905 and 22 in 1900 which manufactured tin and terne plates only; and 8 in 1905 and 9 in 1900 which manufactured black plates only.
[2] Decrease.
[3] Includes value of rented property—1905, $473,000; 1900, $165,000.
[4] Includes a duplication of $22,988,237 in 1905 and $20,590,566 in 1900, the value of black plates reported among the products of the black plate industry and used as material in the tin and terne dipping industry.

As a rule, black plate mills operated in conjunction with dipping establishments produce black plates only, and, with the exception of three cases, black plates constitute the chief product of the independent rolling mills making black plates.

The industry is first considered as a whole, followed by the statistics for the tin and terne dipping industry, and then by those pertaining to the manufacture of black plates. Statistics for the last are included in those for steel works and rolling mills in the report on iron and steel.

The period covered by this report is the calendar year 1904, or the business year of the establishments reporting which most nearly conforms to that year. In the census of 1900 the period covered was from June 1, 1899, to May 31, 1900. The gross ton of 2,240 pounds is used except where otherwise stated.

The establishments which manufacture black plates and also coat them are counted both in the tin and terne dipping industry and in the black plate industry, but such establishments count but one in the number of establishments for the combined industries. There were 27 such establishments in 1905 and 35 in 1900. In other words, 75 per cent of the active dipping establishments were equipped for the manufacture of black plates in 1905, as compared with 61.4 per cent in 1900.

The capital invested in the black plate industry in 1905 constituted 66.4 per cent of the total capital for the combined industries, as against 75.3 per cent in 1900. The cost of materials used as well as the value of the products include a duplication, much of the black plate product of the black plate industry being consumed as material in the tin and terne dipping industry. Thus the cost of the black plates consumed by the dipping establishments was $22,988,237 in 1905 and $20,590,566 in 1900, which leaves $26,021,949 as the approximate cost of materials used by the combined industries in 1905, as against $24,414,150 in 1900. In like manner, deducting the same duplication from the value of products, the approximate value of the products in 1905 was $42,690,880, as compared with $41,322,053 in 1900. This shows an increase of 6.6 per cent in the approximate net cost of materials and 3.3 per cent in the approximate net value of products in 1905, as compared with 1900.

Table 2 shows the capital invested in all establishments, both active and idle, and its distribution between tin and terne dipping establishments and black plate establishments in 1905 and 1900. As the statistics for establishments under construction were not collected at the census of 1905, the statistics for such establishments have been eliminated from the figures for 1900.

TABLE 2.—*Combined industry—active and idle establishments—capital, by industries: 1905 and 1900.*

INDUSTRY.	Census.	Number of establishments.	CAPITAL.			
			Total.	Land.	Buildings, machinery, tools, and implements.	Cash and sundries.
Total	1905	[1] 54	[2] $33,759,901	$1,676,980	$18,231,751	$13,851,170
	1900	[1] 68	[2] 27,515,527	1,906,125	15,097,265	10,512,137
Tin and terne	1905	[3] 41	11,339,049	403,100	5,189,297	5,746,652
	1900	59	6,817,272	539,125	2,650,540	3,627,607
Black plate	1905	41	22,420,852	1,273,880	13,042,454	8,104,518
	1900	44	20,698,255	1,367,000	12,446,725	6,884,530

[1] Includes establishments equipped as follows: 1905—28 plants for the manufacture of black plates and tin and terne plates, 13 plants for the manufacture of tin and terne plates only, and 13 plants for the manufacture of black plates only. 1900—35 plants for the manufacture of black plates and tin and terne plates, 24 plants for the manufacture of tin and terne plates only, and 9 plants for the manufacture of black plates only.

[2] Includes value of rented property—1905, $473,000; 1900, $165,000.

[3] Not including 8 establishments, 6 of which are idle and attached to rolling mills, and 2 to establishments classified as "tinware;" capital not reported separately.

The total capital shows an increase of 22.7 per cent for the period 1900 to 1905, the major part of this increase being in the tin and terne plate dipping industry, in which the capital invested increased 66.3 per cent, while the capital in the black plate industry increased but 8.3 per cent. Of the total capital, that portion invested in buildings, machinery, tools, and implements increased 20.8 per cent and that in cash and sundries, 31.8 per cent. The capital invested in land shows a decrease of 12 per cent, due probably to concentration of the industry during the period.

In 1905, 54 per cent of the total capital was in buildings, machinery, tools, and implements, as against 54.9 per cent in 1900; in the tin and terne plate industry 45.8 per cent was in buildings, machinery, tools, and implements in 1905, as against 38.9 per cent in 1900; and in the black plate industry, 58.2 per cent in 1905, as against 60.1 per cent in 1900.

Table 3 shows the combined capital by active and idle establishments in 1900 and 1905.

TABLE 3.—*Combined industry—active and idle establishments—capital: 1905 and 1900.*

	Census.	Number of establishments.	CAPITAL.			
			Total.	Land.	Buildings, machinery, tools, and implements.	Cash and sundries.
Total	1905	[1] 54	[2] $33,759,901	$1,676,980	$18,231,751	$13,851,170
	1900	68	[2] 27,515,527	1,906,125	15,097,265	10,512,137
Active	1905	44	32,457,487	1,611,380	17,049,327	13,796,780
	1900	66	27,488,302	1,895,400	15,080,765	10,512,137
Idle	1905	10	1,302,414	65,600	1,182,424	54,390
	1900	2	27,225	10,725	16,500	.....

[1] Not including 8 tin and terne dipping establishments, 6 of which are idle and attached to rolling mills, and 2 to establishments classified as "tinware;" capital not reported separately.

[2] Includes value of rented property—1905, $473,000; 1900, $165,000.

Of the total amount of capital invested, less than one-tenth of 1 per cent in 1900 was in idle establishments, and in 1905 only 3.9 per cent.

Table 4 shows the capital invested, number of salaried employees and salaries paid, and the average number of wage-earners and total wages paid for the combined industries for the state of Pennsylvania and "all other states" in 1900 and 1905. On account of the control of many tin and terne dipping plants in Indiana, Ohio, and West Virginia by one company, although there are three or more plants in each of these states, the detailed statistics can not be shown separately for the combined industry, or for the tin and terne dipping industry, without disclosing the operations of individual concerns.

TABLE 4.—COMBINED INDUSTRY—COMPARATIVE SUMMARY, BY STATES: 1905 AND 1900.

STATE.	Census.	Number of establishments.	Capital.	SALARIED OFFICIALS, CLERKS, ETC.		WAGE-EARNERS AND WAGES.	
				Number.	Salaries.	Average number.	Wages.
United States	1905	44	[1] $32,457,487	861	$936,682	17,164	$10,559,723
	1900	66	[1] 27,488,302	726	818,015	14,826	10,288,061
Pennsylvania	1905	19	14,942,692	546	592,466	8,511	5,249,701
	1900	30	12,517,557	342	358,566	6,017	4,349,327
All other states	[2] 1905	25	17,514,795	315	344,216	8,653	5,310,022
	[3] 1900	36	14,970,745	384	459,449	8,809	5,938,734

[1] Includes value of rented property—1905, $473,000; 1900, $165,000.
[2] Includes establishments distributed as follows: Illinois, 1; Indiana, 4; Kentucky, 1; Maryland, 2; Michigan, 1; Missouri, 1; New York, 2; Ohio, 7; West Virginia, 6.
[3] Includes establishments distributed as follows: Illinois, 5; Indiana, 5; Kentucky, 1; Maryland, 3; Michigan, 1; Missouri, 1; New York, 4; Ohio, 12; Virginia, 1; West Virginia, 3.

The cost of materials and the value of products have been omitted from this table, as it is impracticable to show these items by states without duplication; black plates produced in one state, and therefore credited to that state as products, being often consumed in other states by tin and terne dipping establishments and their value consequently reappears in the value of products of such states.

The proportional number of establishments in Pennsylvania decreased from 45.5 per cent of the total in 1900 to 43.2 per cent in 1905. All the other items show an increase proportionately—capital, from 45.5 per cent in 1900 to 46 per cent in 1905; salaried officials, from 47.1 per cent to 63.4 per cent; salaries, from 43.8 per cent to 63.3 per cent; wage-earners, from 40.6 per cent to 49.6 per cent; and wages, from 42.3 per cent to 49.7 per cent.

Table 5 is a comparative summary of the materials used by the tin and terne dipping and black plate establishments for 1900 and 1905, with the per cent of increase.

TABLE 5.—COMBINED INDUSTRY—MATERIALS USED, BY KIND, QUANTITY, AND COST, WITH PER CENT OF INCREASE: 1905 AND 1900.

KIND.	Unit of measure.	1905		1900		PER CENT OF INCREASE.	
		Quantity.	Cost.	Quantity.	Cost.	Quantity.	Cost.
Aggregate			[1] $49,016,487		[1] $45,004,716		8.9
Iron ore	Tons			1,035	6,916		
Pig iron, spiegeleisen, and ferromanganese	Tons			16,514	253,920		
Old iron or steel rails and other scrap iron or steel	Tons	11,630	148,776	34,422	592,222	[2] 66.2	[2] 74.9
Iron or steel ingots, blooms, billets, tin-plate bars, sheet bars and slabs.	Tons	662,887	15,440,072	648,807	13,911,080	2.2	11.0
Domestic black plates or sheets for tinning, total	Pounds	1,019,524,757	22,988,237	825,556,992	20,590,566	23.5	11.6
Bessemer steel	Pounds	911,663,989	20,734,710	(3)	(3)		
Acid open-hearth steel	Pounds	19,343,920	436,850	(3)	(3)		
Basic open-hearth steel	Pounds	87,567,481	1,789,855	(3)	(3)		
Iron	Pounds	949,367	26,822	(3)	(3)		
Foreign black plates or sheets for tinning	Pounds	83,900	3,769	2,358,607	78,282	[2] 96.4	[2] 95.2
Pig tin	Pounds	24,243,851	6,709,164	20,282,778	4,528,473	19.5	43.6
Pig lead	Pounds	8,201,253	366,558	6,871,480	398,617		
Palm oil	Pounds	6,628,526	376,310	5,511,645	282,227	20.3	33.3
Sulphuric acid and tinning flux, bran, and pink meal			180,011		187,318		[2] 3.9
Boxes and nails			504,887		303,316		66.4
Fuel, total			1,490,407		960,526		55.2
Anthracite coal	Tons	3,240	9,960	4,456	6,465		
Bituminous coal	Tons	287,969	462,293	598,113	619,245		
Coke	Short tons	858	2,397	2,962	4,628		
Charcoal	Bushels	156,800	13,325	12,926	739		
Natural gas			293,795		328,388		
Oil	Barrels	2,422	4,238	50	1,061		
Fuel for power			704,399		(3)		
All other materials			808,296		2,911,253		

[1] Includes a duplication equal to the cost of the domestic black plates, products of the black plate industry and used as material in the tin and terne dipping industry.
[2] Decrease.
[3] Not reported separately.

The tin and lead contents of terne mixture, when purchased in 1905, were entered separately at current values in the census returns for that year, but at the census of 1900 terne mixture, when purchased, was in some cases reported as "pig tin" and in other cases as "pig lead." For this reason the quantities and values of tin and lead, as reported for 1900, are not strictly comparable with those for 1905, except when combined.

The heavy increase in the quantity of domestic black plates used—an increase of 193,967,765 pounds, or 23.5 per cent—and the decrease in the quantity of foreign plates used—from 2,358,607 pounds to 83,900 pounds—are worthy of notice.

The average cost of the domestic black plates used by tin and terne plate establishments in 1905 was 2.25 cents per pound, as compared with 2.49 cents per pound in 1900; and the average value of the black plates turned out by the rolling mills in 1905 was 2.24 cents per pound, as compared with 2.38 cents per pound in 1900. The average value of the iron black plates made by rolling mills in 1905 was 1.96 cents per pound; of the Bessemer steel black plates, 2.31 cents per pound; and of the open-hearth steel black plates, 2.17 cents per pound. In 1900 there were no iron black plates reported as manufactured, and the Bessemer steel black plates were of an average value of 2.35 cents per pound and the open-hearth steel black plates 2.63 cents per pound.

Table 6 shows the value of the net products of the tin and terne plate dipping and black plate establishments for 1900 and 1905, with the per cent of increase.

TABLE 6.—*Combined industry—net value of products, with per cent of increase: 1905 and 1900.*

INDUSTRY.	PRODUCTS (NET VALUE).		Per cent of increase.
	1905	1900	
Total	$42,690,880	$41,322,053	3.3
Tin and terne dipping	35,283,360	31,892,011	10.6
Black plate[1]	7,407,520	9,430,042	[2]21.4

[1] Does not include $22,988,237 in 1905 and $20,590,566 in 1900, the value of black plates consumed by tin and terne dipping establishments.
[2] Decrease.

Duplication has been largely avoided by omitting the value of the domestic black plates consumed by the tin and terne plate dipping industry from the products of the black plate industry.

Some duplications remain, however, but they are of a minor character and the values of all products for each census year are substantially correct.

The products of the black plate industry remaining after the exclusion of the black plates consumed by tin and terne dipping establishments include the black plates otherwise used and all other products of the rolling mills making black plates. The slight increase in the value of net products of 3.3 per cent is due to the considerable decrease in the value of the excess of the products of the black plate establishments over and above the black plates consumed by tin and terne dipping establishments.

THE TIN AND TERNE DIPPING INDUSTRY.

The statistics included under this head are those for establishments which buy black plates and coat them, or for the dipping department only in the case of plants which both manufacture and dip black plates.

Table 7 is a comparative summary of the general statistics of the tin and terne dipping industry for 1900 and 1905.

TABLE 7.—*Tin and terne dipping industry—comparative summary, with per cent of increase: 1905 and 1900.*

	1905	1900	Per cent of increase.
Number of establishments	36	57	[1]36.8
Capital	[2]$10,891,239	[2]$6,790,047	60.4
Salaried officials, clerks, etc., number	284	333	[1]14.7
Salaries	$309,554	$291,323	6.3
Wage-earners, average number	4,847	3,671	32.0
Total wages	$2,383,070	$1,889,917	26.1
Men 16 years and over	4,212	3,014	39.7
Wages	$2,193,062	$1,711,475	28.1
Women 16 years and over	579	625	[1]7.4
Wages	$179,917	$172,568	4.3
Children under 16 years	56	32	75.0
Wages	$10,091	$5,874	71.8
Miscellaneous expenses	$389,873	$236,456	64.9
Cost of materials used	$31,375,714	$26,728,150	17.4
Value of products	$35,283,360	$31,892,011	10.6

[1] Decrease.
[2] Includes value of rented property—1905, $78,000; 1900, $140,000.

A noticeable concentration of the industry is shown in this table. Although the number of establishments decreased 36.8 per cent, the capital increased 60.4 per cent and the value of products 10.6 per cent. The advance in wages did not keep pace with the increase in wage-earners, but the amount paid for salaries showed an increase, though the number of salaried officials decreased.

Table 8 presents the statistics relating to the capital of both active and idle tin and terne dipping establishments for the censuses of 1900 and 1905.

TABLE 8.—*Tin and terne dipping industry—active and idle establishments—capital: 1905 and 1900.*

	Census.	Number of establishments.	CAPITAL.			
			Total.	Land.	Buildings, machinery, tools, and implements.	Cash and sundries.
Total	1905	[1]41	[2]$11,339,049	$403,100	$5,189,297	$5,746,652
	1900	59	[2]6,817,272	539,125	2,650,540	3,627,607
Active	1905	36	10,891,239	386,000	4,774,873	5,730,366
	1900	57	6,790,047	528,400	2,634,040	3,627,607
Idle	1905	5	447,810	17,100	414,424	16,286
	1900	2	27,225	10,725	16,500	.....

[1] Not including 8 establishments, 6 of which are idle and attached to rolling mills, and 2 classified as "tinware;" capital not reported separately.
[2] Includes value of rented property—1905, $78,000; 1900, $140,000.

The increase in capital, $4,521,777, or 66.3 per cent, is in the main almost equally divided between equipment, as represented by buildings, machinery, tools, and implements, which have increased $2,538,757, and live capital, which has increased $2,119,045. In 1905 the capital invested in idle plants constituted 3.9 per cent of the total, as compared with four-tenths of 1 per cent in 1900.

Table 9 is a comparative summary of the statistics of the tin and terne dipping industry for the state of Pennsylvania and "all other states" for 1900 and 1905. As before stated, the statistics for states other than Pennsylvania can not be given separately without disclosing the operations of individual owners.

TABLE 9.—TIN AND TERNE DIPPING INDUSTRY—COMPARATIVE SUMMARY, BY STATES: 1905 AND 1900.

STATE.	Census.	Number of establishments.	Capital.	SALARIED OFFICIALS, CLERKS, ETC.		WAGE-EARNERS AND WAGES.		Miscellaneous expenses.	Cost of materials used.	Value of products.
				Number.	Salaries.	Average number.	Wages.			
United States	1905	36	[1] $10,891,239	284	$309,554	4,847	$2,383,070	$389,873	$31,375,714	$35,283,360
	1900	57	[1] 6,790,047	333	291,323	3,071	1,889,917	236,456	26,728,150	31,892,011
Pennsylvania	1905	19	4,700,369	191	218,980	2,421	1,206,781	231,376	17,590,077	19,341,961
	1900	25	3,042,029	189	147,202	1,578	813,692	82,169	10,364,084	12,530,991
All other states	[2] 1905	17	6,190,870	93	90,574	2,426	1,176,289	158,497	13,785,637	15,941,399
	[3] 1900	32	3,748,018	144	144,121	2,093	1,076,225	154,287	16,364,066	19,361,020

[1] Includes value of rented property—1905, $78,000; 1900, $140,000.
[2] Includes establishments distributed as follows: Indiana, 3; Maryland, 1; Michigan, 1; Missouri, 1; New York, 2; Ohio, 5; West Virginia, 4.
[3] Includes establishments distributed as follows: Illinois, 3; Indiana, 5; Kentucky, 1; Maryland, 2; Michigan, 1; Missouri, 1; New York, 4; Ohio, 12; Virginia, 1; West Virginia, 2.

Pennsylvania advanced considerably in importance in the industry during the five-year period from 1900 to 1905, for, notwithstanding a slight decrease in proportion of the total capital invested in the industry, the proportion of the total value of product assignable to the state increased from 39.3 per cent in 1900 to 54.8 at the census of 1905, and at the latter census about one-half of all the wage-earners reported for the industry in the United States were employed in the tin and terne plate mills of Pennsylvania.

The kind, quantity, and cost of materials used in the tin and terne plate industry in 1900 and 1905 are shown in Table 10, with the percentage of increase for the different items.

TABLE 10.—TIN AND TERNE DIPPING INDUSTRY—MATERIALS USED, BY KIND, QUANTITY, AND COST, WITH PER CENT OF INCREASE: 1905 AND 1900.

KIND.	Unit of measure.	1905		1900		PER CENT OF INCREASE.	
		Quantity.	Cost.	Quantity.	Cost.	Quantity.	Cost.
Aggregate			$31,375,714		$26,728,150		17.4
Domestic black plates or sheets for tinning, total	Pounds	1,019,524,757	22,988,237	825,556,992	20,590,566	23.5	11.6
Bessemer steel	Pounds	911,663,989	20,734,710	(1)	(1)		
Acid open-hearth steel	Pounds	19,343,920	436,850	(1)	(1)		
Basic open-hearth steel	Pounds	87,567,481	1,789,855	(1)	(1)		
Iron	Pounds	949,367	26,822	(1)	(1)		
Foreign black plates or sheets for tinning	Pounds	83,900	3,769	2,358,607	78,282	[2] 96.4	[2] 95.2
Pig tin	Pounds	24,243,851	6,709,164	20,282,778	4,528,473	19.5	43.6
Pig lead	Pounds	8,201,253	366,558	6,871,480	398,617		
Palm oil	Pounds	6,628,526	376,310	5,511,645	282,227	20.3	33.3
Sulphuric acid, tinning flux, bran, and pink meal			180,011		187,318		[1] 3.9
Boxes and nails			504,887		303,316		66.4
Fuel, total			159,786		91,456		74.7
Anthracite coal	Tons	3,240	9,960	4,456	6,465		
Bituminous coal	Tons	50,560	78,484	35,048	48,059		
Coke	Short tons			1,092	2,000		
Charcoal	Bushels			556	122		
Natural gas			56,998		34,110		
Oil					700		
Fuel for power			14,344		(1)		
All other material			86,992		267,895		

[1] Not reported separately.
[2] Decrease.

The total quantity of black plates consumed, both domestic and foreign, was 1,019,608,657 pounds in 1905, as against 827,915,599 pounds in 1900, an increase of 191,693,058 pounds, or 23.2 per cent. The imported black plates in 1905 constituted less than one one-hundredth of 1 per cent of the total amount used, as against a little less than three-tenths of 1 per cent in 1900. In 1905 the foreign plates were used in Penn-

sylvania, and in 1900 in Pennsylvania and Virginia. The black plates formed 73.3 per cent of the cost of all material in 1905 and 77.3 per cent in 1900.

As already explained, the quantity and cost of tin and lead in 1905 are not strictly comparable with those items in 1900, on account of the difference at the two censuses in the method of reporting terne mixture. The fuels reported by kinds are, likewise, not comparable, except for the total cost, inasmuch as fuel used for power was classified separately in 1905 and not distributed among the several kinds of fuel as in 1900. The difference between the total quantity of tin or terne plated products, shown in Table 11, and the quantities of black plates, pig tin, and pig lead used, indicates a loss of 1.9 per cent in the process of tin and terne dipping.

Table 11 shows the quantity and value of the products of the tin and terne dipping establishments for the state of Pennsylvania and "all other states" for 1900 and 1905.

TABLE 11.—TIN AND TERNE DIPPING INDUSTRY—COMPARATIVE SUMMARY OF PRODUCTS, BY STATES: 1905 AND 1900.

STATE.	Census.	Total value.	TIN PLATES.		TERNE PLATES.		OTHER SHEET IRON AND SHEET STEEL, TIN OR TERNE PLATED.		All other products, including amount received for custom work and repairing.
			Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	
United States	1905	$35,283,360	867,526,985	$28,429,971	158,857,866	$6,119,572	6,555,855	$217,476	$516,341
	1900	31,892,011	707,718,239	25,553,021	141,285,783	5,731,124	1,000,473	86,492	521,374
Pennsylvania	1905	19,341,961	524,905,922	16,547,120	58,693,218	2,381,277	6,555,855	217,476	196,088
	1900	12,530,991	256,879,332	9,137,483	77,129,648	3,263,769	200,473	6,492	123,247
All other states	[1] 1905	15,941,399	342,621,063	11,882,851	100,164,648	3,738,295	.....	.....	320,253
	[2] 1900	19,361,020	450,838,907	16,415,538	64,156,135	2,467,355	800,000	80,000	398,127

[1] Includes establishments distributed as follows: Indiana, 3; Maryland, 1; Michigan, 1; Missouri, 1; New York, 2; Ohio, 5; West Virginia, 4.
[2] Includes establishments distributed as follows: Illinois, 3; Indiana, 5; Kentucky, 1; Maryland, 2; Michigan, 1; Missouri, 1; New York, 4; Ohio, 12; Virginia, 1; West Virginia, 2.

The total production in 1905 was 1,032,940,706 pounds of tin and terne plates or sheets of all kinds, valued at $34,767,019, as against 850,004,495 pounds, valued at $31,370,637, in 1900, an increase of 182,936,211 pounds in quantity, or 21.5 per cent, and of $3,396,382 in value, or 10.8 per cent.

In 1905 tin plates constituted 84 per cent in quantity of the tin or terne plated output; terne plates, 15.4 per cent; and other sheet iron and sheet steel, tin or terne plated, six-tenths of 1 per cent, as against 83.3 per cent for tin plates, 16.6 per cent for terne plates, and one-tenth of 1 per cent for other tin or terne plated iron and steel sheets in 1900.

The average value of tin plate was 3.28 cents per pound, as against 3.61 cents in 1900; the average value of the terne plates was 3.85 cents per pound, as against 4.06 cents in 1900; and the average value of other sheet iron and sheet steel, tin or terne plated, was 3.32 cents per pound, as against 8.65 cents in 1900.

There has been a heavy increase in tin plate production in Pennsylvania during the period, amounting to 268,026,590 pounds, or 104.3 per cent. The state produced 60.5 per cent of the total tin plate product of the country in 1905, as against 36.3 per cent in 1900.

Table 12 shows for tin plates, terne plates, taggers tin, etc., the total domestic production and consumption, the imports, the exports of domestic and of foreign origin, and the percentage of the domestic consumption supplied by imported plates, for the quinquennial periods from 1890 to 1905.

TABLE 12.—TIN PLATE, TERNE PLATE, AND TAGGERS TIN PRODUCED, IMPORTED, EXPORTED, AND RETAINED FOR CONSUMPTION: 1890 TO 1905.[1]

YEAR.	Production (pounds).	Exports of domestic (pounds).	Domestic retained for consumption (pounds).	Imports (pounds).	Exports of foreign (pounds).	Total retained for consumption (pounds).	Per cent of imports to total consumption.
1905	[2] 1,032,940,706	22,990,816	1,009,949,890	161,066,820	180,550	1,170,836,160	13.7
1900	[2] 850,004,495	319,579	849,684,916	147,963,804	850,228	996,798,492	14.8
1895	193,800,320	.....	193,800,320	508,038,938	468,249	701,371,009	72.4
1890	([3])	.....	.....	680,060,925	1,550,229	678,510,696	100.0

[1] Bureau of Statistics, Department of Commerce and Labor, "Statistical Abstract of the United States," 1905.
[2] Production according to Census returns.
[3] Not reported separately.

The tin plate industry was of very small proportions in the United States in 1890; very few tin and terne plates were made for sale, and the market was practically supplied by imports. The establishment of the industry dates from 1891, when the output was about 2,236,000 pounds. The first export of domestic plates was made in 1898, the amount being 20,827 pounds; in 1900 the amount had increased to 319,579 pounds, while in 1905 it was 22,990,816 pounds, a gain for the last five years of more than seventyfold. The net amount retained for consumption increased for the five-year period 1900 to 1905, 174,037,668 pounds, or 17.5 per cent, and the domestic production increased 182,936,211 pounds, or 21.5 per cent.

Table 13 shows the equipment of all tin and terne dipping establishments, whether active or idle, and the daily capacity of the plants in pounds of tin and terne plates, on single turn, for the years 1900 and 1905.

TABLE 13.—TIN AND TERNE DIPPING INDUSTRY—ACTIVE AND IDLE ESTABLISHMENTS—NUMBER, EQUIPMENT, AND DAILY CAPACITY, BY STATES: 1905 AND 1900.

STATE.	Census.	Number of establishments.	NUMBER OF SETS.			DAILY CAPACITY, IN POUNDS, SINGLE TURN.		
			Total.	Employed on— Tin plates.	Employed on— Terne plates.	Total.	Tin plates.	Terne plates.
United States	1905	[1] 49	685	544	141	4,504,949	3,754,099	750,85[illegible]
	1900	59	585	(2)	(2)	2,759,901	2,018,538	741,36[illegible]
Illinois	1905	2	21	21	.....	193,000	193,000	.....
	1900	3	30	30	.....	142,000	142,000	.....
Indiana	1905	4	92	82	10	764,700	657,900	106,80[illegible]
	1900	5	84	(2)	(2)	452,000	380,050	71,95[illegible]
Kentucky	1905	1	4	1	3	24,666	6,166	18,50[illegible]
	1900	1	4	(2)	(2)	10,600	5,300	5,30[illegible]
Maryland	1905	1	16	16	.....	100,000	100,000	.....
	1900	2	21	21	.....	120,000	120,000	.....
Michigan	1905	1	2	2	.....	3,000	3,000	.....
	1900	1	4	4	.....	3,000	3,000	.....
Missouri	1905	1	16	16	.....	35,000	35,000	.....
	1900	1	15	15	.....	100,000	100,000	.....
New York	1905	2	11	3	8	24,800	4,800	20,000
	1900	4	13	(2)	(2)	47,800	27,800	20,000
Ohio	1905	9	118	77	41	703,433	562,000	141,433
	1900	13	103	(2)	(2)	500,500	358,500	142,000
Pennsylvania	1905	[3] 21	328	269	59	2,168,417	1,799,800	368,617
	1900	26	285	(2)	(2)	1,220,001	806,888	413,113
Virginia	1905	1	3	1	2	18,000	6,000	12,000
	1900	1	3	(2)	(2)	10,000	.....	10,000
West Virginia	1905	6	74	56	18	469,933	386,433	83,500
	1900	2	23	(2)	(2)	154,000	75,000	79,000

[1] Includes 8 establishments and equipments not included in other tables, of which 6 are idle and attached to rolling mills and 2 to establishments classified as "tinware," distributed as follows: Indiana, 1; Illinois, 2; Kentucky, 1; Pennsylvania, 2; Virginia, 1; WestVirginia, 1.
[2] Not reported separately.
[3] Includes 6 plants reported as 3 establishments.

There is included in the above table the equipment of 8 establishments which do not figure in the other tables. Of these, 6 are idle tin or terne dipping plants attached to rolling mills and 2 are dipping plants in establishments making tinware and so classified. There are 24 plants in Pennsylvania, although only 21 are credited to this state, 6 plants having been covered by three reports in making the returns for 1905. Hence in the aggregate there are 52 completed tin and terne dipping plants in 1905, as against 59 in 1900.

On the basis of three hundred working days for the year the tin and terne plate product for 1905 was 76 per cent of the capacity of all establishments on single turn; the output of tin plates being 77 per cent of the annual capacity and the terne plate product, 70.5 per cent.

The majority of the active establishments operated in 1905 on double turn. There were 8 establishments on single turn, which as a rule is ten hours; 21 on double turn; 7 on triple turn, eight hours to a crew; and 5 establishments were idle during the year. There were 23 establishments equipped for the manufacture of both tin and terne plates, 20 establishments for the manufacture of tin plates only, and 6 for the manufacture of terne plates only. Thus 43 plants had tin plate and 29 terne plate equipments. In 1900, of the 59 active and idle plants, 35 were equipped for the manufacture of both tin and terne plates, 15 for the manufacture of tin plates only, and 9 terne plates only; or 50 for the manufacture of tin plates and 44 for the manufacture of terne plates.

A detailed summary of the statistics of the active establishments is presented for Pennsylvania and "all

other states" in Table 20 at the end of this report. The table does not include the statistics of 2 dipping equipments in Illinois attached to establishments making tinware and so classified.

The statistics for the 5 idle tin and terne dipping establishments for which reports are available are shown in Table 21 at the end of this report. Four of these establishments are located in Ohio and 1 in West Virginia. This table is exclusive of 6 idle dipping plants attached to rolling mills, where a separation of capital has not been made. Of these establishments, 1 is in Indiana, 1 in Kentucky, 2 in Pennsylvania, 1 in Virginia, and 1 in West Virginia.

THE BLACK PLATE INDUSTRY.

Black plates or sheets for tinning are a product of the rolling mill, and the statistics therefor are included in those for steel works and rolling mills in the report on the iron and steel industry. The following statistics are those of the rolling mills which make black plates or sheets for tinning, either solely or in connection with other rolling mill products.

Table 14 is a comparative summary of the statistics of the black plate industry for 1900 and 1905.

TABLE 14.—*Black plate industry—comparative summary, with per cent of increase: 1905 and 1900.*

	1905	1900	Per cent of increase.
Number of establishments	35	44	[1] 20.5
Capital	[2] $21,566,248	[2] $20,698,255	4.2
Salaried officials, clerks, etc., number	577	393	46.8
Salaries	$627,128	$526,692	19.1
Wage-earners, average number	12,317	11,155	10.4
Total wages	$8,176,653	$8,398,144	[1] 2.6
Men 16 years and over	12,167	10,784	12.8
Wages	$8,145,308	$8,285,364	[1] 1.7
Women 16 years and over	29	63	[1] 54.0
Wages	$5,454	$21,266	[1] 74.4
Children under 16 years	121	308	[1] 60.7
Wages	$25,891	$91,514	[1] 71.7
Miscellaneous expenses	$1,425,415	$268,672	430.5
Cost of materials used	$17,640,773	$18,276,566	[1] 3.5
Value of products	$30,395,757	$30,020,608	1.2
Black plates	$25,297,079	$20,967,805	20.6
All other products	$5,098,678	$9,052,803	[1] 43.7

[1] Decrease.
[2] Includes value of rented property—1905, $395,000; 1900, $25,000.

The products of this industry include at the census of 1905 black plates valued at $25,297,079, or 83.2 per cent of all products, and in 1900 black plates valued at $20,967,805, or 69.8 per cent of all products. "All other products" in 1900 included plates and sheets other than black plates having a value of $4,517,644, and in 1905 there is included in "all other products" boiler and other plates and sheets having a value of $3,941,563 and scrap sold amounting to $1,041,949.

There was a decrease in the number of establishments making black plates in 1905 as compared with 1900, but the total products in 1905 show a small increase over the products in 1900, and the black plate product shows a very material increase, the percentage of increase being 20.6.

The proportionate increase in miscellaneous expenses is apparently very large, but the amount reported for miscellaneous expenses by rolling mills making black plates in 1900 constituted but 1 per cent of the total expense; whereas in the industry as a whole—"steel works and rolling mills"—miscellaneous expenses constituted 4.7 per cent of all expenses reported. In 1905 miscellaneous expenses as reported by the black plate rolling mills is 5.1 per cent of all expense, as compared with 6 per cent for all steel works and rolling mills.

The statistics of capital invested in the active and idle black plate establishments in 1900 and 1905 are presented in detail in Table 15.

TABLE 15.—*Black plate industry—active and idle establishments—capital: 1905 and 1900.*

CLASS.	Census.	Number of establishments.	CAPITAL.			
			Total.	Land.	Buildings, machinery, tools, and implements.	Cash and sundries.
Total	1905	41	[1] $22,420,852	$1,273,880	$13,042,454	$8,104,518
	1900	44	[1] 20,698,255	1,367,000	12,446,725	6,884,530
Active	1905	35	21,566,248	1,225,380	12,274,454	8,066,414
	1900	44	20,698,255	1,367,000	12,446,725	6,884,530
Idle	1905	6	854,604	48,500	768,000	38,104
	1900	.....	.....	.....	.....	.....

[1] Includes value of rented property—1905, $395,000; 1900, $25,000.

The increase from 1900 to 1905 in the amount of capital invested in these establishments was not large—only 8.3 per cent. The part invested in land decreased, while that invested in equipment increased only 4.8 per cent. The capital invested in idle establishments, nearly 90 per cent of which was in the form of equipment, amounted to only 3.8 per cent of the total.

Table 16 presents the statistics of the industry for Pennsylvania and "all other states" for 1900 and 1905.

TABLE 16.—BLACK PLATE INDUSTRY—COMPARATIVE SUMMARY, BY STATES: 1905 AND 1900.

STATE.	Census.	Number of establishments.	Capital.	SALARIED OFFICIALS, CLERKS, ETC.		WAGE-EARNERS AND WAGES.		Miscellaneous expenses.	Cost of materials used.	Value of products.
				Number.	Salaries.	Average number.	Wages.			
United States	1905	35	[1] $21,566,248	577	$627,128	12,317	$8,176,653	$1,425,415	$17,640,773	$30,395,757
	1900	44	[1] 20,698,255	393	526,692	11,155	8,398,144	268,672	18,276,566	30,020,608
Pennsylvania	1905	16	10,242,323	355	373,486	6,090	4,042,920	732,745	9,059,252	15,679,736
	1900	22	9,475,528	153	211,364	4,439	3,535,635	66,948	6,708,650	11,147,659
All other states	[2] 1905	19	11,323,925	222	253,642	6,227	4,133,733	692,670	8,581,521	14,716,021
	[3] 1900	22	11,222,727	240	315,328	6,716	4,862,509	201,724	11,567,916	18,872,949

[1] Includes value of rented property—1905, $395,000; 1900, $25,000.
[2] Includes establishments distributed as follows: Illinois, 1; Indiana, 4; Kentucky, 1; Maryland, 1; Ohio, 7; West Virginia, 5.
[3] Includes establishments distributed as follows: Illinois, 3; Indiana, 5; Kentucky, 1; Maryland, 1; Missouri, 1; Ohio, 9; West Virginia, 2.

In the black plate as well as in the other branch of the industry, Pennsylvania is much the most important state, reporting 47.5 per cent of the total capital, 50 per cent of the total number of salaried officials, clerks, and wage-earners, and 51.6 per cent of the total value of products. Within the state itself the number of establishments decreased, but all the other items showed considerable increases.

The cost of materials used in the manufacture of black plates in 1900 and 1905 is shown in Table 17.

TABLE 17.—BLACK PLATE INDUSTRY—MATERIALS USED, BY KIND, QUANTITY, AND COST, WITH PER CENT OF INCREASE: 1905 AND 1900.

KIND.	Unit of measure.	1905		1900		PER CENT OF INCREASE.	
		Quantity.	Cost.	Quantity.	Cost.	Quantity.	Cost.
Aggregate			$17,640,773		$18,276,566		[1] 3.5
Iron ore	Tons			1,035	6,916		
Pig iron, spiegeleisen and ferromanganese	Tons			16,514	253,920		
Old iron or steel rails and other scrap iron or steel	Tons	11,630	148,776	34,422	592,222	[1] 66.2	[1] 74.9
Iron or steel ingots, blooms, billets, tin-plate bars, sheet bars and slabs	Tons	662,887	15,440,072	648,807	13,911,080	2.2	11.0
Fuel, total			1,330,621		869,070		53.1
Bituminous coal and slack	Tons	237,409	383,809	563,055	571,186		
Coke	Short tons	858	2,397	1,870	2,628		
Charcoal	Bushels	156,800	13,325	12,370	617		
Natural gas			236,797		294,278		
Oil	Barrels	2,422	4,238	50	361		
Fuel for power			690,055		(2)		
All other materials			721,304		2,643,358		

[1] Decrease.
[2] Not reported separately.

Although, as has been shown, the value of products increased slightly from 1900 to 1905, the total cost of materials decreased 3.5 per cent. In 1905 no iron ore or pig iron, etc., was reported as purchased, and the amount of iron or steel scrap used decreased largely. For the census of 1905 the cost of fuel used for power was reported separately, amounting to $690,055, but the kinds and quantities of fuel so used were not stated. Hence a comparison with 1900 can only be made as to the total expenditures for fuel, which amounted to $1,330,621 in 1905 and to $869,070 in 1900. Natural gas was used as fuel in whole or in part by 18 establishments, of which 2 were located in Indiana, 3 in Ohio, 10 in Pennsylvania, and 3 in West Virginia.

Table 18 shows in detail the products of the black plate industry for Pennsylvania and "all other states" for 1900 and 1905.

TABLE 18.—BLACK PLATE INDUSTRY—COMPARATIVE SUMMARY OF PRODUCTS, BY STATES: 1905 AND 1900.

	Census.	Total value.	BLACK PLATES.								ALL OTHER PLATES AND SHEETS.		All other products.
			Total.		Iron.		Bessemer steel.		Open-hearth steel.		Tons.	Value.	
			Tons.	Value.	Tons.	Value.	Tons.	Value.	Tons.	Value.			
United States	1905	$30,395,757	504,025	$25,297,079	64,111	$2,809,936	353,027	$18,271,625	86,887	$4,215,518	77,867	$3,941,563	$1,157,115
	1900	30,020,608	394,014	20,967,805			355,077	18,673,311	38,937	2,294,494	79,096	4,517,644	4,535,159
Pennsylvania	1905	15,679,736	266,068	13,552,164	34,665	1,505,020	213,904	11,141,073	17,499	906,071	27,831	1,448,033	679,539
	1900	11,147,659	178,574	9,423,900			169,464	9,012,437	9,110	411,463	23,547	1,296,279	427,480
All other states	[1] 1905	14,716,021	237,957	11,744,915	29,446	1,304,916	139,123	7,130,552	69,388	3,309,447	50,036	2,493,530	477,576
	[2] 1900	18,872,949	215,440	11,543,905			185,613	9,660,874	29,827	1,883,031	55,549	3,221,365	4,107,679

[1] Includes establishments distributed as follows: Illinois, 1; Indiana, 4; Kentucky, 1; Maryland, 1; Ohio, 7; West Virginia, 5.
[2] Includes establishments distributed as follows: Illinois, 3; Indiana, 5; Kentucky, 1; Maryland, 1; Missouri, 1; Ohio, 9; West Virginia, 2.

In 1900 no iron black plates were reported, and nine-tenths of the black plates were made of Bessemer steel and one-tenth of open-hearth steel. In 1905, 70 per cent of these plates were made of Bessemer steel, 17.2 per cent of open-hearth steel, and 12.7 per cent of iron. The black plates show an increase in 1905, as compared with 1900, of 27.9 per cent in quantity and 20.6 per cent in value. The average value of all kinds of black plates in 1905 was $50.19 per ton, as compared with $53.22 per ton in 1900. The iron black plates show an average value of $43.83 per ton; Bessemer steel, $51.76 per ton; and open-hearth steel, $48.52 per ton. In 1900 the average value of the Bessemer black plates was $52.59 per ton, and of the open-hearth steel black plates $58.93 per ton. There is included in the "value of all other products" the billets, tin-plate bars, and sheet bars produced for sale by the rolling mills making black plates, valued at $53,230 in 1905, also iron and steel scrap sold having a value of $1,041,949. In 1900 the billets and sheet and tin-plate bars included in "all other products" amounted to $1,894,000.

The black plate product of the state of Pennsylvania increased 49 per cent in 1905, as compared with 1900, and this state contributed 52.8 per cent of all black plates manufactured in the country in 1905, as against 45.3 per cent in 1900.

Table 19 shows the hot and cold mill equipment, by states, of the active and idle rolling mill establishments producing black plates, and the annual capacity of the hot mills, for 1900 and 1905.

TABLE 19.—*Black plate industry—active and idle establishments—number, equipment, and capacity, by states: 1905 and 1900.*

STATE.	Census.	Number of establishments.	Number of hot mills.	Number of cold mills.	Annual capacity of hot mills (tons).
United States	1905	41	406	334	958,455
	1900	44	332	294	641,450
Ohio	1905	9	81	71	183,581
	1900	8	59	58	114,525
Pennsylvania	1905	17	209	173	491,408
	1900	23	160	157	314,325
West Virginia	1905	5	43	33	105,098
	1900	2	14	14	27,250
All other states	[1] 1905	10	73	57	178,368
	[2] 1900	11	99	65	185,350

[1] Includes establishments distributed as follows: Illinois, 1; Indiana, 6; Kentucky, 1; Maryland, 1; Wisconsin, 1.
[2] Includes establishments distributed as follows: Illinois, 3; Indiana, 5; Kentucky, 1; Maryland, 1; Missouri, 1.

The above table includes completed mills only. There has been an increase in each state for which details are given in numbers of hot and cold mills, and in the annual capacity of the hot mills. In 1905 the black plate product equaled 52.6 per cent of the capacity of the hot plate mills, as compared with 61.4 per cent in 1900.

TABLE 20.—*Tin and terne plate—detailed summary, by states: 1905.*

	United States.	Pennsylvania.	All other states.[1]
Number of establishments	36	19	17
Capital, total	$10,813,239	$4,692,369	$6,120,870
Land	$310,000	$221,000	$89,000
Buildings	$1,859,927	$384,000	$1,475,927
Machinery, tools, and implements	$2,912,946	$1,046,500	$1,866,446
Cash and sundries	$5,730,366	$3,040,869	$2,689,497
Value of rented property	$78,000	$8,000	$70,000
Proprietors and firm members	1	1	.....
Salaried officials, clerks, etc.:			
Total number	284	191	93
Total salaries	$309,554	$218,980	$90,574
Officers of corporations—			
Number	21	15	6
Salaries	$67,450	$57,750	$9,700
General superintendents, managers, clerks, etc.—			
Total number	263	176	87
Total salaries	$242,104	$161,230	$80,874
Men—			
Number	232	152	80
Salaries	$232,788	$154,234	$78,554
Women—			
Number	31	24	7
Salaries	$9,316	$6,996	$2,320
Wage-earners, including pieceworkers, and total wages:			
Greatest number employed at any one time during the year	6,161	3,121	3,040
Least number employed at any one time during the year	3,741	1,877	1,864
Average number	4,847	2,421	2,426
Total wages	$2,383,070	$1,206,781	$1,176,289
Men 16 years and over—			
Average number	4,212	2,096	2,116
Wages	$2,193,062	$1,112,001	$1,081,061
Women 16 years and over—			
Average number	579	305	274
Wages	$179,917	$91,289	$88,628
Children under 16 years—			
Average number	56	20	36
Wages	$10,091	$3,491	$6,600
Average number of wage-earners, including pieceworkers, employed during each month:			
Men 16 years and over—			
January	3,715	1,743	1,972
February	3,997	1,895	2,102
March	4,216	1,972	2,244
April	4,279	2,192	2,087
May	4,545	2,341	2,204
June	4,737	2,484	2,253
July	4,647	2,418	2,229
August	4,379	2,211	2,168
September	3,894	1,896	1,998
October	3,947	1,953	1,994
November	3,653	1,746	1,907
December	4,535	2,301	2,234
Women 16 years and over—			
January	541	266	275
February	589	278	311
March	617	289	328
April	572	309	263
May	626	337	289
June	698	377	321
July	670	357	313
August	618	328	290
September	497	280	217
October	490	286	204
November	466	262	204
December	564	291	273
Children under 16 years—			
January	36	5	31
February	48	16	32
March	56	23	33
April	58	23	35
May	69	31	38
June	64	25	39
July	61	23	38
August	65	23	42
September	53	15	38
October	55	17	38
November	51	16	35
December	56	23	33
Miscellaneous expenses, total	$389,873	$231,376	$158,497
Rent of works	$2,615	$1,350	$1,265
Taxes	$28,267	$16,104	$12,163
Rent of offices, interest, insurance, and all other sundry expenses not hitherto included	$358,991	$213,922	$145,069

[1] Includes establishments distributed as follows: Indiana, 3; Maryland, 1; Michigan, 1; Missouri, 1; New York, 2; Ohio, 5; West Virginia, 4.

TABLE 20.—*Tin and terne plate—detailed summary, by states: 1905*—Continued.

	United States.	Pennsylvania.	All other states.
Materials used, aggregate cost	$31,375,714	$17,590,077	$13,785,637
Black plates or sheets for tinning—			
Total pounds	1,019,608,657	566,744,792	452,863,865
Total cost	$22,992,006	$12,934,377	$10,057,629
Domestic—			
Total pounds	1,019,524,757	566,660,892	452,863,865
Total cost	$22,988,237	$12,930,608	$10,057,629
Bessemer steel—			
Pounds	911,663,989	528,914,790	382,749,199
Cost	$20,734,710	$12,056,046	$8,678,664
Acid open-hearth steel—			
Pounds	19,343,920	13,038,320	6,305,600
Cost	$436,850	$296,870	$139,980
Basic open-hearth steel—			
Pounds	87,567,481	23,758,415	63,809,066
Cost	$1,789,855	$550,870	$1,238,985
Iron—			
Pounds	949,367	949,367	.....
Cost	$26,822	$26,822	.....
Foreign (iron)—			
Pounds	83,900	83,900	.....
Cost	$3,769	$3,769	.....
Pig tin—			
Pounds	24,243,851	13,796,949	10,446,902
Cost	$6,709,164	$3,800,156	$2,909,008
Pig lead—			
Pounds	8,201,253	3,012,247	5,189,006
Cost	$366,558	$132,935	$233,623
Palm oil—			
Pounds	6,628,526	3,582,475	3,046,051
Cost	$376,310	$202,321	$173,989
Sulphuric acid, tinning flux, bran and pink meal, etc	$180,011	$106,311	$73,700
Boxes and nails	$504,887	$291,458	$213,429
Fuel, total cost	$159,786	$73,376	$86,410
Anthracite coal and culm—			
Tons	3,240	3,120	120
Cost	$9,960	$9,360	$600
Bituminous coal and slack—			
Tons	50,560	19,562	30,998
Cost	$78,484	$28,959	$49,525
Natural gas	$56,998	$28,414	$28,584
Fuel used for power	$14,344	$6,643	$7,701
Mill supplies	$30,755	$15,333	$15,422
All other materials	$56,237	$33,810	$22,427
Products, total value	$35,283,360	$19,341,961	$15,941,399
Tin plates—			
Pounds	867,526,985	524,905,922	342,621,063
Value	$28,429,971	$16,547,120	$11,882,851
Terne plates—			
Pounds	158,857,866	58,693,218	100,164,648
Value	$6,119,572	$2,381,277	$3,738,295
Other sheet iron or sheet steel, tinned or terne plated, taggers tin, tinned stamped ware, etc.—			
Pounds	6,555,855	6,555,855	.....
Value	$217,476	$217,476	.....
All other products, including tin dross, scruff, scrap, etc.—			
Pounds	23,377,952	4,620,450	18,757,502
Value	$516,341	$196,088	$320,253
Equipment of tin plate and terne plate department:			
Number of completed tin or terne sets in works	598	321	277

TABLE 20.—*Tin and terne plate—detailed summary, by states: 1905*—Continued.

	United States.	Pennsylvania.	All other states.
Equipment of tin plate and terne plate department—Continued.			
Number of sets usually employed in coating tin plates	478	266	212
Number of sets usually employed in coating terne plates	120	55	65
Capacity of plant—			
Daily capacity of tinning department for producing bright tin plates, single turn, pounds	3,221,500	1,772,300	1,449,200
Daily capacity of works for producing terne plates, single turn, pounds	625,050	335,317	289,733
Black plate department of tin plate and terne plate establishments (not including detached black plate mills):			
Number of completed hot plate mills	315	196	119
Annual capacity of completed mills in finished black plates, in gross tons, on triple turn	707,405	462,208	245,197
Number of completed cold plate mills	272	164	108
Power:			
Number of establishments reporting power	20	12	8
Total horsepower	9,231	5,896	3,335
Owned—			
Engines—			
Steam—			
Number	39	31	8
Horsepower	8,878	5,793	3,085
Gas and gasoline—			
Number	1	.....	1
Horsepower	50	.....	50
Electric motors—			
Number	18	7	11
Horsepower	241	91	150
Rented—			
Electric motors—			
Number	3	3	.....
Horsepower	12	12	.....
Other kind, horsepower	50	.....	50

TABLE 21.—*Tin and terne plate—idle establishments—capital, capacity, and power: 1905.*

Number of establishments	[1] 5
Capital, total	$447,810
Land	$17,100
Buildings	$122,510
Machinery, tools, and implements	$291,914
Cash and sundries	$16,286
Daily capacity of plants, single turn:	
Tin plates, pounds	45,000
Terne plates, pounds	42,000
Power:	
Number of establishments reporting	3
Total horsepower owned	2,500
Engines, steam—	
Number	4
Horsepower	2,500

[1] Ohio, 4; West Virginia, 1.

COPPER, LEAD, AND ZINC, SMELTING AND REFINING

COPPER, LEAD, AND ZINC, SMELTING AND REFINING.

By Story B. Ladd.

The smelting and refining of ores was first treated as manufacturing at the census of 1870. Prior thereto the statistics for mining and the milling and smelting and refining of ores were combined, and no segregation was made of the statistics relating to mining and milling and those bearing on the manufacturing side of the industry. At the census of 1870 a separation of the industry was made, and the treatment of the ores after delivery from the mines was classed as manufacturing, but at the census of 1890 smelting and refining was reported as an adjunct to the mining industry, and no attempt was made to secure data in harmony with the returns secured from manufacturing establishments. Under the act of Congress for taking the Twelfth and subsequent censuses the smelting and refining of ores is considered a manufacturing industry, and a full presentation of the statistics for lead, copper, and zinc smelting and refining was made at the Twelfth Census.

It is possible to present statistics for the present census comparable with those of 1900, but not with those for censuses prior thereto.

Copper and lead ores constitute the medium through which the precious metals contained in the bulk of the dry ores reach the refineries. Copper and lead ores not only often carry gold and silver values, but gold and silver ores deficient in base metal, or "dry ores," so called, are smelted with lead or copper ores to facilitate the extraction of the precious metals from the dry ores. Hence the gold and silver products are relatively large and in the case of the argentiferous lead smelters they exceed the base metal values.

In order to show the total quantities and cost of ore and matte or crude metal treated and of finished products manufactured, the ores and matte or crude metal smelted and refined under contract are reported, both as to quantities and cost of materials and value of products, as if bought by the reporting establishments, and in addition the amounts received for contract smelting or refining are reported.

With the exception of the smelting of nickel, tungsten, and molybdenum ores, and the few products of electric smelting, the statistics herewith presented cover all data relating to the smelting of ores and the refining of the products, with the exception of those relating to iron, which will be found in the special report on iron and steel.

The period covered by this report is the calendar year 1904, or the business year of the establishment reporting which most nearly conforms thereto. At the census of 1900 the period covered was from June 1, 1899 to May 31, 1900. The short ton is used unless otherwise stated.

THE COMBINED INDUSTRY.

Table 1 is a summary of the leading statistics of the copper, lead, and zinc smelting and refining industries for 1900 and 1905, showing the combined totals and the per cent of increase for the five-year period for the combined industry and the several sections.

Table 1.—COPPER, LEAD, AND ZINC, SMELTING AND REFINING—COMPARATIVE SUMMARY, BY INDUSTRIES, WITH PER CENT OF INCREASE: 1905 AND 1900.

	TOTAL.		COPPER.		LEAD.		ZINC.		PER CENT OF INCREASE.			
	1905	1900	1905	1900	1905	1900	1905	1900	Total.	Copper.	Lead.	Zinc.
Number of establishments	103	117	40	47	32	39	31	31	[1]12.0	[1]14.9	[1]17.9	.....
Capital	$164,349,036	$139,354,138	$76,824,640	$53,063,395	$63,822,810	$72,148,933	$23,701,586	$14,141,810	17.9	44.8	[1]11.5	67.6
Salaried officials, clerks, etc., number	1,687	1,121	809	488	524	425	354	208	50.5	65.8	23.3	70.2
Salaries	$2,996,463	$2,150,018	$1,527,382	$954,905	$887,602	$754,913	$581,479	$440,200	39.4	60.0	17.6	32.1
Wage-earners, average number	26,853	24,512	12,752	11,324	7,573	8,319	6,528	4,869	9.6	12.6	[1]9.0	34.1
Total wages	$20,058,200	$15,973,626	$10,827,043	$8,529,021	$5,374,691	$5,088,684	$3,856,466	$2,355,921	25.6	26.9	5.6	63.7
Men 16 years and over	26,774	24,427	12,702	11,272	7,566	8,312	6,506	4,843	9.6	12.7	[1]9.0	34.3
Wages	$20,030,593	$15,944,937	$10,808,442	$8,509,895	$5,371,031	$5,086,704	$3,851,120	$2,348,338	25.6	27.0	5.6	64.0
Women 16 years and over	9	12	.....	4	7	.....	2	8	[1]25.0	.....	.....	[1]75.0
Wages	$4,284	$5,869	.....	$2,500	$3,660	.....	$624	$3,369	[1]27.0	.....	.....	[1]81.5
Children under 16 years	70	73	50	48	.....	7	20	18	[1]4.1	4.2	.....	11.1
Wages	$23,323	$22,820	$18,601	$16,626	.....	$1,980	$4,722	$4,214	2.2	11.9	.....	12.1
Miscellaneous expenses	$6,972,896	$3,088,007	$4,748,399	$1,522,325	$897,876	$1,166,210	$1,326,621	$399,472	125.8	211.9	[1]23.0	232.1
Cost of materials used	$382,723,480	$279,655,350	$196,736,986	$122,174,129	$168,958,076	$144,195,163	$17,028,418	$13,286,058	36.8	61.0	17.2	28.2
Value of products	$451,398,354	$358,786,472	$240,780,216	$165,131,670	$185,826,839	$175,466,304	$24,791,299	$18,188,498	25.8	45.8	5.9	36.3

[1] Decrease.

At the census of 1900 the lead smelting and refining industry was in the van, and copper occupied second place, but the positions have since been reversed.

The increase in capital in both the copper and zinc

industries is large, and proportionately the greater in the latter, whereas in the lead industry there is shown a decrease. The same holds true of the average number of wage-earners employed, the copper and zinc industries showing increased numbers, the largest increase being in the zinc industry, whereas the lead industry shows a decrease. With respect to the value of products both the actual and proportionate increase was greatest in the copper industry.

The following tabular statement shows the per cent of the total capital, wage-earners, and value of products, represented by the copper, lead, and zinc industries, for 1900 and 1905:

INDUSTRY.	1905			1900		
	Capital	Wage-earners.	Value of products.	Capital.	Wage-earners	Value of products.
Total	100.0	100.0	100.0	100.0	100.0	100.0
Copper	46.8	47.5	53.3	38.1	46.2	46.0
Lead	38.8	28.2	41.2	51.8	33.9	48.9
Zinc	14.4	24.3	5.5	10.1	19.9	5.1

The statistics for the zinc smelting industry show the straight growth of that industry. The statistics for the copper and lead smelting industries are, however, colored by the practice of smelting dry ores of the precious metals along with these base ores, and a large increase in the consumption of dry ores by copper smelters at the expense of the lead smelters has helped to swell the growth of the copper smelting and refining industry.

This is shown by the following statement, which gives the gold and silver production of the copper smelting and refining, and lead smelting and refining industries, for the censuses of 1900 and 1905, and shows also the copper product of the former industry, exclusive of Lake copper, and the lead product of the latter industry, exclusive of soft lead, which exclusions are made for the reason that dry ores, so called, are not smelted in conjunction with Lake copper ores or "mineral," or soft lead ores. The statement also gives the increase of the several products for the period 1900 to 1905, and the per cent of increase:

Copper and lead, smelting and refining—quantity of principal products, with amount and per cent of increase: 1905 and 1900.

KIND.	QUANTITY.				INCREASE.		PER CENT OF INCREASE.	
	Copper smelting and refining.		Lead smelting and refining.		Copper smelting and refining.	Lead smelting and refining.	Copper smelting and refining.	Lead smelting and refining.
	1905	1900	1905 [1]	1900				
Silver, ounces fine	28,115,790	13,229,911	71,920,997	70,420,917	14,885,879	1,500,080	112.5	2.1
Gold, ounces fine	636,207	224,352	2,543,757	2,514,836	411,855	28,921	183.6	1.2
Copper, not including Lake copper, pounds	728,620,468	444,654,289	.....	.....	283,966,179	.....	63.9	.....
Lead, not including soft lead, pounds	.....	.....	613,331,956	497,455,931	.....	115,876,025	.....	23.3

[1] Duplication on account of Doré bars reported both as materials and products deducted; contents of same 671,990 ounces of silver, 30,792 ounces of gold.

It will be seen that the increase in the gold and silver products of the copper smelting and refining industry was very large and greatly in excess of the increase in the related copper product, although the latter increase is in itself large, 63.9 per cent; whereas the gains in the gold and silver products of the lead smelting and refining industry are very small and fall far below that for the related lead product.

The following statement further illustrates the change in smelting conditions and shows the total gold and silver production of the copper and lead smelters and refineries for 1900 and 1905 and the per cent of the total contributed by each class:

INDUSTRY.	SILVER (OUNCES FINE).		GOLD (OUNCES FINE).		PER CENT OF TOTAL.			
					Silver.		Gold.	
	1905	1900	1905	1900	1905	1900	1905	1900
Total	100,036,787	83,650,828	3,179,964	2,739,188	100.0	100.0	100.0	100.0
Copper smelting and refining	28,115,790	13,229,911	636,207	224,352	28.1	15.8	20.0	8.2
Lead smelting and refining	71,920,997	70,420,917	2,543,757	2,514,836	71.9	84.2	80.0	91.8

The silver output of the lead refineries shows a decrease from 84.2 per cent of the total silver product of the copper and lead refineries in 1900 to 71.9 per cent of the total for 1905, and a decrease in the gold output for the same period from 91.8 per cent to 80 per cent; while on the other hand the copper refineries show very heavy proportional gains in both silver and gold.

The increase in the consumption of dry ores by copper smelters appears to be due in part to the development of electrolytic copper refining whereby gold and silver values are easily and cheaply recovered, and also to the fact that, in the rapid advance in the art of matte smelting, copper has proved to be on the whole a better absorbent of the precious metals than lead.

COPPER SMELTING AND REFINING.

The general statistics of the copper smelting industry are shown in Table 2 for 1905 in comparison with like statistics for 1900.

TABLE 2.—*Copper smelting and refining—comparative summary, with per cent of increase: 1905 and 1900.*

	CENSUS.		Per cent of increase.
	1905	1900	
Number of establishments	40	47	[1] 14.9
Capital	$76,824,640	$53,063,395	44.8
Salaried officials, clerks, etc., number	809	488	65.8
Salaries	$1,527,382	$954,905	60.0
Wage-earners, average number	12,752	11,324	12.6
Total wages	$10,827,043	$8,529,021	26.9
Men 16 years and over	12,702	11,272	12.7
Wages	$10,808,442	$8,509,895	27.0
Women 16 years and over	.....	4	.....
Wages	.....	$2,500	.....
Children under 16 years	50	48	4.2
Wages	$18,601	$16,626	11.9
Miscellaneous expenses	$4,748,399	$1,522,325	211.9
Cost of materials used	$196,736,986	$122,174,129	61.0
Value of products	$240,780,216	$165,131,670	45.8

[1] Decrease.

In addition to the active establishments shown in Table 2, there were 6 idle establishments reported at the census of 1905, located 1 each in Alaska, California, Colorado, Georgia, Montana, and Utah. The statistics are as follows:

TABLE 3.—*Copper smelting and refining—idle establishments: 1905.*

Number of establishments	6
Capital, total	$3,461,991
Land	$103,085
Buildings	$713,462
Machinery, tools, and implements	$663,976
Cash and sundries	$1,981,468
Power owned:	
Number of establishments reporting	5
Total horsepower	4,052
Engines—	
Steam—	
Number	15
Horsepower	3,060
Gas and gasoline—	
Number	3
Horsepower	128
Water wheels—	
Number	4
Horsepower	425
Water motors—	
Number	1
Horsepower	8
Electric motors—	
Number	17
Horsepower	431

At the census of 1900 there were 9 idle establishments with a capital of $371,320, located as follows: Arizona, 4; California, 1; Illinois, 1; and Nevada, 3.

The value of products as given in Table 2 is the aggregate of the products of all establishments, the smelters as well as the refineries, and such establishments as do both smelting and refining, and hence includes the duplication arising from the products of the smelters which appear as material for the refineries. The products of the refineries, or smelters combined with refineries, represent the finished products, the same including the product of the Lake ores.

The totals for the copper smelting industry as reported at the census of 1890 (Report on Mineral Industries), though too meager for comparison with later years, are given in Table 4.

TABLE 4.—*Copper smelting and refining: 1890.*

Capital, total	$4,037,593
Land	634,000
Buildings and fixtures	1,758,856
Tools, implements, etc	600,214
Cash, etc	1,044,523
Expenditures, total	1,885,261
Wages	800,484
Salaries	71,720
Paid contractors	19,591
Supplies and materials	737,098
Rent, interest, insurance, taxes, etc	256,368

In the absence of other statistics, the copper production can be taken as a gauge of the growth of the industry, and Table 5 shows the copper production from 1845 to 1904, inclusive.

The copper product of the United States for 1904, which is the year covered by the census of 1905, as reported to the United States Geological Survey, was 362,739 long tons. This includes the copper contents of blue vitriol and the copper product of lead smelters.

The refined copper product as reported at this census was 933,809,701 pounds, which is the copper product of the refineries and of the refineries combined with the smelters. (See Table 12.) There is included in this, however, a duplication of 23,829,109 pounds on account of material which, after treatment at some of the refineries, was sent for final treatment to others. To arrive at the copper product of the United States there is to be added the copper contents of the blue vitriol manufactured, estimated at one-fourth for copper contents, or 6,932,475 pounds; also the exports of copper in the form of matte, namely, 29,346,550 pounds, and further, there is to be deducted 91,743,719 pounds of refined copper produced from imported ore, matte, and pig copper. This gives 854,515,898 pounds as the product from mines located in the United States, or 381,480 long tons. Total quantity of Lake copper produced was 205,189,233 pounds.

The production of the smelters not connected with refineries contained 620,872,420 pounds of fine copper. This amount includes a duplication of 17,634,605 pounds, which represents the copper contents of matte shipped from certain of the smelters to others within the same class. After this duplication is eliminated the total product of the detached smelters contained 603,237,815 pounds of fine copper.

TABLE 5.—*Production of copper in the United States: 1845 to 1904.*[1]

YEAR.	Total (long tons).	LAKE SUPERIOR.		MONTANA.		ARIZONA.		ALL OTHER.	
		Quantity (long tons).	Per cent of total.	Quantity (long tons).	Per cent of total.	Quantity (long tons).	Per cent of total.	Quantity (long tons).	Per cent of total.
1904	362,739	92,995	25.6	133,168	36.7	85,537	23.6	51,039	14.1
1903	311,627	85,833	27.6	121,677	39.0	65,914	21.2	38,143	12.2
1902	294,423	76,165	25.9	128,955	43.8	54,547	18.2	35,736	12.1
1901	268,782	69,772	26.0	102,621	38.2	58,383	21.7	38,006	14.1
1900	270,588	64,958	24.0	120,865	44.7	52,820	19.5	31,965	11.8
1899	253,870	65,803	25.9	100,503	39.6	59,399	23.4	28,165	11.1
1898	235,050	66,291	28.2	92,041	39.2	49,624	21.1	27,094	11.5
1897	220,571	64,858	29.4	102,867	46.6	36,398	16.5	16,508	7.5
1896	205,384	64,073	31.2	99,071	48.2	32,560	15.9	9,680	4.7
1895	169,917	57,737	34.0	84,900	50.0	21,408	12.6	5,872	3.4
1894	158,120	51,031	32.3	81,729	51.7	19,873	12.5	5,487	3.5
1893	147,033	50,270	34.2	69,290	47.1	19,200	13.1	8,273	5.6
1892	154,018	54,999	35.7	72,800	47.3	17,160	11.1	8,999	5.9
1891	126,839	50,992	40.2	50,028	39.5	17,800	14.0	8,019	6.3
1890	115,966	45,273	39.0	50,437	43.5	15,534	13.4	4,722	4.1
1889	101,239	39,364	38.9	43,849	43.3	13,654	13.5	4,372	4.3
1888	101,054	38,604	38.2	43,704	43.3	14,195	14.0	4,551	4.5
1887	81,017	33,941	41.9	35,133	43.4	7,910	9.7	4,033	5.0
1886	70,430	36,124	51.3	25,362	36.0	6,990	9.9	1,954	2.8
1885	74,052	32,209	43.5	30,267	40.9	10,137	13.7	1,439	1.9
1884	64,708	30,961	47.8	19,256	29.8	11,935	18.4	2,556	4.0
1883	51,574	26,653	51.7	11,011	21.3	10,658	20.7	3,252	6.3
1882	40,467	25,439	62.9					15,028	37.1
1881	32,000	24,363	76.1					7,637	23.9
1880	27,000	22,204	82.2					4,796	17.8
1879	23,000	19,129	83.2					3,871	16.8
1878	21,500	17,719	82.4					3,781	17.6
1877	21,000	17,422	83.0					3,578	17.0
1876	19,000	17,085	89.9					1,915	10.1
1875	18,000	16,089	89.4					1,911	10.6
1874	17,500	15,327	87.6					2,173	12.4
1873	15,500	13,433	86.7					2,067	13.3
1872	12,500	10,961	87.7					1,539	12.3
1871	13,000	11,942	91.9					1,058	8.1
1870	12,600	10,992	87.2					1,608	12.8
1869	12,500	11,886	95.1					614	4.9
1868	11,600	9,346	80.6					2,254	19.4
1867	10,000	7,824	78.2					2,176	21.8
1866	8,900	6,138	69.0					2,762	31.0
1865	8,500	6,410	75.4					2,090	24.6
1864	8,000	5,576	69.7					2,424	30.3
1863	8,500	5,797	68.2					2,703	31.8
1862	9,000	6,065	67.4					2,935	32.6
1861	7,500	6,713	89.5					787	10.5
1860	7,200	5,388	74.8					1,812	25.2
1859	6,300	3,985	63.3					2,315	36.7
1858	5,500	4,088	74.3					1,412	25.7
1857	4,800	4,255	88.6					545	11.4
1856	4,000	3,666	91.7					334	8.3
1855	3,000	2,593	86.4					407	13.6
1854	2,250	1,819	80.8					431	19.2
1853	2,000	1,297	64.9					703	35.1
1852	1,100	792	72.0					308	28.0
1851	900	779	86.6					121	13.4
1850	650	572	88.0					78	12.0
1849	700	672	96.0					28	4.0
1848	500	461	92.2					39	7.8
1847	300	213	71.0					87	29.0
1846	150	26	17.3					124	82.7
1845	100	12	12.0					88	88.0

[1] United States Geological Survey, "Mineral Resources of the United States," 1904.

The following statement presents a comparison of the production of smelters and refineries:

	Pounds.
Total production of copper placed on the market	939,327,142
Production of smelters	603,237,815
Imported material treated by refineries in the United States	57,684,506
Total	660,922,321
Difference	278,404,821
	939,327,142

The total production of copper placed on the market is the refined copper product, less the duplication of 23,829,109 pounds above noted and plus the copper exported in the form of matte.

The difference between the product of the refineries on the one hand and the product of the smelters, together with imported material, on the other represents the production of pig copper by smelters connected with refineries. The total product of refined copper by the latter class of establishments was equal to 480,453,170 pounds, which can be classified as follows:

	Pounds.
Smelted and refined	278,404,821
Refined only	202,048,349
Total	480,453,170

Practically all of the copper matte product of the lead smelters, amounting to 51,617,670 pounds of contained copper, figures as material in the returns of the copper refineries, as also does 3,689,000 pounds of blister copper produced by an establishment engaged primarily in the manufacture of other products.

An estimate of the quantity of copper electrolytically refined is obtained by deducting from the total quantity placed on the market, the copper exported in the form of matte, and the Lake copper product less that portion of the latter which is electrolytically treated. This gives 754,693,459 pounds as the estimated production of electrolytic copper.

THE INDUSTRY, BY STATES AND TERRITORIES.

The general statistics, by states and territories, for the censuses of 1900 and 1905 are shown by Table 6.

All of the states and territories for which details can be presented show an increase in products with the exception of California. The statistics for Colorado and Montana are included under "all other states," and although there are in each state 3 or more establishments, the state details can not be given without disclosing individual operations, because two or more plants are owned by one corporation.

The very large increase for New Jersey in cost of materials used and value of products, along with a decrease in wage-earners, wages, and miscellaneous expenses, is due to the growth in electrolytic refining and decrease in smelting in the eastern establishments. This change in smelting and refining conditions will be further considered in treating of the eastern and western establishments.

TABLE 6.—COPPER SMELTING AND REFINING—COMPARATIVE SUMMARY, BY STATES AND TERRITORIES: 1905 AND 1900.

STATE OR TERRITORY.	Census.	Number of establishments.	Capital.	SALARIED OFFICIALS, CLERKS, ETC.		WAGE-EARNERS AND WAGES.		Miscellaneous expenses.	Cost of materials used.	Value of products.
				Number.	Salaries.	Average number.	Wages.			
United States	1905	40	$76,824,640	809	$1,527,382	12,752	$10,827,043	$4,748,399	$196,736,986	$240,780,216
	1900	47	53,063,395	488	954,905	11,324	8,529,021	1,522,325	122,174,129	165,131,670
Arizona	1905	7	9,340,839	107	218,402	2,349	2,050,409	828,097	12,486,782	22,761,981
	1900	9	7,265,659	80	140,621	1,648	1,276,759	266,548	6,370,884	17,286,517
California	1905	3	946,000	21	34,867	413	401,240	77,383	1,317,972	2,583,524
	1900	3	1,114,882	21	25,357	381	342,491	90,026	1,379,423	4,508,259
Colorado [1]	1900	3	2,308,309	30	59,765	410	315,958	11,547	3,385,113	3,893,034
Michigan	1905	3	2,378,315	37	50,763	650	454,943	407,119	18,807,701	21,222,217
	1900	3	1,523,407	17	25,500	462	364,647	33,685	16,754,220	17,340,041
Montana [1]	1900	7	26,824,298	107	233,711	4,290	3,791,983	556,852	20,556,336	36,387,063
New Jersey	1905	5	7,892,904	102	129,187	1,243	644,577	275,705	58,811,990	62,795,613
	1900	7	6,943,886	74	138,728	1,707	915,112	290,423	32,545,179	38,365,131
Utah [2]	1905	5	3,584,788	32	97,850	1,416	1,016,052	63,453	5,133,990	8,498,956
All other states	[3] 1905	17	52,681,794	510	996,313	6,681	6,259,822	3,096,642	100,178,542	122,917,925
	[4] 1900	15	7,082,954	159	331,223	2,426	1,522,091	273,244	41,182,974	47,351,625

[1] Included in "all other states" in 1905.
[2] Included in "all other states" in 1900.
[3] Includes establishments distributed as follows: Colorado, 3; Idaho, 1; Maryland, 1; Montana, 5; New York, 2; Oregon, 1; Tennessee, 2; Virginia, 1; Washington, 1.
[4] Includes establishments distributed as follows: Connecticut, 2; Illinois, 1; Maryland, 1; Nevada, 1; New Mexico, 1; New York, 2; Ohio, 1; South Dakota, 1; Tennessee, 1; Utah, 2; Virginia, 1; Washington, 1.

Table 7 presents the comparative statistics for 1900 and 1905 of the establishments located east and west of the Mississippi river, with their respective per cents of increase.

TABLE 7.—COPPER SMELTING AND REFINING—COMPARATIVE SUMMARY OF ESTABLISHMENTS, BY LOCATION, EAST AND WEST OF THE MISSISSIPPI RIVER, WITH PER CENT OF INCREASE: 1905 AND 1900.

	TOTAL.		EAST OF THE MISSISSIPPI.		WEST OF THE MISSISSIPPI.		PER CENT OF INCREASE.		
	1905	1900	1905	1900	1905	1900	Total.	East.	West.
Number of establishments	40	47	14	19	26	28	[1] 14.9	[1] 26.3	[1] 7.1
Capital	$76,824,640	$53,063,395	$20,444,672	$13,680,563	$56,379,968	$39,382,832	44.8	49.4	43.2
Salaried officials, clerks, etc., number	809	488	280	226	529	262	65.8	23.9	101.9
Salaries	$1,527,382	$954,905	$454,339	$416,981	$1,073,043	$537,924	60.0	9.0	99.5
Wage-earners, average number	12,752	11,324	4,422	4,083	8,330	7,241	12.6	8.3	15.0
Total wages	$10,827,043	$8,529,021	$2,567,758	$2,323,370	$8,259,285	$6,205,651	26.9	10.5	33.1
Miscellaneous expenses	$4,748,399	$1,522,325	$1,321,363	$551,228	$3,427,036	$971,097	211.9	139.7	252.9
Materials used, total cost	$196,736,986	$122,174,129	$139,182,413	$86,840,595	$57,554,573	$35,333,534	61.0	60.3	62.9
Ores and concentrates—									
Tons	7,361,473	4,524,033	566,530	156,256	6,794,943	4,367,777	62.7	262.6	55.6
Cost	$60,402,094	$25,190,522	$19,588,436	$733,622	$40,813,658	$24,456,900	139.8	2,570.1	66.9
Matte, purchased—									
Tons	29,265	53,664	8,608	49,229	20,657	4,735	145.8	[1] 82.5	336.3
Cost	$4,135,742	$10,513,431	$633,458	$9,767,037	$3,502,284	$746,394	[1] 60.7	[1] 93.5	369.2
Blister or anodes, purchased—									
Tons	372,607	318,102	372,607	318,102	.....	.....	17.1	17.1	.....
Cost	$111,248,191	$72,401,654	$111,248,191	$72,401,654	.....	.....	53.7	53.7	.....
All other materials	$20,950,959	$14,068,522	$7,712,328	$3,938,282	$13,238,631	$10,130,240	48.9	95.8	30.7
Products, aggregate value	$240,780,216	$165,131,670	$151,034,048	$97,832,016	$89,746,168	$67,299,654	45.8	54.4	33.4
Smelting, total value	$88,374,830	$54,275,173	$620,272	$1,140,140	$87,754,558	$53,135,033	62.8	[1] 45.6	65.2
Copper (in matte, blister or anodes)—									
Pounds	620,872,420	334,679,443	5,334,097	6,570,418	615,538,323	328,109,025	85.5	[1] 18.8	87.6
Value	$69,606,496	$43,365,047	$604,246	$898,462	$69,002,250	$42,466,585	60.5	[1] 32.8	62.5
Silver—									
Ounces fine	21,945,304	8,866,472	6,708	305,487	21,938,596	8,560,985	147.5	[1] 97.8	156.2
Value	$12,274,779	$5,020,050	$3,826	$172,033	$12,270,953	$4,848,017	144.5	[1] 97.8	153.1
Gold—									
Ounces fine	321,747	300,914	610	3,486	321,137	297,428	6.9	[1] 82.5	8.0
Value	$6,493,555	$5,890,076	$12,200	$69,645	$6,481,355	$5,820,431	10.2	[1] 82.5	11.4
Refining, including smelting and refining, total value	$149,711,214	$107,635,247	$147,949,700	$93,470,626	$1,761,514	$14,164,621	39.1	58.3	[1] 87.6
Ingots, bars, wire, etc.—									
Pounds	933,809,701	602,595,113	932,849,931	507,190,645	959,770	95,404,468	55.0	83.9	[1] 99.0
Value	$119,420,862	$94,061,667	$119,294,238	$81,871,103	$126,624	$12,190,564	27.0	45.7	[1] 99.0
Blue vitriol—									
Pounds	27,729,900	27,298,926	27,673,749	26,017,613	56,151	1,281,313	1.6	63.7	[1] 95.6
Value	$1,120,368	$1,225,745	$1,117,593	$1,178,208	$2,775	$47,537	[1] 8.6	[1] 5.1	[1] 94.2
Silver—									
Ounces fine	28,115,790	13,229,911	27,633,444	10,203,023	482,346	3,026,888	112.5	170.8	[1] 84.1
Value	$16,034,886	$7,790,985	$15,754,560	$6,076,707	$280,326	$1,714,278	105.8	159.3	[1] 83.6
Gold—									
Ounces fine	636,207	224,352	570,149	213,740	66,058	10,612	183.6	166.7	522.5
Value	$13,135,098	$4,556,850	$11,783,309	$4,344,608	$1,351,789	$212,242	188.2	171.2	536.9
All other products	$2,694,172	$3,221,250	$2,464,076	$3,221,250	$230,096	.....	[1] 16.4	[1] 23.5	.....

[1] Decrease.

Table 7 shows the growth and concentration of the refining industry in the east which has been a marked feature of the copper industry for the last few years. The following statement shows the percentages of the total capital, wage-earners, cost of materials, and value of products represented by the eastern and western establishments for 1900 and 1905, and illustrates the changes in smelting and refining conditions:

	EAST OF THE MISSISSIPPI.		WEST OF THE MISSISSIPPI.	
	1905	1900	1905	1900
Capital	26.6	25.8	73.4	74.2
Wage-earners	34.7	36.1	65.3	63.9
Cost of materials used	70.7	71.1	29.3	28.9
Value of products	62.7	59.2	37.3	40.8
Smelting	0.7	2.1	99.3	97.9
Refining, including smelting and refining	98.8	86.8	1.2	13.2

It will be seen that the proportionate share of the refining done for 1905 by the establishments west of the Mississippi was but one-eleventh of what it was for 1900, and practically all of the refining was done in the east. The operations of the western establishments are now confined almost entirely to smelting, with, in a majority of cases, the conversion of the matte into blister copper, which is electrolytically refined in the east.

The eastern establishments show an increase in capital and value of products proportionally greater than the western establishments, with a slight decrease in proportionate share of cost of materials used and in average number of wage-earners.

The statistics, for 1905, of the refineries handling the Lake Superior product, the same including, however, the expense pertaining to the refining of 9,000 tons of Montana anodes not separable from the rest of the expense, are as follows:

Refining Lake Superior mineral: 1905.

Expenditures, total	$1,697,943
Wages	$606,487
Superintendence	$74,104
Fuel	$367,457
Supplies and materials, not including cost of "mineral"	$204,997
Rent, interest, insurance, etc	$444,898
"Mineral" treated, tons	164,756
Refined copper product, pounds	205,189,233

The mineral treated averaged 62.3 per cent copper as against 65.1 per cent for 1900, the decrease in average grade being due to the increase in utilization by concentration of the finer slimes of the stamp mills. If the Montana anodes which were refined are figured at par with the Lake copper, in order to give an approximation to the average cost of refining, it gives 0.761 of a cent as the average expenditure per pound of refined copper, as compared with 0.591 of a cent deduced at the census of 1900.

MATERIALS USED.

Table 8 exhibits the quantity and the cost of materials used, by kind, for the years 1900 and 1905, with the number of establishments reporting.

TABLE 8.—*Copper smelting and refining—materials used, by kind, quantity, and cost, with number of establishments reporting: 1905 and 1900.*

KIND.	Census.	Number of establishments reporting.	Tons.	Cost.
Total	1905	40	.....	$196,736,986
	1900	47	.....	122,174,129
Ores and concentrates	1905	34	7,361,473	60,402,094
	1900	33	4,524,033	25,190,522
Matte, purchased	1905	9	29,265	4,135,742
	1900	11	53,964	10,513,431
Blister or anodes, purchased	1905	9	372,607	111,248,191
	1900	13	318,102	72,401,654
All other materials, including fuel, mill supplies, etc.	1905	.....	.....	20,950,959
	1900	.....	.....	14,068,522

The consumption of ore shows an increase of 62.7 per cent in quantity, and blister or anodes, purchased, an increase of 17.1 per cent, while matte, purchased, shows a decrease of 45.8 per cent. The decrease in matte, purchased, is due to the more general use by the smelters of the Bessemerizing process and the conversion of their matte into blister copper, which is electrolytically refined by the refineries with a recovery of the precious metals contained in the crude copper.

Of the ores and concentrates consumed by all classes of smelters, 6,123,770 tons, valued at $38,884,183, were from mines operated by the same owners, and 1,237,703 tons, valued at $21,517,911, were purchased.

The consumption of copper yielding materials, by states, for the census years 1900 and 1905, is shown by Table 9.

TABLE 9.—*Copper smelting and refining—principal materials used by kind and quantity, and by states and territories: 1905 and 1900.*

STATE OR TERRITORY.	Census.	Ores and concentrates (tons).	Matte, purchased (tons).	Blister, or anodes purchased (tons).
United States	1905	7,361,473	29,265	372,607
	1900	4,524,033	53,964	318,102
Arizona	1905	1,231,468	3,349	.....
	1900	842,959	1,583	.....
California	1905	270,006	.....	.....
	1900	250,041	22	.....
Michigan	1905	[1] 128,119	.....	9,000
	1900	.....	.....	[1] 93,914
New Jersey	1905	345	2,796	169,435
	1900	4,218	33,351	81,611
Utah	1905	744,929	5,488	.....
	1900	73,127	.....	.....
All other states	[2] 1905	4,986,606	17,632	194,172
	[3] 1900	3,353,688	19,008	142,577

[1] "Mineral."
[2] Includes states as follows: Colorado, Idaho, Maryland, Montana, New York, Oregon, Tennessee, Virginia, Washington.
[3] Includes states as follows: Colorado, Connecticut, Illinois, Maryland, Montana, Nevada, New Mexico, New York, South Dakota, Tennessee, Virginia, Washington.

The Western states consumed 6,794,943 tons of ore, or 92.3 per cent of the total quantity, as compared with 4,367,777 tons, or 96.5 per cent, for 1900. Montana ranked first for 1905 with nearly six-tenths of the total

quantity of ores and concentrates smelted as compared with a little over six-tenths of the total quantity for 1900. As the details for Montana can not be shown in the general tables, on account of the ownership of all establishments by less than 3 corporations, the statistics for the state are included in "all other states" in all tables. Arizona was second with 16.7 per cent of the ores smelted for 1905 as compared with 18.6 per cent of all ores for 1900; Utah, third with 10.1 per cent; Tennessee, fourth; and California, which ranked third for 1900, fifth with 3.7 per cent. The refineries in New Jersey, New York, and Maryland make these states the largest consumers of matte and blister copper or anodes.

There were 24 establishments which reported only a consumption of ore for 1905 as compared with 26 in 1900; 6 which reported only matte and blister copper or anodes for 1905, as compared with 13 for 1900, and 10 which used both classes of material. Table 10 gives the comparative statistics, for 1900 and 1905, of all establishments according to this grouping, with the per cent of increase.

TABLE 10.—COPPER SMELTING AND REFINING—ESTABLISHMENTS CLASSIFIED ACCORDING TO KIND OF MATERIALS USED: 1905 AND 1900.

	TOTAL.		ESTABLISHMENTS USING ORES ONLY.		ESTABLISHMENTS USING MATTE AND BLISTER OR ANODES ONLY.		ALL OTHER ESTABLISHMENTS.		PER CENT OF INCREASE.			
	1905	1900	1905	1900	1905	1900	1905	1900	Total.	Ores only.	Matte and blister or anodes only.	All other.
Number of establishments	40	47	24	26	6	13	10	8	[1] 14.9	[1] 7.7	[1] 53.8	25.0
Capital	$76,824,640	$53,063,395	$45,536,164	$35,973,221	$9,430,804	$9,232,105	$21,857,672	$7,858,069	44.8	26.6	2.2	178.2
Salaried officials, clerks, etc., number	809	488	488	239	134	124	187	125	65.8	104.2	8.1	49.6
Salaries	$1,527,382	$954,905	$971,628	$494,695	$204,817	$211,031	$350,937	$249,179	60.0	96.4	[1] 2.9	40.8
Wage-earners, average number	12,752	11,324	6,806	6,399	2,043	2,344	3,903	2,581	12.6	6.4	[1] 12.8	51.2
Total wages	$10,827,043	$8,529,021	$6,753,996	$5,586,784	$1,091,025	$1,393,006	$2,982,022	$1,549,231	26.9	20.9	[1] 21.7	92.5
Miscellaneous expenses	$4,748,399	$1,522,325	$3,521,146	$938,139	$297,406	$192,272	$929,847	$391,914	211.9	275.3	54.7	137.3
Materials used, total cost	$196,736,986	$122,174,129	$52,017,764	$32,028,770	$78,660,651	$74,103,544	$66,058,571	$16,041,815	61.0	62.4	6.1	311.8
Ores and concentrates—												
Tons	7,361,473	4,524,033	6,070,017	4,143,865	.....	.....	1,291,456	380,168	62.7	46.5	.....	239.7
Cost	$60,402,094	$25,190,522	$41,025,045	$22,858,610	.....	.....	$19,377,049	$2,331,912	139.8	79.5	.....	731.0
Matte and blister or anodes, purchased—												
Tons	401,872	372,066	.....	.....	229,624	316,792	172,248	55,274	8.0	.....	[1] 27.5	211.6
Cost	$115,383,933	$82,915,085	.....	.....	$77,438,166	$72,300,591	$37,945,767	$10,614,494	39.2	.....	7.1	257.5
All other materials	$20,950,959	$14,068,522	$10,992,719	$9,170,160	$1,222,485	$1,802,953	$8,735,755	$3,095,409	48.9	19.9	[1] 32.2	182.2
Products, aggregate value	$240,780,216	$165,131,670	$80,107,081	$58,892,793	$83,442,793	$82,438,564	$77,230,342	$23,800,313	45.8	36.0	1.2	224.5
Smelting, total value	$88,374,830	$54,275,173	$69,562,830	$44,775,709	.....	.....	$18,812,000	$9,499,464	62.8	55.4	.....	98.0
Copper (in matte and blister or anodes)—												
Pounds	620,872,420	334,679,443	493,907,472	271,615,580	.....	.....	126,964,948	63,063,863	85.5	81.8	.....	101.3
Value	$69,606,496	$43,365,047	$55,564,588	$34,681,445	.....	.....	$14,041,908	$8,683,602	60.5	60.2	.....	61.7
Silver—												
Ounces fine	21,945,304	8,866,472	17,073,451	7,906,717	.....	.....	4,871,853	959,755	147.5	115.9	.....	407.6
Value	$12,274,779	$5,020,050	$9,485,759	$4,456,251	.....	.....	$2,789,020	$563,799	144.5	112.9	.....	394.7
Gold—												
Ounces fine	321,747	300,914	224,168	281,981	.....	.....	97,579	18,933	6.9	[1] 20.5	.....	415.4
Value	$6,493,555	$5,890,076	$4,512,483	$5,638,013	.....	.....	$1,981,072	$252,063	10.2	[1] 20.0	.....	685.9
Refining, including smelting and refining, total value	$149,711,214	$107,635,247	$10,314,155	$14,117,084	$80,978,717	$80,890,954	$58,418,342	$12,627,209	39.1	[1] 26.9	0.1	362.6
Ingots, bars, wire, etc.—												
Pounds	933,809,701	602,595,113	68,315,799	95,404,468	453,437,635	442,307,615	412,056,267	64,883,030	55.0	[1] 28.4	2.5	535.1
Value	$119,420,862	$94,061,667	$8,686,013	$12,190,564	$59,240,027	$71,652,928	$51,494,822	$10,218,175	27.0	[1] 28.7	[1] 17.3	404.0
Blue vitriol—												
Pounds	27,729,900	27,298,926	56,151	.....	7,645,949	13,017,613	20,027,800	14,281,313	1.6	.....	[1] 41.3	40.2
Value	$1,120,368	$1,225,745	$2,775	.....	$306,800	$578,268	$810,733	$647,537	[1] 8.6	.....	[1] 46.9	25.2
Silver—												
Ounces fine	28,115,790	13,229,911	472,045	3,026,888	23,039,687	9,555,948	4,604,058	647,075	112.5	[1] 84.4	141.1	611.5
Value	$16,034,886	$7,790,985	$274,660	$1,714,278	$13,163,234	$5,688,470	$2,596,992	$388,237	105.8	[1] 84.0	131.4	568.9
Gold—												
Ounces fine	636,207	224,352	66,004	10,612	400,058	145,066	170,145	68,674	183.6	522.0	175.8	147.8
Value	$13,135,098	$4,556,850	$1,350,707	$212,242	$8,268,596	$2,971,348	$3,515,795	$1,373,260	188.2	536.4	178.3	156.0
All other products	$2,694,172	$3,221,250	$230,096	.....	$2,464,076	$1,547,610	.....	$1,673,640	[1] 16.4	.....	59.2	.....

[1] Decrease.

Of the establishments which used ore only, 21 were smelters alone and 3 produced refined products. This group of establishments consumed 6,070,017 tons of ore, as compared with 4,143,865 tons for 1900, an increase of 46.5 per cent, and their products were 34,158 tons of refined copper, as compared with 47,702 tons for 1900; 246,954 tons of copper in matte and blister or anodes, as compared with 135,808 tons for 1900; 17,545,496 ounces of silver, as compared with 10,933,605 ounces for 1900; and 290,172 ounces of gold, as compared with 292,593 ounces for 1900.

The proportions which the different items of expenditures, viz, salaries, wages, miscellaneous expenses, and cost of materials, are of the total expense in the several groups of establishments may be deduced for comparative purposes. Table 11 shows, for 1900 and 1905, each item of cost and the percentage which it forms of the total cost for each of the foregoing groups or classes of establishments.

TABLE 11.—COPPER SMELTING AND REFINING—SALARIES, WAGES, MISCELLANEOUS EXPENSES, AND COST OF MATERIALS FOR ESTABLISHMENTS CLASSIFIED ACCORDING TO KIND OF MATERIALS USED, WITH PER CENT WHICH EACH ITEM FORMS OF TOTAL: 1905 AND 1900.

	Census.	TOTAL.		ESTABLISHMENTS USING ORES ONLY.		ESTABLISHMENTS USING MATTE AND BLISTER OR ANODES ONLY.		ALL OTHER ESTABLISHMENTS.	
		Amount.	Per cent of total.	Amount.	Per cent of total.	Amount.	Per cent of total.	Amount.	Per cent of total.
Total	1905	$213,839,810	100.0	$63,264,534	100.0	$80,253,899	100.0	$70,321,377	100.0
	1900	133,180,380	100.0	39,048,388	100.0	75,899,853	100.0	18,232,139	100.0
Salaries	1905	1,527,382	0.7	971,628	1.5	204,817	0.2	350,937	0.5
	1900	954,905	0.7	494,695	1.3	211,031	0.3	249,179	1.4
Wages	1905	10,827,043	5.1	6,753,996	10.7	1,091,025	1.4	2,982,022	4.3
	1900	8,520,021	6.4	5,586,784	14.3	1,393,006	1.8	1,549,231	8.5
Miscellaneous expenses	1905	4,748,399	2.2	3,521,146	5.6	297,406	0.4	929,847	1.3
	1900	1,522,325	1.2	938,139	2.4	192,272	0.3	391,914	2.1
Cost of materials used	1905	196,736,986	92.0	52,017,764	82.2	78,660,651	98.0	66,058,571	93.9
	1900	122,174,129	91.7	32,028,770	82.0	74,103,544	97.6	16,041,815	88.0

In each group the proportionate share of the expense represented by labor has decreased, the decrease being relatively the largest in the group designated as "all other establishments," which are establishments that use both ores and matte, or blister copper, and in general do both smelting and refining. The labor factor is largest in establishments using ore only and smallest in the establishments using matte and blister or anodes only. Naturally the cost of materials used forms the largest proportionate share of the expense in the group of establishments which chiefly refine, a less per cent in the group using all classes of materials, and a still less per cent of the total in the group using ores only.

PRODUCTS.

The quantities and values of the products of the smelters and refineries, with the number of establishments producing each respective product, are shown in detail in Table 12 for the censuses of 1900 and 1905.

The fine copper contents of matte does not include matte produced as an intermediate product, but only matte produced and sold as such. The matte product of the smelters shows a decrease of 55,890,358 pounds in copper contents, or 40.6 per cent, for the period 1900 to 1905, while the copper product of smelters in form of blister copper or anodes increased 342,083,335 pounds, or 173.6 per cent. The change, as before noted, is due to the more extended use of converters and the Bessemerizing process. In 1900 there were 21 smelters which sold their product, in whole or in part, in the form of matte, while for 1905 there were only 12.

The smelting of 21,945,304 ounces of silver was reported by 23 copper smelting establishments for 1905, compared with 8,866,472 ounces of silver by 25 establishments in 1900; and 321,747 ounces of gold by 22 establishments for 1905, as against 300,914 ounces of gold by 23 establishments in 1900.

TABLE 12.—*Copper smelting and refining—products, by kind, quantity, and value, with number of establishments reporting: 1905 and 1900.*

KIND.	Census.	Number of establishments reporting.	PRODUCTS.		
			Unit of measure.	Quantity.	Value.
Aggregate value	1905	.....	.....	.....	$240,780,216
	1900	.....	.....	.....	165,131,670
Smelting, total value	1905	.....	.....	.....	88,374,830
	1900	.....	.....	.....	54,275,173
Fine copper contents of blister or anodes	1905	15	Pound	539,140,069	60,163,414
	1900	15	Pound	197,056,734	25,853,917
Fine copper contents of matte.	1905	12	Pound	81,732,351	9,443,082
	1900	21	Pound	137,622,709	17,511,130
Silver	1905	23	Ounce fine	21,945,304	12,274,779
	1900	25	Ounce fine	8,866,472	5,020,050
Gold	1905	22	Ounce fine	321,747	6,493,555
	1900	23	Ounce fine	300,914	5,890,076
Refining, total value	1905	.....	.....	.....	149,711,214
	1900	.....	.....	.....	107,635,247
Ingots, wire, bars, etc.	1905	13	Pound	933,809,701	119,420,862
	1900	18	Pound	602,595,113	94,061,667
Blue vitriol	1905	5	Pound	27,729,900	1,120,368
	1900	7	Pound	27,298,926	1,225,745
Silver	1905	9	Ounce fine	28,115,790	16,034,886
	1900	11	Ounce fine	13,229,911	7,790,985
Gold	1905	7	Ounce fine	636,207	13,135,098
	1900	10	Ounce fine	224,352	4,556,850
All other products	1905	.....	.....	.....	2,694,172
	1900	.....	.....	.....	3,221,250

There were 9 refineries, or smelters and refineries combined, for 1905 which reported a product of 28,115,790 ounces of silver, as compared with 11 refineries in 1900, with 13,229,911 ounces of silver; and 7 reported 636,207 ounces of gold, as compared with 10

establishments, with a product of 224,352 ounces of gold in 1900.

There are two commercial methods of handling the materials shipped for treatment to smelters and refineries—they are either bought outright or treated on a toll basis. The cost of materials and the quantity and value of products shown in the present report combine both classes of materials—those bought and sold, as well as those treated on toll. The value of the products of materials treated on toll was estimated on the basis of the average prices reported by other establishments in the same locality, and the cost of materials was determined by deducting from the estimated value of the products the tolls received for treating them. The following statement shows the comparative prevalence of each method:

	COPPER PRODUCTION.		
	Total (pounds).	Returned to patrons (pounds).	Sold (pounds).
Smelters only	620,872,420	2,942,600	617,929,820
Refineries, with or without smelters	933,809,701	596,329,663	337,480,038

For 1905 there was received by the smelters $117,680 on account of contract smelting, as against $293,961 in 1900, and by the refineries or smelters and refineries the sum of $4,806,039, as against $3,452,855 in 1900; a total of $4,923,719 for 1905 as compared with a total of $3,746,816 in 1900, or an increase of 31.4 per cent.

Table 13 shows the quantities of each product for the two branches of the industry—smelting and refining—by states, for the censuses of 1900 and 1905.

TABLE 13.—COPPER SMELTING AND REFINING—PRINCIPAL PRODUCTS, BY KIND AND QUANTITY, AND BY STATES AND TERRITORIES: 1905 AND 1900.

STATE OR TERRITORY.	Census.	SMELTING.				REFINING.			
		Fine copper contents of blister or anodes (pounds).	Fine copper contents of matte (pounds).	Silver (ounces fine).	Gold (ounces fine).	Ingots, wire, bars, etc. (pounds).	Blue vitriol (pounds).	Silver (ounces fine).	Gold (ounces fine).
United States	1905	539,140,069	81,732,351	21,945,304	321,747	933,809,701	27,729,909	28,115,790	636,207
	1900	197,056,734	137,622,709	8,866,472	300,914	602,595,113	27,298,926	13,229,911	224,352
Arizona	1905	172,015,713	15,577,539	1,371,762	37,629	.....	(1)	.....	.....
	1900	75,127,116	52,832,952	711,373	18,074	.....	(1)	.....	.....
California	1905	17,010,365	2,561,660	558,883	14,550	.....	.....	.....	.....
	1900	84,000	25,863,637	427,315	23,328	.....	.....	.....	.....
Michigan	1905	.....	.....	.....	.....	173,287,133	.....	9,000	.....
	1900	.....	.....	.....	.....	102,001,189	.....	.....	.....
New Jersey	1905	.....	.....	.....	.....	332,855,640	7,645,949	19,241,470	356,700
	1900	2,930,000	.....	301,800	3,453	170,326,925	1,818,272	7,594,285	150,949
Utah	1905	37,092,778	2,741,302	3,363,431	109,270	.....	.....	.....	.....
	1900	6,139,757	.....	88,202	7,625	.....	.....	.....	.....
All other states	[2] 1905	313,021,213	60,851,850	16,651,228	160,298	427,666,928	20,083,951	8,865,320	279,507
	[3] 1900	112,775,861	58,926,120	7,337,782	248,434	330,265,999	25,480,654	5,635,626	73,403

[1] Included in "all other states."
[2] Includes states as follows: Colorado, Idaho, Maryland, Montana, New York, Oregon, Tennessee, Virginia, Washington.
[3] Includes states as follows: Colorado, Connecticut, Illinois, Maryland, Montana, Nevada, New Mexico, New York, South Dakota, Tennessee, Virginia, Washington.

The state of New Jersey continues to be the largest producer of refined copper with a large gain in its proportion of the total, its product constituting 35.6 per cent of the total in 1905 and 28.3 per cent in 1900. The refining industry in the state of New York has also made a very heavy advance, so that the states of New Jersey and New York refined nearly two-thirds of the copper product of the country. Michigan was third and Maryland fourth.

The states west of the Mississippi river produced 615,538,323 pounds of the fine copper contents of blister or anodes and matte, out of the total of 620,872,420 pounds, or 99.1 per cent, compared with 98 per cent in 1900.

PROCESS EMPLOYED—SMELTING, REFINING, AND SMELTING AND REFINING.

Table 14 presents the comparative statistics for 1900 and 1905 for the establishments grouped according to process employed—those doing smelting only, those doing refining only, and those doing both smelting and refining—with the per cent of increase for each group.

A comparison of the statistics shows a movement toward a separation of smelting and refining. There was a decrease of 36.2 per cent in the capital invested in refineries and in smelters combined with refineries, and an increase of 185.6 per cent in the capital invested in smelters; and the average number of wage-earners

employed by refineries and by smelters combined with refineries shows a decrease from 7,121 for 1900 to 4,327 for 1905, or 39.2 per cent, while the average number of wage-earners employed by smelters only has increased 100.5 per cent. The movement toward a separation of the two branches of the industry is further shown by the materials used. In 1900 the refineries and the smelters combined with refineries handled 2,403,547 tons of ore, costing $12,849,737, or an average of $5.35 per ton, and the establishments doing smelting only handled 2,120,486 tons of ore of an average cost of $5.82 per ton. For 1905, however, the smelters combined with refineries handled 461,022 tons of ore of an average cost of $45.12 per ton and the detached smelters 6,900,451 tons of an average cost of $5.74 per ton. That is, an increasing proportion of the smelting is being done by establishments which do smelting only, and the ores that go to establishments doing smelting and refining are high-grade ores or concentrates.

TABLE 14.—COPPER SMELTING AND REFINING—ESTABLISHMENTS CLASSIFIED ACCORDING TO PROCESS EMPLOYED: 1905 AND 1900.

	TOTAL.		SMELTING.		REFINING.		SMELTING AND REFINING.		PER CENT OF INCREASE.			
	1905	1900	1905	1900	1905	1900	1905	1900	Total.	Smelting.	Refining.	Smelting and refining.
Number of establishments	40	47	27	27	5	15	8	5	[1]14.9	.....	[1]66.7	60.0
Capital	$76,824,640	$53,063,395	$55,337,938	$19,375,065	$9,300,804	$12,166,962	$12,185,898	$21,521,368	44.8	185.6	[1]23.6	[1]43.4
Salaried officials, clerks, etc., number	869	488	525	221	133	180	151	87	65.8	137.6	[1]26.1	73.6
Salaries	$1,527,382	$954,905	$1,052,370	$435,784	$202,317	$335,526	$272,695	$183,595	60.0	141.5	[1]39.7	48.5
Wage-earners, average number	12,752	11,324	8,425	4,203	2,041	3,213	2,286	3,908	12.6	100.5	[1]36.5	[1]41.5
Total wages	$10,827,043	$8,529,021	$8,220,168	$3,576,429	$1,089,025	$1,895,705	$1,517,850	$3,056,887	26.9	129.8	[1]42.6	[1]50.3
Miscellaneous expenses	$4,748,399	$1,522,325	$3,393,795	$621,573	$296,406	$388,243	$1,058,198	$512,509	211.9	446.0	[1]23.7	106.5
Materials used, total cost	$196,736,086	$122,174,129	$56,344,453	$18,558,130	$78,648,531	$80,268,059	$61,744,002	$23,347,940	61.0	203.6	[1]2.0	164.4
Ores and concentrates—												
Tons	7,361,473	4,524,033	6,900,451	2,120,486	.....	54,099	461,022	2,349,448	62.7	225.4	.....	[1]80.4
Cost	$60,402,664	$25,190,522	$39,660,927	$12,340,785	.....	$477,004	$20,801,167	$12,372,733	139.8	220.9	.....	68.1
Matte and blister or anodes—												
Tons	401,872	372,066	20,657	3,250	229,504	349,681	151,711	19,135	8.0	535.6	[1]34.4	692.8
Cost	$115,383,933	$82,915,085	$3,502,284	$621,393	$77,428,166	$77,713,691	$34,453,483	$4,580,001	39.2	463.6	[1]0.4	652.3
All other materials	$20,950,959	$14,068,522	$13,241,242	$5,595,952	$1,220,365	$2,077,364	$6,489,352	$6,395,206	48.9	136.6	[1]41.3	1.5
Products, aggregate value	$240,780,216	$165,131,670	$88,374,830	$38,173,276	$83,427,613	$90,168,236	$68,977,773	$36,790,158	45.8	131.5	[1]7.5	87.5
Smelting, total value	$88,374,830	$54,275,173	$88,374,830	$38,173,276	.....	.....	(2)	$16,101,897	62.8	131.5	.....	.....
Fine copper contents of blister or anodes—												
Pounds	539,140,069	197,056,734	539,140,069	88,263,325	.....	.....	(2)	108,793,409	173.6	510.8	.....	.....
Value	$60,163,414	$25,853,917	$60,163,414	$11,623,280	.....	.....	.....	$14,230,637	132.7	417.6	.....	.....
Fine copper contents of matte—												
Pounds	81,732,351	137,622,709	81,732,351	137,359,799	.....	.....	(2)	262,910	[1]40.6	[1]40.5	.....	.....
Value	$9,443,082	$17,511,130	$9,443,082	$17,472,588	.....	.....	.....	$38,542	[1]46.1	[1]46.0	.....	.....
Silver—												
Ounces fine	21,945,304	8,860,472	21,945,304	5,995,892	.....	.....	(2)	2,870,580	147.5	266.0	.....	.....
Value	$12,274,779	$5,020,050	$12,274,779	$3,463,235	.....	.....	.....	$1,556,815	144.5	254.4	.....	.....
Gold—												
Ounces fine	321,747	300,914	321,747	287,116	.....	.....	(2)	13,798	6.9	12.1	.....	.....
Value	$6,493,555	$5,890,076	$6,493,555	$5,614,173	.....	.....	.....	$275,903	10.2	15.7	.....	.....
Refining, total value	$149,711,214	$107,635,247	.....	.....	$80,963,537	$88,620,626	$68,747,677	$19,014,621	39.1	.....	[1]8.6	261.5
Ingots, wire, bars, etc.—												
Pounds	933,809,701	602,595,113	.....	.....	453,356,531	475,930,645	480,453,170	126,664,468	55.0	.....	[1]4.7	279.3
Value	$119,420,862	$94,061,667	.....	.....	$59,231,595	$77,021,103	$60,189,267	$17,040,564	27.0	.....	[1]23.1	253.2
Blue vitriol—												
Pounds	27,729,900	27,298,926	.....	.....	7,645,949	26,017,613	20,083,951	1,281,313	1.6	.....	[1]70.6	1,467.5
Value	$1,120,308	$1,225,745	.....	.....	$306,860	$1,178,208	$813,508	$47,537	[1]8.6	.....	[1]74.0	1,611.3
Silver—												
Ounces fine	28,115,790	13,229,911	.....	.....	23,029,386	10,203,023	5,086,404	3,026,888	112.5	.....	125.7	68.0
Value	$16,034,886	$7,790,085	.....	.....	$13,157,568	$6,076,707	$2,877,318	$1,714,278	105.8	.....	116.5	67.8
Gold—												
Ounces fine	636,207	224,352	.....	.....	400,004	213,740	236,203	10,612	183.6	.....	87.1	2,125.8
Value	$13,135,098	$4,556,850	.....	.....	$8,267,514	$4,344,608	$4,867,584	$212,242	188.2	.....	90.3	2,193.4
All other products	$2,694,172	$3,221,250	.....	.....	$2,464,076	$1,547,610	$230,096	$1,673,640	[1]16.4	.....	59.2	[1]86.3

[1] Decrease.

[2] The contents of intermediate products of smelting department which constituted material for refining was: Copper, 12,578,417 pounds; silver, 485,598 ounces fine; gold, 66,086 ounces fine.

Table 15 shows, for the censuses of 1900 and 1905, the items of expense and the percentage which each is of the total for the establishments in each of the groups given in Table 14.

In the case of establishments doing smelting only the proportional expenditure for labor is larger than in the case of refineries and that for material less. In all groups the proportional expenditure for labor shows a decrease for 1905 over 1900 and that for materials, an increase; and further, the proportional expenditures for labor and materials for establishments doing both smelting and refining is approaching that of the establishments which do refining only.

TABLE 15.—COPPER SMELTING AND REFINING—SALARIES, WAGES, MISCELLANEOUS EXPENSES, AND COST OF MATERIALS FOR ESTABLISHMENTS CLASSIFIED ACCORDING TO PROCESS EMPLOYED, WITH PER CENT WHICH EACH ITEM FORMS OF TOTAL: 1905 AND 1900.

	Census.	TOTAL.		SMELTING.		REFINING.		SMELTING AND REFINING.	
		Amount.	Per cent of total.	Amount.	Per cent of total.	Amount.	Per cent of total.	Amount.	Per cent of total.
Total	1905	$213,839,810	100.0	$69,010,786	100.0	$80,236,279	100.0	$64,592,745	100.0
	1900	133,180,380	100.0	23,191,916	100.0	82,887,533	100.0	27,100,931	100.0
Salaries	1905	1,527,382	0.7	1,052,370	1.5	202,317	0.2	272,695	0.4
	1900	954,905	0.7	435,784	1.9	335,526	0.4	183,595	0.7
Wages	1905	10,827,043	5.1	8,220,168	11.9	1,089,025	1.4	1,517,850	2.4
	1900	8,529,021	6.4	3,576,429	15.4	1,895,705	2.3	3,056,887	11.3
Miscellaneous expenses	1905	4,748,399	2.2	3,393,795	4.9	296,406	0.4	1,058,198	1.6
	1900	1,522,325	1.2	621,573	2.7	388,243	0.5	512,509	1.9
Cost of materials used	1905	196,736,986	92.0	56,344,453	81.7	78,648,531	98.0	61,744,002	95.6
	1900	122,174,129	91.7	18,558,130	80.0	80,268,059	96.8	23,347,940	86.1

GROSS AND NET VALUE OF PRODUCTS.

The values of products hereinbefore considered are the net values at the works. In making the canvass for the census of 1905 it was desired to ascertain the gross value of the products as well as the net amount received, the former being the net value, plus the amount paid for treatment, and for freight on the product to the smelter or refinery, and for commissions and selling expense.

Table 16 shows, for the census of 1905, the gross and net values of products and the deductions for refining tolls, freight, and selling expense for establishments reporting the same, by states.

TABLE 16.—COPPER SMELTING AND REFINING—ESTABLISHMENTS REPORTING GROSS AND NET VALUES OF PRODUCTS: 1905.

	Number of establishments.	PRODUCTS.				DEDUCTIONS.				Products, net value.
		Total gross value.	Copper and copper contents.		Gold, silver, and other products, gross value.	Total.	Tolls paid for refining.	Freight.	Commissions and selling expenses.	
			Pounds.	Gross value.						
All establishments	40	.....	.....	.....	.....	.....	.....	.....	.....	$240,780,216
Establishments reporting gross and net values	29	$145,775,565	939,211,635	$119,503,347	$26,272,218	[1] $10,347,562	$4,458,851	$2,825,057	$1,447,680	135,428,003
Smelters, total	24	90,880,376	572,290,970	72,623,376	18,257,000	[1] 9,127,967	4,417,458	2,773,413	1,421,254	81,752,409
Arizona	7	25,300,424	187,593,252	23,688,231	1,612,193	[1] 2,538,443	1,085,673	873,267	404,737	22,761,981
Utah	5	9,150,100	39,834,080	5,001,201	4,148,899	[1] 651,144	209,090	178,484	44,610	8,498,956
All other states [2]	12	56,429,852	344,863,638	43,933,944	12,495,908	[1] 5,938,380	3,121,695	1,721,662	971,907	50,491,472
Smelters and refineries [3]	5	54,895,189	366,920,665	46,879,971	8,015,218	[1] 1,219,595	41,393	51,644	26,426	53,675,594

[1] Includes $1,615,974 of deductions not reported in detail. This total was distributed as follows: Smelters, $515,842—Arizona, $173,766; Utah, $218,960; "all other states" $123,116—smelters and refineries, $1,100,132.
[2] Includes establishments distributed as follows: California, 2; Colorado, 2; Idaho, 1; Montana, 4; Oregon, 1; Virginia, 1; Washington, 1.
[3] Includes establishments distributed as follows: Colorado, 1; Michigan, 2; New York, 1; Tennessee, 1.

There were 24 of the 27 smelting establishments which reported gross and net values, and 5 of the 8 smelters and refineries, or a total of 29 out of the 40 establishments. The total products with a net value of $135,428,003 are the products against which deductions were reported, the deductions aggregating $10,347,562. Of this amount $1,615,974 was reported without any distribution being made between tolls paid for refining, freight, or commissions and selling expenses, hence it is included in the total amount of deductions but not in the segregated columns. If the deductions are all charged against the copper, it gives an average of 1.1 cents per pound of copper for the average expense of marketing the copper product of the smelters.

The detailed statistics for the copper smelting and refining industry at the census of 1905 are given in Table 17. The amount received for contract smelting and refining is given, but the ores thus treated are included in the quantities and values of the materials and products.

TABLE 17.—COPPER SMELTING AND REFINING—DETAILED SUMMARY, BY STATES AND TERRITORIES: 1905.

	United States.	Arizona.	California.	Michigan.	New Jersey.	Utah.	All other states.[1]
Number of establishments	40	7	3	3	5	5	17
Capital, total	$76,824,640	$9,340,839	$946,000	$2,378,315	$7,892,904	$3,584,788	$52,681,794
Land	$2,776,114	$420,000	$7,000	$258,727	$386,250	$107,478	$1,596,659
Buildings	$18,962,965	$1,702,285	$141,000	$399,000	$1,522,810	$1,287,679	$13,850,191
Machinery, tools, and implements	$15,815,148	$2,490,117	$183,000	$1,304,041	$3,521,940	$1,208,372	$7,107,678
Cash and sundries	$39,270,413	$4,668,437	$615,000	$416,547	$2,461,904	$981,259	$30,127,266
Proprietors and firm members	1						1
Salaried officials, clerks, etc.:							
Total number	809	107	21	37	102	32	510
Total salaries	$1,527,382	$218,402	$34,867	$50,763	$129,187	$97,850	$996,313
Officers of corporations—							
Number	39	17			1	4	17
Salaries	$205,535	$61,045			$6,000	$21,500	$116,990
General superintendents, managers, clerks, etc.—							
Total number	770	90	21	37	101	28	493
Total salaries	$1,321,847	$157,357	$34,867	$50,763	$123,187	$76,350	$879,323
Men—							
Number	745	89	21	37	99	26	473
Salaries	$1,298,827	$155,557	$34,867	$50,763	$121,787	$74,600	$861,253
Women—							
Number	25	1			2	2	20
Salaries	$23,020	$1,800			$1,400	$1,750	$18,070
Wage-earners, including piecework, and total wages:							
Greatest number employed at any one time during the year	15,349	3,102	433	697	1,464	1,758	7,895
Least number employed at any one time during the year	10,614	1,899	393	611	1,048	1,121	5,542
Average number	12,752	2,349	413	650	1,243	1,416	6,681
Total wages	$10,827,043	$2,050,409	$401,240	$454,943	$644,577	$1,016,052	$6,259,822
Men 16 years and over—							
Average number	12,702	2,348	413	650	1,243	1,416	6,632
Wages	$10,808,442	$2,050,049	$401,240	$454,943	$644,577	$1,016,052	$6,241,581
Children under 16 years—							
Average number	50	1					49
Wages	$18,601	$360					$18,241
Average number of wage-earners, including piecework, employed during each month:							
Men 16 years and over—							
January	11,928	2,192	427	643	1,155	1,133	6,378
February	12,170	2,241	413	637	1,166	1,196	6,517
March	12,441	2,523	395	636	1,197	1,297	6,393
April	12,860	2,863	397	672	1,236	1,380	6,312
May	13,031	2,771	408	689	1,214	1,451	6,498
June	13,092	2,607	412	693	1,219	1,595	6,566
July	12,716	2,077	422	643	1,269	1,656	6,649
August	12,682	2,082	416	667	1,272	1,467	6,778
September	12,627	2,016	415	646	1,271	1,427	6,852
October	12,954	2,243	423	636	1,297	1,469	6,886
November	12,872	2,243	418	616	1,324	1,489	6,782
December	13,051	2,318	410	622	1,296	1,432	6,973
Children under 16 years—							
January	49	1					48
February	53	1					52
March	52	1					51
April	44	1					43
May	53	1					52
June	48	1					47
July	48	1					47
August	51	1					50
September	42	1					41
October	54	1					53
November	54	1					53
December	52	1					51
Miscellaneous expenses, total	$4,748,399	$828,097	$77,383	$407,119	$275,705	$63,453	$3,096,642
Rent of works	$1,342,753	$4,935				$120	$1,337,698
Taxes	$374,810	$95,367	$29,041	$10,826	$16,162	$17,406	$206,008
Rent of offices, interest, insurance, and all other sundry expenses not hitherto included	$2,913,435	$623,394	$48,342	$396,293	$259,543	$45,927	$1,539,936
Contract work	$117,401	$104,401					$13,000
Materials used, total cost	$196,736,986	$12,486,782	$1,317,972	$18,807,701	$58,811,990	$5,133,999	$100,178,542
Ores and concentrates—							
Tons	7,361,473	1,231,468	270,006	[2] 128,119	345	744,929	4,986,606
Cost	$60,402,094	$8,398,494	$826,031	$16,347,513	$5,104	$3,468,371	$31,356,581
Matte, purchased—							
Tons	29,265	3,349			2,796	5,488	17,632
Cost	$4,135,742	$387,351			$14,160	$204,933	$3,529,298
Blister or anodes, purchased—							
Tons	372,607			9,000	169,435		194,172
Cost	$111,248,191			$2,052,000	$57,824,166		$51,372,025
Flux and other materials operated upon	$5,783,984	$373,194	$197,590	$38,141	$36,621	$88,474	$5,049,964
Fuel	$10,061,427	$2,866,294	$243,972	$296,726	$480,709	$1,018,479	$5,155,247
Rent of power and heat	$119,484		$23,400			$27,000	$69,084
Mill supplies	$621,653	$97,476	$2,979	$2,947	$12,870	$107,278	$398,103
All other materials	$2,572,563	$244,224	$24,000	$70,374	$409,893	$219,464	$1,604,608
Freight	$1,791,848	$119,749			$28,467		$1,643,632
Products, aggregate value	$240,780,216	$22,761,981	$2,583,524	$21,222,217	$62,795,613	$8,498,956	$122,917,925
Smelters, total value	$88,374,830	$22,697,806	$2,583,524			$8,488,088	$54,605,412
Fine copper contents—							
Pounds	620,872,420	187,593,252	19,572,025			39,834,080	373,873,063
Value	$69,606,496	$21,149,788	$1,973,842			$4,351,061	$42,131,805
Silver—							
Ounces fine	21,945,304	1,371,762	558,883			3,363,431	16,651,228
Value	$12,274,779	$789,968	$318,684			$1,919,819	$9,246,308
Gold—							
Ounces fine	321,747	37,629	14,550			109,270	160,298
Value	$6,493,555	$758,050	$290,998			$2,217,208	$3,227,299
Amount received for contract work[3]	$117,680					$38,670	$79,010

[1] Includes establishments distributed as follows: Colorado, 3; Idaho, 1; Maryland, 1; Montana, 5; New York, 2; Oregon, 1; Tennessee, 2; Virginia, 1; Washington, 1.

[2] "Mineral."

[3] Not included in the total or aggregate value.

TABLE 17.—COPPER SMELTING AND REFINING—DETAILED SUMMARY, BY STATES AND TERRITORIES: 1905—Con.

	United States.	Arizona.	California.	Michigan.	New Jersey.	Utah.	All other states.
Products—Continued.							
Refineries and smelters combined with refineries, total value	$149,711,214	$2,775	.....	$21,222,217	$61,585,537	.....	$66,900,685
Ingots, bars, wire, etc.—							
Pounds	933,809,701	.....	.....	173,287,133	332,855,640	.....	427,666,928
Value	$119,420,862	.....	.....	$21,217,267	$42,907,595	.....	$55,296,000
Silver—							
Ounces fine	28,115,790	.....	.....	9,000	19,241,470	.....	8,865,320
Value	$16,034,886	.....	.....	$4,950	$10,999,568	.....	$5,030,368
Gold—							
Ounces fine	636,207	.....	.....	.....	356,700	.....	279,507
Value	$13,135,098	.....	.....	.....	$7,371,514	.....	$5,763,584
Blue vitriol—							
Pounds	27,729,900	56,151	.....	.....	7,645,940	.....	20,027,800
Value	$1,120,368	$2,775	.....	.....	$306,860	.....	$810,733
All other products	$2,694,172	$61,400	.....	.....	$1,210,076	$10,868	$1,411,828
Amount received for contract work[1]	$4,806,039	.....	.....	.....	$1,091,454	.....	$3,714,585
Power:							
Number of establishments reporting	37	7	3	3	3	4	17
Total horsepower	85,828	20,245	2,714	546	5,575	3,173	53,575
Owned—							
Engines—							
Steam—							
Number	320	60	10	13	22	11	204
Horsepower	61,402	13,999	1,850	460	5,295	1,690	38,108
Gas and gasoline—							
Number	19	16	1	.....	.....	.....	2
Horsepower	1,274	1,205	44	.....	.....	.....	25
Water wheels—							
Number	21	4	.....	.....	.....	.....	17
Horsepower	9,400	95	.....	.....	.....	.....	9,305
Electric motors—							
Number	331	115	12	5	54	4	141
Horsepower	9,304	4,596	270	86	280	50	4,022
Other power, horsepower	1,333	350	.....	.....	.....	983	.....
Rented—							
Electric motors—							
Number	70	.....	16	.....	.....	25	29
Horsepower	3,115	.....	550	.....	.....	450	2,115
Furnished to other establishments, horsepower	956	800	.....	.....	140	.....	16

[1] Not included in the total or aggregate value.

LEAD SMELTING AND REFINING.

The general statistics of the lead smelting industry are shown in Table 18 for the censuses of 1900 and 1905, and the per cent of increase of the various items.

TABLE 18.—*Lead smelting and refining—comparative summary, with per cent of increase: 1905 and 1900.*

	CENSUS.		Per cent of increase.
	1905	1900	
Number of establishments	32	39	[1]17.9
Capital	$63,822,810	$72,148,933	[1]11.5
Salaried officials, clerks, etc., number	524	425	23.3
Salaries	$887,602	$754,913	17.6
Wage-earners, average number	7,573	8,319	[1]9.0
Total wages	$5,374,691	$5,088,684	5.6
Men 16 years and over	7,566	8,312	[1]9.0
Wages	$5,371,031	$5,086,704	5.6
Women 16 years and over	7	.....	.....
Wages	$3,660	.....	.....
Children under 16 years	.....	7	.....
Wages	.....	$1,980	.....
Miscellaneous expenses	$897,876	$1,166,210	[1]23.0
Cost of materials used	$168,958,076	$144,195,163	17.2
Value of products	$185,826,839	$175,466,304	5.9

[1] Decrease.

Table 18 includes only active establishments. In addition there were 3 idle establishments reported at the census of 1905, located 1 in California, 1 in Colorado, and 1 in New Mexico, which reported capital investment and power equipment as follows:

TABLE 19.—*Lead smelting and refining—idle establishments: 1905.*

Number of establishments	3
Capital, total	$326,400
Land	$6,800
Buildings	$152,600
Machinery, tools, and implements	$167,000
Power owned:	
Number of establishments reporting	3
Total horsepower	965
Engines, steam—	
Number	5
Horsepower	665
Electric motors—	
Number	3
Horsepower	300

At the census of 1900 there were 3 idle establishments with a capital of $629,871, located 1 in Missouri, 1 in Nevada, and 1 in Utah.

The statistics compiled at the census of 1890 were not in conformity with the methods followed in compiling the statistics for manufactures for 1900 and 1905, and therefore can not be used for purposes of comparison, but Table 20 shows the totals for the lead smelting and refining works as reported at that census.

TABLE 20.—*Lead smelting and refining: 1890.*

Expenditures, total	$11,457,367
Wages	$4,228,634
Salaries	$510,716
Supplies and materials	$5,154,682
Rent, insurance, taxes, etc	$1,489,715
Contractors	$73,620
Number of employees:	
Office force	249
Foremen	173
Mechanics	354
Laborers	5,535
Boys	9
Average daily wages:	
Foremen	$3.98
Mechanics	$2.93
Laborers	$2.15
Boys	$0.50
Average days employed:	
Foremen	337
Mechanics	322
Laborers	307
Boys	336
Products:	
Refined lead (tons)	182,967
Fine copper in matte (pounds)	4,195,929
Stock:	
Base bullion (tons), January 1, 1889	1,474
Base bullion (tons), January 1, 1890	4,730
Refined lead (tons), January 1, 1889	12,058
Refined lead (tons), January 1, 1890	9,230

The lead product reported at the census of 1900, as compared with that of 1890, increased 60.7 per cent, and at the census of 1905 as compared with that of 1900, 33.2 per cent. On account of the different methods of treating the smelting industry prior to 1890, census figures comparable with those for 1900 and 1905 are not available, but the statistics of lead production, as compiled by the Geological Survey since 1873, are presented in Table 21.

TABLE 21.—*Production of refined lead in the United States: 1873 to 1904.*[1]

YEAR.	Total (tons).	Desilverized lead (tons).	Soft lead (tons).
1904	404,453	315,284	89,169
1903	378,518	295,074	83,444
1902	377,061	303,011	74,050
1901	381,688	323,790	57,898
1900	377,679	329,658	48,021
1899	304,392	263,826	40,566
1898	310,621	267,842	42,779
1897	291,036	247,483	43,553
1896	264,994	221,457	43,537
1895	241,882	201,992	39,890
1894	219,090	181,404	37,686
1893	229,333	196,820	32,513
1892	213,262	181,584	31,678
1891	202,406	171,009	31,397
1890	161,754	130,403	31,351
1889	182,967	153,709	29,258
1888	180,555	151,465	29,090
1887	160,700	135,552	25,148
1886	135,629	114,829	20,800
1885	129,412	107,437	21,975
1884	139,897	119,965	19,932

[1] United States Geological Survey, "Mineral Resources of the United States," 1904 and 1905.

TABLE 21.—*Production of refined lead in the United States: 1873 to 1904*—Continued.

YEAR.	Total (tons).	Desilverized lead (tons).	Soft lead (tons).
1883	143,957	122,157	21,800
1882	132,890	103,875	29,015
1881	117,085	86,315	30,770
1880	97,825	70,135	27,690
1879	92,780	64,650	28,130
1878	91,060	64,290	26,770
1877	81,900	50,748	31,152
1876	64,070	37,649	26,421
1875	59,640	34,909	24,731
1874	52,080	.....	.....
1873	42,540	20,159	22,381

The total production of refined lead as reported at the census of 1905 is 391,530 tons, or 12,923 tons less than the total shown for the calendar year 1904 in Table 21, due chiefly to the fact that the periods covered are not identical. The returns of the Geological Survey are for the calendar year, while the reports for the Census Office cover the fiscal year of the corporations reporting, which in only a few cases is the calendar year.

The production of refined lead, as shown by the Census reports, is given in Table 22 for the censuses of 1900 and 1905. To avoid disclosing individual operations, statistics by states can be shown only for Missouri in this and all other detailed tables.

TABLE 22.—*Lead smelting and refining—production of refined lead, by states: 1905 and 1900.*

STATE.	Census.	Total (tons).	Soft lead (tons).	Hard or antimonial lead (tons).	All other lead, including Dorébars (tons).
United States	1905	391,530	84,864	11,953	294,713
	1900	293,965	45,237	8,393	240,335
Missouri	1905	53,840	53,840	.....	.....
	1900	41,976	41,976	.....	.....
All other states	[1] 1905	337,690	31,024	11,953	294,713
	[2] 1900	251,989	3,261	8,393	240,335

[1] Includes states as follows: California, Colorado, Idaho, Illinois, Iowa, Kansas, Montana, Nebraska, New Jersey, Pennsylvania, Texas, Utah, Washington, Wisconsin.

[2] Includes states as follows: California, Colorado, Idaho, Illinois, Iowa, Kansas, Montana, Nebraska, New Jersey, New Mexico, Texas, Utah, Virginia, Washington.

THE INDUSTRY, BY STATES.

Table 23 presents the general statistics by states for 1900 and 1905.

TABLE 23.—LEAD SMELTING AND REFINING—COMPARATIVE SUMMARY, BY STATES: 1905 AND 1900.

STATE.	Census.	Number of establishments.	Capital.	Salaried officials, clerks, etc.		Wage-earners and wages.		Miscellaneous expenses.	Cost of materials used.	Value of products.
				Number.	Salaries.	Average number.	Wages.			
United States	1905	32	$63,822,810	524	$887,602	7,573	$5,374,691	$897,876	[1] $168,958,076	[1] $185,826,839
	1900	39	72,148,933	425	754,913	8,319	5,088,684	1,166,210	[1] 169,703,366	[1] 200,974,507
Missouri	1905	8	1,341,292	41	79,977	489	275,912	64,486	4,683,846	5,473,586
	1900	11	944,539	35	47,360	474	255,590	41,565	3,317,558	3,852,435
All other states	[2] 1905	24	62,481,518	483	807,625	7,084	5,098,779	833,300	164,274,230	180,353,253
	[3] 1900	28	71,204,394	390	707,553	7,845	4,833,094	1,124,645	166,385,808	197,122,072

[1] Includes a duplication in cost of materials and value of products of $1,036,848 for 1905 and of $25,508,203 for 1900. The latter amount represents intermediate products between the ore and the refined metal.

[2] Includes establishments distributed as follows: California, 1; Colorado, 7; Idaho, 1; Illinois, 3; Iowa, 1; Kansas, 1; Montana, 1; Nebraska, 1; New Jersey, 2; Pennsylvania, 1; Texas, 1; Utah, 1; Washington, 2; Wisconsin, 1.

[3] Includes establishments distributed as follows: California, 1; Colorado, 8; Idaho, 1; Illinois, 2; Iowa, 1; Kansas, 2; Montana, 3; Nebraska, 1; New Jersey, 2; New Mexico, 1; Texas, 1; Utah, 2; Virginia, 1; Washington, 2.

Table 24 presents the statistics for the establishments grouped according to location, east and west of the Mississippi river, for 1900 and 1905, with the respective per cents of increase.

TABLE 24.—LEAD SMELTING AND REFINING—COMPARATIVE SUMMARY OF ESTABLISHMENTS, BY LOCATION, EAST AND WEST OF THE MISSISSIPPI RIVER: 1905 AND 1900.

	TOTAL.		EAST OF THE MISSISSIPPI.		WEST OF THE MISSISSIPPI.		PER CENT OF INCREASE.		
	1905	1900	1905	1900	1905	1900	Total.	East.	West.
Number of establishments	32	39	7	5	25	34	[1] 17.9	40.0	[1] 26.5
Capital	$63,822,810	$72,148,933	$12,325,777	$8,975,079	$51,497,033	$63,173,854	[1] 11.5	37.3	[1] 18.5
Salaried officials, clerks, etc., number	524	425	102	36	422	389	23.3	183.3	8.5
Salaries	$887,602	$754,913	$157,595	$69,502	$730,007	$685,411	17.6	126.7	6.5
Wage-earners, average number	7,573	8,319	1,362	715	6,211	7,604	[1] 9.0	90.5	[1] 18.3
Total wages	$5,374,691	$5,088,684	$720,332	$453,787	$4,654,359	$4,634,897	5.6	58.7	0.4
Miscellaneous expenses	$897,876	$1,166,210	$304,709	$87,660	$593,167	$1,078,550	[1] 23.0	247.6	[1] 45.0
Materials used, aggregate cost [2]	$168,958,076	$169,703,366	$43,522,255	$32,963,166	$125,435,821	$136,740,200	.....	.....	.....
Smelting—									
Ores—									
Tons	2,412,005	1,952,459	104,119	13,385	2,307,886	1,939,074	23.5	677.9	19.0
Cost	$60,784,558	$60,868,480	$3,516,301	$1,208,568	$57,268,057	$59,659,912	[1] 0.1	190.9	[1] 4.0
Refining, total cost	$99,283,641	$100,802,504	$37,168,732	$30,688,133	$62,114,909	$70,114,371	.....	.....	.....
Doré bars—									
Ounces	13,147,523	(3)	6,055,516	(3)	7,092,007	(3)	.....	.....	.....
Cost	$31,722,604	(3)	$6,983,030	(3)	$24,739,574	(3)	.....	.....	.....
Domestic base bullion—									
Tons	239,836	180,998	73,952	45,000	165,884	135,998	.....	.....	.....
Cost	$49,883,791	$80,940,771	$13,690,516	$12,006,867	$36,193,275	$68,933,904	.....	.....	.....
Foreign base bullion—									
Tons	97,179	78,939	87,617	76,810	9,562	2,129	.....	.....	.....
Cost	$17,677,246	$19,861,733	$16,495,186	$18,681,266	$1,182,060	$1,180,467	.....	.....	.....
All other materials	$8,890,077	$8,032,382	$2,837,222	$1,066,465	$6,052,855	$6,965,917	10.7	166.0	[1] 13.1
Products, aggregate value [2]	$185,826,839	$200,974,507	$46,933,641	$38,992,943	$138,893,198	$161,981,564	.....	.....	.....
Smelting, total value	$62,220,245	$77,061,277	$1,977,553	$1,482,583	$60,242,692	$75,578,694	.....	.....	.....
Nonargentiferous ores—									
Lead—									
Pounds	169,728,880	90,473,286	46,758,653	686,703	122,970,227	89,786,583	87.6	6,709.2	37.0
Value	$7,324,869	$3,801,242	$1,977,553	$29,610	$5,347,316	$3,771,632	92.7	6,578.7	41.8
Argentiferous ores, total value	$54,895,376	$73,260,035	.....	$1,452,973	$54,895,376	$71,807,062	.....	.....	.....
Lead contents of base bullion—									
Pounds	449,935,104	402,324,605	.....	1,523,330	449,935,104	400,801,275	.....	.....	.....
Value	$13,757,268	$15,546,661	.....	$57,024	$13,757,268	$15,489,637	.....	.....	.....
Silver—									
Ounces fine	37,543,073	52,641,752	.....	2,043,033	37,543,073	50,598,719	.....	.....	.....
Value	$21,322,494	$31,185,203	.....	$1,217,369	$21,322,494	$29,967,834	.....	.....	.....
Gold—									
Ounces fine	965,048	1,322,177	.....	8,825	965,048	1,313,352	.....	.....	.....
Value	$19,815,614	$26,528,171	.....	$178,580	$19,815,614	$26,349,591	.....	.....	.....
Refining and desilverizing, total value	$117,452,682	$115,527,046	$44,912,506	$35,539,276	$72,540,176	$79,987,776	1.7	26.4	[1] 9.3
Hard or antimonial lead—									
Pounds	23,905,398	16,785,097	10,802,331	6,286,000	13,103,067	10,499,097	42.4	71.8	24.8
Value	$925,117	$701,082	$391,486	$262,912	$533,631	$438,170	32.0	48.9	21.8
All other lead, including Doré bars—									
Pounds	589,426,558	480,670,834	294,818,919	226,852,000	294,607,639	253,818,834	22.6	30.0	16.1
Value	$22,107,915	$20,672,140	$10,094,782	$9,663,961	$12,013,133	$11,008,179	6.9	4.5	9.1
Doré bars and fine bars, total value	$94,419,650	$94,153,824	$34,426,238	$25,612,397	$59,993,412	$68,541,427	0.3	34.4	[1] 12.5
Silver—									
Ounces fine	72,592,987	70,420,917	39,257,137	31,619,725	33,335,850	38,801,192	3.1	24.2	[1] 14.1
Value	$41,425,114	$42,143,703	$22,621,331	$18,908,707	$18,803,783	$23,234,996	[1] 1.7	19.6	[1] 19.1
Gold—									
Ounces fine	2,574,549	2,514,836	571,120	325,141	2,003,429	2,189,695	2.4	75.7	[1] 8.5
Value	$52,994,536	$52,010,121	$11,804,907	$6,703,690	$41,189,629	$45,306,431	1.9	76.1	[1] 9.1
All other products, total value	$6,153,912	$8,386,184	$43,582	$1,971,090	$6,110,330	$6,415,094	[1] 26.6	[1] 97.8	[1] 4.8
Copper in matte, etc.—									
Pounds	51,617,670	26,964,031	.....	150,000	51,617,670	26,814,031	91.4	.....	92.5
Value	$4,812,865	$3,768,402	.....	$25,000	$4,812,865	$3,743,402	27.7	.....	28.6
Copper sulphate—									
Pounds	11,371,251	(3)	797,323	(3)	10,573,928	(3)	.....	.....	.....
Value	$541,763	(3)	$41,301	(3)	$500,462	(3)	.....	.....	.....
Other products, value	$799,284	$4,617,782	$2,281	$1,946,090	$797,003	$2,671,692	[1] 82.7	[1] 99.9	[1] 70.2
Including—									
Lead oxide, pounds	11,289,399	10,329,804	.....	.....	11,289,399	10,329,804	9.3	.....	9.3
Arsenic, pounds	554,445	(3)	.....	(3)	554,445	( )	.....	.....	.....

[1] Decrease.
[2] Includes a duplication in cost of materials and value of products of $1,036,848 for 1905, and $25,508,203 for 1900. The latter amount represents intermediate products between the ore and the refined metal.
[3] Not reported separately.

The decrease in the number of active establishments and in the capital invested, wage-earners employed, and general operating expense has all been in the West, the establishments located east of the Mississippi river showing an increase in all of these particulars. On account of the large duplication in cost of materials and value of products in the figures for 1900, which duplication represents the intermediate products of the smelting department in the case of establishments doing both smelting and refining, the detailed figures for materials and products are not in all cases comparable. Deducting the duplication of $1,036,848 for 1905, which all pertains to western establishments, and the duplication of $25,508,203 for 1900, of which amount $801,000 pertains to eastern smelters and the balance to western establishments, there is deduced a comparison of materials and products, as shown in Table 25.

TABLE 25.—LEAD SMELTING AND REFINING—COMPARATIVE SUMMARY OF MATERIALS AND PRODUCTS, NET COST AND VALUE, IN ESTABLISHMENTS, BY LOCATION, EAST AND WEST OF THE MISSISSIPPI RIVER: 1905 AND 1900.

	TOTAL.		EAST OF THE MISSISSIPPI.		WEST OF THE MISSISSIPPI.		PER CENT OF INCREASE.		
	1905	1900	1905	1900	1905	1900	Total.	East.	West.
Materials used, total cost	$167,921,228	$144,195,163	$43,522,255	$32,162,166	$124,398,973	$112,032,997	16.5	35.3	11.0
Products, aggregate value	184,789,991	175,466,304	46,933,641	38,191,943	137,856,350	137,274,361	5.3	22.9	0.4
Smelting	62,220,245	51,553,074	1,977,553	681,583	60,242,692	50,871,491	20.7	190.1	18.4
Refining and desilverizing	116,415,834	115,527,046	44,912,506	35,539,270	71,503,328	79,987,776	0.8	26.4	[1]10.6
All other products	6,153,912	8,386,184	43,582	1,971,090	6,110,330	6,415,094	[1]26.6	[1]97.8	[1]4.8

[1] Decrease.

In addition to the duplication before noted there is also the duplication arising from the refining of the product of the argentiferous smelters, when done by a separate refinery. In such cases the product of the smelters appears as material for a refinery, and materials and products are duplicated to this extent, but it is only where materials and products are included twice in the report for the same establishment that they are considered as duplications. The above comparison shows the greater increase in the eastern smelters.

The Missouri smelters handle nonargentiferous ores exclusively, and a comparison of the operating expenses for the censuses of 1890, 1900, and 1905 is presented in Table 26.

TABLE 26.—*Lead smelting and refining—statistics of Missouri smelters: 1890 to 1905.*

	1905	1900	1890[1]	Per cent of increase, 1900 to 1905.
Total expenses	$650,123	$530,693	$580,210	22.5
Salaries	$79,977	$47,360	$19,680	68.9
Wages	$275,912	$255,590	$206,541	8.0
Miscellaneous expenses, not including contract work	$53,552	$41,565	$166,632	28.8
Amount received for contract work	$10,954	$25,382	$3,182	[2]56.9
Cost of materials used, not including ore	$229,748	$160,796	$184,175	42.9
Quantity of ore treated (tons)	88,286	68,719	49,816	28.5
Lead produced (tons)	53,840	41,976	29,258	28.3
Oxide produced (tons)	5,645	5,165	1,250	9.3

[1] Includes the data for Illinois, Kansas, Missouri, Wisconsin.
[2] Decrease.

The average wage expense per ton of ore smelted was $3.13 for 1905, compared with $3.72 for 1900 and $4.15 for 1890.

MATERIALS USED.

Table 27 shows the quantities of ore and base bullion consumed by smelters and refineries as reported at the censuses of 1900 and 1905. The source of the base bullion, whether foreign or domestic, is shown, but the returns for the census of 1905 do not show the quantity of foreign ore consumed. In 1900 there were 284,914 tons of foreign ore and 1,667,545 tons of domestic.

TABLE 27.—*Lead smelting and refining—quantity of ore smelted and base bullion refined and desilverized, by states: 1905 and 1900.*

STATE.	Census.	Ore smelted (tons).	BASE BULLION REFINED AND DESILVERIZED.		
			Total (tons).	Domestic (tons).	Foreign (tons).
United States	1905	2,412,005	337,015	239,836	97,179
	1900	1,952,459	259,937	180,998	78,939
Missouri	1905	88,286	.....	.....	.....
	1900	68,719	.....	.....	.....
All other states	[1]1905	2,323,719	337,015	239,836	97,179
	[2]1900	1,883,740	259,937	180,998	78,939

[1] Includes states as follows: California, Colorado, Idaho, Illinois, Iowa, Kansas, Montana, Nebraska, New Jersey, Pennsylvania, Texas, Utah, Washington, Wisconsin.
[2] Includes states as follows: California, Colorado, Idaho, Illinois, Iowa, Kansas, Montana, Nebraska, New Jersey, New Mexico, Texas, Utah, Virginia, Washington.

The consumption of ore shows an increase of 459,546 tons, or 23.5 per cent, and base bullion purchased, an increase of 77,078 tons, or 29.7 per cent, the domestic base bullion increasing 58,838 tons, or 32.5 per cent, and foreign bullion 18,240 tons, or 23.1 per cent.

PRODUCTS.

Table 28 gives the quantity and the value of the different classes of products, and the number of establishments reporting each class for 1900 and 1905.

TABLE 28.—LEAD SMELTING AND REFINING—PRINCIPAL PRODUCTS, BY KIND, QUANTITY, AND VALUE, WITH NUMBER OF ESTABLISHMENTS REPORTING: 1905 AND 1900.

KIND.	Census.	Number of establishments reporting.	PRODUCTS.		
			Unit of measure.	Quantity.	Value.
Smelting nonargentiferous ores:					
Soft lead	1905	16	Pound	169,728,880	$7,324,869
	1900	17	Pound	90,473,286	3,801,242
Smelting argentiferous ores:					
Lead contents of base bullion	1905	12	Pound	449,935,104	13,757,268
	1900	[1]23	Pound	402,324,605	15,546,661
Silver	1905	12	Ounce fine	37,543,073	21,322,494
	1900	[1]23	Ounce fine	52,641,752	31,185,203
Gold	1905	12	Ounce fine	965,048	19,815,614
	1900	[1]22	Ounce fine	1,322,177	26,528,171
Copper contents of matte	1905	12	Pound	51,617,670	4,812,865
	1900	19	Pound	26,964,031	3,768,402
Refining and desilverizing:					
Hard or antimonial lead	1905	6	Pound	23,905,398	925,117
	1900	8	Pound	16,785,097	701,082
All other lead (including Doré bars)	1905	7	Pound	589,426,558	22,107,915
	1900	9	Pound	480,670,834	20,672,140
Doré bars and fine bars, silver	1905	7	Ounce fine	72,592,987	41,425,114
	1900	9	Ounce fine	70,420,917	42,143,703
Doré bars and fine bars, gold	1905	7	Ounce fine	2,574,549	52,994,536
	1900	9	Ounce fine	2,514,836	52,010,121

[1] Includes smelters combined with refineries and duplication of intermediate products between smelting and refining departments.

There were 16 establishments that engaged in smelting nonargentiferous ores in 1905 as compared with 17 in 1900, and 19 in smelting argentiferous ores in 1905 as compared with 23 in 1900. Seven of the 19 argentiferous smelters in 1905 did both smelting and refining, and hence are classed as refiners, making 12 establishments engaged in the smelting only of argentiferous ores.

A comparison of the lead, gold, and silver products, quantities and values, for 1900 and 1905, and the per cent of increase is shown in the following statement:

Lead smelting and refining—quantity and value of principal products, with per cent of increase: 1905 and 1900.

KIND.	PRODUCTS.				PER CENT OF INCREASE.	
	Quantity.		Value.			
	1905	1900	1905	1900	Quantity.	Value.
Total			$124,777,551	$119,328,288		4.6
Lead, total (pounds)	783,090,836	587,929,217	30,357,901	25,174,464	33.2	20.6
Soft	169,728,880	90,473,286	7,324,869	3,801,242	87.6	92.7
Hard or antimonial	23,905,398	16,785,097	925,117	701,082	42.4	32.0
All other	589,426,558	480,670,834	22,107,915	20,672,140	22.6	6.9
Gold and silver (ounces fine)			94,419,650	94,153,824		0.3
Gold	2,574,549	2,514,836	52,994,536	52,010,121	2.4	1.9
Silver	72,592,987	70,420,917	41,425,114	42,143,703	3.1	[1]1.7

[1] Decrease.

The heavy increase in the consumption of dry ores by the copper smelters has been at the expense of the lead smelters and is shown in the relative decrease of the silver and gold products of this industry. The hard or antimonial lead and "all other" lead represents the lead product of the argentiferous smelters and the lead smelters handling dry ores.

The increase in the combined product of hard or antimonial lead and "all other" lead for 1900 and 1905 was 23.3 per cent, while the increase in the silver

and gold product, measured by quantities, was very small.

This marked change is not due in the case of the lead smelters to a falling off in the precious metal values of the argentiferous lead ores treated, nor in the case of the copper smelters to a general increase in the precious metal values of the copper ores handled, but it results from the large increase in the quantity of dry gold and silver ores handled by the latter.

Table 29 presents the quantities of the different varieties of products, for Missouri and "all other states," for 1900 and 1905.

TABLE 29.—LEAD SMELTING AND REFINING—PRINCIPAL PRODUCTS, BY KIND AND QUANTITY, AND BY STATES: 1905 AND 1900.

STATE.	Census.	SMELTING.						REFINING AND DESILVERIZING.			
		Nonargentiferous ores.		Argentiferous ores.				Hard or antimonial lead (pounds).	All other lead, including Doré bars (pounds).	Doré bars, contents of precious metals, and fine bars.	
		Soft lead (pounds).	Lead oxide (pounds).	Lead contents of base bullion (pounds).	Silver (ounces fine).	Gold (ounces fine).	Copper contents of matte (pounds).			Silver (ounces fine).	Gold (ounces fine).
United States	1905	169,728,880	11,289,399	449,935,104	37,543,073	965,048	51,617,670	23,905,398	589,426,558	72,592,987	2,574,549
	1900	90,473,286	10,329,804	402,324,605	52,641,752	1,322,177	26,964,031	16,785,097	480,670,834	70,420,917	2,514,836
Missouri	1905	107,680,403	11,289,399	.....	.....	.....	48,000	.....	.....	.....	.....
	1900	83,952,833	10,329,804	.....	.....	.....	.....	.....	.....	.....	.....
All other states	[1] 1905	62,048,477	.....	449,935,104	37,543,073	965,048	51,569,670	23,905,398	589,426,558	72,592,987	2,574,549
	[2] 1900	6,520,453	.....	402,324,605	52,641,752	1,322,177	26,964,031	16,785,097	480,670,834	70,420,917	2,514,836

[1] Includes states as follows: California, Colorado, Idaho, Illinois, Iowa, Kansas, Montana, Nebraska, New Jersey, Pennsylvania, Texas, Utah, Washington, Wisconsin.

[2] Includes states as follows: California, Colorado, Idaho, Illinois, Iowa, Kansas, Montana, Nebraska, New Jersey, New Mexico, Texas, Utah, Virginia, Washington.

The location of the dry gold and silver ores and cheap fuel have been the chief factors which have influenced the location of the lead smelters.

The Missouri smelters are the largest producers of soft lead. The product of the state increased 23,727,570 pounds in 1905 over 1900, or 28.3 per cent; its output constituting 63.4 per cent of the total product of 1905 as compared with 92.8 per cent in 1900. The large increase in the soft lead product of the Illinois and Kansas smelters operates to lower the proportional share of the Missouri smelters.

Missouri also manufactured the entire product of lead oxide reported at both censuses. While the bulk of the smelting of argentiferous ores centers in Colorado, Utah, Washington, Texas, and Montana, in the order named, the refining and desilverizing is located in California, Nebraska, New Jersey, Illinois, and Washington. Idaho is the largest producer of lead ores, outranking Utah, Colorado, and the soft lead states of the Mississippi valley, but its argentiferous lead ores are shipped to smelters in other states and a very small amount is smelted within the state.

PROCESS EMPLOYED—SMELTING, AND SMELTING AND REFINING.

Table 30 presents the statistics for all establishments for 1900 and 1905, segregated according to those doing smelting only and those doing smelting and refining—the latter including refining only—with the per cent of increase.

As before noted there is included in materials and products the duplication arising from the intermediate product between the ore and the refined metal being reported in certain cases by establishments doing both smelting and refining, this intermediate product appearing as product of the smelting department and as material for the refining department.

The group of establishments doing only smelting shows a large increase in capital, while the smelting and refining shows a decrease from 1900 to 1905. With respect to wage-earners there is a decrease in each group, with the larger proportional decrease in the smelting and refining group.

TABLE 30.—LEAD SMELTING AND REFINING—ESTABLISHMENTS CLASSIFIED ACCORDING TO PROCESS EMPLOYED, WITH PER CENT OF INCREASE: 1905 AND 1900.

	TOTAL.		SMELTING.		SMELTING AND REFINING.		PER CENT OF INCREASE.		
	1905	1900	1905	1900	1905	1900	Total.	Smelting.	Smelting and refining.
Number of establishments	32	39	25	30	7	9	[1] 17.9	[1] 16.7	[1] 22.2
Capital	$63,822,810	$72,148,933	$32,677,874	$21,796,609	$31,144,936	$50,352,324	[1] 11.5	49.9	[1] 38.1
Salaried officials, clerks, etc., number	524	425	315	225	209	200	23.3	40.0	4.5
Salaries	$887,602	$754,913	$554,678	$427,000	$332,924	$327,913	17.6	29.9	1.5
Wage-earners, average number	7,573	8,319	5,477	5,635	2,096	2,684	[1] 9.0	[1] 2.8	[1] 21.9
Total wages	$5,374,691	$5,088,684	$4,050,936	$3,209,779	$1,323,755	$1,878,905	5.6	26.2	[1] 29.5
Miscellaneous expenses	$897,876	$1,166,210	$536,323	$730,773	$361,553	$435,437	[1] 23.0	[1] 26.6	[1] 17.0
Materials used, aggregate cost [2]	$168,958,076	$169,703,366	$56,537,817	$42,875,982	$112,420,259	$126,827,384	.....	.....	.....
Smelting, ore—									
Tons	2,412,005	1,952,459	2,262,743	1,496,065	149,262	456,394	23.5	51.2	[1] 67.3
Cost	$60,784,358	$60,868,480	$52,349,372	$38,738,064	$8,434,986	$22,130,416	[1] 0.1	35.1	[1] 61.9
Refining, total cost	$99,283,641	$100,802,504	.....	.....	$99,283,641	$100,802,504	.....	.....	.....
Doré bars—									
Ounces	13,147,523	(3)	.....	.....	13,147,523	(3)	.....	.....	.....
Cost	$31,722,604	(3)	.....	.....	$31,722,604	(3)	.....	.....	.....
Domestic base bullion—									
Tons	239,836	180,998	.....	.....	239,836	180,998	.....	.....	.....
Cost	$49,883,791	$80,940,771	.....	.....	$49,883,791	$80,940,771	.....	.....	.....
Foreign base bullion—									
Tons	97,179	78,939	.....	.....	97,179	78,939	.....	.....	.....
Cost	$17,677,246	$19,861,733	.....	.....	$17,677,246	$19,861,733	.....	.....	.....
All other materials	$8,890,077	$8,032,382	$4,188,445	$4,137,918	$4,701,632	$3,894,464	10.7	1.2	20.7
Products, aggregate value [2]	$185,826,839	$200,974,507	$67,341,324	$50,696,417	$118,485,515	$150,278,090	.....	.....	.....
Smelting, total value	$62,220,245	$77,061,277	$62,220,245	$47,328,485	.....	$29,732,792	.....	.....	.....
Nonargentiferous ores, total value	$7,324,869	$3,801,242	$7,324,869	$3,624,668	.....	$176,574	.....	.....	.....
Lead—									
Pounds	169,728,880	90,473,286	169,728,880	86,009,974	.....	4,463,312	87.6	97.3	.....
Value	$7,324,869	$3,801,242	$7,324,869	$3,624,668	.....	$176,574	92.7	102.1	.....
Argentiferous ores, total value	$54,895,376	$73,260,035	$54,895,376	$43,703,817	.....	$29,556,218	.....	.....	.....
Lead contents of base bullion—									
Pounds	449,935,104	402,324,605	449,935,104	283,305,467	.....	119,019,138	.....	.....	.....
Value	$13,757,268	$15,546,661	$13,757,268	$10,594,433	.....	$4,952,228	.....	.....	.....
Silver—									
Ounces fine	37,543,073	52,641,752	37,543,073	33,071,356	.....	19,570,396	.....	.....	.....
Value	$21,322,494	$31,185,203	$21,322,494	$19,701,888	.....	$11,483,315	.....	.....	.....
Gold—									
Ounces fine	965,048	1,322,177	965,048	676,035	.....	646,142	.....	.....	.....
Value	$19,815,614	$26,528,171	$19,815,614	$13,407,496	.....	$13,120,675	.....	.....	.....
Lefining and desilverizing, total value	$117,452,682	$115,527,046	.....	.....	$117,452,682	$115,527,046	1.7	.....	1.7
Hard or antimonial lead—									
Pounds	23,905,398	16,785,097	.....	.....	23,905,398	16,785,097	42.4	.....	42.4
Value	$925,117	$701,082	.....	.....	$925,117	$701,082	32.0	.....	32.0
All other lead, including Doré bars—									
Pounds	589,426,558	480,670,834	.....	.....	589,426,558	480,670,834	22.6	.....	22.6
Value	$22,107,915	$20,672,140	.....	.....	$22,107,915	$20,672,140	6.9	.....	6.9
Doré and fine bars, total value	$94,419,650	$94,153,824	.....	.....	$94,419,650	$94,153,824	0.3	.....	0.3
Silver—									
Ounces fine	72,592,987	70,420,917	.....	.....	72,592,987	70,420,917	3.1	.....	3.1
Value	$41,425,114	$42,143,703	.....	.....	$41,425,114	$42,143,703	[1] 1.7	.....	[1] 1.7
Gold—									
Ounces fine	2,574,549	2,514,836	.....	.....	2,574,549	2,514,836	2.4	.....	2.4
Value	$52,994,536	$52,010,121	.....	.....	$52,994,536	$52,010,121	1.9	.....	1.9
Doré bars, total value	$1,145,309	(3)	.....	.....	$1,145,309	(3)	.....	.....	.....
Silver—									
Ounces fine	$41,234	(3)	.....	.....	$41,234	(3)	.....	.....	.....
Value	$500,476	(3)	.....	.....	$500,476	(3)	.....	.....	.....
Gold—									
Ounces fine	31,240	(3)	.....	.....	31,240	(3)	.....	.....	.....
Value	$644,833	(3)	.....	.....	$644,833	(3)	.....	.....	.....
Fine bars, total value	$93,274,341	(3)	.....	.....	$93,274,341	(3)	.....	.....	.....
Silver—									
Ounces fine	71,751,753	(3)	.....	.....	71,751,753	(3)	.....	.....	.....
Value	$40,924,638	(3)	.....	.....	$40,924,638	(3)	.....	.....	.....
Gold—									
Ounces fine	2,543,309	(3)	.....	.....	2,543,309	(3)	.....	.....	.....
Value	$52,349,703	(3)	.....	.....	$52,349,703	(3)	.....	.....	.....
All other products, total value	$6,153,912	$8,386,184	$5,121,079	$3,367,932	$1,032,833	$5,018,252	[1] 26.6	52.1	[1] 79.4
Copper in matte, etc.—									
Pounds	51,617,670	26,964,031	47,522,080	20,467,894	4,095,590	6,496,137	91.4	132.2	[1] 37.0
Value	$4,812,865	$3,768,402	$4,336,902	$2,785,010	$475,963	$983,392	27.7	55.7	[1] 51.6
Copper sulphate—									
Pounds	11,371,251	(3)	.....	(3)	11,371,251	(3)	.....	.....	.....
Value	$541,763	(3)	.....	(3)	$541,763	(3)	.....	.....	.....
Other products, value	$799,284	$4,617,782	$784,177	$582,922	$15,107	$4,034,860	[1] 82.7	34.5	[1] 99.6
Including—									
Lead oxide (pounds)	11,289,399	10,329,804	11,289,399	10,329,804	.....	.....	9.3	9.3	.....
Arsenic (pounds)	554,445	(3)	.....	(3)	554,445	(3)	.....	.....	.....

[1] Decrease.
[2] Includes a duplication in cost of materials and value of products of $1,036,848 for 1905 and $25,508,203 for 1900. The latter amount represents intermediate products between the ore and the refined metal.
[3] Not reported separately.

If correction is made for the duplication due to intermediate products the comparative figures for materials and products are as given in Table 31.

TABLE 31.—LEAD SMELTING AND REFINING—COMPARATIVE SUMMARY OF MATERIALS AND PRODUCTS, NET COST AND VALUE, CLASSIFIED ACCORDING TO PROCESS EMPLOYED: 1905 AND 1900.

	TOTAL.		SMELTING.		SMELTING AND REFINING.		PER CENT OF INCREASE.		
	1905	1900	1905	1900	1905	1900	Total.	Smelting.	Smelting and refining.
Materials used, total cost	$167,921,228	$144,195,163	$56,537,817	$42,875,982	$111,383,411	$101,319,181	16.5	31.9	9.9
Products, aggregate value	184,789,991	175,466,304	67,341,324	50,696,417	117,448,667	124,769,887	5.3	32.8	[1] 5.9
Smelting	62,220,245	51,553,074	62,220,245	47,328,485	.....	4,224,589	20.7	31.5	.....
Refining and desilverizing	116,415,834	115,527,046	.....	.....	116,415,834	115,527,046	0.8	.....	0.8
All other products	6,153,912	8,386,184	5,121,079	3,367,932	1,032,833	5,018,252	[1] 26.6	52.1	[1] 79.4

[1] Decrease.

GROSS AND NET VALUES OF PRODUCTS.

In making the canvass for the census of 1905 inquiries were made as to the expense of marketing the product of the smelters, in order to show the gross and net values of the smelter products. This expense consists of tolls paid for refining, freight on bullion, matte, or other smelter product to the refining or desilverizing establishment, treating the smelter product, and commissions and selling expenses. In the prior tables the values of products have been net values. Table 32 presents the statistics bearing on gross and net values and the deductions reported.

TABLE 32.—LEAD SMELTING AND REFINING—ESTABLISHMENTS REPORTING GROSS AND NET VALUES OF PRODUCTS: 1905.

	Total.	SMELTERS ONLY.		Refineries and desilverizers, including smelters connected with refineries.
		Nonargentiferous.	Argentiferous.	
All establishments:				
Number	32	13	12	7
Products, net value	$185,826,839	$8,112,956	$59,228,368	$118,485,515
Establishments reporting gross and net values:				
Number	20	4	12	4
Total products, net value	$148,609,966	$2,801,464	$59,228,368	$86,580,134
Products not charged with deductions	$93,602,178	.....	$21,779,657	$71,822,521
Products charged with deductions—				
Gross value	$62,086,584	$2,857,672	$43,605,940	$15,622,972
Net value	$55,007,788	$2,801,464	$37,448,711	$14,757,613
Total deductions on bullion and matte products, for refining, freight, commissions, etc.	$7,078,796	$56,208	$6,157,229	$865,359
Tolls paid for refining	$3,825,208	.....	$3,792,067	$33,141
Freight	$3,216,093	$51,927	$2,331,948	$832,218
Commissions and selling expenses [1]	$37,495	$4,281	$33,214	.....
Lead—				
Number	19	4	12	3
Gross value	$35,730,921	$2,857,672	$18,194,013	$14,679,236
Net value	$30,432,176	$2,801,464	$13,757,268	$13,873,444
Deductions	$5,298,745	$56,208	$4,436,745	$805,792
Tolls paid for refining	$2,279,834	.....	$2,279,834	.....
Freight	$3,003,742	$51,927	$2,146,023	$805,792
Commissions and selling expenses	$15,169	$4,281	$10,888	.....
Silver—				
Number	3	.....	2	1
Gross value	$1,047,190	.....	$1,022,796	$24,394
Net value	$1,027,610	.....	$1,004,923	$22,687
Deductions, tolls paid for refining	$19,580	.....	$17,873	$1,707
Gold—				
Number	10	.....	9	1
Gross value	$18,486,177	.....	$18,482,320	$3,857
Net value	$18,357,260	.....	$18,353,528	$3,732
Deductions, tolls paid for refining	$128,917	.....	$128,792	$125
Copper—				
Number	13	.....	9	4
Gross value	$6,822,296	.....	[2] $5,906,811	[3] $915,485
Net value	$5,190,742	.....	[2] $4,332,992	[3] $857,750
Deductions	$1,631,554	.....	$1,573,819	$57,735
Tolls paid for refining	$1,396,877	.....	$1,365,568	$31,309
Freight	$212,351	.....	$185,925	$26,426
Commissions and selling expenses	$22,326	.....	$22,326	.....
All other establishments:				
Number	12	9	.....	3
Products	$37,216,873	$5,311,492	.....	$31,905,381

[1] Commissions and selling expenses reported by 4 smelting establishments—3 nonargentiferous and 1 argentiferous.
[2] Gross value: Copper contents of matte, $5,906,311; other products, $500. Net value: Copper contents of matte, $4,332,502; other products, $490.
[3] Gross value: Copper and copper contents of matte, $516,859; blue vitriol, $398,626. Net value: Copper and copper contents of matte, $475,963; blue vitriol, $381,787.

Of the 32 establishments there were 20 reporting gross and net values, 4 of these being nonargentiferous smelters, 12 argentiferous smelters, and 4 refineries or smelters and refineries. The gross value of the products charged with deductions was $62,086,584, against which the deductions were $7,078,796, leaving $55,007,788 as the net value of the same. The 20 establishments reporting deductions had products of a value of $93,602,178 not charged with deductions, and the remaining 12 establishments had products amounting to $37,216,873, making a total of $130,819,051 of products not charged with the expense of subsequent treatment. In the case of the few nonargentiferous smelters reporting deductions they are entirely for freight and selling expense. The bulk of the deductions pertain to the bullion and matte products of the argentiferous smelters. The lead contents of the base bullion product of the argentiferous smelters amounted to 449,935,104 pounds and the tolls paid for refining were $3,792,067 and freight to refineries $2,331,948.

The detailed statistics for the lead smelting and refining industry at the census of 1905 are shown in Table 33. The amount received for contract smelting and refining is given, but the ores thus treated are included in the quantities and values of the materials and products.

TABLE 33.—*Lead smelting and refining—detailed summary, by states: 1905.*

	United States.	Missouri.	All other states.[1]
Number of establishments	32	8	24
Capital, total	$63,822,810	$1,341,292	$62,481,518
Land	$2,958,080	$58,000	$2,900,080
Buildings	$18,628,976	$160,200	$18,468,776
Machinery, tools, and implements	$20,941,814	$409,500	$20,532,314
Cash and sundries	$21,293,940	$713,592	$20,580,348
Proprietors and firm members	5	.....	5
Salaried officials, clerks, etc.:			
Total number	524	41	483
Total salaries	$887,602	$79,977	$807,625
Officers of corporations—			
Number	18	8	10
Salaries	$78,027	$40,627	$37,400
General superintendents, managers, clerks, etc.—			
Total number	506	33	473
Total salaries	$809,575	$39,350	$770,225
Men—			
Number	498	33	465
Salaries	$802,595	$39,350	$763,245
Women—			
Number	8	.....	8
Salaries	$6,980	.....	$6,980
Wage-earners, including pieceworkers, and total wages:			
Greatest number employed at any one time during the year	8,342	533	7,809
Least number employed at any one time during the year	6,695	391	6,304
Average number	7,573	489	7,084
Total wages	$5,374,691	$275,912	$5,098,779
Men 16 years and over—			
Average number	7,566	489	7,077
Wages	$5,371,031	$275,912	$5,095,119
Women 16 years and over—			
Average number	7	.....	7
Wages	$3,660	.....	$3,660
Average number of wage-earners, including pieceworkers, employed during each month:			
Men 16 years and over—			
January	7,522	492	7,030
February	7,654	497	7,157
March	7,771	491	7,280
April	7,609	492	7,117
May	7,265	481	6,784
June	7,493	480	7,013
July	7,502	476	7,026
August	7,571	485	7,086
September	7,565	486	7,079
October	7,493	491	7,002

[1] Includes establishments distributed as follows: California, 1; Colorado, 7; Idaho, 1; Illinois, 3; Iowa, 1; Kansas, 1; Montana, 1; Nebraska, 1; New Jersey, 2; Pennsylvania, 1; Texas, 1; Utah, 1; Washington, 2; Wisconsin, 1.

TABLE 33.—*Lead smelting and refining—detailed summary, by states: 1905*—Continued.

	United States.	Missouri.	All other states.
Average number of wage-earners, including pieceworkers, employed during each month—Continued.			
Men 16 years and over—Continued.			
November	7,580	496	7,084
December	7,767	501	7,266
Women 16 years and over—			
January	9	.....	9
February	8	.....	8
March	6	.....	6
April	7	.....	7
May	7	.....	7
June	7	.....	7
July	8	.....	8
August	7	.....	7
September	7	.....	7
October	6	.....	6
November	6	.....	6
December	6	.....	6
Miscellaneous expenses, total	$897,876	$64,486	$833,390
Rent of works	$1,200	.....	$1,200
Taxes	$115,030	$6,601	$108,429
Rent of offices, interest, insurance, and all other sundry expenses not hitherto included	$743,712	$46,951	$696,761
Contract work	$37,934	$10,934	$27,000
Materials used, aggregate cost	$168,958,076	$4,683,846	$164,274,230
Smelting, total cost	$66,861,509	$4,657,403	$62,204,106
Ores—			
Tons	2,412,005	88,286	2,323,719
Cost	$60,784,358	$4,427,655	$56,356,703
Argentiferous—			
Tons	2,271,724	.....	2,271,724
Cost	$53,934,731	.....	$53,934,731
Nonargentiferous—			
Tons	140,281	88,286	51,995
Cost	$6,849,627	$4,427,655	$2,421,972
Fluxes—			
Tons	487,317	16,000	471,317
Cost	$615,703	$24,166	$591,537
Fuel	$3,019,972	$162,188	$2,857,784
Rent of power and heat	$27,366	.....	$27,366
Mill supplies	$62,357	$21,394	$40,963
All other materials	$2,351,753	$22,000	$2,329,753
Refining and desilverizing, total cost	$101,890,582	.....	$101,890,582
Doré bars—			
Ounces	13,147,523	.....	13,147,523
Cost	$31,722,604	.....	$31,722,604
Base bullion—			
Pounds	674,031,114	.....	674,031,114
Cost	$67,561,037	.....	$67,561,037
Domestic—			
Pounds	479,672,346	.....	479,672,346
Cost	$49,883,791	.....	$49,883,791
Foreign—			
Pounds	194,358,768	.....	194,358,768
Cost	$17,677,246	.....	$17,677,246
Fuel	$772,297	.....	$772,297
Mill supplies	$36,041	.....	$36,041
All other materials	$1,798,603	.....	$1,798,603
Freight	$205,985	$26,443	$179,542
Products, aggregate value	$185,826,839	$5,473,586	$180,353,253
Smelting, total value	$67,341,324	$5,473,586	$61,867,738
Nonargentiferous ores, total value	$8,112,956	$5,473,586	$2,639,370
Soft lead—			
Pounds	169,728,880	107,680,403	62,048,477
Value	$7,324,869	$4,685,499	$2,639,370
All other products of nonargentiferous ores[2]	$788,087	$788,087	.....
Amount received for contract work on nonargentiferous ores[3]	$170,000	.....	$170,000
Argentiferous ores, total value	$59,228,368	.....	$59,228,368
Lead contents of base bullion—			
Pounds	449,935,104	.....	449,935,104
Value	$13,757,268	.....	$13,757,268
Silver—			
Ounces fine	37,543,073	.....	37,543,073
Value	$21,322,494	.....	$21,322,494
Gold—			
Ounces fine	965,048	.....	965,048
Value	$19,815,614	.....	$19,815,614
All other products of argentiferous ores	$4,332,992	.....	$4,332,992
Amount received for contract work on argentiferous ores[3]	$390,910	.....	$390,910
Refining and desilverizing, total value	$118,485,515	.....	$118,485,515
Hard or antimonial lead—			
Pounds	23,905,398	.....	23,905,398
Value	$925,117	.....	$925,117
All other lead (including Doré bars)—			
Pounds	589,426,558	.....	589,426,558
Value	$22,107,915	.....	$22,107,915
Doré bars, contents of precious metals—			
Silver—			
Ounces fine	841,234	.....	841,234
Value	$500,476	.....	$500,476
Gold—			
Ounces fine	31,240	.....	31,240
Value	$644,833	.....	$644,833

[2] Includes the value of 11,289,399 pounds of sublimed white lead.
[3] Not included in the total or aggregate value.

TABLE 33.—*Lead smelting and refining—detailed summary, by states: 1905*—Continued.

	United States.	Missouri.	All other states.
Products—Continued.			
Refining and desilverizing—Cont'd.			
Fine bars—			
Silver—			
Ounces fine	71,751,753	.....	71,751,753
Value	$40,924,638	.....	$40,924,638
Gold—			
Ounces fine	2,543,309	.....	2,543,309
Value	$52,349,703	.....	$52,349,703
All other products of refining and desilverizing	$1,032,833	.....	$1,032,833
Amount received for contract work on refining and desilverizing[1]	$253,918	.....	$253,918
Contents of foreign ores treated:			
Imported for consumption, total—			
Lead (pounds)	263,471	.....	263,471
Silver (ounces fine)	7,979,912	.....	7,979,912
Gold (ounces fine)	173,660	.....	173,660
Copper (pounds)	12,395,603	.....	12,395,603
From Mexico—			
Lead (pounds)	233,302	.....	233,302
Silver (ounces fine)	7,128,713	.....	7,128,713
Gold (ounces fine)	55,463	.....	55,463
Copper (pounds)	388,840	.....	388,840
From British Columbia—			
Silver (ounces fine)	531,338	.....	531,338
Gold (ounces fine)	108,562	.....	108,562
Copper (pounds)	11,968,045	.....	11,968,045
From other countries—			
Lead (pounds)	30,169	.....	30,169
Silver (ounces fine)	319,861	.....	319,861
Gold (ounces fine)	9,635	.....	9,635
Copper (pounds)	38,718	.....	38,718
Smelted and refined in bond and re-exported, total—			
Lead (pounds)	107,647,481	.....	107,647,481
Silver (ounces fine)	6,469,281	.....	6,469,281
Gold (ounces fine)	36,543	.....	36,543
Copper (pounds)	8,592,275	.....	8,592,275
From Mexico—			
Lead (pounds)	105,683,586	.....	105,683,586
Silver (ounces fine)	4,686,068	.....	4,686,068
Gold (ounces fine)	34,460	.....	34,460
Copper (pounds)	7,805,580	.....	7,805,580
From Bolivia and all other countries—			
Lead (pounds)	1,963,895	.....	1,963,895
Silver (ounces fine)	1,783,213	.....	1,783,213
Gold (ounces fine)	2,083	.....	2,083
Copper (pounds)	786,695	.....	786,695
Power:			
Number of establishments reporting	30	6	24
Total horsepower	32,648	1,357	31,291
Owned—			
Engines—			
Steam—			
Number	169	13	156
Horsepower	22,440	1,212	21,228
Gas and gasoline—			
Number	4	1	3
Horsepower	100	20	80
Water wheels—			
Number	1	.....	1
Horsepower	1	.....	1
Electric motors—			
Number	210	3	207
Horsepower	6,981	125	6,856
Rented—			
Electric motors—			
Number	66	.....	66
Horsepower	3,126	.....	3,126

[1] Not included in the total or aggregate value.

ZINC SMELTING.

The vigorous growth of the zinc smelting industry noted at the census of 1900 has continued, and the production of spelter, including sheet zinc, at the census of 1905 reached a total of 186,990 tons, as compared with 131,546 tons for 1900, 58,860 tons for 1890, and 23,239 tons for 1880. This shows an increase of 35,621 tons for the decade 1880 to 1890; 72,686 tons for the decade 1890 to 1900; and 55,444 tons for the five-year period 1900 to 1905.

The general comparative statistics for the industry are given in Table 34 for 1890, 1900, and 1905, with the per cent of increase. The statistics for 1890 in the table are taken from the Eleventh Census of mines and mining.

TABLE 34.—*Zinc smelting—comparative summary, with per cent of increase: 1890 to 1905.*

	CENSUS.			PER CENT OF INCREASE.	
	1905	1900	1890[1]	1900 to 1905	1890 to 1900
Number of establishments	31	31	21	.....	47.6
Capital	$23,701,586	$14,141,810	$4,469,386	67.6	216.4
Salaried officials, clerks, etc., number	354	208	95	70.2	118.9
Salaries	$581,479	$440,200	$140,280	32.1	213.8
Wage-earners, average number	6,528	4,869	2,690	34.1	81.0
Total wages	$3,856,466	$2,355,921	$1,424,981	63.7	65.3
Men 16 years and over	6,506	4,843	(2)	34.3	.....
Wages	$3,851,120	$2,348,338	(2)	64.0	.....
Women 16 years and over	2	8	(2)	[3] 75.0	.....
Wages	$624	$3,369	(2)	[3] 81.5	.....
Children under 16 years	20	18	(2)	11.1	.....
Wages	$4,722	$4,214	(2)	12.1	.....
Miscellaneous expenses	$1,326,621	$399,472	$226,232	232.1	76.6
Cost of materials used	$17,028,418	$13,286,058	$4,807,710	28.2	176.3
Value of products	$24,791,299	$18,188,498	(4)	36.3	.....

[1] Report on Mineral Industries, Eleventh Census.
[2] Not reported separately.
[3] Decrease.
[4] Value of products not reported.

Although the number of establishments is the same for 1905 as for 1900, the increase in capital invested, wage-earners, and materials and products indicate the steady growth of the industry. In addition to the active establishments shown, there were 3 idle establishments reported at the census of 1905, located 2 in Iowa and 1 in Pennsylvania, which reported capital investment and power equipment as shown in Table 35.

TABLE 35.—*Zinc smelting—idle establishments: 1905.*

Number of establishments	3
Capital, total	$386,000
Land	$131,000
Buildings	$216,000
Machinery, tools, and implements	$35,300
Cash and sundries	$2,500
Power, owned:	
Number of establishments reporting	3
Total horsepower	1,095
Engines, steam—	
Number	5
Horsepower	1,070
Water wheels—	
Number	1
Horsepower	25

In 1900 there were 2 idle establishments, in addition to the 31 active establishments, with a capital of $59,500, located 1 in Kansas and 1 in Virginia.

On account of the different methods of treating the smelting industry prior to 1890 Census figures comparable with those of 1900 and 1905 are not available, but the production of spelter as compiled by the Geological Survey since 1873 is presented in Table 36.

TABLE 36.—*Production of spelter in the United States: 1873 to 1904.*[1]

YEAR.	Quantity (tons).	YEAR.	Quantity (tons).
1904	186,702	1891	80,873
1903	159,219	1890	63,683
1902	156,927	1889	58,860
1901	140,822	1888	55,903
1900	123,886	1887	50,340
1899	129,051	1886	42,641
1898	115,399	1885	40,688
1897	99,980	1884	38,544
1896	81,499	1883	36,872
1895	89,686	1882	33,765
1894	75,328	1880	23,239
1893	78,832	1875	15,833
1892	87,260	1873	7,343

[1] United States Geological Survey, "Mineral Resources of the United States," 1904.

The total production of spelter, including sheet zinc made at the smelters, as reported at the census of 1905, was 186,990 tons, or 288 tons more than for the calendar year 1904 as shown in Table 36, due to the fact that the periods covered are not identical. The returns for the United States Geological Survey are for the calendar year, while the reports for the Census Office cover the fiscal year of the establishment reporting most nearly conforming to the calendar year 1904, and in a number of reports the fiscal year includes part of 1905.

THE INDUSTRY, BY STATES.

The general statistics, by states, for the censuses of 1900 and 1905, so far as they can be given, are shown in Table 37.

TABLE 37.—ZINC SMELTING—COMPARATIVE SUMMARY, BY STATES: 1905 AND 1900.

STATE.	Census.	Number of establishments.	Capital.	SALARIED OFFICIALS, CLERKS, ETC.		WAGE-EARNERS AND WAGES.		Miscellaneous expenses.	Cost of materials used.	Value of products.
				Number.	Salaries.	Average number.	Wages.			
United States	1905	31	$23,701,586	354	$581,479	6,528	$3,856,466	$1,326,621	$17,028,418	$24,791,299
	1900	31	14,141,810	208	440,200	4,869	2,355,921	399,472	13,286,058	18,188,498
Illinois	1905	5	2,876,201	74	140,158	1,643	883,504	102,947	3,900,058	5,425,636
	1900	5	3,186,319	80	222,022	1,551	758,912	109,407	4,416,815	5,882,746
Indiana	1900	3	144,835	8	7,050	119	58,138	5,588	387,399	445,643
Kansas	1905	13	10,903,432	141	247,433	2,507	1,569,533	412,310	8,448,549	10,999,468
	1900	11	5,218,529	40	60,800	1,487	705,803	81,169	4,678,946	5,790,144
Missouri	1905	4	602,898	24	34,316	364	233,590	25,500	1,154,366	1,624,480
	1900	5	804,029	17	36,880	500	268,196	36,903	1,651,387	2,011,724
Pennsylvania [1]	1900	3	1,871,626	9	13,669	448	174,510	4,869	896,192	1,521,307
All other states	[2] 1905	9	9,319,055	115	159,572	2,014	1,169,839	785,804	3,525,445	6,741,715
	[3] 1900	4	2,916,472	54	99,179	764	390,362	161,536	1,255,319	2,536,934

[1] Included in "all other states" in 1905.
[2] Includes establishments distributed as follows: Colorado, 2; New Jersey, 1; Pennsylvania, 3; Virginia, 1; West Virginia, 1; Wisconsin, 1.
[3] Includes establishments distributed as follows: New Jersey, 2; Virginia, 1; Wisconsin, 1.

The production of the Illinois and Missouri zinc smelters shows a decrease at the census of 1905 over that of 1900, and no production was reported from Indiana, but the output of the Kansas zinc smelters has nearly doubled since 1900, and Pennsylvania's output has more than doubled, though the detailed statistics for the latter state can not be shown and are included in "all other states."

Table 38 presents the statistics for establishments located east and west of the Mississippi river, for the censuses of 1900 and 1905, with per cent of increase.

TABLE 38.—ZINC SMELTING—COMPARATIVE SUMMARY OF ESTABLISHMENTS, BY LOCATION, EAST AND WEST OF THE MISSISSIPPI RIVER: 1905 AND 1900.

	TOTAL.		EAST OF THE MISSISSIPPI.		WEST OF THE MISSISSIPPI.		PER CENT OF INCREASE.		
	1905	1900	1905	1900	1905	1900	Total.	East.	West.
Number of establishments	31	31	12	15	19	16	.....	[1] 20.0	18.7
Capital	$23,701,586	$14,141,810	$9,917,256	$8,119,252	$13,784,330	$6,022,558	67.6	22.1	128.9
Salaried officials, clerks, etc., number	354	208	171	151	183	57	70.2	13.2	221.1
Salaries	$581,479	$440,200	$259,891	$342,520	$321,588	$97,680	32.1	[1] 24.1	229.2
Wage-earners, average number	6,528	4,869	3,169	2,882	3,359	1,987	34.1	10.0	69.0
Total wages	$3,856,466	$2,355,921	$1,632,496	$1,381,922	$2,223,970	$973,999	63.7	18.1	128.3
Miscellaneous expenses	$1,326,621	$399,472	$860,916	$281,400	$465,705	$118,072	232.1	205.9	294.4
Materials used, total cost	$17,028,418	$13,286,058	$6,723,118	$6,955,725	$10,305,300	$6,330,333	28.2	13.3	62.8
Ore—									
Tons	743,760	463,609	401,781	289,618	341,979	173,991	60.4	38.7	96.5
Cost	$13,663,607	$10,995,846	$5,114,069	$5,174,548	$8,549,598	$5,821,298	24.3	[1] 1.2	46.9
All other materials	$3,364,751	$2,290,212	$1,609,049	$1,781,177	$1,755,702	$509,035	46.9	[1] 9.7	244.9
Products, total value	$24,791,299	$18,188,498	$10,733,676	$10,386,630	$14,057,623	$7,801,868	36.3	3.3	80.2
Spelter and sheet zinc—									
Pounds	373,979,078	263,091,688	116,346,975	117,846,473	257,632,103	145,245,215	42.1	[1] 1.3	77.4
Value	$19,210,859	$14,843,416	$6,387,505	$7,041,548	$12,823,354	$7,801,868	29.4	[1] 9.3	64.4
All other products	$5,580,440	$3,345,082	$4,346,171	$3,345,082	$1,234,269	.....	66.8	29.9	.....

[1] Decrease.

In 1900, although the quantity of zinc made by the western establishments exceeded the zinc output of the eastern plants, the total value of the products of the eastern plants was largely in excess, the latter producing $3,143,370 of zinc oxide and sulphuric acid besides other products, in addition to spelter and sheet zinc products; that is, in 1900 the output of the western smelters was all in the form of spelter; while of the eastern establishments only 67.8 per cent of the total products was spelter and sheet zinc.

For 1905 the western establishments show a production of 257,632,103 pounds of zinc (spelter and sheet zinc), of a value of $12,823,354, an increase of 77.4 per cent in quantity and 64.4 per cent in value over 1900, and in addition zinc oxide, sulphuric acid, and other products of a value of $1,234,269; whereas the

eastern establishments show a slight decrease in zinc metal product for 1905 over 1900, with an increase in other products, the total products of the eastern smelters showing a small increase of 3.3 per cent, as compared with an increase of 80.2 per cent for the western establishments. For 1905 zinc metal constituted 59.5 per cent of the total products of the eastern smelters (67.8 per cent in 1900) and 91.2 per cent of the product of the western.

The capital invested in the entire industry shows a very heavy increase, and, as at the census of 1900, is in part due to improvements in appliances and in part to the development of industries collateral to zinc smelting, viz, the manufacture of zinc oxide, sulphuric acid, and the rolling of zinc. The production of rolled sheet zinc by zinc smelting establishments has increased from 9,389 tons at the census of 1890 to 17,723 tons at the census of 1900 and to 24,346 tons for 1905, an increase of 37.4 per cent for 1905 as compared with 1900. The production of zinc oxide by smelting establishments increased from 37,557 tons for 1900 to 58,743 tons for 1905, or 56.4 per cent; and sulphuric acid from 58,828 tons for 1900 to 77,305 tons for 1905, or 31.4 per cent.

In the report for the zinc smelting industry for the Twelfth Census a presentation was made of the statistics by two groups of states, one group including the works of the Mississippi valley states, which are dependent almost exclusively upon the ores mined in the Mississippi valley, and purchase their ores in the open market, and the other group including the works of the states which control nearly the whole of their own ore supply. The first group then included the works of Illinois, Indiana, Kansas, Missouri, and Wisconsin, and the latter, the works of Pennsylvania, New Jersey, and Virginia, all eastern states.

Table 39 presents corresponding statistics for 1905 in comparison with those of 1900, and gives the per cent of increase.

TABLE 39.—ZINC SMELTING—COMPARATIVE SUMMARY OF ESTABLISHMENTS ARRANGED ACCORDING TO LOCATION: 1905 AND 1900.

	TOTAL.		EASTERN STATES.[1]		WESTERN STATES.[2]		PER CENT OF INCREASE.		
	1905	1900	1905	1900	1905	1900	Total.	Eastern.	Western.
Number of establishments	31	31	6	6	25	25	.....	.....	.....
Capital	$23,701,586	$14,141,810	$6,498,055	$4,193,098	$17,203,531	$9,948,712	67.6	54.9	72.9
Salaried officials, clerks, etc., number	354	208	75	48	279	160	70.2	56.2	74.4
Salaries	$581,479	$440,260	$95,911	$88,668	$485,568	$351,532	32.1	8.2	38.1
Wage-earners, average number	6,528	4,869	1,348	1,080	5,180	3,789	34.1	24.8	36.7
Total wages	$3,856,466	$2,355,921	$658,634	$506,258	$3,197,832	$1,849,663	63.7	30.1	72.9
Miscellaneous expenses	$1,326,621	$399,472	$742,969	$157,325	$583,652	$242,147	232.1	372.3	141.0
Materials used, total cost	$17,028,418	$13,286,058	$2,534,060	$1,799,315	$14,494,358	$11,486,743	28.2	40.8	26.2
Ore—									
Tons	743,760	463,609	285,796	163,459	457,964	300,150	60.4	74.8	52.6
Cost	$13,663,667	$10,995,846	$1,662,474	$889,819	$12,001,193	$10,106,027	24.3	86.8	18.8
All other materials	$3,364,751	$2,290,212	$871,586	$909,496	$2,493,165	$1,380,716	46.9	[3]4.2	80.6
Products, total value	$24,791,299	$18,188,498	$4,815,340	$3,552,330	$19,975,959	$14,636,168	36.3	35.6	36.5
Spelter and sheet zinc—									
Pounds	373,979,078	263,091,688	22,927,636	17,610,736	351,051,442	245,480,952	42.1	30.2	43.0
Value	$19,210,859	$14,843,416	$1,406,339	$1,196,145	$17,804,520	$13,647,271	29.4	17.6	30.5
All other products	$5,580,440	$3,345,082	$3,409,001	$2,356,185	$2,171,439	$988,897	66.8	44.7	119.6

[1] Includes states as follows: 1905—New Jersey, Pennsylvania, Virginia, West Virginia. 1900—New Jersey, Pennsylvania, Virginia.
[2] Includes states as follows: 1905—Colorado, Illinois, Kansas, Missouri, Wisconsin. 1900—Illinois, Indiana, Kansas, Missouri, Wisconsin.
[3] Decrease.

The state of Colorado appears as a producer for 1905 and has been included in the first group, though the ores handled by the Colorado smelters are not Mississippi valley ores. The table therefore presents the statistics grouped to show the western establishments, which with one exception purchased their ores, and the eastern establishments, which control nearly the whole of their own supply.

There were 4 establishments which treated exclusively ores produced from their own mines, valued in all at $1,539,106 and located 1 in Missouri, 1 in New Jersey, and 2 in Pennsylvania. All other establishments operated on purchased ores.

The establishments purchasing their ores report the price paid for ore in the open market, while the establishments smelting ores produced by their own mines necessarily have to report an estimated cost for the ore at the smelter. The ores handled by the Colorado smelters are low grade zinc ores carrying values in lead and the precious metals, and are not in the same class with the rich zinc ores of the Mississippi valley. The average cost price paid by the Colorado smelters for ores approximates nearer to that of the eastern group than to that of the Mississippi valley smelters. The average cost per ton of the ores purchased by the Mississippi valley smelters for 1905 was $28.35 per ton as compared with an average cost of $33.67 for 1900, whereas the average cost of the ores used by the eastern group for 1905 was $5.82 per ton as against $5.44 per ton for 1900. At the census of 1900, the price of zinc ore in the Mississippi valley district was subject to wide fluctuations, zinc ore of standard quality in the bin at the mines reaching $55 per ton, and the average was abnormally high.

PRODUCTS.

Table 40 shows in detail the specific products of the zinc smelters for the United States, for 1900 and 1905.

TABLE 40.—*Zinc smelting—products, by kind, quantity, and value: 1905 and 1900.*

KIND.	1905	1900	Per cent of increase.
Total value	$24,791,299	$18,188,498	36.3
Spelter—			
Pounds	325,287,010	227,646,314	42.9
Value	$16,379,383	$12,348,036	32.6
Sheet zinc—			
Pounds	48,692,068	35,445,374	37.4
Value	$2,831,476	$2,495,380	13.5
Zinc oxide—			
Pounds	117,485,861	75,114,904	56.4
Value	$4,330,394	$2,718,700	59.3
Sulphuric acid—			
Pounds	154,609,036	117,655,214	31.4
Value	$576,060	$424,670	35.6
All other products	$673,986	$201,712	234.1

Between 1900 and 1905 the total production of zinc metal—spelter and sheet zinc—increased 110,887,390 pounds, or 42.1 per cent.

Kansas, which stood second at the census of 1890, was easily first both for 1900 and 1905. Its spelter product for 1900 was 109,031,632 pounds, or 41.4 per cent of the total spelter and sheet zinc product, and for 1905 its spelter and sheet zinc product was 221,638,884 pounds, or 59.3 per cent of the total. Illinois was second at both censuses, with 91,517,175 pounds of spelter and sheet zinc, or 34.8 per cent of the total product for 1900, and 93,419,339 pounds, or 25 per cent, for 1905; Missouri was third in both cases, with 36,213,583 pounds of spelter, or 13.8 per cent, for 1900, and 24,249,219 pounds of spelter, or 6.5 per cent, for 1905; and Pennsylvania fourth, with 3.6 per cent in 1900 and 4.1 per cent for 1905. Colorado and West Virginia appear as producers for the first time for 1905.

The use of natural gas as fuel was confined, at the census of 1905, to smelters in Kansas, and 9 plants reported natural gas used as fuel; 6 using gas from wells operated by the same owner, and 4 using purchased gas.

The following statement shows the fuel expense of the Kansas establishments:

CLASS OF FUEL USED.	Cost.
Total	$507,930
Natural gas, total	244,206
From wells operated by same owner	163,487
Purchased	80,719
Other fuel	263,724

In only 2 cases was natural gas alone used, 7 of the establishments using natural gas also using other fuel. Other fuel was used entirely by 2 smelters in the state.

The values reported for the products are the net values. The statistics with respect to amounts paid for freight and commissions and selling expenses are too incomplete to permit of any general deductions as to gross value of products. Of the 31 establishments, 8 reported freight on product to the amount of $197,315, and commissions and selling expenses to the amount of $38,452 on 133,597,263 pounds of spelter products of a net value of $6,724,034, or a gross value of $6,959,801. But 3 of these 8 establishments reported deductions on value of product for freight only, 1 a deduction for commissions and selling expenses only, and 4 deductions on account of freight and commissions and selling expenses. The 4 establishments reporting deductions for both freight and commissions and selling expenses were located 3 in Kansas and 1 in Missouri, and the total quantity of spelter product was 62,338,520 pounds, of a value per New York and St. Louis quotations of $3,072,469 and a net value of $2,967,619. The deductions were $81,040 for freight and $23,810 for commissions and selling expenses. The average gross value per pound, or value per New York and St. Louis quotations, was therefore 4.93 cents in the case of these 4 establishments; deductions for freight, 0.13 cent; for commissions and selling expenses, 0.04 cent, and net value, 4.76 cents.

Table 41 gives the detailed statistics for the industry at the census of 1905.

TABLE 41.—ZINC SMELTING—DETAILED SUMMARY, BY STATES: 1905.

	United States.	Illinois.	Kansas.	Missouri.	All other states.[1]
Number of establishments	31	5	13	4	9
Capital, total	$23,701,586	$2,876,201	$10,903,432	$602,898	$9,319,055
Land	$2,248,905	$263,050	$1,077,481	$24,000	$884,374
Buildings	$8,545,416	$554,000	$5,444,616	$113,700	$2,433,100
Machinery, tools, and implements	$4,688,300	$894,980	$1,670,650	$119,487	$2,003,183
Cash and sundries	$8,218,965	$1,164,171	$2,710,685	$345,711	$3,998,398
Proprietors and firm members	2	.....	.....	2	.....
Salaried officials, clerks, etc.:					
Total number	354	74	141	24	115
Total salaries	$581,479	$140,158	$247,433	$34,316	$159,572
Officers of corporations—					
Number	50	9	18	2	21
Salaries	$157,807	$51,137	$65,701	$10,400	$30,569
General superintendents, managers, clerks, etc.—					
Total number	304	65	123	22	94
Total salaries	$423,672	$89,021	$181,732	$23,916	$129,003
Men—					
Number	287	64	109	21	93
Salaries	$413,836	$88,221	$173,932	$23,016	$128,667
Women—					
Number	17	1	14	1	1
Salaries	$9,836	$800	$7,800	$900	$336

[1] Includes establishments distributed as follows: Colorado, 2; New Jersey, 1; Pennsylvania, 3; Virginia, 1; West Virginia, 1; Wisconsin, 1.

TABLE 41.—ZINC SMELTING—DETAILED SUMMARY, BY STATES: 1905—Continued.

	United States.	Illinois.	Kansas.	Missouri.	All other states.
Wage-earners, including piecework, and total wages:					
Greatest number employed at any one time during the year	7,637	1,697	3,031	431	2,478
Least number employed at any one time during the year	5,272	1,585	1,883	298	1,506
Average number	6,528	1,643	2,507	364	2,014
Total wages	$3,856,466	$883,504	$1,569,533	$233,590	$1,169,839
Men 16 years and over—					
Average number	6,506	1,628	2,507	364	2,007
Wages	$3,851,120	$879,627	$1,569,533	$233,590	$1,168,370
Women 16 years and over—					
Average number	2				2
Wages	$624				$624
Children under 16 years—					
Average number	20	15			5
Wages	$4,722	$3,877			$845
Average number of wage-earners, including piecework, employed during each month:					
Men 16 years and over—					
January	6,096	1,600	2,200	263	2,033
February	6,107	1,596	2,146	273	2,092
March	6,849	1,612	2,596	400	2,241
April	6,827	1,629	2,564	396	2,238
May	6,858	1,648	2,569	407	2,234
June	6,674	1,669	2,530	395	2,080
July	6,534	1,651	2,613	399	1,871
August	6,434	1,630	2,568	405	1,831
September	6,410	1,640	2,565	383	1,822
October	6,345	1,591	2,610	309	1,835
November	6,413	1,634	2,543	363	1,873
December	6,525	1,636	2,580	375	1,934
Women 16 years and over—					
January	2				2
February	2				2
March	2				2
April	2				2
May	2				2
June	2				2
July	2				2
August	2				2
September	2				2
October	2				2
November	2				2
December	2				2
Children under 16 years—					
January	19	15			4
February	19	15			4
March	19	15			4
April	19	15			4
May	19	15			4
June	19	15			4
July	23	15			8
August	23	15			8
September	23	15			8
October	19	15			4
November	19	15			4
December	19	15			4
Miscellaneous expenses, total	$1,326,621	$102,947	$412,310	$25,560	$785,804
Rent of works	$3,600			$3,600	
Taxes	$65,172	$15,347	$28,974	$2,601	$18,250
Rent of offices, interest, insurance, and all other sundry expenses not hitherto included	$1,251,359	$87,600	$378,793	$17,412	$767,554
Contract work	$6,490		$4,543	$1,947	
Materials used, aggregate cost	$17,028,418	$3,900,058	$8,448,549	$1,154,366	$3,525,445
Ore—					
Tons	743,760	98,985	257,022	34,136	353,617
Cost	$13,663,667	$3,251,595	$7,152,761	$959,485	$2,299,826
Flux and other materials operated upon	$535,001	$46,306	$337,142		$151,553
Fuel, total cost	$1,666,281	$477,223	$507,930	$144,886	$536,242
Natural gas	$244,206		$244,206		
Other fuel	$1,422,075	$477,223	$263,724	$144,886	$536,242
Mill supplies	$137,826	$8,089	$28,456	$24,359	$76,922
All other materials	$654,389	$21,412	$249,178	$22,897	$360,902
Freight	$371,254	$95,433	$173,082	$2,739	$100,000
Products, total value	$24,791,299	$5,425,636	$10,999,468	$1,624,480	$6,741,715
Zinc spelter and sheet zinc—					
Pounds	373,979,078	93,419,339	221,638,884	24,249,219	34,671,636
Value	$19,210,859	$4,981,166	$10,911,468	$1,336,480	$1,981,745
All other products	$5,580,440	$444,470	$88,000	$288,000	$4,759,970
Power:					
Number of establishments reporting	31	5	13	4	9
Total horsepower	23,452	5,574	5,739	430	11,709
Owned—					
Engines—					
Steam—					
Number	154	41	71	11	31
Horsepower	17,556	5,187	5,701	430	6,238
Gas and gasoline—					
Number	5		4		1
Horsepower	48		38		10
Electric motors—					
Number	219	34			185
Horsepower	5,048	387			4,661
Other kind, horsepower	800				800
Furnished to other establishments, horsepower	25				25

AGRICULTURAL IMPLEMENTS

AGRICULTURAL IMPLEMENTS.

The statistics of the manufacture of agricultural implements extend over half a century. They include the number and value of implements used for tilling the soil, sowing or planting the seed, harvesting, and preparing the crop for the market.

The importance of this industry is shown by the value of farm implements and machinery in use on the farms of the United States which in 1904 reached the sum of $844,989,863,[1] a gain of nearly $100,000,000 since 1900. The invention and perfection of machinery for use in connection with agriculture have revolutionized farming in the United States, and thus have exercised a far-reaching influence upon the economic conditions of the nation. Moreover, a large proportion of the labor-saving devices in use in the year 1905 upon farms in all parts of the globe were of American design and manufacture. But in spite of the wide extent of its market, the area of significant product within the United States is relatively small.

At the outset the industry was widely distributed in small shops over the country. The implements used were of simple construction, and their manufacture required little capital. With the progress in agriculture the demand grew for labor-saving devices. The increased cost of producing such machinery required increased capital, and to make the industry pay under present conditions, extensive and particularly expensive exploitation has been necessary. Indeed, the requirement for a large and increasing proportion of capital to product is now a marked characteristic of the industry.

The manufacture of agricultural implements is so closely allied to that of foundry and machine shop products that some establishments classified as "agricultural implements" at one census so change the character of their products as to come entirely or principally under "foundry and machine shop products" at a succeeding census, and thus drop out of the class in which they had been previously included. Such changes should be considered in comparing the statistics for the different censuses.

Table 1 presents the leading facts of the industry for each census from 1850 to 1905.

[1] Bureau of the Census, Report on Wealth, Debt, and Taxation, page 37.

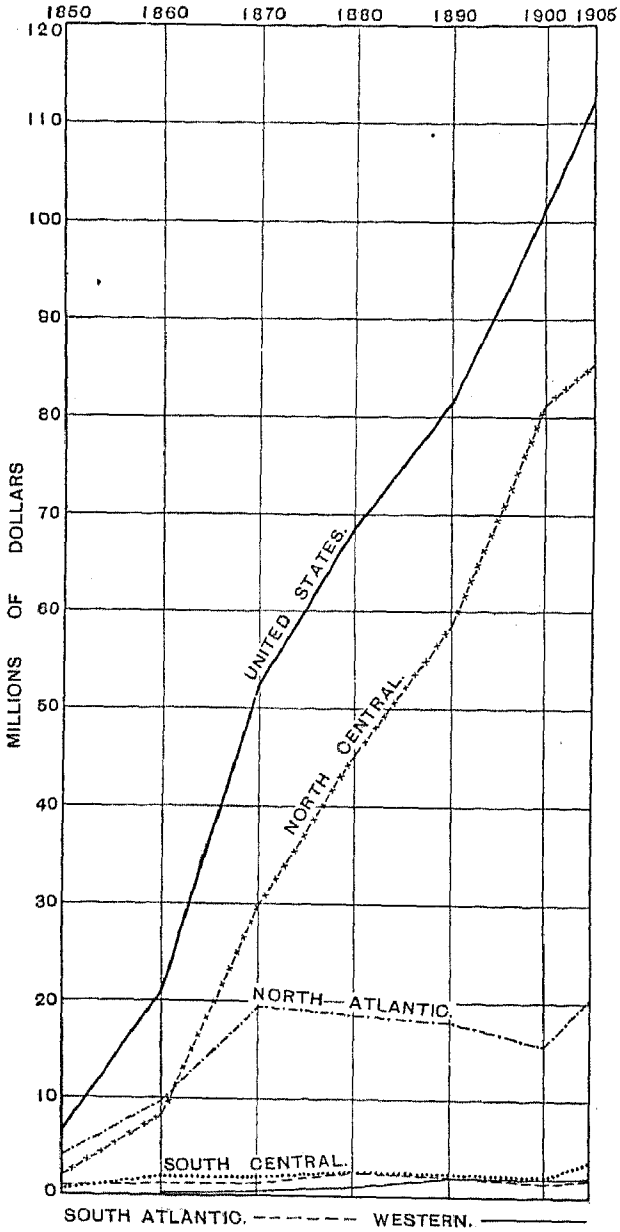
TABLE 1.—COMPARATIVE SUMMARY, WITH PER CENT OF INCREASE: 1850 TO 1905.

	CENSUS.							PER CENT OF INCREASE.					
	1905[1]	1900	1890	1880	1870	1860	1850	1900 to 1905	1890 to 1900	1880 to 1890	1870 to 1880	1860 to 1870	1850 to 1860
Number of establishments	648	715	910	1,943	2,076	2,116	1,333	[2]9.4	[2]21.4	[2]53.2	[2]6.4	[2]1.9	58.7
Capital	$196,740,700	$157,707,951	$145,313,997	$62,109,668	$34,834,600	$13,866,389	$3,564,202	24.8	8.5	134.0	78.3	151.2	289.0
Salaried officials, clerks, etc., number	7,199	10,046	[3]3,717	(4)	(4)	(4)	(4)	[2]28.3	170.3	.....	.....	.....	.....
Salaries	$7,572,646	$8,363,210	[3]$3,704,667	(4)	(4)	(4)	(4)	[2]9.5	125.7	.....	.....	.....	.....
Wage-earners, average number	47,394	46,582	38,827	39,580	25,249	17,093	7,220	1.7	20.0	[2]1.9	56.8	47.7	136.7
Total wages	$25,002,650	$22,450,880	$18,107,094	$15,359,610	$12,151,504	$5,925,177	$2,167,868	11.4	24.0	17.9	26.4	105.1	173.3
Men 16 years and over	46,631	46,174	38,327	38,313	24,634	17,086	7,211	1.0	20.5	(5)	55.5	44.2	136.9
Wages	$24,777,846	$22,358,158	$17,998,650	(4)	(4)	(4)	(4)	10.8	24.2	.....	.....	.....	.....
Women 16 years and over	579	214	288	73	12	7	9	170.6	[2]25.7	294.5	508.3	71.4	[2]22.2
Wages	$191,308	$66,042	$75,553	(4)	(4)	(4)	(4)	189.7	[2]12.6	.....	.....	.....	.....
Children under 16 years	184	194	212	1,194	603	(4)	(4)	[2]5.2	[2]8.5	[2]82.2	98.0	.....	.....
Wages	$33,496	$26,680	$32,891	(4)	(4)	(4)	(4)	25.5	[2]18.9	.....	.....	.....	.....
Miscellaneous expenses	$15,178,098	$11,394,656	$11,129,548	(6)	(6)	(6)	(6)	33.2	2.4	.....	.....	.....	.....
Cost of materials used	$48,281,406	$43,944,628	$31,603,265	$31,531,170	$21,473,925	$6,993,162	$2,445,765	9.9	39.1	0.2	46.8	207.1	185.9
Value of products	$112,007,344	$101,207,428	$81,271,651	$68,640,486	$52,066,875	$20,831,904	$6,842,611	10.7	24.5	18.4	31.8	149.9	204.4

[1] Exclusive of the statistics of 93 establishments engaged primarily in the manufacture of other products. These establishments made agricultural implements to the value of $1,349,679.
[2] Decrease.
[3] Includes proprietors and firm members, with their salaries; number only reported in 1905 and 1900, but not included in this table.
[4] Not reported separately.
[5] Less than one-tenth of 1 per cent.
[6] Not reported.

The number of establishments has steadily decreased since 1860 until in 1905 there were less than half the number reported in 1850. To some extent this reduction is accounted for by the changes in classification, but a more important reason is undoubtedly the absorption of small establishments by large ones.

DIAGRAM I.—*Comparative growth of the value of products, by geographic divisions: 1850 to 1905.*



With increased transportation facilities which bring the products of the great factories within easy reach of the farmer, many small shops which were formerly equal to supplying all local demands, have been either driven out of business or absorbed by larger establishments.

Coincident with the decrease in establishments there has been a steady increase in capital. Between 1850 and 1905 capital increased over fiftyfold. This increase is explained in part by the different methods of reporting capital employed at various censuses. Live capital—cash on hand, bills receivable, material and stock on hand, etc.—was first reported at the census of 1890. In all discussion of capital this fact should not be overlooked.

The decrease in the number of establishments and the increase in the capital invested, number of persons employed, and value of products indicate a concentration of the industry.

The centralizing tendency is further illustrated by the fact that the average capital invested and the average value of products per establishment increased from $2,674 and $5,133, respectively, at the census of 1850, to $303,612 and $172,850 at the census of 1905.

It is probable that the tendency shown toward increasing cost of materials is in part the result of change in the character of the principal material, rather than an increase in quantity. Wood was superseded by iron, and that in turn by steel. Furthermore, prices of the same material fluctuated from year to year, so that only the most general deductions can be made from the returns for cost of materials.

Value of products showed no change commensurate with those recorded in number of establishments. The value of products of the industry in 1905 was approximately sixteen times that of 1850. In the last thirty-five years the value of products has increased moderately but steadily. From 1900 to 1905, computed on the decade basis, the percentage of increase was slightly less than during the previous decade. It must be remembered, however, that the value of products in many industries has become so large that a small percentage often represents a great absolute increase.

The current expenditure per dollar of product—that is, salaries, wages, miscellaneous expenses, and cost of materials—has increased from 79 cents in 1890 to 85 cents in 1900 and 86 cents in 1905. Prior to 1890 the only items of current expenditures reported separately were wages and material. The amount thus expended per dollar of product was singularly uniform throughout the thirty years—67 cents in 1850, 62 cents in 1860, 65 cents in 1870, and 68 cents in 1880.

The following tabular statement shows the average value of products per establishment from 1850 to 1905:

CENSUS.	AVERAGE VALUE OF PRODUCTS PER ESTABLISHMENT.	
	Amount.	Per cent of increase.
1905	$172,850.84	22.1
1900	141,548.85	58.5
1890	89,309.51	152.8
1880	35,327.06	40.9
1870	25,080.38	154.8
1860	9,844.95	91.8
1850	5,133.24	.....

The industry by geographic divisions.—The distribution of the returns by geographic divisions of states brings out in a striking way the localization of the industry; this is shown in Table 2.

TABLE 2.—PER CENT DISTRIBUTION OF ESTABLISHMENTS, CAPITAL, AND VALUE OF PRODUCTS, WITH PER CENT OF INCREASE, BY GEOGRAPHIC DIVISIONS: 1905 AND 1900.

DIVISION.	ESTABLISHMENTS.			CAPITAL.			VALUE OF PRODUCTS.		
	Per cent of total.		Per cent of increase.	Per cent of total.		Per cent of increase.	Per cent of total.		Per cent of increase.
	1905	1900		1905	1900		1905	1900	
United States	100.0	100.0	[1] 9.4	100.0	100.0	24.8	100.0	100.0	10.7
North Atlantic	26.4	29.1	[1] 17.8	15.9	16.9	17.3	17.9	15.3	30.0
South Atlantic	7.2	5.7	14.6	0.7	0.7	20.8	1.5	1.2	33.3
North Central	57.6	57.6	[1] 9.5	80.6	79.7	26.2	76.1	80.1	5.2
South Central	4.3	4.1	[1] 3.4	1.5	1.4	31.7	2.9	1.9	69.3
Western	4.5	3.5	16.0	1.3	1.3	24.3	1.6	1.5	15.9

[1] Decrease.

The predominance of the North Central division in both 1900 and 1905 is very marked. The only division which in any degree competes with it is the North Atlantic. The latter, although it did not contribute one-fourth as much to the total value of product, increased from 1900 to 1905 at a rate about six times that of the North Central division. The North Atlantic and the South Central divisions gained slightly in their proportion of products, at the expense of the leading group.

The industry, by states.—Centralization is further emphasized when the contribution of each state to the total is seen. Table 3 is a comparative summary, by states and geographic divisions, for 1900 and 1905.

TABLE 3.—COMPARATIVE SUMMARY, BY STATES AND GEOGRAPHIC DIVISIONS: 1905 AND 1900.

STATE.	Census.	Number of establishments.	Capital.	SALARIED OFFICIALS, CLERKS, ETC.		WAGE-EARNERS AND WAGES.		Miscellaneous expenses.	Cost of materials used.	Value of products.
				Number.	Salaries.	Average number.	Wages.			
United States	1905	648	$196,740,700	7,199	$7,572,646	47,394	$25,002,650	$15,178,098	$48,281,406	$112,007,344
	1900	715	157,707,951	10,046	8,363,210	46,582	22,450,880	11,394,656	43,944,628	101,207,428
North Atlantic division	1905	171	31,327,403	1,280	1,175,095	9,921	4,944,159	2,094,553	8,511,900	20,087,471
	1900	208	26,703,466	973	967,287	8,202	3,969,712	1,156,856	6,749,331	15,454,912
Maine	1905	13	393,859	19	12,700	153	77,471	20,140	75,565	205,650
	1900	17	584,247	27	17,195	218	100,033	28,430	98,197	290,261
New Hampshire	1905	8	62,100	3	2,200	45	24,767	4,449	13,568	61,860
	1900	12	112,003	4	2,300	45	16,626	3,485	22,364	79,891
Vermont	1905	10	490,725	23	31,084	247	113,524	41,559	182,403	441,671
	1900	17	484,277	24	18,267	211	85,846	15,909	163,515	369,537
Massachusetts	1905	9	731,710	27	35,804	418	212,586	63,554	252,036	654,051
	1900	9	706,472	35	45,358	312	159,700	44,577	216,313	534,789
Connecticut	1905	3	320,374	17	17,148	181	81,698	16,253	117,420	269,743
	1900	5	348,221	19	13,330	154	62,111	9,961	76,132	194,746
New York	1905	75	23,436,429	934	809,322	6,279	3,240,885	1,329,244	5,678,339	13,045,891
	1900	87	20,115,962	659	675,999	5,551	2,797,269	833,948	4,824,871	10,537,254
New Jersey	1905	10	432,195	37	40,005	204	89,787	53,082	117,596	391,926
	1900	11	249,957	8	11,289	147	60,083	23,827	115,697	249,963
Pennsylvania	1905	43	5,460,011	220	226,832	2,394	1,103,441	566,272	2,074,973	5,016,679
	1900	50	4,102,327	197	183,549	1,564	688,044	196,719	1,232,242	3,198,471
South Atlantic division	1905	47	1,272,255	64	73,594	1,024	324,658	105,183	852,255	1,619,366
	1900	41	1,053,020	59	56,592	751	234,197	64,242	623,000	1,214,866
Virginia	1905	11	329,990	21	20,220	314	115,727	20,640	182,433	404,281
	1900	13	472,863	29	21,738	278	107,980	26,183	128,434	343,291
North Carolina	1905	13	116,735	8	9,250	107	30,883	5,108	50,950	126,865
	1900	9	77,537	7	3,970	91	20,169	1,971	41,047	99,128
South Carolina	1905	4	13,351	.....	.....	12	4,065	6,794	12,635	34,032
	1900	5	14,575	.....	.....	10	2,606	931	5,394	14,090
Georgia	1905	16	792,004	35	44,124	584	170,723	71,728	601,894	1,039,671
	1900	10	454,988	23	30,884	360	99,951	33,864	437,799	737,652
Not distributed by states	[1] 1905	3	20,175	.....	.....	7	3,260	913	4,343	13,617
	[2] 1900	4	33,057	.....	.....	12	3,491	1,293	10,326	20,705

[1] Includes establishments distributed as follows: Maryland, 2; West Virginia, 1.
[2] Includes establishments distributed as follows: Delaware, 1; Maryland, 2; West Virginia, 1.

TABLE 3.—COMPARATIVE SUMMARY, BY STATES AND GEOGRAPHIC DIVISIONS: 1905 AND 1900—Continued.

STATE.	Census.	Number of establishments.	Capital.	SALARIED OFFICIALS, CLERKS, ETC.		WAGE-EARNERS AND WAGES.		Miscellaneous expenses.	Cost of materials used.	Value of products.
				Number.	Salaries.	Average number.	Wages.			
North Central division	1905	373	$173,310,927	5,579	$6,007,792	34,167	$18,617,027	$12,384,957	$36,561,534	$85,277,440
	1900	412	125,638,588	8,785	7,086,506	35,913	17,467,911	9,865,933	35,209,845	81,098,474
Ohio	1905	71	24,301,986	918	1,001,714	5,659	2,609,540	1,650,747	5,692,218	12,891,197
	1900	78	23,628,442	1,588	1,368,775	6,852	3,271,163	1,483,605	6,059,515	13,975,268
Indiana	1905	41	14,523,167	389	466,156	3,543	1,840,609	1,594,046	2,975,468	8,060,575
	1900	45	8,324,564	518	489,649	3,419	1,593,881	596,403	2,619,621	6,415,081
Illinois	1905	82	71,383,289	1,929	2,152,293	15,359	8,851,404	3,900,647	17,750,852	38,412,452
	1900	94	62,202,330	4,444	3,419,742	18,231	9,064,954	5,346,224	18,859,517	42,033,796
Michigan	1905	42	14,342,106	713	678,309	3,164	1,685,677	1,902,405	3,497,210	8,719,719
	1900	59	8,932,344	620	548,763	1,944	952,626	1,329,530	2,482,235	6,339,508
Wisconsin	1905	52	20,837,995	1,017	1,050,112	3,569	1,885,775	2,278,736	3,519,856	10,076,760
	1900	51	15,291,554	1,180	836,316	3,289	1,625,765	699,865	3,290,690	7,886,363
Minnesota	1905	21	7,793,316	249	319,375	1,176	637,232	541,739	1,089,641	2,885,055
	1900	18	3,730,055	182	189,832	928	423,054	241,388	718,604	1,763,780
Iowa	1905	30	3,319,102	231	204,277	1,027	469,690	337,149	1,356,712	2,692,212
	1900	24	1,878,090	154	123,472	644	243,489	96,540	699,989	1,508,667
Missouri	1905	21	1,299,575	89	93,161	525	261,116	57,362	452,056	1,068,008
	1900	26	1,412,165	81	101,977	493	242,307	65,325	406,977	953,965
Nebraska	1905	3	134,600	11	6,000	25	15,025	6,574	13,686	46,000
	1900	9	184,081	11	6,705	87	41,128	4,646	82,856	176,446
Kansas	1905	7	629,439	32	35,705	105	52,181	52,124	204,522	395,262
	1900	4	19,750	6	1,075	11	2,460	856	10,819	18,275
Not distributed by states	[1] 1905	3	46,352	1	690	15	8,778	3,428	9,313	30,200
	[2] 1900	4	35,213	1	200	15	7,074	1,491	9,022	27,325
South Central division	1905	28	2,696,365	176	201,585	1,724	711,643	427,575	1,547,395	3,289,546
	1900	29	2,274,794	140	169,085	1,102	428,630	184,932	752,712	1,942,840
Kentucky	1905	6	1,898,666	129	135,092	970	438,101	316,892	1,091,345	2,190,917
	1900	9	1,735,595	95	124,720	680	300,106	148,009	466,193	1,320,714
Tennessee	1905	12	756,812	34	50,593	613	216,306	65,203	314,279	768,895
	1900	11	417,689	38	35,065	373	113,425	12,170	201,712	463,406
Mississippi	1905	3	38,650	.....	.....	22	8,310	1,203	13,630	38,000
	[3] 1900	4	63,875	2	1,350	21	4,680	825	18,235	41,350
Texas	1905	4	147,271	8	9,400	47	23,943	36,402	74,233	187,134
	1900	5	57,635	5	7,950	28	10,419	23,928	66,572	117,370
Not distributed by states	[4] 1905	3	154,966	5	6,500	72	24,983	7,875	53,908	104,600
Western division	1905	29	2,533,750	100	114,580	558	405,163	165,830	808,322	1,733,521
	1900	25	2,038,083	89	83,740	614	350,430	122,693	609,740	1,496,336
California	1905	25	2,240,143	87	99,440	479	348,531	122,086	723,602	1,483,746
	1900	20	1,852,157	81	74,900	562	322,272	106,011	538,568	1,357,849
Not distributed by states	[5] 1905	4	293,607	13	15,140	79	56,632	42,844	84,420	249,775
	[6] 1900	5	185,926	8	8,840	52	28,158	16,682	71,172	138,487

[1] Includes establishments distributed as follows: North Dakota, 1; South Dakota, 2.
[2] Includes establishments distributed as follows: North Dakota, 1; South Dakota, 3.
[3] Includes 1 establishment in Alabama.
[4] Includes establishments distributed as follows: Alabama, 2; Arkansas, 1.
[5] Includes establishments distributed as follows: Colorado, 1; Utah, 1; Washington, 1; Oregon, 1.
[6] Includes establishments distributed as follows: Colorado, 1; Utah, 2; Washington, 2.

Of the 37 states engaged in the manufacture of agricultural implements in 1905, 23 have reported manufactures at each of the seven censuses since 1850, and 4 others—California, Kansas, Minnesota, and Texas—since 1860. In the 10 remaining states the industry has maintained an irregular existence.

In 1880 only 12 states reported products valued at over $1,000,000 each. All of these except Massachusetts and Missouri have continued in the same class, and 4—Indiana, Michigan, Wisconsin, and Pennsylvania—within twenty-five years have raised their contribution beyond the $5,000,000 mark. New York has been prominent at every census since 1850, but after 1860 it ceased to be preeminent. In 1905, however, New York reported a gain of $2,508,637 coincident with Illinois' loss of $3,621,344.

In 1905, 24 states having products valued at more than $100,000, contributed 99.6 per cent of the total value of products; 6, having products valued at between $1,000,000 and $5,000,000, 10.1 per cent; and 7, whose products passed the $5,000,000 mark, 85.9 per cent. Of the last 7, Illinois, New York, and Ohio contributed 57.5 per cent, and Illinois alone 34.3 to the total output.

From Map 1 it will be observed that with the exception of California and Georgia the states reporting in 1905 a product valued at less than $5,000,000 but more than $1,000,000 border on the states reporting highest production, bounding these on the south and west. Georgia has passed the $1,000,000 mark since

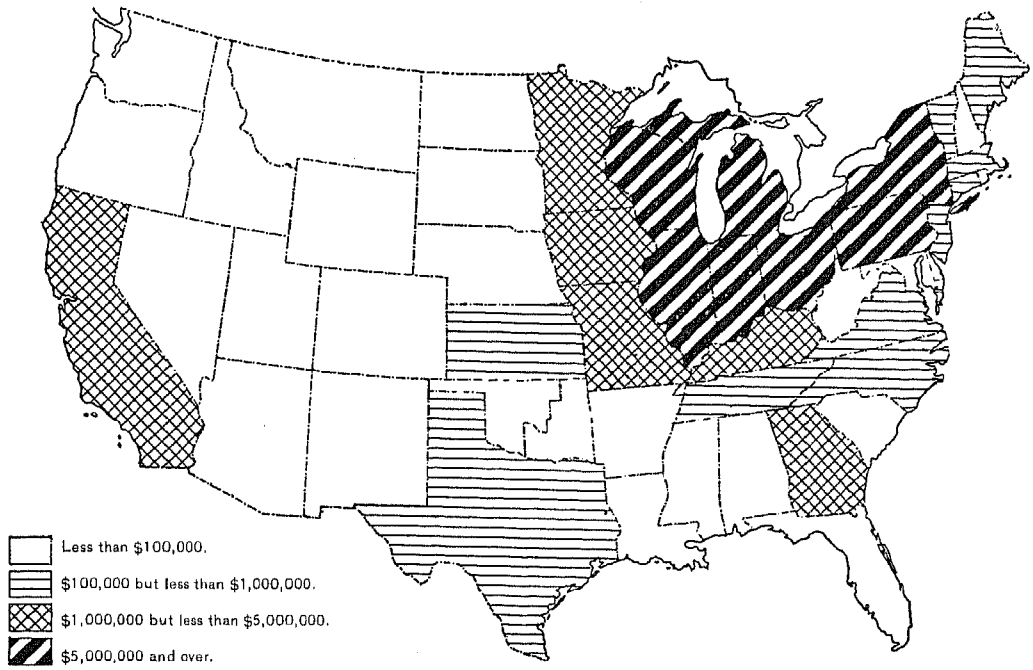
1900, having become a center for the South as California became for the West.

In addition to a decrease in the value of products in two of the leading states—Ohio and Illinois—there has been a decrease since 1900 in Maine, New Hampshire, and Nebraska. These last states, however, report a comparatively insignificant output.

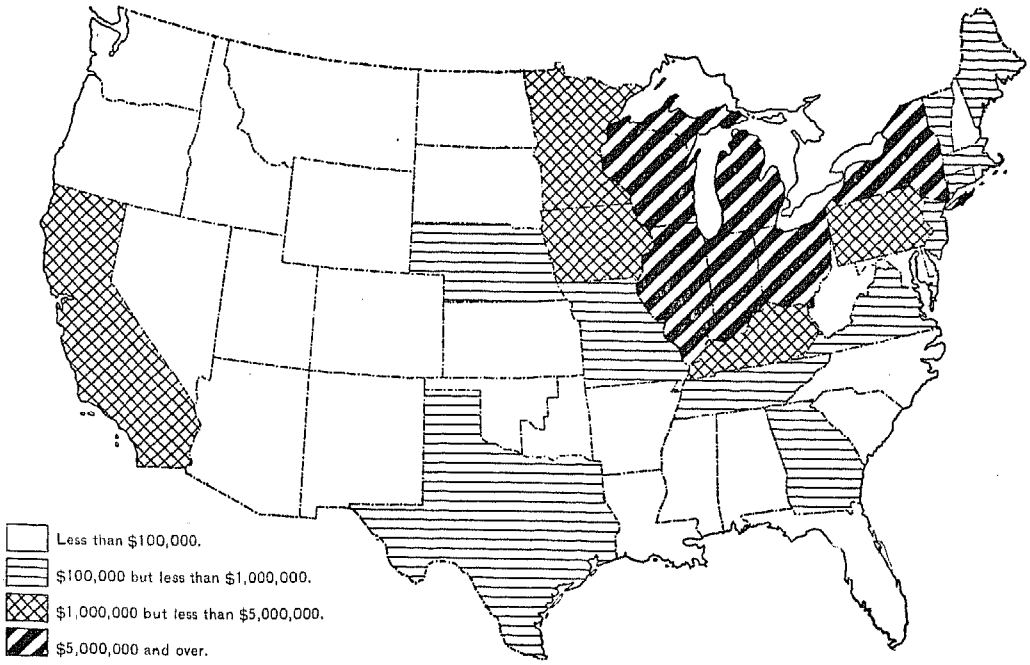
Rank of the three states leading in value of products in 1905: 1850 to 1905.

STATE.	1905	1900	1890	1880	1870	1860	1850
Illinois	1	1	1	2	3	3	4
New York	2	3	3	3	2	1	1
Ohio	3	2	2	1	1	2	5

MAP 1.—STATES HAVING PRODUCTS VALUED AT $100,000 AND OVER: 1905.



MAP 2.—STATES HAVING PRODUCTS VALUED AT $100,000 AND OVER: 1900.



The three states which led in 1860—New York, Ohio, and Illinois—were still the largest producers in 1905. They have each in turn held the lead, but Illinois outstripped Ohio in 1890, and made such rapid strides that it now far outdistances all others in value of products. The central location of Illinois and its proximity to the rich prairie farms of the central West is probably the primary cause of its preeminence.

It is unlikely that the decrease reported in 1905 in Illinois is more than temporary, since the decrease of $3,621,344 in value of products between 1900 and 1905 is due primarily to the fact that many of the largest plants had an unused production, or "carryover," at the close of the season of 1903 almost twice as large as that of any other year in their history. This resulted in a great decrease in production in 1904, the year covered by the census figures.

New centers of manufacture have appeared since 1900 in Iowa, Kansas, Minnesota, and Tennessee. The greatest advance has been in Kansas, where the value of products has increased more than twentyfold. In Iowa, the value of products has increased 78.4 per cent; in Minnesota, 63.6 per cent; and in Tennessee, 65.9 per cent.

The industry in cities.—In the report upon this industry at the census of 1900 a table was presented summarizing the returns for the cities in which this industry was an important factor. Table 4 presents the main statistics of the industry, as reported at the census of 1905, in cities of 20,000 population or over. The remarkable consolidation which has been in progress renders it necessary to include several of the cities shown in 1900 with "all other cities" in 1905.

TABLE 4.—SUMMARY FOR CITIES HAVING A POPULATION IN 1900 OF 20,000 OR OVER: 1905.

CITY.	Number of establishments.	Capital.	SALARIED OFFICIALS, CLERKS, ETC.		WAGE-EARNERS AND WAGES.		Miscellaneous expenses.	Cost of materials used.	Value of products.
			Number.	Salaries.	Average number.	Wages.			
Total	172	$114,539,659	3,916	$4,168,950	26,867	$14,498,587	$7,527,340	$28,463,530	$63,787,418
Canton, Ohio	5	2,421,469	67	75,795	525	238,644	173,366	533,039	1,154,239
Dayton, Ohio	4	1,778,762	47	54,211	359	187,937	180,648	487,109	1,014,321
Decatur, Ill	5	339,182	20	23,465	120	63,353	18,004	178,882	326,183
Detroit, Mich	3	848,282	98	82,256	255	121,379	261,143	433,719	939,657
Evansville, Ind	4	456,223	27	28,940	179	91,564	32,360	172,758	402,880
Indianapolis, Ind	6	324,744	28	26,250	86	39,928	34,965	80,824	242,339
Kansas City, Mo	3	375,921	26	36,370	113	59,526	7,784	121,182	303,648
La Crosse, Wis	5	904,650	34	40,599	256	118,691	85,329	260,956	542,425
Minneapolis, Minn	6	371,775	31	28,690	148	69,900	36,174	177,649	387,834
Moline, Ill [1]	4	18,218,130	258	408,529	2,199	1,353,187	1,255,637	4,129,411	8,347,014
Norfolk, Va	3	171,286	10	9,890	163	57,916	10,559	76,365	199,392
Peoria, Ill	6	4,615,744	155	195,814	946	560,953	276,546	1,007,653	2,309,962
Quincy, Ill	3	312,921	26	26,876	152	72,559	47,121	148,207	343,865
Racine, Wis	8	12,090,893	705	682,106	1,485	807,611	1,737,228	1,397,077	5,177,079
Rockford, Ill	4	970,274	32	35,990	386	219,740	265,285	631,022	1,161,036
South Bend, Ind	4	2,636,883	122	163,635	1,559	855,488	261,086	1,158,664	2,744,001
Springfield, Ohio	9	11,453,519	332	376,339	1,746	946,051	485,777	1,783,390	4,051,167
York, Pa	5	1,475,441	76	71,414	809	318,953	116,328	637,245	1,263,635
All other cities [2]	85	54,773,557	1,822	1,801,781	15,381	8,315,207	2,243,000	15,048,378	32,876,741

[1] Population less than 20,000 in 1900, but the city is included in this table on account of its importance in the industry.
[2] Includes establishments distributed as follows: Akron, Ohio, 1; Albany, N. Y., 1; Anderson, Ind., 1; Atlanta, Ga., 1; Auburn, N. Y., 4; Bay City, Mich., 2; Binghamton, N. Y., 1; Boston, Mass., 1; Buffalo, N. Y., 1; Cedar Rapids, Iowa, 1; Chattanooga, Tenn., 2; Chicago, Ill., 6; Cleveland, Ohio, 1; Columbus, Ohio, 3; Council Bluffs, Iowa, 2; Dallas, Tex., 2; Denver, Colo., 1; Duluth, Minn., 1; East St. Louis, Ill., 1; Elmira, N. Y., 1; Harrisburg, Pa., 1; Jackson, Mich., 2; Joliet, Ill., 2; Kalamazoo, Mich., 2; Kansas City, Kans., 1; Los Angeles, Cal., 2; Louisville, Ky., 3; Macon, Ga., 1; Milwaukee, Wis., 4; New York, N. Y., 1; Oakland, Cal., 1; Omaha, Nebr., 1; Petersburg, Va., 1; Philadelphia, Pa., 2; Portland, Me., 1; Poughkeepsie, N. Y., 2; Richmond, Va., 2; Saginaw, Mich., 1; St. Joseph, Mo., 1; St. Louis, Mo., 2; St. Paul, Minn., 2; Salem, Mass., 1; San Francisco, Cal., 1; Springfield, Ill., 2; Syracuse, N. Y., 2; Toledo, Ohio, 2; Topeka, Kans., 1; Trenton, N. J., 2; Utica, N. Y., 2; Worcester, Mass., 2; Zanesville, Ohio, 1.

Of the establishments reported at the census of 1905, 26.5 per cent were located in the above cities. These plants returned 58.2 per cent of the entire capital invested in the industry and 56.9 per cent of the total value of products. The average capital per establishment for these cities was $665,928, and the average value of products was $370,857, while for all agricultural work outside of these cities the average capital and the average value of products per establishment was $172,691 and $101,302, respectively.

Chicago ranked first, but it has been included in "all other cities" in order not to disclose individual operations. Auburn, N. Y.; Columbus, Ohio; Louisville, Ky.; and Milwaukee, Wis., have also been so included for the same reason. The preeminence of Chicago is due chiefly to the extensive manufacture of harvesting machines, in which it leads all cities of the world. It also produced 69.4 per cent of the grain harvesters, 67.5 per cent of the headers and binders, 61.5 per cent of the mowers, 58.8 per cent of the reapers, 20.7 per cent of the corn harvesters, and 46.2 per cent of the horse hayrakes manufactured in the United States.

Although the population of Moline in 1900 was less than 20,000, the city is included in Table 4 on account of its importance in the industry, in which it ranks second. By far the greater value of its manufactures of agricultural implements was in implements of cultivation, viz, $5,945,108, or 71.2 per cent of the total value of all agricultural implements manufactured in the city.

Products.—Illinois leads in the production of most of the principal agricultural implements, some of the notable exceptions being horse hayforks, scythes, and thrashers. Of the first, Ohio contributes almost the

whole product, but in the manufacture of scythes Maine leads, followed by New York. The scythe, in fact, appears to be a distinctively Eastern product, being contributed in 1905, entirely by Maine, Connecticut, Vermont, New York, and New Hampshire. Iowa, which had a small product in 1900, reported none in 1905. The manufacture of thrashers centers in Michigan and Wisconsin, which together contributed about one-third the total number, but in 1905 the former reported an increasing and the latter a decreasing product.

Table 5 shows by states the number and kind of the principal agricultural implements reported at the census of 1905.

The total value of products, classified according to kind, is shown by states in Table 6.

TABLE 5.—NUMBER AND KIND OF PRINCIPAL AGRICULTURAL IMPLEMENTS MANUFACTURED, BY STATES: 1905.

STATE.	Cultivators.	Harrows.	Plows.	Planters and drills.	Harvesters, headers, and binders.	Horse hayforks.	Horse hayrakes.	Mowers.	Scythes.	Thrashers, horsepower and steam-power.
United States	555,720	453,173	1,258,441	446,053	119,560	62,801	236,297	267,692	705,025	10,187
California	599	557	2,362	71	264	2,190	371			8
Connecticut	100	4,000	700						79,026	
Georgia	9,364	4,789	130,453	27,706						
Illinois	192,122	157,798	268,787	108,691	79,682		120,926	170,826		513
Indiana	10,489	1,808	265,258	21,288			880			1,031
Iowa	7,836	2,115	6,197	397	499	1,673	12,568			60
Kansas	3,615	800	2,309	2,010	105		110			
Kentucky	10,000	2,000	140,847	48,038	1,075					
Maine	718	212	1,248						253,791	11
Massachusetts	2,951	1,280	4,431	1,293			942	1,565		2
Michigan	25,663	26,291	25,058	106,173	1,302		378			2,150
Minnesota		3,134	1,713	3,257	1,208		496	930		859
Mississippi	8,500	450	415	2,500						
Missouri	9,411	455	626	1,232			12,000			18
Nebraska				1,000						
New Hampshire			295						72,004	
New Jersey	15,034	7,622	65	979		200				37
New York	27,467	126,817	90,802	16,861	22,292	750	39,844	57,919	240,204	700
North Carolina	6,455	90	4,010	4,800						
Ohio	109,576	72,480	125,611	66,859	5,512	55,000	36,262	19,382		976
Pennsylvania	71,139	4,553	48,497	4,672	2					1,563
South Carolina				260						
Tennessee		692	39,332	6,200						
Texas			19,191				30			
Vermont			2,080						60,000	203
Virginia	5,900	5,250	31,248	1,950						
Wisconsin	33,541	29,255	43,115	19,815	7,594	2,988	11,140	17,070		1,975
All other states [1]	5,240	725	3,791	1	25		350			81

[1] Includes states as follows: Alabama, Arkansas, Colorado, Maryland, North Dakota, Oregon, South Dakota, Utah, Washington, West Virginia.

TABLE 6.—KIND AND VALUE OF PRODUCTS, BY STATES: 1905.

STATE.	Total value.	Seeders and planters.	Implements of cultivation.	Harvesting implements.	Seed separators.	Miscellaneous.	All other products	Amount received for repair work, etc.
United States	$112,007,344	$11,225,122	$30,607,960	$30,862,435	$6,639,883	$19,534,114	$11,169,534	$1,968,296
California	1,483,746	12,260	123,717	413,262	3,015	267,475	326,487	337,530
Connecticut	269,743	600	226,662	29,880		998	11,603	
Georgia	1,039,671	162,957	424,580		5,875	128,206	310,800	7,247
Illinois	38,412,452	2,998,075	12,273,939	16,874,413	915,095	2,532,881	2,634,487	183,552
Indiana	8,060,575	694,047	3,346,695	138,533	718,575	2,513,607	520,650	128,468
Iowa	2,692,212	269,957	497,435	868,104	277,189	310,950	446,118	22,459
Kansas	395,262	49,050	132,742	12,470	750	113,770	79,500	6,980
Kentucky	2,190,917	484,709	1,638,150	3,050	9,766	42,980	10,262	2,000
Maine	205,650	325	22,022	117,579	2,500	3,107	52,967	7,150
Massachusetts	654,051	133,002	166,057	108,328	14,968	65,889	119,807	46,000
Michigan	8,719,719	1,004,734	1,313,564	530,215	1,479,173	2,824,237	1,453,419	114,377
Minnesota	2,885,055	272,876	83,936	148,397	535,246	1,229,401	382,460	232,739
Mississippi	38,000	5,000	33,000					
Missouri	1,068,008	40,115	226,333	291,189	45,389	362,821	85,882	16,279
Nebraska	46,000	36,000	7,500			2,500		
New Hampshire	61,860		3,950	47,600			9,500	810
New Jersey	391,926	74,912	187,243	2,000	14,133	85,401	19,047	9,190
New York	13,045,891	1,800,182	2,545,947	5,841,389	461,814	1,410,520	889,596	96,443
North Carolina	126,865	24,000	46,070	1,100		8,495	33,225	13,975
Ohio	12,891,197	2,016,919	3,031,384	3,193,853	501,482	2,430,577	1,193,560	523,422
Pennsylvania	5,016,679	186,449	987,619	393,917	489,956	2,229,802	658,270	70,666
South Carolina	34,932	3,215	192			20,000	10,725	800
Tennessee	768,895	12,000	545,076	5,806	40,000	87,685	70,293	8,035
Texas	187,134		156,074	700		3,800	26,450	110
Vermont	441,671		40,829	263,270	26,569	96,602	11,035	3,366
Virginia	404,281	32,225	189,287	1,465	16,800	3,295	152,279	8,936
Wisconsin	10,076,760	911,438	2,219,657	1,541,020	1,035,688	2,742,225	1,547,331	79,401
All other states [1]	398,192	75	138,300	34,895	45,900	16,890	113,775	48,357

[1] Includes states as follows: Alabama, Arkansas, Colorado, Maryland, North Dakota, Oregon, South Dakota, Utah, Washington, West Virginia.

Implements of cultivation and harvesting, which together form more than one-half of the total value of products, are by far the most important classes, and are thus obviously the staple articles at the present time in this industry. It is of interest therefore to analyze the geographic location of these products. Seven states, all except Kentucky bordering the Great Lakes, reported approximately four-fifths of the value of implements of cultivation, and four—Illinois, New York, Ohio, and Wisconsin—nine-tenths of the value of harvesting implements. These values combined represent nearly 50 per cent of the total value of products. Unfortunately no comparison with 1900 is possible as this segregation was not made at that census.

It is from harvesting implements that Illinois derives supremacy in the industry, although this state also leads in value of products of implements of cultivation. New York and Illinois produced 73.6 per cent of the total value of harvesting implements manufactured. The preponderance of the value of these implements in the two leading states is noteworthy. It was the large value of this class of products in New York which enabled that state to outrank Ohio, since Ohio surpassed New York in the value of every other class of implements produced.

In value of implements of cultivation Indiana is second, closely followed by Ohio and New York. Kentucky, Michigan, and Wisconsin also passed the million dollar mark.

Table 7 compares the number and kind of implements manufactured as reported at each census from 1870 to 1905.

TABLE 7.—*Comparative summary—number and kind of agricultural implements manufactured: 1870 to 1905.*

KIND.	1905	1900	1890	1880	1870
Seeders and planters:					
Planters—					
Bean	7,210	200	.....	.....	.....
Corn—					
Hand	86,553	129,515	77,501	68,691	21,709
Horse	83,719	78,135	54,639	.....	.....
Cotton	127,052	45,575	56,740	19,288	2,000
Potato	35,756	25,338	.....	.....	.....
Drills—					
Beet	606	5,302	.....	.....	.....
Corn	28,228	21,940	.....	.....	.....
Grain	76,929	91,635	44,830	43,222	32,033
Grain sowers	33,546	36,862	16,728	15,563	.....
Lime spreaders	521	474	.....	.....	.....
Listers	23,012	26,995	18,603	.....	.....
Manure spreaders	22,236	5,263	.....	[1]8,155	.....
Seed sowers	59,910	83,283	57,716	20,289	6,900
Tobacco transplanters	1,142	3,788	.....	4,245	.....
Implements of cultivation:					
Cultivators—					
Bean	232	189	.....		
Beet	3,459	2,008	.....	[2]318,057	88,740
Small	238,941	206,982	239,008		
Wheeled	313,088	295,799	206,482		
Celery hillers	1,070	130	.....	.....	.....
Cotton scrapers	22,519	15,230	.....	.....	.....
Cotton sweeps	8,098	75,311	.....	.....	.....
Equalizers	67,852	74,168	.....	.....	.....
Harrows—					
Disk	104,323	97,261	53,980	.....	.....
Other than disk	348,850	380,259	214,985	.....	9,150
Hoes, dozens	331,620	277,173	254,814	299,338	135,139
Markers and furrowers	5,512	854	.....	.....	.....

[1] Classified as "fertilizer distributers."
[2] Not reported separately.

TABLE 7.—*Comparative summary—number and kind of agricultural implements manufactured: 1870 to 1905*—Continued.

KIND.	1905	1900	1890	1880	1870
Implements of cultivation—Continued.					
Plows—					
Disk	39,146	17,345	.....	.....	.....
Shovel	121,899	102,320	.....	.....	.....
Steam	1,599	207	.....	.....	.....
Sulky or wheel	138,899	136,105	67,286	.....	.....
Walking	956,898	819,022	1,182,059	1,326,123	864,947
Potato coverers and hillers	2,938	3,052	.....	.....	.....
Rollers	22,188	12,590	5,168	3,002	4,803
Stalk cutters	15,146	13,425	21,605	.....	.....
Harvesting implements:					
Grain cradles	30,056	36,163	84,222	167,492	103,646
Harvesters and binders and headers, grain	108,810	233,542	125,942	.....	3,566
Harvesters—					
Bean	665	1,425	.....	.....	.....
Corn	6,924	20,707	.....	.....	.....
Other	3,161	6,283	3,429	[1]25,737	.....
Hay carriers	85,121	54,303	24,351	.....	.....
Hayforks—					
Hand, dozens	345,297	152,840	[2]264,742	206,727	108,188
Horse	62,801	51,770	1,823	.....	.....
Hay loaders	27,174	7,273	3,019	8,057	.....
Hayrakes—					
Hand, dozens	76,139	58,013	64,825	308,732	207,310
Horse	236,297	216,345	114,790	95,625	80,619
Hay stackers	8,670	12,069	5,184	.....	.....
Hay tedders	35,745	14,510	12,176	2,334	.....
Mowers	267,692	397,561	170,893	72,090	39,486
Mowers and reapers combined	5,693	1,055	15,681	54,920	59,645
Potato diggers	11,703	21,033	4,816	33,453	.....
Potato hooks	139,940	20,860	.....	.....	.....
Reapers	60,996	35,945	8,834	35,327	60,388
Scythes	705,025	718,453	795,400	1,244,204	881,244
Scythe snaths	699,636	537,214	511,856	437,178	17,680
Sickles	247,716	446,660	.....	95,613	3,600
Stackers	845	247	.....	.....	.....
Seed separators:					
Bean separators	727	40	.....	.....	.....
Other separators	12,109	1,707	4,577	9,103	1,131
Clover hullers	351	661	651	1,412	5,206
Corn huskers	1,327	10,726	.....	44,370	.....
Cornshellers—					
Hand	47,189	106,381	85,438	59,157	12,941
Power	6,082	8,185	5,726	.....	.....
Fanning mills	22,994	30,369	21,460	45,412	19,772
Thrashers—					
Horsepower	2,237	1,314	2,769		
Steampower	7,950	3,661	2,661	[3]10,424	[3]22,931
Thrashers and separators combined	.....	5,394	5,937		

[1] Harvesters of all kinds, not reported separately.
[2] Hay, manure, and spading forks, hand; not reported separately.
[3] Not reported separately.

General comparisons only are possible with the reports previous to 1900, owing to the difference in the schedules used before and since that census. The heads and subheads in the table are those of the schedule of inquiry for the census of 1905, and are almost identical with those of the 1900 schedule. For these years, therefore, a fair comparison can be made. At the three earlier censuses, however, the form varied materially and was much less comprehensive. Articles were put under one head which in the later censuses came under two or more heads, and some implements, manufactured only on a small scale, were left out altogether. Moreover at the later censuses there was naturally a greater variety of implements. Comparison of these earlier censuses with the later ones is, therefore, often misleading.

Horse corn planters increased steadily from 1890 to 1905, while the number of hand corn planters advanced from 1870 to 1900 and then declined. Of implements classed as seeders and planters, bean planters, cotton

planters, and manure spreaders have made the most marked gains since 1900, and of implements of cultivation, beet cultivators, celery hillers, markers and furrowers, steam and disk plows, and rollers, the greatest proportional increase. Disk harrows show an increase over 1900, while all other varieties show a decline.

The advance of over 54,000 dozens since 1900 in the number of hoes manufactured, indicates that no labor-saving device has yet been invented to supplant this simple and useful instrument.

The more important harvesting implements show a decrease in number. The falling off in harvesters and mowers, however, should not be interpreted as indicating a decline in the use of such implements, for a greater number of improved harvesting machines are in use to-day than ever before. The decrease in number manufactured may be accounted for, in part, by the fact that important manufacturers in Illinois and Ohio reported a greater "carryover" from the year 1903 than ever before. Also most of the large farms are now supplied with elaborate labor-saving devices, and as these are standardized so that when repair is needed the worn-out part may be easily replaced, new machines are not required for a long period of time.

The output of scythes has decreased steadily since 1880. Except in very rough and hilly regions, the scythe has been displaced by mowing machines, which require less labor. Mechanical motive power has been successfully adapted to use in mowing machines and the auto-mower is now a frequent sight in city parks.

Table 8 shows the number of establishments reporting each kind of implement with the number of each kind manufactured at the census of 1905.

TABLE 8.—*Number of establishments reporting each kind of implement, with the total number manufactured: 1905.*

KIND.	Number of establishments.	Number of implements.
Seeders and planters:		
Planters—		
Bean	7	7,210
Corn—		
Hand	10	86,553
Horse	48	83,719
Cotton	36	127,052
Potato	18	35,756
Drills—		
Beet	6	606
Corn	25	28,228
Grain	39	76,929
Grain sowers	29	33,546
Lime spreaders	3	521
Listers	21	23,012
Manure spreaders	22	22,236
Seed sowers	28	59,910
Tobacco transplanters	4	1,142
All other	15	22,063
Implements of cultivation:		
Cultivators—		
Bean	5	232
Beet	11	3,459
Small	79	238,941
Wheeled	90	313,088
Celery hillers	6	1,070
Cotton scrapers	10	22,519
Cotton sweeps	6	8,098
Equalizers	12	67,852
Harrows—		
Disk	55	104,323
Spring-tooth	35	86,408
Spike-tooth	106	262,442
Hoes, dozens	22	331,620
Markers and furrowers	12	5,512

TABLE 8.—*Number of establishments reporting each kind of implement, with the total number manufactured: 1905*—Continued.

KIND.	Number of establishments.	Number of implements.
Implements of cultivation—Continued.		
Plows—		
Disk	29	39,146
Shovel	62	121,899
Steam	5	1,599
Sulky or wheel	52	138,899
Walking	155	956,898
Potato coverers and hillers	14	2,938
Rollers	58	22,188
Stalk cutters	34	15,146
All other	10	12,480
Harvesting implements:		
Grain cradles	18	30,056
Harvesters and binders and headers, grain	21	108,810
Harvesters—		
Bean	5	665
Corn	17	6,924
Other	8	3,161
Hay carriers	19	85,121
Hayforks—		
Hand, dozens	17	345,297
Horse	10	62,801
Hay loaders	11	27,174
Hayrakes—		
Hand, dozens	23	76,139
Horse	64	236,297
Hay stackers	26	8,670
Hay tedders	16	35,745
Mowers	19	267,692
Mowers and reapers combined	3	5,693
Potato diggers	31	11,703
Potato hooks	8	139,940
Reapers	10	60,996
Scythes	8	705,925
Scythe snaths	11	699,636
Sickles	3	247,716
Stackers	4	845
All other	12	6,659
Seed separators:		
Bean separators	6	727
Other separators	15	12,109
Clover hullers	4	351
Corn huskers	21	1,327
Cornshellers—		
Hand	27	47,189
Power	21	6,082
Fanning mills	22	22,994
Thrashers—		
Horsepower	32	2,237
Steampower	37	7,950
All other	6	1,182
Miscellaneous:		
Bean pullers	6	1,587
Cane mills	4	2,996
Carts	11	21,365
Check rowers	4	12,478
Corn cleaners	2	106
Corn hooks	3	44,628
Corn knives	8	125,149
Cotton gins	3	72
Cotton presses	2	18
Ensilage cutters	20	10,696
Engines and boilers	6	369
Farm trucks	16	4,320
Gardening implements	27	494,034
Grubbing machines	5	1,043
Hand carts	15	9,359
Hay-cutters	13	29,283
Hay presses	24	5,719
Hayracks	3	620
Horsepowers	43	4,804
Lawn mowers	2	34,000
Pea hullers	7	1,706
Portable sawmills	19	1,828
Portable steam engines	13	1,190
Pumps—		
Hand	5	81,765
Horse	1	1,000
Steam	2	165
Road carts	4	373
Shovels, spades, and scoops	3	868,899
Singletrees	15	220,549
Sirup evaporators	1	768
Sorghum evaporators	3	2,447
Straw stackers	29	8,034
Thrasher trucks	11	1,269
Traction engines	23	6,165
Wagons	23	7,027
Wagon trucks	2	54
Water trucks	16	2,077
Weeders	21	12,224
Windmills	4	2,009

The tendency of establishments toward specialization is shown by an increase in the numbers of certain kinds of implements manufactured with a corresponding decrease in number of establishments reporting.

This was the case in connection with the following implements: Horse corn-planters, small and wheeled cultivators, disk harrows, shovel and walking plows, rollers, horse hayforks, hay loaders, hayrakes, and reapers.

The fourfold increase in the number of mowers and reapers combined is particularly marked when it is considered that the same number of establishments manufactured these in both years.

Attention is called to the list of implements enumerated under the heading "miscellaneous." Some of them are semiagricultural and not closely connected with the tilling of the soil, but are included because made in establishments manufacturing agricultural implements as their principal product.

All the foregoing statistics refer to establishments engaged exclusively or primarily in the manufacture of agricultural implements. The extent to which agricultural implements were manufactured as a minor product in connection with other industries is shown in Table 9.

TABLE 9.—INDUSTRIES MANUFACTURING AGRICULTURAL IMPLEMENTS AS A MINOR PRODUCT, WITH NUMBER OF ESTABLISHMENTS AND VALUE OF SUCH PRODUCTS, BY KINDS: 1905.

INDUSTRY.	Number of establishments.	VALUE OF PRODUCTS.						
		Total.	Seeders and planters.	Implements of cultivation.	Harvesting implements.	Seed separators.	All other agricultural implements and parts.	Amount received for repair work, etc.
Aggregate	741	$113,357,023	$11,450,958	$30,889,085	$31,030,843	$7,012,698	$30,961,391	$2,012,048
Agricultural implements	648	112,007,344	11,225,122	30,607,960	30,862,435	6,639,883	30,703,648	1,968,296
Industries otherwise classified	93	1,349,679	225,836	281,125	168,408	372,815	257,743	43,752
Foundry and machine shop products	54	823,412	123,804	216,917	48,945	207,561	204,621	21,564
Carriages and wagons	24	308,569	63,332	59,858	6,740	143,129	15,762	19,748
Lumber, planing mill products	5	53,748	1,000	.....	31,823	9,025	9,500	2,340
All other[1]	10	163,950	37,700	4,350	80,900	13,100	27,800	100

[1] Includes establishments distributed as follows: Cordage and twine, 1; dairymen's, poulterers', and apiarists' supplies, 2; galvanizing, 2; iron and steel forgings, 1; steam fittings and heating apparatus, 1; structural ironwork, 1; wood, turned and carved, 1; woodenware, not elsewhere specified, 1.

In view of the close relation between foundry and machine shop products and agricultural implements, it is but natural to find in that industry the greatest number of plants manufacturing agricultural implements as a minor product and the greatest value of this product.

The value of agricultural implements manufactured as a minor product by establishments in other industries forms but a small part of the aggregate value. Seed separators are in value the most important agricultural implements made by such establishments.

The 741 establishments engaged in the manufacture of agricultural implements, either as a principal or a subsidiary product, with their total value of products of $113,357,023, represent the actual extent of this manufacture in the United States during the calendar year 1904, so far as can be ascertained from the various schedules returned.

In addition to the 648 establishments reported at the census of 1905 as actively engaged in the manufacture of agricultural implements as a principal product, 8 idle establishments were reported, with a capital of $242,400. These idle establishments embrace plants that were once in operation but not operated during the census year.

Table 10 shows the number of establishments producing agricultural implements as a subsidiary product and the value of such products distributed by states.

TABLE 10.—*Establishments manufacturing agricultural implements as a minor product, and value of such products, by states: 1905.*

STATE.	Number of establishments.	Value of products.
Total	93	$1,349,679
California	14	21,044
Illinois	7	144,006
Indiana	5	220,125
Kentucky	3	9,298
Michigan	5	28,901
Minnesota	5	60,673
Missouri	3	9,567
New York	7	54,119
North Carolina	3	5,375
Ohio	8	289,181
Pennsylvania	5	136,034
South Carolina	4	3,232
Vermont	4	16,600
Wisconsin	9	278,260
All other states[1]	11	74,164

[1] Includes establishments distributed as follows: Arkansas, 1; Connecticut, 1; Georgia, 1; Iowa, 1; Kansas, 1; Massachusetts, 1; Mississippi, 1; Texas, 1; Virginia, 2; Washington, 1.

These 93 plants, which were scattered over 24 states, do not cover all establishments in which a small quantity of agricultural implements or parts were produced, but only those which have separately reported finished implements in commercial quantities.

Of the states, California had by far the greatest number of plants; but the average value of product per establishment was only $1,503. Wisconsin ranked second in number of establishments, with an average value of product of $30,918. Ohio stood third in number of plants, but first in value of products. In

value of products, Wisconsin, Indiana, Illinois, and Pennsylvania followed in the order named.

Power.—Table 11 shows the different kinds of power employed by agricultural implement manufacturers at the censuses of 1900 and 1905.

TABLE 11.—*Power—comparative summary, with per cent each kind is of the total: 1905 and 1900.*

	1905		1900	
	Amount.	Per cent of total.	Amount.	Per cent of total.
Number of establishments reporting power	589	.....	595	.....
Total horsepower	106,623	100.0	77,189	100.0
Owned:				
Engines—				
Steam—				
Number	698	.....	678	.....
Horsepower	75,018	70.4	61,147	79.2
Gas and gasoline—				
Number	165	.....	75	.....
Horsepower	2,360	2.2	1,055	1.4
Water wheels—				
Number	128	.....	159	.....
Horsepower	6,288	5.9	6,758	8.8
Water motors—				
Number	4	.....	(1)	.....
Horsepower	12	(2)	(1)	.....
Electric motors—				
Number	690	.....	193	.....
Horsepower	16,885	15.8	6,543	8.5
Other power, horsepower	2,157	2.0	320	0.4
Rented:				
Electric motors—				
Number	182	.....	(1)	.....
Horsepower	3,828	3.6	1,100	1.4
Other kind, horsepower	75	0.1	266	0.3
Furnished to other establishments, horsepower	751	.....	338	.....

[1] Not reported.
[2] Less than one-tenth of 1 per cent.

The total horsepower used increased 38.1 per cent between 1900 and 1905. To this increase steam engines and electric motors were the largest contributers. The horsepower of the latter in 1905 was between two and three times as great as in 1900. Gas and gasoline engines, although they have more than doubled in number and horsepower, still form a very small proportion of the total. The only decreases reported are those for water wheels and "other kind" of rented power, 7 and 71.8 per cent, respectively.

Patents in relation to agricultural implements.—The following is a list of patents granted to June 5, 1906:

TABLE 12.—*Patents granted to June 5, 1906.*

CLASS.	Total.	Jan. 1, 1902, to June 5, 1906.	Prior to 1902.
Total	46,729	4,828	41,901
Plows:			
Including cotton choppers and scrapers, cultivators, etc., parts and attachments	12,799	1,175	11,624
Harrows and diggers:			
Including clod crushers, forks, hoes, land rollers, potato diggers, rakes, shovels, stalk choppers, transplanters, etc., parts and attachments	6,430	944	5,486
Seeders and planters:			
Including broadcast, checkrow, drills, fertilizer distributers, etc., parts and attachments	9,411	862	8,549
Harvesters:			
Including binders, fruit gatherers, hand binders, hay loaders, horse rakes, mowers, scythes, and cradles, etc., parts and attachments	12,431	1,136	11,295
Separators and thrashers:			
Including band cutters and feeders, cane strippers, clover hullers, corn husking machines and implements, cornshellers, fruit and vegetable separators, etc., parts and attachments	5,658	711	4,947

Exports.—The exportation of agricultural implements is one of the most important branches of the American export trade in manufactured articles, ranking fourteenth among all classes. Compared with the value of the other classes of exported machinery agricultural implements are far in the lead, being nearly twice as great as that of carriages, cars, other vehicles, etc.; and builders' hardware and saws and tools. The United States leads the world in the exportation of agricultural implements, with the United Kingdom as its principal competitor.

Table 13 shows the value of agricultural implements exported each year from 1900 to 1905; distributed by class and country.

TABLE 13.—VALUE OF EXPORTS OF AGRICULTURAL IMPLEMENTS: YEARS ENDING JUNE 30, 1900 TO 1905.[1]

CLASS AND COUNTRY.	1905	1904	1903	1902	1901	1900
Aggregate	$20,721,741	$22,749,635	$21,006,622	$16,286,740	$16,313,434	$16,099,149
Mowers, reapers, and parts of:						
Total	10,559,891	11,568,062	10,326,641	8,818,370	9,943,680	11,243,763
France	2,556,573	2,666,602	2,420,428	1,428,823	1,459,807	2,652,795
Germany	1,015,385	1,042,176	775,674	1,153,933	1,660,946	2,529,422
Russia	2,589,457	2,341,199	2,015,374	1,698,794	1,295,277	710,066
United Kingdom	402,970	908,862	788,247	708,379	1,435,330	982,188
Canada, Newfoundland, and Labrador	499,206	1,265,471	1,918,342	1,729,873	1,259,570	1,192,458
Argentina	1,472,156	1,289,412	635,549	689,509	805,703	1,194,961
British Australasia	476,112	510,797	416,571	271,502	384,411	466,397
All other countries	1,548,032	1,543,543	1,356,456	1,137,557	1,642,636	1,515,476
Plows, cultivators, and parts of:						
Total	2,892,060	3,537,810	3,169,961	2,791,092	1,888,373	2,178,098
France	55,723	95,285	87,501	396,098	124,957	68,197
Germany	31,899	31,611	26,143	158,055	65,172	227,378
Russia	224,551	205,391	42,299	34,961	126,469	45,993
United Kingdom	121,699	150,714	53,402	158,652	98,513	179,950
Canada, Newfoundland, and Labrador	364,409	523,771	534,788	366,098	234,108	247,306
Argentina	805,136	1,146,267	1,003,880	621,802	369,522	388,903
British Australasia	215,527	250,078	131,141	264,682	151,170	162,109
All other countries	1,073,116	1,134,693	1,290,807	790,744	718,462	858,262
All other implements, and parts of:						
Total	7,269,790	7,643,763	7,510,020	4,677,278	4,481,381	2,677,288
France	205,702	301,865	281,327	276,776	483,513	189,583
Germany	198,817	505,239	617,266	556,684	951,201	129,654
Russia	1,048,653	861,468	1,578,472	664,201	270,851	274,671
United Kingdom	543,712	864,603	580,983	320,618	361,549	188,305
Canada, Newfoundland, and Labrador	1,035,300	1,572,871	1,570,727	1,027,689	633,426	571,442
Argentina	2,755,561	1,560,797	1,181,828	628,511	245,353	221,880
British Australasia	468,294	794,210	720,451	428,328	471,319	269,776
All other countries	1,013,751	1,182,710	978,966	774,471	1,064,169	831,977

[1] Bureau of Statistics, Department of Commerce and Labor, "Commerce and Navigation of the United States."

In the fifteen years 1890 to 1905 the extension of trade to foreign countries has been very great. The value of exports during the fiscal year 1905 formed 18.5 per cent of the total value of products for the census of 1905; for 1900 the ratio was 15.9 per cent. The absolute increase in value from 1900 to 1905 was more than $4,000,000 and from 1890 to 1905 between $16,000,000 and $17,000,000.

The value of agricultural implements exported during the fiscal years 1870, 1880, and 1890, together with their percentages of the total value of products of the industry for the census years 1870, 1880, and 1890, are as follows: 1870, $1,068,476, or 2.1 per cent; 1880, $2,245,742, or 3.3 per cent; and 1890, $3,859,184, or 4.7 per cent.

Almost every agricultural country in the world imports American implements in quantities governed by its industrial and economic condition. The use of labor-saving machinery for agricultural purposes naturally depends largely on the cost of labor. This was revealed by the 54 replies received from United States consuls to a Department circular sent at the request of the National Association of Agricultural Implement and Vehicle Manufacturers, which indicated that where the cost of farm labor is low very few agricultural implements are used. The higher the wage the greater the demand for the up to date implements.

Russia and Argentina, the two great wheat producing countries, were in 1905 the leading importers of American agricultural machinery. Russia received 18.6 per cent of the total value of all exports, nearly four times as much as in 1900, and Argentina 24.3 per cent, an actual increase since 1900 of 178.7 per cent.

Of all the economy effected by labor-saving machines, the saving resulting from the use of machines in harvesting the corn and wheat crops is greater than any other, and that obtained in the harvesting of the wheat crop probably greatest. Moreover, evidence confirming the statement already made that the demand is intensified in countries where labor is expensive or hard to obtain is found in the report of the American consul at Odessa in 1903 where he writes that at that time labor was so scarce in many places that troops were sent to work in the fields. In Argentina the scarcity and consequent high price of labor renders the use of labor-saving machinery a necessity. Much of the land suitable for wheat growing in that country is not as yet under cultivation, and in the opening up of this land lies an opportunity for agricultural implements similar to, though less extensive than, that which came from the opening up of the West.

DIAGRAM 2.—*Growth of the total value of exports and of total value of exports to specified countries: 1890 to 1905.*

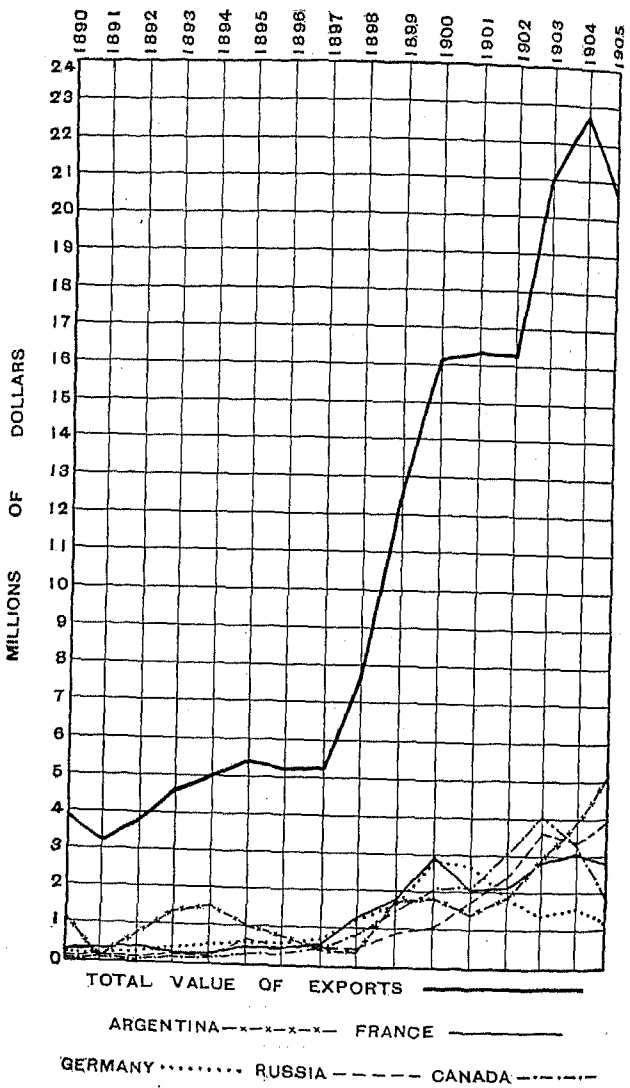


Table 14, which follows, is a full statement by states of the agricultural implement industry as reported at the census of 1905.

TABLE 14.—AGRICULTURAL IMPLEMENTS—

		United States.	California.	Connecticut.	Georgia.	Illinois.
1	Number of establishments	648	25	3	16	82
2	Capital, total	$196,740,700	$2,240,143	$320,374	$792,004	$71,383,289
3	Land	$12,648,650	$158,198	$11,600	$13,650	$6,118,380
4	Buildings	$26,547,150	$201,928	$75,000	$157,449	$10,689,969
5	Machinery, tools, and implements	$26,036,717	$248,276	$148,892	$208,372	$11,588,525
6	Cash and sundries	$131,508,183	$1,631,741	$84,882	$412,533	$42,986,415
7	Proprietors and firm members	496	19	2	16	43
	Salaried officials, clerks, etc.:					
8	Total number	7,199	87	17	35	1,929
9	Total salaries	$7,572,646	$99,440	$17,148	$44,124	$2,152,293
	Officers of corporations—					
10	Number	607	8	5	7	126
11	Salaries	$1,481,818	$16,200	$5,808	$16,600	$429,389
	General superintendents, managers, clerks, etc.—					
12	Total number	6,592	79	12	28	1,803
13	Total salaries	$6,090,828	$83,240	$11,340	$27,524	$1,722,904
	Men—					
14	Number	5,889	69	9	27	1,558
15	Salaries	$5,767,189	$78,622	$10,352	$27,104	$1,619,469
	Women—					
16	Number	703	10	3	1	215
17	Salaries	$323,639	$4,618	$988	$420	$103,435
	Wage-earners, including pieceworkers, and total wages:					
18	Greatest number employed at any one time during the year	62,979	706	207	852	20,273
19	Least number employed at any one time during the year	29,513	256	76	306	10,113
20	Average number	47,394	479	181	584	15,359
21	Total wages	$25,002,650	$348,531	$81,698	$170,723	$8,851,404
	Men 16 years and over—					
22	Average number	46,631	473	175	550	14,914
23	Wages	$24,777,846	$347,101	$80,278	$166,607	$8,703,660
	Women 16 years and over—					
24	Average number	579	.....	.....	.....	441
25	Wages	$191,308	.....	.....	.....	$147,003
	Children under 16 years—					
26	Average number	184	6	6	34	4
27	Wages	$33,496	$1,430	$1,420	$4,116	$741
	Average number of wage-earners, including pieceworkers, employed during each month:[1]					
	Men 16 years and over—					
28	January	51,543	524	188	749	16,585
29	February	53,639	559	189	742	16,940
30	March	53,836	559	188	669	16,741
31	April	51,648	604	190	538	15,690
32	May	48,431	603	177	439	15,029
33	June	44,799	444	169	325	13,455
34	July	40,435	366	70	291	11,735
35	August	39,781	349	164	416	12,211
36	September	39,160	345	176	482	12,454
37	October	41,813	435	196	560	14,929
38	November	45,311	437	196	663	16,043
39	December	49,176	451	197	726	17,156
40	Miscellaneous expenses, total	$15,178,098	$122,986	$16,253	$71,728	$3,960,647
41	Rent of works	$81,113	$1,425	.....	$4,700	$19,528
42	Taxes	$714,836	$11,404	$2,029	$7,376	$208,340
43	Rent of offices, interest, insurance, and all other sundry expenses not hitherto included.	$14,248,729	$110,007	$14,224	$59,502	$3,717,542
44	Contract work	$133,420	$150	.....	$150	$15,228
45	Materials used, aggregate cost	$48,281,406	$723,602	$117,420	$601,894	$17,750,852
46	Principal materials, total cost	$36,522,850	$470,884	$79,562	$377,781	$13,593,622
47	Purchased in raw state	$97,348	.....	.....	.....	$312
48	Purchased in partially manufactured form	$36,425,502	$470,884	$79,562	$377,781	$13,593,310
49	Fuel	$1,756,298	$20,033	$15,730	$20,504	$677,209
50	Rent of power and heat	$46,872	$7,365	.....	$145	$10,009
51	Mill supplies	$485,453	$3,553	$1,989	$1,997	$223,501
52	All other materials	$8,625,381	$168,362	$16,822	$187,117	$2,892,745
53	Freight	$844,552	$53,675	$3,317	$14,350	$353,766
54	Products, total value	$112,007,344	$1,483,746	$269,743	$1,039,671	$38,412,452
55	Seeders and planters	$11,225,122	$12,260	$600	$162,957	$2,998,075
56	Implements of cultivation	$30,607,960	$123,717	$226,662	$424,580	$12,273,939
57	Harvesting implements	$30,862,435	$413,262	$29,880	.....	$16,874,413
58	Seed separators	$6,039,883	$3,015	.....	$5,875	$915,095
59	Miscellaneous	$19,534,114	$267,475	$998	$128,206	$2,532,881
60	All other products	$11,169,534	$326,487	$11,603	$310,806	$2,634,487
61	Amount received for repair work, etc	$1,968,296	$337,530	.....	$7,247	$183,562
	Kind and quantity of products, number of implements:					
	Seeders and planters—					
	Planters—					
62	Bean	7,210	61	.....	.....	780
	Corn—					
63	Hand	86,553	.....	.....	.....	2,165
64	Horse	83,719	.....	.....	.....	58,061
65	Cotton	127,052	.....	.....	27,507	31,256
66	Potato	35,756	.....	.....	.....	461
	Drills—					
67	Beet	606	.....	.....	.....	556
68	Corn	28,228	.....	.....	.....	11,014
69	Grain	76,929	10	.....	199	4,398
70	Grain sowers	33,546	676	100	.....	12,191
71	Lime spreaders	521	.....	.....	.....	.....
72	Listers	23,012	.....	.....	.....	16,815
73	Manure spreaders	22,236	.....	.....	425	681
74	Seed sowers	59,910	.....	.....	600	1,422
75	Tobacco transplanters	1,142	.....	.....	.....	.....
76	All other	22,063	.....	.....	18,039	1,475
	Implements of cultivation—					
	Cultivators—					
77	Bean	232	73	.....	.....	.....
78	Beet	3,459	2	.....	.....	1,906
79	Small	238,941	47	.....	9,364	9,572
80	Wheeled	313,088	477	100	.....	180,044

[1] The average numbers of women and children employed during each month, being small, are not shown in this table.

DETAILED SUMMARY, BY STATES: 1905.

Indiana.	Iowa.	Kansas.	Kentucky.	Maine.	Massachusetts.	Michigan.	Minnesota.	Mississippi.	
41	30	7	6	13	9	42	21	3	1
$14,523,167	$3,319,102	$629,439	$1,898,666	$393,859	$731,710	$14,342,106	$7,793,316	$38,650	2
$1,000,274	$114,373	$45,400	$166,300	$38,430	$7,400	$559,432	$136,366	$550	3
$2,283,839	$449,833	$92,200	$225,600	$60,850	$36,926	$1,410,165	$799,069	$4,600	4
$1,263,391	$349,677	$126,426	$246,400	$76,011	$99,127	$1,141,299	$642,551	$14,400	5
$9,975,663	$2,405,219	$365,413	$1,260,366	$218,568	$588,257	$11,231,210	$6,215,330	$19,100	6
15	19	9	4	14	7	26	10	5	7
389	231	32	129	19	27	713	249	.....	8
$466,156	$204,277	$35,705	$135,092	$12,700	$35,804	$678,399	$319,375	.....	9
42	29	5	8	2	3	64	28	.....	10
$100,567	$40,848	$7,120	$28,600	$3,200	$12,000	$124,726	$74,745	.....	11
347	202	27	121	17	24	649	221	.....	12
$365,589	$163,429	$28,585	$106,492	$9,500	$23,804	$553,583	$244,630	.....	13
318	177	23	115	13	19	568	200	.....	14
$351,958	$153,301	$26,505	$103,292	$8,800	$21,720	$520,245	$234,148	.....	15
29	25	4	6	4	5	81	21	.....	16
$13,631	$10,128	$2,080	$3,200	$700	$2,084	$33,338	$10,482	.....	17
4,322	1,632	175	1,204	201	502	4,110	1,696	35	18
2,608	720	26	796	84	340	1,736	522	19	19
3,543	1,027	105	970	153	418	3,164	1,176	22	20
$1,840,609	$469,690	$52,181	$438,101	$77,471	$212,586	$1,685,677	$637,232	$8,310	21
3,488	1,023	104	950	151	417	3,142	1,175	22	22
$1,823,786	$469,204	$52,056	$435,101	$76,850	$212,386	$1,681,545	$636,868	$8,310	23
42	.....	.....	.....	2	1	2	1	.....	24
$14,398	.....	.....	.....	$621	$200	$725	$364	.....	25
13	4	1	20	.....	.....	20	.....	.....	26
$2,425	$486	$125	$3,000	.....	.....	$3,407	.....	.....	27
3,529	923	134	1,037	163	425	3,459	1,426	19	28
3,937	978	136	1,015	164	448	3,497	1,492	19	29
3,962	1,017	118	990	182	463	3,572	1,396	17	30
3,921	1,052	108	865	181	469	3,425	1,378	15	31
3,780	1,076	110	813	174	472	3,186	1,375	16	32
3,694	1,082	114	801	151	444	3,165	1,301	24	33
3,458	1,210	59	846	98	423	3,128	1,238	23	34
3,300	1,173	59	857	103	361	2,953	1,141	23	35
3,015	1,106	86	904	151	375	2,982	1,028	28	36
2,923	954	90	1,049	164	370	2,529	817	29	37
2,977	884	112	1,073	163	372	2,781	652	28	38
3,360	821	122	1,150	118	382	3,026	856	23	39
$1,594,046	$337,149	$52,124	$316,892	$20,140	$63,554	$1,902,405	$541,739	$1,203	40
$1,920	$2,938	.....	.....	$322	$13,702	$2,682	$2,246	$240	41
$75,200	$12,463	$3,621	$13,163	$2,506	$6,994	$78,891	$21,413	$108	42
$1,515,638	$310,109	$48,253	$303,729	$17,312	$35,245	$1,788,096	$518,080	$855	43
$1,288	$11,639	$250	.....	.....	$7,613	$32,736	.....	.....	44
$2,975,468	$1,350,712	$204,522	$1,091,345	$75,565	$252,036	$3,497,210	$1,089,641	$13,630	45
$1,876,772	$942,293	$183,703	$961,018	$46,317	$198,633	$2,860,059	$598,940	$11,750	46
$49,718	.....	.....	$20,000	$481	$3,090	$2,783	$2,876	.....	47
$1,827,054	$942,293	$183,703	$941,018	$45,836	$195,543	$2,857,256	$596,064	$11,750	48
$113,081	$26,274	$5,161	$29,969	$8,795	$9,231	$90,224	$58,553	$650	49
$6,724	$1,615	$100	$1,545	$448	$193	$8,371	$958	.....	50
$17,708	$19,398	$2,713	$7,430	$604	$1,772	$31,929	$5,042	$25	51
$845,423	$341,216	$9,620	$87,244	$13,514	$37,145	$486,647	$420,806	$725	52
$115,760	$25,916	$3,225	$4,139	$5,887	$5,062	$20,000	$5,342	$480	53
$8,060,575	$2,692,212	$395,262	$2,190,917	$205,650	$654,051	$8,719,719	$2,885,055	$38,000	54
$694,047	$269,957	$49,050	$484,709	$325	$133,002	$1,004,734	$272,876	$5,000	55
$3,346,695	$497,435	$132,742	$1,638,150	$22,022	$166,057	$1,313,564	$83,936	$33,000	56
$138,533	$868,104	$12,470	$3,050	$117,579	$108,328	$530,215	$148,397	.....	57
$718,575	$277,189	$750	$9,766	$2,500	$14,968	$1,479,173	$535,246	.....	58
$2,513,607	$310,950	$113,770	$42,980	$3,107	$65,889	$2,824,237	$1,229,401	.....	59
$520,650	$446,118	$79,500	$10,262	$52,967	$119,807	$1,453,419	$382,400	.....	60
$128,468	$22,459	$6,980	$2,000	$7,150	$46,000	$114,377	$252,759	.....	61
.....	.....	.....	.....	.....	.....	6,324	.....	.....	62
.....	.....	.....	.....	.....	.....	54,982	.....	.....	63
2,830	103	.....	5,000	.....	1,293	1,748	.....	.....	64
180	.....	1,300	40,000	.....	.....	6,215	.....	2,500	65
200	.....	10	.....	.....	.....	26,946	.....	.....	66
.....	.....	.....	.....	.....	.....	14	.....	.....	67
6,595	244	550	.....	.....	.....	592	.....	.....	68
11,483	50	150	3,038	.....	.....	9,352	3,257	.....	69
8,517	.....	.....	4	.....	.....	3,195	.....	.....	70
.....	.....	.....	.....	.....	364	.....	.....	.....	71
.....	1,051	1,035	.....	.....	.....	282	.....	.....	72
.....	2,890	.....	.....	.....	1,053	2,959	.....	.....	73
35,522	.....	.....	.....	50	2,300	1,867	665	.....	74
.....	.....	.....	.....	.....	.....	.....	.....	.....	75
804	.....	.....	.....	.....	.....	485	110	.....	76
.....	.....	.....	.....	.....	.....	152	.....	.....	77
.....	.....	.....	.....	.....	.....	826	.....	.....	78
5,400	.....	15	5,000	718	2,851	12,367	.....	8,500	79
5,089	7,836	3,600	5,000	.....	100	12,318	.....	.....	80

TABLE 14.—AGRICULTURAL IMPLEMENTS—

		United States.	California.	Connecticut.	Georgia.	Illinois.
	Kind and quantity of products, number of implements—Continued.					
	Implements of cultivation—Continued.					
81	Celery hillers	1,070				20
82	Cotton scrapers	22,519			3,981	3,900
83	Cotton sweeps	8,098			2,026	867
84	Equalizers	67,852				52,550
	Harrows—					
85	Disk	104,323	171	4,000		44,418
86	Spring-tooth	86,408				1,200
87	Spike-tooth	262,442	386		4,789	112,180
88	Hoes, dozens	331,620		39,155		51
89	Markers and furrowers	5,512				4,033
	Plows—					
90	Disk	39,146	990	400		19,478
91	Shovel	121,899	30		4,674	5,977
92	Steam	1,599	20			23
93	Sulky or wheel	138,899	58	300		85,403
94	Walking	956,898	1,264		125,779	157,906
95	Potato coverers and hillers	2,938				
96	Rollers	22,188	12	15		231
97	Stalk cutters	15,146				8,822
98	All other	12,480	367			9,293
	Harvesting implements—					
99	Grain cradles	30,056				
100	Harvesters and binders and headers, grain	108,810	227			78,018
	Harvesters—					
101	Bean	665	35			
102	Corn	6,924				1,628
103	Other	3,161	2			36
104	Hay carriers	85,121	6			27,751
	Hayforks—					
105	Hand, dozens	345,297				
106	Horse	62,801	2,190			
107	Hay loaders	27,174	1			18,158
	Hayrakes—					
108	Hand, dozens	76,139				
109	Horse	236,297	371			120,926
110	Hay stackers	8,670	89			560
111	Hay tedders	35,745				1,019
112	Mowers	267,692				170,826
113	Mowers and reapers combined	5,693				16
114	Potato diggers	11,703				1,592
115	Potato hooks	139,940				
116	Reapers	60,996				35,856
117	Scythes	705,025		79,026		
118	Scythe snaths	699,636				
119	Sickles	247,716				
120	Stackers	845				
121	All other	6,659	1,449			237
	Seed separators—					
122	Bean separators	727	1			
123	Other separators	12,109				412
124	Clover hullers	351				
125	Corn huskers	1,327				583
	Cornshellers—					
126	Hand	47,189				10,653
127	Power	6,082				2,573
128	Fanning mills	22,994	1			300
	Thrashers—					
129	Horsepower	2,237	5			
130	Steampower	7,950	3			513
131	All other	1,182			47	950
	Miscellaneous—					
132	Bean pullers	1,587				221
133	Cane mills	2,096	30		1,071	
134	Carts	21,365	480			10,890
135	Check rowers	12,478				10,303
136	Corn cleaners	106				106
137	Corn hooks	44,628				
138	Corn knives	125,149		990		
139	Cotton gins	72			50	
140	Cotton presses	18				
141	Ensilage cutters	10,696				174
142	Engines and boilers	369				
143	Farm trucks	4,320	172			1,125
144	Gardening implements	494,034			1,350	15,767
145	Grubbing machines	1,043				165
146	Hand carts	9,359				2,739
147	Hay-cutters	29,283				
148	Hay presses	5,719	8		30	1,983
149	Hayracks	620				
150	Horsepowers	4,804	73			2,615
151	Lawn mowers	34,000				27,000
152	Pea hullers	1,706			412	
153	Portable sawmills	1,828	50			
154	Portable steam engines	1,190				
	Pumps—					
155	Hand	81,765				13,932
156	Horse	1,000				1,000
157	Steam	165				135
158	Road carts	373	12			
159	Shovels, spades, and scoops	868,899				
160	Singletrees	220,549	1,350		124,896	
161	Sirup evaporators	768			768	
162	Sorghum evaporators	2,447			874	
163	Straw stackers	8,034				715
164	Thrasher trucks	1,269				
165	Traction engines	6,165	29			397
166	Wagons	7,027	133			1,161
167	Wagon trucks	54	4			
168	Water trucks	2,077				18
169	Weeders	12,224	1,050	150		
170	Windmills	2,009				1,934

DETAILED SUMMARY, BY STATES: 1905—Continued.

Indiana.	Iowa.	Kansas.	Kentucky.	Maine.	Massachusetts.	Michigan.	Minnesota.	Mississippi.	
									81
638		800	5,000						82
205		4,000	1,000						83
3,600	1,300		5,000			424	800		84
	40				10	5,032			85
700	373			212		1,300		200	86
1,108	1,702	800	2,000		1,270	19,959	3,134	250	87
1,200	30,240			15	6,300	47,547			88
	134								89
320		75	1,000			263			90
10,540	146	225	5,000	56		9,025	47		91
20,414	2,301	300	1,000		297	2,132	166		92
233,984	3,750	1,709	133,847	1,192	4,134	13,638	1,500	415	93
				700					94
					200	3,039			95
125		1,400	1,500		125	1,152			96
		425			118				97
									98
15,000	168								99
							1,208		100
									101
	499	105				2			102
			1,075			1,300			103
	12,316						700		104
	35,660					62,004			105
	1,673								106
	4,612								107
	5,850			1,200	2,196	1,496			108
880	12,568	110			942	378	496		109
	3,556	43					5		110
					798	200			111
					1,565		930		112
									113
800	1,100	8			5	60			114
						26,616			115
									116
				253,791					117
169,000	42,960					129,692			118
				129,716					119
						822			120
				1,200					121
						300			122
290		50				3,730	7,457		123
191									124
133	183					185			125
	628		8,415		690				126
6					250	15	40		127
770					20	11,750	5,748		128
3				11	2	588	41		129
1,028	60					1,562	818		130
	35								131
						139			132
									133
	9,500				150		200		134
						1,209			135
									136
	7,332			25,296					137
	219	20		6,024		1,780			138
									139
									140
					42	40			141
							27		142
50					12				143
	15,396		5,000		24,800	14,363			144
	758								145
	1,093				150				146
				960	932				147
158	309	660				532			148
						400			149
					7	78	60		150
									151
									152
216					20	175			153
47						32			154
									155
									156
									157
						61			158
					61,566				159
	6,288		75,000		500	5,125			160
									161
									162
1,129	300					1,010	1,750		163
						98			164
740						1,727	571		165
			8		20	50			166
									167
504						584	50		168
				10		1,132			169
									170

TABLE 14.—AGRICULTURAL IMPLEMENTS—

		United States.	California.	Connecticut.	Georgia.	Illinois.
	Power:					
171	Number of establishments reporting	589	21	3	14	76
172	Total horsepower	106,623	605	590	1,557	46,648
	Owned—					
	Engines—					
	Steam—					
173	Number	698	9	8	16	181
174	Horsepower	75,018	184	270	916	31,038
	Gas and gasoline—					
175	Number	165	11	.....	3	16
176	Horsepower	2,360	183	.....	23	147
	Water wheels—					
177	Number	128	1	11	.....	10
178	Horsepower	6,288	10	320	.....	928
	Water motors—					
179	Number	4	3	.....	.....	.....
180	Horsepower	12	4	.....	.....	.....
	Electric motors—					
181	Number	690	2	.....	21	415
182	Horsepower	16,885	22	.....	618	11,714
183	Other power, horsepower	2,157	.....	.....	.....	1,025
	Rented—					
	Electric motors—					
184	Number	182	15	.....	.....	41
185	Horsepower	3,828	197	.....	.....	1,163
186	Other kind, horsepower	75	5	.....	.....	33
187	Furnished to other establishments, horsepower	751	.....	15	.....	22

DETAILED SUMMARY, BY STATES: 1905—Continued.

Indiana.	Iowa.	Kansas.	Kentucky.	Maine.	Massachusetts.	Michigan.	Minnesota.	Mississippi.	
36	28	6	4	11	9	39	18	2	171
3,916	1,918	255	983	1,691	888	6,659	2,717	45	172
35	21	2	6	5	6	51	22	2	173
3,248	1,526	150	856	89	413	5,217	2,463	45	174
10	9	5	.....	4	2	11	4	.....	175
137	103	93	.....	46	120	138	39	.....	176
2	1	.....	.....	13	7	1	.....	.....	177
100	22	.....	.....	1,548	345	50	.....	.....	178
.....	.....	.....	.....	.....	.....	.....	.....	.....	179
.....	.....	.....	.....	.....	.....	.....	.....	.....	180
5	12	.....	3	.....	.....	31	18	.....	181
85	177	.....	18	.....	.....	673	190	.....	182
20	.....	.....	.....	.....	.....	.....	.....	.....	183
15	11	5	4	1	2	29	3	.....	184
321	90	12	109	8	10	581	25	.....	185
5	.....	.....	.....	.....	.....	.....	.....	.....	186
.....	.....	.....	.....	685	.....	.....	.....	.....	187

TABLE 14.—AGRICULTURAL IMPLEMENTS—

		Missouri.	Nebraska.	New Hampshire.	New Jersey.	New York.	North Carolina.
1	Number of establishments	21	3	8	10	75	13
2	Capital, total	$1,299,575	$134,600	$62,100	$432,195	$23,436,429	$116,735
3	Land	$138,550	.....	$3,250	$21,375	$1,001,905	$3,960
4	Buildings	$191,914	$15,000	$9,000	$75,967	$2,926,797	$23,600
5	Machinery, tools, and implements	$185,020	$60,300	$16,400	$54,767	$2,998,146	$27,550
6	Cash and sundries	$784,091	$59,300	$33,450	$280,086	$16,509,581	$61,625
7	Proprietors and firm members	18	2	11	9	66	13
	Salaried officials, clerks, etc.:						
8	Total number	89	11	3	37	934	8
9	Total salaries	$93,161	$6,000	$2,200	$40,005	$809,322	$9,250
	Officers of corporations—						
10	Number	13	2	.....	8	53	6
11	Salaries	$29,100	$2,500	.....	$13,050	$144,912	$7,600
	General superintendents, managers, clerks, etc.—						
12	Total number	76	9	3	29	881	2
13	Total salaries	$64,061	$3,500	$2,200	$26,955	$664,410	$1,650
	Men—						
14	Number	70	9	2	27	809	2
15	Salaries	$60,637	$3,500	$1,900	$26,445	$632,480	$1,650
	Women—						
16	Number	6	.....	1	2	72	.....
17	Salaries	$3,424	.....	$300	$510	$31,930	.....
	Wage-earners, including pieceworkers, and total wages:						
18	Greatest number employed at any one time during the year	845	69	71	326	8,516	160
19	Least number employed at any one time during the year	360	5	33	95	2,897	103
20	Average number	525	25	45	204	6,279	107
21	Total wages	$261,116	$15,025	$24,767	$89,787	$3,240,885	$30,883
	Men 16 years and over—						
22	Average number	521	25	45	204	6,251	103
23	Wages	$260,181	$15,025	$24,767	$89,787	$3,233,585	$30,328
	Women 16 years and over—						
24	Average number	1	.....	.....	.....	19	.....
25	Wages	$300	.....	.....	.....	$4,789	.....
	Children under 16 years—						
26	Average number	3	.....	.....	.....	9	4
27	Wages	$635	.....	.....	.....	$2,511	$555
	Average number of wage-earners, including pieceworkers, employed during each month:						
	Men 16 years and over—						
28	January	537	7	53	245	7,392	121
29	February	560	7	46	271	7,707	125
30	March	571	17	59	286	7,741	120
31	April	616	33	64	298	7,358	113
32	May	633	34	64	259	6,520	94
33	June	598	38	37	239	6,124	85
34	July	534	60	29	108	5,111	82
35	August	505	36	22	113	4,918	82
36	September	415	25	30	125	4,277	84
37	October	399	19	45	143	4,927	108
38	November	435	19	48	160	6,103	110
39	December	449	5	43	201	6,834	112
40	Miscellaneous expenses, total	$57,362	$6,574	$4,449	$53,082	$1,329,244	$5,108
41	Rent of works	$4,029	$435	$100	$406	$6,382	$140
42	Taxes	$3,564	$108	$422	$1,159	$62,600	$788
43	Rent of offices, interest, insurance, and all other sundry expenses not hitherto included.	$48,487	$6,031	$3,927	$50,323	$1,259,841	$3,755
44	Contract work	$1,282	.....	.....	$1,200	$421	$425
45	Materials used, aggregate cost	$452,056	$13,686	$13,568	$117,596	$5,678,339	$50,950
46	Principal materials, total cost	$361,299	$12,521	$10,425	$108,417	$4,127,262	$40,554
47	Purchased in raw state	.....	.....	$2,260	.....	$5,109	.....
48	Purchased in partially manufactured form	$361,299	$12,521	$8,165	$108,417	$4,122,153	$40,554
49	Fuel	$15,190	$227	$2,120	$4,524	$227,673	$3,185
50	Rent of power and heat	.....	$80	.....	.....	$5,770	.....
51	Mill supplies	$4,341	$38	$403	$970	$42,909	$420
52	All other materials	$58,041	$170	$620	$1,265	$1,214,238	$4,391
53	Freight	$13,185	$650	.....	$2,420	$60,487	$2,400
54	Products, total value	$1,068,008	$46,000	$61,860	$391,926	$13,045,891	$126,865
55	Seeders and planters	$40,115	$36,000	.....	$74,912	$1,800,182	$24,000
56	Implements of cultivation	$226,333	$7,500	$3,950	$187,243	$2,545,947	$46,070
57	Harvesting implements	$291,189	.....	$47,600	$2,000	$5,841,389	$1,100
58	Seed separators	$45,389	.....	.....	$14,133	$461,814	.....
59	Miscellaneous	$362,821	$2,500	.....	$85,401	$1,410,520	$8,495
60	All other products	$85,882	.....	$9,500	$19,047	$889,596	$33,225
61	Amount received for repair work, etc	$16,279	.....	$810	$9,190	$96,443	$13,975
	Kind and quantity of products, number of implements:						
	Seeders and planters—						
	Planters—						
62	Bean	.....	.....	.....	45	.....	.....
	Corn—						
63	Hand	750	.....	.....	.....	2,445	.....
64	Horse	.....	.....	.....	.....	950	50
65	Cotton	.....	.....	.....	.....	.....	4,750
66	Potato	.....	.....	.....	934	250	.....
	Drills—						
67	Beet	.....	.....	.....	.....	.....	.....
68	Corn	357	.....	.....	.....	1,268	.....
69	Grain	125	1,000	.....	.....	11,948	.....
70	Grain sowers	.....	.....	.....	.....	118	.....
71	Lime spreaders	.....	.....	.....	.....	34	.....
72	Listers	1,060	.....	.....	.....	.....	.....
73	Manure spreaders	.....	.....	.....	906	8,504	300
74	Seed sowers	700	.....	.....	2,691	1,375	.....
75	Tobacco transplanters	.....	.....	.....	.....	100	.....
76	All other	.....	.....	.....	.....	.....	.....
	Implements of cultivation—						
	Cultivators—						
77	Bean	.....	.....	.....	.....	.....	.....
78	Beet	.....	.....	.....	.....	.....	.....
79	Small	1,804	.....	.....	11,759	23,746	6,000
80	Wheeled	7,607	.....	.....	3,275	3,721	455

[1] Includes establishments distributed as follows: Alabama, 2; Arkansas, 1; Colorado, 1; Maryland, 2; North Dakota, 1; Oregon, 1; South Dakota, 2; Utah, 1; Washington, 1; West Virginia, 1.

DETAILED SUMMARY, BY STATES: 1905—Continued.

Ohio.	Pennsylvania.	South Carolina.	Tennessee.	Texas.	Vermont.	Virginia.	Wisconsin.	All other states.[1]	
71	43	4	12	4	10	11	52	13	1
$24,301,986	$5,460,011	$13,351	$756,812	$147,271	$490,725	$329,990	$20,837,995	$515,100	2
$1,532,522	$416,306	$600	$49,750	$1,950	$39,000	$25,600	$997,476	$46,053	3
$3,660,252	$746,505	$2,465	$108,183	$12,800	$77,600	$48,906	$2,072,312	$88,421	4
$3,186,546	$803,640	$3,500	$126,574	$18,928	$102,889	$53,115	$2,129,587	$116,408	5
$15,922,666	$3,493,560	$6,786	$472,305	$113,593	$271,236	$202,369	$15,638,620	$264,218	6
39	54	5	9	.....	8	18	42	13	7
918	220	.....	34	8	23	21	1,017	19	8
$1,001,714	$226,832	.....	$50,593	$9,400	$31,084	$20,220	$1,050,112	$22,330	9
103	31	.....	7	3	3	1	44	6	10
$230,794	$54,006	.....	$17,700	$4,600	$10,000	$3,000	$98,615	$6,140	11
815	189	.....	27	5	20	20	973	13	12
$770,920	$172,826	.....	$32,893	$4,800	$21,084	$17,220	$951,499	$16,190	13
686	168	.....	21	5	20	16	915	13	14
$713,156	$164,674	.....	$29,945	$4,800	$21,084	$14,960	$920,252	$16,190	15
129	21	.....	6	.....	.....	4	58	.....	16
$57,764	$8,152	.....	$2,948	.....	.....	$2,260	$31,247	.....	17
7,612	2,674	17	846	72	288	445	4,897	226	18
3,280	2,141	9	466	43	207	234	1,909	129	19
5,659	2,394	12	613	47	247	314	3,569	173	20
$2,909,540	$1,103,441	$4,065	$216,306	$23,943	$113,524	$115,727	$1,885,775	$93,653	21
5,619	2,376	12	593	47	238	312	3,550	171	22
$2,894,691	$1,099,719	$4,065	$213,231	$23,943	$111,589	$115,277	$1,874,628	$93,278	23
39	1	.....	3	.....	7	.....	20	.....	24
$14,673	$235	.....	$825	.....	$1,635	.....	$5,540	.....	25
1	17	.....	17	.....	2	2	19	2	26
$176	$3,487	.....	$2,250	.....	$300	$450	$5,607	$375	27
6,531	2,396	12	746	67	261	310	3,516	188	28
6,888	2,435	12	643	50	270	319	4,013	177	29
6,964	2,472	12	641	51	255	330	4,263	180	30
6,740	2,531	10	609	34	254	338	4,027	187	31
6,155	2,509	8	528	37	248	323	3,573	196	32
5,584	2,447	11	496	34	237	321	3,194	184	33
4,720	2,314	13	478	37	224	311	3,328	141	34
4,048	2,246	12	510	35	204	300	3,503	137	35
4,129	2,248	12	550	48	224	286	3,421	154	36
4,491	2,263	14	638	53	218	284	3,000	166	37
5,312	2,296	14	626	56	221	306	3,052	172	38
5,866	2,355	14	651	62	240	316	3,470	170	39
$1,650,747	$566,272	$6,794	$65,203	$36,402	$41,559	$20,640	$2,278,736	$55,060	40
$1,977	$685	$125	.....	$750	$50	$6,340	$8,497	$1,500	41
$114,757	$10,904	$54	$4,954	$968	$2,143	$1,823	$64,561	$2,814	42
$1,504,925	$541,183	$5,365	$59,299	$19,584	$39,366	$12,477	$2,205,328	$50,246	43
$29,088	$13,500	$1,250	$950	$15,400	.....	.....	$350	$500	44
$5,692,218	$2,074,973	$12,635	$314,279	$74,233	$182,403	$182,433	$3,519,656	$151,984	45
$4,639,103	$1,615,192	$11,745	$234,683	$65,935	$156,879	$139,833	$2,662,268	$135,420	46
$200	$244	.....	.....	.....	$9,075	$645	$555	.....	47
$4,638,903	$1,614,948	$11,745	$234,683	$65,935	$147,804	$139,188	$2,661,713	$135,420	48
$169,408	$65,457	$180	$22,461	$1,960	$11,802	$7,898	$143,062	$5,737	49
$130	$620	.....	.....	$276	.....	$600	$623	$1,300	50
$63,386	$11,803	$69	$774	$299	$2,985	$680	$37,877	$817	51
$729,922	$367,379	$650	$55,361	$2,848	$13,737	$31,816	$632,612	$7,945	52
$90,269	$14,522	.....	$1,000	$2,915	.....	$1,606	$43,414	$765	53
$12,891,197	$5,016,679	$34,932	$768,895	$187,134	$441,671	$404,281	$10,676,760	$398,192	54
$2,016,919	$186,449	$3,215	$12,000	.....	.....	$32,225	$911,438	$75	55
$3,031,384	$987,619	$192	$545,076	$156,074	$40,829	$189,287	$2,219,657	$138,300	56
$3,193,853	$393,917	.....	$5,896	$700	$263,270	$1,465	$1,541,020	$34,895	57
$501,482	$489,956	.....	$40,000	.....	$26,569	$16,800	$1,655,658	$45,000	58
$2,430,577	$2,229,802	$20,000	$87,685	$3,800	$96,602	$3,295	$2,742,225	$16,890	59
$1,193,560	$658,270	$10,725	$70,293	$26,450	$11,035	$152,279	$1,547,331	$113,775	60
$523,422	$70,666	$800	$8,035	$110	$3,366	$8,930	$79,401	$48,357	61
.....	.....	.....	.....	.....	.....	.....	.....	.....	62
25,578	.....	.....	.....	.....	.....	.....	633	.....	63
6,054	3,022	.....	.....	.....	.....	575	4,033	.....	64
3,634	575	200	6,000	.....	.....	1,375	1,500	.....	65
664	.....	.....	.....	.....	.....	.....	6,291	.....	66
35	.....	.....	.....	.....	.....	.....	.....	1	67
7,258	.....	.....	200	.....	.....	.....	150	.....	68
23,636	1,075	.....	.....	.....	.....	.....	7,208	.....	69
2,338	.....	.....	.....	.....	.....	.....	6,407	.....	70
123	.....	.....	.....	.....	.....	.....	.....	.....	71
244	.....	.....	.....	.....	.....	.....	2,525	.....	72
2,442	1,611	.....	.....	.....	.....	.....	75	.....	73
68	11,700	600	.....	.....	.....	.....	350	.....	74
542	.....	.....	.....	.....	.....	.....	500	.....	75
.....	.....	.....	.....	.....	.....	1,150	.....	.....	76
7	.....	.....	.....	.....	.....	.....	.....	.....	77
225	.....	.....	.....	.....	.....	.....	500	.....	78
65,157	62,116	.....	.....	.....	.....	5,900	3,385	5,240	79
44,187	9,023	.....	.....	.....	.....	.....	29,656	.....	80

TABLE 14.—AGRICULTURAL IMPLEMENTS—

		Missouri.	Nebraska.	New Hampshire.	New Jersey.	New York.	North Carolina.
	Kind and quantity of products, number of implements—Con.						
	Implements of cultivation—Continued.						
81	Celery hillers					720	
82	Cotton scrapers						
83	Cotton sweeps						
84	Equalizers		1,500			2,447	
	Harrows—						
85	Disk	199				22,866	
86	Spring-tooth					65,594	
87	Spike-tooth	256			7,622	38,357	90
88	Hoes, dozens			250		67,051	
89	Markers and furrowers				209	476	
	Plows—						
90	Disk					422	
91	Shovel					8,884	10
92	Steam						
93	Sulky or wheel	144				2,951	
94	Walking	482		295	65	78,545	4,000
95	Potato coverers and hillers					1,338	
96	Rollers				8	2,014	
97	Stalk cutters	108					30
98	All other						
	Harvesting implements—						
99	Grain cradles					700	300
100	Harvesters and binders and headers, grain					19,161	
	Harvesters—						
101	Bean					550	
102	Corn					1,881	
103	Other					700	
104	Hay carriers				50	740	
	Hayforks—						
105	Hand, dozens					60,800	
106	Horse				200	750	
107	Hay loaders						
	Hayrakes—						
108	Hand, dozens	525		7,550		14,157	
109	Horse	12,000				39,844	
110	Hay stackers	3,691					
111	Hay tedders					18,063	
112	Mowers					57,919	
113	Mowers and reapers combined					5,677	
114	Potato diggers				24	526	
115	Potato hooks					2,200	
116	Reapers					21,457	
117	Scythes			72,004		240,204	
118	Scythe snaths						
119	Sickles						
120	Stackers						
121	All other					1,373	
	Seed separators—						
122	Bean separators					221	
123	Other separators	55					
124	Clover hullers						
125	Corn huskers					4	
	Cornshellers—						
126	Hand	4,000				891	
127	Power	40				92	
128	Fanning mills					125	
	Thrashers—						
129	Horsepower	9			14	89	
130	Steampower	9			23	611	
131	All other						
	Miscellaneous—						
132	Bean pullers					1,207	
133	Cane mills						
134	Carts						145
135	Check rowers						
136	Corn cleaners						
137	Corn hooks						
138	Corn knives						
139	Cotton gins	14				67,716	
140	Cotton presses	13					
141	Ensilage cutters						
142	Engines and boilers					300	
143	Farm trucks				30	32	
144	Gardening implements					4	540
145	Grubbing machines	75			3,220	120,000	
146	Hand carts						
147	Hay-cutters	500				1,384	
148	Hay presses	700				23,232	
149	Hayracks	1,550				325	
150	Horsepowers					220	
151	Lawn mowers	110			6	8	
152	Pea hullers						
153	Portable sawmills					85	
154	Portable steam engines	20			17	21	
	Pumps—				6	106	
155	Hand						
156	Horse						
157	Steam						
158	Road carts					30	
159	Shovels, spades, and scoops						
160	Singletrees						
161	Sirup evaporators						
162	Sorghum evaporators						
163	Straw stackers					60	
164	Thrasher trucks					479	
165	Traction engines	30				592	
166	Wagons	11				362	
167	Wagon trucks						87
168	Water trucks						
169	Weeders				462	174	
170	Windmills	75	500			1,803	

DETAILED SUMMARY, BY STATES: 1905—Continued.

Ohio.	Pennsylvania.	South Carolina.	Tennessee.	Texas.	Vermont.	Virginia.	Wisconsin.	All other states.	
200	130								81
200			8,000						82
									83
231									84
19,245						100	8,242		85
12,486	3,603		140				600		86
40,749	950		552			5,150	20,413	725	87
76,994	18,000		41,507		3,250				88
	160							500	89
7,356	15		6,074	770			1,943	40	90
66,749	875		4,811			1,850		3,000	91
1,501	15						40		92
213	350						22,720	150	93
49,792	47,242		28,447	18,421	2,080	29,398	18,412	601	94
150					500		250		95
10,863	4,139				90	1,000	562	15	96
172	30	12				800	370	500	97
1,077				1,200					98
600	7,638					650		5,000	99
4,099							6,097		100
80									101
1,285	2						1,497	25	102
48									103
32,500							11,058		104
98,741	47,203		797		40,092				105
55,000							2,988		106
4,403									107
27,833	15,332								108
36,262				10			11,140	350	109
501								225	110
15,215	400						50		111
19,382							17,070		112
									113
3,353	2,950						1,285		114
45,684	36,000		11,028		18,412				115
2,186							1,497		116
					60,000				117
97,260	86,400				174,324				118
					108,000				119
								23	120
2,300								100	121
	205								122
68	22						25		123
100	60								124
							239		125
4,246	12,991		3,200			1,450	25		126
451	2,265					350			127
	250					5	4,025		128
4	850				203		393	25	129
972	713						1,582	56	130
100	50								131
20									132
			1,825			70			133
									134
906									135
									136
					12,000				137
					48,000		400		138
						8			139
						5			140
9,539	250				20		331		141
	280								142
1,700	177						540		143
116,955	3,048		29,280		144,780				144
120									145
3,023	15					50	405		146
	2,608					325	526		147
139				25					148
									149
198	560				159		899	31	150
7,000									151
	205	1,000	4						152
140	805				127		225	12	153
196	703						100		154
67,800	33								155
									156
									157
							300		158
	804,045		3,288						159
5,030	2,000					360			160
									161
			1,513						162
232	379						2,007	33	163
316	149				26		58		164
773	357						1,209		165
3,546	3						2,008		166
								50	167
266	6						13		168
229	5,929				331		890	200	169
									170

TABLE 14.—AGRICULTURAL IMPLEMENTS—

		Missouri.	Nebraska.	New Hampshire.	New Jersey.	New York.	North Carolina.
	Power:						
171	Number of establishments reporting	21	3	7	9	73	11
172	Total horsepower	856	32	365	423	13,342	206
	Owned—						
	Engines—						
	Steam—						
173	Number	20	1	1	7	80	9
174	Horsepower	790	25	40	123	8,893	177
	Gas and gasoline—						
175	Number	7	2	.....	3	9	1
176	Horsepower	66	7	.....	130	114	14
	Water wheels—						
177	Number	.....	.....	8	5	43	1
178	Horsepower	.....	.....	325	150	1,861	15
	Water motors—						
179	Number	.....	.....	.....	.....	.....	.....
180	Horsepower	.....	.....	.....	.....	.....	.....
	Electric motors—						
181	Number	.....	.....	.....	5	65	.....
182	Horsepower	.....	.....	.....	20	1,323	.....
183	Other power, horsepower	.....	.....	.....	.....	512	.....
	Rented—						
	Electric motors—						
184	Number	.....	.....	.....	.....	13	.....
185	Horsepower	.....	.....	.....	.....	629	.....
186	Other kind, horsepower	.....	.....	.....	.....	10	.....
187	Furnished to other establishments, horsepower	.....	.....	.....	.....	.....	.....

DETAILED SUMMARY, BY STATES: 1905—Continued.

Ohio.	Pennsylvania.	South Carolina.	Tennessee.	Texas.	Vermont.	Virginia.	Wisconsin.	All other states.	
70	33	3	11	3	9	9	48	12	171
9,152	3,240	34	704	50	666	383	8,101	597	172
83	40	2	13	2	4	8	58	6	173
7,607	2,725	24	649	40	225	351	6,683	251	174
27	6	1	5	.....	4	.....	20	5	175
598	53	10	43	.....	66	.....	211	19	176
3	5	.....	.....	.....	13	1	2	1	177
125	46	.....	.....	.....	367	12	32	32	178
.....	.....	.....	.....	.....	1	.....	.....	.....	179
.....	.....	.....	.....	.....	8	.....	.....	.....	180
56	1	.....	2	.....	.....	.....	49	5	181
798	10	.....	12	.....	.....	.....	1,135	90	182
.....	.....	.....	.....	.....	.....	.....	.....	.....	183
1	28	.....	.....	1	.....	3	3	7	184
4	406	.....	.....	10	.....	20	38	205	185
20	.....	.....	.....	.....	.....	.....	2	.....	186
4	25	.....	.....	.....	.....	.....	.....	.....	187