HEMP BAGGING.

The manufacture of hemp bagging in 1860 employed 34 establishments in 5 States of the Union, having an aggregate capital of $505,250, and giving employment to 661 male and 126 female hands. They consumed 6,247 tons of hemp, valued with other materials at $803,800, and the labor expended upon it cost $141,636. The total product was 9,540,000 yards of bagging, valued at $1,109,628.

This manufacture was principally carried on in the States of Kentucky and Missouri. The former State contained 26 establishments, with a capital amounting collectively to $323,050. These consumed annually 3,542 tons of hemp, worth with other materials $465,500, and employed 512 men and 18 women, whose wages amounted to $93,372. The quantity of bagging made was 5,750,000 yards, of which the value was $699,450. Missouri, with 3 establishments and a capital of $170,000 employed in this business, made from 2,600 tons of hemp 3,680,000 yards of bagging, valued at $371,578, or considerably more than one-half as much as Kentucky. The cost of material in that State was $314,000 per annum, and the labor of 125 males and 100 females cost annually $43,272. Two factories in Tennessee, employing 14 hands, made 70,000 yards, worth $13,000; and 1 in Alabama, with 12 hands, turned out 40,000 yards, valued at $6,000. From Wisconsin 2 factories having 6 hands were reported as making bags to the value of $19,600. The average value of the general product per yard was 11.52 cents; in Kentucky it was 12.16 cents, in Missouri about 10 cents, in Tennessee 18.57 cents, and in Alabama 15 cents a yard.

The manufacture of hempen bagging for packing cotton, generally called cotton bagging, according to the census of 1810, employed 13 establishments in Kentucky, 11 of which produced 453,750 yards, valued at $159,455. The larger part of this product, or 281,750 yards, including some duck, and worth $98,612, was made by 5 factories in Fayette county, chiefly in Lexington and vicinity, and 50,000 yards, by 2 mills, at Paris, in Bourbon county. In Georgia 9,463 yards, valued at $5,032, were made. There were also two manufactories of duck and cotton bagging in West Tennessee, although they were not reported as such; and there was another establishment in Philadelphia, employing 8 looms and capable of making 45,000 yards of bagging annually. In 1826 this article was extensively made, chiefly by negro operatives at Lexington, Paris, Danville, Shelbyville, and other places in Kentucky. A manufactory of cotton bagging, from cotton instead of hemp, was, about the same time, started at Nashville, Tennessee, by a Mr. Allen. The specimens of this new article induced some persons at Huntsville, Alabama, to advertise for 25,000 yards of it; and some planters in Missouri contracted with Mr. Rapp, of Economy, Pennsylvania, for 20,000 yards of the same, at 23 cents a yard, of the usual width. In 1829 the Phœnix mill, at Paterson, New Jersey, was awarded a premium by the American Institute, in New York, for the best article of cotton bagging which was made from Sea Island cotton. In addition to about 400,000 yards of cotton duck made in the place in 1832, the Phœnix Company consumed annually about 600,000 pounds of flax, and made 450,000 yards of duck and 143,000 yards of bagging, which was also made by steam-power at Elizabethtown. In 1830 considerable quantities of cotton bagging were also made from the waste of the cotton mills in Providence and vicinity, which weighed 1¾ pound to the yard, or ¼ pound more than the best hemp bagging. It was strong and stout, and was invoiced to southern markets at 18 cents a yard. A cotton hosiery factory at Newburyport also made about the same time cotton bagging for the southern markets. Cotton bagging, (of hemp,) osnaburgs and negro cloths were made by the South Carolina Manufacturing Company, in Darlington district, in 1829, and bagging and twine in Alabama in 1831. Upward of half a million yards of cotton bagging was made in Newport and Covington, Kentucky, in 1836, partly from Russian hemp.

In 1841 a machine for the manufacture of bagging from hemp, which carried the raw material through all the processes of heckling, spinning, and weaving, was in operation at Lexington, Kentucky. It was the invention of Andrew Caldwell, of that city, who claimed to be able to manufacture bagging for 3 cents a yard, saving 5 to 6 cents a yard in the cost over the former modes. It wove at the rate of 30 yards an hour, while other looms would produce only 40 to 50 yards per diem.

In 1844 it was estimated that there were 500 hand-looms in Kentucky engaged in making bagging, each of which produced weekly, on an average, 400 yards, or a total of 10,000,000 yards annually. In Louisville, New Albany, Cincinnati, and Maysville, five power-loom factories produced annually about 3,800,000 yards. In North Alabama and Tennessee, 80 hand-looms made an average of 15,000 yards each, or 1,200,000 yards annually; and 50 hand-looms in Missouri produced 750,000 yards, making a total manufacture of about 15,750,000 yards produced in the West in that year. At an average of 6 yards to each bale of cotton, that quantity was sufficient to bale 2,625,000 bales of cotton, and was in excess of the actual demand. The consumption of hemp was estimated at 1½ pound to the yard, or a total of 23,625,000 pounds, and the consumption for bale-rope at about as much more, being a total of 21,000 tons, which was 5,500 tons more than Kentucky produced in 1842. One factory at Cincinnati, the Fulton Bagging Company, made about 800,000 yards in the previous year, when the total production of the western States was computed at 10,200,000 yards, at an average cost of about 11 cents a yard.

The price showed a decline of about one-half from the selling price of domestic bagging in 1823–'24, when Kentucky bagging was quoted in New Orleans at 20 to 22 cents, and Scotch bagging, which formed the chief supply, at 22 to 26 cents a yard. Previous to that date, and for many years after, Scotch bagging was annually imported into southern ports to a heavy amount, and often sold at a price exceeding 50 cents a yard, at which it was quoted in New Orleans in March, 1822. Imported bagging was then subject to a duty of 15 per cent. ad valorem. In 1824, when the value of cotton bagging imported amounted to only $18,491, an effort was made in Congress to raise the duty to 6 cents per square yard, but 4½ cents was all that could be obtained. In May of the same year it was reduced to 3¾ cents, and in 1832 to 3½ cents the square yard.

In 1825 the value of the imports of this article amounted to $637,023, and during the 20 years from 1824 to 1843, inclusive, the value of cotton bagging imported was $7,561,390, an average of $378,069 per annum. The quantity imported on an average of the years 1832 and 1833 was 1,112,000 yards. The cotton crop at that time required annually for 1,100,000 bales, at an average of 5 yards per bale, about 4,400,000 yards more than was imported, and at 20 cents a yard the value of that quantity made in this country would have been $880,000.

On a revision of the tariff in 1842 a duty of 5 cents a pound on this article was proposed, and resisted by the cotton-growers as being equivalent to an annual tax of $1,422,222 on the cotton interests of the south. The duty was consequently fixed at 4 cents the square yard. A large increase of the domestic manufacture ensued, and in 1846, when the duty was changed to an ad valorem rate of 25 per cent., a Georgia senator stated that good bagging was made in Kentucky more than 5 cents a yard less than it cost in Dundee in 1842, and for 3 or 4 cents a yard less than the price in Scotland in 1846. The price of cotton bagging in 1838 was from 18 to 20 cents per yard, in 1841 from 25 to 27 cents, and in 1846 from 8½ to 9½ cents. Bale-rope in the first of those years cost from 7 to 8 cents a pound, in 1841 from 11 to 12 cents, and in 1846 from 3 to 4 cents. In 1852 the quantity imported was 497,301 yards, valued at $49,347, an average of nearly 10 cents a yard custom-house valuation. In 1857 the duty was reduced to 15 per cent., and in 1862 was laid at 2¼ and 3 cents a pound, according as it cost over or under 10 cents a pound. The number of running yards imported in the fiscal year preceding the late war was only 97,615, valued at $12,258. The amount of cotton exported in that year would have required, at an average of 6 yards to each bale, 22,374,070 yards, or more than double the quantity returned by the marshals. The amount reported was probably less than the actual manufacture, and a portion was probably included with other linens and cordage, from which it cannot always be accurately separated. For many years past, however, large quantities of gunny bags have been annually imported direct, and some through British ports, from the British East Indies and Australia, which is chiefly used at the south for baling cotton. The value of gunny bags imported in 1858 was $420,966, and of gunny cloth $1,016,800. In 1860 the value of the former article imported was $287,387, and of the latter $1,795,256; and in 1862 the weight of the two articles imported was

9,780,876 pounds, valued at $230,404. It was subject, under the act of 1857, to a duty of 15 per cent. ad valorem, which was increased in 1862 to 25 per cent. Some bagging is also made, it is probable, from cotton and the waste of cotton mills both in the manufacturing and cotton-growing States.

Statistics of hemp bagging produced during the year ending June 1, 1860.

States.	Number of establishments.	Capital invested.	Tons of hemp used.	Cost of raw material.	Number of hands employed.		Annual cost of labor.	Annual value of product.	Yards of bagging.
					Male.	Female.			
Wisconsin*	2	$2,700	.....	$12,800	3	3	$1,392	$19,600	.....
Missouri	3	170,000	2,600	314,000	125	100	43,272	371,578	3,680,000
Kentucky	26	323,050	3,542	465,500	512	18	93,372	699,450	5,750,000
Tennessee	2	5,500	68	7,500	14	.....	1,800	13,000	70,000
Alabama	1	4,000	37	4,000	7	5	1,800	6,000	40,000
Total in United States	34	505,250	6,247	803,800	661	126	141,636	1,109,628	9,540,000

* More properly classified as "bags."

PAPER.

The total number of paper-mills in the United States in 1850 was 443. They employed an aggregate capital of $7,260,864, and 6,285 hands, of whom 2,950 were females. The annual cost of labor was $1,497,792, and of raw materials $5,553,929, and the value of the product was $10,187,177.

On the 1st of June, 1860, the number of paper manufactories in 24 States was 555. The total amount of their investments was $14,052,683, and the number of hands was of males 6,519, females 4,392—total, 10,911. The annual expenditure for labor was $2,767,212, and for materials $11,602,266. The total value of product was $21,216,802, which included the values of 131,508,000 pounds of printing paper, 22,268,000 pounds of writing paper, 33,379 tons of wrapping paper, 8,150 tons of straw board, besides 1,944,000 pounds of colored paper, 91,960 pounds of bank-note paper, and 3,097 tons of wall paper—a total weight of 253,778,240 pounds. The average value per pound of the whole quantity was upwards of 8⅓ cents (8.36) The increase in the value of the product over that of 1850 was 108.2 per cent. The quantity was in the proportion of 8.07 pounds to each person in the Union.

In the New England States the paper-mills numbered 204, which produced nearly one-half of the total value of paper made. Their aggregate capital was $6,533,460, the number of hands 5,420, (one-half females,) and the cost of wages was $1,375,790, and of materials $5,907,365 annually. The product was 56,105,300 pounds of printing, 17,298,000 pounds of writing, and 11,600 tons of wrapping paper, 1,568 tons of straw pasteboard, 1,720,000 pounds of colored papers, 67,000 pounds bank-note and 2,147 tons of wall paper, valued altogether at $10,502,069, an increase of upward of 109 per cent. in ten years. Considerably more than one-half the capital and product was reported by 99 manufactories in Massachusetts, employing 3,339 persons, of whom 1,845 were females, and making paper valued at $6,170,127, the increase being upward of 137 per cent. It was the value of 27,747,000 pounds of printing paper, 15,598,000 pounds of writing, 6,443 tons of wrapping paper, and 815 tons of straw board, beside colored and wall papers.

In Connecticut there were 55 mills, producing paper of the value of $2,453,258. The manufactures consisted largely of printing paper, of which 14,581,500 pounds were made, 1,500,000 pounds of writing paper, 2,848 tons of wrapping, 1,000,000 pounds colored, 575 tons of wall paper, and all the bank-note paper made in New England, namely, 67,000 pounds The principal factories were at Hartford, where there were 21, and at Norwich. The Pacific mills at Windsor Locks, near Hartford, and those of the Chelsea Manufacturing Company, at Norwich, are among the largest establishments of the kind in the world.

In the other New England States the value fell below one million dollars in each. In Maine, which had 14 mills, it amounted to $990,000, and the manufacture in that State showed the largest rate of increase of all the New England States, viz: 420 per centum. In New Hampshire there were 24 mills and in Vermont 12, and from Rhode Island none were reported.

The middle States contained 273 paper-making establishments, whose aggregate investments in the business amounted to $5,499,770. The labor was performed by 3,971 persons, including 1,188 females, whose annual wages cost $950,444, the cost of material being $4,292,358, and the value of the manufactures $7,908,437, an increase of 102 per cent. on the product of 1850. The quantity of paper made in these States was 50,604,500 pounds of printing, 4,923,000 pounds of writing, 17,446 tons of wrapping, and 6,582 tons of straw boards, beside miscellaneous articles.

The largest product was returned by 126 mills in New York, containing 1,857 hands, and having a capital of $2,039,000. They manufactured 17,304,300 pounds of printing paper, 1,772,000 pounds of writing paper, 14,340 tons of wrapping paper, and 2,154 tons of straw board, beside 950 tons of wall paper, valued in all at $3,059,776, an increase of 87 per cent. Pennsylvania contained 84 paper-mills, having $1,917,970 in capital and 1,082 hands, who made 18,198,000 pounds of printing, 400,000 pounds of writing paper, 1,503 tons of wrapping, 1,500 tons of straw board, and 24,960 pounds of bank-note paper, the total value of which articles was $2,367,268, which was an increase of 128 per cent. since 1850. New Jersey had 36 paper manufactories, with an aggregate capital of $990,000, 715 hands, and produced paper of the value of $1,582,703, the increase being over 78 per cent. These mills made 8,198,000 tons of printing paper, 2,750,000 tons of writing paper, 668 tons of wrapping, and 2,928 tons of straw board, beside 224,000 pounds of colored papers. They turned out more writing paper and straw board than were made in any other State in the Union. The principal mills are at Trenton, Paterson, and Newark, the Ivanhoe mills, at Paterson, being one of the most complete in the United States. Twenty-five mills in Maryland made paper of the value of $513,690, and two in Delaware made $385,000 worth of printing and wrapping papers, the increment in both considerably exceeding 100 per cent.

In the western States there were 53 mills, of which 29 were in Ohio. The total capital employed in paper-making in those States was $1,386,603, the number of hands was 1,109, of which 362 were females; the annual cost of labor was $299,436, and of materials $1,074,178. The product amounted to $2,041,793, an increase of 104 per cent. It embraced 18,408,000 pounds of printing paper, 48,000 pounds of writing paper, and 3,381 tons of wrapping paper. The writing paper was all made in Ohio, which also produced 12,590,000 pounds of printing paper and 2,500 tons of wrapping, valued altogether at $1,382,141, the rate of increase being upward of 197 per cent. The 29 mills in Ohio employed a capital of $875,500 and 724 hands. In Indiana there were 10 mills, in Michigan and Wisconsin five each, in Illinois two, and in Iowa and Kentucky each one mill. In each of the three first named and in Kentucky between one and two million pounds of printing paper, beside wrapping paper, was made, Wisconsin producing the largest amount, or 1,724,000 pounds, and showing also the largest rates of increase in the value. In Kentucky the value of paper made showed a falling off from the product in 1850, and in Iowa, where no paper was made in that year, 170,000 pounds, worth $17,400, was produced.

The southern States numbered, in 1860, 24 paper-mills, whose aggregate investments were reported at $572,850. They employed 397 persons, (131 of them females,) the cost of whose labor was $137,042 per annum, and of material the cost was $320,365. They manufactured 6,120,200 pounds of printing paper and 952 tons of wrapping paper, valued in all at $724,503, showing an increase since 1850 in the ratio of 176.5 per cent. In Virginia nine mills made 1,940,000 pounds of printing paper, worth $270,000. Six mills in North Carolina made 1,495,200 pounds, valued at $165,703, and four in Georgia produced nearly the same quantity and value. Three mills in South Carolina made 1,085,000 pounds of printing paper, worth $96,500, and two in Tennessee made 200,000 pounds, worth $28,000, which was a decrease. From Alabama, which returned a value of $18,000 in 1850, no return was made. The increase in Georgia and the Carolinas was very large.

A paper-mill in California, (the Pioneer mill, at Taylorsville, in Marin county,) with a capital of $60,000 and 14 male hands, made 360,000 pounds of printing paper, valued at $40,000. The cost of material was $8,000, and of labor $4,800.

The annual production of paper in the United States is greater than that either of Great Britain or France, and the annual consumption is estimated to exceed that of both countries together. The consumption of rags for paper by 380 paper-mills in Great Britain, in 1854, was about 201,000,000 pounds, (an increase in 20 years of upwards of 100 per cent.,) from which were made 177,800,000 pounds of paper, whereof 161,700,000 pounds were consumed and 16,112,000 exported. In France about 235,200,000 pounds of rags were made into 156,300,000 pounds of paper, (assuming 1½ pound of rags to make one pound of paper,) making in the two countries a total weight of 436,200,000 pounds of rags consumed and of 334,600,000 pounds of paper made, the latter being at the rate of 4.55 pounds per capita for both populations. The consumption of rags in the United States at the same time was assumed to be 405,000,000 pounds annually, and the weight of paper made 270,000,000 pounds, an average of 10.80 pounds of paper per capita.

Although the weight of rags consumed in 1860, calculated at the rate above mentioned, was only 380,667,360 pounds, and the weight of paper made only 253,778,240, or a little over 8 pounds per capita, showing the foregoing estimate for the United States to have been probably too large, there is little doubt that when the actual production, the exportation, and importations of each country are compared, the United States will be found to exceed either in the amount of its annual production, and both in the consumption per capita and in the aggregate. The decrease of paper-mills in England was in consequence of improvements in machinery and the use of steam-power, which in that country and in this has rendered the establishments much more extensive than formerly.

Some of the largest mills in the United States have turned out paper at the rate of seven tons per diem. The materials used are not only cotton and linen rags, the waste of cotton, flax, and hemp mills, and of rope and cordage factories, coir and jute, hemp and other fibres, either crude, fibrilized, or in the shape of worn-out bagging, cable rope, &c., but also straw, hay, and stable refuse, various kinds of wood, particularly bass or white wood, hemlock, &c., corn-husks, mulberry leaves and bark, canes and reeds, &c., &c.

HISTORY AND STATISTICS.

The first paper-mill erected within the present limits of the United States was built at Roxborough, near Germantown, Pennsylvania, as early as 1693. This was fifty years after the first introduction of printing in the British colonies, but not more than five or six years after a proclamation was issued by government to establish the first manufactory of white paper in England.

The mill was built and owned by an ancestor of David Rittenhouse, whose family had been long engaged in the manufacture of paper in Holland, and by William Bradford, the first printer in the middle colonies. Printing, writing, and wrapping paper was made there until the mill was carried away by a freshet. In 1728 Mr. Bradford, while a government printer in New York, owned a paper mill at Elizabethtown, New Jersey, which was probably the second one built in the colonies. About the same time, or earlier, a paper-mill was erected on Chester creek, Delaware county, Pennsylvania, by Thomas Wilcox, which afterward supplied the press of Benjamin Franklin with printing paper, and during the Revolution, in addition to writing and printing paper, clothiers' paste-boards, &c., made the bank-note paper used in the old continental paper currency. This was made by the old hand process, which his son Mark continued and improved upon at the Ivy mill until 1827. The mill, after having been in operation a hundred years, gave place in 1829 to another, in which hand-made and bank-note paper has continued to be made to the present time. A paper-mill was early erected at Ephrata, in Lancaster county, Pennsylvania, for the use of a German printing press at that place, and was in operation at the Revolution. The paper manufacture in Pennsylvania and the adjoining provinces was greatly promoted by the enterprise of the Philadelphia printers and booksellers, and particularly by Dr. Franklin. The three provinces of Pennsylvania, New Jersey, and Delaware, in 1769, contained

40 paper-mills, of which 6 were within the present limits of Philadelphia. The value of their manufactures was estimated at $100,000 annually. After the war, in 1787, Dr. Franklin stated that he had been interested in the establishment of 18 paper-mills, and the number in the States named was then 63, of which 48 were in Pennsylvania. They made yearly about $250,000 worth of paper. Among these was one at Wilmington, Delaware, owned by Messrs. Gilpin & Fisher, which produced a fine quality of paper. John Carnes, jr., of Delaware, in April, 1793, took out the first American patent for paper-making, which was for an improvement in the moulds. The second was issued in March, 1794, to John Biddis, of Pennsylvania.

During the year 1728 Daniel Henchman, a large bookseller and publisher of Boston, Benjamin Faneuil, Thomas Hancock, and others, obtained permission to erect the first paper-mill in Massachusetts. They were required by the terms of their license to make during the first 15 months 140 reams of brown and 60 reams of printing paper, and at least 500 reams, including 25 reams of writing paper, during each succeeding year thereafter. Samples of their manufacture were furnished the assembly in 1731, and in the following year this first New England mill was the subject of complaint by the paper merchants to the British Board of Trade, who ascertained that it made paper to the value of £200 sterling annually. It was built on the Neponsett river, at Milton, 7 miles from Boston, and, with some interruptions from lack of experienced workmen, continued in operation until the Revolution, or later. In 1796 there were three paper-mills in that town, where the business is still carried on. There were but three mills in the province at the date of the Revolution, and after the peace Andover, Worcester, Sutton, Springfield, and many other places contained paper mills. In 1792 the value of paper made in Massachusetts was estimated at £200,000 annually, and 4 years later the number of mills in the State was 20, of which 7 were on the Charles river and 6 on the Neponsett.

These mills had usually 2 vats each, and employed 10 men and as many boys and girls. Their annual product was about 70,000 reams of wrapping, printing and writing paper, the latter being all laid paper, made by the hand process, no machines, except for grinding the pulp, being then in use. Each mill required a capital of about $10,000, and was capable of making from two to three thousand reams annually of different kinds of paper. The price of printing paper was from $3 to $3 50 per ream at that time. Some of the mills in Pennsylvania were larger, and had 3 or 4 vats each.

In 1765 a large and complete paper-mill was put in operation at Olneysville, near Providence, Rhode Island; and in 1768 the first one in Connecticut was erected at Norwich, by Christopher Leffingwell, who, two years after, was paid by the assembly a bounty of 2*d.* a quire on 4,020 quires of writing paper, and 1 cent each on 10,600 quires of printing paper. A mill was in operation in 1776 at East Hartford, owned by Watson & Ledyard, who, in addition to printing paper for a weekly edition of 8,000 papers by the Hartford press, supplied nearly all the writing paper used in Connecticut and by the continental army.

A paper-mill was erected at Hempstead, Long Island, about 1768, by Henry Onderdonk and Hugh Gaine, a printer of New York, and the business is still carried on at that place. But in 1781 paper was so scarce in the State that the journal of the assembly was not printed. A paper-mill was built at Troy in 1793, by Webster, Ensign & Seymour, who made 5 to 10 reams of paper daily. Previous to that much of the paper used at Albany and vicinity was obtained from a paper-mill at Bennington, Vermont, erected during the Revolution, from which the paper was carried on horseback through the forests. In 1794 Colonel Matthew Lyon put up a paper-mill at Fair Haven, Vermont, for making paper from the bark of the bass-wood, both for wrapping and to supply a printing press owned by him.

One of the earliest paper-mills erected in the south was built at Salem, North Carolina, by the Moravians, who settled there in 1766. During the war the manufacture of paper in that and other States was encouraged by local bounties and other means, and on the return of peace by a loan from the State.

The report of Secretary Hamilton to Congress on the subject of domestic manufacture, in 1791,

classed the manufacture of paper among the branches which had arrived at the greatest maturity, and was most adequate to a national supply.

In 1796 the first paper-mill west of the Alleghanies was put in operation near Redstone Old Fort, (Brownsville,) in Fayette county, Pennsylvania. It was built by Samuel Jackson and Jonathan Sharpless, two Friends, from Delaware, and was long known as the Redstone paper-mill. A paper-mill appears to have been soon after built at Pittsburg, for which the proprietor, Mr. Cramer, in 1800, was able to collect only 260 pounds of rags, but in 1813 collected 70,000 pounds. The business in that town, in 1815, employed 50 hands and produced paper to the value of $40,000. In the following year the first steam paper-mill in the United States is said to have gone into operation at Pittsburg, with a steam-engine of 16 horse-power and 40 hands, and turned out $30,000 worth of paper. The first paper-mill within the limits of Ohio was the Ohio paper-mill, built about the year 1805, on Little Beaver creek, in Columbiana county, by John Bowman and others. In 1816 there was a steam paper-mill at Steubenville, producing paper of superior quality, more than sufficient to supply the neighboring counties, and in 1836 was considered the largest in the west. A paper-mill with two vats, at Mount Pleasant, in the same county, was in operation at the former date.

In 1802 the first paper-mill in Berkshire county, Massachusetts, which has ever since been the seat of an extensive paper manufacture, went into operation at Dalton. It has been long known as the "Old Berkshire" mill, and was built by Messrs. Wiswell, Crane & Willard, who during the next five years made about 20 tons of paper annually. Since 1810 it has been owned by David Carson and his sons, who greatly enlarged it in 1855, and made yearly 180 tons of paper, worth 20 cents a pound. The first mill in South Lee, which now makes more paper than any other town in the United States, was begun in 1806, by Samuel Church, on the site of Owen & Hurlbut's mill. About the same date a paper-mill was erected on the north side of the Chicopee, which, about 1825, became the property of David Ames, who introduced improved machinery and became the largest manufacturer of paper in the United States. It was run by his sons, who introduced many improvements in paper-making, until 1853, when it passed into the hands of the Lenox Chicopee Company.

In 1810 the marshals returned 179 paper-mills in 17 States, including one in the District of Columbia, but exclusive of Massachusetts, the number in which was not complete. They reported a manufacture of 425,521 reams, 22,500 rolls, and 428¼ tons of paper made, estimated, altogether, at $1,689,718. Of the whole number, 64 were in Pennsylvania, which made 165,981 reams and 340 tons of paper, worth $626,749; 28 in New York, of which the product was 77,756 reams, valued at $233,268, or $3 per ream; and the mills of Massachusetts made 95,129 reams and 22,500 rolls, worth $290,951. The value made in Connecticut was $82,188, and in the four States named it amounted to upwards of three-fourths the total product of the Union. In Pennsylvania, which produced 37 per cent. of the whole, returns were made from 14 counties, of which the principal producers were Delaware, Montgomery, and Berks, having, respectively, 11, 15, and 10 mills each, and Philadelphia county 6 mills, these counties, alone, exceeding the whole number in Massachusetts, which was estimated to be 39, chiefly situated in Middlesex, Norfolk and Worcester.

Eleven of the larger mills in the United States are ascertained to have an aggregate capital of $200,000, and to produce $150,000 worth of paper annually.

The consumption of paper was at that time chiefly supplied by the domestic manufacture, of which the product was limited only by the want of material. Rags began about that date to be largely imported for the use of paper-makers, and several attempts were made to utilize other fibrous materials in the paper manufacture. These efforts were stimulated in part by the American Company of booksellers, who offered, in 1804, gold and silver medals for the greatest quantities and best qualities of printing and wrapping papers made from other materials than cotton and linen rags.

In December, 1801, Joseph Condit, jr., of Newark, New Jersey, recorded a patent for making paper from curriers' shavings, and Burgiss Allison and J. Hawkins, of Burlington, in that State, were the next year granted patents for making paper from corn-husks, which at a later period was employed

by Dr. Jones, of Alabama, and has been the subject of some later patents in this country. Samuel Green, of New London, Connecticut, in 1809, took out a patent for making paper from algae or sea-weed, and J. M. Thorndike, of New York, in 1814, for making paper from pelts, and another was issued to E. H. Collier, of Plymouth, Massachusetts, for the use of sea-grass for paper-pulp, in 1828.

Improvements were also attempted in the machinery and various processes of paper-making. Wire-cloth for paper-moulds came into general use in England about the year 1780, but few other important improvements had yet been adopted. The paper was chiefly made of white rags beaten to pulp by tilt-hammers in stone or iron mortars, and the paper was unbleached and uncalendered.

In 1804 Abraham Frost was allowed a patent for preparing tow, &c., for making paper, and Francis Bailey, of Pennsylvania, one, in 1809, for hot-pressing paper. Phares Bernard, of Whitestown, New York, in the latter year, obtained a patent for weaving wire for paper-moulds. In 1816 Jacob Perkins and Thomas Gilpin, of Philadelphia, took out a patent for water-marks in paper, in imitation of those on hand-made paper. During the same month Mr. Gilpin, who had large cotton, woollen, and paper-mills on the Brandywine, took out a patent for an improvement in paper-making, which covered the use of the first cylinder machine made or operated in this country. It was made from published drawings and descriptions of the endless wire machine invented by Louis Robert in 1799, and subsequently improved by Gamble, Donkin and Foudrinier, in England, which had recently come into general use in Europe. It differed considerably from that machine, having been modified by the mechanical ingenuity of the proprietor. In February of the following year Mr. Gilpin sent to Philadelphia paper cut from a continuous sheet, which was used in printing Poulson's Daily Advertiser, a leading journal of the city, and afterward for several valuable publications from the press of M. Carey. Further improvements were made on the machine and the operations of the establishment were greatly enlarged, and employed nearly half a million dollars in capital. The machinery and improvements were all swept off by a flood in 1822. During the year 1817 a quantity of paper, considered superior to any ever before made in the United States, was manufactured by Thomas Amies, of the Dove Paper Mills, in Lower Merion, Montgomery county, Pennsylvania. It was made of the finest linen rags, in sheets 36 by 26 inches, and was valued at $125 per ream.

The prosperous paper manufacture of the middle States and New England was nearly prostrated by the heavy importations, chiefly of low-priced paper from southern Europe, which followed the peace of 1815. Of 70 paper-mills in full operation in Pennsylvania and Delaware in that year, containing 95 vats, which cost nearly half a million dollars, consuming 2,600 tons of rags, and employing 950 persons, and producing paper to the value of $800,000 per annum, but 17 vats were at work in October, 1819, and their product was reduced to $136,000. The number of hands employed was reduced to 175, and the annual wages paid from $247,000, in 1816, to $45,000. In the paper-hanging and card factories of Philadelphia and vicinity the hands were reduced from 189 to 82, and in the book-printing establishments from 241 to 170. Congress used English paper, although the Messrs. Gilpin offered paper admitted to be equally good at 25 per cent. less cost. The manufacturers of the middle States asked for an increase of the duty on imported paper.

The number of paper-mills in the United States, according to the official census of 1820, was only 108, of which 22 were in Pennsylvania, 21 in New York, 14 in Connecticut, 9 each in Massachusetts and Vermont, 6 in New Hampshire, 5 in Rhode Island, 4 in New Jersey, 3 each in Delaware, Maryland, and Tennessee, 2 in Kentucky, and 1 each in Maine, Ohio, North Carolina, and District of Columbia. They employed 109 vats, of which only 100 were in operation. The value of the product was about $3,000,000.

About the year 1825 the automaton paper-machine of Foudrinier, imported from England, was introduced into the United States at Springfield, Massachusetts, where the largest manufactory at that time in the United States, that of D. & J. Ames, employed 12 steam-engines and more than 100 females, besides the usual number of male hands, and used machinery patented by them for making continuous sheets, which enabled 1 man to do the work of 30. Four years later there were 6 of

these machines in the State, a proportion of one for every 10 mills, and they had come into use in several other parts of the country. The total value of the paper then made in the United States was estimated at $6,000,000, of which Massachusetts made $700,000, using 1,700 tons of rags, junk, &c.

The Foudrinier machines were first manufactured in the United States at Windham, Connecticut, in 1830, by Phelps & Spafford, and soon after at Worcester, Massachusetts, since which time few have been imported. This mechanism, since much improved, and the introduction about the same time of other improvements in preparing and bleaching the pulp, particularly the use of chlorine, greatly facilitated and improved the manufacture of paper and enabled the manufacturers to employ coarse and colored materials, such as calico, worn-out sails, bale-rope and bagging, the refuse of cotton-mills, &c., in making writing and other fine papers which had previously been produced almost exclusively from white cotton and linen rags carefully assorted. The price of paper was accordingly reduced, and a great impulse was given to the manufacture. In 1850 the automatic machinery was used in all but two paper-mills in the United States.

The official returns of the sixth census made the number of paper-mills in the United States in 1840 to be 426, in 20 States and the federal district. The capital invested was $4,745,239; the number of hands 4,726; and the value of the product was $5,641,499, exclusive of playing cards and other manufactures of paper valued at $511,495. Of these, 156 were in the eastern, 237 in the middle, 27 in the western, and 20 in the southern States. The largest production in that year was in Massachusetts, which contained 82 paper-mills, employing 967 persons and a capital of $1,082,800, and made paper of the value of $1,659,930. Pennsylvania contained 87 mills, producing a value of $792,335; New York 77 paper-mills, and a value of $673,121; and in Connecticut 36 mills made paper to the value of $596,500.

The value of the paper manufacture of Massachusetts, as reported by the secretary of the Commonwealth in 1845, was $1,750,273, and in 1855 it was $4,141,847. The manufacture in the latter year employed 121 manufactories, of which 37 were in Berkshire county and 20 in the single town of Lee. The total capital of the paper-mills of the State was $2,564,500, the persons employed numbered 2,630, and the product was 17,959 tons and 711,953 reams of paper, valued as above stated. In addition to the foregoing, a mill at Natick, for manufacturing paper pulp, made from 490 tons of stock paper pulp to the value of $70,475 annually, and a small establishment at Winchenden, with one hand, made 400 reams of sand-paper, worth $1,200.

The paper manufacture of New York, in the same year, as appears from the State census, employed in 39 counties 109 establishments, 12 of them using steam and 86 water-power, and employing altogether 1,674 persons. They had invested in machinery alone $664,570, and consumed raw materials, including 6,200 tons of straw and 19,881½ tons of rags, &c., to the value of $1,511,724. The product included 2,028,595 reams of paper, 3,265 tons of binders' boards, &c., 35 tons of wall-paper, and 87 tons of wrapping paper, together valued at $2,813,147. That was exclusive of the product of 37 straw-paper manufactories, five of them using steam-power and employing 252 hands, and consuming 8,120 tons of straw, valued, with lime, fuel, oil, &c., at $76,611. They made 2,213 tons of board and 769,160 reams of paper, of the total value of $250,564.

At different times since 1756 attempts have been made in Europe to manufacture paper from Straw. As early as the year 1800 Matthias Koops is said to have first made, in England, from old waste written and printed papers, which had always been thrown away as useless, 700 reams, weekly, of good white paper. At the same time he is said to have made from straw, wood, and other vegetable fibres, without the addition of any other stock, a better quality of paper than had been produced previously. He obtained a patent for the use of straw, hay, thistles, &c., and the waste and refuse of hemp and flax, as materials for paper. Tolerably white and durable paper was made from pure straw by Huygergon, a Frenchman, who obtained a patent for the process in that country in 1820, and another for the same purpose was obtained by Louis Lambert in 1824.

In the United States the first patent for preparing straw, hay, &c., for paper, by the use of lime

or an alkali to act on the silex of the outer cuticle, was recorded by William Magaw, of Meadville, Pennsylvania, in May, 1828, and was reissued to him in 1830. He communicated his discovery, accidentally made, to Mr. John Shryock, proprietor of a paper-mill at Chambersburg, by whom and his son, G. A. Shryock, the manufacture was first undertaken in this or probably any other country, at least on a commercial scale, with the aid of a cylinder machine adapted to the new material. Mr. Shryock made paper from straw and blue-grass, &c., at the rate of 300 reams per diem by water-power, and for a number of years continued the manufacture with such success as to attract attention in America and Europe. The article was also made about the same time under the authority of Mr. Magaw, at Philadelphia, by Aaron Denman, and also at Baltimore. The product was chiefly wrapping paper, which, though coarse and brittle, was in great demand at Philadelphia and elsewhere, and mills were afterward commenced in other places until the use of that material became quite extensive. A very good quality of paper is made of straw and other materials combined.

Improvements were made in the manufacture of straw paper in England, where it is largely used by the newspaper press, and also in France. A work published in 1838, by M. Piette, chiefly relating to the use of straw as a material for paper, was accompanied by samples of paper from that and other fibrous materials mixed or unmixed, showing that superior paper could be produced from straw, wood, &c. In the United States, white paper was first made to any extent from straw by the Messrs Ames, of Springfield, Massachusetts, about the year 1849. Within the last 12 or 15 years many improvements have been made, and several newspapers of large circulation have employed it for several years. Among the earliest of these was the Public Ledger, of Philadelphia, which, in its daily and weekly issues, has annually consumed upwards of 50,000 reams, chiefly made at Manayunk, near that city. The use of caustic alkali, and boiling at a high heat in closed boilers, for preparing straw for paper, was patented in France by Coupier and Mellier, who exhibited it at the World's Fair, in New York, in 1853, and in 1857 took out a patent for their process in this country. This method of treating straw was improved by C. S. Buchanan, of Saratoga county, New York, who boiled the straw under high pressure in closed boilers, thereby so disintegrating the fibre that paper of greater whiteness, softness, and strength was obtained. The use of rotary boilers, first used in this country at Paterson, New Jersey, by H. V. Butler & Co., for preparing paper pulp on a large scale from cotton waste, bale-rope, bagging, &c, has still further contributed to improve the quality of straw paper. These and other improvements have been carried into extensive use at the Niagara Paper-mills in the State of New York, which now supply large quantities for the New York Tribune. M. Kelin, of Belgium, in 1854, introduced a treatment, analogous to that of water-rotting of hemp, for converting straw into paper pulp; but whatever process is used, the cost of reducing the raw material to pulp in a great degree offsets the cheapness of the crude material.

In August, 1838, Homer Holland, of Westfield, Massachusetts, took out a patent for preparing the husks of Indian corn for paper-making, a material which is said to have been earlier used in a mill near Rimini, in Italy, and was also unsuccessfully tried by Schaeffer. An Austrian patent for making paper from corn-husks is now owned in the United States, and the experiments have been so successful that preparations on a large scale have been made to manufacture printing and other papers from it, among others, by the Clinton paper-mills, at Steubenville, Ohio.

In 1830 a patent was taken out by two citizens of Meadville, Pennsylvania, for making paper from wood, at the rate of 5 to 7 reams from 100 pounds of wood. Paper has been successfully made from the bass or white wood and from that of the hemlock tree. The Ligneous Paper Company erected several years ago a large mill at Little Falls, New York, for making paper from bass wood alone. The cane or reed of the southern swamps has been used for paper pulp by a mill near Baltimore, and before the rebellion a mill was erected at Wilmington, North Carolina, to prepare that material on a large scale for paper-machines. The southern States contain vast quantities of fibrous materials suitable for paper which have never yet been turned to account.

The recent improvements in machinery and in the chemical processes for preparing flax, hemp.

and similar fibres, as textile materials, under the names of flax-cotton, fibrilia, cottonized hemp, &c., promise to become a source of abundant materials from hitherto unutilized vegetable fibres. The number of different fibrous plants and articles which have at one time and another been used as materials for paper exceeds one hundred.

Improvements have also been made in the Dutch engine for preparing the pulp from rags, which superseded the old mortar, and is still used with the patented improvements of Joseph Kingsland, of New Jersey, which have been adopted in this country and in England.

Several mills in New England and New York produce chiefly wall-papers, to be printed as paper-hangings.

For the encouragement of the paper manufacture, Congress in 1789 imposed a duty of 7½ per cent. on foreign paper imported into the United States. In 1816 the duty was increased to 30 per cent., and in 1828 was changed to a specific rate of 10 to 20 cents a pound on the different kinds of paper. In 1842 the duty was reduced somewhat on the better qualities, and in 1846 was again laid at 30 per cent. ad valorem. In 1857 it was again reduced to 24 per cent., but was raised in 1862 to 30 per cent.

Rags have been generally admitted as raw material, free of duty.

The value of rags imported in 1833 was $411,785, and of paper only $63,083. In 1846 the importations of rags from all countries into the United States amounted to 9,897,706 pounds, valued at $385,020, an average of less than 4 cents a pound. Of that quantity 8,002,865 pounds were obtained from Italy which has continued to furnish from one-half to three-fourths of all the rags imported. In the 10 years from 1846 to 1855, inclusive, the total weight of rags imported was 209,833,718 pounds, of which 148,300,155 pounds came from Italy, the whole valued at $7,328,721. The annual average from all countries in that time was 20,988,371 pounds, valued at $732,872, and from Italy the annual weight received was 14,830,015 pounds. In the year ending June 30, 1862, the importation of cotton and linen rags amounted to 9,067,449 pounds, valued at $241,738, of which 1,499,746 pounds, worth $35,785, came from Canada and the British Provinces.

The quantity of paper, exclusive of paper-hangings, playing-cards, &c., imported in the fiscal year 1834–'35, was 522,468 pounds, valued at $103,862; and the value of paper and stationery of domestic manufacture exported in the same year was $69,700. The value of paper-hangings imported in that year was $93,634. In 1856 the value of writing and printing paper imported amounted to $272,010; of paper-hangings, to $228,577; of playing-cards, $10,577; sheathing paper, $5,530; various manufactures of paper, $135,167; paper and fancy boxes, $36,700; blank books, $12,940; papier-mache articles, $25,051; total, $726,552. In the year ending June 30, 1862, the value of writing paper, paper-hangings, and other manufactures of paper imported, was $179,684. The exports of domestic paper and stationery in that year amounted to $399,793, chiefly to Canada and the British Provinces, the Spanish West Indies, and South America, and including the value of $16,053 exported to Great Britain, which amount in the next fiscal year was increased to $29,979.

PAPER-HANGINGS.

This branch of decorative art employs 26 establishments in 2 of the eastern and 3 middle States, more than one-half the value being made in New York. The aggregate capital was $1,037,600, the number of hands 1,203 males and 91 females, whose wages cost annually $328,224. The cost of materials was $1,153,670, and the value of the product $2,148,800.

Returns were made by 6 mills in New England, of which 4 were in Massachusetts and 2 in Connecticut, employing, respectively, 54 and 31 hands, and producing, the former a value of $89,500, and the latter of $52,700.

The manufacturers of wall-paper in New York numbered 9, which employed an aggregate capital of $465,000 and 682 persons, whose wages amounted yearly to $173,760. The consumption of materials cost $661,250, and the product was valued at $1,181,000. Seven manufacturers in New Jersey

made paper-hangings of the value of $390,600, and gave employment to 228 persons, 36 of them females. Four mills in Pennsylvania returned a total capital of $310,000 and 299 male and female hands, who manufactured a value of $435,000, including some of the finest qualities made in the country.

These statistics show a very large increase in the business since 1850, when there were only 6 mills, with a total capital of $49,500 and 93 hands, producing paper-hangings of the value of $107,040, at a cost for labor of $25,872, and for material of $52,335.

The printing in these establishments is done both by blocks and by cylinder machines, and the manufacture has been so much improved that the better qualities of the domestic article rival the French and English papers, and the designs are generally original. They embrace nearly every variety of paper-hangings, including plain, velvet, satin-faced, flocked, and gilt patterns.

As an article of decorative furniture paper-hangings were first offered for sale in America about the year 1737, but, except occasionally in the houses of very wealthy persons, were little used before the middle of the last century. Their manufacture on a limited scale was commenced as early as 1763. In 1787 there were several manufacturers of wall-papers in Boston, in New Jersey, and in Pennsylvania. Two years after, John Carnes, of Delaware, who subsequently took out the first American patent for paper-moulds, and was for some time American consul at Lyons, associated himself with Burrell Carnes and two Frenchmen, under the firm name of Le Collay & Chardon, and commenced the manufacture of paper-hangings in Philadelphia, producing in the first 9 months 10,000 pieces of a common quality of unglazed paper. William Poyntell soon after engaged in the same business, which by the Secretary of the Treasury, in his report to Congress in 1791, was declared to have made considerable progress in the United States Boston in 1794 produced yearly 24 000 pieces, and exported wall-papers to other States. In 1810 there were 4 paper-hanging establishments in Philadelphia and vicinity which stamped annually 140,000 pieces of paper, valued at $97,417; and in Providence, Rhode Island, 8,000 pieces, valued at as many dollars, were produced. Within the next 10 years paper-hangings were made in Philadelphia by Beck & Stewart, H. G. Borrekens, John Carson, T. M. Longstreth, John Van Meter, John B. Howell, and others. It was commenced at East Hartford and Killingly, Connecticut, and at Albany, New York, and elsewhere.

During the war of 1812 superior styles from French designs were attempted, and about 1824 glazed grounds were introduced. Hezekiah Steele, of Hudson, New York, in 1813, took out a patent for making paper-hangings with satin grounds. In 1822 Peter Force, of Washington, recorded an improvement in the printing of paper-hangings. The introduction here soon after of the Foudrinier machine, which was first brought into use for producing long rolls of paper for paper-hangings, was the principal improvement made in the early manufacture. The rolls for this purpose are usually 1,200 yards in length and from 20 to 40 inches in width, and cost before the war from 9 to 14 cents per pound, or 11 cents on the average.

One of the largest establishments in the United States, and exceeded in extent before the rebellion by few in the world, was that of Howell Brothers, established at Philadelphia in 1813, and has turned out as much as 5,000 tons of wall-paper per annum, with the labor of 200 hands. The cheaper and more common qualities are printed by machinery, the patterns being engraved on cylinders, as in ordinary calico printing. The finer descriptions are printed by the old hand process. The initial operation of chalking the blank roll, which, as well as many other processes, were not long since done by hand in England, have in the largest American establishments been effected by steam. Machinery consisting of a series of cylinders driven by steam is also used in the subsequent processes of polishing and glazing.

Curtain papers, printed in the piece, in patterns of suitable size and design to be cut off for window shades, in place of roller-blinds of linen or muslin, and for screens, &c., are in extensive demand, and form a considerable item in retail sales.

The Philadelphia and New England schools of design for women, and other institutions of the

kind, now furnish the domestic manufacturers with many original designs for paper-hangings, and the taste in this article, which is one of very large consumption, has been much improved within a few years.

The value of paper-hangings imported in 1834–'35 was $93,634; in 1837–'38, $3,390; in 1850, $76,820; in 1852, $113,164; and in 1862 amounted to only $8,874. It was chiefly from France and Great Britain.

The duty on paper-hangings was laid in 1816 at 30 per cent. ad valorem. In 1824 the duty was increased to 40 per cent., but in 1842 was reduced to 35, and in 1846 to 20, and again in 1857 to 15 per cent. ad valorem, from which it was raised in 1862 to 30 per cent., and since that to a still higher rate.

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

STATES.	Number of establishments.	Capital invested.	Cost of raw material.	NO. OF HANDS EMPLOYED.		Annual cost of labor.	VALUE OF PRODUCT.		QUANTITIES PRODUCED IN 1860.*			
				Male.	Female.		In 1860.	In 1850.	Pounds of printing paper.	Pounds of writing paper.	Tons of wrapping paper.	Tons straw boards.
Maine	14	$519,100	$535,539	223	183	$100,834	$949,675	$179,520	8,191,000	.....	468	430
New Hampshire	24	425,000	378,596	207	126	95,580	701,209	205,010	4,093,800	.....	1,231	40
Vermont	12	139,500	152,396	57	55	35,688	227,800	252,370	1,492,000	200,000	610	283
Massachusetts	99	3,589,860	3,313,162	1,494	1,845	800,692	6,170,127	2,601,628	27,747,000	15,598,000	6,443	815
Rhode Island	.....	.....	.....	.....	.....	.....	.....	46,000	.....	.....	.....	.....
Connecticut	55	1,860,000	1,527,672	698	502	342,996	2,453,258	1,726,685	14,581,500	1,500,000	2,848	.....
Total in New England States	204	6,533,460	5,907,365	2,709	2,711	1,375,790	10,502,069	5,011,213	56,105,300	17,298,000	11,600	1,568
New York	126	2,039,000	1,394,210	1,411	446	433,028	3,059,776	1,634,579	17,304,300	1,772,000	14,340	2,154
New Jersey	36	900,000	997,109	461	254	179,940	1,582,703	888,475	8,198,000	2,750,000	668	2,928
Pennsylvania	84	1,917,920	1,313,841	690	392	256,656	2,367,268	1,036,655	18,496,000	400,000	1,508	1,500
Delaware	2	280,000	286,439	66	27	29,292	385,000	119,240	3,066,200	.....	407	.....
Maryland	25	272,800	300,759	155	69	51,228	513,690	234,365	3,540,000	.....	523	.....
Total in Middle States	273	5,499,770	4,292,358	2,783	1,188	950,144	7,908,437	3,913,314	50,604,500	4,922,000	17,446	6,582
Ohio	29	875,500	737,246	512	212	197,448	1,382,141	701,036	12,590,000	48,000	2,500	.....
Indiana	10	147,500	56,785	64	26	25,548	140,200	94,500	1,186,000	.....	272	.....
Michigan	5	46,500	62,837	53	35	16,248	127,000	15,000	1,100,000	.....	240	.....
Illinois	2	47,103	43,075	29	12	13,080	59,938	39,600	438,000	.....	269	.....
Wisconsin	5	133,000	99,135	56	37	23,988	193,114	15,000	1,724,000	.....	100	.....
Iowa	1	12,000	6,600	8	5	3,924	17,400	.....	170,000	.....	.....	.....
Kentucky	1	125,000	68,500	25	35	19,200	122,000	135,600	1,200,000	.....	.....	.....
Total in Western States	53	1,386,603	1,074,178	747	362	299,436	2,041,793	1,000,736	18,408,000	48,000	3,381	.....
Virginia	9	154,500	130,165	111	38	41,678	270,000	147,208	1,940,000	.....	.....	.....
North Carolina	6	121,850	54,600	54	35	53,916	165,703	7,400	1,495,200	.....	.....	.....
South Carolina	3	111,000	53,000	38	19	16,044	96,500	23,200	1,085,000	.....	.....	.....
Georgia	4	171,000	72,400	52	26	20,904	146,300	26,000	1,400,000	.....	.....	.....
Alabama	.....	.....	.....	.....	.....	.....	.....	18,000	.....	.....	.....	.....
Tennessee	2	14,500	10,200	11	13	4,500	28,000	40,106	200,000	.....	.....	.....
Total in Southern States	24	572,850	320,365	266	131	137,042	724,503	261,914	6,120,200	.....	952	.....
California, (Pacific)	1	60,000	8,000	14	.....	4,800	40,000	.....	360,000	.....	.....	.....
Total in United States	555	14,052,683	11,602,266	6,519	4,392	2,767,212	21,216,802	10,187,177	131,508,000	22,268,000	33,379	8,150
Total in 1850	443	7,260,864	5,553,929	3,835	2,950	1,497,792	10,187,177	.....	.....	.....	.....	.....
Increase	112	6,791,819	6,048,337	2,684	1,442	1,269,420	11,029,625	.....	65,754	11,134	.....	.....

* MISCELLANEOUS.—New Hampshire, 560,000 pounds colored paper; Massachusetts, 1,772 tons wall and 160,000 pounds colored paper; Connecticut, 67,000 pounds bank-note paper; 375 tons wall and 1,000,000 pounds colored paper. New York, 950 tons wall-paper; New Jersey, 224,000 pounds colored paper; Pennsylvania, 24,960 pounds bank-note paper. Totals, 1,944,000 pounds colored paper; 91,960 pounds bank-note paper; 3,097 tons wall-paper.

Paper-hangings, (or wall paper.)

States.	Number of establishments.	Capital invested.	Cost of raw material.	Number of hands employed.		Annual cost of labor.	Value of products in 1860.
				Male.	Female.		
Massachusetts	4	$47,600	$42,690	47	7	$18,720	$89,500
Connecticut	2	35,000	29,510	16	15	8,736	52,700
New York	9	465,000	661,250	678	4	173,760	1,181,000
New Jersey	7	180,000	211,920	192	36	51,528	390,600
Pennsylvania	4	310,000	208,300	270	29	75,480	435,000
Total in United States	26	1,037,600	1,153,670	1,203	91	328,224	2,148,800
Total in 1850	6	49,500	52,335	91	2	25,872	107,040

PRINTING.

The number of printers and publishers in 25 States and Territories, exclusive of lithographic and copper-plate printers, in 1850, was 673, and they employed capitals amounting in the aggregate to $5,862,715. The number of employés was 8,268, of whom 1,279 were females, the annual cost of whose wages amounted to $2,737,308, and the cost of raw materials was $4,964,225. The value of the product was $11,586,549.

On the 1st of June, 1860, the book, job, and newspaper establishments, returned from 36 States and Territories, numbered 1,666. They employed an aggregate capital of $19,622,318, and 20,159 persons, including 2,333 females, at an annual cost of $7,588,096, and paid for materials the sum of $12,844,288. The total value of the product was $31,063,898, an increase of $19,477,349, or 168 per cent. over the value of the same industry in 1850. The increase in this branch of domestic manufactures is unprecedented in our previous history. The value of the printing done, though in the aggregate far short of the real value both on account of the incompleteness of the returns, from some States, especially in regard to the newspapers printed, and also because the profits accruing in the hands of the bookseller, are in most cases not included in the total value, was, nevertheless, in the proportion of nearly one dollar to each individual in the Union.

Of the whole number of printing-houses the New England States returned 278, having an aggregate capital of $2,602,400, and giving employment to 3,013 persons, 453 of them females, who received as wages annually $1,139,870, the raw materials costing $2,027,148, and the value of the work done amounting to $4,421,401, an increase of upward of 96 per cent. in ten years.

Of the establishments in these States Massachusetts contained 150, against 112 in 1850; Maine, 38; New Hampshire, 30; Connecticut, 28; Vermont, 18; and Rhode Island, 14.

The business in Massachusetts employed a capital of $1,755,200 and 1,772 hands, and yielded a product of $2,989,416, an increase of 96 per cent. Of that amount 23 book and job printing establishments (three of them book publishing alone) in Boston produced a value of $699,522, and 77 newspaper establishments in the same city a value of $1,703,280.

Connecticut, with the labor of 522 hands, turned out an annual value of $675,528, the increment being in the ratio of 16 per cent.; and Maine produced the value of $261,874, an increase of 119 per cent.

The five middle States and District of Columbia numbered 708 printing offices, employing $13,056,750 in capital and 11,850 hands, including 1,461 females, and paid for wages $4,355,856, and for material $8,585,413 annually. The value of printing done was $20,260,906, an increase over the product of 1850 of $11,789,274, or 139 per cent. in the value and of 365 in the number of establish-

ments. The value of the industry in that section amounted to 65.2 per cent. of the aggregate for the United States, and that of New York and Pennsylvania together to 60 per cent. of the whole. The value produced in those States was $18,639,982, and in the other middle States and federal district to $1,630,924. The value of the manufacture in New York alone reached the sum of $12,617,105, which was upward of 40 per cent. of the total product of the Union, and exceeded the total value of printing in all the States in 1850 by $1,030,951, being 104.6 per cent. in excess of its own product in that year. The number of printing-houses in that State was 349, an increase of 149; and their collective capital amounted to $7,880,550, the cost of materials annually to $5,867,458, and of labor to $2,603,116, the last value being the cost of the labor of 6,207 males and 1,011 females employed. Of the total value of printing returned from that State, $10,438,155 was the product of 149 establishments in the city of New York, in which there were 51 newspaper establishments with a total capital of $2,941,200 and 2,486 hands, which printed newspapers and periodicals annually to the value of $6,182,946. Seventeen book publishing houses, with capitals amounting to $3,121,000 and 2,153 hands, printed books of the annual value of $3,225,551, and 81 book and job printing offices, with $645,800 in capital and 871 hands, produced work valued at $1,033,658. The value of the business in the second ward of that city amounted to $5,355,641, and included 134,116,800 copies of newspapers, valued at $3,574,493; $932,590 worth of books published, and $848,558 worth of book and job printing. One establishment issued 31,805,000 copies of newspapers, valued with advertisements at $800,000 per annum, and consumed 78,000 reams of paper, worth $400,000; another house in the same ward published 20,000,000 copies of newspapers; a third, 18,200,000 copies; and a fourth, 16,443,000 copies. The value of the printing done in the fourth ward of the city was $2,900,613, of which $2,143,613 was the value of daily, weekly, and other newspapers and periodicals, and $500,000 the value of 3,000,000 copies of books published by one house. The number of newspapers was 80,841,960 copies, of which 28,600,000 were from the "Tribune" " office, and 16,000,000 from that of the "Stats Zeitung." The number of magazines was 2,700,000, of which 1,500,000 were from one establishment. The value of printing done by four establishments in Albany county was $470,000, and Erie and Monroe each exceeded a value of $270,000 annually.

The number of establishments in Pennsylvania was 267, an increase of 165 They aggregated a capital of $4,137,850, employed materials of the value of $2,122,635, and paid for the annual labor of 3,087 male and 315 female hands $1,214,768. The value of the book, job, and newspaper printing done in the State amounted to $6,022,877, chiefly done in Philadelphia and Pittsburg. It was an increase of $4,305,265 in 10 years, or 250 per centum. Book printing was executed by 42 establishments to the value of $2,377,400, annually employing a capital of $2,191,500 and 816 hands. Sixty-seven job printing-houses, having invested $589,600 and employing 739 hands, executed work valued at $1,084,225; and 158 newspaper establishments, with capitals amounting altogether to $1,356,750 and 1,847 hands, printed newspapers annually to the value of $2,561,252. Of the total value upward of $5,000,000 was produced by 31 newspaper offices, about 40 book-publishing houses, and a large proportion of the job offices in Philadelphia.

Sixteen newspaper establishments in Alleghany county (chiefly in Pittsburg) employed in capital $248,400 and 326 hands, and printed newspapers of the value of $538,103 annually.

In New Jersey 59 printing establishments employed a capital of $215,400 and 344 persons, producing work of the value of $303,669, which was a large increase upon the returns of 1850. From Delaware, which made no return in 1850, a value of $105,332 was returned by 7 establishments, and 26 in Maryland reported printing done of the annual value of $433,423. Eight establishments in the District of Columbia, having a capital employed of $471,250 and 495 hands, produced printed work in the value of $778,500, (chiefly government printing,) an increase of 322 per cent.

Eleven western States and Territories contained 487 printing establishments, possessing a capital of $2,595,569, and employing, at a total cost of $1,393,922, 3,646 male and 366 female hands. They expended for materials $1,732,712, and the value of the printing done was $4,546,281, against a value

of $676,186 reported in 1850, the ratio of increase exceeding 572 per centum. The largest amount of printing was done in Ohio, which numbered 141 printing establishments, with a collective capital of $1,224,374 and 1,813 hands, which produced work of the annual value of $2,227,264, an increase of nearly 523 per cent. About $1,503,000 was the product of 32 printing-houses in Cincinnati, which employed a capital of $689,000 and 1,043 persons; and 10 printing establishments in Cleveland executed about the value of a quarter million dollars.

Illinois was next to Ohio in the number and extent of its printing establishments, of which there were in the State 84, with capitals amounting to $487,200, and producing a value of $825,905, against $18,475 returned in 1850. The city of Chicago contained 19 of the whole number in the State, and the value of the work executed there was $525,000.

In each of the other western States the increase was large. Returns were received in 1860, for the first time, from 13 printing establishments in Minnesota, which executed work of the value of $31,835; from 2 houses in Kansas, where work was valued at $4,630; and from 5 in Nebraska, where the product amounted to $24,675.

From 11 southern States returns were made of 151 establishments, having collectively a capital of $1,161,799 and 1,014 hands, whose wages cost $417,912. The materials used cost $308,431, and the value of the printing done was $1,253,154, an increase of $1,080,149 over the returns of that section in 1850. The largest product was in Tennessee, where 21 printing offices executed work valued at $443,120. Georgia and Texas each contained the same number of printing-houses as Tennessee, and the values returned by them respectively were $267,974 and $142,520. Virginia and Alabama each numbered 22 printing establishments, and the value of work done in the former was $102,959, and in the latter $63,100. No report of printing done in North Carolina, Florida, Texas, and Mississippi in 1850. In 1860 the first contained 13 establishments, producing a value of $87,950; South Carolina, a value of $15,295, by 5 establishments; Florida, $2,000 in 1 shop; and Mississippi, a value of $63,890, executed by 11 offices; while 6 in Arkansas produced a value of $16,650.

The Pacific States since 1850 have brought into operation 42 printing establishments, with a total capital of $205,800 and 270 male hands, who received in wages $280,536, the materials consumed costing $140,584. The value of the work executed was $582,156. Of these establishments California reported 31, Oregon 9, and Utah 2; the first employing 219 hands, the second 31, and the last 20; and they produced, respectively, the following values, in newspaper, book, and job printing, viz: California, $485,954; Oregon, $60,202; Utah, $36,000.

The growth of this great American industry which has received such extraordinary development in the last decade, and now employs a capital of nearly twelve millions of dollars and more than twenty thousand operatives, and in several of its branches exceeds in extent the same industry in any other country, has corresponded in time and measure with the rapid increase of population and of the wealth and intelligence of the country since its first implanting. The activity of the press has been at once the index and the instrument of progress in civilization and that mental activity which has contributed to the present position of the nation in its moral, social, and material interests.

Printing was first executed in the American colonies, at Cambridge, in Massachusetts, by a printer named Daye, who, in January, 1639, printed the "Freeman's Oath," on a press shipped the previous year from England, by Rev. Mr. Glover. The first issue in book form from the colonial press was the "Bay Psalm Book," printed by the same person, in 1640, a crown octavo of 300 pages, of which a second edition was printed in 1647. In addition to a yearly almanac, a volume of colonial laws printed in 1641, several other unimportant works were printed by Daye, down to 1649, when Samuel Green, an early emigrant and the ancestor of several pioneer printers in different towns, succeeded him in charge of the Cambridge press.

A second press, designed for printing Eliot's Indian Bible, was sent from England in 1655 and set up in the same building with the first one, where all the printing done in the colonies for nearly forty years was executed, amounting to little more than an average of one publication annually. A second

and more skilful printer, Marmaduke Johnson, was added to the establishment in 1660. The most important work printed in the years referred to was the Indian Bible, in quarto, on fine post paper costing six shillings per ream, the presswork costing, when done by Green alone, £3 10*s.* per sheet, and when assisted by Johnson, £2 10*s.* per sheet.

In 1672 the first privilege in the nature of copy-right was granted to John Usher, one of the earliest booksellers of Boston, for a revised edition of the Laws of the Colony. In 1674 the first press in Boston was established by John Foster, by permission of the General Court, which ten years before had restricted the privilege of printing to Cambridge only. Foster's first book was issued about 1676, his printers being James Glen and Samuel Green, jr., a son of the Cambridge printer. Foster was succeeded in 1681 by Mr. Sewall, and in 1684 Richard Pierce commenced printing in Boston, where, on the 25th of September, 1690, he published the first newspaper sheet ever printed in America. It was designed to appear once a month or oftener, but was immediately suppressed by the General Court. In April, 1704, appeared the first number of the "Boston News Letter," the first successful newspaper in America, a weekly publication, issued "by authority," by John Campbell, postmaster, and printed by Bartholomew Green, another son of the Cambridge printer, who had set up business in Boston in 1690, and in 1722 became the proprietor of the News Letter, which, during the first 15 years of its existence, was the only periodical in America. The Boston Gazette, issued December 21, 1719, was the second.

The next province in which a printing press was erected was Pennsylvania, by William Bradford, in 1686, four years after the first English settlement was made at Philadelphia.

At Kensington, in that city, Bradford printed, the same year, a small quarto tract, of which a copy is extant. And soon after printed "Leeds Almanac," for Samuel Alkins, followed by other ephemeral and controversial tracts on religious and political subjects, which, with a few books of statistics, Bibles, and psalm books, formed the staple of the early publications throughout the colonies. Becoming involved in litigation with his Quaker brethren in authority because of some polemical publications from his press, Bradford in 1693 removed to New York, and set up the first press in that province, where for 30 years he was public printer for the States of New York and New Jersey, enjoying from the former a stipend of £50 per annum. During the same period he was part owner of the first paper-mill in this country, on the Wissahickon, near Philadelphia, and of another at Elizabethtown, New Jersey, where he resided. After his removal from Philadelphia, his press in that place was managed by one Jansen until 1712, when Andrew S. Bradford, a son of the original proprietor, resumed control of it, and continued to be the principal or only printer in Philadelphia until 1723, when S. Keimer, an English printer, established the second press in that place, employing as a workman young Benjamin Franklin, the most illustrious of American typographers. In December, 1719, Andrew Bradford issued the "American Weekly Mercury," which was the third newspaper in the colonies, and was followed in 1725 by the New York Gazette, published by the elder Bradford in New York. A press was established at Albany in 1771, but was stopped by the Revolution in 1776.

The next State in which printing was executed was Connecticut, where Thomas Short commenced printing at New London in 1709, and was succeeded by Timothy Green, a son of Samuel Green, jr, of Boston, who printed for the colony at a salary of £50 per annum. A newspaper was started in Connecticut, at New Haven, in 1755, by James Parker & Co.; and the first press at Hartford was set up in 1764 by a grandson of Timothy Green, who commenced the Connecticut Courant, the third paper in that colony.

A press was erected at Annapolis, Maryland, in 1726, by William Parks, who executed the printing for the government, which had been previously done by Andrew Bradford, at Philadelphia, and was followed in that office by Jonas Green, from New London, Connecticut, whose salary was £500 currency The first press at Baltimore was erected by N. Hasselboot, who had learned the art of Christopher Sower, of Germantown, Pennsylvania. The first newspaper in that town and the third in

the province was the Maryland Journal or Baltimore Advertiser, begun in August, 1773, by William Goddard, who had been the first printer at Providence, Rhode Island.

In 1729 a press was also established at Williamsburg, Virginia, by Mr. Parks, the Maryland printer, who printed the same year Steth's History of Virginia and the Colonial Laws; and in 1736 commenced the Virginia Gazette, the first newspaper in the province.

A press was set up at Charleston, South Carolina, in 1730, by E. Phillips, of Boston, who, with three other printers, is said to have been tempted thither by a reward of £1,000 offered to any printer who would settle in the province. He died soon after, and his successor, Thomas Whitmarsh, in 1731 or 1732, issued the South Carolina Gazette, the first paper in the Carolinas. Lewis Timothee, from Philadelphia, succeeded Whitmarsh, who died in 1733.

The first press in Rhode Island was that of James Franklin, the brother of Benjamin, at Newport, where, in 1732, he commenced the publication of the Rhode Island Gazette. He died in 1735, and his press, brought by him from England, where he had learned the art, and first employed in Boston on the Boston Gazette, and afterward on the New England Courant, the third paper in Massachusetts, was managed by his widow and daughters, and after 1752 by his son James, who, six years later, established the Newport Mercury, in the office of which it remained until a recent period. This press, which has acquired celebrity as the one on which Benjamin Franklin learned the printer's art in the office of his brother, is now preserved in the Patent Office at Washington, and is interesting as a type of the old lever hand-press nearly in its rude and primitive form, as it was invented in 1450, requiring two men to work it, and capable of turning off 200 or 250 copies (printed on one side) per hour.

In 1762 William Goddard established the first press at Providence, where he commenced the Providence Gazette and Country Journal. Like the press of Franklin, at Newport, and some earlier and later ones, this was also for some time managed by the females of the proprietor's family.

The first press owned in New Jersey was that of James Parker, at Woodbridge, established in 1751, and removed to Burlington in 1765, where Keimer & Franklin had occasionally done government work, and where he printed Smith's history of that province, after which he returned to Woodbridge.

Daniel Fowle, of Boston, established the first printing press in New Hampshire, at Portsmouth, in 1756, and the same year issued the New Hampshire Gazette.

At Newbern, North Carolina, printing was commenced about 1755 by James Davis, who published in December of that year the North Carolina Gazette. There was another in the province before the Revolution.

In Delaware, a press was first set up at Wilmington, by James Adams, who did the government printing, previously executed at Philadelphia, where Adams had a press. He proposed to publish the Wilmington Courant, and was the only printer in that province before 1775.

The public printing of Georgia was done at Charleston until 1762, when James Johnson, a Scotchman, established a press at Savannah, for which he was liberally rewarded. He commenced the Georgia Gazette in 1763.

In 1778 J. P. Spencer and Timothy Green, two printers of Norwich, erected a printing press at Hanover, then claimed to be in Vermont, where they commenced a newspaper, which was removed the same year to Westminster, at the request of the newly organized government of the State, which was the first of the new States to receive the art. In 1781 they published the Vermont Gazette or Green Mountain Postboy, but in 1783 the press was removed to Windsor, under new management.

Printing was first executed within the present boundaries of Maine as early as 1780, and in 1810 six towns now in that State published newspapers, including Portland, which had three.

The introduction of this important art in the remaining States and Territories may be more briefly stated as follows:

The first press established west of the Alleghanies, was in Kentucky in 1786, the second at Knoxville, Tennessee, in 1793, and one at Cincinnati, Ohio, in 1795. In Louisiana printing was executed to a limited extent by the French as early as 1704, but on the cession of the territory to the United

States there was but one press there. In 1810 there were about ten. Presses were established in Mississippi in 1809; in Missouri and Michigan in 1810; in Indiana in 1811; in Alabama in 1812; in Illinois, at Kaskaskia, by Matthew Duncan, in 1815; in Arkansas in 1825; in Texas, by the Spaniards, in 1760, and by Americans about 1829; in Wisconsin in 1833, at Green Bay, by General Ellis, who had executed printing at that place as early as 1827 by a planer and mallet without a press, and on obtaining a press in 1833 established the first newspaper in the State. In Iowa printing was done in 1836, by W. C. Connell, and in Minnesota in 1849. In California the first press was established by Americans at Monterey, in August, 1846, and one at Salt Lake, by the Mormons, in 1848, in which year the Oregon Free Press was published by Geo. L. Curry, at Oregon City, in Oregon, which is believed to have had a press a year or two earlier. Nebraska and Kansas had each a press in 1854, and in August, 1859, the Rocky Mountain Gold Reporter was commenced at Mountain City, in Colorado Territory, by Thomas Gibson.

It is thus apparent that the newspaper which now employs so large a proportion of the presses in every part of the country, and is so valuable as a vehicle of public instruction, was an early and favorite offspring of the American press even in colonial times. Magazines and other serials were also attempted by Franklin as early as 1741, and by others subsequently. Book printing was done by the proprietors of printing presses who were often booksellers and publishers also.

In 1791 the number of printing presses in the United States was officially declared by the Secretary to be sufficient to render the country independent of foreign publishers for other books required, and to warrant a duty of 10 per cent. on books imported.

By the census of 1810 returns of printing done were made only from two States; 1 office in Vermont returned a value of $3,194, and 108 in Pennsylvania executed work to the value of $353,517. The number of printing offices in Philadelphia was stated to be 51, and the number of presses 153. They were supposed to print annually half a million volumes. There were 2 manufactories of printing presses in the city, including that of Adam Ramage, long afterward known as a builder of improved presses. The number of newspapers printed in the United States at that date was estimated at upward of 22,000,000 copies annually.

The relative proportions of British and American books annually consumed in the United States in 1820 was estimated by the late S. G. Goodrich to be of American 30 and of British 70 per cent. of the whole. These proportions were reversed during the next 30 years, the American being 70 and the British 30 per cent. of the total consumption.

The following table, prepared and published by the same authority from official and other data, shows approximately the value of books manufactured and sold in the United States at different periods, and the several values of each class sold:

	1820.	1830.	1840.	1850.
School books	$750,000	$1,100,000	$2,000,000	$5,500,000
Classical books	250,000	350,000	550,000	1,000,000
Theological books	150,000	250,000	300,000	500,000
Law books	200,000	300,000	400,000	700,000
Medical books	150,000	200,000	250,000	400,000
All others	1,000,000	1,300,000	2,000,000	4,400,000
Total	2,500,000	3,500,000	5,500,000	12,500,000

By the same writer the value of the American book trade for 1856 was estimated at $16,000,000, distributed as follows: City of New York, $6,000,000; other parts of the State of New York, $600,000; Boston, $2,500,000; other parts of New England, $600,000; Philadelphia, $3,400,000; Cincinnati, $1,300,000; northwestern States, $100,000; District of Columbia, by the government, $750,000; southern and southwestern States, $750,000.

Among the influences which have contributed to the growth of the book trade in the United States is the system of annual fairs and trade sales by auction. The fairs were commenced at New York in 1802, under the auspices of the American Company of Booksellers, and for a while held alternately in New York and Philadelphia, in which last the first auction sale was held in 1824. The former was suggested by M. Carey, who in 1804 issued in Philadelphia the first quarto Bible printed from movable types in America, and the trade sales were planned by his son, H. C. Carey.

Steam-power printing, which was first executed by the London Times on one of Koenig's presses in 1814, at the rate of 1,800 impressions per hour, and after 1838 on the Applegarth press, improved by Cooper, which produced 6,200 impressions hourly, was first practiced in the United States about the years 1823 or 1824, by James Booth, of New York, and according to some accounts by S. Van Benthuysen, of Albany. In 1826 Daniel Treadwell, of Boston, patented a cylinder power-press, which at once came into use and is still the principal one employed in medium sized establishments. It produced about 600 impressions hourly. In 1830 and again in 1836 Isaac Adams, also of Boston, took out patents for improvements in the power-printing press, consisting chiefly in applying power to the hand-press, which he made to work at three different velocities, averaging 900 impressions in an hour.

The double-cylinder printing press, introduced by Richard M. Hoe, of New York, and patented in 1842 and subsequently improved, combined all the improvements previously known in this country and in England, and was capable of producing 6,000 impressions per hour. It was first used in the office of the New York Sun, and is still extensively employed in country newspaper offices. In 1847 he made the first successful attempt to print with revolving type, by securing the type to the cylinder instead of a flat bed, as in his first machine. A four-cylinder press on this principle, capable of printing 10,000 sheets in an hour, was ordered for the Philadelphia Ledger office, and soon after for other establishments. The ten-cylinder presses used by the London Times and other journals in this country and in England, using as auxiliaries the gelatine rollers, invented by Gannel, in France, the distributing tables, &c., of other inventors, are capable of turning off 15,000 impressions hourly, and one in operation in New York is said to be capable of printing 25,000 in an hour, requiring ten men to supply the sheets. The Hoe presses are used in Great Britain to the number of 18 or 20, and there are upwards of 15 in use in New York city alone. The four-cylinder presses are used in France and Australia. Several improvements in the hand-press, in ink-distributing and other apparatus, have been made in the United States.

As early as 1776 Benjamin Dearborn, the publisher of the New Hampshire Gazette, the first paper in that State, introduced a wheel press, which was adopted in some places. In 1810 he devised another, in which greater power and despatch was gained by using a lever instead of a screw. Earl Stanhope's great improvement on the old press was made in 1815, by building it of iron and substituting a jointed lever for the screw, giving more power.

The first patent for a printing press was taken out in 1796 by Dr. Apollos Kinsley, of Connecticut, for an improvement on Nicholson's press, in which he placed the cylinders vertically instead of horizontally. In 1818 Adam Ramage, of Philadelphia, patented improvements on the Scotch press of his countryman, Ruthven, which he had introduced here, and at that time much esteemed for fine work. The roller for distributing ink on the types, patented in 1817 by Hugh Maxwell, of Lancaster, Pennsylvania, was a great improvement on the balls previously used for inking. The contrivance was furnished complete for $100, and was computed to save each press $6 per week, besides a gain in time and quality of work.

The Columbian press, a hand-press invented by George Clymer, of Pennsylvania, about the same time, was introduced in England in 1818, and is still used there extensively. In style of finish and emblematic embellishment it exceeded anything before seen there, and its efficiency there as well as in the United States, where it superseded the Ramage press then much used for newspapers, gave it immediate acceptance. It was the first press constructed in America to print two sides of a newspaper at once, which it effected by a combination of levers.

These and several others preceded the introduction of power-printing and the power-presses of Treadwell, Adams and Hoe. The Washington press, a modification of the Stanhope, was patented in 1829 by Samuel Rust, of New York, and afterward improved by R. Hoe & Co., who commenced building improved Napier and other presses in that city as early as 1819, one of the partners being Peter Smith, the inventor of the Smith press. The Ruggles press, patented in 1840, and the hand-press, patented in 1844, by Seth Adams, of Boston, have also had some repute, the latter being used for fine work at the present time.

Type-setting and type-distributing machines have been introduced by several persons in this country. Those of W. H. Mitchell, of New York, are in use in some large printing houses in that city. The type-setter resembles in form a harpsichord piano, and by means of 34 keys, each marked with a small letter, point, or space, an operator is able to adjust the types with great rapidity. A more recent invention is spoken of as combining the two operations of setting and distributing type in the same machine, the latter process being entirely automatic.

Statistics of printing presses, type founding, &c., 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.
				Male.	Female.		
PRINTING PRESSES.							
Massachusetts	1	$200,000	$30,180	100	.....	$52,600	$103,500
Rhode Island	1	26,000	7,175	35	.....	12,000	20,500
New York	7	758,000	91,280	530	.....	209,220	757,250
Pennsylvania	4	16,000	10,485	17	.....	6,864	38,700
Ohio	1	15,000	6,400	25	.....	9,000	23,500
Total	14	1,015,000	145,520	707	.....	289,684	943,450
TYPE FOUNDING.							
Massachusetts	6	97,500	37,287	105	61	55,836	176,770
New York	9	310,900	180,837	247	193	160,156	540,400
Pennsylvania	12	561,200	69,350	251	12	108,180	*308,300
Ohio	3	99,000	61,500	162	20	75,408	210,000
Illinois	1	25,000	6,210	10	6	4,824	24,600
Missouri	1	20,000	2,416	20	20	12,000	16,500
Total	32	1,113,600	357,600	795	312	416,404	1,276,570
WOODEN TYPE.							
Connecticut	2	26,500	5,000	32	7	11,520	25,000
STEREOTYPING AND ELECTROTYPING.							
Connecticut	1	5,000	500	6	.....	2,880	4,000
New York	11	73,500	42,757	162	.....	66,360	193,500
Pennsylvania	29	48,000	17,250	137	.....	51,600	88,800
Total	41	126,500	60,507	305	.....	120,840	286,300

*Part of this amount was for stereotyping.

Printing presses are now manufactured in two New England, two middle, and one western State, to the value annually of $943.450, by 14 establishments, which employ altogether a capital of $1,015,000 and 707 men, at a cost for wages of $289,684, and for materials of $145,520.

In Massachusetts one establishment, with a capital of $200,000 and employing 100 men, manufactured presses of the value of $103,500; and one in Rhode Island, having 35 hands and a capital of $26,000, reported a product of $20,500.

Seven manufactories in the State of New York employed in this business an aggregate capital of $758,000 and 530 hands, producing printing presses valued at $757,250, at a cost for wages of $209,200, and for material of $91,280, annually. Most of these are in the city of New York.

In Pennsylvania there were, in 1860, 4 small manufactories of printing presses, with a total capital of $16,000 and 17 hands, which produced a value of $38,700.

One establishment in Cincinnati, Ohio, had a capital of $15,000, and made presses of the value of $23,500.

The Type Founding establishments in the United States in 1860 numbered 32, having invested $1,113,600, and employing 795 male and 312 female hands, at an annual cost for labor of $416,404, and for materials of $357,600. They manufactured types to the value of $1,276,570.

Of these establishments 6 in Massachusetts, employing 166 persons, produced a value of $176,770; 9 in New York, with 440 hands, turned out a product of $540,400; 12 in Pennsylvania, having 263 hands, reported a product of $308,300, of which a part was the value of stereotyping done by them. In Cincinnati, Ohio, 3 type foundries, employing 182 hands, manufactured type of the value of $210,000. One establishment in Chicago reported a value of $24,600, and one in St. Louis a value of $16,500.

In Connecticut 2 manufactories of wooden types, with a capital of $26,500 and 39 hands, returned a value of $25,000.

Stereotyping and Electrotyping employed, in three States, a capital of $126,500 and 41 establishments, having 305 persons employed and paying annually for wages $120,840, and for materials $60,507. They produced work of the value of $286,300. One of these was in Connecticut, and with 6 hands produced a value of $4,000; 11 in New York employed 162 persons, and reported a value of $66,360; and 29 in Pennsylvania, having employed 137 hands, executed work to the value of $51,600.

Lithographic Printing.—Lithography employed in the United States on the 1st of June, 1860, 53 establishments, in seven States. The aggregate capital invested in the business was $445,250; the number of persons employed, including 26 females, 786; the annual cost of wages was $338,868, and of materials $229,206; and the value of the product was $848,230.

Of these establishments the States of Massachusetts and Connecticut each contained two; those in the former having capitals amounting to $10,500, and producing, by the labor of 24 persons, work valued at $19,000, and the latter, with 23 hands and a capital of $9,500, the value of $17,500.

In each of the States of New York and Pennsylvania there were 23 lithographic establishments; those in New York having invested in the art $157,850, and producing work of the value of $383,700 with the labor of 321 hands, and those in Pennsylvania, with capitals amounting to $255,600 and 382 hands, (19 of them females,) a value of $386,300.

The States of Ohio, Indiana, and Missouri each contained one house for lithographic printing. The first employing $10,000 in capital, and 29 hands, who produced work valued at $38,000 per annum; the others, with capitals of $800 and $1,000 respectively, and 3 and 4 hands each, produced work to the amount, severally, of $2,830 and $900.

The first published specimen of American lithography may be seen in the 24th volume of the Analectic Magazine for July, 1819, which was but a few years subsequent to the introduction of the art into England from Germany. It was executed upon Munich stone, by Benjamin Otis, of Philadelphia, who had also executed lithographic engraving upon stone from a quarry near Dick's river, Kentucky, obtained through Dr. Brown, of Alabama, and Judge Cooper, of Pennsylvania. Lithographic work in an improved form was commenced in 1822 in New York, by Messrs. Barnett & Doolittle, who had been regularly instructed in the art in Paris. In 1824 a patent was granted to David Henderson, of Jersey City, for an improvement in lithography, and another in 1833 to Robert C. Manners, of Boston, for applying the art to reprinting books. The first regular lithographic establishment in the United States was commenced in 1827, at Boston, by W. S. Pendleton, who imported artists and materials from England and executed portraits, music, titles, and other specimens of the art with much success. The establishment continued in operation a few years ago. The second establishment was commenced at Philadelphia in 1828, by Kennedy & Lucas, but failed for want of experienced printers. Messrs. John Pendleton, Kearney & Childs commenced soon after, employing as draughtsmen Rembrandt Peale and Mr. Swett.

Mr Pendleton established, in New York, the first successful lithographic house in that city, while the business continued to be carried on in Philadelphia by Childs & Inman, Childs & Lehman, and Lehman and Duval, and, after 1836, by P. S. Duval and P. S. Duval & Son, and by other artists. In 1858 there were 235 lithographic presses in that city, and manufactories of lithographic presses and ruling machines, &c.

The number of lithographic and copperplate printers in the United States in 1850 was 26. They employed 375 hands, and executed work valued at $247,200. Since that time the number of establishments has nearly doubled, and the product has increased at the rate of 243 per centum.

Statistics of lithography 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.		
Massachusetts	2	$10,500	$2,275	24	.....	$10,404	$19,000
Connecticut	2	9,500	5,160	17	6	9,900	17,500
Total in New England States	4	20,000	7,435	41	6	20,304	36,500
New York	23	157,850	83,045	321	.....	139,236	383,700
Pennsylvania	23	255,600	125,292	363	19	167,796	386,300
Total in Middle States	46	413,450	208,337	684	19	307,032	770,000
Ohio	1	10,000	12,500	28	1	9,780	38,000
Indiana	1	800	800	3	.....	1,152	2,830
Missouri	1	1,000	134	4	.....	600	900
Total in Western States	3	11,800	13,434	35	1	11,532	41,730
Total in United States	53	445,250	229,206	760	26	338,868	848,230
ENGRAVING, ETC.							
Massachusetts	8	5,200	3,564	16	2	9,584	24,025
Rhode Island	4	3,600	1,931	25	.....	10,920	17,300
Connecticut	2	3,000	840	5	.....	2,556	3,775
Total in New England States	14	11,800	6,335	46	2	23,060	45,100
New York	97	138,100	86,495	404	2	179,700	437,396
New Jersey	2	1,550	973	4	.....	1,920	2,950
Pennsylvania	72	271,000	59,586	228	14	116,256	322,400
District of Columbia	1	4,000	532	1	.....	408	3,744
Total in Middle States	172	414,650	147,586	637	16	298,284	766,490
Illinois	2	3,300	2,150	12	.....	5,700	12,550
Wisconsin	1	400	200	1	.....	480	1,000
Missouri	2	1,500	900	10	.....	3,000	4,000
Total in Western States	5	5,200	3,250	23	.....	9,180	17,550
Total in United States	191	431,650	157,171	706	18	330,524	829,140

ENGRAVING.—This branch of art-manufacture employed, in 1850, 112 establishments and 480 workmen, whose labor produced a value of $566,005. In 1860 the establishments in 10 States numbered 191; their capital amounted to $431,650; the number of hands to 706 males and 18 females; the cost of labor to $330,524, and of materials to $157,171; and the value of engraving of different kinds done amounted to $829,140, an increase of over 48 per cent.

The value of this industry, in Massachusetts, Rhode Island, and Connecticut, which had, respectively, 8, 4, and 2 establishments, was $45,100, of which $24,025 was produced in Massachusetts, $17,300 in Rhode Island, and $3,775 in Connecticut. The first employed 18 hands, the second 25, and the third 5, and the total capital in those States was $11,800.

In the middle States and District of Columbia there were 172 engraving establishments, having

altogether employed a capital of $414,650, and 637 male and 16 female hands. The annual wages paid was $298,284, and the cost of materials was $147,586, the value of work executed amounting to $766,490.

Of the whole product in those States, 97 in New York, having invested $138,100, and employing 406 persons, returned a value of $437,396, and 72 in Pennsylvania, with capitals aggregating $271,000, executed, with the labor of 242 persons, engraved work valued at $322,400 In New Jersey 2 establishments produced work of the value of $2,950, and 1 in the District of Columbia a value of $3,744.

There were 5 in the western States, viz, 2 in Illinois, 2 in Missouri, and 1 in Wisconsin. They produced work, respectively, to the value of $12,550, of $1,000, and of $4,000, and, together, employed 18 hands. This work is principally executed in the larger cities.

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

STATES AND TERRITORIES.	No. of establishments.	Capital invested.	Cost of raw materials.	AVERAGE NUMBER OF HANDS EMPLOYED.		Annual cost of labor.	ANNUAL VALUE OF PRODUCT.	
				Male.	Female.		In 1860.	In 1850.
Maine	38	$234,200	$81,105	222	32	$77,220	$261,874	$119,988
New Hampshire	30	131,200	53,380	176	14	50,590	196,620	44,706
Vermont	18	89,200	43,364	100	17	34,452	101,701	19,950
Massachusetts	150	1,755,200	1,498,748	1,515	257	744,848	2,989,416	1,493,232
Rhode Island	14	106,000	66,933	152	6	64,004	196,262	.....
Connecticut	28	286,600	288,618	395	127	168,756	675,528	577,850
Total in New England States	278	2,602,400	2,027,148	2,560	453	1,139,870	4,421,401	2,255,726
New York	349	7,880,550	5,867,458	6,207	1,011	2,603,116	12,617,105	6,163,809
Pennsylvania	267	4,137,850	2,122,635	3,087	315	1,214,768	6,022,877	1,717,612
New Jersey	51	215,400	90,312	333	11	109,368	303,669	36,142
Delaware	7	88,000	48,372	69	.....	23,616	105,332	.....
Maryland	26	263,700	149,076	316	6	134,616	433,423	379,569
District of Columbia	8	471,250	307,560	377	118	270,372	778,500	184,500
Total in Middle States	708	13,056,750	8,585,413	10,389	1,461	4,355,856	20,260,906	8,481,632
Ohio	141	1,224,374	1,046,969	1,464	3[illegible]	558,372	2,227,264	357,565
Indiana	59	120,320	38,085	252	.....	70,892	175,737	92,648
Michigan	34	204,150	66,189	294	1	103,514	255,166	20,000
Illinois	84	487,200	264,773	648	5	253,380	825,905	18,475
Wisconsin	56	136,800	92,030	268	4	85,612	242,983	28,698
Minnesota	13	14,500	7,043	37	.....	10,260	31,835	.....
Iowa	41	107,500	49,281	169	3	50,400	155,110	5,450
Missouri	33	137,550	81,441	232	.....	121,464	292,274	22,150
Kentucky	19	145,075	81,387	253	4	127,716	310,702	131,200
Kansas	2	2,800	975	6	.....	2,640	4,630	.....
Nebraska	5	15,300	4,545	23	.....	9,672	24,675	.....
Total in Western States	487	2,595,569	1,732,712	3,646	366	1,393,922	4,546,281	676,186
Virginia	22	94,000	33,902	128	8	34,152	102,959	19,060
North Carolina	13	42,050	23,518	81	.....	29,892	87,950	.....
South Carolina	5	18,700	2,146	18	.....	6,276	15,295	5,500
Georgia	21	181,250	87,241	183	3	102,744	267,974	64,200
Florida	1	1,700	200	3	.....	960	2,000	.....
Alabama	22	51,400	11,478	70	.....	20,304	63,100	5,900
Louisiana	8	51,600	9,565	43	.....	20,220	47,696	28,500
Texas	21	78,824	32,243	110	.....	56,088	142,520	.....
Mississippi	11	25,575	5,682	32	5	14,172	63,890	.....
Arkansas	6	9,800	2,715	19	.....	6,264	16,650	3,950
Tennessee	21	606,900	149,741	274	37	126,840	443,120	45,895
Total in Southern States	151	1,161,799	358,431	961	53	417,912	1,253,154	173,005
Utah	2	21,000	11,900	20	.....	14,040	36,000	.....
California	31	157,800	118,788	219	.....	242,436	485,954	.....
Oregon	9	27,000	8,896	21	.....	24,060	60,202	.....
Total in Pacific States	42	205,800	140,584	270	.....	280,536	582,156	.....
Total in United States	1,666	19,622,318	12,844,288	17,826	2,333	7,588,096	31,063,898	11,586,549

BOOKBINDING AND BLANK BOOKS.

These branches of domestic industry employ 269 establishments, 2,045 male and 2,732 female hands, and a capital of $1,654,830, consuming materials of the annual value of $1,554,082, and producing, with an expenditure of $1,048,930 for labor, a yearly product of $3,729,080, an increase of a little over 14 per cent. on the product of 1850, which amounted to $3,255,678.

In the New England States there were 58 establishments, one-half of which were in Massachusetts. The business in these States employed a capital of $299,250 and 960 persons, and produced work valued at $863,223, which was a depreciation of $114,656 as compared with its value in 1850. The falling off was in the States of Massachusetts and Vermont, the former of which manufactured to the value of $569,680, and the latter of $1,200, a decline in the one of $234,740, or 78 per cent., and in the other of $8,800, from the returns of 1850. In each of the other States there was a large increase of business. Eight establishments in Connecticut produced a value of $147,000, an increase of upward of 24 per cent.

The middle States enumerated 132 binding and blank book establishments, having invested, as capital, $1,072,850, and employing 1,318 males and 2,053 females, at a cost for wages of $660,200. The value of their manufactures amounted to $2,273,449, the increase being 23.5 per cent.

All but $115,143 of the value in those States was returned by 120 establishments in the two States of New York and Pennsylvania. The former of these had 64 establishments, with a capital of $490,900, and 1,140 operatives, of whom 527 were females, who received as wages $326,312, and manufactured goods valued at $1,173,628, an increase of 36.8 per cent., and 56 concerns in Pennsylvania, having a capital of $518,900, and paying annually $297,816 for the labor of 641 male and 1,474 female hands, made binding and blank books of the value of $984,678, which exceeded the product of 1850 in the ratio of 30 per cent. and upward. In New Jersey 7 manufactories returned a value of $65,317, which was a falling off of nearly 50 per cent., and in Maryland, which reported in 1850 a product of $52,850, one establishment returned a value of only $1,700.

Fifty-nine establishments in the western States employed in capital $194,680 and 362 persons, and paid for labor $101,562, and for material $219,055. They manufactured to the value of $460,608, an increase of nearly 16 per cent. in 10 years. Their business amounted to a little more than one-half that of New England, which had 3 establishments less.

Twenty-six of the western manufactories were in Ohio, and employed a total capital of $77,780 and 202 hands, which made bindings and blank books of the value of $212,413, which was $9,599 less than was made in that State in 1850. The product of 8 factories in Indiana was $104,800, an increase of over 214 per cent., and the same number in Wisconsin made work valued at $49,750, or 332.6 per cent. more than in 1850. Four establishments in Michigan produced a value of $40,600, and 6 in Illinois returned a product of $18,700, each having produced, in 1850, $12,000 worth.

From Missouri and Kentucky a large decrease in this branch, being reduced to one establishment each, was reported, while Iowa, which made no return in 1850, produced, in 5 establishments, a value of $26,545.

The shops in 5 southern States numbered 17, combining a capital of $76,350, and paying for material $60,880, and for the labor of 66 males and 3 females $32,604. The value of their manufactures was $99,500, the increase being at the rate of 150 per centum. Of the total product in these States, $25,500 was returned by 8 establishments in Virginia, which, in 1850, returned only $2,500; $49,000 by 4 in Louisiana; $17,500 by 3 in Georgia; $5,000 by 1 in Mississippi; and $2,500 by 1 in North Carolina. From the two last named and from Louisiana there was no return in 1850, and South Carolina and Alabama, which in that year reported, the one a value of $4,000, and the other of $23,500, no report was made in 1860.

California, in 1860, contained 4 binderies and blank book factories, having capitals amounting to $9,700. They employed 9 males and 5 females, at a cost for labor of $6,360, and for materials of

$10,782, and produced work valued at $31,500. One small shop in Oregon, with a single hand, made $800 worth of binding and blank work.

The earliest bookbinding done in America, of which we have any account, was by John Ratliffe, an Englishman, who, in 1661, received £5, or 6*d.* each, for binding in leather two hundred copies of John Eliot's edition of the New Testament in the Indian tongue, and afterwards bound the same number of copies of the Bible in quarto, with clasps, for about 2*s.* 6*d.* each. He afterward became a bookseller in Boston, where that class of tradesmen generally associated bookbinding with their business. Edward Ranger was a bookbinder and dealer in books in Boston in 1673, and of upwards of 90 booksellers who carried on business in that city previous to the Revolution, more than 30 are known to have had binderies connected with their shops, and many of them made binding a principal branch of their business. One of the number, Richard Fry, "Stationer, Bookseller, Papermaker, and Rag-merchant from the city of London," who, in 1732, kept on Cornhill, appears to have been one of the earliest blank-book manufacturers in that city. He assured the merchants in a card that he would sell them all sorts of account-books, "done after the most acute manner," 20 per cent. cheaper than they were accustomed to have them from London.

Bookbinding was carried on at Newburyport and Salem in 1761, and at New York, by Robert MacAlpine, in 1769, followed by others, soon after. Andrew Bradford, the printer, in 1718, and Benjamin Franklin, in 1729, and others in Philadelphia, and at least two in Charleston, South Carolina, executed binding, in connexion with printing and bookselling, before the Revolution.

In 1810, returns were made of bookbinding from Pennsylvania, only, where there were 102 bookbinders, whose manufactures were of the value of $107,183. In New Jersey one binder was reported, but the value of his business was not stated.

In 1840, the number of binderies in the United States was 447, of which 147 were in the New England, 190 in the middle, 41 in the southern, and 69 in the western States. New York contained 107, Massachusetts 72, Pennsylvania 46, Ohio 41, New Hampshire 22, and the other States from 1 to 20 each.

The number of bookbinding and blank-book establishments in the United States in 1850 was 235, and their capital $1,063,700. They employed 3,468 hands, and the value of their manufactures was $3,255,678.

The principal improvements in bookbinding within the present century consist in the introduction of the cheaper materials of cloth and marbled paper for covering the boards, and in the greater use of machinery in the several processes of the bindery, of which last Americans make more use than European binders.

By far the larger proportion of all the books now published in the United States are put up in cloth binding, which, in addition to its cheapness and the rapidity with which work of that kind may be turned out, possesses considerable durability and capacity for ornamentation. Within the last ten years, bookbinders' muslin has been manufactured in the United States by at least one house, and marbled paper has been made for a number of years in Philadelphia of superior quality, in great variety of patterns, as well as by several manufacturers in other places. Their use has contributed to the growth of the publishing business of the country.

Bookbinders' tools for producing the ornamental work were manufactured in Philadelphia upward of forty years ago, by David H. Mason, who took out a patent in January, 1826, for ornamental rolls and stamps for bookbinders, and in partnership with M. W. Baldwin, the eminent locomotive builder, introduced many new designs. Benjamin Gaskill, established as a bookbinder of the same place previous to 1812, was one of the first to use hydraulic presses and other machinery in bookbinding in this country. The improvements since made by Americans in the mechanism for folding, cutting, block-gilding, blind-tooling, embossing, backing, finishing, &c., and particularly in cloth binding, which employs machinery to a greater extent than other kinds, are very numerous and valuable, as well as those for ruling, paging, &c, of blank books. Machines for ruling and paging commercial, account, and

blank books, in the manufacture of which Americans excel, have been invented and patented by Messrs. J. & W. McAdams, of Boston. The ruling machine produces horizontal and vertical lines in red and blue inks on both sides at one operation, and has been deemed so valuable that one manufacturer a few years since paid $15,000 for a limited right to its use. The paging machine applies the types simultaneously to both sides of the sheet at the rate of 30 to 40 thousand impressions daily, by the labor of one man.

Statistics of bookbinding and blank books 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.	
				Male.	Female.		In 1860.	In 1850.
Maine	7	$31,200	$12,146	21	10	$9,000	$42,128	$8,900
New Hampshire	9	45,000	42,480	42	30	20,456	73,515	24,219
Vermont	1	800	419	1	3	672	1,200	10,000
Massachusetts	28	154,250	287,065	237	382	166,452	569,680	804,420
Rhode Island	3	14,500	7,670	24	13	10,176	29,700	12,000
Connecticut	8	53,500	54,576	61	136	40,848	147,000	118,350
Total in New England States	56	299,250	404,356	386	574	247,604	863,223	977,889
New York	64	490,900	451,996	613	527	326,312	1,173,628	864,716
Pennsylvania	56	518,900	363,903	641	1,474	297,816	984,678	756,295
New Jersey	7	50,350	27,575	41	22	19,104	65,317	123,000
Delaware	1	1,200	750	3	1	1,080	1,876	1,000
Maryland	1	1,000	525	1	.....	600	1,700	52,850
District of Columbia	3	10,500	14,135	19	29	15,288	46,250	42,800
Total in Middle States	132	1,072,850	858,884	1,318	2,053	660,200	2,273,449	1,840,661
Ohio	26	77,780	102,916	137	65	52,872	212,413	222,012
Indiana	8	70,000	60,440	39	2	12,672	104,800	33,316
Michigan	4	12,200	13,117	13	9	7,926	40,600	12,000
Illinois	6	5,400	6,142	16	5	5,916	18,700	12,000
Wisconsin	8	18,000	19,774	36	6	12,072	49,750	11,500
Iowa	5	9,500	13,541	16	10	6,924	26,545	.....
Missouri	1	1,500	3,000	7	.....	2,520	7,000	32,600
Kentucky	1	300	125	1	.....	600	800	74,000
Total in Western States	59	194,680	219,055	265	97	101,562	460,608	397,428
Virginia	8	9,600	10,138	24	3	9,264	25,500	2,500
North Carolina	1	1,250	372	3	.....	1,200	2,500	.....
South Carolina	.....	.....	.....	.....	.....	.....	.....	4,000
Georgia	3	16,500	6,120	10	.....	4,500	17,500	9,700
Alabama	.....	.....	.....	.....	.....	.....	.....	23,500
Louisiana	4	46,000	29,250	27	.....	16,440	49,000	.....
Mississippi	1	3,000	15,000	2	.....	1,200	5,000	.....
Total in Southern States	17	76,350	60,880	66	3	32,604	99,500	39,700
California	4	9,700	10,782	9	5	6,360	31,500	.....
Oregon	1	2,000	125	1	.....	600	800	.....
Total in Pacific States	5	11,700	10,907	10	5	6,960	32,300	.....
Total in United States	269	1,654,830	1,554,082	2,045	2,732	1,048,930	3,729,080	3,255,678

MUSICAL INSTRUMENTS.

The manufacture of musical instruments in the United States employed, in 1850, in 18 States, 204 establishments, aggregating a capital of $1,545,935. They employed 2,307 male and 24 female hands, who received in annual wages $1,054,728, and produced, from raw materials valued at $698,168, musical instruments to the value of $2,580,715, whereof $1,073,343 was the product of 58 establishments in New York, and $903,512 that of 49 in Massachusetts, those States being the principal producers. On the 1st of June, 1860, the total number of establishments engaged in this manufacture in 19 States was 223, of which the invested capitals amounted to $4,431,900, the number of hands to 4,461, including 7 females. The annual cost of raw materials was $2,144,298, and of labor $2,378,520. The value of the product was $6,548,432, an increase of 153.3 per cent. in ten years.

The manufactures included 21,797 piano-fortes, made in 15 States; 12,643 melodeons and harmoneons made in 12 States; 245 organs, the product of 8 States, including 2 in California; 25 aeolians, made in Maine; 12 calliopes, manufactured in Massachusetts; and 300 guitars, made in Pennsylvania.

Of the whole number of establishments, 110, employing a capital of $3,644,250 and 3,482 hands, manufactured piano-fortes of the value of $5,260,907; 40 establishments, having a capital of $418,400 and 451 hands, made melodeons and harmoneons to the value of $646,975; and organs were manufactured to the value of $324,750 in 20 establishments having a capital of $184,600 and 265 hands. The remaining 53 establishments, representing a capital of $184,650 and employing 263 persons, manufactured instruments of various kinds to the value of $315,800.

New York was the largest producer of musical instruments, its factories, 77 in number, having made 12,800 pianos, 8,100 melodeons and harmoneons, and 75 organs. These employed a capital of $2,654,700 and 2,454 hands, 4 of them females, whose wages cost $3,392,567. The raw material consumed was valued at $1,072,524, and the product at $3,392,567, which was an increase of 216 per cent. on the product of 1850.

Massachusetts was the next in the value of musical instruments made, and employed 44 factories, having invested $1,088,500, and producing, from $667,287 worth of materials by the labor of 1,054 hands, an annual product of $1,901,470, an increase of 110 per cent. since 1850. The articles made were 5,611 pianos, 1,296 melodeons, &c., 100 church organs, and 12 calliopes.

In Pennsylvania 31 establishments made 1,188 piano-fortes, 238 melodeons and harmoneons, 17 organs, and 300 guitars, together valued at $446,910, which was an increase of 135 per cent.

The only other States which reached a product of $100,000 were Maryland and Kentucky, the former of which made musical instruments of the value of $282,000, and the latter $114,730, the increment being, respectively, 93 and 555 per cent.

The other States showed, severally, the following rates of increase in this manufacture, viz: Maine 96, New Hampshire 33, Vermont 294, New Jersey 59, Ohio 37, Illinois 330, Michigan 172, Wisconsin 486, Missouri 196 per cent. Rhode Island and Connecticut showed a decrease in the business, and Indiana, Virginia, and California made no returns in 1850.

The extent and perfection to which the manufacture of instruments of music is carried at the present day may be safely received as an index of the general progress of mankind in civilization and social comfort. It does not detract from this view of the subject to say that instrumental music is addressed merely to the ear, and therefore appears to gratify only the sensuous part of our nature with an artificial strain destitute of the charm of vocalization. We all know that the physical senses are the inlets of many of our purest pleasures, and that a delicate organization may become the medium of awakening emotions of the sublimest and tenderest kind.

In our day, the manufacture of musical instruments, considered in its economical relations, is confined to the production of a few of the larger and more perfect ones belonging to the classes of keyed instruments, which are so improved in construction and so comprehensive in their powers as to combine the characteristics of nearly all other kinds.

In this department, American skill and genius have placed our manufacturers in rivalship with

those of Europe, on which, for many years, we were dependent for our instruments of music. So unimportant was this branch of industry a half century since, that its products were recorded by the marshals in 1810 only in one State, in which they amounted in value to only $17,830, nearly the whole of which was produced in the city of Boston. That city now contains twenty establishments, which produce, annually, upward of one and a half million worth of instruments. The State of Massachusetts, in 1810, made musical instruments to the value of $1,901,470. In 1820 the statistics of this branch were very limited, and even so late as 1840 we find the returns of the total value of this manufacture in the United States to amount to less than one million dollars, giving employment to nearly one thousand hands. The returns of 1850 make the aggregate value of musical instruments manufactured $2,580,715 in value. The increase in this branch of industry in the succeeding ten years amounts to $3,967,717, being 153.3 per centum.

Although this disparity in the product is probably, in part, due to the greater accuracy of the late returns, there is no doubt of a rapid increase in this branch in the past ten years. This is a cause of satisfaction in a social as well as economical view of the subject, as indicating the progress of a taste for refined and intellectual pleasures among the masses of the people, and also an increased ability to indulge it.

Piano-fortes.—First in importance among musical instruments stands the piano-forte, whether we regard the high place which it deservedly holds in the popular esteem, its wide-spread social influence, or the extent of its manufacture considered as a branch of trade. In addition to several powers peculiar to this most valuable of instruments, it possesses nearly all the elements of expression which belong to all others. The rapid increase, both in Europe and America, within a few years, in the number of piano-fortes relatively to the population, is not only capable of statistical proof, but is apparent to almost every one in the limited sphere of his own observation, a fact which does not apply to any other instrument. Evidence of this adaptation of the piano to the wants of the community is also found in the large proportion of piano music now to be found on the shelves of music dealers everywhere, and in the great number of persons who obtain support by teaching the use of the instrument. As the character of the amusements of a people changes with its advancement in civilization, this general disposition to transplant to the home circle enjoyments which formerly could only be indulged abroad is an evidence of progress.

In our country, where wealth is more equally distributed, the piano is no uncommon appendage to the farm-house and is often found in the cottage of the humbler class of artisans and laborers in our cities. It becomes in all, from the highest to the lowest, a source of innocent and intellectual pleasure and moral improvement. It beguiles the hours of sorrow and alleviates the cares of business, while it diffuses through all classes an increasing taste for the enjoyments of the social and domestic circle, harmonized and elevated under the influence of music. Even the higher sentiments of religion and patriotism are powerfully stimulated by its aid, as the national and sacred character of the popular songs and airs heard in public and private at all times abundantly testify.

The piano-forte appears to have originated in Germany early in the last century. The original, from which it came to its present form by successive modifications, was a more ancient instrument called the psalterium or tympanum, better known in modern times as the dulcimer. This was played by striking a series of brass wires stretched across a small box forming the musical scale, by means of a pair of little wooden hammers or small rods. Still closer approximations to the piano-forte are traced in the clavichord, in which a keyboard and digital action were employed; in the clavicitherium, of square form, in which little leather hammers acted upon strings of catgut, and in the virginal, a keyed instrument, with metallic chords vibrated by quills affixed to the end of levers or keys. The virginal is said to have been invented in England in the time of Elizabeth, and to have been a favorite instrument with the virgin queen, whence it derives its name.

The harpsichord, also a common instrument at that period, was a still nearer approach to a grand piano. It had strings of wire stretched over bridges, and operated upon by little jacks by means of

two key-boards, which could be used either separately or together. The harpsichord was a quilled instrument and was familiar to the first settlers of this country, as was also the spinet, which was only a square harpsichord. Both of these were harsh-toned instruments. Many attempts were made to improve the tones of the harpsichord, aptly described as "a scratch with a sound at the end of it," and also to adapt to it the peculiar action of the piano-forte, to which a century since it still remained superior. Unmelodious as were its sounds, the harpsichord has been honored as the medium through which Beethoven, Mozart, Handel, and other eminent composers gave forth their finest inspirations.

Marius, of Paris, is believed to have been the first, in 1716, to improve the quality and character of the tones of the harpsichord by the use of small hammers instead of plectrums of quills. Two years after Christophero, of Florence, produced an instrument which, being capable of giving forth sounds both soft and loud, was first called piano-forte. Manufactories of the instrument were established in 1760 by Zumpf in England, and by Silberman in Germany, and in 1767 the piano was introduced on the stage of Covent Garden theatre as "a new instrument."

In 1774 Joseph Merlin obtained in England a patent for a compound harpsichord, having hammers on the plan of the piano-forte. But the first grand-action piano was made two years before by Becker, a German, assisted by John Broadwood and R. Stodart, all in the employ of Tschudi, of London. They succeeded in applying to the harpsichord the piano-forte mechanism then in use, or "direct action" as it is called, which has been since employed with slight modifications by the Broadwoods in upwards of 18,000 grand piano-fortes, besides 1,500 of smaller dimensions; by Stodart, of London, and at least one large firm in this country. The earliest entry of a piano on the books of the Broadwoods was in 1771, and of a grand piano in 1781. Clementi, in the year following, first brought the grand piano into notice as a concert instrument, by playing on one of Broadwood's at the Pantheon, in London. We may here mention among the attempts to improve the harpsichord, that the ingenious Governor Hopkinson, of Philadelphia, in 1783, essayed an improved mode of quilling the instrument, and the following year received from the manufactory of the Messrs. Tschudi & Broadwood a harpsichord made according to his plan. He also attempted to adapt keys to the harmonica in 1785.

The first patent of an upright piano was taken out by W. Stodart in 1795, though its first construction is ascribed to an Englishman named Hancock. In 1794 and 1798 Southwall, of Dublin, patented what is known as the "Irish damper" for square pianos, and in 1807 introduced the "cabinet" piano. This was followed by the "cottage" upright, 4 to 5 feet high, by Robert Wornum, in 1811, and in 1827 by the "picolo," 3½ feet in height.

The ample fortunes and high repute acquired by Zumpf, Clementi, Kirkman, and others, in England; by Silberman, in Germany; and the Erards, in Paris, were the fruits of successive improvements and excellence in the manufacture of the piano-forte. The English manufacturers long maintained the highest reputation in this branch. The extent of the piano manufacture in England may be inferred from the fact that the entire number of piano-fortes of all kinds manufactured by the Messrs. Broadwood from 1771 to 1851 was 103,750, of which number 60,382 were made from the year 1824 to 1850, an average of 2,236 per annum. The Messrs. Collard, of that city, sold in the twenty years previous to 1851 about 32,000 piano-fortes. The entire production of all England in 1853 was estimated at 1,500 instruments per week, of which number about 10 per cent. were grand pianos, a like proportion were squares, and the remainder uprights.

Many improvements have been made in the piano since the great exhibition of 1851, when 173 instruments, shown by 101 exhibitors from different countries, afforded an opportunity for comparison and stimulated improvement.

The result is seen, among other things, in an extension of the compass of the piano, and has been followed by an increase of the price of first-class instruments, with a corresponding reduction in those of humbler construction. Thus Broadwood & Son's first-rate concert grands, which in 1851 sold for

175 guineas, commanded 250 guineas each in 1862, in consequence of improved construction, while small uprights of full compass were sold in 1862 at less than £20 each.

The piano-forte came into use in the United States before the close of the last century. By whom they were first made in this country is uncertain. Mr. John Osborn, who as late as 1823 made upright, grand, square, and cabinet pianos, opposite Boylston Market, Boston, and J. Thurston have been mentioned among the earliest manufacturers. As early as 1790 several piano-fortes, claimed to be equal in workmanship to any imported, were made in Philadelphia.

Even thus early had been observed and urged in favor of the domestic article the fact, since well understood, that in consequence of the great humidity of the climate of London, and that contracted in the subsequent passage of the Atlantic ocean, instruments made in England shrank and opened at the seams when brought into the dryer atmosphere of this country. This, added to the oxidation of the wires and the loosening of the keys, greatly impaired or destroyed the tone and durability of the instrument. It still remains a valid objection to foreign instruments, notwithstanding various contrivances, the most valuable of which is of American origin, to obviate the effects of a change of climate. Although artificial heat is extensively employed for this purpose, it is very inferior to the natural, and hence large capitals are required to enable manufacturers to keep a sufficient stock on hand, the best of them keeping their material from two to three years in seasoning.

The first American patent for improvement in the piano-forte was taken out in 1796 by James S. McLean, of New Jersey; and the next in February, 1800, by John Isaac Hawkins, of Pennsylvania, for an upright of novel and ingenious construction, which did not take, however, with the public. For many years the manufacture of piano-fortes, though carried on to some extent in our principal cities, continued to be quite a limited business in the United States. Our piano-makers have striven with laudable ambition, as the records of the Patent Office will testify, to improve the mechanism and qualities of the instrument. In this they have succeeded in adding some substantial improvements, among which may be named the "cast metal plate frame" for sustaining the strings, and which has been adopted abroad. This was introduced by Jonas Chickering, of Boston, who commenced business nearly forty years since. The "eolian attachment," or combination of the accordion and piano in one instrument, was invented by Obed Coleman, of Barnstable, Massachusetts, in 1842. The patent for this improvement sold in this country for $110,000. The "reversed top piano-forte" of Conrad Meyer, one of the oldest manufacturers in the country, the "dolce campana" attachment patented in 1848, the "corrugated sounding board," and the modifications of earlier or later date, may be included among American contributions.

Many American manufacturers now produce instruments admitted by the best performers to be in all respects equal to those of any foreign piano-makers. In the selection of woods, of which a considerable variety is used in their construction, our builders possess many advantages. The principal kinds employed are pine, walnut, white holly, maple, oak, mahogany, ebony, rosewood, &c., on the complete seasoning of which, particularly in the sound-board, the perfect *timbre* or tone of the instrument is greatly dependent. To this end, as already remarked, the clearness and dryness of the climate materially contribute.

At the great exhibition in London, in 1851, all the American exhibitors of piano-fortes received either gold medals or honorable mention. Of four American contributors to the exhibition of 1862, two received prize medals, the number of competitors being 332, and the number of medals awarded 113. "For excellency of material, simplicity of style, elegance of finish, and faithfulness of workmanship, and, above all, for volume and variety, mellow sweetness, brilliancy and permanency of tone, the American pianos now challenge competition from all quarters of the world." *

Church Organs.—The organ is the largest, the most complicated in construction, and the most costly of musical instruments. It is also the most harmonious and the most capable of an almost endless variety of combinations, imitating the melody of all others, but exceeding all in the grandeur,

* Moore's Cyclopædia of Music, page 729.

solemnity, and rich volume of its tone, and eminently adapted to the purpose for which it is more particularly used. It is an ancient instrument, but its origin is enveloped in doubt. The earliest form appears to have been acted upon by water, and the invention of this *hydrauhcon* is ascribed to Ctesilaus, of Alexandria, about 220 B. C. The earliest mention of an organ with bellows (*pneumaticon*) is of one in possession of Julian the apostate, in the 4th century. The instrument was in high esteem in the time of Cassiodorus, A. D. 528. It was first introduced into some of the churches of western Europe by Pope Vitalian, about the year 670, but the earliest reliable account is of an organ sent, in 757, to King Pepin, of France, the father of Charlemagne, by Constantine Compronymus, the Greek emperor. Others were built by French artists, on the Greek model. Winchester Cathedral is said to have had an organ in 951, the largest then known, having 26 pairs of bellows, requiring seventy men to fill it with wind It had 10 keys, with 40 pipes to each key. The organ did not, however, possess a compass of more than 12 or 15 notes in the 12th century, about which time half-notes were introduced at Venice. Pedals, or foot keys, were added by Bernhard, a German, in 1470, and large pipes of 16 to 32 feet began to be made about the same time. Before the close of the 16th century the organ had reached, substantially, its present perfection, as to general arrangement and detail of parts. The Antignati, of Brescia, were the most famous builders at that time, to whom succeeded, in the 18th century, Serassi, of Bergamo, and Callido, of Venice. Few organs in England, except that of York Minster, escaped destruction in 1641, and at the Restoration, in 1660, when there were only four organ-builders in Great Britain, foreign artists were called in. English organ-builders remained inferior to the continental, until the introduction of the works of the celebrated Bach, some thirty or forty years since, showed that true organ music could not be played on English organs, and that the true organ style was unknown to English players. The continental plan thenceforth became common. Within the last twenty years, great improvements have been made in the tone of the organ as dependent on "voicing" of the pipes, in the touch or quickness of response to the keys, and in other mechanical arrangements.

The first mention we find of an organ in America is in 1711, of one belonging to Mr. Thomas Brattle, of Boston, and probably the same that was presented by him to Queen's (afterwards King's) chapel, in August, 1713. That such an innovation in church music was not favored by the churches of that day is evident, from the fact that the instrument was not erected until the following year, having remained seven months in the vestibule of the church before it was unpacked. It continued in use from that time until 1756, when it was sold to St. Paul's church, in Newburyport, whence, after eighty years' further service, it was removed, in 1836, to St. John's church, Portsmouth, New Hampshire. The original pipes and wind-chest remain in perfect order to this day. Attempts to reform the psalmody of New England elicited strong objections to the revival of singing by note, lest it should bring instrumental music into the church. Nearly half a century after the erection of this ancient organ, we find "the complete introduction of the organ into all places of public worship" to be the subject of a pamphlet published in Philadelphia, in 1763, by a Presbyterian, on "the Lawfulness and Advantages of Instrumental Musick in the publick Worship of God," &c. A similar tract was issued in Boston, in 1771. Indeed, the first organ introduced into a Congregational church in New England was one set up in 1785 in the First church in Boston.

The first organ built in this country appears to have been erected by John Clark, in 1743, for the Episcopal church in Salem, Massachusetts. In 1754 it was presented to the Episcopal church in Marblehead, and a new one put in its place by Thomas Johnson, of Boston, who had built one in 1752 for Christ's church in that city. The Salem organ, of Johnson, a relic of which is preserved by the Messrs. Hook, of Boston, was a small organ with one bank of keys and six stops. Mention is also made of Edward Bromfield, jr., of Boston, as the builder of an organ in 1745, supposed to have been the first constructed in this country. Johnson died in 1768, and was succeeded by Dr. Josiah Leavitt, who was many years engaged in the business. He was followed by Henry Pratt, of Winchester, New Hampshire, who died in 1849, having built 23 small church organs and about 19 of less size. Mr. Pratt was succeeded by Wm. M. Goodrich, a native of Templeton, Massachusetts, but for thirty-four years a

resident of Boston, where he died in 1833, at the age of 56. Mr. Goodrich is generally admitted to have been the first organ-builder in the United States deserving the name. The superiority of his instruments to those previously constructed here gave a name and a fame to American organs, and made his reputation known throughout the Union. The importation of foreign instruments became thenceforth, in a great measure, unnecessary, and those of his construction were to be found in nearly every State. This talented self-taught artist commenced, in 1805, by building an organ for the Catholic church of Bishop Chevereaux, in Boston. In its place he set a much larger and finer one in 1822. It is said that during the whole time of his business career only three church organs were imported into Boston from abroad. Mr. Goodrich's brother and pupil, Ebenezer Goodrich, also built in Boston quite a number of small organs on his own account, and afterward in partnership with Hayts, Babcock & Appleton, on Milk street, until 1820. At this time Appleton, also a pupil of W. M. Goodrich, commenced business for himself, which he afterward continued as Appleton & Warren. The reputation of Goodrich was also ably sustained by E. & G. G. Hook, the former of whom also acquired the art of organ-building from him. They commenced in 1831, at Salem, Massachusetts, where they built 19 organs, and afterward removed to Boston, where they still prosecute the business. In 1853 there were 4 large organ factories in Boston, and a large one was started at Bellows Falls, Vermont. As early as 1808 we find mention of an organ built for the North church, in Salem, by John Geib, of New York, at a cost of $2,800. Other churches in Salem obtained organs by Goodrich, Hook & Appleton, which cost from $1,200 to $1,700 each.

Organs are sometimes built of very large size. The organ of the Cathedral church at Ulm, in Germany, is said to be 93 feet high and 28 broad. Its largest pipe is 13 inches in diameter, and it has 16 pairs of bellows. Willis, of London, exhibited at the World's Fair, in 1851, an organ of great power, said to weigh 30 tons and to have 5,000 pipes.

The largest church organs in the United States, until quite recently, were in New York. That of Trinity church, the great organ of which has a compass from CCC, through 5½ octaves, has 3 rows of keys, 43 stops, and 2,169 pipes, including a double open diapason of 32 feet. The organ of St. George's church, in that city, has 47 stops and 2,446 pipes, including one of 32 feet, and that of St. Stephen's has 46 stops and 2,029 pipes. An organ in Concert Hall, Philadelphia, built by Standbridge, of that city, has 4 manuals and pedals, 60 registers, and 3,050 pipes.

The great organ recently erected in Music Hall, Boston, the masterpiece of the builder of the large organ at Ulm, is one of the great instruments of the world in size, finish, and musical qualities. It has nearly 6,000 pipes, the largest 32 feet in length, and its combinations and changes are produced by 89 stops. Its several systems of pipes are controlled by 4 manuals or hand keyboards and 2 pedals, and 12 pairs of bellows, which are to be moved by Cochituate water-power, will supply wind to its vocal throats. The exterior of the case, which is of black walnut, is covered with elaborate carvings, statuary, and emblematic devices in the highest style of art, and fills a space of 60 feet in height, 48 feet in breadth, with an average depth of 24 feet. The steam organ or calliope is an American invention.

Melodeons.—The melodeon has within a few years become a favorite parlor instrument. It is a frequent substitute for the organ both in public and private entertainments, uniting, as it does, much of the compass and of the deep, full, and sustained harmony of that instrument, with great cheapness of cost, simplicity, compactness, and portability of form. Vast numbers of these instruments are now manufactured in this country and in Europe, and at prices which bring them within the reach of nearly every class in the community.

The melodeon, like its congeners the seraphine, concertina, harmonicon, melophone, physharmonica, and reed organ, belongs to the class of reed instruments. The leading characteristic of these is, that the tones "are due to the vibrations of a body of air in a tube, throat, or chamber, by means of a lamina or tongue of wood or metal having one end fixed and the other lying over or within an aperture and actuated by forcibly directing through this a current of air."* This tongue, or reed as it is

* Appleton's New American Cyclopædia, vol. 14, page 2.

technically called, has two forms, in one of which it is larger than the aperture which it alternately opens and closes by its pulsations, as seen in the clarionet—hence termed the "beating reed;" in the other form, called the "free reed," the tongue is slightly smaller than the aperture, as in the accordion, and oscillates within the opening, which it nearly closes. The free reed produces the most smooth, mellow, and agreeable sound; it requires no pipe, thus saving much space, is less liable to derangement, and admits of greater expression and power of tone by varying the pressure of air.

M. Grenie is said to have applied free reeds to the organ in 1810, either by original invention or by adoption either from the pitch-pipe or the Chinese organ, called cheng. But its early applications were chiefly to small instruments, such as those blown by the mouth, still in use, and other hand instruments, which, having a bellows and set of keys attached, became the accordion. The Accordion is said to have been brought to England from Germany in 1828, but instruments upon that principle were known in the United States several years before. Indeed its invention has been claimed, probably upon insufficient grounds, for J. H. Bazin, of Canton, Massachusetts, who took the idea from a pitch-pipe brought to him for repairs in 1821.

Whatever may have been the first application of the free reed to hand instruments, numerous modifications of it were introduced in rapid succession, particularly between the years 1825 and 1835. Among the earliest of these seen were in Wheatstone's æolina and concertina. The attempts to improve the accordion by enlarging and extending the scale rendered it unwieldy. Hence originated a form of organ with free reeds, and a regular key-board and bellows worked by the foot, but without pipes. This was called the seraphine. With slight modifications it was called in England and America the melodeon. The French melodeon, originated by M. Debain, of Paris, and improved by the MM. Alexandre, father and son, accordeon manufacturers in that city, is known in its most improved form, in France, as the orgue-melodium or piano Liszt, and in the United States as the Alexandre organ.

The best melodeons have a compass of five or six octaves, the lowest note being eight feet C, the same as that of the violoncello. The reeds are in duplicate, so that the same key always produces the same note. Stops are often added, giving to the instrument many of the effects of a small organ. A form of this instrument, known in the United States since 1825, called the rocking melodeon, was unsightly, tardy in sounding, and harsh in tone. Great improvements have been made in the reed instrument within the last twenty or thirty years. The most important of these it has received at the hands of Mr. J. Carhart, of New York, who perfected in 1846 the present method of acting on the reeds by suction instead of blowing. To this end the bellows and reeds were reversed, whereby greater promptness of response to the touch of the performer and a more pure and flute-like tone was secured. The sweetness of tone was further enhanced by curving the reed, called "voicing" it. These, with other patented improvements in the reed-block and reed, have contributed to the present perfection and cheapness of the instrument, which as an American manufacture is already known throughout America and Europe, in Australia, India, and the Sandwich Islands.

The combination of a free reed instrument like the melodeon or harmonium, with the piano-forte, in the same case, with a separate set of keys for each, so that either can be played separately, or the one as an accompaniment to the other, is the subject of a recent American patent.

Our largest melodeon builders make several different sizes of the instrument, ranging in price from $40 to $1,000 each. The largest ones, with two banks of keys, several sets of reeds and stops, rival the organ in power and tone, being in nowise inferior to the celebrated Alexandre organ. A single establishment in New York city, one of the oldest in the United States, employs in ordinary times about 200 hands in the manufacture of melodeons and harmoniums.

In addition to the wind and stringed instruments already noticed, and quite a number belonging to the class of reed instruments, such as reed organs, harmoniums, concertinas, and accordions, we may enumerate the following as embraced in the musical instrument manufacture in this country, viz: dulcimers, violins and violoncellos, harps, guitars and banjos, clarionets and flutes, including India-

rubber flutes, drums and tamborines, trumpets, bugles, saxehorns, and other brass and German silver instruments.

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

STATES	Number of establishments.	Capital invested.	Cost of raw material.	NO. OF HANDS EMPLOYED.		Annual cost of labor.	VALUE OF PRODUCE.		Per cent. increase.	NUMBER OF INSTRUMENTS.*		
				Male.	Female.		In 1860.	In 1850.		Piano-fortes.	Melodeons and harmoniums.	Organs.
Maine	5	$37,000	$9,075	23	.....	$11,570	$32,850	$16,700	96	50	156	.....
New Hampshire	6	34,200	16,375	76	.....	30,768	64,800	48,700	33	136	645	.....
Vermont	4	25,500	17,840	42	.....	18,720	57,960	14,700	294	.....	696	8
Massachusetts	44	1,088,500	667,287	1,051	3	696,720	1,901,470	903,512	110	5,611	1,296	100
Rhode Island	1	500	50	3	.....	1,080	1,200	1,600	Dec.	.....	.....	.....
Connecticut	7	46,300	12,798	44	.....	17,640	44,425	63,175	Dec.	15	364	.....
New York	77	2,654,700	1,073,524	2,450	4	1,259,878	3,392,567	1,073,343	216	12,800	8,100	75
Pennsylvania	31	271,850	121,330	346	.....	151,212	446,910	189,220	135	1,188	238	17
New Jersey	3	14,000	5,725	18	.....	6,456	21,000	13,100	59	.....	210	.....
Maryland	6	124,100	125,500	198	.....	96,228	282,000	137,050	93	1,137	.....	20
District of Columbia	.....	.....	.....	.....	.....	.....	.....	1,825	.....	.....	.....	.....
Ohio	15	27,050	19,663	45	.....	17,556	61,350	44,640	37	87	362	13
Indiana	1	2,000	8,100	14	.....	5,040	23,000	.....	.....	.....	386	.....
Illinois	3	17,000	7,258	9	.....	3,540	25,800	6,000	330	120	.....	.....
Michigan	3	20,000	3,602	24	.....	10,128	24,500	9,000	172	15	180	.....
Wisconsin	5	5,800	4,252	18	.....	5,988	14,370	2,450	486	59	10	.....
Missouri	6	14,800	5,679	16	.....	8,556	22,900	7,700	196	37	.....	10
Kentucky	2	43,000	43,565	59	.....	28,140	114,730	17,500	555	500	.....	.....
Virginia	1	2,000	800	12	.....	3,000	4,200	.....	.....	12	.....	.....
Louisiana	.....	.....	.....	.....	.....	.....	.....	30,500	.....	.....	.....	.....
California	3	3,600	1,875	6	.....	6,300	12,400	.....	.....	30	.....	2
Total	223	4,431,900	2,144,298	4,454	7	2,378,520	6,548,432	2,580,715	153.3	21,797	12,643	245

* MISCELLANEOUS.—Maine, 25 æolicans. Massachusetts, 12 calliopes. Pennsylvania, 300 guitars.

The leading branches of musical instruments are as follows, viz:

MUSICAL INSTRUMENTS.	Number of establishments.	Capital invested.	Cost of raw material.	NUMBER OF HANDS EMPLOYED.		Annual cost of labor.	Value of products, 1860.
				Male.	Female.		
Piano-fortes	110	$3,644,250	$1,727,885	3,479	3	$1,929,664	$5,260,907
Melodeons and harmoniums	40	418,400	214,980	447	4	230,352	646,975
Organs	20	184,600	111,395	265	.....	112,764	324,750
Miscellaneous	53	184,650	90,038	263	.....	105,740	315,800
Total	223	4,431,900	2,144,298	4,454	7	2,378,520	6,548,432

HATS AND CAPS.

The manufacture of hats and caps in the United States ranks among the large branches of pure manufacture. In 1850 no less than 1,048 establishments, in 29 different States, made returns of this industry, in which there was invested an aggregate capital of $4,427,798. It gave employment to 15,200 persons, of whom 8,226 were females, and their annual wages amounted to $3,179,700. The cost of raw materials was $7,100,028, and the value of the manufactures $14,319,864. New York, New Jersey, Pennsylvania, Connecticut, and Massachusetts were the principal producers, and in the order named, the aggregate value of their manufactures being $12,803,300, of which nearly one-half was made in New York.

The number of establishments reported on 1st June, 1860, including manufactories of hat bodies, was 622, in 30 States and the District of Columbia. They represented an aggregate capital of $4,126,572, and employed 7,338 male and 3,503 female hands, whose labor cost, annually, $3,638,596. They consumed 3,039,700 pounds of wool, 1,658,520 pounds of fur, and about 350,000 yards of plush, together costing, with other materials, $8,333,454. The value of the annual product was $16,665,475, an increase of 16 3 per cent in ten years.

The following were the principal items of production, viz: Silk hats made, 688,879; fur hats, 2,449,672; felt or soft hats, 2,462,974; wool hats, 6,191,482; total number of hats made, 11,793,007. The number of hat bodies made was 4,458,000; the number of caps, 1,646,600; and the value of caps, $956,891, which is included in the aggregate above stated.

Nearly five-sixths of all the silk hats made, a still larger proportion of the fur hats and caps, and upward of three-fourths of the hat bodies, were the product of the middle States, in which the total value of the product amounted to upwards of 72 per cent. of the aggregate in the United States.

The New England States contain 103 hat and cap manufactories, having, collectively, a capital of $1,013,400, and consuming 1,276,240 pounds of wool and 300,000 pounds of fur, worth, with other materials, $1,916 312. The labor of 1,860 male and 885 female hands cost, annually, $945,606, and produced hats, hat bodies, and caps to the value of $3,870,431, or 23.2 per cent. of the whole product. This included the value of 62,300 silk hats, 2,500 fur hats, 909,360 felt hats, 3,093,240 wool hats, 1,080,000 hat bodies, and 114,700 caps, the last valued at $65,825. Upward of 73 per cent. of the value made in New England, or $2,849,031, was the product of 53 establishments in Connecticut, having, together, invested in the business $711,500, and employing 1,268 males and 519 females at an annual cost for wages of $657,804. The materials included 714,440 pounds of wool and 300,000 pounds of fur, and cost $1,451,482. The product embraced 909,360 felted or soft hats of fur, 1,910,640 wool hats, and 920,000 hat bodies. It was the only New England State that manufactured soft hats, and the only one, except Massachusetts, that produced hat bodies; but it made no return of caps made in that year. The manufacture was principally confined to Fairfield county, which contained 32 establishments, chiefly in the towns of Danbury and Bethel, some of them among the largest in the United States. They employed 1,054 male and 442 female hands, and consumed 390,000 pounds of wool and all the fur worked up in New England, say 300,000 pounds, from which were made 78,169 dozen wool hats, 284,780 finished felt hats of fur, and 74,706 hat bodies. The largest establishment employed 250 male and 75 female hands, besides some others outside, and made 19,000 dozen hats of fur, valued at $234,000. Another had 165 male and 75 female hands, and produced, annually, 29,570 dozen wool hats, worth $240,000. Two others manufactured to the value of $170,000 each; and 3 produced from $125,000 to $135,000 each. One factory made 700,000 hat bodies, worth $500,000, using in the process 120,000 pounds of fur, costing $270,000.

From Massachusetts were reported 33 establishments, with a capital of $269,000 and 883 operatives, (of whom 331 were females,) receiving annually in wages $264,580, and producing from 561,000 pounds of wool, costing, with plush and other materials, $416,150, a total value of silk and wool hats, hat bodies, and caps, of $931,325. The number of silk hats made was 38,700; of wool hats, 1,181,400;

of hat bodies, 160,000; and of caps, 97,600; the last articles valued at $54,200. Of the whole value made in the State, $183,500 was the product of 6 silk hat factories and one of soft hats and hat bodies, in Boston, in addition to 5 cap factories making upward of $50,000 in value. Large quantities are also made at Methuen and Haverhill, in Essex county, and about 40,000 hat bodies in Norfolk county.

Only one establishment in New England was reported as having made fur hats. It was in Maine, and turned out 2,500 in addition to caps. Two others in that State made silk hats to the number of 2,600, using 1,200 yards of plush, costing $3,117, and one factory made 100 dozen wool hats. The total value made in the State was $14,400.

New Hampshire and Rhode Island manufactured only silk hats and caps, the former State to the value of $23,425, and the latter of $52,250. In New Hampshire 10,500 caps, valued at $8,125, were made, and 5,000 silk hats, and in Rhode Island 16,000 silk hats and 6,000 caps, the latter valued at $3,000. The cost of plush used in New Hampshire was given at $2 25 per yard.

The middle States contained 366 establishments, of which the aggregate capital was $2,765,190; and the persons employed numbered 5,135 males and 2,489 females, whose labor cost, annually, $2,525,666. The quantity of wool used in three States was 1,706,150 pounds, and the weight of fur in four of them 1,343,200 pounds, at a total cost for all materials of $6,122,723. The value of hats, hat bodies, and caps made amounted to $12,106,546, which was the value of 567,113 silk hats, 2,376,952 fur hats, 1,519,784 soft hats, 3,024,864 wool hats, or a total of 7,518,713 hats, 3,378,000 hat bodies, and 1,343,038 caps, the value of the last item being $743,432. New York and New Jersey greatly exceeded any other States in the extent of their hat and cap manufactures, of which each produced a considerably larger amount than all New England.

In New York the establishments numbered 150, with capital amounting to $1,086,750, and employing 2,866 hands, of whom 886 were females, the annual wages costing $1,017,086. The weight of wool wrought into hats and hat bodies was 1,285,850 pounds, and of fur used 635,000 pounds, of which the cost, with that of plush and other materials, was $2,739,256. The articles turned out were 311,390 hats of silk, 338,160 of fur, 633,070 of felt, 2,157,564 of wool; total, 3,440,184 hats, 2,000,000 hat bodies, and 520,000 caps, valued at $379,982, the aggregate value amounting to $5,663,040. This value was upwards of 46 per cent. of the total product of the middle States, and more than one-third of the aggregate value made in the United States.

Of the whole number of factories 42 were in the city of New York and 19 in Brooklyn. In New York 39 establishments made silk hats; the whole number of hats of silk and fur finished in the city having been 321,205, or nearly one-half of all made in the State. One large concern, which owns the patent right to an invention which has made a complete revolution in the manufacture of hats, turned out all the hat bodies (2,000,000) made in the State, using in their production 475,000 pounds of fur, at a cost of $550,000, the product being valued at $1,200,000. The largest factory in Brooklyn employed 200 males and 50 females, consumed 30,000 pounds of fur, and produced 270,000 soft hats, worth $577,500; another used 360,000 pounds of wool and 40,000 pounds of fur, making 600,000 wool and 180,000 fur hats, together valued at $400,000; and a third worked up $300,000 pounds of wool, producing, with the labor of 200 male and 75 female hands, 600,000 wool hats, valued at $300,000. A large establishment at Yonkers, in Westchester county, made wool hats to the value of $307,000; and another 300,000 soft hats, worth $250,000. Nearly all the caps made in the State were the production of 18 factories in New York. There were a number of hat and cap factories at Albany.

In New Jersey 61 establishments, having a collective capital of $833,250 and 2,078 male and 783 female hands, produced an annual value of hats and caps amounting to $4,363,328, or more than one-fourth the total product of the Union. The expenditure for raw materials, including 75,000 pounds of wool and 596,000 pounds of fur, was $2,464,886, and for labor $975,816, and the manufactures comprised 50,174 silk hats, 1,871,892 hats of fur, 604,764 soft felt hats, and 160,800 wool hats, a total of 2,687,630 hats and 1,274,000 hat bodies, besides 24,788 caps, valued at $14,000. Hat bodies were

made to the value of $637,400 by 3 establishments in that State, which employed 68 males and 12 females, and consumed 252,000 pounds of furs, costing $508,320. The remaining 58 concerns used 314,000 pounds of fur, 252,000 hat bodies, and 75,000 pounds of wool, from which were made, in addition to silk, felt, and wool hats, more than three times as many fur hats as were made in all other States together. The principal establishments were in Essex county, at Newark, Millburn, Orange, Belleville, and Bloomfield, in the first of which there are upward of 20 hat and cap factories.

The hat and cap factories of Pennsylvania numbered 130, and produced a greater number of caps than those of any other State, although their value was less than in New York. The aggregate capital employed by these manufactories was $760,450, and the persons engaged were 981 males and 779 females, for whose labor was paid annually $496,452. The materials used were 345,300 pounds of wool and 104,700 pounds of furs, besides plush and other articles, costing altogether $840,410. The articles manufactured were 187,000 silk hats, 147,700 fur hats, 304,400 soft or felt hats, 706,500 wool hats; total number, 1,345,600 hats; of hat bodies 104,000 and of caps 685,900, valued at $280,560. The aggregate value of the whole was $1,901,406, or nearly one-half the product of New England, and less than one-third that of New York.

The hat manufactories of the State alone numbered 104, of which 52 were in Philadelphia. Of the latter 35 made silk hats to the number of 181,000, of which one concern made the value of $150,000, and another $120,000. One large manufactory of soft fur hats in Philadelphia used 40,850 pounds of furs, and employed 120 males and 80 females, making 187,200 hats, valued at $250,000. Of wool hats, 56,475 were made in Berks county and 2,400 in Lancaster. The cap factories in the State numbered 26, of which 22 were in Philadelphia, and made 680,500 caps, valued at $273,200.

There were 22 hat and cap factories in Maryland, two in Delaware, and one in the District of Columbia. The value of the manufacture in the first named was $157,547, of which 68,890 was the product of 7 cap-making establishments, which made 114,350 caps, with a few hats. The value made in Delaware was $3,225, chiefly silk hats; and in the federal District the value was $18,000, which was altogether for silk hats made by one firm.

The western States contained 92 establishments, having $201,673 invested in hat and cap making, which employed 195 male and 93 female hands, at a total cost for labor of $96,376, and for material of $179,183, the latter cost including the value of 2,860 pounds of wool, 8,450 pounds of furs, and other materials. The product was returned at $416,000, which represented the values of 46,570 silk, 38,520 fur, 3,230 soft or felt, and 5,950 wool hats; total, 94,270; and of 184,150 caps, valued at $142,934.

Upward of one-half of the business of the western States was done in Ohio, which reported 38 establishments and a capital of $104,850, and an expenditure for materials amounting to $106,957. With the labor of 87 males and 63 females, costing $47,920, there were made from 750 pounds of wool and 4,500 pounds of fur, &c., 26,350 silk hats, 11,500 fur hats, 1,850 wool hats, and 156,000 caps, altogether valued at $236,953, of which sum $114,362, or nearly one-half, was the value of the caps made.

The States of Illinois, Missouri, Indiana, and Kentucky, each reported 11 establishments, Wisconsin 5, Michigan 4, and Minnesota 1. The first two produced each a value of upward of $44,000, the next four between 15 and 30 thousand, and the last $2,600 in value. In Kentucky only fur and wool hats were made to the number of 7,100, in Minnesota and Wisconsin only silk, and in Michigan only fur, and Indiana was the only State that reported any soft or felt hats. Caps were made in all but Minnesota and Kentucky, the largest number next to Ohio having been made in Illinois, whence 11,950 were returned, valued at $10,572, being the product of 6 factories, of which 2 were in Chicago and 2 in Peoria county, and 4 in Wisconsin, chiefly in Milwaukie, made 7,000 caps.

In the southern States this manufacture employed 49 establishments, all but Florida having made returns on the subject. The business gave employment to a capital of $94,657 and to 125 male and 26 female hands. Their labor cost $46,512, and the materials used $70,917, the latter sum including

the value of 54,450 pounds of wool and 5,270 pounds of fur consumed. The total product was $177,764, which was the value of 4,600 silk hats, 27,010 fur hats, 600 felt hats, (made in Tennessee,) 67,428 wool hats; total of hats 99,638, and 612 caps made in Virginia and valued at $600. The largest value was produced in Virginia, which turned out 15,700 silk, fur, and wool hats, worth $56,475. Louisiana made 15,000 silk and fur hats, valued at $50,000; and Alabama, 18,050 silk, fur, and wool hats, of which the value was $26,607; Georgia, 18,000 wool hats, worth $14,250. In all the others the value fell below $8,000; and in Texas amounted to only $800, which was the value of 600 wool hats made. North Carolina, Georgia, and Texas produced only wool hats.

From the Pacific States returns were made of 9 manufactories in California and 3 in Utah, the former having a capital of $50,950, and consuming 1,300 pounds of fur, at a cost of $43,349, from which were made by 27 hands, whose wages cost $22,080 per annum, 8,296 silk and 3,928 fur hats and 2,100 caps, the last article valued at $4,100, and the whole at $91,274.

The 3 establishments in Utah employed 6 hands and 300 pounds of fur, and turned out 762 fur hats, valued at $3,460.

Silk hats were made in 4 New England States, in all the middle States, in all but 2 of the western, in 3 southern, and in 1 of the Pacific States; fur hats in 1 eastern, 4 middle, all but 2 western, in 6 southern, and the 2 Pacific States; and felt or soft hats in 1 New England, 5 middle, 1 western, and 1 southern State, but chiefly in the middle section and 1 eastern. Hat bodies were produced only in 2 of the New England and 3 of the middle States.

Silk Hats are made by covering a body or foundation of felt, fur, silk, or muslin with plush or shag, having a long nap or pile of silk. The bodies were formerly made of pasteboard, chip, cane, willow, whalebone, or straw plat, but the stiffness and discomfort and other objectionable qualities caused them to be discarded for felted wool, &c. The bodies of the best silk hats are now made chiefly of Russian hare's fur, of a quality equal to that used in the manufacture of superfine beaver hats. The lightness, elasticity, elegance, and durability of the hat is in proportion to the fine quality of the body. Some of these qualities are improved by the process of water-proofing previous to napping. Many improvements have also been made in the manufacture of the plush, which was first made upon a cotton foundation; but the best is now made wholly of silk. It comes principally from France, where the best is made, particularly at Lyons, and inferior qualities from Germany and England. It was imported a few years since at a cost of from 80 cents to $3 75 a yard. It requires about 6 yards of plush to make a dozen hat bodies, and a pound of fur, costing on an average about $3 50, will make 13 hat bodies. The hat leathers are made of Japanned skivers, of which one dozen will make about 13½ dozen hat leathers. Other trimmings cost on an average 4 cents for each hat, and the labor and other expenses is about $4 per dozen. The stiffening, varnishing, ironing, and drying of the hat bodies previously made on the premises or in separate establishments, as well as the finishing of fur hats, is chiefly done by men, and the sewing of the plush, trimming, &c., by females, who constitute nearly one-half of all the hands employed in hat and cap making.

Fur Hats were formerly made of beaver, but as that material became scarce and expensive, the furs of hares, rabbits, muskrats, neutrias, and wool, variously mixed and felted together, and afterward napped or covered with a thin coating of fine beaver's fur, were substituted, and now few, if any, even of the finest fur hats are wholly made of beaver. The bodies were formerly shaped and felted by manual labor, but these operations, particularly the forming of the bats, are very expeditiously accomplished by contrivances to be mentioned hereafter, which have greatly reduced the cost and improved the quality of the hat.

The materials used for soft or felt hats are beaver's, rabbit's, and hare's furs, and for the cheaper qualities, sheep's wool, &c., sometimes with a covering of camel's and goat's hair, &c., beaver fur being the most esteemed. These materials are first felted and then dyed, unless the natural color is retained, as in ladies' white felts and drab hats, in which the color is determined by selection of the material.

HISTORY AND STATISTICS.

The manufacture of fur hats is one of the oldest and earliest matured branches of American industry. As early as 1662 the general assembly of Virginia offered a premium of 10 pounds of tobacco for every good wool or fur hat made in the province. Ten years later, John Clough, John Tapping, and other hatters of Massachusetts, sought exclusive privileges for their business in that colony, which were promised them by the general court, "when they should make as good hats and sell them as cheap as those from other parts." In 1675, the exportation of wool and raccoon furs from the province was prohibited, and in 1704 the felt-makers of Pennsylvania had leave to bring in a bill to prohibit the exportation of beaver, raccoon, and other furs proper and needed to be worked up.

In 1731 hat-making had become so general in the American colonies, that the felt-makers of London petitioned Parliament to prohibit the exportation thence of hats to foreign markets, which they represented to be almost entirely supplied from America, while not a few were sent to Great Britain. A special committee on the subject reported that in New York and New England beaver hats were manufactured annually to the number, it was estimated, of 10,000. In Boston there were ten hatters, one of whom furnished 40 hats weekly, and they were exported to the southern colonies and the West Indies, to Spain, Portugal, and to Ireland. It was accordingly enacted in the following year that "no hats or felts, dyed or undyed, finished or unfinished, shall be put on board any vessel in any place within any of the British plantations, nor be laden upon any horse or other carriage, to the intent to be exported from thence to any other plantation or to any other place whatever, upon forfeiture thereof, and the offender shall likewise pay £500 for every such offence," with a like penalty for every officer, and £40 for every other person, knowingly aiding in it. Though often evaded, this law remained in force until the Revolution, and many were exported to the West Indies and elsewhere from New England and more southern ports, including Charleston, where beaver hats were made quite extensively in 1765, and shipped thence to the Spanish provinces. In Danbury, Connecticut, which now turns out between one and two million hats annually, the business was commenced in an humble way in 1780, by Zadoc Benedict, who employed one journeyman and two apprentices, making three hats per diem, or less than 1,000 in a year. Before the end of the last century hat-making was carried on to some extent in every State in the Union, particularly in the maritime and larger inland towns. It was quite an extensive industry in Pennsylvania, where, in 1786, it was estimated that upward of 160,000 wool hats, and over 54,000 fur hats, were made annually. There were 68 hatters within the present limits of Philadelphia, who made 31,627 fur and 7,000 wool hats yearly. Berks county had also 38 hat-makers; York county 26; Lancaster and Cumberland, each 16; Delaware and Westchester, each 14; and each of the others, 6 to 12. The four counties beyond the mountains had 33 hatters, who made 10,140 wool and 2,200 fur hats yearly, and the whole State numbered 315 hat-makers. In 1791, New London county, Connecticut, contained 17 hatters, who made 10,000 fur and wool hats yearly. American hatters were, at that time, able to underbid the importers in proposals for supplying the army and navy with hats, and the fine beavers of home manufacture were preferred to the English. Materials only were wanting to make the supply equal to the demand.

Newark, New Jersey, was early engaged in this business, which was commenced also at Plainfield in 1808. In the following year it was computed that 50,000 hats, worth $5 each, were made at Providence, Rhode Island, and vicinity.

In 1810, returns were made from 18 States and Territories of hats made to the value of $4,323,744, exclusive of the product of 14 hatteries in Louisiana, not reported. The number of hatteries was returned from only 8 States, and numbered in them 842, of which number 532 were in Pennsylvania and 102 within the city and county of Philadelphia. The whole number of fur hats reported from 13 States and Territories was 457,666, and of wool and mixed hats made in 7 States, 1,095,465. Of that number 474,924 wool and mixed hats, and 45,369 fur hats, were made in Pennsylvania, and valued at $1,288,246, about one-half of which was made within the present limits of Philadelphia. From Connecticut the value only was returned, and amounted to $522,209, of which $348,791 was the product

of Fairfield county, the largest factory being at Danbury. In Massachusetts, 142,645 fur hats were made, valued at $415,167, or nearly $3 each. In Rhode Island, the value of fur and wool hats made was $269,992, and in New York 124 batteries reported 104,014 hats, averaged by the marshals at $2 50 each, or $260,035. Virginia, next to Pennsylvania, returned the largest number of wool hats made, viz: 276,267, valued at $397,979; and Maryland, a value of $321,712, chiefly fur hats made in 106 establishments. New Jersey made 31,524 fur hats, valued at $94,052, an average of $2 98 each. They were chiefly made in Essex county, at Newark and vicinity.

In Pennsylvania, a patent loom was in operation for making hats of cotton, and also of straw.

Several of the States, at that date, supplied their own consumption; and others, as Massachusetts, Connecticut, New York, and Pennsylvania, produced a considerable surplus for exportation.

The report of Mr. Gallatin, Secretary of the Treasury, to Congress, in April, 1810, stated the annual importation of hats to be $350,000, and the exportation of American hats $100,000, showing the domestic manufacture to be nearly equal to the home consumption. In that document the manufacture of hats was estimated at a much higher sum than was returned by the census. From information obtained, the business in Massachusetts, alone, appeared to have employed a capital of $3,000,000, and about 4,000 persons, and the number of hats made annually was 1,550,000, of which 1,150,000 were fine hats, valued on an average at four dollars each, and 400,000 were felt hats, worth one dollar each, which would make the total value exceed that reported by the marshals for the whole Union. The Hat Company of Boston estimated the hats made in the State to be four times the number required for its consumption. Many of the fur hats made in Rhode Island, Connecticut, and Pennsylvania were estimated at $5 each, and country-made hats sold at $3 each. The total value of hats made was estimated in the report at nearly $10,000,000.

In 1831 the manufacture of hats in the United States for home consumption was estimated by a convention of manufacturers at $10,000,000 annually, and the yearly exportation of domestic hats at $500,000 more, making the annual value of the manufacture $10,500,000, which was estimated to employ 15,000 men and boys and 3,000 women. American hats were manufactured at a less price, considering their quality, than was paid for them elsewhere. The whole value of hats and caps made in the United States was computed at $15,000,000 annually.

The census of 1840 made the value of hats and caps manufactured in the United States to be only $8,704,342, of which New York produced $2,914,117, and New Jersey $1,181,562.

Previous to that time several inventions had been introduced in Europe and America for facilitating the manufacture of hats and hat bodies, which was still in a great measure effected by manual labor, although a committee of hat manufacturers reported to the New York convention in 1842 that hats were then sold from 25 to 50 per cent cheaper than they were ten years before, fur hats of fair quality affording a profit at $1 50 each, which formerly sold for $2 to $2 50 each, and the first quality, which ten years before ranged from $6 15 to $10 each, being sold for $5.

Among the early patented inventions by Americans, the first was granted to James Long, of Maryland, in 1799, for a method of napping hats; and one patented by Roswell Pitkin, of East Hartford, Connecticut, in 1808, for forming hats, cloths, &c., from the fleece without bowing, which was at that time the universal practice. In 1812 Messrs. Holladay & Griffin, of Lyme, in that State, received a patent for a machine for bowing wool, &c., for hats; and Mr. Griffin received another for the same purpose in 1815. A mould for forming wool and rorum hats was patented in 1813 by John Warely, of Albany, New York. A machine for making bats or frames for wool hats was patented by Richard Gookins, of New Hampshire, in 1806; and in 1819 Silas Mason, of Norfolk, Massachusetts, recorded a patent for manufacturing hats by the help of a carding machine, which produced the hat in a conical form at a single operation. At that date bowing machines were in operation in two hat factories in Lyme, Connecticut, the patents for which were held by the proprietors, probably the individuals before mentioned. There was another establishment at East Hartford, in which the principal labor of hat-making was said to be done by machinery, (probably Pitkins's,) patented by the proprietor.

In April, 1825, and again in 1827, Joseph Grant, of Providence, Rhode Island, obtained letters patent for improvements in the mode of making hat bodies, by aid of a machine for winding and setting up the bodies. In November of that year a machine for the same purpose, said to be of foreign invention and ingeniously contrived, was patented in England by Mr. Borrowdaile. A steam factory for making hat bodies, under Grant's patent, was in operation in Pittsburg, Pennsylvania, in 1837. It was adapted, we believe, for forming wool hat bodies by winding the fleece from a carding machine upon two cones united at the base.

Steam was applied to the making and hardening of hats by Jonathan Sizer, of New London, Connecticut, in 1811, and by N. Wildman, of Danbury, in 1824. And in 1829 a machine for scalding and napping hats by steam was the subject of a patent by Daniel Baldwin, of Ithaca, New York. Four years later machinery for napping hats by steam was in successful operation in Philadelphia. Water-proof stiffening was the subject of a patent by William Buckles, of Baltimore, in 1817; and in 1835 a machine for stiffening hat bodies by immersing them in solutions of different strengths and afterward pressing them between rollers—a process still in use—was patented by Henry Blynn, of Newark, New Jersey. It was said to enable one man to do as much work in one hour as five could do by the old process. Water-proof stiffening has effected much saving in the material of fur hats, and at the same time rendered them more light and elastic. It has been the subject of some valuable improvements in England.

Hardening hats upon a cone was covered by a patent granted to Stephen Hurlbut, of Glastonbury, Connecticut, in 1831.

For machinery for forming hat bodies several patents were taken out by different persons in 1829. But the germ of the present improved mode of giving to the materials the primary fitting and of forming the bats for fur hats, by what is known as the pneumatic process, was introduced by the late Thomas Blanchard, of New York city, and was contained in machinery patented by him in June, 1837. It consisted in forming a thin web or fleece of fur by means of a rapidly rotating picker brush to disintegrate the materials and throw them upon an endless apron or band of fine wire cloth, passing over rollers; upon which wire cloth the fur was deposited by a current of air, produced by an exhausting fan beneath the apron. The thin, narrow, ribbon or web thus formed was wound upon a double cone of a size to form two hat bodies. The machine was not successful in practice, but H. A. Wells, one of the proprietors, early conceived the idea of depositing the fur directly upon a pervious cone connected with an exhausting fan beneath, which would produce a current of air through the cone from all sides.

On visiting England soon after to introduce the Blanchard machinery and other improvements in hat-making, patented by H. A. Wells and R. W. Peck in 1837, Mr. Wells found Thos. R. Williams, an American, engaged with machinery for bowing, breaking up, and felting wools for hats by means of a carding engine for preparing the fibres, and of pervious cones and exhausting fans for forming the web which was afterward agglutinated by dipping in a sizing liquid. His process was patented in England; and in 1840 he took out in the United States a patent for so much of the mechanism as related to the making of felt cloths without spinning or weaving, abandoning that relating to hats which did not come into successful use. Mr. Wells by experiment reduced his idea to successful practice, and took out his first patent in April, 1846, which he assigned to Henry A. Burr and others in New York, by whom it was resigned, and to whom, in September and October, 1856, it was reissued in two separate patents, the one for forming the bats, and the other for hardening and removing them from the cone. These have since been extended and reissued, and are still owned by Mr. Burr and partners, who have added other improvements, and purchased the patent rights of several other inventors.

Under an upright perforated cone of sheet copper, revolving slowly on its axis, a vacuum is created by an exhausting fan which rotates 4,000 times in a minute, and by means of the current of air through the holes the fur, previously prepared by blowing and other machinery, which separates the long hairs from the short, is deposited on the outside in quantity sufficient to form one hat body at a time. A

wet cloth is then thrown over the cone, and the whole is removed to a vat of hot water, and the subsequent felting and sizing is done either by the hat-finisher or in separate establishments, by hand, though some have employed a sizing machine of French invention for fulling up the bodies previously made in the "forming machine."

By this "former," two men and a boy, with a third person to roll the bodies, can complete in a day 400 to 450 hat bodies, all alike in weight, shape, and thickness, and better made than they were by the old process, by which one man could make only four or five in a day. The cost of labor for forming and sizing hat bodies has been reduced in proportion, from 56 cents to 6 or 10 cents. Nearly all the hat bodies are now made by this mode, either by Messrs. Burr & Co., in New York, or by their agents and licensees throughout the country, the manufacturers generally furnishing the materials, which are made into hat bodies of such weight and quality as may be ordered.

From January 1, 1846, when this machinery went into operation, to December 31, 1859, the number of hat bodies made under this patent by Messrs. Burr & Co., and by others, at Milburn and Newark, New Jersey, was 41,431,693. The patentees, in 1856, manufactured three million hat bodies, and other authorized producers had a capacity for making about as many more.

In 1860 the former returned a manufacture of two million of hat bodies, of an average value of 60 cents each. An improvement in machinery for making hat bodies was patented during that year, by Seth Boyden, of Newark, New Jersey, which, we believe, is used in one or more of the large establishments in that place.

The following approximate estimate of the annual importations of hatters' materials was given by a writer in 1853, viz: 560,000 yards of silk plush, (French,) at an average cost of $2 per yard, $1,120,000, which will make 1,120,000 hats, worth, at retail, $4,408,000; 90,000 yards of silk plush, (German,) at an average of $1 38 per yard, $121,000, which will make 180,000 hats, worth, at retail, $540,000; 800,000 yards of Angola cotton plush, (French and German,) at $1 per yard, $800,000, from which can be manufactured 2,400,000 hats, worth, at retail, $1 25 each, $3,000,000; coney and hares' furs, imported from France and Germany, $1,000,000. These materials are used for the bodies of hats and the making of California and soft hats. About 4,000,000 of these latter are made, annually, in this country, at an average of $1, which will make $4,000,000. Amount of other goods used by hatters, such as trimmings, bindings, bands, &c., the greater part of which are imported, $2,100,000.

In the year ending June 30, 1860, the importations of hatters' furs, dressed and undressed, amounted to the value of $1,222,811; of hatters' plush, of cotton and silk, to $68,965; and of hats, caps, and bonnets, of silk, (chiefly from England,) $95,529. During the same year we exported, chiefly to Canada and the British provinces, Hayti, and the Sandwich Islands, hats of fur and silk to the value of $118,770.

In the corresponding year 1862 the value of hatters' furs imported was $929,534; of cotton and silk or wool plush, $14,110; and of hats of hair, whalebone, and like materials, $38,553. The value of wool or silk hats exported in the latter year was $77,281.

The duty on hats and caps of wool, fur, &c., was laid in 1816 at 30 per cent. ad valorem. In 1842 wool hats and hat felts or bodies were charged with a duty of 18 cents each; cotton hat bodies, 30 per cent.; fur hats and caps, 35 per cent.; fur hat bodies or felts and hatters' furs, 25 per cent.; and all other hats, 35 per cent. In 1846 wool hats and felts were made subject to a duty of 20 per cent., and other kinds, 30 per cent., hatters' furs paying 10 per cent. These duties were changed in 1857 to 15 per cent. on wool hats and hat bodies, and 24 per cent. on all other kinds, and on hatters' furs to 8 per cent., from which rates the duties were raised in 1862 to 30 per cent. on wool hats; 25 per cent. on wool felts; 35 per cent on cotton hat bodies, fur hats and caps, and fur felts; and 20 per cent. on hatters' furs dressed, not on the skin.

Statistics of Hats and Caps (including hat bodies) produced in the United States during the year ending June 1, 1860.

STATES.	No. of establishments.	Capital invested.	Pounds of wool used.	Pounds of fur used.	Cost of raw materials.	NO. OF HANDS EMPLOYED. Male.	Female.	Annual cost of labor	Ann. value of product.	No. of silk hats.	No. of fur hats.	No. of felt or soft hats.	No. of woollen hats.	Total number of hats.	No. of hat bodies.	No. of caps.	Value of caps.
Maine	4	$7,800	800	.....	$7,615	10	7	$4,154	$14,400	2,600	2,500	.....	1,200	6,300	.....	600	$500
New Hampshire	7	10,100	.....	.....	13,185	7	10	4,908	23,425	5,000	.....	.....	.....	5,000	.....	10,500	8,125
Massachusetts	33	269,000	561,000	.....	416,150	552	331	264,580	931,325	38,700	.....	.....	1,181,400	1,220,100	160,000	97,600	54,200
Rhode Island	6	15,000	.....	.....	27,880	23	18	14,160	52,250	16,000	.....	.....	.....	16,000	.....	6,000	3,000
Connecticut	53	711,500	714,440	300,000	1,451,482	1,268	519	657,804	2,849,031	.....	.....	909,360	1,910,640	2,820,000	920,000	.....	.....
Total in New England States	103	1,013,400	1,276,240	300,000	1,916,312	1,860	885	945,606	3,870,431	62,300	2,500	909,360	3,093,240	4,067,400	1,080,000	114,700	65,825
New York	150	1,086,750	1,285,850	635,000	2,739,256	1,980	886	1,017,086	5,663,040	311,390	338,160	633,070	2,157,564	3,440,184	2,000,000	520,000	379,982
Pennsylvania	130	760,450	345,300	104,700	840,410	981	779	496,452	1,901,406	187,000	147,700	304,400	706,500	1,345,600	104,000	685,900	280,560
New Jersey	61	833,250	75,000	596,000	2,464,886	2,078	783	975,816	4,363,328	50,174	1,871,892	604,764	160,800	2,687,630	1,274,000	24,788	14,000
Delaware	2	3,100	.....	.....	1,365	2	1	1,332	3,225	824	.....	50	.....	874	.....	.....	.....
Maryland	22	68,640	.....	7,500	62,606	88	40	32,520	157,547	14,075	19,200	7,500	.....	40,775	.....	114,250	68,890
District of Columbia	1	13,000	.....	.....	14,200	6	.....	2,460	18,000	3,650	.....	.....	.....	3,650	.....	.....	.....
Total in Middle States	366	2,765,190	1,706,150	1,343,200	6,122,723	5,135	2,489	2,525,666	12,106,546	567,113	2,376,952	1,549,784	3,024,864	7,518,713	3,378,000	1,345,038	743,432
Ohio	38	104,850	750	4,500	106,957	87	63	47,920	236,953	26,350	11,500	.....	1,850	39,700	.....	156,000	114,362
Indiana	11	12,675	.....	1,900	10,933	18	1	6,468	26,625	1,020	5,300	3,230	.....	9,550	.....	400	500
Michigan	4	5,600	.....	.....	6,085	7	8	3,276	20,425	.....	3,300	.....	.....	3,300	.....	6,600	8,925
Illinois	11	25,700	.....	1,100	19,182	26	7	12,480	44,352	4,000	9,500	.....	.....	13,500	.....	11,950	10,572
Wisconsin	5	7,700	.....	.....	14,725	12	4	5,136	25,575	7,200	.....	.....	.....	7,200	.....	7,000	6,575
Minnesota	1	1,000	.....	.....	1,400	1	1	744	2,600	520	.....	.....	.....	520	.....	.....	.....
Missouri	11	34,850	310	.....	14,936	26	8	13,512	44,180	7,480	5,420	.....	500	13,400	.....	2,200	2,000
Kentucky	11	9,300	1,800	950	4,965	18	1	6,840	15,290	.....	3,500	.....	3,600	7,100	.....	.....	.....
Total in Western States	92	201,675	2,860	8,450	179,183	195	93	96,376	416,000	46,570	38,520	3,230	5,950	94,270	.....	184,150	142,934
Virginia	18	31,700	1,300	3,500	21,678	38	8	16,104	56,475	1,000	13,000	.....	1,700	15,700	.....	612	600
North Carolina	5	1,250	7,150	.....	5,235	14	.....	3,204	11,100	.....	.....	.....	11,240	11,240	.....	.....	.....
South Carolina	3	3,400	2,500	200	1,490	7	3	1,932	6,732	.....	800	.....	4,616	5,416	.....	.....	.....
Georgia	6	7,125	16,500	.....	5,250	16	.....	3,396	14,250	.....	.....	.....	18,000	18,000	.....	.....	.....
Alabama	7	33,132	17,600	300	8,139	24	10	9,756	26,607	600	650	.....	16,800	18,050	.....	.....	.....
Mississippi	3	6,750	7,900	.....	2,225	7	2	2,760	7,600	.....	60	.....	13,472	13,532	.....	.....	.....
Louisiana	4	8,800	.....	1,100	25,000	13	.....	6,900	50,000	3,000	12,000	.....	.....	15,000	.....	.....	.....
Texas	1	500	500	.....	150	3	.....	540	800	.....	.....	.....	600	600	.....	.....	.....
Arkansas	1	1,000	1,000	170	1,400	2	3	1,320	3,000	.....	500	.....	1,000	1,500	.....	.....	.....
Tennessee	1	1,000	.....	.....	350	1	.....	600	1,200	.....	.....	600	.....	600	.....	.....	.....
Total in Southern States	49	94,657	54,450	5,270	70,917	125	26	46,512	177,764	4,600	27,010	600	67,428	99,638	.....	612	600
California	9	50,950	.....	1,300	43,349	18	9	22,080	91,274	8,296	3,928	.....	.....	12,224	.....	2,100	4,100
Utah	3	700	.....	300	970	5	1	2,356	3,460	.....	762	.....	.....	762	.....	.....	.....
Total in Pacific States	12	51,650	.....	1,600	44,319	23	10	24,436	94,734	8,296	4,690	.....	.....	12,986	.....	2,100	4,100
Total in United States	622	4,126,572	3,039,700	1,658,520	8,333,454	7,338	3,503	3,638,596	16,665,475	688,879	2,449,672	2,462,974	6,191,482	11,793,007	4,458,000	1,646,600	956,891

COAL MINING.

The mining of anthracite and bituminous coals in the United States, in 1850, employed 510 establishments, with an aggregate capital of $8,317,501. They employed 15,118 persons, including 6 females, whose annual wages cost $4,069,188, the cost of raw materials being $246,414. The product of all the mines, distributed throughout 12 States, was valued at $7,173,750, of which sum $5,268,351, or upward of 73 per cent., was the value of anthracite mined in Pennsylvania.

The statistics of this business in 1860 embraced returns from 16 States and Territories, and from 622 establishments, of which the aggregate capital amounted to $29,428,670. The number of persons employed was 36,469 males and 17 females, to whom were paid, in annual wages, $9,650,264, or $264 each. The cost of raw material was $2,752,972. The product was 6,218,080 tons or 155,452,000 bushels of bituminous, and 8,115,842 tons of anthracite coals, valued together at $20,243,637. This showed an increase in the value of fossil fuel raised of no less than $13,069,887, or 182 per cent. over the returns of 1850. Capital was attracted to this branch of industry during those ten years in the ratio of 253 per centum, the increment alone amounting to the sum of $21,111,169. The increased expenditure for raw materials, such as fuel, oil, &c., was at the rate of 1,017 per centum in the same time. Missouri alone showed a falling off both in capital and product. The whole quantity of soft and hard coals raised was 14,333,922 tons, and the average price $1 41 per ton; the average of bituminous coal being $1 34, and of anthracite $1 46 per ton. On an average of the whole quantity, the mining cost, for labor and materials alone, $1 15 per ton.

The State of Pennsylvania is by far the largest producer of both anthracite and bituminous coals; all but 1,000 tons of the total quantity of the former having been raised in that State. The coal mining establishments of Pennsylvania in 1850 numbered 246, and in 1860 had increased to 310. The capital employed in the business augmented in the same time from $5,313,721 to $17,602,030, and the product from $5,268,531 to $14,746,153, showing in the capital an increment in ten years of $12,288,309, or 331 per cent., and in the value of coal mined of $9,477,622, at the rate of 179.9 per cent. The number of hands employed in 1860 was 29,777, and their annual labor cost $7,213,496, an average of $269 to each hand. The cost of raw materials was $2,105,284.

The mining operations of that State yielded, according to the returns, 2,690,786 tons, or 67,269,650 bushels of bituminous and 8,114,842 tons of anthracite coal, valued, as already stated, at $14,746,153, which was about 72 per cent. of the total value of coal mined in all the States. If to this be added 6,093,150 bushels of bituminous coal, (worth at the mines $335,692,) unofficially reported as the product of that year, and not included in the returns of the marshals, it will make the total product of bituminous fuel in Pennsylvania 73,362,800 bushels, or 2,934,512 tons, of the value of $3,212,271, and in the United States 161,545,150 bushels, or 6,461,806 tons, valued at $8,704,755. The yield of Pennsylvania in both kinds of coal thus becomes 11,049,354 tons, and the value $15,081,845, and the product of the whole country is raised to 14,577,648 tons, worth $20,579,329.

Agreeably to instructions, the returns of the value of coal gave the value at the mines, exclusive of the cost of transportation. In most manufactured articles, the cost of moving them to market is a very small percentage on the value at the place of manufacture, but in 1860 the cost of transporting coal to tide-water was 50 to 100 per centum of its cost at the mouth of the pit. At an average cost for transportation of only 50 per cent. on its cost at the mines, the total quantity of coal mined in the United States would be worth, on reaching a market, at least $30,868,993, and that of Pennsylvania $22,627,767.

Of the aggregate business in Pennsylvania, the Anthracite trade employed 176 establishments, having a total capital of $13,880,250, working 25,126 hands, at an annual cost for labor of $5,503,124, and for raw material of $1,637,898. The value of the anthracite raised (8,114,842 tons) was $11,869,574 at the mines. It was produced in the counties of Schuylkill, Luzerne, Carbon, Northumberland, Dau-

phin, and Columbia, which, in their relative amount of trade, ranked in the order named. The first named county had 95 mining establishments and 15,053 hands, and produced 4,134,687 tons of anthracite, valued at $7,217,210, its business constituting more than one-half the whole anthracite trade of the State. In Luzerne county there were 50 establishments, employing 6,048 persons, and producing 2,547,500 tons of coal, worth $2,812,000, or about one-fourth of the whole yield of the State. Carbon county, with 11 establishments and 1,706 hands, mined 731,000 tons of anthracite, worth $955,000. Dauphin had only two concerns, but the amount of capital, number of hands, and product indicate that they were relatively the largest operators in the State. The average capital of all the establishments was $78,808, and the average product was $67,440, while the two in Dauphin county had, together, a capital of $650,000, and shipped coal to the value of $265,000.

The only State besides Pennsylvania in which anthracite is mined is that of Rhode Island, which had one operator, employing a capital of $5,000 and 12 hands. The quantity of coal raised was only 1,000 tons, valued at $5,000.

The Bituminous coal trade of the United States employed 445 mining establishments, with an aggregate capital of $15,543,420. They expended for raw materials $1,114,074, and gave employment to 11,331 men and 17 women, whose labor cost annually $4,143,540, an average of $365 each, or $101 per annum more than was paid to miners of anthracite. The aggregate product of this species of fuel has already been stated to be 161,545,150 bushels, worth $8,704,755, or about 5.38 cents per bushel. It included that omitted by the marshals in Pennsylvania, which was the largest producer, and contained 134 establishments, with a capital of $3,721,780 and 4,651 hands.

Next to Pennsylvania, the largest return of bituminous coal was made from Ohio, which had 69 establishments, with an aggregate capital of $750,910 and 1,678 hands. The product of that State was 31,640,000 bushels, valued at $1,653,553.

In Illinois there were 73 mining firms, having together $3,169,290 invested. With 1,480 hands they raised 18,210,000 bushels of bituminous coal, worth $1,285,501. These were the only States in which the value of coal mined reached $1,000,000. The next in the value of its product was Virginia, in which 22 establishments reported a capital of $2,191,400 and 1,190 hands, of whom 3 were females. They mined 11,834,000 bushels of coal, valued at $798,128. In Maryland there were 8 establishments, which reported a larger aggregate capital than those of any State except Pennsylvania. The amount invested was $3,415,000. They gave employment to only 705 persons, and made returns of 10,950,000 bushels of coal raised, of which the value was $464,338. Thirty-three establishments in Kentucky employed 757 persons, including 11 females, and produced 7,144,000 bushels of coal. In Tennessee, whence there was no return of coal mining in 1850, the quantity produced was 4,132,500 bushels, worth $423,662; in Indiana it amounted to 2,500,000, and in Iowa to upward of 1,000,000 bushels, and in Washington Territory one establishment reported a capital of $25,000 and a product of 134,350 bushels, worth $32,244. Rhode Island, Michigan, Missouri, Georgia, Alabama, and Arkansas, produced smaller amounts of bituminous coal, but in all except Alabama (where it reached 255,000 bushels) the product was less than 100,000 bushels in each State.

The average capital of each establishment in this branch of the coal trade was $34,929; the average number of hands employed by each was 25; and the average product in quantity and value was 363,022 bushels, worth $19,561.

The value of bituminous coal at the mines, on an average of the whole product, was a little more than 5⅜ cents per bushel. In Rhode Island it was 30 cents; in Pennsylvania, 4⅜ cents; in Maryland, 4¼ cents; in Virginia, 6¾ cents; in Alabama, upward of 16¾ cents; in Tennessee, 10¼ cents; in Ohio, less than 5¼ cents; in Illinois, 7 cents; in Iowa, upward of 8¾ cents; in Missouri, not quite 8½ cents; and in Washington Territory, 24 cents per bushel.

The following are the rates per centum in which the several States increased their values of all kinds of coal mined in the ten years preceding the eighth census, viz: Iowa, 220.4 per cent.; Illinois, 170.8; Indiana, 651.8; Alabama, 236.9; Kentucky, 200.9; Pennsylvania, 186.2; Maryland, 136.9;

Ohio, 129.6; Virginia, 70.7; Rhode Island, 48.8; and Arkansas, 20 per cent. The increase in the product of all the States, with the addition before mentioned, was $13,405,579, or 186.8 per cent. In Missouri the mining of coal fell off in value from $226,118, in 1850, to $8,200, or 96.3 per cent. The returns made from Michigan, Georgia, Tennessee, and Washington Territory were the first ever received from those districts.

Although the mining of coal in several of the western and southern States is yet in its infancy, and limited in extent, notwithstanding the large percentages which are calculated on small amounts, yet the general distribution of that valuable mineral throughout the different sections of the Union, and the large amount of capital invested in mining in some States, render these statistics interesting when considered in their relation to the iron and other minerals found in proximity with the coal, and to the steam navigation, railways, and various industrial enterprises of the several States.

The increased production of mineral fuel by Pennsylvania must, however, be considered extraordinary, whether we regard the recent origin of the trade, its great development in the ten years preceding 1860, or the important relations which its present magnitude bears to the great centres of industry in that and neighboring States. The decade embraced a period of more than ordinary financial embarrassment in every branch of productive industry. Indeed, the enterprise of her citizens in developing the vast resources of that State in fossil coal is only limited by their ability to command transportation to the markets. Her almost exclusive possession of the anthracite deposits of the country, her proximity to the seaboard and to the great manufacturing establishments of the eastern and middle States and to the salt works of New York, of which coal is the aliment, as well as the outlets she possesses by way of Lake Erie and the Ohio river to the markets of the west, give her unequalled advantages for the extension of what is already a principal source of her commercial and manufacturing prosperity. Coal being a prime essential for the generation of motive-power for locomotive, marine, and stationary engines, of illuminating gas for our growing cities, and for the comfort of the domestic hearth, the demand cannot fail to be enormously increased with the rapid advance in population and every form of productive enterprise which may be looked for with the reinstallment of the arts of peace. With enlarged facilities and cheaper means of conveying coal to market, and with the improved appliances almost daily introduced by the mining engineer, we may confidently anticipate that the next census will reveal an unprecedented increase of the coal trade, not only of Pennsylvania, but of every State in which coal has been mined. In value of product the coal measures of the United States already exceed the annual yield of all the gold and silver mines of the American continent at the commencement of the decade under review. As a dynamic agent in maintaining the activity of our workshops, railways, and steamboats, as an employer of active, intelligent, and moral labor, and of well-directed capital, if not in its actual commercial value, there is no doubt that the mineral coal of the United States is a more potential element in the general prosperity of the country, material and moral, than the gold of California, however abundant. Next to that of gold, it is the most important mining interest in the United States.

The coal area of the United States was estimated in 1845 to cover 133,132 square miles, or 85,204,480 acres, which was nearly one-fourth of the total area of the 12 States in which the coal formations lay. It was equivalent to nearly three-fourths of the coal areas of the principal coal-producing countries of the world. Of this area, 8,397 square miles were on the west side of the Mississippi, and 437 square miles were occupied by the anthracite deposits of Pennsylvania. More recent estimates* have made the American coal-fields, so far as they have been developed, to cover nearly 200,000 square miles. The coal areas of Great Britain and Ireland, by far the most productive in the world, are estimated to cover about 12,000 square miles, or 1-10th the entire area of the kingdom. The coal formations of British America are computed to have an area of 18,000 square miles. In 1845 the production of the British coal-fields was set down at 31,500,000 tons annually. The product in 1858 was stated to be upward of 65,000,000 tons, worth £16,700,000 at the pit; about one-sixth of which

* Report of the Commissioner of the General Land Office.

was supposed to be employed in generating force, equivalent to the power of 55,000,000 of men. An eminent geologist estimates the average thickness of the workable coal of Great Britain at 35 feet, and the total quantity of workable coal at 190,000,000,000 tons. If the whole area of the productive coal-fields of North America be taken at 200,000 square miles and the average thickness at 20 feet, the product will be 4,000,000,000,000 tons. The relative amplitude of the coal measures of our own and other countries may be made more appreciable by taking the amount of workable coal in Belgium as 1, then that of the British islands becomes rather more than 5, that of all Europe 8¾, and that of North America 111.

This great extent of coal area has in the United States been usually divided into four principal coal-fields or tracts, viz: the great Central, Alleghanian, or Apalachian coal-field, extending from Tuscaloosa, in Alabama, through Eastern Tennessee and Kentucky, Western Virginia, Maryland, Ohio, and Pennsylvania, and reappearing in New Brunswick and Nova Scotia. This field has been computed to cover within the United States an area of 50,000 to 60,000 square miles, of which about 40,000 square miles, or 25,600,000 acres, are considered workable area. It is subdivided into eight minor divisions productive of bituminous coal. The second coal-field occupies the greater part of Illinois and Indiana, and in extent is nearly equal to the first. A third field covers a large portion of Missouri; and the fourth the greater part of the State of Michigan. The Chesterfield bituminous coal-field, a detached district of small area near Richmond, Virginia, contains the oldest worked collieries in America, and for many years furnished the only supply of coal for the seaboard towns.

The greater part of the area of workable coal in the bituminous coal-fields above mentioned remains as yet almost undeveloped.

The detached basins of anthracite coal in Pennsylvania, which form one of the most interesting portions of this great coal-producing territory, though limited in aggregate area, as yet produce considerably more than all the others together.

This anthracite region is usually spoken of under three separate divisions: the Schuylkill or southern, the middle, and the Wyoming, Wilkesbarre or northern coal regions, each of them, particularly the middle, consisting of a great number of separate or subordinate coal basins. The existence of this valuable fossil has been known for about a century, but attracted no attention until about the year 1791. It is less than fifty years since it became an article of any commercial value.

HISTORY AND STATISTICS.

The earliest historic mention of coal in this country is believed to have been made by Hennepin, the French Jesuit missionary, who, in 1679, saw traces of bituminous coal on the Illinois river, and on the map illustrating his journal marks the site of a "cole mine," above Fort Crevecœur, near the present Ottawa. In 1763, Colonel Croghan, a British officer sent to conciliate the Indians, by whom he was taken prisoner, noticed on the south side of the Wabash "a high bank in which are several fine coal mines," which is the earliest reference to coal in that region. In the map of Captain Hutchins, published in London fourteen years later, coal mines or beds are marked on the western side of the Ohio river, and other bituminous coal seams were noticed near the same time in the great basin of the Ohio. One of these, near the site of Pittsburg, took fire about the year 1765, and burned for upwards of sixteen years. This tract was purchased of the Indians by the Penns, in 1736, and by later purchases in 1768 the whole bituminous coal-field south of Kittanning, including the northern or Wyoming anthracite region, became the property of the family at a cost of about $10,000. The portion lying north of Kittanning was purchased in 1784, and in the same year the town of Pittsburg was laid out and the Penns granted the privilege of mining coal in the "great seam," opposite Pittsburg, which is there six feet thick, and was long regarded as the largest stratum of coal in the country. The price for mining privileges was £30 per lot, extending back to the centre of the hill.

One of the first purchases of land from the State for the sake of its coal deposits was of a tract near Oldtown, now Clearfield, on the West Branch of the Susquehanna. The land was taken up and

patented by Mr. S. Boyd, on November 1, 1785, but no coal was sent eastward of the Alleghenies until 19 years later. In 1804 Mr. W. Boyd shipped from that place the first ark-load of bituminous coal to tide-water, at Columbia, in Lancaster county, a distance of 260 miles. Its arrival was a cause of great astonishment to the people, who were wholly unacquainted with the article. From that time a limited trade in coal was carried on from that vicinity by arks and canal boats with the towns and iron-works on the Susquehanna. In 1828 the first cargo of Pennsylvania bituminous coal reached Philadelphia from Karthaus, in Clearfield county, and some coal was about the same time sent to Baltimore from the same source.

The great Pittsburg coal seam above mentioned, which is widely extended along the Ohio, Allegheny, and Monongahela rivers, with others of minor value in the vicinity, have been the great stimulus to the almost unrivalled manufacturing enterprise of that city, which, as early as 1825, was estimated to consume, annually, one million bushels, or 35,714 tons of coal, and in 1864 nearly nineteen million bushels. The extent of the bituminous coal-field surrounding Pittsburg has been estimated* at 15,000 square miles, or 8,600,000 acres. The upper seam alone of this area, rated at an average thickness of 8 feet, is estimated to contain 1,498,464,000,000 bushels, or 53,516,480,000 tons of coal. From the original mining privileges of Coal Hill, opposite Pittsburg, operations have extended seventy miles up the Monongahela, as many up the Youghiogheny, and a distance of 20 miles or more along the Pennsylvania Central and Alleghany Valley railroads. The coal veins of the Monongahela, which vary in thickness from 4½ feet at Pittsburg, to 7 and 8 feet at Brownsville, and in some places reach 10 feet, have been the most extensively worked in consequence of the ready outlet offered by the slack-water navigation of that river. This is divided into 5 pools, in which 69 collieries have been opened within the last 20 years, 12 of them in the last and 5 in the present year, (1865,) and employing 3,485 hands. The total quantity mined from 1845, when there were 3 collieries, producing for home consumption 1,944,845 bushels, and for exportation 2,660,340 bushels, to 1864, when the amount exported was 29,541,367 and the consumption 5,529,350 bushels, amounted altogether to 366,732,263 bushels, or 13,097,581 tons. The cost of this coal, including digging and loading, was, in 1860, from $1 25 to $2 per 100 bushels, or 31 to 50 cents per ton, since which time it has risen to about $7 per 100 bushels. It is transported on flats, barges, and boats; the first holding about 2,000 bushels each, and used for transporting it to the city market; the barges having modelled hulls, employed for towing it to the lower markets, have a capacity of about 11,000 bushels; and the boats, 125 to 150 feet long, about 16 feet wide and 8 feet deep, with flat ends, sides, and bottoms, hold about 20,000 bushels each, and are floated in pairs to the lower markets of the Ohio and Mississippi valleys.

The coal basin of the Youghiogheny river is distinct from the one just mentioned, and lies 400 feet above the Pittsburg coal seam, and covers an area 20 miles long by 5 miles wide, divided by the river. The coal is of superior quality, and being free from sulphur, produces some of the best coke known. Since 1845, when there was but one mine opened, 22 collieries have been put in operation, six of them within the present year.

Exclusive of a large amount of coal which goes to market by way of the Monongahela, and included in the preceding statistics, the Pittsburg and Connellsville railroad carried, principally to the home market, in 1860, 842,044 bushels, and in 1864, 3,664,892 bushels or 130,889 tons, mined at about the same cost as in the Monongahela district.

In the hills around Pittsburg there are also 10 or more collieries, embracing an area of about 1,570 acres, which produced, chiefly for the use of rolling-mills, in 1860, about 1,937,500 bushels, and in 1864, 3,675,000 bushels, or 131,250 tons.

Along the Pennsylvania railroad, coal mines occupying about 1,405 acres sent to Pittsburg in 1855 about 110,000 tons, and eastward 135,000 tons, and in 1864 supplied Pittsburg with about 162,536 net tons, of 25 bushels each, of coal.

* Pittsburg Quarterly Trade Circular for September, 1865.

Three collieries in the Alleghany valley, embracing 1,460 acres, sent to Pittsburg in 1862 53,018 tons, and in 1864 72,368 tons, or 1,809,200 bushels.

Thus the whole number of collieries tributary to the furnaces, forges, foundries, rolling-mills, machine-shops, glass-works, cotton-mills, flouring-mills, &c., and to the commerce of Pittsburg and its lines of communication, number at the present time, exclusive of several small ones around the city, about 103. They employ 6,424 hands, and for their transportation 21,258 cars, besides boats, barges, &c. The population of the several collieries is about 30,960, and the quantity of coal mined in 1864, exclusive of what was exported by the Pennsylvania railroad, was 48,462,966 bushels, of which Pittsburg consumed 18,921,399 bushels, and 29,541,567 was exported by the Ohio river. Averaging the price of coal consumed at Pittsburg at 12 cents a bushel, and of that exported at 20 cents, the value of the coal trade of Pittsburg for 1864 would amount to $8,168,880, and if to that be added the value of coke made in about 410 coke-ovens in the districts above mentioned, the value would be nearly $9,000,000, a value exceeding the total product of bituminous coal returned in 1860 for the whole Union. These figures serve to show the value of this interest in an important portion of the bituminous coal-field of the United States, and the rapid development of the mining and manufacturing interests to which it is related. For shipment the coal is put on board the boats, barges, &c., for dealers, at a given price per bushel of 76 pounds, instead of by the ton. The quantity reaching the seaboard from the Allegheny coal-field is never large, much of it being taken up on the route, by the several towns and iron-works, and the coal of Virginia and Nova Scotia underselling it in the eastern markets. Small quantities are exported by the lakes from Erie.

The Maryland division of the field has been estimated to contain an aggregate of 550 square miles of bituminous coal, for which the internal improvements of that State and Virginia have opened a valuable trade with the seaboard cities. The Eastern Cumberland or Frostburg region, in Maryland, contains a productive coal-bearing surface of 135 square miles, or 86,847 acres, and an available quantity of upwards of 4,000,000,000 tons of coal, which in quality is intermediate between the fat bituminous coking coals of Pittsburg and the anthracites or non-bituminous coals. The experiments of Professor Johnson show that in evaporating power it holds the highest place among American coals, and hence is valued as a generator of steam for ocean steamers. Three working veins of this region, one of which is, in places, fourteen feet thick, and the others six and four feet, respectively, are capable of supplying 1,210 millions of tons. In 1820 about 7,000 bushels of semi-anthracite coal was mined in Allegheny county, Maryland, at a cost of 6¼ cents a bushel, and a part of it was sent down the Potomac, in boats. In 1832, about 300,000 bushels were sent down the Potomac from Maryland, but little of which descended lower than Harper's Ferry.

The price of Cumberland coal at tide-water, in Georgetown, in 1838 was about 20 cents a bushel. The cost of mining was $1 per ton, and of transportation by canal about $2 85 per ton. The cost of both has since been reduced. In 1846 the toll on the Chesapeake and Ohio canal from Cumberland to Georgetown was half a cent a ton per mile. In 1848 the cost of transportation on the same was fixed at 4¼ mills a ton per mile, and to Washington city in 1853 it was $2 10½ per ton for the whole distance.

The extent and growth of the Maryland coal trade, which is principally in the hands of the Cumberland Coal and Iron Company, having a large capital, as shown by the census returns, was, during the first 17 years, from 1842, as follows: In 1842 there was sent to market 1,708 tons; in 1843, 10,082 tons; in 1849, 142,449 tons; in 1853, 533,979 tons; and in 1858, 649,656 tons. The transportation of Cumberland coal from Baltimore and Alexandria employed in 1852 1,424 vessels.

In Virginia the bituminous deposits of the Richmond or Chesterfield coal basin, extending on both sides the James river from Petersburg to 15 or 20 miles above Richmond, were the first opened in this country, and afforded the only supply of domestic coal in the last century. It is said to have been first discovered by a boy while digging for cray fish. In 1789 coal was exported thence to Philadelphia and other eastern towns, and sold in the former place at 1*s.* 6*d.* a bushel. The superficial

area of this coal-field has been estimated at 185 square miles of productive coal land. At the eastern margin, where it has been chiefly worked, the dip of the seams is at an angle of 35°, and the workings have gone as deep as 800 feet, and others to 400 feet and upward. With one or two exceptions these deep mines are incommoded by water, and as the structure of the basin does not admit of adits for cheap drainage, the cost of pumping and of raising the coal makes the expense of mining much greater than in the Alleghany coal-field, which is above water-level. In 1836 it was stated that coal could be delivered at a profit in Richmond at 15 or 16 cents a bushel, and in 1838 it was said it could be supplied for national purposes at 10 cents on the north and at 12½ cents per bushel on the south side of the James, or at $2 80 and $3 50 per ton. In 1846 Richmond coal sold in Philadelphia at 20 to 22 cents a bushel, or 2 to 3 cents higher than Alleghany bituminous coal. In 1822 these mines produced for exportation 48,214 tons, and in 1833 142,000 tons, but in 1842 the quantity had declined to 65,750 tons. The average quantity for twenty years was 87,500, which cost for raising $1 12 per ton, or 4 cents a bushel. In 1846 new mines at Clover Hill were opened to commerce by railway, which in 1847 furnished coal at the rate of 1,500,000 bushels or 53,500 tons per annum. The average annual importation of Virginia coal into Philadelphia from 1824 to 1829 inclusive was 4,143 tons, and into Boston from 1835 to 1841 inclusive, 5,805 tons. In 1848 Boston imported thence 183,352 bushels, and in 1850 63,417 bushels.

Small deposits of anthracite and semi-bituminous coal of little practical value occur in Virginia, which in 1840 produced 200 tons of anthracite. Bituminous coal and cannel coal is also found on the Kanawha, in West Virginia, and elsewhere in that State, and the latter kind in Kentucky, Pennsylvania, Indiana, and Missouri.

The importations of foreign bituminous coals from Great Britain and the British Provinces into Philadelphia, chiefly for the gas-works, amounted in 1833 to 3,018 tons, in 1838 to 9,792 tons, in 1850 to 7,698 tons, and in 1853 to 12,246 tons, at a duty after 1850 of 30 per cent.

The ANTHRACITE trade of the United States, confined chiefly to Pennsylvania, although small deposits of that mineral are found in Rhode Island, Massachusetts, Texas, and some other States, is at present the most important of the coal mining interests.

The northern or Wyoming anthracite region of Pennsylvania, embracing the districts of Shickshinny, Wilkesbarre, Newport, Pittston, Lackawanna, and Carbondale, and an area estimated at 120 square miles, or 76,805 acres, was the first in which this species of coal was observed and applied to practical purposes. As early as 1768, in the first settlement of the Wyoming valley, Obadiah Gore, of Wilkesbarre, an ingenious blacksmith, began to use it in his forge, and his example was followed by others of the trade. In 1788 Jesse Fell, of the same place, employed it in a nailery, and twenty years later contrived a grate for burning it as fuel in his house. In 1775 a cargo of this article was sent down the Susquehanna to Carlisle barracks. From 3,500,000 to 4,000,000 bushels had been shipped to the seaboard previous to 1829, when mining operations first commenced at Carbondale. This northern part of the district contains the hardest species of white-ash coal, and from this point to the Hudson a railroad was opened in that year. The Lykens Valley Company had mined about 60,000 tons during several years preceding 1841, when in the Wilkesbarre district operations were commenced by sending to market 32,917 tons. From 1829 to 1846 this whole region sent to market an aggregate of 3,732,686 tons, and from that period to 1853 6,826,637 tons, a total in twenty-four years of 10,559,323 tons.

The southern or Schuylkill coal-field, containing three principal basins and extending from the Lehigh on the east nearly to the Susquehanna on the west, comprises the Lehigh, Tamaqua, Tuscarora, Schuylkill valley, Pottsville, Minersville, Swatara, Lykens valley, Dauphin, and other districts. Its area of workable coal has been approximately computed at 164 square miles, or 104,960 acres. Anthracite was first accidentally discovered in this region on the Mauch Chunk mountain, in Carbon county, where the summit mines now are, by a hunter named Ginter. The specimen of "stone coal" was exhibited in Philadelphia, and in 1793 the "Lehigh Coal Mine Company" was formed to open a mine,

and took up several thousand acres where the celebrated Mauch Chunk mines are still worked as open mines. Though used in smitheries in that region, no coal was sent to market until 1806, when William Turnbull sent an ark-load of two or three hundred bushels to Philadelphia, which was bought for the Philadelphia Water Works. Through inexperience in its use it proved intractable as a fuel, and nothing was done until the war of 1812 rendered Virginia and British coals so dear that the proprietors opened a mine, which was again abandoned or leased on the return of peace. The difficulty of transportation was a principal obstacle to its use. Oliver Evans, of Philadelphia, in the year 1800, devised and patented a "luminous" grated stove, with talc light, with special reference to the use of mineral coal, but Dr. Thos. C. James was one of the first to use it habitually in his house, which he continued to do from 1804 to 1826. Some successful experiments in the use of anthracite in manufactures, made about the year 1812, at a rolling-mill in Delaware county, and at White & Hazard's wire-mill, on the Schuylkill, with a few loads of coal sent from the Centreville mines, in Schuylkill county, and sold for the cost of transportation, attracted attention to this species of fuel. In 1814 about 20 tons were received at Philadelphia from Mauch Chunk, by the Lehigh and Delaware rivers, at a cost of $14 per ton. In 1820 the trade may be said to have opened by the arrival of 365 tons from the same place, which for five years furnished the only supply of hard coal. It was delivered at the doors of purchasers for $8 50 per ton. In 1827 the Mauch Chunk railroad, 9½ miles from the summit to the Lehigh, was commenced and finished, and subterranean railways were at the same time extended into the "drifts," which, until 1834, were the only mode of mining in use. In 1825 the Schuylkill coal district was opened and sent down 6,500 tons, the whole quantity sent to market from both sources, which for four years more were the only sources of anthracite, being 34,893 tons. The Lehigh Coal and Navigation Company, formed in 1822 by the union of two other companies and incorporated in 1832, opened navigation in 1825 from Philadelphia to Port Carbon, 108 miles, at a cost of nearly $3,000,000, and gave an impulse to the trade. The company worked the mines for a number of years. In 1839 the railroad was opened from Philadelphia to Reading, and in 1842 was completed to Pottsville, 93 miles, at a cost, including real estate, of upward of $16,000,000. This rapidly developed the coal trade of that district, and in 1847 203,540 tons were received at Philadelphia by railroad and 226,610 tons by canal. New roads and canals have been built and old communications extended throughout this whole region and to various points of delivery. Coal was first sent from the Swatara district in 1834. From the opening of the trade in 1820 to 1848 the Lehigh district sent to market an aggregate of 5,505,327 tons, and the Schuylkill district, from its commencement in 1825 to the same date, 11,859,150 tons. In the second year of its trade the latter shipped 17,000 tons, and in 1830, 89,000 tons. Up to January, 1854, the Lehigh district had furnished 9,756,598 tons, and up to 1861, 18,198,788 tons of anthracite. The Schuylkill region at the last period had sent to market 46,503,794 tons. Schuylkill county in 1860 had 78 coal operators, and mined 4,134,637 tons annually, in about 113 collieries.

The middle anthracite region of Pennsylvania, a wild and broken country, extending from Shamokin to the Lehigh, is estimated to cover at least 115 square miles, or 73,000 acres of workable coal. Of this area the two large basins of Mahanoy and Shamokin, with a few minor ones, contain 75 square miles, or 48,000 acres, and the eastern group of 20 to 30 smaller basins, including Beaver Meadow, Hazleton, &c., the balance of 25,000 acres.

In an early provincial map of 1770 coal pits or mines are marked near the Mahanoy creek, above Crab run, in this region. But little or no mining was done in it until 1834, when only 500 tons were mined in this region, and hauled in wagons to neighboring districts. The Shamokin basin is one of the richest in the State, containing numerous large seams, of which the "mammoth vein" has a maximum thickness of 50 feet, and others 5 to 27 feet. From 1839, when a railway 16 miles in length was opened to Sunbury, on the Susquehanna, and the shipment of coal from Shamokin and Sugar Loaf mines began, down to 1847, inclusive, this district supplied 119,311 tons of white ash coal. From 1848 to 1853, inclusive, it supplied 124,262 tons. The iron works at Danville then required 200,000

tons of coal annually, which had been previously supplied from Wilkesbarre, 20 miles more distant. The Mahanoy district of this region contains the Girardville coal mines, the noble bequest of Stephen Girard to the city of Philadelphia. Mining operations commenced at Beaver Meadow about 1837, and during the next year a colliery was opened at Hazleton, where the deepest coal-shaft probably in the United States is now worked at the Sugar Loaf colliery, which has reached the bottom of the fourth lift, over 900 feet below the surface, by a slope 619 yards in length.

The aggregate quantity of anthracite sent to market from all sources in Pennsylvania, from 1820 to 1840, inclusive, was 6,847,172 tons, and in the next 7 years to 1847, inclusive, 12,371,961 tons; total, 19,219,133 tons. From 1848 to 1853, inclusive, it was 23,841,358 tons, making the aggregate to that date 43,060,491 tons. The increase in the 10 years from 1827 to 1837 was 1,735 per cent.; from 1837 to 1847, 240 per cent.; and in the 20 years from 1827 to 1847, 6,150 per cent.

The total production of anthracite returned by the census of 1840 was 863,489 tons, and the number of miners 3,043. Of bituminous coal, (returned in bushels,) the product was 985,828 tons, and the workmen numbered 3,768; total quantity of both, 1,849,317 tons and 6,811 miners.

The annual consumption of American anthracite in 1853 has been estimated by Professor Haldeman at 5,195,151 tons.

In the 29th annual report of the Philadelphia Board of Trade for 1862 the anthracite region of Philadelphia is, for commercial purposes, considered under two grand divisions—the northern and southern coal-fields. The southern field includes all the coal-basins south of the Nescopeck mountain, comprising the Schuylkill, Lehigh, Mahanoy, Shamokin, Wiconisco, and Swatara basins, with an area of 233 square miles, or 149,120 acres. The northern field includes the long canoe-shaped basin north of Wyoming mountain, with its centre near Pittston, the junction of the Lackawanna and Susquehanna rivers, by which, exclusively, it is watered. Its area is given as 178 square miles, or 113,920 acres.

The grand aggregate of hard anthracite coals sent to market from these two regions since the opening of the trade is there given as 97,924,969 tons. Of this quantity the Schuylkill and Lehigh districts, together, furnished 67,819,517 tons, and the Wyoming and Lackawanna region, 27,556,792 tons, while the Pine Grove and Shamokin mines sent down 3,191,604 tons. The total quantity sent from the southern coal-field by its several outlets, of which the principal were the Philadelphia and Reading railroad and the Schuylkill canal, was, in 1860, 5,482,979 tons, and in 1861, 4,785,375 tons. From the northern division, in the same years, were sent 2,817,957 tons in 1860, and 2,888,459 tons in 1861, making a total in the former year of 8,300,936 tons, and in the latter of 7,673,834 tons. The semi-bituminous fields of Broad Top, Blossburg, and Barclay, together, sent in the same years 313,142 and 426,255 tons.

The canal and railroad system, set in operation since 1821, for the development of the great carboniferous wealth of the anthracite coal-measures of Pennsylvania, embraced, in 1848, about ten different canals, with a total length of about 750 miles, and 25 lines of railroad, with an aggregate length within the State of about 1,000 miles, all having direct communication with the mines and constructed almost entirely with reference to the coal trade, at an aggregate cost to the State and to private enterprises of at least 45 million of dollars. The length of private railroads to the mines and under ground was 320 miles. Others, including several very important outlets, have been completed since that time. These have connected the several coal districts with the great chain of internal improvements in Pennsylvania, New York, and neighboring States, and have been a principal agency in the extension of the anthracite trade of the State. Baltimore is also connected with the coal region of Pennsylvania by a coal route between one and two hundred miles in length.

Among the causes which have contributed to build up the anthracite and bituminous coal trade of Pennsylvania and other States may be mentioned the vast consumption of coal-gas for illuminating purposes, and in smelting, and the direct substitution of raw coals for charcoal in the iron manufacture.

Inflammable gas was eliminated from mineral coal by Rev. Doctor Clayton, who wrote on America as early as 1688. It was first practically applied to purposes of illumination by Mr. Murdock, of Scot-

land, in 1797. In 1802 an Englishman, named Henfrey, patented in the United States a cheap mode of obtaining light from fuel, and proposed to light the city of Richmond and the United States light-houses with gas from coal. In September, 1815, two citizens of Georgetown took out patents for making light from stone-coal gas, and during the following year measures were taken in Baltimore, New York, Cincinnati, and Philadelphia, to illuminate the streets and private buildings with coal-gas, which Baltimore was probably the first to carry into operation for city use. From that time its use became general, and on January 1, 1862, the number of gas-works in the United States was 420, representing a capital of $51,620,940. The consumption of coal by these works, chiefly bituminous and cannel coals, domestic and British, is enormous.

The generation of steam from anthracite was attempted in Philadelphia very early in the present century, but was first successfully carried into operation, it is believed, at Phœnixville, Pennsylvania, in 1825. For stationary engines and steamboats both anthracite and bituminous coals have been since used to a large amount, and more recently have been employed with encouraging success in locomotive engines for railroads.

An attempt was made many years ago at a small furnace in Plymouth county, Massachusetts, to smelt iron with raw anthracite coal, and in 1830 a furnace at Mauch Chunk was adapted to that kind of fuel from the neighboring mines. Success in this use of hard coal and the hot-blast was first measurably attained in this country at a furnace in Pottsville, Pennsylvania, built in 1837, and blown in on the 26th October, 1839, under the management of Mr. Perry, an experienced furnace manager, probably acquainted with the recent operations of Mr. Crane, of South Wales. The use of the blast-furnace, with anthracite, and the general adoption of Cort's puddling process in our rolling-mills, with the use of bituminous coal, gave a great impulse to the iron manufacture and to the demand for coals. The growth of Pittsburg, which had coal at its very doors, is very much due to this cause.

In 1845 there were in Pennsylvania and New Jersey 18 iron-works, having in blast 19 furnaces with anthracite, out of blast 4, and 10 others erecting. They produced annually about 57,000 tons of pig metal. Five other works, having 17 furnaces, including 12 in course of erection, chiefly in western Pennsylvania, used raw bituminous coal, including two very large rolling-mills. Several rolling-mills used anthracite almost exclusively in the processes of refining, puddling, heating, and reheating. Pig-iron could then be made with anthracite fuel, costing $2 per ton, for $15, and could be worked into common bar-iron for $37 per ton. After many failures the use of anthracite appeared to be fully established in iron smelting and puddling, and has since been greatly extended. In 1847 the consumption of anthracite in the iron-works of Pennsylvania was 483,000 tons, worth on an average $3 per ton; and of bituminous coal 9,007,600 bushels, worth 5 cents a bushel. In 1853, according to the publications of the American Iron Association, there were in the United States 121 anthracite furnaces in operation. The product of anthracite iron in the United States in 1849 was about 115,000 tons, and in 1854 307,710 tons, an increase of 200 per cent. in five years, or 22 per cent. per annum. In 1856 121 anthracite blast furnaces made 394,509 tons of anthracite iron, worth $25 per ton, of which 306,972 tons were made in Pennsylvania. The product of raw bituminous coal iron in the latter year, by 19 furnaces, was 25,073 tons; and 24 furnaces made 44,481 tons of pig-iron with coke, which in its chemical character is nearly identical with anthracite. The production of charcoal pig-iron by 416 furnaces was 348,854 tons, worth $30 per ton, a decline of 18,729 tons in that year.*

The requirements of the Construction Bureau, for the use of the United States navy, of its vast workshops and other establishments during the late rebellion, and particularly in the last year, have vastly increased the production of coal in the loyal States, and rendered the mining interest unusually prosperous. We have no means of ascertaining the exact product of 1864. An internal revenue tax of 3½ cents per ton is now levied on all coals mined in the United States. The amount collected from this source for the year ending June 30, 1864, was $572,436, of which sum $437,192 was levied on the coal product of Pennsylvania. This would make the whole quantity of coal mined in that year 16,398,186 tons, and in Pennsylvania 12,491,219 tons.

* Iron Manufacturers' Guide, by J. P. Lesley, Secretary of the American Iron Association.

The importations of foreign coals into the United States are made almost exclusively from Great Britain and the British Provinces, and notwithstanding the increased domestic supply, appear to be increasing. It is principally for the use of the gas-works of the Atlantic cities. In 1802 we imported from Nova Scotia 233 tons, and in 1846 95,330 tons, of bituminous coal. The total importations from abroad amounted in 1822 to 22,123 tons, and in 1839 to 181,551 tons. An increase of the tariff on coals in 1842 checked importations of this article, which in the next year amounted to only 41,163 tons. In 1847 it rose to 148,021 tons, of which 12,000 to 15,000 tons were re-exported for the use of English steamships. In 1850 we imported 180,439 tons, and in 1853 231,508 tons. For the year ending June 30, 1862, the quantity imported was 348,487 tons, valued at $1,113,404.

Our exports of domestic coal in 1862 to all foreign countries were 213,046 tons, valued at $837,117. In the years 1856 and 1858, respectively, we exported 677,420 and 558,014 tons of coal.

The duty on foreign coals, by the act of June, 1794, was 5 cents per heaped bushel, or about $1 40 per ton. In May, 1824, it was raised to 6 cents a bushel, and in 1842 it was laid at $1 75 per ton. In 1846 the duty was changed to an ad valorem one of 30 per cent., which rate in 1857 was reduced to 24 per cent. In 1862 a duty of $1 10 per ton of 28 bushels was adopted. Under the treaty of reciprocity, coal to and from the British Provinces pays no duty.

A profitable field for invention and capital, in connexion with the mining of coal, lies open for the introduction of improved machinery and mining appliances both above and below ground, and in the more general resort to a regular system of mining, by shafts going down through all the strata of coal with gangs running into the several veins. The mode heretofore chiefly in use of mining by drifts and slopes, though less expensive at the outset, has often involved disappointment and ruin by the occurrence of faults or interruptions in the veins thus worked. Few if any mines in this country were sunk below water-level previous to 1836, and steam-engines were not much used before the introduction of coal-breaking machinery, about the year 1847. Now most of the mines go below water-level, and nearly all use one or more steam-engines, often of great power. Improvements are made almost daily, and many are required in this department of engineering and mechanics, in which the inventor of successful machinery, that will become generally available, holds the clue to a fortune. We are informed that a new mine, working a 40-foot seam of superior coal in Locust mountain, in the Mahanoy district, has in operation very perfect machinery, including a small locomotive engine to run in the gangways in the place of mules. Our coal deposits are practically inexhaustible, and there is little probability that the supply will materially exceed the future demand.

Statistics of coal mined in the United States during the year ending June 1, 1860.

States and Territories.	No. of establishments.	Capital invested.	Cost of raw material.	NO. OF HANDS EMPLOYED.		Ann. cost of labor.	Tons of bituminous coal.	Tons of anthracite coal.	ANNUAL VALUE OF PRODUCE.		Per cent. increase.
				Male.	Female.				In 1860.	In 1850.	
Rhode Island	2	$35,000	$10,000	77	.....	$21,600	3,800	1,000	$33,500	$22,500	48.8
Pennsylvania	310	17,602,030	2,105,284	29,777	.....	7,213,496	2,690,786	8,114,842	14,746,153	5,268,351	179.9
Maryland	8	3,415,000	56,000	705	.....	307,500	438,000	.....	464,338	196,000	136.9
Ohio	69	750,910	16,920	1,678	.....	635,232	1,265,600	.....	1,653,553	720,126	129.6
Indiana	15	142,500	21,325	176	.....	62,148	101,280	.....	157,878	21,000	651.8
Michigan	2	5,000	1,025	9	.....	2,700	2,320	.....	6,900	.....	.....
Illinois	73	3,169,290	210,433	1,430	.....	486,684	728,400	.....	1,285,501	71,135	1708.
Iowa	69	34,900	10,600	174	.....	50,904	41,920	.....	92,180	4,000	2204.
Missouri	4	15,500	3,480	9	.....	1,860	3,880	.....	8,200	226,118	Dec.
Kentucky	33	1,047,840	162,910	746	11	276,384	255,760	.....	493,150	163,865	200.9
Virginia	22	2,191,400	116,760	1,187	3	421,500	473,360	.....	798,128	467,408	70.7
Georgia	3	35,000	1,750	14	.....	3,360	1,900	.....	4,800	.....	.....
Alabama	4	285,000	400	51	3	18,576	10,200	.....	42,850	12,747	236.9
Arkansas	1	300	.....	2	.....	420	200	.....	600	500	20
Tennessee	6	674,000	36,085	399	.....	126,900	165,300	.....	423,662	.....	.....
Washington	1	25,000	.....	35	.....	21,000	5,374	.....	32,244	.....	.....
Total	622	29,428,670	2,752,972	36,469	17	9,650,264	*6,218,080	*8,115,842	20,243,637	7,173,750	182
In 1850	510	8,317,501	246,414	15,112	6	4,069,188	.....	.....	7,173,750	.....	.....
Increase	112	21,111,169	2,506,558	21,357	11	5,581,076	.....	.....	13,069,887	.....	.....

* Total of bituminous and anthracite coal, 14,333,922 tons.

Statistics of coal, bituminous, mined in the United States during the year ending June 1, 1860.

STATES AND TERRITORIES.	Number of establishments.	Capital invested.	Cost of raw material.	NUMBER OF HANDS EMPLOYED.		Annual cost of labor.	Bushels of coal.	Annual value of products.
				Male.	Female.			
Rhode Island	1	$30,000	$9,000	65	.....	$18,000	95,000	$28,500
Pennsylvania	134	3,721,780	467,386	4,651	.....	1,710,372	67,269,650	2,876,579
Maryland	8	3,415,000	56,000	705	.....	307,500	10,950,000	464,338
Ohio	69	750,910	16,920	1,678	.....	635,232	31,640,000	1,653,553
Indiana	15	142,500	21,325	176	.....	62,148	2,532,000	157,878
Michigan	2	5,000	1,025	9	.....	2,700	58,000	6,900
Illinois	73	3,169,290	210,433	1,430	.....	486,684	18,210,000	1,285,501
Iowa	69	34,900	10,600	174	.....	50,904	1,048,000	92,180
Missouri	4	15,500	3,480	9	.....	1,860	97,000	8,200
Kentucky	33	1,047,840	162,910	746	11	276,384	7,144,000	493,150
Virginia	22	2,191,400	116,760	1,187	3	421,500	11,834,000	798,128
Georgia	3	35,000	1,750	14	.....	3,360	47,500	4,800
Alabama	4	285,000	400	51	3	18,576	255,000	42,850
Arkansas	1	300	.....	2	.....	420	5,000	600
Tennessee	6	674,000	36,085	399	.....	126,900	4,132,500	423,662
Washington	1	25,000	.....	35	.....	21,000	134,350	32,244
Total	445	15,543,420	1,114,074	11,331	17	4,143,540	155,452,000	8,369,063

Coal, anthracite.

STATES AND TERRITORIES.	Number of establishments.	Capital invested.	Cost of raw material.	NUMBER OF HANDS EMPLOYED.		Annual cost of labor.	Tons of coal.	Annual value of products.
				Male.	Female.			
Rhode Island	1	$5,000	$1,000	12	.....	$3,600	1,000	$5,000
Pennsylvania	176	13,880,250	1,637,898	25,126	.....	5,503,124	8,114,842	11,869,574
Total	177	13,885,250	1,638,898	25,138	.....	5,506,724	8,115,842	11,874,574

IRON MINING.

Iron ore is widely distributed throughout the United States, frequently in close proximity to the deposits of fossil fuel in the coal-measures of the several States. A strict geological classification of these ores, or their precise geographical distribution, will not be required in this connexion.

Iron is found in the formations of every geological era, and the more recent the age in which they were deposited, as a general thing, the poorer and more earthy are the ores.

The primary rocks, for the most part, contain the magnetic and specular iron ores and the red oxide, generally in large masses, as in northern and western Canada, the Adirondack mountains of New York, the Blue Ridge and Black mountains of Virginia and North Carolina, in Wisconsin and Missouri. These ores have a crystalline structure and metallic lustre, and furnish 70 per cent. or upwards of the purest and richest iron, such as the Swedish and Russian.

In the secondary series of unchanged rocks are found the carbonate of iron, or spathic, sparry, or steel ore, from which German iron and steel are made. It occurs in large beds or layers, and is found in Connecticut and Vermont and some other States. To this formation also belongs the brown iron-stone, hematite or limonite, found in veins or lodes, seldom in masses, and, like the last, containing from 50 to 70 per cent. of iron. It is the source of the Salisbury iron of Connecticut, and similar deposits

occur in Massachusetts, Vermont, eastern New York, Kentucky, Tennessee, and Alabama, but especially in Pennsylvania, in rich and inexhaustible beds. Higher up in the coal-measures of this series the compact carbonate of iron, or clay iron-stone, is found in veins of greater or less extent, between beds of coal and limestone. It is the ore from which iron is principally smelted in England and Scotland, and yields 25 to 45 per cent. of metallic iron. It is widely distributed in the United States, especially throughout the anthracite, semi-anthracite, and bituminous coal areas of Pennsylvania, where it is often found imbedded with the coal itself. Western Maryland and Virginia, eastern Ohio, Kentucky, and Tennessee, northern Alabama, western Kentucky, southern Illinois, central Michigan, western Iowa and Missouri, and eastern Kansas, abound in this ore. It is better adapted to the cold than the hot-blast.

The ores of the tertiary period are the granular and clay ores and the bog iron ores of the present surface. Bog ore has, doubtless, been deposited in every age as a peroxide from ferruginous waters that have percolated beds of iron ore, and form, with earthy sediment and living organic matters, in low, moist places, considerable dome-shaped masses of wet and spongy bog, which, when drained, furnish a pabulum for charcoal furnaces. Along the southern lake shores, and in the coal-measures of Pennsylvania, Ohio, and other States, many furnaces have been run upon bog ores, of which the supplies have often failed. It is chiefly, however, in the cretaceous, tertiary, and drift formations of the Atlantic seaboard that the bog ores have been made available for iron-making. At the bottom of the numerous peat bogs, ponds, lakes, and swamps, along with sand, marl, and dead vegetable remains, the oxide of iron is deposited in crystallized honey-comb masses and nodules at the bottom, and in more fusible "loam" at the top, which when removed, are, in time, renewed again. From this ore, which yields 25 to 45 per cent. of iron, the first small charcoal furnaces in America were built in Massachusetts and other parts of New England, New Jersey, and Delaware, and made a poor quality of iron, suitable for castings, but not well adapted for forging.

These several kinds of ore are by no means limited to the formations indicated by the familiar geological terms used, but, with other varieties, occur more or less plentifully in each series of rocks.

We shall avail ourselves of the labors of the American Iron Association for the following synopsis of the more important iron regions of the United States, in relation both to the distribution of iron-works as they existed in 1858, and of the principal ores on the mining of which they were dependent for material:

"1. There is the iron region of New York, which formerly included Vermont, and makes its iron from primitive ores by means of 40 bloomaries and a few blast furnaces, three of which are now anthracite.

"2. There is the hematite and primary ore belt of the Highlands, beginning in western Massachusetts and running through northern New Jersey, into Pennsylvania, containing 44 charcoal and 22 anthracite furnaces and 60 forges, most of them making iron from the ore. Some of these works are of the oldest in the United States, and of revolutionary celebrity. Yet the region itself hardly holds its own, in spite of its admirable location, in the present condition of the manufacture, owing to its ruinous proximity to the seaboard ports, glutted as they are with foreign iron.

"3. Eastern Pennsylvania and northeastern Maryland is the greatest iron region in the Union, containing, as it does, 98 anthracite and 103 charcoal furnaces and 117 forges, none of which last produce iron from the ore. It is itself divisible into smaller areas with distinct geographical and geological limits, affording primitive and brown hematite ores, and in the centre lies its anthracite region of principal productiveness.

"4. Northern Virginia and northwestern Pennsylvania constitute together a fourth, much smaller iron region, with its coal-measure, carbonate ores, and its 42 furnaces and two or three forges. Its production in the tables (of the association) is accidentally increased by the circumstance that the great Cambria works, of Johnstown, have been built within its northern limits.

"5. Pennsylvania has still another and more important iron region in the northwest, including the northeastern corner of Ohio. Here 66 furnaces have been in blast, manufacturing iron from the burh-

stone and other carbonaceous ores at the northern outcrop of the great bituminous coal region. All the forging of this region is done in the rolling-mills and workshops of Pittsburg and other centres of trade upon the Ohio waters.

"6. The Ironton region, through which the Ohio river breaks above Portsmouth, contains 45 furnaces on the Ohio and 17 on the Kentucky side, some of which use the coal of the mine for fuel, and all of them the ores of the coal-measure for stock.

"7. The old iron-making region of middle and eastern Virginia, a prolongation of the Pennsylvania region, across the Potomac, supplied with the same brown hematite and magnetic ores, containing 16 furnaces in its division east of the Blue Ridge, only one of which is in blast, and 30 furnaces west of the Blue Ridge. It has also 35 forges.

"8. In the northern part of East Tennessee and northwest corner of North Carolina is seen a knot of 41 bloomary forges and 9 furnaces using the hematite and magnetic ores of the Highland range, while to the west of them, at the base of the Cumberland mountains and on the outcrop of the fossiliferous "dyestone" ore of the upper silurian rocks, are 14 forges and 5 furnaces. In the southwestern corner of North Carolina are 5 forges of the same kind, and further to the east is a belt through the centre of North Carolina, passing over the line a few miles into South Carolina, consisting of 27 forges and 5 furnaces. There is also a small iron region in northern Georgia, along the line of the Chattahoochie, which passes over into Alabama. This whole country possesses an incalculable, inexhaustible abundance of the richest ores, while its production of iron still remains at a minimum.

"9. There is yet but one principal iron region in the far west, that of western Tennessee and western Kentucky, with its peculiar ores and 45 furnaces and 6 or 8 forges.

"10. In Missouri a beginning has been made with the Iron mountain as a centre, and there already exist 7 furnaces in blast upon brown hematite and primitive ores."*

As an independent business, iron mining in the United States employed, in 1850, 197 establishments having an aggregate capital of $923,775 and employing 2,195 persons. The annual cost of raw material was $63,651 and of labor $590,866, and the total value of the product was $1,217,803.

On the 1st of June, 1860, the mining establishments numbered 157, and their combined capital was $2,090,527, an increase of $1,166,752. The annual expenditure for material amounted to $249,699, and the wages of 3,177 hands employed to $901,852. They raised 908,300 tons of ore, valued at $2,182,667, an average of $2 40 per ton. The increase of capital in this industry in ten years was 126.3 per cent., and the value of the product was increased 79.2 per cent.

Of the whole number of mining establishments 9 belonged to the New England, 143 to the middle, and 5 to the western States.

Of the three New England States from which returns were made, Connecticut had 5, Massachusetts 3, and New Hampshire 1 establishment. In Connecticut the invested capital amounted to $111,000, and in Massachusetts to $107,000, but the product of the latter was 30,000 tons of ore, valued at $66,875, and in the former only 20,700 tons, worth $40,625. The total capital of that section invested in iron mining was $238,000, the number of hands 168, whose wages were $43,428, and the product 51,700 tons, valued at $121,500, an average of $2 35 per ton.

The middle States, exclusive of Delaware, employed a capital of $1,302,227 and 2,831 persons, whose annual wages cost $794,224. The quantity of ore mined was 724,500 tons, worth $1,667,067, or $2 30 per ton. The mining interest of Pennsylvania was by far the largest, employing 112 establishments, with a capital amounting to $804,727 and 1,876 hands, whose yearly wages cost $472,024, the annual cost of raw material being $106,878. The iron ore raised in the State was 508,100 tons, worth $1,022,892, an average value of $2 01 per ton. The quantity of ore mined in that State was more than one-half of all raised in the Union, but its value was somewhat less than half the total value. New Jersey was next to Pennsylvania in this industry, having 20 mining concerns whose investments amounted to $359,000, the number of hands to 636, costing annually, for wages, $232,020, and the

* Iron Manufacturers' Guide.

product 164,900 tons of iron ore, valued at $481,750, an average of $2 92 per ton. In New York there were 9 establishments, and in Maryland 2, of which the former mined 49,200 tons, worth $156.675, and the latter 2,300 tons, valued at $5,750.

In iron mining, Michigan ranked next to Pennsylvania in amount of capital employed, 3 establishments in that State having invested $550,000. They employed 170 laborers, whose wages amounted to $62,400 per annum. The ore mined in the State was 130,000 tons, worth $390,000, or $3 per ton, placing Michigan next to Pennsylvania and in advance of New Jersey in the value of iron ore raised in 1860. About 2,100 tons of ore were mined by 2 establishments in Ohio, which was the only other State from which returns were received of iron mining.

Many of the large iron-works of the country either own or farm the mineral lands and mine their own ore, which is not included in the foregoing product. The quantity thus raised in 1860 amounted to about 2,309,975 tons, which, added to the product of regular mining establishments, makes the total quantity raised in 1860 3,218,275 tons. At an average price of $2 40 per ton, the total value would be $7,723,860.

Statistics of iron ore mined 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.	Ann. value of product.	Tons of ore mined.	Average price per ton.
				Male.	Female.				
New Hampshire	1	$20, 000	$1, 675	22	.....	$636	$5, 000	1, 000	.....
Massachusetts	3	107, 000	6, 000	90	.....	24, 600	66, 875	30, 000	.....
Connecticut	5	111, 000	10, 920	56	.....	18, 192	49, 625	20, 700	.....
Total in New England States	9	238, 000	18, 595	168	.....	43, 428	121, 500	51, 700	2. 35
New York	9	132, 000	6, 777	309	.....	88, 020	156, 675	49, 200	.....
Pennsylvania	112	804, 727	106, 878	1, 876	.....	472, 024	1, 022, 892	508, 100	2. 01
New Jersey	20	359, 000	52, 049	636	.....	232, 020	481, 750	164, 900	2. 92
Maryland	2	6, 500	1, 900	10	.....	2, 160	5, 750	2, 300	.....
Total in Middle States	143	1, 302, 227	167, 604	2, 831	.....	794, 224	1, 667, 067	724, 500	2. 30
Ohio	2	300	.....	8	.....	1, 800	4, 100	2, 100	.....
Michigan	3	550, 000	63, 500	170	.....	62, 400	390, 000	130, 000	3. 00
Total in Western States	5	550, 300	63, 500	178	.....	64, 200	394, 100	132, 100	.....
Total in United States	157	2, 090, 527	249, 699	3, 177	.....	901, 852	2, 182, 667	908, 300	2. 40
In 1850	197	923, 775	63, 651	2, 192	3	590, 866	1, 217, 803	.....	.....
Increase	.....	1, 166, 752	186, 048	985	.....	310, 986	964, 864	.....	.....
Increase per cent	.....	.....	.....	.....	.....	.....	79.	.....	.....
Number of tons used in furnaces	.....	.....	.....	.....	.....	.....	.....	2, 309, 975	.....
								3, 218, 275	