IRON AND IRON-MANUFACTURES.

IRON BLOOMS.

The number of bloomary forges in 10 States on the 1st of June, 1860, was 97. Their aggregate capital was $2,135,600, and the number of persons employed was 1,746, whose labor cost $532,652, and the materials consumed were valued at $110,889. The total weight of blooms made was 51,290 tons, valued at $2,623,178, an average value of $51 14 per ton.

Of the whole number of forges Pennsylvania contained 57, and produced 24,700 tons of blooms, worth $1,467,450, which was upward of one-half the total value; and New York, in 24 bloomaries, manufactured 17,536 tons, valued at $697,198, which was over one-fourth of the whole value produced in the Union. Vermont was the only New England State which reported bloomary forges, of which there were 3, producing 1,400 tons, worth $54,000. Tennessee had the same number, and ranked next to the two States first named in the quantity of blooms made, which was 4,486 tons, worth $251,580. In none of the other States did the product exceed $50,000 in value. In New Jersey there were 5 small bloomaries, and in Maryland, Virginia, Ohio, Kentucky, and Missouri, 1 each.

Statistics of iron bloom produced during the year ending June 1, 1860.

STATES.	Number of establishments.	Capital invested.	Tons of pig-iron and ore used.	Cost of raw material.	NUMBER OF HANDS EMPLOYED.		Annual cost of labor.	Annual value of products.	Tons of blooms.
					Male.	Female.			
Vermont	3	$23,000	2,750	$38,550	28	.....	$10,280	$54,000	1,400
New York	24	442,100	36,664	468,559	439	.....	141,936	697,198	17,536
Pennsylvania	57	1,336,400	58,764	1,005,045	1,053	2	317,796	1,467,450	24,700
New Jersey	5	38,300	2,214	16,694	30	.....	9,360	37,480	867
Maryland	1	50,000	560	14,192	10	.....	3,360	18,635	*516
Ohio	1	800	45	1,220	3	.....	300	1,835	35
Missouri	1	80,000	2,000	28,560	30	.....	16,356	50,000	1,000
Kentucky	1	50,000	250	8,000	20	5	3,780	13,000	200
Virginia	1	27,000	825	25,825	14	.....	5,040	32,000	550
Tennessee	3	88,000	6,817	186,789	102	10	24,444	251,580	4,486
Total	97	2,135,600	110,889	1,793,434	1,729	17	532,652	2,623,178	51,290

* Also 250 tons produced in a rolling-mill.

PIG-IRON.

The iron furnaces in 21 States in 1850 were 404. They employed an aggregate capital of $16,648,360, and 21,054 persons, including 207 females. They consumed about 1,579,309 tons of ore, and produced about 564,755 tons of pig-iron, valued at $13,491,898, an average of $23 43 per ton.

In 1860 returns of pig-iron were made by 286 establishments, in 18 States, in which the total capital invested was $24,672,824, the number of hands, including 73 females, 15,927, and the cost of labor $4,545,430. They smelted 2,309,975 tons of ore, costing with other materials $12,293,030, and made 987,559 tons of pig metal, worth $20,870,120, or $21 13 per ton, an increase of 422,804 tons of pig, and of 54 per cent. over the value of the manufacture in 1850.

The business employed, in three New England States, 14 establishments, which with 786 hands manufactured from 72,800 tons of ore, 26,600 tons of pig-iron, valued at $814,000, an increase of 9 per cent., and equivalent to $30 60 per ton. From New Hampshire, in which 1 furnace, in 1850, made pig-iron of the value $17,200, there was no return in 1860. The State of Massachusetts, with 5

furnaces, produced the largest amount, having increased its product 49 per cent., while Connecticut, with 7 establishments, scarcely held its own, and Vermont, with 2 furnaces, showed a considerable decrease from the value in 1850.

In the four States of New York, Pennsylvania, New Jersey, and Maryland, the number of establishments fell off from 235 to 157, but in all, except the last mentioned, showed a large increase in the capital and value of the manufacture since 1850. The furnaces in these States employed a capital of $15,799,744, and 9,385 persons, including 4 females. From 1,689,550 tons of ore smelted they produced 736,869 tons of pig-metal, valued at $14,654,962, an increase of $5,872,961, or 66.9 per cent. in the value of the product, and an average of $19 88 per ton for the iron.

Pennsylvania, which is the principal iron-producing State in the Union, numbered 125 establishments, which was 43 less than were reported in 1850. Of the total capital employed in this branch of production in the United States, upward of one-half, or $12,723,644, belonged to that State, in which the number of hands was 7,593. The weight of pig-metal made from 1,351,000 tons of ore was 580,049 tons, worth $11,262,974, or $19 41 per ton, an increase of $5,092,349, or 82 per cent., over the value made in 1850. The product was nearly 54 per cent. of the total value made in the Union, and nearly 75 per cent. of the quantity produced in 1860. In New York the product of pig-iron was augmented at the rate of 53 per cent., 15 furnaces having made 74,645 tons, worth $1,635,758, an average of $21 91 per ton; and New Jersey, in 6 establishments, made 51,675 tons of pig-metal, worth $1,016,630, or $19 67 per ton, an increase of 105 per centum in ten years. The value of 30,500 tons of iron made by 11 furnaces in Maryland averaged $24 25 per ton, the whole value being $739,600, or $308,650 less than the value in 1850.

From 7 western States returns were made of 76 pig-iron furnaces, aggregating a capital of $6,223,000 and 4,021 hands. They consumed 456,127 tons of iron ore, producing 187,300 tons of metal, worth an average of $23 74 per ton, or $4,447,255, which was an increase of 75 per cent. The States of Ohio and Kentucky were the principal producers. The first-named State employed in its iron furnaces an aggregate capital of $3,654,000 and 3,119 persons, and from 288,977 tons of ore made 117,754 tons of pig-metal, valued at $2,697,366, which was equal to $22 90 per ton, and an increase of 88 per cent. in ten years. In Kentucky $1,520,000 was invested in iron furnaces, which employed 465 men and smelted 98,750 tons of ore, producing 33,471 tons of iron, worth $804,214, or $24 02 per ton, an increase of over 27 per cent. In Michigan, which had 4 furnaces; in Missouri, with 2; and in Wisconsin, with 2 furnaces, the increase was large, while in Indiana and Illinois, with 1 establishment each, the falling off in the product was large.

Returns were made of 39 establishments in Virginia, Georgia, Alabama, and Tennessee, in 1860; the two Carolinas, which, in 1850, returned a value of $44,400, reporting none at the last census. In the first-mentioned southern States the total capital amounted to $1,934,080, and the number of persons employed to 1,735. The quantity of ore smelted was 91,498 tons, the weight of pig-iron made was 36,790 tons, valued at $953,903, an average of $25 92 per ton, and a decrease from the total value made in 6 States in 1850 of $469,632, or upward of 14 per cent. The State of Tennessee was the largest producer of pig-iron in the south, its furnaces numbering 17, with a capital of $1,062,675 and 991 male and 60 female hands, who produced, from 56,969 tons of ore, 22,302 tons of metal, valued at $549,640, or $24 64 per ton, a decrease from the product of 1850 of $183,050, or 13.3 per cent. In Virginia, 16 furnaces, employing 529 persons, also showed a considerable falling off in the product of pig metal made, which amounted, in 1860, to 11,646 tons, worth $538,249, or $26 46 per ton. The decrease in Georgia, which had 2 furnaces, was upward of 50 per cent., and in Alabama, with 4 establishments, it was increased from $28,896 to $64,590. The value per ton in the two States last named was $28 63 and $37 07 per ton, respectively, the latter being the highest average value of pig-iron reported from any State, and $5 84 per ton above the average price in all the States.

Statistics of pig iron produced in the United States during the year ending June 1, 1860.

STATES.	Number of establishments.	Capital invested.	Tons of ore used.	Value of all raw materials.	NUMBER OF HANDS EMPLOYED.		Annual cost of labor.	ANNUAL VALUE OF PRODUCT.		Per cent. increase.	Tons of pig iron.	Average price per ton.
					Male.	Female.		In 1860.	In 1850.			
New Hampshire	.....	.....	.....	.....	.....	.....	.....	.....	$17,200	.....	.....	.....
Vermont	2	$40,000	3,250	$13,420	40	.....	$10,320	$31,500	80,000	Dec.	1,100	$28 63
Massachusetts	5	216,000	42,000	209,960	326	.....	109,668	403,000	270,123	49	13,700	29 41
Connecticut	7	460,000	27,550	238,885	420	.....	116,976	379,500	379,600	Dec.	11,800	32 16
Total in New England States	14	716,000	72,800	462,265	786	.....	236,964	814,000	746,923	9	26,600	30 60
New York	15	1,369,100	151,378	1,018,772	656	.....	215,364	1,635,758	1,067,572	53	74,645	21 91
Pennsylvania	125	12,723,644	1,351,000	7,014,037	7,593	4	2,107,500	11,262,974	6,170,625	82	580,049	19 41
New Jersey	6	932,000	107,972	665,285	517	.....	167,268	1,016,630	495,554	105	51,675	19 67
Maryland	11	775,000	79,200	528,750	615	.....	173,880	739,600	1,048,250	Dec.	30,500	24 25
Total in Middle States	157	15,799,744	1,689,550	9,226,844	9,381	4	2,664,012	14,654,962	8,782,001	66.9	736,869	19 88
Ohio	48	3,654,000	288,977	1,291,778	3,115	4	975,024	2,697,366	1,427,838	88	117,754	22 90
Indiana	1	66,000	1,000	4,950	10	.....	3,600	9,375	158,084	Dec.	375	25 00
Michigan	4	350,000	22,900	201,642	162	.....	55,920	391,400	2,880	In.	13,700	28 56
Illinois	1	25,000	4,000	20,000	30	.....	10,800	37,500	93,600	Dec.	1,500	25 00
Wisconsin	2	105,000	5,500	21,150	60	.....	18,000	57,400	32,500	Inc.	2,500	22 96
Missouri	2	503,000	35,000	181,750	175	.....	63,000	450,000	194,600	Inc.	18,000	25 00
Kentucky	18	1,520,000	98,750	517,628	465	.....	149,904	804,214	629,937	27	33,471	24 02
Total in Western States	76	6,223,000	456,127	2,238,898	4,017	4	1,276,248	4,447,255	2,539,439	75	187,300	23 74
Virginia	16	616,405	28,109	132,894	524	5	111,102	308,173	538,249	Dec.	11,646	26 46
North Carolina	.....	.....	.....	.....	.....	.....	.....	.....	3,400	.....	.....	.....
South Carolina	.....	.....	.....	.....	.....	.....	.....	.....	41,000	.....	.....	.....
Georgia	2	30,000	2,700	8,600	60	.....	18,000	31,500	79,300	Dec.	1,100	28 63
Alabama	4	225,000	3,720	19,765	95	.....	25,800	64,590	28,896	Inc.	1,742	37 07
Tennessee	17	1,062,675	56,969	203,764	991	60	213,304	549,640	732,690	Dec.	22,302	24 64
Total in Southern States	39	1,934,080	91,498	365,023	1,670	65	368,206	953,903	1,423,535	Dec.	36,790	25 92
Total in United States	286	24,672,824	2,309,975	12,293,030	15,854	73	4,545,430	20,870,120	13,491,898	54	987,559	21 13

BAR, SHEET, AND RAILROAD IRON.

In 1850 the number of forges returned was 375, and of rolling-mills 64. The capital employed by the former was $8,517,011, and by the latter $5,214,700, a total of $13,731,711. The forges employed 7,775 persons, and the rolling-mills 3,829, in all 11,604, whose aggregate wages was $3,762,508, the cost of material in both branches being $9,691,655. The product of the forges was a value of $9,002,705, and of the rolling-mills $6,936,081, making a total of $15,938,786.

The number of establishments employed in 1860 in 20 States in producing bar, sheet, and railroad iron, was 256. Their aggregate capitals amounted to $19,924,473; the number of persons employed to 19,262; the cost of wages to $6,514,258; and of materials to $19,242,743. The materials included 656,803 tons of blooms, pig-metal, and ore, from which were made bar and other iron of the aggregate value of $31,888,705, an increase of 100 per cent. on the product of 1850. This sum comprised the values of 227,682 tons of bar-iron, 30,895 tons of boiler and nail-plate, 11,200 tons of sheet iron, and 4,200 tons of wire-rods, tire and other iron, a total weight of 513,213 tons, of the average value of $62 14 per ton. In addition to the foregoing, there were also produced, in the same establishments,

2,956 tons of nails, 660 tons of spikes, 210 tons of rivets, 115 tons of anchors, and 250 tons of blooms, and some machinery.

In the eastern States there were 14 establishments, (one-half of them in Massachusetts,) which, with a capital of $1,293,000 and 1,298 hands, made from 61,895 tons of raw material, 50,590 tons of bar, railroad, and other iron, valued at $3,361,400, an average of $66 44 per ton, and an increase of 84.1 per cent. on the product of New England in 1850. The product of Massachusetts was 40,925 tons, worth $2,634,000, an average price of $64 36 per ton, and an increase of 277 per cent. on the product of that State in 1850. Included in that amount were 24,000 tons of railroad and 9,425 tons of bar-iron. Maine produced only bar-iron, beside nails and rivets—the former amounting to 5,100 tons, made in one establishment, and valued at $63 per ton. The increase of the manufacture in Maine was 152 per cent., while in Vermont and Connecticut there was a decrease; and from New Hampshire there were returns of 70 tons of iron rails inserted by mistake in the table of iron railing.

The manufacture of bar, sheet, and railroad iron, &c., in the middle States employed 134 establishments, having, collectively, a capital of $13,627,863, or nearly as much as was employed in all the States in 1850. They wrought up 437,850 tons of blooms, pigs, &c., costing, with other materials, $12,071,969, and employed 13,151 persons, at an annual cost for labor of $4,330,848. The value of the iron produced was $20,040,336, which was an increase of 85 per cent. upon the value made in these States in 1850, and $4,101,550, or upward of 25 per cent. in excess of the total product of the United States in that year. The whole weight of iron manufactured was 346,969 tons, at an average price of $57 70 per ton. This quantity consisted of 154,297 tons of bar, 158,577 tons of rails, 22,795 tons of boiler and nail plate, 10,000 tons of sheet, and 1,300 tons of other iron, in addition to some anchors and blooms.

Pennsylvania and New York were the largest producers, the former having 87 and the latter 10 establishments. The capital invested in this branch of the iron trade in Pennsylvania amounted to $10,974,013, or more than one-half that of all the States. The business employed 10,177 persons, whose labor cost $3,283,536, the cost of materials, including 330,987 tons of crude iron, being $8,862,947. The value of the product in that State was more than doubled, and amounted to $15,122,842, the rate of increase being 106 per cent. It fell short of the value made in the United States in 1850 in the sum of only $815,944. Comprised in the manufactures were 112,276 tons of bar-iron, 133,577 of railway iron, 13,000 tons of boiler plate, &c., 7,000 tons of sheet iron, and 400 tons of galvanized iron, a total of 266,253 tons, of the average value of $56 80 per ton. Of the whole value, $3,761,683 was made by 13 mills in Pittsburg. The quantity of iron made in New York, including 22,825 tons of bar, 14,000 tons of rails, and 1,450 tons of nail-rods, was 38,275 tons, worth altogether $2,251,250, an increase of 19 per cent. on the product of 1850, and an average value of $58 81 per ton. In its production were employed a capital of $939,750 materials, including 50,650 tons of raw iron and ore, of the value of $1,529,833, and 1,473 hands, whose labor cost $514,680. In New Jersey there were 26 establishments, employing a capital of $1,098,100, and 963 persons. They consumed 39,990 tons of material, from which were made, besides 115 tons of anchors, 29,186 tons of iron, including 900 tons of iron wire, the whole valued at $1,617,519, an average of $55 20 per ton, and an increase of 43 per cent.

The iron mills in Delaware numbered 4, and in Maryland 7—the former producing 2,570 tons of bar, plate, and sheet iron, worth $192,600, an increase of 230 per cent.; and the latter 10,685 of bar and sheet iron, in addition to 250 tons of blooms, the whole valued at $856,125, an increase of 104 per cent. in ten years.

The western States contained 24 manufactories of bar and rolled iron, of which 13 were in Ohio, 5 in Kentucky, 2 in Missouri, 2 in Indiana, and 1 each in Michigan and Illinois. The total amount of capital invested in this industry in the west was $3,370,300, and it gave employment to 2,804 persons, at an annual cost of labor of $1,097,160. The consumption of pig-iron, blooms, &c., was 113,374 tons, valued, with other articles, at $776,250, and from it were manufactured 41,973 tons of bar-iron, 40,000

tons of rails, 2,100 tons of plate iron, and 1,200 tons of sheet iron, a total weight of 85,273, of which the value, including 2,000 tons of nails and spikes made in Ohio, was $6,028,850, an increase of 234 per cent., and an average value per ton of $69 10. More than one-half of the product in that section was made in Ohio and Kentucky, the former having 13 and the latter 5 iron mills. In the extent of its iron trade Ohio is, next to Pennsylvania, the largest in the Union, having, in 1860, returned a larger value than either New York or Massachusetts. In the State was employed a total capital of $961,800 and 1,326 hands, who used up 58,270 tons of pigs, valued at $1,719,798, and produced 20,495 tons of bar-iron, 19,000 tons of railroad, and 1,200 tons of plate iron, a total of 40,695 tons, worth, with 1,500 tons of nails and 500 tons of spikes made, $2,806,200. The increase was 173 per cent.

In Kentucky a larger capital was invested than in Ohio, or $1,350,000, but the weight of material rolled was only 16,850 tons, which made 14,000 tons of bar, plate, and sheet iron, worth $1,183,150, an increase of 68 per cent.

One mill in Illinois produced 12,000 tons of rails, worth $660,000; one in Michigan, 9,500 tons of bars and rails, worth $585,000, being the first returns of rolled iron made from these States.

In Missouri the product was largely increased over that returned in 1850, and amounted to 6,678 tons, valued at $670,000, while 2 mills in Indiana reported 2,300 tons of bar-iron and rails, worth $124,500, against a value of $4,000 in 1850.

The southern States contained 84 iron mills, employing about one-half as much capital as the western establishments, viz: $1,633,010, and made from 43,684 tons of crude iron and ore, which, with other materials, cost $1,294,104, by the labor of 2,009 persons, 26,252 tons of bar and railroad iron, valued, with some nails, spikes, and machinery, at $2,458,119, or $91 52 per ton. The increase in that section was 63 per cent.

The State of Virginia produced the largest value, having 20 establishments, with 1,382 hands, and a capital of $1,047,725, which wrought 29,167 tons of material into 7,709 tons of bar and 10,180 tons of rails, valued, with 160 tons of spikes and some machinery, at $1,666,885. The increase was 194 per cent.

Thirty-five mills in Tennessee consumed 8,181 tons of material, making 5,144 tons of bar-iron, valued at $543,398, or upward of $105 per ton. The product was a decrease from that of 1850. In North Carolina 25 small mills made 1,096 tons of bar-iron, worth $99,656; and 2 in Alabama made 93 tons, worth $8,550, which was also a decline in these States from the values returned in 1850. Two iron mills in Georgia made 2,030 tons of iron, chiefly rails, worth $139,630, showing an increase in that State. In South Carolina, from which none was reported in 1850, 275 tons of bar-iron were made and returned as iron castings in the statistics of which it is included.

Statistics of bar, sheet, and railroad iron produced in the United States during the year ending June 1, 1860.

STATES.	Number of establishments.	Capital invested.	Tons of blooms, pig-iron, and ore used.	Cost of raw materials.	NO. OF HANDS EMPLOYED.		Annual cost of labor.	ANNUAL VALUE OF PRODUCTS.		Per cent. increase.	TONS OF IRON PRODUCED.						Price per ton.	Other articles.
					Male.	Female.		In 1860.	In 1850.		Bar.	Railroad.	Boiler plate and nail plate.	Sheet.	Miscellaneous.	Total.		
Maine	1	$100,000	7,900	$220,250	250	.....	$84,000	$388,650	$154,000	152	5,100	.....	.....	.....	.....	5,100	$63 00	Also, 950 tons nails and 210 tons rivets.
New Hampshire *a*	.....	.....	.....	.....	.....	.....	.....	.....	10,400	.....	.....	.....	.....	.....	.....	.....	.....	
Vermont	1	25,000	1,200	47,800	10	.....	3,600	63,250	117,050	Dec.	1,100	.....	.....	.....	.....	1,100	.....	
Massachusetts	7	979,300	47,930	1,972,300	879	.....	371,400	2,634,000	697,160	277	9,425	24,000	*b* 6,000	.....	*c* 1,500	40,925	64 36	
Connecticut	5	189,000	4,865	127,280	159	.....	63,480	275,500	847,196	Dec.	1,715	350	.....	.....	*d* 1,400	3,465	.....	
Total New England States	14	1,293,300	61,895	2,367,630	1,298	.....	522,480	3,361,400	1,825,806	84.1	17,340	24,350	6,000	.....	2,900	50,590	66 44	
New York	10	939,750	50,650	1,529,833	1,473	.....	514,680	2,251,250	1,885,585	19	22,825	14,000	*e* 1,450	.....	.....	38,275	58 81	
Pennsylvania	87	10,974,013	330,987	8,862,947	10,177	.....	3,283,536	15,122,842	7,319,883	106	112,276	133,577	13,000	7,000	*f* 400	266,253	56 80	
New Jersey	26	1,098,100	39,990	1,086,108	963	.....	320,976	1,617,519	1,125,956	43	9,561	11,000	*g* 2,350 *b* 5,375	.....	*h* 900	29,186	55 20	Also, 115 tons anchors.
Delaware	4	190,000	2,676	112,254	83	.....	32,400	192,600	58,200	230	1,300	.....	620	650	.....	2,570	.....	
Maryland	7	426,000	13,547	480,827	455	.....	179,256	856,125	418,531	104	8,335	.....	.....	2,350	.....	10,685	.....	Also, 250 tons blooms.
Total Middle States	134	13,627,863	437,850	12,071,969	13,151	.....	4,330,848	20,040,336	10,808,155	85	154,297	158,577	22,795	10,000	1,300	346,969	57 70	
Ohio	13	961,800	58,270	1,719,798	1,326	.....	533,700	2,806,200	1,025,192	173	20,495	19,000	1,200	.....	.....	40,695	.....	Also, 1,500 tons nails and 500 tons spikes.
Indiana	2	101,500	2,560	72,500	68	.....	33,360	124,500	4,000	.....	300	2,000	.....	.....	.....	2,300	.....	
Michigan	1	232,000	10,800	323,300	300	.....	60,000	585,000	.....	.....	2,500	7,000	.....	.....	.....	9,500	.....	
Illinois	1	200,000	14,000	445,000	195	.....	96,000	660,000	.....	.....	.....	12,000	.....	.....	.....	12,000	.....	
Missouri	2	525,000	10,894	172,202	275	.....	125,100	670,000	67,200	.....	6,678	.....	.....	.....	.....	6,678	.....	
Kentucky	5	1,350,000	16,850	776,250	640	.....	249,000	1,183,150	704,000	68	12,000	.....	900	1,200	.....	14,100	.....	
Total Western States	24	3,370,300	113,374	3,509,040	2,804	.....	1,097,160	6,028,850	1,800,392	234	41,973	40,000	2,100	1,200	.....	85,273	69 10	
Virginia	20	1,047,725	29,167	854,466	1,382	.....	430,086	1,666,885	565,234	194	7,709	10,180	.....	.....	.....	17,889	.....	Also, 160 tons spikes and some machinery.
North Carolina	25	165,250	3,470	34,909	129	.....	26,148	99,656	127,849	Dec.	1,096	.....	.....	.....	.....	1,096	.....	
South Carolina *i*	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	
Georgia	2	102,200	2,746	63,462	104	.....	36,864	139,630	12,384	.....	30	2,000	.....	.....	.....	2,030	.....	
Alabama	2	33,000	120	3,325	15	.....	3,000	8,550	14,000	Dec.	93	.....	.....	.....	.....	93	.....	
Tennessee	35	284,835	8,181	337,942	344	35	67,672	543,398	784,966	Dec.	5,144	.....	.....	.....	.....	5,144	.....	Also, 444 tons nails.
Total Southern States	84	1,633,010	43,684	1,294,104	1,974	35	568,770	2,458,119	1,504,433	63	14,072	12,180	.....	.....	.....	26,252	91 52	
Total in United States	256	19,924,473	656,803	19,242,743	19,227	35	6,514,258	31,888,705	15,938,786	100	227,682	235,107	30,895	11,200	4,200	*j* 509,084	.....	Average price, $62 11.

MISCELLANEOUS.—2,894 tons nails, 660 tons spikes, 210 tons rivets, 115 tons anchors, 250 tons blooms and machinery.

a 70 tons of "iron rails," made in this State, were erroneously included with "iron railing." *b* Nail plate. *c* Tire. *d* Wire rods. *e* Nail. *f* Galvanized. *g* Boiler. *h* Wire rods.
i 275 tons of "bar-iron," made in this State, were returned and included with "iron castings." *j* Exclusive of 4,129 tons in South Carolina

IRON WIRE.

Wire-drawing, in 1860, employed 16 establishments in five States, having invested the sum of $556,063, and employing 629 males and 28 females, whose wages cost $240,960, the cost of materials being $886,645 annually. Including 900 tons made by 1 mill in New Jersey and embraced in the statistics of bar-iron, the whole weight of wire made was 10,670 tons. The value in the other States was $1,643,857, whereof $1,237,600 was the value of 7,015 tons made by 9 mills in Massachusetts, employing 481 men and 28 females. Five of these were in the city of Worcester, where the value made was about $940,000. One establishment in that place, founded in 1831, employed 2 mills with patent wire-drawing machinery and processes for producing all kinds of round, flat, or oval iron and steel wire, plated and galvanized wire, &c., for pianos and other musical instruments, needles, screws, springs, and machinery, covered wire for crinolines, bonnets, &c., and telegraph wire.

Four wire-mills in New York made 1,080 tons of wire, worth $175,550, and 1 large establishment in Pennsylvania, with a capital of $139,063, made 1,300 tons, worth $178,957. A wire-mill in Ohio drew 300 tons of wire, worth $39,000, and 1 in Virginia 75 tons, valued at $12,750.

WIRE ROPE has been made for some years past by Mr. John A. Roebling, at Trenton, New Jersey, and in 1860 he employed a capital of $100,000 and 30 hands, producing rope of the value of $70,000 annually.

Statistics of iron wire produced in the United States during the year ending June 1, 1860.

STATES.	Number of establishments.	Capital invested.	Cost of raw material.	NUMBER OF HANDS EMPLOYED.		Annual cost of labor.	Annual value of products.	Tons of iron ware.
				Male.	Female.			
Massachusetts	9	$357,000	$684,075	481	28	$176,940	$1,237,600	7,015
New York	4	38,000	79,980	63	.....	32,580	175,550	1,080
Pennsylvania	1	139,063	87,400	60	.....	21,600	178,957	1,300
New Jersey*	.....	.....	.....	.....	.....	.....	.....	900
Ohio	1	17,000	30,190	15	.....	6,240	39,000	300
Virginia	1	5,000	5,000	10	.....	3,600	12,750	75
Total	16	556,063	886,645	629	28	240,960	1,643,857	10,670

* One rolling-mill, in Trenton, New Jersey, made 900 tons of wire, the product of which is included in "bar-iron," &c.

IRON FORGING.

The several branches of iron forging employed 56 establishments, with a capital of $1,362,650 and 1,049 hands, producing articles of the value of $1,907,460.

Forged iron-work of a general character, including iron shafting made by one establishment in Massachusetts to the value of $86,500, employed 33 establishments, with a total product of $1,501,701, of which $708,500 was produced by 7 in Massachusetts, exclusive of the one above named, $253,500 by 12 in New York, $102,250 by 3 in Pennsylvania, and $160,000 by 1 large one in New York.

Twelve ANCHOR forges, in five States, produced a value of $148,200, of which sum $82,200 was turned out by seven forges in Massachusetts. Each of the States of Connecticut, New York, and New Jersey contained 1, and Kentucky 2 anchor works.

AXLES were also forged to a greater or less extent in five States, in which were 11 establishments with 156 hands, producing annually a value of $257,559. The principal axle-works were in Connecticut, where 4 shops produced a value of $165,000; 3 in Pennsylvania, a value of $58,050; and 2 in Delaware, $15,650; 1 in Maryland, about the same amount; and 1 in Massachusetts, $3,000.

Statistics of iron forging produced in the United States during the year ending June 1, 1860.

	Number of establishments.	Capital invested.	Cost of raw material.	NUMBER OF HANDS EMPLOYED.		Annual cost of labor.	Annual value of products.
				Male.	Female.		
Iron forging	32	$1,063,700	$559,912	757	.....	$281,520	$1,415,201
Iron shafting, (in Massachusetts)	1	20,000	59,000	40	.....	18,720	86,500
Anchors	12	124,000	65,537	96	.....	41,844	148,200
Axles	11	154,950	151,562	156	.....	53,844	257,559
Total forgings	56	1,362,650	836,011	1,049	.....	395,928	1,907,460

CAR-WHEELS

Were made in 17 establishments, returned from 7 States, to the value, annually, of $2,083,350, which was the value of 142,000 car-wheels, including 7,000 wheels, valued at $87,000, cast in a shop at Worcester, Massachusetts, and included in the statistics of iron castings. The average value was $14 67 each. In addition to the wheels made at Worcester, which are somewhat celebrated, being made of cold-blast charcoal iron and chilled in sand-pits, a large locomotive establishment at Taunton, in the same State, manufactures its own car-wheels, chiefly of the tubular kind. But the principal car-wheel factories are in the middle States.

Five establishments in the State of New York, at Troy, Albany, Rochester, and Buffalo, made 30,000 car-wheels, averaging nearly 5 to the ton, and valued, altogether, at $386,550. Four establishments in New Jersey, three of them in Jersey City and one in Warren county, turned out 18,000 car-wheels, worth $271,800. Three factories in Pennsylvania employed a capital of $503,700 and 121 persons, and made 45,000 car-wheels, valued at $613,000. The principal one at Philadelphia employed a capital of $490,000 and 100 hands, and manufactured 24,000 car-wheels, which were cooled by a patent process, and valued at $270,000, beside 725 axles, worth $80,000. One factory at Hawley, in Wayne county, made 20,000 wheels, worth $250,000, and one in Columbia county, 1,000 wheels, valued at $13,000.

The largest car-wheel factory in the United States was at Wilmington, Delaware, and had invested a capital of $200,000. This celebrated foundry consumed 10,000 tons of iron, and with 200 hands cast 30,000 car-wheels, valued at $500,000, besides 1,000 chilled tires and 300 tons of other castings—a total value of $562,000.

An establishment at Cincinnati, with 20 hands, made 1,200 tons of car-wheels, (about 6,000,) valued at $75,000, and one at Chicago, 1,000 tons of car-wheels, or 4,000 in number, worth $56,000.

Statistics of car-wheels produced in the United States during the year ending June 1, 1860.

STATES.	No. of establishments.	Capital invested.	Cost of raw material.	No. of male hands employed.	Annual cost of labor.	Ann. value of product.	No. of wheels made.
Vermont	1	$25,000	$8,500	14	$6,000	$32,000	2,000
New York	5	296,000	235,600	84	34,980	386,550	30,000
Pennsylvania	3	503,700	409,800	121	48,300	613,000	45,000
New Jersey	4	139,000	142,240	76	33,540	271,800	18,000
Delaware	1	200,000	363,500	200	76,800	562,000	30,000
Ohio	1	50,000	40,000	20	8,400	75,000	*6,000
Illinois	1	10,000	43,560	8	2,160	56,000	4,000
Add Massachusetts, (included with iron castings)	1	.....	.....	.....	.....	87,000	7,000
Total in United States	17	1,223,700	1,243,200	523	210,180	2,083,350	142,000

* Number of wheels estimated.

IRON CASTINGS.

The number of iron foundries in the United States in 1850 was 1,319, returned from 29 States. They employed a capital of $14,722,749, and 18,969 persons, including 31 females, producing an aggregate value of castings, exclusive of stoves and ranges, of $20,111,517, each of five States producing one million and upward.

IRON CASTINGS, exclusive of stoves, ranges, iron railings, and car-wheels, were made in 1860 by 955 establishments, in 32 States, and employed an aggregate capital of $13,890,512 and 15,225 persons, of whom 11 were females. The value of the castings made was $20,000,267, an amount nearly equal to the value of all castings, except stoves, made in 1850. Of a total product of $4,202,690 by 173 foundries in New England, upwards of one-half, or $2,158,935, was made in Massachusetts, where it has been a prominent industry for nearly a century past. Of 443 establishments in the middle States, 195 in New York produced a value of $4,342,244; 170 in Pennsylvania, the value of $3,125,684. Much of the value in the latter State was made at Pittsburg, which contained 17 or more iron foundries. Fifty establishments in New Jersey reported a value of $2,198,531, and 24 in Maryland a value of $772,825, including some bar-iron made. In Delaware there were 4 foundries, and in the District of Columbia 2. More than one-half the value made in the western States was the product of 67 foundries in Ohio, which reported castings made to the value of $1,588,560. In Illinois 28 foundries made castings worth $516,280. The value in all the other States fell below half a million each.

Virginia returned castings made by 54 foundries to the value of $621,025. In each of the States of Tennessee, Louisiana, Georgia, and Mississippi, which ranked next, the value was below $200,000, and in North Carolina amounted to $61,100. In the remainder it was less than $40,000 each. One foundry in Washington Territory, with 4 hands, produced $10,000 worth of castings.

STOVES AND RANGES were made in 1850 by 230 foundries, in 13 States, to the value of $6,124,748.

In 1860 stove castings alone employed 290 establishments, in 15 States, and 8,066 hands, which produced a value of $10,709,972, an increase of $4,585,224, or 74.8 on the above product. Of these establishments 40 in New England returned $1,141,130, of which Massachusetts produced the value of $617,470, exclusive of $76,000 worth of stoves and ranges made in general iron foundries, and included with "iron castings." There was a falling off in that State from the product in 1850. Six foundries in Maine increased the value of castings made from $18,000, in 1850, to $111,760, and 4 in Rhode Island reported a value of $259,000, against $3,800 in 1850. The value of stoves made by 196 establishments in the middle States was $7,162,132, of which sum 86 foundries in New York produced $4,563,560, an increase of upward of 100 per cent. In that State 2 were exclusively devoted to making "hollow-ware," which was made to the value of $113,000. In New York city and vicinity there were 23 foundries for stoves, in Albany 7, and in Troy 8. Both the last-named cities exceeded one million dollars in the value of stoves made, and are widely celebrated for their stove castings.

In Pennsylvania 107 stove and hollow-ware foundries returned a value of $2,526,685, an increase of nearly 100 per cent. Of these, Philadelphia contained 45 and Pittsburg 5 stove and range factories. The value made in New Jersey was $71,887, exclusive of some stoves made in that State, and, as in other States, returned simply as "castings." The value of stoves made in Maryland is included with iron castings, and amounted probably to $125,000. One large foundry made 7,500 stoves, and another stoves and hollow-ware to the value of $50,000. The value in 1850 was $665,000.

In the western States there were 51 stove foundries, reporting a value of $2,368,610, of which sum 39 in Ohio made $1,074,650; 4 in Missouri, $810,960; 3 in Kentucky, $294,000; Illinois, a value of $129,000, and Indiana of $60,000. Tennessee was the only southern State which made a return of stoves cast, of which the value was $16,500; and one foundry in California turned out a value of $21,600.

HOT-AIR FURNACES AND COOKING RANGES were manufactured in 4 States, by 37 establishments, to the value of $788,288, of which sum 11 foundries in Massachusetts produced the value of $306,250, and 22 in Pennsylvania $361,838; two in New Jersey reported a value of $81,200, and 2 in Ohio $39,000.

IRON RAILING employed 88 factories in 15 States, in which the value of railing made was $1,706,356. Of these establishments 14 were in New England and 10 in Massachusetts, the latter producing a value of $108,460; and Maine, New Hampshire, and Connecticut the balance of $181,705 made in that section. Fifty-two foundries in the middle States reported $1,135,206 worth of iron railing made, whereof $854,750 was the product of 36 factories in New York, and $232,853 of 12 in Pennsylvania, chiefly in Philadelphia. Three in New Jersey made a value of $44,000. The western States made railing valued at $324,445 in 18 foundries, of which 11 in Ohio turned out $189,485, and one in Kentucky $120,000.

Louisiana and Tennessee each contained 2 railing factories, making, respectively, $65,000 and $55,000 worth of railing.

MALLEABLE IRON CASTINGS.—Malleable cast-iron, which, by a modification of the annealing process, is made to combine the tenacity of wrought-iron with the cheapness of ordinary cast-iron, and less liability to oxidation, was first made at Newark, N. J., about the year 1828. In 1831 Seth Boyden, of that place, took out 2 patents for making it. In 1860 26 establishments, in 5 States, manufactured various articles of ironmongery, domestic, and other hardware, &c., to the value of $930,800, of which amount $333,500 was the product of 7 factories in New Jersey, 6 of them in Newark, where the value made was $193,500. Eight establishments in Connecticut reported a value of $276,500, principally made by 6 foundries in New Haven. There were others at New Britain and Meriden. Five malleable cast-iron foundries in New York returned a value of $161,800, made chiefly at New York city, Troy, Watervliet, &c. Three foundries in Pennsylvania produced $80,000; 3 in Massachusetts, $79,000, of which $38,000 was by 1 in Worcester. Malleable cast-iron guns were first made in the United States by Cyrus Alger, in South Boston, in 1836.

Statistics of iron castings of all kinds produced in the United States during the year ending June 1, 1860.

	Number of establishments.	Capital invested.	Cost of raw material.	Number of hands employed.		Annual cost of labor.	Annual value of products.
				Male.	Female.		
CASTINGS OF A GENERAL CHARACTER.							
New England States	173	$2,418,000	$1,835,913	3,388	10	$1,219,571	$4,202,690
Middle States	453	7,998,491	4,805,653	7,885	1	2,847,418	10,616,734
Western States	223	2,504,839	1,464,420	2,792	.....	1,042,176	3,618,753
Southern States	96	903,182	526,932	1,101	.....	404,082	1,422,590
Pacific States	10	66,000	52,090	48	.....	50,268	139,500
Total	955	13,890,512	8,685,008	15,214	11	5,563,515	20,000,267
Stoves	290	7,483,679	3,959,627	8,066	.....	3,326,851	10,709,972
Hot air furnaces, cooking-ranges, &c	37	303,200	329,572	300	.....	144,792	788,288
Car-wheels	16	1,223,700	1,243,200	523	.....	210,180	1,996,350
Iron railing	88	791,875	637,740	993	.....	406,832	1,706,356
Malleable iron castings	26	557,000	326,263	912	10	316,176	930,800
Total iron castings	1,412	24,249,966	15,181,410	26,008	21	9,968,346	36,132,033

MACHINERY, STEAM-ENGINES, &c.

Machinists' and millwrights' work, in 1850, employed 1,061 establishments in 29 States, and the labor of 27,892 hands, producing a value of $27,998,344.

In 1860 the same branch, exclusive of cotton and woollen and other special machinery, employed in 35 States and districts 1,173 manufactories, with an aggregate capital of $33,319,080 and 37,370 hands. The value of steam-engines and machinery made was $46,644,586, an increase of $18,646,132, or 66.6 per cent. on the value returned in 1850.

The principal increase was in the middle, western, and southern States, and amounted, in the first, to $5,341,426, or 36.8 per cent.; in the western States, to $7,875,982, or 217 per cent.; and in the southern States, to $4,907,241, or 5.88 per cent. over the values made in these sections, respectively, in 1850. New England decreased its production, and the Pacific States returned, for the first time, a value of $1,500,000. Maine and Vermont were the only New England States showing an increase, while in Massachusetts the value fell off nearly $2,000,000.

The middle States numbered 426 establishments, of which 184 were in New York, 166 in Pennsylvania, and 50 in New Jersey. The western States contained 329 factories, of which 133 were in Ohio; the southern States 115 establishments; and the Pacific States 28.

Of special machinery, the following were the principal branches:

Cotton and Woollen Machinery—192 establishments; capital employed, $2,422,088; number of hands, 4,813; value of product, $4,902,704.

Hay and Cotton Presses were made by 2 establishments to the value of $31,000.

Paper Machinery employed 3 factories and 33 hands, producing a value of $41,400.

Ribbon Looms were made by one establishment to the value of $15,000.

Shingle Machines employed 5 factories and 13 hands, with a product of $10,620.

Silk Machinery was made by 2 establishments, having 17 hands, to the value of $12,756.

Stamp Machines were produced by one firm to the amount of $7,210.

Turbine Water-wheels employed 2 factories with 50 hands, turning out a value of $96,700.

Wood-working Machinery was made by 2 establishments at Worcester, Massachusetts, having a capital of $34,000 and 78 hands, whose labor produced a value of $135,000, including several kinds of planing machinery, &c., &c.

Machinists' Tools employed 17 manufactories, a capital of $536,150, and 455 hands, and the value of the manufacture was $540,292, of which $205,000 was the product of one establishment in Philadelphia, having a capital of $280,000 and employing 190 hands, and turning out machinists' tools of acknowledged excellence. Nine establishments in Massachusetts reported a value of $165,600 made, and 2 in New Haven, Connecticut, a product of $71,600. Three in New York, made tools of the value of $47,950; 1 in New Jersey, $2,800; and 1 in Delaware, $22,142.

LOCOMOTIVES.

Locomotive engines were manufactured in 7 or 8 States, to the number of 470, or upward. The number of establishments engaged wholly or chiefly in this branch of machinery was 19, which, together, employed a capital of $482,592 and 4,174 hands. The value of the engines made was $4,866,900, an average of $10,355 each.

The largest value was made by 4 manufactories in New Jersey, from which were turned out 166 locomotives, valued at $1,565,000, of which sum $765,000 was the product of one of three factories at Paterson, which employed 720 men and built 90 locomotives. The next in size was also largely engaged in making cotton machinery. The fourth shop was that of the Camden and Amboy Railroad Company, at Bordentown, which made a few engines and a number of cars.

Next to New Jersey, came Pennsylvania, in which 2 large factories in Philadelphia, among the oldest and largest in the country, employed capitals, respectively, of $900,000 and $750,000. The

largest, with 675 hands, constructed 89 engines, worth $750,000, and the other, with 580 men, turned out 79 locomotives, valued at $670,000. Two locomotives were built in Scranton, and two in Pottsville, the values of which are not included in the statistics of this branch.

Five locomotive shops in Massachusetts built 54 engines worth $643,000. The two largest were at Taunton, one of which, with 175 hands, built 23 locomotives valued at $180,000, and the other, with 425 men, made $250,000 worth of cotton machinery and 14 complete locomotives, including the wheels, and valued at $80,000. Others were manufactured at Worcester and Roxbury.

Four shops in New Hampshire constructed 43 engines valued at $805,900. The largest were 2 at Manchester, one of which, the machine department of the Amoskeag Manufacturing Company, employed 450 men, and turned out 37 locomotives, valued, with mill machinery and castings, at $695,000. The Manchester Locomotive Works, formerly extensively engaged in the business, built about 5 engines, worth $37,500, and the railroad shop, at Lake Village, a few locomotives and 32 cars. Another repaired engines and built 70 cars.

An old locomotive establishment at Baltimore, not in full operation in 1860, built in that year about 6 engines, worth $50,000. Two railroad shops in Kentucky executed work of the value of $250,000, of which $235,000 was the value of about 10 locomotives, some cars and repairs, made by one, and the balance chiefly repairing by the other.

The greater part of the locomotives made in the country, however, are built by 2 shops in Boston, 2 in Taunton, 3 in Paterson, and 2 in Philadelphia. One at Portland, Maine, one at Baltimore, and perhaps one or more in the State of New York, built a few locomotives, but were chiefly engaged in other work.

Statistics of locomotive engines produced in the United States during the year ending June 1, 1860.

STATES.	No. of establishments.	Capital invested.	Cost of raw material.	No. of male hands employed.	Annual cost of labor.	Annual value of products.	No. of locomotive engines.
New Hampshire	4	$241,000	$452,704	534	$172,848	$805,900	43
Massachusetts	5	533,000	308,850	750	280,080	643,000	54
Pennsylvania	2	1,650,000	696,500	1,255	464,880	1,420,000	172
New Jersey	4	711,592	716,900	1,295	531,300	1,565,000	166
Maryland	1	137,000	13,500	60	18,000	50,000	*6
Kentucky	2	190,000	102,800	250	108,000	250,000	*10
Virginia	1	20,000	120,700	30	9,360	133,000	19
Total	19	3,482,592	2,411,954	4,174	1,584,468	4,866,900	470

* The number of engines in these States was estimated.

SEWING MACHINES.

These employed but few establishments in 1850; but their manufacture increased rapidly in the next ten years, and, in 1860, occupied 74 manufactories in 12 States, a capital of $1,426 and 2,287 hands. They turned out 111,263 machines, of the value of $4,247,820.

Sewing machines were made in all the New England States except Maine, the factories in that section numbering 22, from which were turned out 61,746 machines, worth $2,506,300. Of that value $1,104,800 was the product of 10 factories in Massachusetts, which made 21,700 machines. Five factories in Connecticut reported 24,046 machines made, and valued at $1,043,805, and 11 in Pennsylvania made 12,800 machines, worth $406,480. Ohio turned out 11,423 sewing machines, worth $262,935. In most of the other States the product was small. Sewing machines are now exported to several foreign countries. The value exported in 1861 was $61,000.

Statistics of sewing machines produced in the United States during the year ending June 1, 1860.

STATES.	Number of establishments.	Capital invested.	Cost of raw material.	NUMBER OF HANDS EMPLOYED.		Annual cost of labor.	Annual value of product.	Number of machines.
				Male.	Female.			
New Hampshire	5	$20, 350	$25, 160	97	.....	$39, 300	$134, 500	6, 500
Vermont	1	25, 000	8, 320	40	.....	19, 200	42, 000	3, 500
Massachusetts	10	258, 000	64, 671	506	8	246, 960	1, 104, 800	21, 700
Rhode Island	1	35, 000	6, 745	60	.....	21, 600	102, 000	6, 000
Connecticut	5	426, 000	170, 830	611	.....	389, 880	1, 123, 000	24, 046
New York	19	368, 200	212, 440	473	.....	196, 260	1, 043, 805	24, 230
Pennsylvania	11	211, 000	83, 048	270	20	105, 492	406, 480	12, 800
Delaware	1	10, 000	2, 875	15	.....	6, 000	15, 000	500
Ohio	17	67, 600	70, 398	173	.....	62, 016	262, 935	11, 423
Indiana	1	2, 000	420	8	.....	2, 400	6, 000	300
Illinois	2	2, 800	446	4	.....	1, 080	3, 050	114
Kentucky	1	600	2, 560	2	.....	768	4, 250	150
Total	74	1, 426, 550	647, 963	2, 259	28	1, 090, 956	4, 247, 820	111, 263

FIRE-ARMS.

Fire-arms were manufactured, in 1860, in 239 establishments, having a total capital of $2,512,781 and 2,056 hands. They reported a value of $2,342,681 made, of which sum $1,544,090 was the product of 26 factories in New England, $625,094 the value made in the middle States by 94 establishments, $85,834 by 72 in the western, $72,652 by 41 shops in the southern, and $15,011 the product of 6 factories in the Pacific States. The largest amount was made in Connecticut, where 9 manufactories, chiefly at Hartford, New Haven, and Norwich, including some of the largest private armories in the United States, produced upward of one-half the total value made in the country, or $1,186,500. Seven factories in Massachusetts turned out fire-arms of the value of $340,000, including the product of the United States armory at Springfield, the product of which, like that of several private establishments, was increased many fold during the late rebellion. In Pennsylvania 44 establishments reported a value of $336,030, and 37 in New York $193,739; 1 in New Jersey produced $60,000 worth, and 6 in Maryland $36,400. Twenty fire-arms factories in Ohio reported a value of $26,420. In all the others the value made was below $20,000 each.

HARDWARE.

The number of establishments for the manufacture of general hardware in 1850 was 340, reported from 16 States of the Union. They employed altogether a capital of $3,539,025 and 7,030 persons. The value of hardware manufactured was $6,957,770, of which 96 factories in Connecticut produced $2,360,190, and 112 in New York a value of $1,807,140; the value in each of the others being less than a million, and in all but 4, less than one hundred thousand dollars.

In 1860 the total number of hardware establishments in 19 States was 443. Their aggregate capital amounted to $6,707,000; the cost of materials was $4,402,758; the number of hands, 10,721, of whom 1,263 were females; the cost of labor was $3,443,664, and the value of the product $10,903,106, an increase of 56.7 per cent. on the product of 1850.

Upwards of two-thirds the entire value of hardware made was the product of 204 establishments in New England, employing in the manufacture a total capital of $4,649,100, and 5,587 male and 1,088

female hands. The value of the goods made in these States was $7,281,603, which was nearly double the product of the same States in 1850, and $323,853 more than the value made in all the States in that year.

Of that sum 118 establishments in Connecticut, having altogether invested $2,887,800 and 4,706 hands, produced a value of $4,812,043, or nearly 62 per cent. of the whole, and 103.8 per cent. in excess of the value made in the State in 1850. These manufactories are distributed throughout the State, and are particularly numerous in the valleys of the Naugatuck and Housatonic rivers, and the counties of Hartford, New Haven, and Middlesex. They employ machinery in the production of every description of useful and ornamental article of iron, brass, copper, and other metals, to an extent and perfection that has rendered the State pre-eminent for the excellence and variety of its miscellaneous and general hardware, which, for cheapness and ingenious adaptation to every requirement of household and general economy, is nowhere excelled. Twenty establishments in Hartford county produced miscellaneous hardware of the value of $1,368,264, and six manufactories of coach and saddlery hardware in the same produced a value of $174,460. Much of these values was made at New Britain, where one large establishment manufactured locks and other building and miscellaneous hardware of the value of $500,000, employing 400 hands, and another, with 245 hands, a value of $252,000. In New Haven county 13 manufactories of miscellaneous hardware produced a value of $816,600, and 8 others manufactured coach and saddlery hardware worth $323,100, much of which was the product of hardware establishments in Meriden and its vicinity. Twenty establishments in Middlesex county made miscellaneous hardware of the value of $306,720. Four establishments in New London county, chiefly at Norwich and New London, produced the value of $209,760 in miscellaneous hardware.

In Rhode Island 8 establishments manufactured hardware to the value of $1,376,300, employing therein 868 persons, and a capital of $1,183,400. Sixty-six smaller establishments in Massachusetts, with 854 hands, produced a value of $855,000, and 7 in New Hampshire returned a value of $147,950.

The hardware manufactories of the middle States numbered 209. Their investments amounted to $1,967,450, the number of persons employed to 3,629, and the value of their manufactures to $3,263,207, the increase being less than 10 per cent. Ninety establishments in New York, with the labor of 1,549 persons, manufactured hardware of the value of $1,409,999, which was less than the value returned in 1850. Fifty-four factories in New Jersey, employing 1,291 hands, produced the value of $1,071,783 in hardware, an increase of over 360 per cent. In Pennsylvania 54 establishments, with 766 hands, turned out hardware of the value of $764,303, which was a decline from the product of that State in 1850; and in Maryland, where the number of factories was increased from 2 to 6, there was also a falling off in the value of the product.

Twenty-three factories in the western States, of which 17 were in Ohio, employed a capital of $83,700 and 384 hands, making hardware to the amount of $326,736, an increase of 74 per cent. The increase was principally in Ohio, in which 366 hands produced a value of $309,316, an increase of 99 per cent. In Kentucky, which made no return in 1850, the value of $3,100 was returned by one establishment. In Missouri the product fell off from $21,350 to $6,100; and Indiana, which returned a value of $2,000 in 1850, made no return of hardware in 1860.

Statistics of hardware of all kinds produced in the United States during the year ending June 1, 1860.

STATES.	No. of establishments.	Capital invested.	Cost of raw material.	NUMBER OF HANDS EMPLOYED.		Annual cost of labor.	Ann. value of product.
				Male.	Female.		
Maine	4	$36,000	$12,674	58	15	$20,544	$55,290
New Hampshire	7	52,200	36,922	131	3	33,008	147,950
Vermont	1	30,000	18,000	40	.....	12,000	35,000
Massachusetts	66	459,700	372,453	588	266	284,060	855,020
Rhode Island	8	1,183,400	477,519	568	300	358,200	1,376,300
Connecticut	118	2,887,800	2,050,928	4,202	504	1,582,872	4,812,043
Total in New England States	204	4,649,100	2,968,496	5,587	1,088	2,290,684	7,281,603
New York	90	897,900	591,792	1,504	45	457,767	1,409,999
Pennsylvania	54	542,800	259,051	764	2	192,149	764,303
New Jersey	58	506,400	428,058	1,163	128	386,868	1,071,783
Maryland	6	20,050	4,985	22	.....	6,480	16,482
District of Columbia	1	300	180	1	.....	360	650
Total in Middle States	209	1,967,450	1,284,066	3,454	175	1,043,624	3,263,217
Ohio	17	74,650	137,694	366	.....	89,568	309,316
Illinois	3	3,050	1,512	8	.....	3,240	8,220
Missouri	2	3,000	2,245	6	.....	2,508	6,100
Kentucky	1	3,000	980	4	.....	1,200	3,100
Total in Western States	23	83,700	142,431	384	.....	96,516	326,736
Virginia	4	5,500	4,940	23	.....	7,320	19,000
Louisiana	1	500	400	1	.....	360	1,200
Tennessee	1	250	125	1	.....	360	550
Total in Southern States	6	6,250	5,465	25	.....	8,040	20,750
California, (Pacific)	1	500	2,500	8	.....	4,800	10,800
Total in United States	443	6,707,000	4,402,758	9,458	1,263	3,443,664	10,903,106

STEEL.

The number of steel furnaces in the United States in 1850 was 5, all in Pennsylvania. They employed a capital of $52,300 and 40 hands, consumed materials of the value of $133,420, and paid for labor $23,100, yielding a product valued at $172,080.

In 1860 returns were made of 13 steel-making establishments, of which 9 were in Pennsylvania, 2 in New York, and 2 in New Jersey. Their total capital amounted to $1,640,000. The number of hands was 748, and the cost of labor $308,736. The materials used cost $805,174, and produced 11,838 tons of steel, valued at $1,778,240, an average value of $150 per ton. The product was nearly tenfold the amount manufactured in 1850.

The Pennsylvania furnaces employed a capital of $1,345,000 and the labor of 592 persons. They manufactured 9,890 tons of steel, worth $1,358,200, being about eightfold its product in 1850, and an average of $135 per ton. Six of the establishments were in Alleghany county, and their united capitals amounted to $1,230,000, and the number of hands in them to 522 persons. They used 3,600 tons of pig-iron, 3,500 tons of blooms, and 1,100 tons of bar-iron, and made 6,390 tons of steel, of which about 2,000 tons was cast-steel, besides carriage-springs and some axles, valued altogether at $880,000. The largest of the six employed 220 men and produced steel, &c., of the value of $400,000, and another employed 150 hands, with a product of $300,000.

Three smaller establishments, in Philadelphia, owned capitals amounting to $115,000, and with the labor of 70 hands manufactured steel of the value of $458,000. Of these last, one made 800 tons of cast-steel, worth $90,000; another 1,200 tons of German and 200 tons of cast-steel, together valued at $174,200; and the third made 200 tons of saw-steel, 500 tons of spring-steel, 350 tons of plow-steel,

and 200 tons of shovel-steel, a total of 1,250 tons, valued altogether at $194,000. In its production were used 1,400 tons of scrap-iron, 350 tons of Swedish, and 1,850 tons of other iron; total, 3,600 tons.

The 2 furnaces in the State of New York combined a capital of $205,000 and employed 91 hands. From materials valued at $137,899 they made 1,248 tons of steel, worth $277,040, an average price of $222 per ton. One of these, the Peru Iron Company, in Clinton county, used 50 tons of bar-iron, and made 48 tons of steel, worth $5,040. The other, the Damascus Steel and Iron Company, on Staten Island, with a capital of $200,000 and 90 hands, made 800 tons of rolled steel, worth $160,000, and 400 tons of hammered steel, valued at $112,000; total, 1,200 tons, worth $272,000. The materials consumed in the production of this amount were 1,300 tons of bar-iron, costing $84,000; 6,000 tons of coal, worth $27,000; and other materials valued at $23,000; a total of $134,000.

The New Jersey steel furnaces had a total capital of $90,000 and employed 65 hands. One was in Morris county, and used 800 tons of iron and the labor of 40 men, producing 400 tons of cast-steel, valued at $88,000. The Etna Steel Works, in Jersey City, consumed 300 tons of iron, and with 25 hands made 300 tons of steel, worth $75,000; a total of 700 tons, worth $163,000; an average value of $231 per ton.

MANUFACTURES OF STEEL.

The various manufactures consisting wholly or in part of steel, such as cutlery, axes, and other edge tools, artisans' tools of different kinds, saws, springs, steel wire, &c., employed 382 factories, with a total capital of $5,797,649 and 7,284 persons, whose labor produced a value of $9,151,893.

Cutlery was made in 51 establishments to the value of $1,366,223, of which $1,104,750 was produced by 16 factories in New England—$219,225 by 23 in the middle States. The largest product, or $721,200, was by 6 factories in Massachusetts, of which the principal were at Shelburne Falls, where the largest factory in the United States is located, and at Chicopee and Boston. Nine factories in Connecticut, chiefly in New Haven county, at Meriden, and in Litchfield county, returned a value of $381,750. Four factories in New Haven county made table, pocket, and other cutlery of the value of $253,200, of which value $167,000, was by 1 factory at Meriden. Seven cutlery factories in Newark, New Jersey, produced a value of $161,000, and 9 in New York $33,125. Six at Cincinnati, Ohio, reported a product of $16,800.

Axes and Edge-tools employed 166 establishments, with a product of $3,243,992, of which New England produced $1,582,659. Of the latter sum 18 shops in Connecticut returned $730,035; 19 in Massachusetts, $649,056; and 9 in New Hampshire, $135,600. The largest product of edge-tools was in the State of New York, where it amounted to $959,168, as the product of 45 factories. In Pennsylvania, 23 establishments made a value of $372,925; and 17 in New Jersey, the value of $257,925.

Carpenters' Tools, such as augers, auger-bitts, gimlets, plane-irons, &c., employed 33 factories, and the product thereof was $731,430. The largest number of factories was reported by Connecticut, in which 14 produced a value of $264,400. The largest factory was at Humphreysville. Seven factories in New York turned out tools worth $189,400; and 4 in Ohio, a value of $163,880.

Coopers' Tools were made to the amount of $9,100 by 4 establishments in Ohio, employing 12 hands.

Curriers' Tools employed 2 regular factories in New Hampshire, together employing 5 men and producing the value of $5,197

Shoemakers' Tools were made in 3 States, by 39 factories, to the value of $93,592, of which $77,000 was made by 3 in New York; $8,592, by 3 in New Hampshire; and $8,000, by 1 in Ohio.

Stone-cutters' Tools, to the amount of $850, were made by one shop in Ohio.

Saws employed 42 establishments in 11 States. The number of hands engaged in the manufacture was 756, and the value of saws manufactured was $1,237,063, of which 8 factories in New England, with 108 hands, made $258,400. Of the latter sum $205,000 was the product of 3 in Massachusetts, of which the largest were 2 in Boston; the oldest of them established in 1830, when the

total value of saws manufactured in the United States was only about $5,000 annually. Twelve factories in New York produced saws of the value of $352,750, and 9 in Pennsylvania $330,599. Among those in Pennsylvania, several in Philadelphia are among the oldest and largest in the country, one of them having been established in 1802. Eleven factories in the western States produced saws worth $266,314, of which 6 in Ohio made a value of $87,314.

SPRINGS FOR CARS, CARRIAGES, AND LOCOMOTIVES were manufactured in 40 establishments, to the value of $2,117,377. Although made in 9 States, the principal values were produced in Connecticut, three of the middle States, and Virginia. Ten establishments in the first-named employed 497 persons, and turned out a value of $952,550, chiefly carriage-springs, of which amount $434,000 was returned by 2 in New Haven and vicinity, and $218,500 was the value of springs and axles made at Bridgeport. Seven factories in New York reported a value of $451,020, 5 in Pennsylvania $134,082, and 7 in New Jersey $224,200, as the value of car and carriage springs made. One manufactory of car-springs at Wilmington, Delaware, made a value of $24,750, and one large one in Virginia, with a capital of half a million, a value of $225,000.

STEEL WIRE employed 4 establishments, with 123 male and 18 female hands, who manufactured a value of $101,600.

Statistics of steel produced in the United States during the year ending June 1, 1860.

STATES.	No. of establishments.	Capital invested.	Cost of raw material.	NUMBER OF HANDS EMPLOYED.		Annual cost of labor.	Ann value of product.	Tons of steel.	Average price per ton.
				Male.	Female.				
New York	2	$205,000	$137,899	91	.....	$42,336	$277,040	1,248	$222
Pennsylvania	9	1,345,000	606,875	592	.....	237,600	1,338,200	9,890	135
New Jersey	2	90,000	60,400	65	.....	28,800	163,000	700	231
Total	13	1,640,000	805,174	748	.....	308,736	1,778,240	11,838	150

Steel manufactures.

STATES.	No. of establishments.	Capital invested.	Cost of raw material.	NUMBER OF HANDS EMPLOYED.		Annual cost of labor.	Ann. value of product.
				Male.	Female.		
Cutlery	51	$869,800	$433,492	1,305	33	$472,920	$1,366,225
Edge tools and axes	166	2,146,499	1,270,171	2,869	.....	1,036,935	3,243,992
Carpenters' tools	33	578,250	214,974	754	2	251,204	731,430
Coopers' tools	4	1,000	1,894	12	.....	4,128	9,100
Curriers' tools	2	1,800	750	5	.....	2,204	5,197
Shoemakers' tools	39	139,900	73,096	387	7	120,396	339,059
Stone-cutters' tools	1	200	100	1	.....	360	850
Springs—car, carriage, and locomotive	40	1,264,000	1,093,142	1,009	.....	408,160	2,117,377
Saws	42	770,200	583,123	756	3	281,392	1,237,063
Steel wire, &c.	4	26,000	53,100	123	18	30,144	101,600
Total	382	5,797,649	3,723,842	7,221	63	2,657,843	9,151,893

NAILS AND SPIKES were made in 1850, by 87 establishments, in 13 States, and employed a capital of $4,428,498. The cost of raw materials was $4,438,976, and of labor $1,812,972, which was the wages of 5,231 persons, who turned out a product of $7,662,144.

In 1860 the number of nail-works reported in 12 States and Territories was 99. Their capitals aggregated the sum of $5,810,250, and the number of work people, including 157 females, was 6,878. The cost of wages was $2,398,872, and of materials $6,069,195, the value of nails and spikes made being $9,857,223, an increase of 28.6 per cent.

The value made by 44 nail factories in New England, employing 2,440 persons, was $3,689,321, of which $3,326,321 was made in Massachusetts by 40 mills, employing 2,068 male and 135 female hands, and a capital of $1,781,500; and $327,000 by 3 establishments and 223 hands in Rhode Island. The balance was the product of one factory in Vermont. The nail-works of Massachusetts, which, in the last century, were numerous at Bridgewater, Abington, and other places where machinery for cut-nails was introduced as early as 1786, now produce more than one-third of all the nails and spikes made in the United States.

In the middle States these articles were manufactured to the value of $4,408,432, by 38 establishments, employing 3,202 persons. More than one-half the value, or $2,268,355, was the product of 20 nail factories in Pennsylvania, employing 1,628 males and 20 females. Of these 5 rolling mills and nail-works in Pittsburg, with 889 men and 20 women, produced a value of $1,031,968, in addition to railroad spikes, &c., to the value of $325,000, made by 2 manufactories, employing 110 hands and a number of Swett's railroad spike machines, or other mechanism, which produces 50 half-pound spikes per minute, and 5 tons per diem for each machine, worked by 7 hands. Cut-nail machinery is also extensively used in Pittsburg; and 1 factory in Philadelphia made cut-nails of the value of $173,000 per annum.

Fifteen nail-works in the State of New York, with 649 hands, returned a value of $1,021,736; 2 in New Jersey, with 546 hands, made nails and spikes worth $968,341; and 1 in Maryland, employing 160 hands, made a value of $150,000.

Seven nail and spike factories in Ohio returned a force of 370 hands, and a product of $438,385 Of these 4 in Cincinnati made wrought-nails to the value of $7,385, and one spike and railroad-chair factory produced a value of $93,000.

Five mills in Virginia, with the labor of 1,026 persons, returned nails and spikes made of the value of $1,222,000, making that State the fourth in the amount of these articles made.

Three small factories in Utah, with 20 hands, returned a value of $35,712.

Statistics of nails and spikes produced in the United States during the year ending June 1, 1860.

STATES.	No. of establishments.	Capital invested.	Cost of raw material.	NUMBER OF HANDS EMPLOYED.		Annual cost of labor.	Ann. value of product.
				Male.	Female.		
Vermont	1	$10,000	$27,250	14	.....	$3,960	$36,000
Massachusetts	40	1,781,500	2,115,694	2,068	135	751,248	3,326,321
Rhode Island	3	344,200	199,600	223	.....	90,900	327,000
Total in New England States	44	2,135,700	2,342,544	2,305	135	846,108	3,689,321
New York	15	456,950	566,493	647	2	208,116	1,021,736
Pennsylvania	20	1,883,400	1,400,685	1,628	20	615,276	2,268,355
New Jersey	2	370,000	633,200	546	.....	192,000	968,341
Maryland	1	75,000	90,600	160	.....	30,000	150,000
Total in Middle States	38	2,785,350	2,690,978	2,981	22	1,045,392	4,408,432
Ohio	7	231,900	269,241	370	.....	118,572	438,385
Kentucky	1	300	800	3	.....	1,080	3,700
Total in Western States	8	232,200	270,041	373	.....	119,652	442,085
Virginia	5	632,000	710,707	1,026	.....	368,280	1,222,000
Tennessee	1	10,000	45,075	16	.....	8,000	59,673
Total in Southern States	6	642,000	755,782	1,042	.....	376,280	1,281,673
Utah, (Territory)	3	15,000	9,850	20	.....	11,440	35,712
Total in United States	99	5,810,250	6,069,195	6,721	157	2,398,872	9,857,223
In 1850	87	4,428,498	4,438,976	5,227	4	1,812,972	7,662,144

Bolts, Nuts, Washers, and Rivets were made, in 1860, in 54 establishments, employing a capital of $1,235,300 and 1,504 hands. The value made was $2,175,555. The States of Connecticut and Pennsylvania were the largest producers, the former having 13 factories, producing a value of $663,750, of which the counties of Hartford and Fairfield each returned $250,000. In Pennsylvania 10 establishments reported a product of $591,500, of which value $410,000 was returned by 7 factories in Philadelphia. In Massachusetts a value of $179,600 was made, and in Rhode Island $186,300, each State having 4 factories. The Providence Tool Company's Works in the latter State employ a large number of cold punching presses, invented by A. O. Arnold, of Pennsylvania, and early adopted by them for punching nuts from cold iron. In New York the value of $108,300 was made; in New Jersey, $157,975; and in Missouri, $162,000. In the other States the product was smaller. Many establishments employ machinery for making rivets also, by which rivets, weighing 7 to the pound, are made at the rate of 80 per minute.

Scales and Balances, in 1850, employed 22 manufactories in 11 States, with capitals amounting to $130,267 and 402 hands, producing a value of $359,505. In 12 States, in 1860, scales and balances were made, in 43 establishments, to the value of $1,292,560, an increase of 260 per cent. They employed a capital of $744,300 and 725 persons. Of the total product, 6 factories in New England returned a value of $700,200; and $665,000, or more than one-half the total value, was the product of 2 factories in Vermont; the factory of E. & T. Fairbanks, at St. Johnsbury, being the principal one in the United States. Since the first patent was taken out by Thaddeus Fairbanks, in 1831, upward of 100 different modifications of steelyards, scales, and balances have been manufactured by them, and in the same time they have manufactured about 150,000 scales, which are exported to foreign countries, and have proved a benefit to the commercial classes.

Blacksmithing was carried on in 1850 by 10,373 establishments in 32 States, to the value, annually, of $16,048,536, employing 25,002 hands, including 19 females, and a capital of $5,884,149.

In 1860 there were returned from 38 States and Territories only 7,504 blacksmithing establishments, having capitals amounting to $4,940,756 and 15,720 hands, including 1 woman. The value of work executed was $11,641,243, a decrease of 13.7 per cent., due, probably, in part, to the transfer of much of the heavier work to regular forges and to other manufactures employing machinery and other improved processes.

The several branches of the iron manufacture above enumerated, which do not include all manufactures of that metal and of steel, yielded altogether, in 1860, a product of $205,879,510.* Many of these, especially the manufactures of pig, bar, and rolled iron and steel, of heavy castings, marine engines, fire-arms, &c., were greatly increased during the war just ended.

In the year ending June 30, 1864, direct taxes were paid on iron and manufactures thereof to the amount of $3,303,027, and on steel and its manufactures to the amount of $391,141, a total of $3,694,178. The quantities of the principal articles subject to tax and the amount of tax paid on each was approximately as follows, viz:

	Tax collected.		Tons
Railroad iron, paying 75 cents to $1 50 per ton	$295,064	=	276,192
Band, hoop, sheet, and plate iron, paying $1 50 to $2 per ton	242,513	=	153,921
Bar and other rolled iron, nails, spikes, &c., paying 50 cents to $1 50 per ton	279,932	=	201,279
Castings, paying $1 to $1 50 per ton	242,736	=	172,985
Stoves and hollow-ware, $1 50 per ton of 2,000 pounds	123,487	=	82,325
Wood-screws, paying 1½ cent per pound (41,962 pounds)	62,943	=	21
Steel of all kinds, paying $4 to $10 per ton	91,768	=	10,862¾
Marine engines, paying 3 per cent	65,434		
Manufactures of iron, paying 3 per cent	1,891,061		
Manufactures of steel, paying 3 per cent	299,373		

* Exclusive of the use of Iron used in the Manufacture of Agricultural Implements.

SALT MANUFACTURE.

The number of salt-works in the United States in 1850 was 340. They returned an aggregate capital of $2,640,885; a consumption of raw materials of the value of $1,051,425; an expenditure for the labor of 2,699 male and 87 female hands of $754,224; and a product of 9,763,840 bushels of salt, valued at $2,222,745, an average of 22½ cents per bushel, and estimating a bushel to weigh 56 pounds, equivalent to 23½ pounds for each person in the Union.

The manufacture of salt employed on the 1st day of June, 1860, in 12 States of the Union, 399 establishments, whose aggregate investments in the business amounted to $3,692,215, and the number of persons employed by them, including 23 females, was 2,213. The cost of raw materials used annually was $1,054,780, and of labor employed $371,954. They produced 12,717,200 bushels of salt, valued at $2,289,504, an average value of 18 cents a bushel, and an increase of 30.2 per cent. on the product of 1850.

About 59 per cent. of the whole quantity, or 7,521,335 bushels, valued at $1,289,511, was the product of the State of New York, from which returns were made of 296 salt-making establishments, having a total capital of $2,313,590, and employing 1,079 persons, at an annual cost for labor of $24,520, and for raw materials of $676,301. The product was an increase of 3,021,335 bushels, or upward of 67 per cent. on that of 1850. The limited outlay for labor in proportion to the aggregate business done in that State is due to the fact that the New York salines are the property of the State, which pumps up the water and delivers it on the premises of the manufacturers for a royalty sufficient to cover the expense. The average value per bushel in that State was a little over 17 cents.

Next to New York the largest production of salt was in Virginia, (now West Virginia,) in which were 14 salt-works, having collectively a capital of $523,800 and 445 hands, (of whom 11 were females,) whose annual wages cost $148,464. The cost of materials consumed was $166,004, and the quantity of salt made 2,076,513 bushels, valued at $410,684, an average value of 19.2 cents a bushel That State produced rather more than one-sixth of the whole quantity made, but fell off from its production in 1850 about 59.6 per cent.

In Ohio, 28 establishments, with a total capital of $338,700 and 293 hands, manufactured 1,743,200 bushels, valued at $276,871, or a little over 15¾ cents per bushel. The cost of materials was $139,627, and of labor $91,524 per annum, and the increase in the quantity of salt made was 216.7 per cent. over the yield of 1850.

Pennsylvania ranked next to New York in the number of salt-works returned, which was 34, with capitals amounting altogether to $190,800 and 205 hands, whose wages cost yearly $64,776, the cost of materials being $48,603, and the quantity of salt made 1,011,800 bushels, valued at $196,916, an average of nearly 19½ cents a bushel. The increase of product was only 10 per cent.

Returns were made from 6 salt-works in Kentucky, having invested a capital of $70,000 and employing 66 male and 8 female hands, at an annual cost of $14,978. They produced 169,665 bushels of salt, worth $41,190, an average value of about 24¼ cents a bushel, and a decrease in quantity of 68.8 per cent. from the returns of 1850. In each of the remaining States the product fell below 50,000 bushels.

In Massachusetts 13 establishments were engaged in making salt, with 21 hands, by solar evaporation, to the amount of 31,525 bushels, valued at $9,832, or upwards of 31 cents a bushel; and one in Illinois, with a capital of $38,000 and 15 hands, produced 35,000 bushels, worth $10,000, or 28½ cents per bushel. One establishment in Florida reported a capital of $35,000 and 12 hands, which made 40,000 bushels, valued at $11,000, an average of 27½ cents a bushel and an increase of $5,000 upon the value returned in 1850. Two salt-works in Texas in 1850 returned a manufacture of 8,000 bushels of salt, worth $5,900, and in 1860 29,800 bushels, valued at $1 a bushel. Their capitals amounted to $47,000, and the persons employed, including 4 females, to 22. The largest establishment in the

western States was one in Michigan, which had just commenced business, with a capital of $100,000 and 30 hands, which had produced in the ten days it had been in operation, 2,362 bushels of salt, worth $600, or nearly 25½ cents a bushel, with an expenditure for raw materials of $275, and for labor of $200.

Next to the five principal salt-producing States, first mentioned, the largest quantity of salt reported was by 2 establishments in California, which, with a capital of only $800 and 15 hands, produced 44,000 bushels, valued at $7,100, an average value of 16 cents a bushel. The cost of labor was $5,400, that of materials used not returned. One concern in Utah, having invested $4,000 in salt-making, paid for materials $5,000, and for the labor of 2 hands $840, producing 12,000 bushels of salt valued at $6,000, or 50 cents a bushel. From Maine and Connecticut, each of which made returns of salt made in 1850, no report was received in 1860.

The average annual consumption of salt by each person in the United States has been estimated to be about 60 pounds; in Great Britain it is about 25 pounds, and in France 21½ pounds for each inhabitant.

If each bushel be supposed to weigh 56 pounds, the total production of salt in the United States in 1860 was 712,163,200 pounds, which was equivalent to rather more than 22½ pounds to each inhabitant of the Union in that year, or one pound more than the average annual consumption per capita in France, 2½ pounds less than in England. It was 37½ pounds less than the amount required for home consumption by each individual, the total deficiency being 1,174,326,060 pounds, or 33,687,308 bushels.

The only States which produced a surplus were New York and Virginia, in which the production of salt amounted, respectively, to 168½ and 72¾ pounds *per capita* of the population of those States, and, in the first of them, to an average of upward of 13¼ pounds for each person in the Union. In each of the other States the manufacture of salt fell below the average required for each one of its inhabitants; and in Ohio alone, where it was 41¾ pounds to each person, exceeded the average production of the whole Union *per capita.* In Pennsylvania the product reached 19½ pounds, in Kentucky 12¾ pounds, in California 8¼ pounds, and in Massachusetts amounted to only 1½ pounds to each inhabitant of the State.

Although the census of 1860 showed only 12 States to have been engaged in the manufacture of salt, no less than 23 States have at different periods made returns of this industry, and deposits of salt, salt springs, or lakes, are found in nearly every State and Territory of the Union. It has been made by the evaporation of sea water on our Atlantic shores from the first settlement of the country; and since an early period, also, from the salt springs existing in various States, which are the principal source of the present production, those of New York, western Virginia, Pennsylvania, and Michigan being the most noted. Rock salt has been found in western Virginia, in Missouri, Utah, California, Arizona, and the Salmon mountains of Oregon, and salt lakes in Minnesota, Texas, New Mexico, Utah, and California. The great salt lake of Utah, situated toward the summit of the Rocky mountains, 4,200 feet above the level of the sea, has an area of 2,000 square miles, and furnishes one of the strongest and purest brines in the world.

With natural resources so abundant, cheap fuel, and a climate well adapted by its warmth and dryness for making salt, either by solar evaporation or by boiling, there is no reason why a future census shall not show that the United States is more nearly independent of foreign countries for an article that is indispensable as a condiment and antiseptic for the seasoning and preservation of food, and as a material in several processes in the arts, and which is probably consumed by our population to a greater relative amount than by any other people.

Salt was first made in this country near Cape Charles, in Virginia, previous to 1620, and having been allowed, with other interests of the colony, to go to decay, the works were again set up in that year on a scale designed not only to supply the colony itself but also the northern fisheries. Salt was exported thence to Massachusetts in 1633. For the encouragement of the salt-works of Colonel Scar-

borough at Accomac, on the eastern shore of the Chesapeake, the colonial assembly, in 1662, prohibited the importation of salt into the county of Northampton, but repealed the act four years later.

At a place long afterward known as the "Salt Ponds," on Sewee bay, or Bull's harbor, South Carolina, salt-making was attempted about the year 1689 by Sir Nathaniel Johnson, an enterprising emigrant from the Leeward Islands. What success he met with is unknown; but the manufacture of salt in that province was encouraged by acts of assembly in 1725.

The first salt-works in New England appear to have been erected, about the year 1623, by a company which settled near the present city of Portsmouth, in New Hampshire.

In 1624 the Plymouth Colony commenced the manufacture of salt, and in the following year attempted the same thing at Cape Ann, but were unsuccessful through lack of skill in the manager. In 1629 a more skilful person was sent out from England, and the right of making salt for sale was reserved to the company in London until the transfer of authority from London to the colony, when it was placed on the same footing with other industries. Salt-making was commenced at Salem in 1636, and in 1641 Samuel Winslow was allowed, for 10 years, the exclusive right of making salt in Massachusetts by a new method. Like privileges for 21 years and 30 acres of land were the same year granted to John Jenny and associates for making salt at Plymouth, and they were required to sell it at two shillings a bushel. These efforts were, however, inadequate to supply the colonists, who were actively engaged in the shore fisheries, and salt frequently became very scarce and dear. In March, 1648, John Winthrop, jr, was encouraged to manufacture salt, by a new method, under an act of the assembly making salt receivable for public taxes at the principal towns, the first year at the same rate as wheat, bushel for bushel; the second year two bushels for each family were to be taken at three shillings a bushel, and the third year 200 tons at two shillings per bushel. In the following year he received a grant of 3,000 acres of land, on condition that within three years he set up, between the capes of Massachusetts bay, works to make at least 100 tons of salt per annum. This effort appears to have been successful, and in 1656 the proprietor was granted, for 21 years, exclusive privileges for making salt "after his new way." In 1652 salt-works were ordered to be set up at Cape Ann; and about the same time, Edward Burt, who was refused the use of two islands near Salem for salt-making, because it was "prejudicial to the town in divers ways," received leave to carry on the business for 10 years at Cape Ann, provided he made it only after his own "new way;" but, in 1673, it was officially reported that no salt was made by the solar process in New England. In 1746 two persons, named Jerome, proposed to set up evaporating pans to make salt in Connecticut.

Previous to the Revolution the manufacture of salt along the Atlantic shores, from Cape Cod to Georgia, was a very rude process. It was made in New England chiefly by boiling, the water being pumped from the sea, either by hand-power or by the aid of wind-mills. About 250 gallons of water were evaporated to obtain a bushel of salt, which crystallized in fine grains, and was often quite impure. About the year 1775, the first considerable attempt to make salt along our eastern shores, by solar evaporation, was commenced by the salt-boilers of Harwich, on Cape Cod, and more successfully, two years after, by John Sears and others, at Dennis, in Barnstable county, where they built a vat 150 feet in length and 10 in width, and covered it with a curiously constructed roof. Salt having soon after risen in price to six and eight dollars a bushel, many other solar salt-works were constructed on the plan of Mr. Sears, who, in 1799, obtained a patent for a machine for manufacturing salt. In the following year Hattel Tilley, of Massachusetts, took out a patent for a method of covering vats by causing a double roof to revolve on an upright post. He was enabled to make pure white salt weighing 70 to 75 pounds to the bushel, and to make the process more economical by extracting from the mother-waters the crystallized sulphates of soda and magnesia. In 1802 it was estimated that $130,000 was invested in the manufacture of salt in Barnstable county, Massachusetts, which yielded a profit of 25 per cent. The number of salt-works was then 136, having an evaporating surface of 121,313 feet and a capacity to make 40,438 bushels of pure white salt, and 181,969 bushels of glauber salt, worth together $40,700. The works were increased the next year, by adding 27,587 feet of surface.

Captain John Sears, who had triumphed over many difficulties, was the only successful manufacturer of salt by solar evaporation, for which his works at Dennis were quite extensive. These appear to have been conducted essentially upon the plan since found most efficient, and used along our sea-coast and in Florida and at Onondaga for making salt by solar heat, in which the advantage is taken of the different degrees of solubility or affinity for water in the several salts which are constituents of the brine. By conducting the evaporation in a series of vats or shallow tanks those salts which are least soluble are first deposited, and afterward successively those that have greater affinity for water, until the chloride of sodium is crystallized nearly pure. At Martha's Vineyard, Nantucket, Plymouth, Kingston, Rochester, Hingham, and Dorchester other works of this kind were commenced within two or three years, those at Dorchester the same year, by Captain Deane, who had, at Preston's Point, a series of vats 200 feet long with 4,000 feet of evaporating surface. In 1810 Massachusetts contained 468,198 square feet of roofing for salt-works, and manufactured 118,757 bushels of salt, valued at $79,526. The salt-works in that State were exempted from taxation, and in 1809 the manufacturers petitioned Congress for a restoration of the duty on foreign salt.

This duty, which had been laid, in 1789, at 6 cents a bushel, and raised the next session to 12 cents, was increased in 1797 to 20 cents a bushel, but in 1807 was entirely repealed. In July, 1813, the duty of 20 cents was again imposed during the war, and was continued until 1832, when it was reduced to 10 cents a bushel, and in 1842 to 8 cents.

The manufacture now increased, and in 1820 was stated to employ, in Massachusetts, a capital of $777,000, and to yield an annual product of $95,000 A memorial to Congress, in 1827, against the repeal of the duty, stated that the salt-works of that State were numerous, and made annually (chiefly by solar evaporation) 600,000 bushels of the best salt, Barnstable county alone having 15,000,000 feet of salt-vats, valued at $1,300,000 and owned by 1,000 persons. The price of salt, which had been as high as 60 cents a bushel, had fallen to 33 cents at the works. In 1831 the area of salt-vats in the State was 17,545,700 square feet. Large quantities of solar salt were made at that time in Maine. On the reduction of the duty at this time the manufacture began to decline. In 1840 the product was 376,596 bushels, and in 1855, 319,630, valued at $187,324, chiefly in Suffolk and Barnstable counties.

A refinery of imported rock-salt in Maine, in 1833, was said to have made in the previous year $100,000 by making and selling refined salt at 25 cents a bushel, while common Liverpool salt, imported under a duty of 10 cents, cost 35 cents a bushel.

In 1631 a company of French emigrants arrived in an English ship to carry on salt-making at Piscataway, probably in New Jersey, along the southern shores of which, as well as of more southern provinces, there were many small salt-works before and during the Revolution, several of which were destroyed by the British, requiring means for their protection, and active measures by Congress and the several legislatures for their re-establishment. Salt-making was carried on at a later period in Cape May county, and, in 1818, large solar salt-works were erected at Lewistown, Delaware.

Salt-works were erected in New Netherlands by the Dutch previous to 1649. Imported white salt appears to have sold in that province before that as low as $1 04 per half barrel; but in 1661 was very scarce. It rose to 12 guilders ($4 80) per bushel. In that year Dirck DeWolff, a merchant of Amsterdam, received a grant of Coney Island, in New York harbor, for the manufacture of salt, for which he was also granted the exclusive right for seven years. In the exercise of this right he was resisted by the Connecticut settlers at Gravesend, on Long Island, where, in early times, salt was also made by exposing sea water in shallow vats along the shores to solar evaporation.

The saline springs of Onondaga had already attracted the notice of the French missionaries among the Indian tribes, by whom they were used, to a limited extent, as a source of salt. They were first mentioned by Pere Lallamont; and, in 1654, Le Moyne recorded a notice of them in his journal. He carried a sample of the salt to Canada, and, in 1658, communicated the discovery to persons in New Amsterdam, (New York.) Onondaga salt continued in common use among the Six Nations for more than a century, and, in 1770, was sold in Quebec. It was not until 1787 that salt was first made from

the springs near Syracuse, by boiling, at the rate of about ten bushels per diem. The lands were that year ceded to New York by the Oneida Indians, and the fountains were reserved to the State. In 1791 the capacity of the works there erected was 8,000 bushels per annum, and the product sold 60 miles westward for 50 cents a bushel. In June, 1797, these salines were first made the subject of legislative enactment. They were placed under a commissioner, and lots were leased to manufacturers, who were required to pay to the State a duty of 4 cents a bushel of 56 pounds, and to supply salt at not over 60 cents a bushel. The product of the springs in that year was 25,474, and the whole quantity from that time to June, 1861, inclusive, was 137,937,548 bushels.

In 1829, when the Onondaga salt-works produced 1,129,280 bushels, the manufacturers paid to the State, for the canal fund, a duty of 12½ cents a bushel of the standard weight of 56 pounds, and the salt was delivered, at a fair profit, in New York at 40 cents a bushel, after paying 9 cents freight and toll to Albany, 4 cents freight thence to New York, and 2 cents allowed for waste. The medium price of salt was then 48 to 50 cents a bushel. In 1834 the quantity made was 2,209,867 bushels, and the State duty was reduced to 6 cents a bushel, and the proceeds were transferred from the canal to the general fund of the State.

In 1846, when this duty yielded a large revenue to the State on a product of 3,838,851 bushels, the tax was reduced to its present rate of one cent a bushel, sufficient to cover the expense of sinking wells pumping, superintendance, &c.

The situation of the New York salines on the Oswego and Erie canals, with other outlets by the great lakes and by railroad, with access to large quantities of wood on the borders of the small lakes, and to the bituminous coal-fields of Blossburg, Pennsylvania, give the manufacturers unusual facilities for the manufacture of salt. The brine issues from rocks of the lower silurian series, and is obtained by boring wells from 50 to 312 feet deep, whence it is raised by steam-power and conducted to the boilers by troughs. A bushel of salt is made from every 40 or 45 gallons of water. It was at first made by boiling, but at present about one-eighth of the whole product is made by solar evaporation, and seven-eighths by boiling. The salt reservation is divided into four districts, those of Syracuse, Salina, Liverpool, and Geddes, of which, in 1863, the first produced, of solar and fine salt, 1,264,000 bushels; the second, 4,237,888; the third, 966,648; and the fourth, 1,473,847—total, 7,942383. The great reservoirs for making solar salt cover altogether about 700 acres, and are divided into tanks 16 by 18 feet each and 6 inches deep, provided with movable covers, and producing each about 50 bushels annually of coarse salt, such as is used in packing and curing provisions, and weighing about 70 pounds to the bushel. The number of covers in use in 1863 was about 44,000, capable of making 2,200,000, bushels, and nearly 100 salt-blocks were unused for want of brine.

The manufacture of boiled salt is conducted in large cast-iron kettles, holding about 100 gallons each, set in "blocks" of brick-work, usually in two parallel rows. A double block may contain 80 kettles, each capable of making yearly 20,000 to 25,000 bushels of 56 pounds, with a consumption of one cord of hard wood, or a ton of coal, for every 45 bushels. In 1862 there were 316 salt blocks in the reservation, containing about 16,500 kettles, capable of making at least 12 million bushels of fine salt annually. But the State was at no time able to supply more than 190 blocks with brine, and the average number supplied was about 160. The cost of manufacturing coarse or solar, and common or fine salt does not materially differ, and is about one dollar a barrel of 280 pounds, or five bushels. New York salt has the reputation of being comparatively pure and uniform in quality, and the finest ground solar salt made at Onondaga is not surpassed by any. "Factory-filled" dairy salt, for table and dairy use, has been made by a modification of the English method, which produces the celebrated "Ashton's" brands, and sold, in 1862, in any part of the State for 31 to 37 cents a bushel. The business is carried on for about eight months in the year. The toll on domestic salt charged by the State canals is 1 mill per 1,000 pounds per mile, and the freight from Onondaga to Buffalo, 198 miles on the canals, amounts to 15 cents per barrel over the toll.

During the last century the western settlements were chiefly supplied with salt by the expensive and tedious system of "packing" on horses across the mountains from the maritime towns, which in turn derived their principal supplies through a prosperous trade with the West Indies and Europe, whence much salt was brought in ballast by returning timber and provision ships. The price of salt on the frontiers was always high in consequence. About the close of the century Onondaga salt first became an article of trade at Pittsburg, chiefly through the enterprise of General James O'Hara, an enterprising citizen who had a contract to supply the garrison at Oswego, New York, with provisions, and who carried back, by land and water carriage, domestic salt which he was able to deliver at Pittsburg at $4 per bushel, or one-half its cost when packed over the mountains. In a few years a large trade grew up in this article, and the price fell to $12 per barrel of five bushels, until the war, in 1812, suspended the supply.

In the mean time the numerous "salt-licks" in Pennsylvania and Virginia had attracted attention and some effort to produce salt. A company of Philadelphia and Pittsburg merchants are said to have erected salt-works on the Big Beaver creek, in 1784. In 1810 1 salt-work in Indiana county was reported as having made 600 bushels of salt, worth $1,000. About that time, William Johnson commenced boring on the Conemaugh river, near the mouth of the Loyalhanna, and struck an abundant fountain of salt water at the depth of 450 feet, and erected furnaces, pans, &c., by which he made about 30 bushels per diem, which sold at a high price. Other wells were soon sunk at a depth of 300 to 600 feet in the coal-measures of that region, and the price of salt was reduced as low as $1 per barrel, but afterward fixed at $2, which afforded a profit. The pumps were first worked by horse-power, and afterward by small engines. In 1820 the business employed a capital of $33,000 in western Pennsylvania, and in 1826 there were 35 salt-works on the Conemaugh and Kiskeminetas, 3 upon the Alleghany, and others in progress elsewhere, one of which was expected to yield 1,500 bushels daily. Salt was supplied at the works for 20 to 25 cents a bushel, while it brought 50 cents in Kentucky, Ohio, and Illinois. In 1840 Pennsylvania produced 549,478 bushels of salt, and in 1850 919,100 bushels, worth $206,796.

The salt regions of Virginia, which are the most important after that of New York, are two in number, one along the Great Kanawha river, and the other in the southwestern part of the State, on the north branch of the Holston river, in Washington and Wythe counties. The manufacture was commenced at Kanawha in 1804. In 1810 that State produced 740,000 bushels, valued at $704,000, of which 540,000 bushels, worth $504,000, was made in Kanawha county, and the remainder in Westmoreland. Virginia salt was already coming in competition with that of New York. In 1820 23 salt-works in the Kanawha, having a capital of $696,000 and 1820 kettles, &c., made salt at 75 cents a bushel.

Kentucky, which in 1810 produced 324,870 bushels, worth one dollar a bushel, had, at that date, upward of 1,600 kettles, and make salt to the value of $190,000 per annum. In 1831 about 2,400,000 bushels was the annual product of salt on the western waters, and the price was from 50 to 62 cents a bushel. Salt had seldom fallen below $3 until the Kanawha works displaced the foreign. In 1840 Virginia ranked next to New York in this branch of production, having in that year made 1,745,618 bushels, which was more than one-fourth the product of the whole United States. In 1850 it produced 3,479,890 bushels, valued at $700,466.

From North Carolina, in 1810, returns were made of 366 vats owned by 2 salt-works, which made 7,500 bushels, worth $3,800.

The reservoirs of salt-water which underlie the valley of the Ohio and its branches were penetrated at several other points before the close of the last century. Salt was first made in the Muskingum valley in 1796, by a company. In a few years the springs passed into other hands, and finally to the State, which leased them at a fixed rate. In 1810 a manufacture of 24,000 bushels of salt, worth as many dollars, was reported from Ohio, and in 1830 the product of that State had increased to 446,350 bushels, valued at 37 to 50 cents per bushel, each bushel requiring 95 gallons of water to be evaporated. In 1850 that State manufactured 550,350 bushels, valued at $132,293.

Salt was made to a limited amount in the last century in Tennessee, Illinois, Missouri, Louisiana, and other parts of the west. The Wabash salines, 26 miles below the mouth of the Wabash, which had been used for half a century by the French and Indians as a source of salt, made, in 1809, about 130,000 bushels. They were soon after leased by government, under the name of the United States salines, to Wilkins & Morrison, of Lexington, Kentucky, and, in 1817, yielded about 300,000 bushels annually, supplying the settlements in Illinois and Indiana at 50 to 75 cents a bushel. Near Shawneetown, in Gallatin county, Illinois, quite a trade in salt existed in 1817, and in Jackson and Vermillion counties salt was made some forty years ago from springs leased by the State.

In Missouri, where salt springs or flats abound, a son of Daniel Boone made the first settlement in Howard county, at Boone's Lick, or Mackay's salines, in 1805, for the purpose of carrying on the manufacture of salt, which is still made there. In 1811 Mr. Braxton Cooper superintended salt-works at Mine river, on the Upper Missouri, and rock salt was found near the head of the Arkansas before that time. In 1840 Illinois made 20,000 and Missouri 13,150 bushels. Between the Ouachita and Red rivers, in Arkansas, numerous salt-flats were early noticed, and salt-works were in operation previous to 1818 on the Saline and Red rivers. Salt was also made at Attacapas and some other places. A manufacture of 10,200 bushels, worth $6,110, was reported from Orleans Territory in 1810, chiefly made at Natchitoches and Opelousas.

One of the most promising salt regions of the United States is that of Saginaw, Michigan. About the year 1842 a salt fountain was struck, by boring, at Grand Rapids, about forty miles from Lake Michigan, on the Grand river. The water yielded a bushel of salt from every 70 or 80 gallons evaporated. Messrs. Lucius Lyon & Co. commenced the manufacture of salt at that place, but it has not been found profitable, owing, in part, to the weakness of the brine. In 1859 the East Saginaw Salt Manufacturing Company was formed, with a capital of $100,000, for the manufacture of salt at East Saginaw, where they commenced the following year. The progress since made in the salt manufacture at that place has not been equalled in any salt region of the United States in the same time. In 1864 the number of companies in operation was 67, and their total investments in the business amounted to $2,269,500. They employed 892 men, and had in use 118 blocks, containing 4,210 kettles and 4,949 solar covers, and occupied 9,475½ acres of land. The quantity of salt made in the year was 529,078 barrels, or 2,645,390 bushels, valued at the shipping point at $1,190,410. The southern coasts of Texas and the Florida keys are admirably adapted to making salt by solar evaporation, and the latter have, for the last 25 years, been a source of some domestic salt, made by a method similar to that pursued at New Bedford and Cape Cod. The quantity reported in 1840 was 12,000 bushels, and in 1850 the value made there was $6,000, since which it has increased.

The comparative statistics of this manufacture during the last fifty years are as follows: Number of salt-works in the United States, as officially reported in 1810, 62; bushels of salt made, 1,238,365; value of same, $1,149,725. In 1820 the value of salt made was about $1,852,253. In 1830 the capital employed was $6,964,988, and the product was 4,444,929 bushels, valued at $935,173. In 1840 the capital remained about the same, and the quantity of salt made was 6,179,174 bushels, valued at $1,235,835, or about 20 cents a bushel. In 1850 9,763,849 bushels, valued at $2,222,745, were returned.

The importations of foreign salt amounted, in 1790, to 2,337,920 bushels; in 1820 to 4,010,569 bushels; in 1830 to 5,374,046 bushels; in 1840 to 8,183,203 bushels; in 1850 to 11,224,185 bushels; and in 1860 to 14,094,227 bushels, of which last amount upward of 10¼ million bushels were from Great Britain and its West India Islands. In the last of these years we exported of domestic salt 475,445 bushels, the greater part of it to Canada, which is the principal market for New York salt.

Statistics of salt produced in the United States during the year ending June 1, 1860.

STATES.	Number of establishments.	Capital invested.	Cost of raw material.	NUMBER OF HANDS EMPLOYED.		Cost of labor.	Annual value of product.	Bushels of salt.	Per cent.
				Male.	Female.				
Massachusetts	13	$30,525	$1,020	21	.....	$5,892	$9,832	31,525	.....
New York	296	2,313,590	676,301	1,079	.....	24,520	1,289,511	7,521,335	67.1
Pennsylvania	34	190,800	48,603	205	.....	64,776	196,916	1,011,800	.....
Ohio	28	338,700	139,627	293	.....	91,524	276,871	1,743,200	216.7
Virginia	14	523,800	166,004	434	11	148,464	410,684	2,076,513	.....
Kentucky	6	70,000	7,450	66	8	14,978	41,190	169,665	.....
Illinois	1	38,000	4,000	15	.....	4,680	10,000	35,000	.....
Michigan	1	100,000	275	30	.....	*200	600	2,362	.....
Florida	1	35,000	2,500	12	.....	5,160	11,000	40,000	.....
Texas	2	47,000	4,000	18	4	5,520	29,800	29,800	.....
California	2	800	.....	15	.....	5,400	7,100	44,000	.....
Oregon	1	4,000	5,000	2	.....	840	6,000	12,000	.....
Total	399	3,692,215	1,054,780	2,190	23	371,954	2,289,504	12,717,200	30.26

* This establishment having been in operation but ten days, the cost of labor was calculated for that time.

AGRICULTURAL IMPLEMENTS.

[Extract from the introduction of Agricultural volume, census of 1860, pages XI to XXIX.]

"PROBABLY no exhibition of our national statistics is more important or satisfactory than the foregoing tables, showing the great increase and present extent of the construction and employment of agricultural implements and machinery.

"The high price of labor has stimulated mechanical invention. In no other country are there so many cheap and efficient implements and machines for facilitating the labors of the farm. In older and richer countries we find more expensive machinery, but, as a general rule, it is too complicated and cumbersome for our use. We have been thrown on our own resources, and have no reason to regret it.

"Whatever augments the productive capacities of the soil, or increases the profits of labor and capital employed on so large a scale, either in the first production or the subsequent handling of crops, becomes a practical element in the general prosperity. The vast power resident in machinery, even the more simple applications of the mechanical powers, with their modern perfection of detail, gives this creative force, which may be increased almost beyond computation by the use of steam as a prime mover. Thus, every machine or tool which enables one farm-hand to do the work of two, cheapens the product of his labor to every consumer, and relieves one in every two of the population from the duty of providing subsistence, enabling him to engage in other pursuits, either laborious, literary, professional, or scientific, practically duplicating at the same time the active capital or the purchasing power of the producer, thus enhancing the comfort of all, and stimulating the common enterprise.

"When the utility of labor-saving appliances in agriculture shall come to be fully apprehended, and made generally available in the clearing, draining, and tilling of the soil; in the planting, irrigating, cultivating, and harvesting of crops, and in their speedy preparation for market, we may regard the occurrence of famine, either from deficiency of labor, as in time of war, or from the contingencies of soil and climate, as practically impossible. Already has the use of improved implements, aided by scientific and practical knowledge in all the processes of the farm, resulted—like the use of machinery in other departments of industry—in such a diversification and increase of the forms of labor, and such a cheapening of its products under ordinary circumstances, that we rarely hear of the unreasoning and jealous violence of farm laborers, who in England, a generation since, wantonly destroyed all the agricultural machinery of a neighborhood, even to the common drills, in the mistaken opinion that its use was an infringement of their rights to labor. Its palpable advantages have disarmed the traditionary prejudice of the husbandman himself, who is fast becoming as progressive as his neighbor. It has lifted much of the drudgery from the shoulders of the country-bred youth, who no longer loses his elastic step and suppleness of limb in the moil of the farm, which he once instinctively shunned as degrading, while he sought the lighter and more or less intellectual pursuits of the city. It has thus tended to elevate the pursuit of agriculture to its proper position in the social scale, as one of dignity and independence, and not one of mere physical toil, to be shared in common with the brute.

"It is in the United States especially, where vast areas of improvable and fertile lands invite the labor of a sparse population, that agricultural machinery is capable of effecting its greatest triumphs. Far back in our colonial days the stream of emigration bore the young and adventurous of the Atlantic settlements towards the richer bottoms and prairies of the west. A gradual deterioration of the fertility of the soil of older States from constant cropping, and the consequent increased labor required with the imperfect implements formerly in use, were sufficient to maintain the yearly exodus. Columns of hardy laborers from Europe have annually sought our shores, and for the most part have as promptly filed off in the same direction in quest of cheap farms, or in the more alluring search for the precious metals. As a consequence, civilization smiles upon the shores of either ocean, and looks down from the mountain summits which separate them. A prosperous and expanding agriculture, with most of the arts which it demands and fosters, has been rapidly extended over a territory of enormous breadth and fertility, which lacks only the labor of adequate cultivation to develop its vast resources in a wealth of cereal production as yet scarcely imagined. The very causes, however, which have opened up this territory to agriculture and the arts have produced and maintained a continued scarcity of labor, and kept its wages at a permanently high price. It is this enormous area of farm lands, and this great dearth of manual labor throughout the Union, that our inventors and mechanics have, from an early period, been invited to supply with labor-saving contrivances.

"Fortunately the people of this country have not been slow to adopt the most efficient substitutes for animal power, and the inventive talent of the nation has found an ample and remunerating field for its exercise in originating and perfecting instruments adapted to all the wants of the farmer and planter. The great staple products of cotton, grain, and hay, have especially demanded the substitution of mechanical for muscular labor, and some of the happiest products of American skill have been the result.

"Scarcely less valuable in the aggregate, however, are the numerous minor inventions whereby the labors of the farm and the household have been saved. Implements of this kind make up a large portion of the stock in trade of the makers and venders of agricultural wares. This successful application of the mechanics of agriculture has happily supplemented the rapid displacement of a large amount of rural labor called off by the war, manufactures, and the mines, and has itself in turn been stimulated by the high prices of produce consequent upon increased demand both for home and foreign consumption.

"Evidence that this scarcity of labor in the United States has been a principal incitement to the invention and manufacture of agricultural implements is found in a late report of the Commissioner of Patents, who states that 'the most striking fact connected with this class is the rapid increase of applications filed. Notwithstanding half a million of our agriculturists have been called from the farm to engage in military service, still the number of applications for patents on agricultural implements, (exclusive of reapers, bee-hives, horse hay-forks, and horse hay-rakes,) has increased from three hundred and fifty in 1861, to five hundred and two in 1863.'* The number of patented inventions belonging to the class of agriculture, previous to 1848, was 2,043, since which time the number has been vastly augmented. In the United States, as in Europe, the principal improvements in agricultural and horticultural implements have been made within the present century. As a branch of manufacture, this class of machinery has been wonderfully extended within the last ten or fifteen years, having received a great impetus from the exhibition in London in 1851—where our own progress in this respect created so much surprise among foreigners—and the several international fairs which have taken place since that time. Throughout Europe and America, until a comparatively recent date, the implements of the farm remained extremely rude, primitive, and inefficient in form. Attention appears to have been first strongly awakened to the value of mechanical aids in farming about the period of the first introduction of agricultural societies.

"The Royal Society, established in England in 1660, encouraged improvements in agriculture. But in the transactions of the Society for the Encouragement of Arts, Manufactures, and Commerce, instituted in London in 1753, we trace a still more liberal promotion, and a general interest in agricultural progress. These societies prepared the way for the establishment of purely agricultural associations. The first associated effort made in England to encourage agriculture by specific rewards was in the premiums annually offered by the Society of Arts after the year 1758, for experiments in husbandry, and for improved implements of the farm. The first agricultural society in Great Britain, the Society of Improvers in Scotland, established in 1723, encouraged improvements in tillage, and in farm implements, with such effect that 'more corn was grown yearly where corn never grew before than a sixth of all that the kingdom used to produce at any previous time.'† About the same time Jethro Tull introduced—along with his system of deep tillage and thorough pulverization of the soil—the use of the horse-hoe, the drill, and other improved utensils, and became the greatest practical improver of agriculture in the last century. He even attempted an automatic threshing machine, and incurred the usual charge of being a visionary innovator. The profit of drill husbandry was also demonstrated by John Wynn Baker, of Kildare, in Ireland, who, in 1766, commenced a series of experiments with a view of systematizing agricultural knowledge by establishing fixed principles of rural economy, and showed by actual experiment that the saving effected by the drill and horse-hoe amounted in fifteen years to the fee-simple of all the tillage lands of the kingdom. He established as a part of his project a manufactory of farm implements, and issued a catalogue of seventy different machines and tools, all new to the agriculturists at that time. Agricultural machines were thenceforth made with more regard to scientific principles.

"The earliest agricultural associations in the United States were established in 1785, in South Carolina and Pennsylvania. In the first-mentioned State, indeed, nearly a century before, the assembly passed 'an act for the better encouragement of the making of engines for the propagating the staples of the colony,' which was followed by legislative encouragement to various individuals who improved the machines for pounding and cleaning rice. In 1784 the assembly enacted a regular patent and

* Introductory report of Commissioner of Patents for 1863, page 21.

† Philps' History of Progress in Great Britain.

copyright law, giving to the authors of books and the inventors of useful machinery the exclusive benefit of their productions for fourteen years. The Philadelphia Society for Promoting Agriculture, established in March, 1785, and after a period of inaction revived and incorporated in 1809, through the exertions of the Hon. Richard Peters, awakened much attention to the subject of improved implements and machinery, by means of a judicious system of premiums, and of practical essays. In July, 1809, Mr. Peters proposed to the society 'a plan for establishing a manufactory of agricultural instruments, and a warehouse and repository for receiving and vending them.' In that paper he states that no manufactory of agricultural implements in general existed in the United States, although the demand was prodigiously great. The proposed manufactory was to produce, under the patronage of the society, every implement of husbandry, both common and extraordinary, in use at home or abroad, if approved on trial; none to be sold without inspection and the stamp of the society's agent. His plan also embraced a collection of models in the manner of the Conservatory of Arts and Trades, established at Paris a few years before. The Massachusetts Society for Promoting Agriculture, incorporated in 1792, labored successfully to promote like improvements. The first statistics of the national industry collected in the following year embraced one small manufactory of hand-rakes, in Berkshire county, Massachusetts, which made annually 1,100 rakes, valued at$ 1,870. The census of 1820 gave very meagre information respecting this branch of production. Several small manufactories of ploughs, scythes, axes, shovels, hoes, &c., existed in different States, and one of patent steel pitchforks, in New Haven, Connecticut, turned out about $5,000 worth annually. During the next thirty years the business increased more rapidly, the traditionary prejudices of farmers gradually giving way before the established utility of labor-saving appliances in the cultivation of the vast domain of our national agriculture. The form and finish of ordinary farm tools were much improved, and a few grand inventions were brought forward. In 1833 rice was successfully threshed out in the southern States by animal and steam power. The harvesting of grain by machinery, which had been several times essayed at an earlier period, was the same year attempted at Cincinnati, where the late Obed Hussey cradled wheat as fast as eight persons could bind it.

"State and county agricultural societies were, during the same time, organized in nearly every section of the Union where they did not already exist. The system of annual fairs and exhibitions of farm products and machinery instituted by them, and encouraged by public awards of premiums, powerfully stimulated invention, and made our farmers familiar with the best forms of agricultural implements in use at home or abroad. Of like influence, but wider scope, was the American Institute in New York, which has made its influence felt in every department of industry.

"The exhibition of the industry of all nations held in London in the year 1851 exerted a vast influence upon the progress of ideas on the subject of mechanical agriculture, as it did upon all other branches of art. The contrast there presented between the highest results of modern skill and ingenuity exercised upon the implements of husbandry, and the rude models of the plough and other tools to be seen in the Indian department, little improved since the days of the Hebrew prophets, forcibly illustrated the agency of the mechanic and the engineer in the art of subduing nature to the will and service of mankind.

"Although the number of implements of each kind exhibited by the United States on that occasion was small, the variety shown was considerable. The general excellence of American ploughs, reapers, churns, scythes, axes, forks, and other implements, was acknowledged by the public admission of disinterested judges from all parts of the world, and the particular merits of many by the medals awarded, and by the number of orders received at the time by the manufacturers. The triumph of the American reapers marked a new era in agriculture, and gave a strong impulse to the inventive genius of Europe and America. The emulation awakened among manufacturers by the London exhibition was still further stimulated by the Crystal Palace exhibition, which took place in New York in 1853–'54, when more than one hundred American manufacturers competed for honorable distinction in this department of mechanics.

"The influence of these exhibitions of the collective ingenuity of the world upon our own countrymen, in furnishing our mechanics with a standard of comparison by which to measure their own contributions to the world's progress with the most improved implements of the civilized world, and our agriculturists—already familiar with American instruments through our State and local fairs—with a view of the appliances of agriculture in other lands, can scarcely be overrated.

"Some of the results are to be seen in the tables before us.

"Credit is also due to the United States Agricultural Society for instituting a great national field trial of reapers, mowers, and other implements, held at Syracuse, New York, in 1857, for the purpose of testing practically the relative merits of different machines and rewarding special excellence.

"The magnitude of the interests involved in the successful production of a new labor-saving implement for husbandry should alone prove a sufficient spur to inventors and manufacturers. A slight improvement in straw-cutters has enabled its inventor in a western tour of eight months with a model to realize forty thousand dollars. Another has been known to sell a machine to thresh and clean grain, after fifteen months use, for sixty thousand dollars. The McCormick reaper is believed to have yielded its inventor annually a princely income. A single manufacturer has paid the legal representatives of a patentee $117,000 in a single year for the use of a patent-right on an agricultural machine which others were making at the same time by contract with the owner.

"From an article upon agricultural implements, published in the annual report of the Department of Agriculture, by the Hon. M. L. Dunlap, of Illinois, we are pleased to see that invention in this branch has not been stationary during the war. Among the principal competitors for public favor in prairie farming, to which his remarks chiefly relate, are the rotary spader with horse power, which promises to be more effective than the steam-plough with traction engines, the latter having thus far proved a failure in moist or cultivated soils; the steel-clipper plough, with polished cast-steel mold-board; the two-horse cultivator or plough; the iron roller; the hand sowing machine; reaping and mowing machines, separate or uncombined; the sulky,

wire-tooth horse hay-rake; the horse hay-fork or patent pitchfork; the horse-power thresher with straw-carrier and bagging apparatus attached; the drain plough; the portable farm mill and the sorghum mill. But the statistics of the eighth census will measure the public appreciation of these and other new productions of American skill, and their influence upon the rural economy of the nation.

"The cash value of farms under actual cultivation in the United States in 1850 was $3,271,575,426. Their value had risen in 1860 to $6,645,045,007, an increase of 103 per cent. in ten years. The amount of capital invested in implements and machinery for their cultivation in 1860 was $246,118,141, having in ten years increased $94,530,503, or more than sixty-three per cent. Thus, the fixed capital of the agriculturists in farms, and in farm tools and machinery, both increased in a ratio much more accelerated than that of the population, which during the same time augmented at the rate of only thirty-five and one-half per centum. If we suppose the rural population to have increased in the same proportion to the whole, and the productiveness of the soil to have remained unchanged, we shall perceive that an immense increment of productive force accrued to the nation within ten years in the mechanical appliances of agriculture alone. Taking the aggregate number of acres of improved lands in the United States to be, in round numbers, one hundred and sixty-three millions, as shown by the returns, it would thus appear that the average value of farm implements and machinery for each farm of one hundred acres is only about $150, which is probably less than one-third the sum that could be so invested with profit, at least in the older settled States. The greatest deficiency in this respect is found in New England, where it is only $1 34 per acre, probably due to the ruggedness of the country. In the middle States the value of machinery employed is $2 07 per acre; in the western States $1 56, and in the southern $1 48 per acre. Notwithstanding the evidence, therefore, of an improvement in the quantity and quality of implements, and inferentially of a better system of farming, there is manifestly room for further improvements in this respect, and ample encouragement to our agricultural machinists to supply the growing demand.

"The production of labor-saving machinery, as will be shown by the tables of manufactures, was still going on to the amount of $17,487,960 in 1860, which was likewise an increase of nearly 156 per cent. over the value made in 1850, when it reached the sum of $6,842,611. This was exclusive of all articles made on the farm, which was formerly considerable, but is yearly decreasing as regular manufactories and depots for the sale of farm implements are multiplied, and their cost diminished. It also excludes cotton-gins, scythes, hoes, shovels, spades, forks, and some other articles of hardware, wagons, carts, and wheelbarrows, the value of which amounted to $11,796,941, and might appropriately be added to the above table.

"Of the total product in 1860, nearly two millions in value was made in New England, being an increase of about sixteen per cent. upon the returns of 1850.

"The middle States increased their production from less than two and a quarter to upward of five and three quarter millions, or 134.2 per cent, The great States of New York and Pennsylvania returned, the one 333, and the other 260 establishments devoted to this branch of manufacture, and the increase in their product was 172.7 and 85.5 per cent., respectively, over the business of 1850.

"In the western States the increase was most extraordinary, the value having augmented from $1,923,927 to $8,707,194, or 352.5 per cent. Their total production was nearly one-half that of the whole Union. Its increase alone was nearly thirty-nine per cent. of the whole, and nearly equalled the total manufacture of the United States in 1850. The States of Ohio and Illinois, together, manufactured to a greater amount than any other two States in the Union, the value amounting in the former to $2,820,626, and in the latter to $2,379,362, and the increase to 405.5 and 212.2 per cent., respectively. Iowa increased its manufacture 1,208.6 and Kentucky 755.4 per cent. over the product of 1850.

"In the southern States the aggregate was but little over one million, and the rate of increase nearly thirty per cent. Virginia was the largest manufacturer, but in several there was a falling off from the product of 1850, after excluding cotton-gins, &c., as before mentioned.

"The largest amount manufactured in any one county in 1860 was in Stark county, Ohio, in which fifteen establishments produced $900,480, the larger part of which consisted of mowers and reapers, and of threshing machines and separators, in each of which three factories were employed. The next largest county production in this branch was in Cook county, Illinois, which made to the value of $529,000, chiefly in the city of Chicago. Of that sum, $414,000 was the value of 4,131 reapers and mowers made by a single establishment, the largest in the country. Rensselaer and Cayuga counties, in New York, each produced upward of $400,000 worth of agricultural implements, and a single firm in Canton, Stark county, Ohio, made reapers, mowers, and threshers to the value of $399,000.

"From the New England States there is a considerable exportation of agricultural implements to the British provinces, the southern States, and other parts of the world.

"That the large rates of increase in this branch indicated by the foregoing figures are not due simply to the increase of population, is shown by the fact that in Illinois, whose rate of increase with so large a population is without a parallel, the increase in value of agricultural implements manufactured in 1860, as compared with 1850, was 212 per cent., while the increase of population during the same period was only 101 per cent. In Ohio the population increased only 18.14 per cent., while its production of agricultural implements was augmented 417.6 per cent.

"We subjoin a summary of the progress of invention in relation to a few of the more important instruments of this class, having given in the preliminary report an account of the progress in threshing implements.

"THE PLOUGH.—Could the history of this machine, the type and pioneer of all other implements of husbandry, be traced from its origin, it would probably be found that few agricultural utensils have undergone greater modifications, or been more slowly improved than the plough. Originally, nothing more than the rude branch of a tree, with its cleft and curved end sharpened to scratch a furrow for the seed, possibly, as suggested by the ingenious Tull, in imitation of the tillage effected by

swine, the instrument appears at this time to have been brought as nearly to perfection as it is possible to attain. The primitive plough, a 'mere wedge with a short beam and crooked handle,' became in time fitted with a movable share of wood, stone, copper or iron, wrought to suitable shape, as we find it in the hands of our Saxon ancestors. To this a rude wooden mould-board to turn the furrow was afterwards added, and, with various improvements in shape, continued in use until near the present time.

"What was its form or efficiency in the days when Elisha was summoned from ploughing with twelve yoke of oxen, to assume the mantle and functions of the Hebrew prophet, may not be quite apparent, but the plough was certainly hundreds of years in reaching the imperfect state above described, and was several hundred more in approximating its present improved condition. In the middle of the last century the ploughs of southern Europe had been little improved, and were still destitute of a coulter, as in the old Roman plough of the days of Virgil and Columella. It has received few modifications there down to this time. Even in England, at that period, the plough was an exceedingly rude and cumbersome affair compared with the best now in use. It was no uncommon thing in parts of the island thirty years ago to see from three to five horses in light soils, and in heavy ones sometimes as many as seven attached to a plough, which turned about three-quarters of an acre per diem. The old Scotch plough was still worse, and in Scotland, where agricultural machinery is now most perfect, no instance was known of ploughing with less than four horses. The usual number was six horses, or four horses and two oxen-and sometimes as many as ten or twelve were yoked to it, each requiring a driver. William Dawson, soon after 1760, introduced the custom of ploughing with two horses abreast with lines.*

"Although the swing-plough is believed to have been the earliest used in Great Britain, one and two wheel ploughs—long used on the continent—were most in favor. Turn-wrest ploughs, drill, drain, and trenching ploughs, and others adapted to different uses, were employed in considerable variety.

"A capital improvement in the plough was the invention of the iron mould-board and landside. An approach to this was made by Joseph Foljambre, of Rotherham, England, who in 1720 took out the first patent of the kind recorded. It was for a mould-board and landside of wood sheathed with iron plates, the share and coulter being made of wrought-iron with steel edges. One of these patent or Rotherham ploughs—as all similar ones were called for many years—was imported and used for some time with much satisfaction by General Washington, but, becoming worn, our ploughwrights were unable to repair it. The ploughs used in New England early in this century, and more recently in the south, were of similar construction. About the year 1740 James Small, of Berwickshire, in Scotland, first introduced the cast-iron mould-board, still using wrought-iron shares. During fifty years he continued to manufacture and improve the Scotch swing-plough, which, since made wholly of iron, has long been regarded as the best in use in England. In 1785 Robert Ransome, of Ipswich, introduced cast-iron shares, and about 1803 made improvements still in use, by making the cutting edges of chilled iron harder than steel, by casting them in moulds upon bars of cold iron. The making of the first iron plough has been attributed to William Allan, a farmer of Lanarkshire, in Scotland, in 1804, but an iron plough was presented to the Society of Arts in London as early as 1773, by a Mr. Brand. The cast-iron plough was introduced soon after. Like most other improvements in rustic machinery, the iron ploughs, though doing much superior work at less than half the expense of the clumsy wooden plough of that date came tardily into use. It is said that Sir Robert Peel, in 1835, having presented a farmer's club with two iron ploughs of the best construction, found on his next visit the old plough with wooden mould-boards again at work; 'Sir,' said a member, 'we tried the iron, and be all of one mind, *that they made the weeds grow.*'† A similar prejudice opposed the introduction of the first cast-iron plough in America, patented in 1797 by Charles Newbold, of New Jersey, who, after spending, as he alleges, $30,000 in trying to get it into use, abandoned the attempt, the farmers declaring that iron ploughs poisoned the soil and prevented the growth of crops.

"The plough has received many improvements at the hands of Americans, and has become an article of frequent exportation, while even in Great Britain the ploughs now used are generally made after American models. The year 1617 is mentioned by an early annalist as the 'remarkable period of the first introduction of the labor of the plough' in Virginia. In 1625 we find the Dutch colony on the Hudson supplied with 'all sorts of seeds, ploughs, and agricultural implements,' to which in 1662 was added a first-class wheel-plough with its pulleys, &c., at a cost of sixty florins. In 1637 the colony of Massachusetts contained but thirty ploughs, and Connecticut probably less than one-third the number. Nevertheless, the same year a resident of Salem was promised an addition of twenty acres to his original grant if he would 'set up ploughing.' We involuntarily think of the steam-plough when we read that another citizen of that town in the following year was allowed more land because he had 'not sufficient ground to maintain a plough' on his farm of 300 acres. Owing to the scarcity of mechanical labor, most of the ploughs and other farm utensils were for a long time made on the farm, with the aid of the nearest smith. The casting of plough-irons was done at nearly every small foundry. Their make was, of course, clumsy and inefficient. Among the kind still remembered by many was the Cary plough, with clumsy wrought-iron share, wooden landside and standard, and wooden mould-board plated over with sheet-iron or tin, and with short upright handles, requiring a strong man to guide it. The bar-share plough was another form, still remembered by many for its rudely fitted wooden mould-board and coulter, and immense friction from the rough iron bar which formed the landside. The Bull-plough was similar in form, but without a coulter. Even the shovel-plough, not unlike the rude instrument still used by the Chinese, may be remembered by some, and was in common use in the cotton States a few years since. As early as 1765 the London Society of Arts awarded a gold medal to

*McCulloch's Statistics of British Empire. †Philips' History of Progress in Great Britain.

Benjamin Gale, of Killingworth, Connecticut, for a drill-plough, the invention of which was claimed by Benoni Hilliard, of the same place. The first patent taken out after the organization of the United States Patent Office was in June, 1797, by Charles Newbold, of Burlington, New Jersey, for the cast-iron plough already mentioned, which combined the mould-board, share, and landside, all in one casting. He afterwards substituted wrought-iron shares, objections having been made to the cast-iron probably because not chill-hardened. He did not succeed in getting them into permanent favor, although cast-iron ploughs were advertised for sale in New York in the year 1800, by Peter J. Curtenius, a large iron founder of the city. Newbold was paid one thousand dollars by David Peacock, a fellow-townsman, who, in April, 1807, patented a modification of the iron plough, having the mould-board and landside cast separate, with a wrought-iron steel-edged share attached.

"As early as 1798 Mr. Jefferson also exercised his mechanical tastes in improving the mould-board of ploughs, which he afterwards adapted to an improved plough sent him by the Agricultural Society of the Department of the Seine, in France. His son-in-law, Mr. Randolph, whom Mr. Jefferson thought probably the best farmer in Virginia, invented a side-hill plough adapted for the hilly regions of that State, and designed to turn horizontally, in the same direction, the sides of steep hills, which, in northern Europe, was effected by a shifting mould-board, constituting the variety called turn-wrest ploughs. Colonel Randolph's plough was made with two wings welded to the same bar, with their planes at right angles to each other, so that by turning the bar, adjusted as an axis, either wing could be laid flat on the ground, while the other, standing vertically, served as a mould-board. Mr. Jefferson advocated an adherence to scientific principles in the construction of the plough. Perhaps the first attempt to carry out these suggestions was made by Robert Smith, of Pennsylvania, who, in May, 1800, took out the first patent for the mould-board alone of a plough. It was of cast-iron, and of improved form, the principles of which were published by him. In July, 1814, Jethro Wood, of Scipio, New York, was granted a patent for a cast-iron plough having the mould-plate, share, and landside cast in three parts. The mould-plate combined the mechanical principles of the wedge and screw in raising and inverting the furrow-slice. It became the foundation of many patented improvements of later date, and of a handsome competence to the inventor, who, in 1819, received a second patent, which was renewed by act of Congress in 1832.

"A series of improvements in the cast-iron ploughs was commenced about 1810 by Josiah Ducher, of New York, which were patented in 1822. Some of them are still retained in use. Two improvements in cast-iron plough, designed to make it easier of draught, were covered by letters patent issued in April, 1821, to A. L. & E. A. Stevens, of Hoboken, New Jersey. One of these was for hardening the cutting-edges and parts exposed to wear by cold-chilling them. Four other patents on the cast-iron plough were granted the same year. Much credit is also due to Joel Nourse, of Massachusetts, and his partners, for improving and perfecting the cast-iron plough, which was comparatively a rude instrument, in limited demand, as late as 1836, when they commenced the manufacture of agricultural implements at Worcester. The sale of twenty thousand ploughs in a single year by this firm, within twenty years after they commenced business, indicated the increased demand for ploughs, which they were able to supply, of one hundred and fifty different forms and sizes. Among these were *subsoil* ploughs adapted to teams of from one to six horses, the first implement of that kind in the United States having been imported by them in 1840 from Scotland, and subsequently improved by making it more simple, light, and cheap in construction. American hill-side ploughs are now exported to Great Britain. The number of patents granted for ploughs previous to 1830 was 124, and up to 1848 had reached between three and four hundred.

"A distinctive feature in American ploughs is their great simplicity, lightness of draught, neatness, and cheapness, which is often in striking contrast with those of foreign make. This economy of power attracted attention to two ploughs sent, in 1815, to Robert Barclay, of Bury Hill, near Dorking, in England, by Judge Peters, president of the Philadelphia Society of Agriculture, the seal of which society, by the way, bears as a device a representation of the plough of the date of 1785. The ploughs referred to were made by order of Mr. Peters, to combine the best principles and forms of American ploughs, and when tested in August of that year against the best English ploughs, were found to do the work quite as well and as easily with two horses as the others did with four. American ploughs obtained favor with English farmers for substantially the same characteristics, namely, 'extraordinary cheapness and lightness of draught,' at the trial of ploughs at Hounslow during the great exhibition in 1851.

"In the early part of this century the manufactories of ploughs in the United States were few and small in size. It has since become an important branch of the agricultural implement business. Ploughs were made and exported in considerable quantity at Enfield, Connecticut, previous to 1819. One of the largest establishments in this or any country, devoted chiefly to plough-making, was established in Pittsburg, Pennsylvania, in 1829. In 1836 it made by steam-power one hundred ploughs daily, of patterns adapted largely for the lower Mississippi, and cotton and prairie lands of the south and west. The iron-centre plough, and hill-side revolving beam-plough, were among the valuable modifications originated by the concern which now makes also the steel ploughs so valued in prairie farming. Another steam-plough factory in Pittsburg made in 1836 about 4,000 ploughs annually, including wood and cast-iron ploughs, and a great variety of other kinds. These two factories, together, made 34,000 ploughs yearly, of the value of $174,000. There are several other extensive and numerous smaller manufactories throughout the country, particularly in the western States, in which plough-making is carried on as a specialty. It forms, however, a branch of the general manufacture of agricultural implements. In the best conducted of these, machinery is extensively employed, and such a division of labor as to secure great speed and perfection of workmanship, as well as a great reduction of the cost. For each size and pattern of plough, the several parts subject to wear are made alike, so as to fit any plough of that class, and allow it to be readily replaced without the aid of the plough-wright. Sulky ploughs, with a seat for the driver, and gang-ploughs, cutting several furrows at a time, have been introduced, but have not proved generally satisfactory. Rolling or

wheel coulters have, in many cases, taken the place of the old standing coulter. Many ploughs now have a hook attached for turning the weeds under the furrow, an important improvement for prairie farms, where weeds, like other vegetation, are luxuriant.

"Several attempts were made in 1858 and the following years to introduce steam-ploughs, for which the Illinois Central Railroad Company offered a premium of $3,000. They have been employed with success for several years in Great Britain English steam-ploughs are operated by stationary engines placed at one side of the field, and draw the plough from one side to the other by means of wire-chains. At other seasons the engines are used in driving threshing-machines and performing other farm labor. Our inventors have employed traction engines of several tons weight, which on hard ground worked satisfactorily but on cultivated or moist soil were found to bury themselves inextricably in the ground. They appear to have been abandoned for the present.

"A more recent machine, which promises to be a valuable one, is the rotary-spader, which, with the power of four horses, spades the ground eight inches deep and three feet wide, at the rate of five or six acres a day. It is rather too costly for small farms, but on large ones may prove valuable, and in time may be adapted to steam-power.

"Many improvements have been made in implements for cultivating corn and other hoed crops, among which the horse-hoe or cultivator is exceedingly popular, and in corn-growing districts has nearly supplied the loss of manual labor by the war. The importance of frequently stirring the soil is becoming better understood, and in our dry climate the effects of severe drought may be almost entirely obviated by the use of the cultivator on rich, well prepared-lands.

MOWERS AND REAPERS.

"These implements, making so large an item in the manufacture, deserve a brief notice. The great breadth of land devoted to grain in the western country has rendered mechanical appliances for gathering the crop altogether indispensable to the farmer. But contrivances for that purpose have long been in use. Pliny the elder, in the first century of our era, gives us the earliest description of such an instrument in use among the Gauls. It was a large van, or cart, driven through the standing corn by an ox yoked with his head to the machine, which was fitted with projecting teeth upon its edge for tearing off the heads, which dropped into the van. It is supposed to have been in use for several centuries.

"The earliest proposal in Great Britain for an implement for harvesting grain was made by the Society of Arts in 1780, when it offered its gold medal for a machine to answer the purpose of mowing or reaping grain, simplicity and cheapness in the construction to be considered as the principal part of its merit. The premium was continued for several years. William Pitt. of Pendeford, soon after invented a reaping machine, suggested by the description of Pliny and Palladius, and described in Young's Annals of Agriculture for 1787. A second attempt was made in Lincolnshire, in 1793, by another person, whose name does not appear. In November of that year, two men named Cartwright, each invented a machine for mowing and reaping. In 1799 the first English patent was taken out by Joseph Boyce for a reaping machine, acting on the principle of the common scythe. In the following year, Robert Mears, of Somersetshire, was granted a patent for a reaping machine propelled on wheels, but worked by hand. In June, 1805, Thomas J. Plucknett, of Kent, received a patent for a reaper having the cutting apparatus suspended beneath and in front of the axle, and the power behind. He took out a second patent in 1807. Mr. Gladstone, of Castle Douglas, in 1806 invented a machine with horizontal gathering-wheel, and the next year Mr. Salmon, in Bedfordshire, brought forward a plan for raking the corn off a platform by means of a vertically-working rake driven by a large crank in the rear of the machine. Messrs. Kerr, of Edinburgh, in 1811 introduced the 'conical drum,' and in 1815 Mr. Scott employed rakes with a cylindrical drum, and projecting teeth, &c. In 1822, Mr. Ogle, of Alnwich, invented the large reel or rake for lashing the uncut grain towards the knife, as is now done in some English and American reapers. Some others were brought forward previous to 1826, in which year the Rev. Patrick Bell, of Scotland, produced the oldest machine now known to be in use, having a revolving apron or endless web for gathering, accompanied by Ogle's reel in front, which attracted little attention, however, until after the London exhibition in 1851, when he adopted McCormick's cutting apparatus; since which it has been used to some extent. From the closing of the fair in 1851, to the end of 1852, no less than twenty-eight patents were registered in England for inventions relating wholly or in part to reaping and mowing machines. Patents had been previously granted for this class of machines in Russia in 1831, in Austria in 1839, and in Australia in 1845. The last mentioned, introduced at Adelaide, South Australia, by Mr. Ridley, reaped, threshed, and winnowed all at the same time, at the rate of an acre per hour; but its description conforms very nearly to one patented by D. A. Church, of Friendship, New York, in 1841. Whether from intricacy of construction, or other inherent defect, or, as seems more probable, from indifference on the part of the public, none of these instruments came into permanent use, although they provoked the opposition of agricultural laborers.

"The first American patent for cutting grain was issued in May, 1803, to Richard French and J. T. Hawkins, of New Jersey. Their machine was propelled on three wheels, one of which extended into the grain. Samuel Adams, of the same State, followed in 1805; J. Comfort, of Bucks county, Pennsylvania, and William P. Claiborne, of King William county, Virginia, in 1811; Peter Gaillard, of Lancaster, Pennsylvania, 1812, and Peter Baker, of Long Island, New York, in 1814. The next was the machine of Jer. Bailey, of Chester county, Pennsylvania, patented in February, 1822, which was a rotary mowing machine, having six scythes attached to a shaft. Four other patents were registered previous to 1828, when Samuel Lane, of Hallowell, Maine, patented a machine for cutting, gathering, and threshing grain all at one operation. It does not appear, however, to have been successful. Only one other machine, that of William Manning, of Plainfield, New Jersey, registered in 1831, and having several points of resemblance to some now in use, was patented previous to that of Obed Hussey, of Cincinnati, Ohio,

in December, 1833. The first public trial with this instrument was made before the Hamilton County Agricultural Society, near Carthage, July 2, of that year. During the next it was introduced into Illinois and New York; in 1835 into Missouri; in 1837 into Pennsylvania; and in 1838 the inventor established his manufactory at Baltimore. In June, 1834, Cyrus H. McCormick, of Rockbridge county, Virginia, received his first patent for cutting grain of all kinds by machinery, which was worked in 1831, and since improved, proving a source of large profit to the proprietor, as well as a great boon to this country and foreign lands. From that time to the present nearly every year has produced one or more modifications of harvesting machinery, among which may be mentioned that of Moore & Haskell, of Michigan, patented in June, 1836, which cuts, threshes, and winnows grain at the same time. From the date of this patent to the issue of McCormick's second patent, in 1845, fifteen other machines were registered, including that of W. F. Ketchum, of New York, in 1844, which has since obtained a high reputation. Since 1851, the new machines brought forward have been numerous. In June, 1852, twelve different reaping machines and several mowers were entered for trial before the Ohio State Board as contestants for the premium, all of them—including McCormick's and Hussey's—possessing nearly equal merits.

"The United States Agricultural Society, in 1857, instituted an elaborate trial of reapers, mowers, and implements, which took place at Syracuse, New York, in July of that year, when fifteen mowing machines, nine reapers, and fourteen combined mowing and reaping machines were entered. Medals and diplomas were awarded to several. Among those entered were Pell's, Manny's, Haines's, (Illinois Harvester,) W. A. Woods's, (J. H. Manny's improved,) Seymour & Morgan's, Burrall's, Warder, Brokaw & Childs's, Atkins's, (automaton self-raker,) Moore & Patch's, and C. H. McCormick's, for reaping alone. Mowing machines were entered by several of the same inventors, and also by Heath, Ketchum, Ball, Aultman & Miller, Hallenbeck, Kirby, Hovey, Allen, and Newcomb, and combined machines by some of the same parties, and by A. H. Caryl, Obed Hussey, J. H. Wright, and Dietz & Dunham.

"The whole number of harvesting machines produced in England and the United States up to that time amounted to 160 different kinds, about 100 of which were American; and in October, 1854, it had reached about 200.

"The progress of ideas, or the different channels in which they have run, in regard to the mode of action of the cutters of reaping machines, has been shown by Bennett Woodcroft, esq., of England, in a patent office publication containing illustrations of sixty-nine examples of reapers, including nine American machines. In thirty-one of the number the motion of the knives was rectilinear, and in thirty-three it was circular, while in five the knives were moved by hand. Previous to the introduction of American reapers, the tendency in England was toward a circular action of the cutters; since that time reciprocating motion has been more employed. Although reciprocating and rectilinear motion was used by Salmon, in 1807, only two of the English machines introduced previous to 1862, namely, Ogle's and Bell's, were examples of that kind of motion, and three American, namely, Manning's, Hussey's, and McCormick's, while there were twenty-one of the other kind. Of later examples there were seventeen with reciprocating motion, to eleven with circular.

"Diversities have also existed as to the mode of gearing the horse. Pitt's, Boyce's, Plucknett's, and Gladstone's machines were drawn behind the horses; Salmon's, Kerr's, Harke's, and other early English machines, were pushed before the horses, after the manner of the Romans and Gauls. In America both plans have been used, but since 1833 they have usually been placed behind the horses. By recently proposed improvements, horse-power harvesting machines with four horses will cut twenty acres of grain in a day, at a net cost—including eight dollars for the use of the machine, a driver, two binders, and two hands to shock up—of ninety cents an acre, which harvested by hand would cost $1 90 per acre. The binding is now sometimes done with wire on the large grain-fields of the west, and a machine has lately been invented for performing that part of the labor. There can be little doubt that we shall soon have machines that will cut, gather, and bind up the grain at one operation. American reaping and mowing machines have now been introduced into every civilized country. Their usefulness has been universally acknowledged. In our own land, where labor is so high, and the season so short, they are indispensable. In many sections the labors of sowing and planting the spring crops are quickly followed by haying and harvesting. Corn, beans, potatoes, and other crops require the use of the hoe and cultivator. Summer fallows, for wheat, claim attention at this time; and no sooner is the labor of harvesting over, than the American farmer is under the necessity of sowing his winter wheat, which in the northern and western States is sown from one to two months earlier than in England.

"The nature of our climate, the character of our crops, the scarcity of labor, and the extent of our agricultural operations, all conspire to increase the introduction and use of these and all other implements and machines that will expedite the labors of the farm.

"It is difficult to conceive that American agriculture could have attained its present condition had the invention of reaping and mowing machines been delayed thirty years. The extent to which they are already used is enormous.

"The editor of the Genesee Farmer, Rochester, N. Y., has collected directly from the manufacturers the following statistics of the number of reaping and mowing machines made by a few of the leading firms engaged in this important branch subsequent to the returns of the census in 1860.

"C. Aultman & Co., Canton, Ohio, made last year (1863) 3,100 'Buckeye' mowing and reaping machines, and this year (1864) 6,000 of the same machines.

"Bomberger, Wight & Co., of Dayton, Ohio, have made 1,250 'Ohio Chief' reapers; Rufus Dutton, who formerly manufactured the same machine, has made 3,156, making 4,306 in all.

"Of the 'Manny' reaping and mowing machine there have been manufactured in the State of Illinois, up to 1863, about *forty thousand*. In 1864 there have been made of the same machines in Rockford, Illinois, 10,500.

"Messrs. Adriance, Platt & Co., of Poughkeepsie, New York, have also made 2,500 'Manny' machines for the New

England States. The same parties have also manufactured 1,100 'Buckeye' machines for the New England States, New Jersey, &c.

"S. M. Osborne & Co., of Auburn, New York, have made 15,000 of 'Kirby's' mower and reaper. The Buffalo Agricultural Machine Works have also made 7,000, and other parties have made 5,000, making 27,000 of these machines that have been manufactured in the United States.

"Messrs. Seymour, Morgan & Allen, of Brockport, New York, have made 7,200 of their 'New Yorker' and other machines. Messrs. Warder & Childs, of Springfield, Ohio, also manufacture the same machine, and have made about 9,000.

"The Messrs. McCormick Brothers have manufactured at their establishment in Chicago over 55,000 of their celebrated reaper—6,000 in 1864.

"The establishment of Mr. R. L. Howard, of Buffalo, New York, has manufactured 20,000 of the 'Ketchum' mowing machines, and 5,000 reapers and mowers combined, and 3,500 of the 'Howard harvesters.'

"Mr. Walter A. Wood, of Hoosick Falls, New York, has made over 30,000 reaping and mowing machines. In 1858 Mr. Wood sent an agent to England with fifty; the next year he sent two hundred and fifty machines, and since then his sales in Great Britain and on the continent of Europe have averaged over 1,000 per annum.

"It thus appears that the manufacturers we have named have made two hundred and fourteen thousand and ninety-four mowers and reapers.

"We present these facts, obtained directly from the manufacturers, that our readers may form some idea of the magnitude of the reaper and mower business. There are other machines manufactured of which we have not ascertained the number, but we may safely conclude that there have been two hundred and fifty thousand reaping and mowing machines manufactured and in use in the United States; the importance of which may be estimated, when it is considered that a common reaper will cut from ten to twelve acres in a day of twelve hours, and a mower eight to ten acres in the same time.

"Another valuable implement for facilitating harvesting operations is the hay-unloading fork, with which, by the aid of a horse, a load of hay can be elevated to the stack or mow in a few minutes. Several varieties of these useful little machines are manufactured, and tens of thousands are already in successful use.

"The wooden revolving hay-rake (invented by Moses Pennock, of Pennsylvania, in 1824, and now well known in all parts of the country) also greatly lessens the labor of haying. Fine steel-toothed rakes leave less hay on the ground, but for general use on American farms this wooden revolving hay-rake is one of the most simple, useful, and efficient machines yet invented. On large farms, the sulky wire-tooth rake is fast superseding all others. They throw the windrow into heaps or bundles of eighty or one hundred pounds each, ready for cocking or loading. A boy and horse can thus rake and bunch twenty acres a day. The hay-fork, or patent pitch-fork, is another recent improvement of value.

"For THRESHING AND CLEANING GRAIN, we have machines which are confessedly unsurpassed. In our preliminary report we gave an outline of the progress of invention in this class of implements.

"Nearly all threshing machines now in use have an apparatus for separating the grain from the straw and chaff, and carrying the straw up on to the stack. This simple apparatus is now so common that it attracts no notice, except from the English or continental visitor, to whom it is a novelty. Many machines have also an apparatus for bagging the grain when clean.

"The English threshing machines, especially those drawn by steam, have a much more finished appearance, but for simplicity and efficiency they are in no way superior to those of American manufacture. In fact, wherever the American threshing machines have come into direct competition with those of British and European construction, the American machines have proved superior.

SCYTHES.

"Although the genius of modern improvement promises ere long to rob hay-making of one element of the picturesque, it has not yet wholly succeeded in banishing the hand-scythe and mower from modern scenery. Tedious and laborious as its use appears, compared with that of the mowing machine, it is wonderfully effective in comparison with the rude practice of the Mexican of our day, who cuts his grain and hay by handfulls with a common knife. It may not be generally known that the most valuable improvement made upon this implement for centuries was by one of the first iron-workers of Massachusetts, more than two hundred years ago, in the very infancy of the colony. In the year 1646 the general assembly of that province granted to Joseph Jenckes, of Lynn, a native of Hammersmith, in England, and connected with the first iron-works in that colony, the exclusive privilege for fourteen years "to make experience of his abillityes and inventions for making," among other things, of "mills for the making of sithes and other edge-tooles." His patent "for ye more speedy cutting of grasse" was renewed for seven years in May, 1655. The improvement consisted in making the blade longer and thinner, and in strengthening it at the same time, by welding a square bar of iron to the back, as in the modern scythe, thus materially improving upon the old English scythe then in use, which was short, thick, and heavy, like a bush-scythe.

"The introduction of the scythe and axe manufacture into Massachusetts, Connecticut, and Rhode Island, is to be in a great measure ascribed to Hugh Orr, a Scotchman by birth, who came to Massachusetts about 1737, and a year or two after erected at Bridgewater the first trip-hammer probably in the colony. He engaged in the manufacture of scythes and other edge-tools, in which he acquired a wide reputation. His son, Robert Orr, by successful experiments, established the improved manufacture of scythes by the trip-hammer, and also introduced the iron shovel manufacture into the State. As early as 1766 samples of home-made scythes, shovels, spades, hoes, &c., were laid before the Society of Arts, in New York, and approved.

They were probably from the manufactory of Keen & Payson, of that neighborhood, whose improved scythes, often called Salem scythes, then claimed to be superior in quality and form to any others. The non-importation and non-intercourse of the revolutionary period, and during the last war with England, encouraged the domestic manufacture of scythes and other articles of hardware, which, before the end of the last century, were made in different parts of New England in considerable quantity. Scythes were made in Plymouth county, Massachusetts, and to the number of two or three hundred dozens annually, at Canton, in Norfolk county, and also at Sutton, in Worcester county, which town had in 1793 seven trip-hammers and five scythe and axe factories. In 1810 there were nine factories in Sutton, and two in Oxford, and in 1814 seven others had been erected in the county, some of which could make 1,000 dozens annually. Scythes were at the same time made in Boston, and in 1803 the manufacture was commenced at Orange, by Levi Thurston, who employed in it the first tilt-hammer in the town. A few years later there were two scythe factories at Colebrook, in Litchfield county, Connecticut, which county in 1820 returned the largest manufacture of scythes of any in the Union. At Southfield, Rhode Island, large numbers of scythes were made at that time for exportation. As early as 1812, the scythe factory of S. & A. Waters, at Amsterdam, in Montgomery county, New York, turned out about 6,000 scythes annually. They were made at many small establishments throughout the Union, along with axes, sickles, and other edge-tools and cutlery, shovels, &c., by the aid of the trip-hammer, and were in good demand. The price in 1820 ranged from twelve dollars to eighteen dollars per dozen.

"About the latter date was commenced, at West Fitchburg, Massachusetts, one of the oldest scythe factories now in the country, then owned by F. T. Farwell & Co., which in the hands of its original and later proprietors has originated many improvements in the manufacture, and given reputation to its well-known brand. At a later period, Harris's scythes, extensively manufactured at Pine Plains, in Dutchess county, New York, obtained a high repute, and are said to have been counterfeited in England. The mammoth scythe factory of R. B. Dunn, at North Wayne, in Maine, was a few years ago considered the largest in the world. In 1849 it turned out 12,000 dozens, requiring 450,000 pounds of iron, 75,000 pounds of steel, 1,200 tons of hard coal, 10,000 bushels of charcoal, 100 tons of grindstones, and half a ton of borax. About the same time, the scythe and cast-steel fork manufactory of D. G. Millard, near the village of Clayville, New York, made about 13,000 dozens of scythes and forks annually, by water-power. In 1860 Massachusetts was the largest producer of scythes, returning $168,550 as the aggregate value of the product of ten establishments. Maine ranked second in the value of its scythe manufacture—$129,363 by three factories. In New York, four establishments turned out scythes worth $117,440, and one factory in Rhode Island employed 100 hands, producing to the value of $100,000. The total value of scythes made in 1860 was $552,753, which was the product of twenty-two factories and 474 hands.

SHOVELS, SPADES, HOES, AND FORKS.

"These articles, intimately but not all so directly connected as the foregoing with agriculture, in 1860 gave employment in five States, to forty-three establishments, the value of whose manufacture was $1,452,226. The hands engaged in them numbered 1,015. Upward of one-half the whole value was made in eleven factories in Massachusetts, which, together, employed 578 workmen, and produced an annual value of $777,048, being relatively much the largest concerns in the country. In New York there were twenty-three manufactories, whose product was $307,428, and the number of hands employed 233. Six factories in Pennsylvania employed 177 men, and produced wares to the value of $312,450.

"The manufacture of these articles has long been an established industry in Massachusetts and some other States, having been commenced before the Revolution. The shovel manufacture was successfully introduced at an early period at Easton and Bridgewater, in Massachusetts, where the Messrs. Orr, before mentioned, were instrumental in establishing it by the use of the tilt-hammer. In 1788 the iron-plate shovels made at Bridgewater were deemed superior in workmanship to the foreign article which they undersold. The Easton shovel manufactory—commenced on a small scale nearly sixty years ago by the late Oliver Ames—made in 1822 about 2,500 dozen annually. The proprietor in 1827 took out a patent for improvements in the manufacture, which contributed to give his wares a high reputation, and greatly to extend and perfect the business of his establishment. In 1835, Oliver Ames & Sons had large manufactories at Easton, Braintree, and West Bridgewater, which employed nine tilt-hammers, and were capable of making forty dozen spades and shovels per diem, each shovel passing through the hands of twenty different workmen. They now run twenty-six tilt-hammers, and produce two hundred and fifty dozen per diem. In 1822 three factories in Plymouth county, Massachusetts, made from one to two thousand dozens each per annum. In 1831, it was estimated that about 5,000 dozens of shovels, worth $35,000, were made in New York State annually. It was computed that Litchfield county, Connecticut, at the same date made shovels and spades to the value of $6,500, hoes worth $7,150, pitchforks to the value of $20,000, and scythes valued at $56,000. A steel shovel and spade factory in Philadelphia consumed annually about fifty tons of American steel. The sheet-iron shovel was patented in 1819, and cast-steel shovels in 1828. The first American patent for improvement in hoes was registered in 1819, and for cast-steel hoes in 1827, by C. Bulkley, of Colchester, Connecticut. But cast-steel hoes were made in Philadelphia by at least two manufacturers in 1823. In Pittsburg, Pennsylvania, where scythes, sickles, hoes, shovels, and other hardware were made in considerable amount previous to 1803, Messrs. Foster & Murray carried on the manufacture by steam-power in 1813. On account of the fall in the price of iron and steel, superior steel hoes were made in Pittsburg in 1831 for about $4 50 per dozen, or one-half the price of iron hoes ten years before. Socket-shovels were made at nearly the same price, which was about one-third their former price. Two large establishments in that place in 1836 made annually about 1,600 dozen steel hoes, 8,000 dozen of shovels and spades, 950 dozen steel and other hay and manure forks, and 600 dozen saws. Four establishments in 1857, in addition to nearly half a million dollars'

worth of axes, made 32,000 dozen of hoes, worth $208,000, and 11,000 dozen of planters' hoes, worth $94,000, besides picks, mattocks, vices, saws, &c. The Globe Sickle Factory, in the same place, produced a superior article of sickles to a greater value than all the other factories in the United States. The steel spring pitchfork was introduced by the late Charles Goodyear, by whom it was patented in September, 1831, at which time, and for several years previous, he was engaged with his father, Amasa Goodyear, in the manufacture and sale of hay and manure forks, and other hardware. Their store in Philadelphia is believed to have been the first in the United States for the sale of American hardware exclusively; but the failure of the business during the commercial troubles of that period led the junior Goodyear to abandon it for the new manufacture of India-rubber goods, with which his name will be ever associated in the annals of industry.

"A firm in Philadelphia now manufactures eyeless or solid axes, hoes, picks, shovels, &c. The instrument is made solid, while the handle with which it is to be worked has upon the end an iron socket through which the pick, &c., is put, and kept in its place by an iron wedge. The handle does not become loose, and will answer for any number of tools of the same size, and the blow is rendered more effectual. Many of these tools have been exported to California, where they are prized by the miners.

"There can be no doubt that our agricultural tools, such as hoes, forks, rakes, &c., are in most respects superior to those in common use in Europe. An English gentleman, who has spent some time in this country, says: 'For lightness and finish, combined with strength and durability, American forks and hoes are superior to all others.'

"Dr. Hoyt, alluding to the great international exhibition in London, in 1861, says: 'Among the minor implements of agriculture, we were both surprised and gratified to find a collection of American forks and hoes. The exhibitor was a sensible English dealer, who, discovering the superiority of this class of American implements as compared with articles of the same description manufactured in his own country, has for years been importing and selling them to his customers. On being asked why English manufacturers did not make them, he replied: 'We can't do it; have been trying ever since the great exhibition of 1851, but somehow don't succeed. It is a mortifying admission to make, but it is nevertheless true, that you Yankees have a knack of doing some things which we have not the skill to imitate.'"

COTTON-GINS.

"Although cotton-gins are made by a few establishments in the northern States, their manufacture is principally a southern one, and amounted in 1860 to the value of $1,077,315, which was the product of fifty-five establishments, all but three of them southern. Alabama is the largest manufacturer of machinery for cleaning cotton, having sixteen factories, employing 178 hands, and producing gins to the value of $434,805. Georgia ranks next, having twelve establishments, whose product exceeded a quarter of a million. The manufactories of cotton-gins in Mississippi are relatively the largest, three factories employing seventy hands, and returning an aggregate product of $131,900. In Texas, where the first cotton-gin was erected about 1823, there are four manufactories of gins. Many of these machines are made in northern machine-shops, along with other cotton machinery, from which they are inseparable in the general estimate of value.

"The history of the cotton-gin furnishes one of the most remarkable examples on record of the power of a single labor-saving machine to influence the social and industrial interests, not merely of a single nation, but in a great measure of the civilized world. The simple mechanism of the saw-gin invented by Whitney enabled one farm-hand to separate the seed from 300 pounds of cotton fibre in a day, instead of one pound, as he had been able to do by hand. Its introduction at the particular period when the completion of the brilliant series of inventions for carding, spinning, and weaving cotton had created a demand for the raw material, at once directed into a new and profitable channel the agriculture of the south, and at the same time furnished the manufacturing industry of Europe and America with one of the most valuable staples, and the shipping and commercial interests of the world with an enormous trade in its raw and manufactured products. The increase in the growth and exportation of raw cotton which followed has no parallel in the annals of industry, save in the wonderful development of its manufacture in England and the United States. The effects of this growth of the husbandry and manufacture of cotton in increasing national wealth, in furnishing employment to labor and capital, and in increasing the comfort of all classes, can scarcely be conceived in all its magnitude.

"In 1792, the year preceding the introduction of the saw-gin, the amount of cotton exported from the United States was only 138,328 pounds, and the total domestic consumption was about five and a half millions of pounds. During the next year there were exported nearly half a million pounds; in 1794, 1,601,700 pounds; in 1795, 5,276,300 pounds; and in 1800, 17,789,803 pounds.* In 1860 the production of ginned cotton in the southern States amounted to 5,198,077 bales of 400 pounds each, or 2,079,230,800 pounds, which was more than seven-eighths of the total production of cotton throughout the world. The quantity exported in that year was 1,765,115,735 pounds, equivalent to 4,412,789 bales of 400 pounds each. To prepare this large amount of cotton for market by the primitive methods would have been utterly impracticable. Not only is the labor of the planter facilitated and cheapened by the use of the machine, but the cotton is much better cleaned than by the old methods, which left it unsuitable for the finer fabrics.

"Although the earliest mode of separating cotton from the seed, and the one chiefly practiced in the cotton States previous to the invention of the saw-gin, was to separate the seed with the fingers, yet mechanical contrivances for that purpose have been long in use, having been chiefly borrowed from India, the cradle of the cotton culture and manufacture. In that country

* Woodbury's Treasury Report, 1835–'36.

the practice of beating out the seed was long in use. A more effectual modification of the same method, employed for centuries in eastern countries, and very early introduced into Georgia, which took the lead in cotton husbandry, was the bow-string operation. It consisted in the employment of a long bow fitted with a multitude of strings, which being vibrated by the blows of a wooden mallet while in contact with a bunch of cotton, shook the seed and dust from the mass. Hence upland or short staple cotton became known in commerce as 'bowed cotton.' A form of the roller-gin appears also to have been used in India in early times, as mentioned by Nearchus, and consisted of two rollers of teak-wood fluted longitudinally, and revolving nearly in contact. In 1728 we find mention of "little machines, which being played by the motion of a wheel, the cotton falls on one side, and the seed on the other, and thus they are separated.'

"About the year 1742, M. Dubreuil, a wealthy planter of New Orleans, invented a cotton-gin which was so far successful as to give quite an impulse to the cotton culture in Louisiana, but nearly forty years later the colonial authorities in Paris recommended the importation of machinery from India for cleaning the seed.

"Early in the Revolution, Kinzey Borden, of St. Paul's parish, South Carolina, constructed a roller-gin, believed to have been the first ever used in that State for cleaning the long staple and silky cotton, of which he was one of the first cultivators. It consisted of pieces of burnished iron gun-barrels secured by screws to wooden rollers turned by wooden cranks, like a steel corn-mill. A Mr. Bisset, of Georgia, in 1788, contrived a gin having two rollers revolving in opposite directions, operated by a boy or girl at each, by which five pounds of cleaned cotton was made per diem. Nothing but hand-gins, resembling the cotton hand-mills of India, were yet known in the south, although foot or treadle gins appear to have been in use at this date in Philadelphia and vicinity, some cotton being then raised in New Jersey, Maryland, and Delaware. A great improvement in the treadle gin was made about the year 1790, by Joseph Eve, of Providence, Rhode Island, then residing in the Bahamas, and was patented by him in 1803. It was a double gin, with two pairs of rollers placed obliquely one above the other, and, by adding iron teeth and pulleys, was made by a little assistance to feed itself. It could be worked either by horse or water power. Mr. Pottle, of Georgia, substituted two single rollers for the double ones, and produced a gin very popular in that State for some time. The present form of foot or treadle gin was first introduced into Georgia from the Bahamas, in 1796. It was improved in 1820 by Mr. Harvie, of Berbice, who obtained a patent, and afterwards by another person, who obtained a patent in the United States for making the rollers hollow, to prevent them from becoming hot while revolving. Other improvements on the roller-gin were patented in 1823 and subsequent years by Eleazer Carver, of Bridgewater, Massachusetts, who in 1807 commenced the manufacture of saw and roller gins in Mississippi and Louisiana, then a new country without saw-mills—of which he erected one of the first in these territories—or any machinery for manufacturing the several parts. The Whittemores, of West Cambridge, also secured patents for improvements on the roller-gin, which was in some respects superior to all others, but was found to injure the staple, and was abandoned. Other modifications of these machines were introduced by Birney, Simpson, Nicholson, Farris, Logan, Stevens, McCarthy, and others, several of which were popular in their day, and preferred in certain sections of the cotton States. The machines of Farris and Logan were improvements upon Eve's mechanism, and at a recent period were still used to some extent with steam-power. Jesse Reed, of Massachusetts, inventor of the tack-machine, patented cotton-gins in 1826 and 1827, the latter for cleaning Sea Island cotton, and the eminent American inventors, Jacob Perkins and Isaiah Jennings, each labored in this field. The roller-gin is especially adapted for cleaning the long staple or Sea Island cotton, the long, silky, delicate fibre of which is injured by the saw-gin. In the original machines, a pair of rollers worked by one hand would make about twenty-five pounds of clean cotton in a day. A recent improvement by Mr. Chichester, of New York, consisting of a fluted roller of polished steel, and one of vulcanized rubber, &c., is said to clean 300 pounds per diem, without crushing a seed. The Parkhurst roller-gin, though costly, is deemed a superior machine in Alabama and other cotton districts. The Louisiana cylinder-gin for short staple cotton, made by Jenks, of Bridesburg, Philadelphia, is also much esteemed for completely removing all extraneous matters without injury to the fibre. But as the Upland short staple, or black-seed cotton, was the first variety cultivated in the south, a means of removing the seed from its tenacious envelope was early sought, and happily supplied by the genius of Eli Whitney, a native of Worcester county, Massachusetts, under the patronage of the widow of General Greene, of Georgia, and her husband, Mr. Miller. Whitney's saw-gin, patented in March, 1794, was the first cotton-cleaning machine recorded in the United States Patent Office. Its appearance produced intense excitement, and numerous infringements of his patent rights, which involved him in expensive and vexatious lawsuits, and finally drove him into other enterprises, in which his ingenuity achieved reputation and success. In 1796 Whitney and partner had thirty machines in operation in Georgia by animal or water power, and in December, 1801, the legislature of South Carolina purchased the right for that State at a cost of $50,000, and threw it open to the public. One of the early invasions of the patent was by Hogden Holmes, of Georgia, who also patented a saw-gin in 1796. Two other Georgians the same year took out patents for saw-gins, and in 1803 another was taken for a saw-gin by G. F. Saltonstall, of North Carolina. Among other improvements on gins made by Mr. Carver, before mentioned, who had long experience in their manufacture, was the grate patented by him in 1823, which being placed where the seed is arrested and the fibre taken from it by the saw, prevented clogging, and the delay of cleaning the saw, &c. In 1837 he patented an improvement in ribs for saw-gins. Mr. McCarthy in 1840 connected a vibrating saw to the roller-gin, adapting it for cleaning both green and black seed cotton. This machine it was thought would supersede Whitney's, the fibre cleaned by it having brought three cents per pound more in the Mobile market than that cleaned by the latter.

"The manufacture of cotton-gins has long formed a branch of business in the machine-shops of the northern and middle States, and an independent business in several southern cities. One of the earliest and most extensive of these concerns was that of Samuel Griswold, at Clinton, Georgia. In 1833 the business was commenced in Autauga county, Alabama, by Daniel

Pratt, a native of New Hampshire, who had learned the business with Mr. Griswold. He there manufactured cotton-gins of superior quality for the neighboring southwestern States, including many for Texas, and even New Mexico, and acquired reputation and fortune in supplying the great demand, which required a branch house in New Orleans. His large accumulations were employed in erecting saw and planing mills, one of the first flouring-mills in Alabama, grist-mills, large cotton and cotton-gin factories, and other factories and tenements, forming the flourishing village of Prattville, where in 1851 he employed 200 hands, and made annually about 600 gins. He had manufactured since 1833 upwards of 8,000 cotton-gins. In 1846 he received from the University of Alabama the honorary degree of *master in the mechanic arts*, for the intelligent and benevolent exercise of his mechanical ingenuity and ample means.

"We have thus very briefly, as compared with the importance of the subject, given a sketch of the rise and progress of the manufacture and introduction of some of the most important implements connected with husbandry. To some it might seem a subject better discussed in the volume on manufactures; but believing it to be one of special interest to agriculturists, we have not hesitated respecting the propriety of incorporating the facts in a volume prepared especially for the farmers of the country, in whose tastes and progress we feel a deep interest, and whose advantages in late years we can appreciate from experience. We hope we may be pardoned for referring in a public work to our personal experience in stating that, as recently as 1849, when we relieved ourselves of the cultivation of a farm in Pennsylvania to take charge of the census, nearly all the operations of agriculture, except that of threshing the grain, were performed by manual labor; and the number of workmen to be provided for, especially during the period of harvest, rendered several months of the year a season of family solicitude and drudgery. On the same farm the crops of the past year were sown and gathered in a much shorter time, in better condition, with one-fourth the number of laborers—the grain being cut by machinery, and the grass mown, loaded on the wagon, and transferred therefrom to mow by means of mechanical appliances. The effects of such changes upon the character of the rural population of our country will soon manifest themselves by their elevating influences.

Statistics of shovels, spades, forks, hoes, scythes, and cotton-gins produced during the year ending June 1, 1860.

States	Number of establishments.	Capital invested.	Cost of raw material.	Number of hands employed.		Annual cost of labor.	Annual value of product.
				Male.	Female.		
SHOVELS, SPADES, FORKS, AND HOES.							
Maine	6	$24,500	$69,777	90	.....	$25,464	$94,450
New Hampshire	2	21,500	20,695	26	.....	7,680	35,300
Massachusetts	11	328,800	480,560	578	.....	205,320	777,048
Connecticut	1	2,000	14,250	6	.....	2,160	20,000
New York	24	322,200	116,282	237	1	78,764	309,228
Pennsylvania	10	264,000	164,304	250	.....	95,112	401,450
Ohio	1	300	600	1	.....	120	1,400
Total in United States	55	963,300	866,468	1,188	1	414,620	1,638,876
SCYTHES.							
Maine	3	155,000	38,570	96	.....	36,036	129,363
New Hampshire	3	25,000	13,300	36	.....	13,224	33,400
Massachusetts	10	112,000	59,120	151	.....	65,268	168,550
Rhode Island	1	100,000	55,000	100	.....	24,000	100,000
New York	4	273,025	47,047	86	.....	34,320	117,440
Pennsylvania	1	2,000	1,000	5	.....	875	4,000
Total in United States	22	667,025	214,037	474	.....	173,723	552,753
COTTON-GINS.							
Massachusetts	2	70,000	28,950	62	.....	34,680	78,600
New York	1	15,000	10,200	25	.....	13,500	45,000
South Carolina	8	28,200	6,500	24	.....	7,140	22,080
Georgia	12	88,600	56,155	170	1	51,828	263,710
Alabama	16	335,950	97,086	178	.....	69,300	434,805
Louisiana	5	36,700	32,920	35	.....	22,152	98,300
Texas	4	8,875	6,295	19	.....	10,020	28,285
Mississippi	3	152,000	36,970	70	1	39,060	131,900
Arkansas	4	17,500	8,852	24	.....	14,880	37,285
Tennessee	2	6,000	3,560	7	.....	3,600	12,350
Total in United States	57	758,825	287,488	614	2	266,160	1,152,315

Statistics of agricultural implements produced in the United States during the year ending June 1, 1860.

States.	Number of establishments.	Capital invested.	Cost of raw material.	Average number of hands employed.		Annual cost of labor.	Annual value of product.	
				Male.	Female.		In 1860.	In 1850.
Maine	46	$132, 350	$90, 604	189	.....	$62, 472	$210, 404	$259, 787
New Hampshire	29	46, 100	30, 877	96	.....	29, 868	86, 414	119, 096
Vermont	32	118, 400	61, 207	155	.....	60, 144	167, 347	133, 355
Massachusetts	56	365, 250	374, 549	630	.....	188, 599	842, 980	840, 141
Rhode Island	3	13, 200	6, 338	10	.....	3, 374	15, 845	72, 000
Connecticut	47	346, 500	185, 955	497	1	190, 380	611, 934	258, 047
Total in New England States	213	1, 021, 800	749, 530	1, 577	1	534, 837	1, 934, 924	1, 662, 426
New York	333	2, 364, 846	1, 237, 051	2, 904	1	920, 201	3, 454, 082	1, 266, 276
Pennsylvania	260	1, 204, 520	519, 561	1, 465	.....	499, 002	1, 582, 071	853, 513
New Jersey	33	202, 850	114, 300	260	.....	74, 508	310, 460	72, 636
Delaware	17	70, 000	34, 560	116	.....	41, 112	104, 181	15, 175
Maryland	35	329, 900	120, 761	368	.....	99, 673	340, 430	257, 656
District of Columbia	.....	.....	.....	.....	.....	.....	.....	6, 550
Total in Middle States	678	3, 972, 116	2, 026, 233	5, 113	1	1, 634, 496	5, 791, 224	2, 471, 806
Ohio	182	1, 633, 825	793, 845	2, 239	.....	800, 260	2, 820, 626	557, 932
Indiana	103	462, 049	241, 312	709	.....	268, 200	865, 436	146, 025
Michigan	108	689, 272	263, 121	666	.....	199, 164	684, 913	30, 600
Illinois	201	1, 968, 995	649, 637	1, 790	.....	673, 388	2, 379, 362	761, 970
Wisconsin	81	403, 720	218, 452	666	.....	236, 689	735, 198	187, 335
Minnesota	12	19, 650	11, 870	42	.....	14, 364	45, 150	*
Iowa	44	126, 202	71, 118	208	.....	74, 364	233, 248	17, 900
Missouri	43	170, 550	127, 471	221	.....	88, 476	320, 236	37, 550
Kentucky	65	331, 095	148, 752	462	.....	173, 464	619, 355	184, 615
Kansas	1	2, 000	1, 000	3	.....	1, 440	3, 670	*
Total in Western States	840	5, 807, 358	2, 526, 578	7, 006	.....	2, 529, 809	8, 707, 194	1, 923, 927
Virginia	53	205, 700	116, 669	417	1	132, 276	429, 824	213, 906
North Carolina	22	76, 250	26, 002	100	.....	26, 016	86, 155	32, 930
South Carolina	13	15, 800	4, 957	30	.....	6, 420	15, 375	29, 939
Georgia	17	19, 715	5, 584	37	.....	11, 124	27, 300	228, 837
Florida	3	13, 500	5, 700	15	.....	6, 240	19, 700	*
Alabama	18	68, 620	31, 057	84	.....	28, 692	75, 636	34, 500
Louisiana	13	31, 500	7, 650	28	.....	10, 620	27, 300	25, 610
Texas	46	61, 055	35, 119	138	.....	42, 756	100, 200	*
Mississippi	34	105, 500	32, 923	127	.....	45, 252	111, 813	109, 260
Arkansas	7	1, 975	1, 973	10	.....	3, 096	8, 350	11, 900
Tennessee	15	64, 650	42, 935	109	1	43, 740	117, 260	97, 570
Total in Southern States	241	664, 265	310, 569	1, 095	2	356, 232	1, 018, 913	784, 452
California	5	6, 100	9, 250	12	.....	10, 620	23, 375	*
Oregon	5	5, 600	3, 009	7	.....	4, 680	12, 330	*
Total in Pacific States	10	11, 700	12, 259	19	.....	15, 300	35, 705	*
Total in United States	1, 982	11, 477, 239	5, 625, 169	14, 810	4	5, 070, 674	17, 487, 960	6, 842, 611