BOOTS AND SHOES.

The manufacture of boots and shoes employs a larger number of hands than any other branch of American industry save that of agriculture, and more than one-twelfth of all the operatives engaged in manufactures. Although the returns show a decrease of 4,438 in the number of females employed, as compared with the census of 1850—in part attributable to the increased use of sewing machines—yet there was an increase of 22,163 in the number of male hands, and a total of 123,029 persons engaged in this business on the first day of June, 1860, whose annual wages amounted to $30,938,920. The number of establishments devoted to the manufacture of boots and shoes was 12,487, which employed a capital of $23,358,527, consumed raw material worth $42,729,649, and produced goods to the value of $91,891,498. The total product of this industry was 70 per cent. above that of 1850, when it amounted to $53,967,408, the increase being $37,924,090. Of the whole number of establishments, 2,439 belonged to New England, 5,412 to the middle States, 3,175 to the western, 1,365 to the southern, and 96 to the Pacific States.

The New England manufactories were, relatively, much the largest. They gave employment to nearly $11,000,000 of capital, and to 52,010 male and 22,282 female hands, the annual product of whose labor was $54,818,148, or nearly 60 per cent. of the whole value of this branch—an increase of $24,870,823, or upward of 83 per cent. on the product of those States in 1850. The average value of boots and shoes made in the New England factories was $22,475. More than one-half, or 1,354 of these establishments were in Massachusetts, and they employed over $9,000,000 of capital, 43,068 male and 19,215 female hands, the product of whose labor amounted to $46,230,529, having increased its value 91.8 per cent. The average capital of the Massachusetts factories was $6,655, the number of hands 46, and the value of annual product $34,143.

New Hampshire was second among the New England States, having produced to the value of $3,864,866 in 337 manufactories, an increase of 48 per cent. Connecticut returned over $2,000,000 in value as the product of 212 factories, an increase of only 10.3 per cent., while Maine increased its manufactures of boots and shoes 98.7 per cent., being the third in rank. Rhode Island produced an annual value of $315,759, an increase of 35.7 per cent. upon the returns of 1850.

In the middle States, New York and Pennsylvania are the leading producers. New York had 2,277 factories, employing 13,868 male and female hands, whose labor produced boots and shoes to the value of $10,925,173, an increase of 40.5 per cent. Pennsylvania returned 2,181 establishments, with 13,389 hands, and an annual product of $8,474,127, the increase being 50 per centum. There was a slight decrease in the product of Maryland. The total value of boots and shoes in the middle States was $22,976,783, an increase of 36.9 per cent.

In each of the western States the returns showed an increase of more than fifty per cent. over those of 1850. Their aggregate manufacture of boots and shoes amounted to $9,867,807, an average increase of 91.9 per cent. in ten years. Ohio took the lead, having 1,077 establishments, which employed 4,706 hands, and produced goods to the value of $3,662,831, the increase being 57.8 per centum. Indiana and Illinois each returned an annual value of upwards of one million, an increase in the former of 114 and in the latter of 136.6 per cent. Michigan and Wisconsin, in each of which the manufacture of boots and shoes fell a little short of one million dollars in value, increased their product in the ratio of 88.8 and 214.9 respectively.

In the southern States there was an increase of this manufacture equivalent to 89.9 per cent., the aggregate value being $3,973,313. South Carolina was the only State which showed a falling off from the product of 1850, while in Louisiana, the largest producer, the increase was 262 per cent., and the total value $1,472,830. In Texas, Florida, Arkansas, and Mississippi the value of manufactures, though small, was greater than that of 1850, in the ratios, respectively, of 334, 244, 142, and 98.2 per cent. In Virginia, the second in the extent of this business, the increase was 23.2 per cent.

The Pacific States, which have come into existence since the previous census was taken, manufactured boots and shoes in 1860 to the value of $255,447, of which amount more than one-half was the product of 70 manufactories in California.

In further review of these returns, we cannot but be impressed with the magnitude and importance of this business to the laboring and commercial classes in New England, where *its aggregate value in* 1860 *exceeded by* $850,740 *the total production of all the States in* 1850. The increase alone in the single State of Massachusetts was nearly equal to the entire production of the middle States, which was itself an advance of nearly 37 per cent. on the returns of 1850. This increased production in all sections was in a great measure due to the use of the sewing machine and other mechanism now employed extensively in the business, in many instances propelled by steam. The counties of Essex, Worcester, and Plymouth, in Massachusetts, severally manufactured boots and shoes to the value of about $14,500,000, $9,500,000, and $9,250,000, considerably more than one-third the total product of the Union. The highest value manufactured in any one place was in Philadelphia, where it fell little short of $5,500,000. Lynn, Massachusetts, turned out boots and shoes, chiefly ladies' wear, to the value of upward of $4,750,000, and Haverhill, Massachusetts, considerably over $4,000,000 worth. The city of New York stood next in order, its manufacture amounting to more than $3,750,000. These four cities inclusive manufactured about one-fifth the total value of boots and shoes made in the United States, or upward of $18,250,000. The largest single establishment in this business was one in North Brookfield, Massachusetts, which manufactured to the value of more than $750,000. It was the largest of five manufactories belonging to the same proprietors, which unitedly, in 1860, made more than 1,000,000 pairs of boots and shoes, valued at upwards of $1,250,000.

HISTORY OF BOOT AND SHOE MANUFACTURE IN AMERICA.

The introduction of the present style of shoes was nearly coincident with the first settlement of New England, and with the first implanting there of an art which now forms its predominant industry. A great diversity of forms and materials for coverings for the feet have prevailed among different nations and at different periods of the world's history. In England for a long period, extending into the middle ages, the prevailing fashion of boots and shoes was characterized by long pointed or beaked toes, which at length became so excessive as to require the points to be tied up to the knee. An edict of Edward III, in 1365, restricted their length for the unprivileged classes to two inches, under penalty of a forfeiture of 20 shillings by the shoemaker, to which it was found necessary to add excommunication by the clergy. This restraint upon the length produced a corresponding extension of the breadth of the toes, which in its turn called forth a proclamation of Queen Mary that the toes of shoes should not exceed six inches in width. During the civil wars shoes were decorated with red or green rosettes, which about the year 1668 gave place to buckles; and these again were abandoned about 1791 for shoestrings, as worn at present. In the time of Cromwell boots were worn with high and very wide tops of yellow or scarlet leather, sometimes adorned with lace. At the Restoration the long French boot was introduced, and at a later period *red heels* became a mark of gentility. About the year 1633 shoes of the present shape, with round toes, were adopted. But wooden and cork shoes, or pantofles, bearing the wearer two inches above the ground, were common, and as late as 1717 were prohibited by Frederick William II, of Prussia, as an injury to the trade of shoemakers. Cloth or stuff shoes were much worn by the wealthier classes, and, during the early part of the last century, shoes of silk or velvet were still preferred by ladies, those of the court using figured blue silk, with bright red heels and silver buckles. The gaiter boot is said to have been introduced from France at a later date by the Countess of Blessington. Through the ingenuity of American artists its troublesome arrangement of lacings, tags, and eyelet holes has been superseded by the use of an elastic webbing, rendering the elastic gaiter, or Congress boot, at once the most comfortable, elegant, and popular style of shoe or boot. In its manufacture, as well as in other branches of the trade, our workmen now rival the best foreign artisans, and have almost entirely suspended the importation of French gaiters, at one time quite extensive

In tracing the initial step of this vast industry in our country, we find that in 1629, the second year of the settlement of Massachusetts, a shoemaker named Thomas Beard took passage on board the Mayflower, with a supply of hides, being accredited to the governor of the colony by the company in London, at a salary of £10 per annum, with the recommendation of a grant of fifty acres of land, where he should be directed to settle. In 1635 the business was first commenced at Lynn by Philip Kertland, a native of Buckinghamshire. Within fifteen years the shoemakers of the town were able to supply the merchants of Boston with shoes for their trade. These were chiefly of calfskin, morocco being then unknown there. As early as October, 1648, the shoemakers of the colony were invested by the general court with the privileges of an incorporated company, or guild, with power to regulate their trade for three years. About the same date, also, we find tanning and shoemaking named among the established industries of Virginia; one Captain Matthews, an early planter, being especially mentioned as employing eight shoemakers upon leather tanned and dressed on his own premises. The business of the cordwainer was placed under legal restraint in Connecticut in 1656, and in Rhode Island in 1706. In New York the tanners and shoemakers had become so firmly established previous to the capitulation of the province to the English in 1664 as to give distinctive names to localities occupied by them in what is now the business centre of the city. In 1698 we find these useful classes, with others dependent upon them, profitably employed in Philadelphia, then in its infancy. Journeymen shoemakers received 2*s.* per pair for making men's and women's shoes; last-makers 16*s.* per dozen for lasts; and *heel*-makers 2*s.* per dozen for wooden heels, an article which continued in use for many years after. In 1721 shoemakers in Pennsylvania were prohibited by act of assembly from taking more than 6*s.* 6*d.* for a pair of good, plain, well-made men's shoes, and 5*s.* for women's. The same act prescribed the manner of making them, and forbade the use of neat's and calf leather in the uppers of the same boot or shoe, or any sheepskin uppers when made for sale.

The earliest improvements in the domestic manufacture of shoes were made about the year 1750 by John Adam Dagyr, a Welchman, who settled in Lynn, where the business was as yet quite limited, only three persons employing journeymen. He possessed superior skill in making ladies' shoes, and by his instructions the native workmen—who had frequently taken apart the best English shoes in order to learn how they were made—were soon able to make shoes nearly equal to those imported. The business in Lynn was thenceforward, as at present, chiefly confined to the manufacture of women's shoes. In 1764 the London Chronicle stated that women's shoes were made in Lynn, "exceeding in strength and beauty any that were imported from London." Boots were little worn before the war of Independence, and the shoes of servants, both male and female, were almost exclusively of coarse neat's leather. No inconsiderable part of the boots and shoes worn in the country at the date of the Revolution was of domestic manufacture, chiefly the production of Massachusetts, which supplied many for the army during the war. The heavy importations which followed the peace nearly prostrated this infant industry, which, however, so far revived in Lynn that 100,000 pairs were exported from the town in 1788. In 1795 Lynn employed 200 master workmen and 600 journeymen and apprentices in the shoe business, and sent 300,000 pairs of shoes chiefly to southern markets. Through Boston and other cities it sent also small quantities to Europe.

In 1810 the consumption of foreign boots and shoes of all kinds amounted to only 15,861 pairs, chiefly kid and morocco; the exports of home-manufactured boots was 5,169 pairs; and of shoes, 54,835 pairs, showing that in this branch we had become entirely independent of foreign countries, and had a surplus for exportation.

The census of that year embraced returns of this manufacture from only eleven States, in which the aggregate number of boots, shoes, and slippers made was 5,035,371 pairs, valued at $4,686,624. Of that product, 2,218,671 pairs, worth $2,201,792, were made in Massachusetts, chiefly in Essex and Middlesex counties, and 1,327,776 pairs, of which the value is not separately given, in Pennsylvania—more than one-half in Philadelphia city and county. Vermont, which was second among the New

England States in the boot and shoe manufacture, returned 65,580 pairs of boots, averaging $3 a pair in value, and 238,700 pairs of shoes, worth 75 cents per pair. New Jersey was the second of the middle States in the value of its boots and shoes, which amounted to $427,685, chiefly the product of Essex county and of the town of Newark, which had been long noted for its boot and shoe manufactures, and in which the first shoemaker, William Whitehead, settled about the year 1676.

Mr. Tench Coxe, in 1812, estimated that the boots, shoes, and slippers manufactured in that year "undoubtedly exceeded the value of all the foreign manufactures imported in the first year of the present government, which, by the actual returns of November 30, 1791, were worth here only $15,293,638;" and that, "were shoes, boots, and slippers manufactured in the same proportion to numbers in all the States, as in Massachusetts, they would be equal in value to $25,067,000.* He stated, also, that an improvement in making shoes, which saved four-fifths of the workmanship, had been discovered. At that date few improvements had been made in the process of manufacturing shoes, and machinery had scarcely been called to the aid of the maker. The London Society of Arts, in 1802, and again in 1812, awarded premiums for machines to enable shoemakers to work in a standing position, thereby relieving the pressure upon the breast and the constraint of position, which are so detrimental to health. The invention referred to by Mr. Coxe was probably that of D. M. Randolph, of Richmond, Virginia, who, about the year 1809, introduced a method of uniting the soles and heels to the uppers by means of rivets instead of sewing them. This was effected by covering the bottom of the last with a plate of metal, against which the nails were clinched when driven through the two soles, and the upper united over it. John Bedford, of Philadelphia, in July, 1806, took out a patent for manufacturing iron-bound boots and shoes, whereby it was claimed that a saving was made in leather, and, in consequence of the greater durability of the work, and the disuse of thread, of more than one-half the material. A patent was also granted in 1812 to Ephraim Twombly, of Massachusetts, for making iron-bound boots and shoes.

The first large manufactory in which machinery was employed in the manufacture of boots and shoes was that established at Battersea, in England, by Brunel, the celebrated engineer, for the supply of shoes to the British army during the last war. The labor was performed by the Chelsea pensioners, and the process employed was that of riveting the soles by double rows of small nails, the bottoms being at the same time thickly studded with copper or iron nails. The ingenious proprietor, who had a patent, contrived many other small machines for cutting out and hardening the leather by rolling, punching the holes, forming and inserting the nails, &c., some of which are still used in France. But the method appears to have fallen into disuse after the peace in 1815, probably on account of the cheapness of manual labor.

The manufacture of pegged boots and shoes, which now forms the greater proportion of the work of our factories, and the greatest improvement yet made in the business, as far as labor is concerned, was practiced as early as 1812 in New York, and very generally in Connecticut, although this valuable invention has been ascribed to Joseph Walker, of Hopkinton, Massachusetts, about the year 1818. We find that a patent for a method of pegging boots and shoes was taken out in July, 1811, by Samuel B. Hitchcock & John Bement, of Homer, New York, and another by Robert U. Richards, of Norwalk, Connecticut, in May, 1812, for the use of wooden pegs, screws, &c. Samuel Milliken, of Lexington, Massachusetts, in 1807, took out a patent for metallic bottoms for boots and shoes. A pegging machine was the subject of a patent by Nathan Leonard, of Merrimack, New Hampshire, in June, 1829. Other contrivances for the same purpose were brought forward at different times, among which may be mentioned the ingenious machine for pegging boots and shoes patented in 1851 by A. T. Gallahue, of Pittsburg, Pennsylvania, where it was put in practical operation. It enabled one man to peg a boot or shoe with two rows of pegs on each side in three minutes, cutting its own pegs at the same time. In the following year patents were issued to Mr. Gallahue for a further improvement, and to seven other different persons for shoe-pegging machines. The pegging machines of Sturdevant and of Tripps & Hill have proved useful inventions. Several minor inventions have materially contributed to the

* Statement of the Arts and Manufactures of the United States, &c.

extension of the pegged shoe and boot manufacture, which now constitutes at least three-fourths of the general business. Among these are the various machines for cutting, pointing, setting, and driving the pegs, for punching the holes, &c. In 1839 a peg and last factory, three stories high, was erected at Dayton, Ohio, which made 20 bushels of shoe pegs and 500 lasts per week. A large establishment was also in operation in 1841 at Meredith Bridge, (now Laconia,) New Hampshire, for making pegs by machinery, on which the proprietor, M. H. Baldwin, had secured a patent. The pegs were made of white, yellow, and black birch, and white maple. They were of different sizes and qualities, and were made at an average price of a little over two dollars per bushel. This manufactory for many years furnished the principal supply of pegs for the country, and in 1850 produced about 50 bushels of pegs per diem. The value of shoe pegs made in the State in 1845 was $18,206. Among the shipments from Boston to Liverpool in the first week of September, 1861, were 383 barrels of shoe pegs, chiefly destined, it is probable, for the continent, where large quantities are now consumed in the manufacture of German toys. During the same year a steam peg manufactory was started at Bloomington, North Carolina, by Mr. A. U. Tomlinson, for the supply of the south, which had previously been supplied by New England. An association in New York, called the American Union Company, with branches in the country around, was formed in 1850 for the manufacture of "staple or pegged boots and shoes," the demand for which exceeded the supply. Much saving of labor has also been effected in the manual process of this manufacture by the little invention called the pegging or awl haft, patented by Aiken & Hemenway, and by the several processes for rolling, cutting and crimping the leather, and for the manufacture of lasts, all of which have been the subjects of numerous patents.

LASTS.—A patent for manufacturing shoemakers' lasts was issued in 1807 to William Young, of Philadelphia, and another in 1817 to the same for making right-and-left lasts. But the lathe for turning irregular forms, by which lasts are now made on a large scale with facility and cheapness, was the invention of the late Thomas Blanchard, a native of Sutton, Massachusetts. Originally designed for turning gun-stocks and other objects of irregular form, it has since received a wide range of applications. It turns lasts in complete sets, including all the sizes, and for both feet, from a single pattern, by a simple adjustment of the machinery. Patents were taken out by the inventor in September, 1819, and in January, 1820, which were renewed by act of Congress in 1834, and again in 1847. A valuable improvement upon lasts was made about the year 1827 by John Kimball in cutting blocks from the upper and anterior part of the last according to rules which he laid down, a system which has continued in use ever since, with much satisfaction to the trade.* The value of lasts and shoe pegs made in Massachusetts in 1845 was $98,351. In 1855 there were made in that State 1,099,336 lasts, worth $179,450, and 17,800 bushels of pegs, worth $12,900.

A system of diagram *patterns* for cutting was introduced in 1832 by Mr. Richardson, of Boston, and has since been adopted generally throughout the country, with manifest benefit, in the manufacture of shoes by machinery.

A machine for draughting, cutting, and blocking boots was patented in 1847 by S. C. Shire, of Pennsylvania, which has been found useful by many manufacturers.

But the crowning invention which has supplemented and given practical value to all other kinds of machinery in the manufacture of boots and shoes is the SEWING MACHINE. Its use has introduced a new era in the trade. Without it the partial use of machinery upon the bottoms of boots and shoes was attended with little economy, because the cost of stitching and binding the uppers, which was the larger item of expense, was not reduced in a corresponding degree. Although of quite recent introduction in this branch of industry, its employment, along with the sole-cutting machine, and other appliances, is gradually bringing about a silent revolution in the boot and shoe manufacture, which is daily assuming the characteristics of a factory system, being conducted in large establishments of several stories, each floor devoted to a separate part of the work, with the aid of steam-power, and all the labor-saving contrivances known to the trade. It is safe to predict that this change will go on until the little

* Richardson's Boot and Shoe Manufacturer's Assistant and Guide.

"workshop" of the shoemaker, with its "bench" and "kit," shall become a thing of the past, as the "hand-card" and the great and little "spinning wheel" have disappeared from other branches of the clothing manufacture.

As a branch of domestic trade the boot and shoe business dates its commercial importance from about the year 1818, in which the first full cargo of boots and shoes was shipped from Boston on board the sloop Delight, consigned to Spofford, Tileston & Co., commission merchants, 131 Fly Market, New York. The firm, at that time the largest boot and shoe jobbers in that city, then commenced shipping them from that port instead of Boston, which had previously engrossed the trade. The business was rapidly increased and fostered in other States, the growth of the manufacture having previously been confined chiefly to New England. In 1828, however, the entire value of the jobbing trade of Boston, which was its commercial centre, amounted to but little over $1,000,000, and the jobbing-houses of New York in the following year numbered only four. In 1856 Boston contained upwards of 200 wholesale and jobbing-houses, and the domestic and foreign shoe trade of Massachusetts amounted to nearly $50,000,000. The shipments from Boston to San Francisco alone, in that year, were 42,258 cases, valued at $2,100,000. New York in 1858 contained 56 wholesale and 600 to 800 retail boot and shoe houses. The sales of the former amounted to about $15,000,000, and of the latter to upwards of $5,000,000. In 1863 the exports of boots and shoes from New York to foreign countries consisted of 11,418 cases, worth $937,911. It has also a large export trade in boots and shoes to California.

About the year 1829 the wholesale houses in Boston introduced a new system of business, which has rendered that city the great emporium of the trade in New England. Previously it had been the custom for dealers to consign their goods, on their own account, to merchants in the principal cities of the United States and the West Indies. This was found to be unprofitable when competition had grown strong, and led to the failure of many of the large houses. During the last thirty years or more, it has been customary for the large manufacturers and jobbers to sell their goods at their places of business, thus compelling the market to come to their doors instead of seeking it themselves. The financial embarrassments of 1857–8 severely tested the vigor of this branch of trade, which was found to withstand the shock equal to any in the country.

The staple articles of this heavy domestic trade, which has now grown to be the largest in the Union, consists chiefly of men's and women's pegged boots and shoes, and brogans. Large quantities of the latter were formerly sold to the southern States for negro wear. During the present war the demand for strong army shoes has largely supplied the loss of the southern trade. This class of work is chiefly produced in Maine, New Hampshire, Massachusetts, and Connecticut. Women's pegged and common sewed shoes and gaiters are manufactured at Lynn, Haverhill, Worcester, Milford, Natick, Randolph, Abington, North and South Reading, Danvers, Georgetown, Stoughton, Woburn, Weymouth, Stoneham, and other towns in Massachusetts, several of the towns first named making each from three to five millions' worth annually. Boots are also made in each of them except Lynn, but form a leading article of manufacture in Haverhill, Milford, Worcester, North Brookfield, Spencer, Grafton, Randolph, Stoughton, Weymouth, Hopkinton, South Reading, and Abington. The number of boots made in the State in 1845 was 3,768,160 pairs, and of shoes 17,128,411 pairs, nearly all by hand-labor, of which the total value was $14,799,140. The State census of 1855 returned 11,892,329 pairs of boots, and 33,174,499 pairs of shoes, valued together at $37,501,723.

Boots and shoes of a finer quality are made in New York and Philadelphia. The latter city possesses some advantages for the production of a fine description of boots and ladies' shoes, on account of the large stocks of fine calfskins and morocco leather—in the manufacture of which that city has long enjoyed a high reputation—and also in the number of its skilful German workmen. Its domestic manufacture amounts in value to $5,472,587, and its annual sales to about $15,000,000.

[For remarks on the manufacture of India-rubber shoes, see "India-Rubber Goods," on page lxxiv.]

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

STATES AND TERRITORIES.	Number of establishments.	Capital invested.	Cost of raw material.	AVERAGE NUMBER OF HANDS EMPLOYED.		Annual cost of labor.	ANNUAL VALUE OF PRODUCT.		Per ct. increase.
				Male.	Female.		In 1860.	In 1850.	
Maine	321	$509,124	$973,797	2,065	836	$661,878	$1,910,666	$961,556	98.7
New Hampshire	337	704,955	2,327,371	3,479	1,365	1,089,108	3,864,866	2,610,169	48.0
Vermont	149	134,862	212,070	487	58	169,064	442,566	343,353	29.0
Massachusetts	1,354	9,010,977	22,680,931	43,068	19,215	14,665,922	46,230,529	24,102,366	91.8
Rhode Island	66	104,695	156,137	382	31	85,152	315,759	69,098	337.0
Connecticut	212	513,400	841,085	2,529	777	828,852	2,053,762	1,861,783	10.3
Total in New England States	2,439	10,978,013	27,191,391	52,010	22,282	17,499,976	54,818,148	29,947,325	83.4
New York	2,277	3,298,323	4,849,477	11,839	2,029	3,660,396	10,925,173	7,776,428	40.5
Pennsylvania	2,181	3,038,176	3,302,327	10,987	2,402	3,394,296	8,474,127	5,636,773	50.0
New Jersey	373	580,369	822,903	2,331	482	761,964	1,850,140	1,698,877	8.9
Delaware	57	86,425	99,339	270	58	90,948	230,302	157,254	46.4
Maryland	468	347,355	531,229	1,649	305	502,680	1,287,256	1,372,358	Dec
District of Columbia	56	67,505	85,749	273	20	61,390	209,785	144,597	45.2
Total in Middle States	5,412	7,418,153	9,691,024	27,349	5,296	8,471,674	22,976,783	16,786,287	36.9
Ohio	1,077	1,199,231	1,484,658	4,362	344	1,365,444	3,662,831	2,320,096	57.8
Indiana	378	368,730	469,660	1,164	51	377,048	1,087,495	506,035	114.0
Michigan	282	392,595	422,527	1,075	67	321,620	996,022	527,479	88.8
Illinois	389	433,226	485,477	1,205	24	376,740	1,133,458	478,925	136.6
Wisconsin	286	360,455	432,928	979	55	247,416	913,355	289,998	214.9
Minnesota	59	49,000	57,937	146	3	51,084	138,680	.....	.....
Iowa	134	123,832	152,566	374	15	119,172	364,257	56,553	544.0
Missouri	283	294,340	339,728	925	42	319,128	864,501	559,238	54.5
Kentucky	271	198,085	258,079	710	17	248,416	663,657	403,212	64.5
Kansas	6	26,550	6,287	16	.....	5,064	14,900	.....	.....
Nebraska	10	9,950	11,124	33	1	12,252	28,651	.....	.....
Total in Western States	3,175	3,455,994	4,120,971	10,989	619	3,443,384	9,867,807	5,141,536	91.9
Virginia	258	258,622	272,830	900	122	264,108	735,771	596,883	23.2
North Carolina	62	68,000	59,078	167	9	52,824	150,955	92,109	63.8
South Carolina	51	77,635	64,881	158	2	43,962	142,515	187,180	Dec.
Georgia	125	168,331	194,000	406	17	118,224	406,557	244,260	66.4
Florida	6	7,400	5,730	15	1	5,940	14,300	4,150	244.0
Alabama	110	114,507	135,101	328	8	99,036	288,276	157,303	83.2
Louisiana	505	371,490	587,991	1,177	135	541,296	1,472,830	406,825	262.0
Texas	33	41,200	32,648	89	1	27,732	76,644	17,500	334.0
Mississippi	71	110,350	102,990	232	.....	86,580	245,655	123,924	98.2
Arkansas	17	12,725	13,852	45	3	16,800	44,020	18,150	142.0
Tennessee	127	214,512	175,229	483	17	146,556	395,790	243,976	62.2
Total in Southern States	1,365	1,444,772	1,644,330	4,000	315	1,403,058	3,973,313	2,092,260	89.9
Utah	13	4,520	20,535	28	2	15,720	45,933	.....	.....
California	70	50,275	53,149	113	.....	91,272	179,235	.....	.....
Oregon	12	6,500	7,724	24	.....	13,116	28,759	.....	.....
New Mexico	1	300	525	2	.....	720	1,520	.....	.....
Total in Pacific States	96	61,595	81,933	167	2	120,828	255,447	.....	.....
Total in United States	12,487	23,358,527	42,729,649	94,515	28,514	30,938,920	91,891,498	53,967,408	70.27

INDIA-RUBBER GOODS.

Boots, shoes, clothing, and other water-proof and useful articles from caoutchouc, or India-rubber, are extensively made in several of the States. Few branches of our varied industry are more remarkable for rapidity of development, for the quick succession of new processes introduced, and for the very numerous important uses to which, within the short space of twenty-five or thirty years, a single raw material has been applied in nearly every department of art, science, and domestic economy.
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When we consider the almost inconceivable number of articles of ornament or utility made of hard or soft rubber, and of gutta-percha, so nearly allied to it in properties, we can scarcely overestimate the amount of substantial benefit to the nation, represented in an aggregate product of more than $5,750,000 worth of such articles in a single year. So multiform is the application of these materials that the mere statement of the nominal value of the manufacture but imperfectly measures its influence upon the health, comfort, and progress of the people among whom its products are distributed.

The value of India-rubber goods made in 1850 was $3,024,335. In 1860 it amounted to $5,642,700, an increase of $2,618,365, or 86.6 per cent. The capital invested in the latter year in 27 establishments was $3,534,000; the cost of raw material $3,056,360; the number of hands employed, of whom 973 were females, was 2,768, and their annual wages cost $794,570. With seven fewer establishments than were in operation in 1850, and a very small increase in the number of hands, this business shows an appreciation of its aggregate capital in the ratio of nearly 143 per cent.; in the cost of material, of 90 per cent.; and in annual wages, paid, of nearly 48 per cent. in ten years. In 1850 Maryland made returns from two and New Hampshire from one small factory, which have ceased to exist. New York, in 1860, had three and New Jersey one factory less than in 1850, the only increase being one in Connecticut.

Of the entire product, upward of 40 per cent., or $2,276,000, was made in the nine manufactories of Connecticut, exhibiting an increase of 86.8 per cent. in the business of that State. New Jersey produced upward of $1,200,000 worth of rubber goods, and New York over $1,000,000, the increase in the former being 80 per cent., and in the latter 82.6 per cent. Massachusetts held the fourth rank in this branch, but showed the highest ratio of increase, which, though on a small amount, ($803,000,) was 190.9 per cent. over its product in 1850. Rhode Island fell a little below $250,000 in the value of its rubber manufactures, having only increased the amount 14.7 per cent, while Pennsylvania shows a falling off in its product, which was never large.

HISTORY AND STATISTICS.

Caoutchouc, gum-elastic, or India-rubber, and some of its uses, have been long known in South America and the East Indies. In the former it is called by the natives *cahuchu*. It is obtained from several parts of the country, but most abundantly from the province of Para, in Brazil. It is chiefly produced by a tree variously named by different naturalists as *Jatropha elastica*, *Siphenia elastica*, *Hævea guianensis*, &c. It exudes as a milky juice from incisions made in the bark, and afterward dries into the concrete, elastic caoutchouc. It is imported chiefly in the form of pear-shaped bottles, shoes, half-boots, &c., made by spreading successive layers of the fresh juice over moulds of clay and drying in the smoke of a species of palm-nut, after which the moulds are broken, and the fragments shaken out. It is also imported more cheaply as *sheet*-rubber, in rough, irregular sheets, two inches thick and two feet long by one foot wide. For several years past it has also been obtained in a liquid form, though quite impure, and at high cost, in tightly closed vessels of copper or India-rubber, for which, in 1853, Mr. H. L. Norris, of New York, substituted air-tight vessels of glass and tin, for which he secured patents in England and the United States. The Asiatic trees, which now furnish the principal supply of a similar material, are the *Ficus elastica*, a very large tree, of which immense forests exist in Assam, beyond the Ganges, the *Urceola elastica*, and perhaps others. The product of these comes to us in a very impure state; but Mr. A. S. Day, of Connecticut, several years ago, patented and put in operation at Seymour,

in that State, expensive machinery for freeing it of the sand, bark, and other impurities The euphorbia, poppy, lettuce, chiccory, and other European plants, are said to furnish caoutchouc, or elastic gum.

Caoutchouc was first made known to Europeans by the French academicians sent to Brazil in 1730. One of these, M. de la Candamine, in 1736, presented to the Academy of Sciences an account of its uses by the natives of South America. In 1761 MM. Herissent and Macquer made a report, accompanied by samples, to the French government, and by its order M. Grossart made a number of experiments, in which he at length succeeded in drawing caoutchouc into tubes. The results were published in 1798. About the same time it was used to make extensive ligatures and springs of different kinds. Fourcroy discovered its partial solubility in ether, and in 1820 Nordler cut it into threads suitable for the manufacture of elastic tissues.

The first English work in which this substance is mentioned is that of Dr. Priestley, on the "Theory and Practice of Perspective," printed in 1770, in which he states that after the printing of his book he was shown "a substance excellently adapted for wiping out from paper the marks of a black-lead pencil." It was sold by Mr. Nairne, a mathematical instrument maker, at the rate of three shillings for a cube of about half an inch. From that time it appears to have taken the name of India-rubber, in reference to that use of it. Ten years later it had come into more general notice, and was sold in the shape of bottles, at about a guinea the ounce. A Scotch publication, in 1791, contained an article "on the uses that may be made of caoutchouc, elastic gum, or India-rubber, in the arts and manufactures, with an account of the manner of obtaining and manufacturing it." Its application to a great number of its present uses was therein foretold and recommended, although the substance was then little used except as an amusing toy or to erase pencil-marks.

In 1797 a patent was taken out in England by a Mr. Johnson for rendering cloth water-proof by covering one side with a varnish made of India-rubber dissolved in equal parts of oil of turpentine and spirits of wine, and sifting over the surface silk, wool, flock, or other substance, to conceal the varnish. These fabrics, called *hydrolaines*, do not appear to have come much into use. The strong affinity of caoutchouc for the essential oils was early discovered, as well as its perfect solubility in washed ether; but most of these solvents, as also the liquid hydrocarbon, called *caoutchoucine*, distilled from crude caoutchouc, and patented in 1833 by Barnard, were too costly and dried too slowly for making varnishes for ordinary use. Professor Syme, of Edinburgh, discovered that it was readily dissolved in naphtha, and recovered its elasticity again when dried. Naphtha, distilled from coal-tar, was found to answer the same purpose and to be cheaply produced.

The first practical application of this knowledge in the manufacture of water-proof cloth was effected by Mr. Mackintosh, of Glasgow, who dissolved caoutchouc in naphtha from native petroleum or from mineral tar, and applied the solution as a varnish to the surfaces of two pieces of cloth, which were afterward laid together and pressed between rollers. For this process, which is similar to that by which the natives of South America manufacture *ponchos* with the liquid juice, the inventor obtained a patent in 1823, and the garments made of these water-proof double fabrics were long known as "Mackintoshes." He established the first India-rubber manufactory in Great Britain, if not in the world. This fabric was also used for making the water-beds of Dr. Arnott, nursery aprons, &c., and likewise for boats, by stretching it over wicker frames. This application of the material gave a strong impulse to the manufacture.

As early as 1813 a patent was taken out in the United States by Jacob F. Hummel, of Philadelphia, for a varnish of gum-elastic, and in 1824 Charles Baganelle Fleetwood, in England, was granted letters patent for a liquid composition for making leather water-proof, consisting of India-rubber and beeswax or other gummy matter combined through the agency of spirits. But all the solutions of India-rubber in the common essential oils employed for rendering cloths and leather water-proof either did not dry well, or, when dried, by the addition of linseed oil, were found to be flexible, but inelastic, and after a time became brittle and cracked.

A process capable of numerous practical applications was pointed out in the infancy of the manufacture by the late Professor J. K. Mitchell, of Philadelphia. By immersing caoutchouc bags in common ether, containing no oil of wine and little alcohol, he was able to blow them into thin balloons, light enough to float in the air. In this state caoutchouc could also be stretched over forms, and, when dried, did not return to its original shape. It could likewise be rolled or pressed into sheets of any size and degree of tenuity. This knowledge was made available in the filature of caoutchouc for the manufacture of elastic fabrics, such as braces, garters, bands, &c. The manufacture of these articles appears to have originated with an officer in the Austrian service, who afterward established a large manufactory at St. Denys, near Paris. The threads were at first cut from the original pear-shaped bottles with scissors, at the rate of 100 yards a day, and afterward from the inflated bottles, which afforded a finer thread. In 1826 or 1827 Messrs. Rattier & Guibal, proprietors of the St. Denys factory, employed machinery for cutting the filaments, and made fabrics of great beauty. Subsequently machines for this purpose were patented in England by Westhead, of Manchester, Mr. Nickels, and others, which cut them from a flattened disk of rubber, varying in fineness from 700 yards to 5,000 yards to the pound. The finer threads were used for ladies' silver and gold elastic bracelets, bands, &c., and the coarser for patent hemp-covered India-rubber cordage. Each filament was *inelasticated* by stretching in the process of winding, and, after being covered with silk or cotton, and woven or braided, had its elasticity restored by heat, in which process the semblance of raised figures was sometimes ingeniously given to the fabrics. More recently a machine has been constructed which makes 8,000 yards of thread from a pound of India-rubber, and another which divides it into four parts, making 32,000 yards of filament from a single pound of material. The process of Messrs. Aubert & Gerard, of Grenelle, in France, who have made many improvements, produces a perfectly cylindrical thread of any desired length and size,

In the manufacture of water-proof fabrics. shoes, and other articles in common use, very great improvements have been made, several of which have originated in this country. In April, 1831, George H. Richards, of Washington, District of Columbia, received a patent for a fluid caoutchouc to render articles water-proof. Soon after Edwin M. Chaffee, of Roxbury, Massachusetts, and others established the Roxbury India-rubber Company, which was chartered in 1833, and was the first organized in the United States to manufacture caoutchouc into water-proof clothing and other articles of common use. It manufactured shoes, coats, and hose, life-preservers, carriage traces and other articles of cloth, covering them with caoutchouc dissolved or suspended in one of the essential oils, of which spirits of turpentine was found the cheapest, although the solvent used was first kept a secret. Considerable excitement grew out of this effort, and shares in the company's stock, which originally sold at $100, went up to $300 and $400. Active competition in the business soon sprang up, and during that year six companies were chartered in Massachusetts for manufacturing India-rubber goods, and were soon followed by others in New York and vicinity, in Troy, Providence, and elsewhere. In 1834 Mr. Chaffee took out letters patent for manufacturing India-rubber hose, and another for making boots and shoes of India-rubber leather, which was followed by one to the same in 1836 for applying India-rubber to cloths. About the same time Dr. Alexander Jones, of Mobile, Alabama, produced a very durable and handsome article of carpeting impervious to water or grease by means of an India-rubber varnish applied to canvas previously coated with wall-paper, the colors and patterns of which, showing through the varnish, and sometimes additionally ornamented with gold and silver leaf, gave it a rich and splendid appearance.

But the goods manufactured by the several processes as yet employed—both American and foreign—did not give satisfaction, and in some cases were of little value. They became hard and brittle in cold weather, and in warm weather adhered together, often in a worthless mass.

In September, 1835, the late Charles Goodyear, to whom the world is indebted for several of the most valuable improvements ever made in this department of manufactures, having already devoted several years to patient experiments, took out his first patent, which was for an India-rubber cement. In the following year his first great improvement was made at New York, when he succeeded in divesting

native caoutchouc of its adhesive properties by treating the surface with nitric acid. This enabled the manufacturer, for the first time, to expose an India-rubber surface on his goods. The process was patented in June, 1837, and was received with great favor, especially by the manufacturers of shoes, which continued to be made by that process extensively at Providence, Rhode Island, and elsewhere, until the superior method of vulcanization was introduced.

The first step in the latter discovery was made by Nathaniel Hayward, of Woburn, Massachusetts, who, about the year 1835, after repeated experiments, succeeded in removing the stickiness of caoutchouc by combining it with sulphur, which caused it to dry more completely than any other combination known. This process was patented in February, 1839, by Mr. Goodyear, as the assignee of Hayward. The sulphur, however, was found to impart to the goods the offensive odor of that mineral, and a tendency to become rigid in cold weather. By further experiments made at Woburn with Hayward's sulphurizing process, Goodyear accidentally found that India-rubber combined with sulphur and certain salts of lead, when exposed to a high degree of heat, lost its sulphurous smell and its liability to be affected by changes of temperature. The new product, or vulcanized rubber, for which a patent was secured in June, 1844, reissued in 1849, extended in 1858, and again reissued in 1860, also possessed peculiar properties. It was more perfectly elastic than common caoutchouc, and resisted the action of the ordinary solvents of that substance. It also resisted the wear and tear of surface better, and being equally flexible in summer and winter, was admirably adapted to the manufacture of boots, shoes, harness, fire-hose, mail-bags, boats, &c. Mr. Nelson Goodyear's subsequent improvements, culminating in the production of the metallic or hard rubber, susceptible of polish, and capable of being moulded into any desired form, completed a series of discoveries among the most valuable in the present age. The inventor secured a patent for the vulcanizing process in France, in April, 1844, and during the same year in Great Britain and the United States. Upward of sixty patents obtained by Charles Goodyear for various improvements attest his fertility of invention. The great Council gold medal awarded him at the World's Fair in London in 1851, the grand medal of the World's Exhibition at Paris in 1855, and the ribbon of the legion of honor conferred by the Emperor of France, evinced the general appreciation of the value of his improvements in this branch of industry.

Improvements of the sulphurizing, vulcanizing, and other processes, including the use of steam, were also made in England and on the continent of Europe by Thomas Hancock, Parkes, Burk, Rattier & Guibal, Perouçel, and others, some of whose methods were little more than modifications of Goodyear's process.

In 1844 letters patent were issued to Charles Goodyear and to Horace H. Day, for improvements in the manufacture of corrugated or shirred India-rubber goods; and also, in that and the following year, to Mr. Day, in conjunction with Tyer and Helm, of New Brunswick, New Jersey, and to James Bogardus, of New York, for machines for cutting India-rubber threads for shirred goods, and another to Bogardus for an India-rubber shirring machine. By this shirring process, which was greatly facilitated by the use of these machines, a great variety of useful and elegant articles were made, among which was the elastic webbing so much used in the manufacture of Congress or gaiter boots. Shirred goods and suspenders were made in considerable quantities by several establishments at Newark and New Brunswick, New Jersey, under license from Goodyear. The protracted litigation which ensued between Messrs. Goodyear, Day, and their respective adherents, growing out of alleged infringements of their patents in processes and machinery, especially for the manufacture of shirred goods, is one of the most memorable in the annals of invention. It was for a time suspended by an arrangement between the parties in 1846, whereby Mr. Day agreed to relinquish the manufacture of all but elastic rubber goods, the exclusive right of making and selling which was guaranteed to him in virtue of his possessing superior machinery, by which alone such goods could be profitably made. Shirred goods, particularly elastic webbing for the gores of Congress boots, were thenceforward extensively manufactured at New Brunswick by Mr. Day and his associates. To these, in 1848, having repudiated his contract with Mr Goodyear because of its alleged violation by the latter, Mr. Day added the production of India-rubber

goods in general, such as canes, combs, boxes, buckets, drinking-cups, and other hard-rubber articles; suspender ends of sheet-rubber, elastic rings, hose, coats, capes, and ponchos, steam-packing, leggings, caps, mittens, gloves, beds, water-beds, diving-dresses, air-cylinders, tents, life-preservers, shoes, and boats, on which last Mr. Day secured a patent. Having purchased the right for the United States of Mr. Fuller, the English patentee, Day afterward manufactured at his factory in Connecticut metallic India-rubber car springs, which had been previously made by Mr. F. M. Ray, at Harlem, New York, who claimed to be the original inventor in 1844, and as such secured a patent October 8, 1850. These goods were principally made of India-rubber and sulphur, and cured or vulcanized by steam, according to the improved process of Hancock, in England, the shirred goods being cured by dry heat.

The "Shoe Associates," as the manufacturers licensed by Goodyear were called after he abandoned to Day the manufacture of shirred goods, having, in disregard of the contract, commenced the manufacture of shirred goods, and certain parties having also procured from Goodyear the right to use his metallic rubber process, the patent for which was renewed in December, 1849, in the manufacture of "car springs," a renewal of the contest was begun between Mr. Day and the other manufacturers represented by Goodyear, which was protracted for several years at great expense. But all efforts were unable to do more than to embarrass the business of Mr. Day, whose extraordinary enterprise survived suits at one time pending against him in five or six States, and by as many as five and twenty different parties.

The manufacture of shirred suspenders, which at one time reached a million dollars a year, employing four or five factories, all using the process of Goodyear claimed by Hayward, and the machinery of Day and Tyer, and Helm, his foreman. The demand was afterward considerably diminished by the introduction of a superior article of woven suspenders largely manufactured in Connecticut and Massachusetts, and imported from France, and sold at a much lower price. About 1851 the Nashawannock Manufacturing Company commenced at Easthampton, Massachusetts, the manufacture of gum-elastic webbing, suspenders, &c., in which they employed a capital of $100,000.

A leading branch of the India-rubber business in the United States is the manufacture of boots and overshoes.

The regular importation of India-rubber shoes from South America into the United States commenced in 1823, in which year 500 pairs were imported into Boston. In 1825 Thomas C. Wales, a merchant of that city, introduced the original Para overshoe in its rough state, as made by the Indians of Brazil, and soon after aided in bringing about an improvement in its shape by sending out American lasts to the native shoemakers. In 1848 nearly half a million rubber shoes were exported from Brazil to Europe and the United States. In addition to large quantities of the raw material sent out of the country in other and cheaper forms, nearly 300,000 pairs of shoes have been annually exported from Para for many years past.

Reference has already been made to the early attempts of Hummel, in this country, and of Fleetwood, in England, to manufacture water-proof shoes by the aid of India-rubber, and of the more successful enterprises of Chaffee, and the Roxbury, Providence, and other companies.

In 1832 Wait Webster, of New York, received a patent for attaching soles to gum-elastic boots and shoes. In the following year patents for similar objects were granted to Nathaniel Ruggles, of Bridgeport, Connecticut, and to Samuel D. Breed, of Philadelphia. During the latter year boots were exhibited at the fair of the American Institute, in New York, by J. M. Hood, of Wall street, which had been made in New York, sent to South America to be varnished with the fresh juice, and returned to be sold as India-rubber. Several establishments for the production of shoes and other fabrics came into existence about this time. In 1836 a new factory was erected in place of one recently destroyed by fire at Troy, New York, which made nearly 100 pairs of India-rubber shoes daily. In 1837 Stephen C. Smith, of New York, brought forward a process for making boots and shoes of sheet rubber by coating them with that material, and was granted a patent for it. About this time shoes of India-rubber, as they were then made, also apron cloth, caps, hats, life-preservers, and belting were made by

the Salem India-rubber Company, in Massachusetts, and probably elsewhere. But the first India-rubber overshoe, properly so called, it is claimed by Mr. Charles Goodyear, was about this time made by himself, assisted by his daughter, in a cellar in New York, where he was struggling with adversity in the enthusiastic prosecution of his future discoveries in this branch of industry. He obtained a patent for making shoes wholly of India-rubber. The "Goodyear patent shoe," made in large numbers at Providence, Rhode Island, and a few other places, shared the market with the "old-fashioned rubber" imported in improved form from Brazil. The latter was, however, rapidly superseding the former, to the great loss of the manufacturers, when the Goodyear metallic rubber shoe supplanted it, both by reason of its superior style and durability. This vulcanized or metallic rubber shoe was made, we believe, of sulphur, oxide of lead, or some salt of lead, camphene or other solvent, and India-rubber, ground together and cured in an oven. They were made in many places under licenses from Goodyear, who held the patent, although the process was claimed by Hayward, who opened a factory at Lisbon, Connecticut, where he made shoes stamped as "Hayward's Spring Tempered Rubber," and became one of the contestants of Goodyear's claims.

In 1850 the New Brunswick Rubber Company was established, to manufacture metallic boots and shoes under Goodyear's patent. For several years two of the largest India-rubber establishments in the United States produced annually between one and two million pairs of rubber boots and shoes under the same authority. The Hayward Rubber Company, at Colchester, Connecticut, was also established in the year last named, to use Hayward's solarized or carbonized rubber process. It was awarded a medal for shoes at the Great Exhibition in London in 1851, when Goodyear received the council medal for the extent, variety, and excellence of his goods, including India-rubber globes or spheres, patented by him in 1848. A medal was at the same time awarded S. C. Moulton for India-rubber goods. Among the numerous articles exhibited by Americans on that occasion may be mentioned vulcanized India-rubber carriage wheels, to run without noise, and pontoons of coarse India-rubber cloth.

Considerable improvement was made in the manufacture of shoes by the introduction of *gutta-percha* as a raw material. This curious substance, possessing several properties in common with caoutchouc, and materially differing from it in others, was first brought to the notice of Europeans by Dr. Montgomerie, resident at Singapore, in Asia, who, about the year 1842, sent to England a description of the tree and the uses made by the natives of its product. During the following year the first useful articles made of it, consisting of a lathe band, a short piece of tubing, &c., were presented to the Society of Arts in London, which the same year awarded the gold medal of the society to Dr. Montgomerie for calling attention to its valuable properties. During the next six years about 1,600 tons were imported into England from the islands of Borneo and Singapore, and the Malayan peninsula, by the London Gutta-percha Company, which owned all the early patents issued in England for its manufacture, in which they employed a capital of £300,000 sterling, deriving from the monopoly a large annual dividend. Its value as a material for surgical implements, such as catheters, syringes, &c., in which it has since been extensively employed, was early pointed out by Dr. Oxley, of Singapore.

In March, 1845, Richard Archibald Brooman, of London, recorded in England the first patents for various applications of gutta-percha by moulding, stamping, or embossing, and for making a thread of the same for the manufacture of piece goods. In May, 1848, he secured one or more letters patent in the United States. During the former year, within short intervals of one another, Charles Hancock, of Grosvenor Place, Charles Keene, of Sussex Place, Regent's Park, and Henry Bewley, of Dublin, each received patents in England; the first for making bands or belts of gutta-percha; the second for making boots, shoes, gaiters, and overalls of that material combined with caoutchouc; and the last for making flexible syringes, tubes, &c., of gutta-percha. Each of these also took out patents in the United States, bearing the same date as Brooman's.

In the United States gutta-percha was first used as a material for cement, for which it was found to be superior to caoutchouc. One of its earliest applications was for uniting the soles and other parts of boots and shoes. It was afterward adopted as a cement for cabinet and other wood work, and even

for broken stone, marble, and brick work. It came rapidly into use as a material in the useful and ornamental arts, and for scientific purposes, for all of which it is eminently fitted by reason of its great plasticity under heat, its pliability, toughness, and hardness at ordinary temperatures; by its imperviousness to water, and by its unalterability by means of oils and fatty acids, and by all ordinary chemical agents. These qualities have caused its adoption, either separate or combined, in the manufacture of an almost endless variety of nautical, surgical, chemical, electrical, agricultural, manufacturing, ornamental, and domestic appliances, some of which are met with in almost every household. Between 1845 and 1848 boots and shoes were largely manufactured in England of India-rubber combined with other materials, all of which, including those made under Keene's patent of caoutchouc and India-rubber, proved unserviceable, becoming, after a few months, a sticky mass. A process of dissolving and softening gutta-percha and caoutchouc in chloroform was patented in this country by Charles F. Durant in October, 1847, in which year it was first introduced here as a material for manufactures. In the following May Horace H. Day secured a patent for preparing gutta-percha fabrics in imitation of patent leather. During the same year (1848) the American Gutta-percha Company exhibited a variety of articles of this material at the fair of the American Institute, which awarded a gold medal to Mr. S. T. Armstrong, the company's director, to whom we are mainly indebted for the introduction of gutta-percha into the United States. Having, earlier in the year, contrived improved machinery for making gutta-percha tubing for insulating telegraph wires, Mr. Armstrong the same year submitted to Congress a proposition to lay a line of telegraph between America and some point on the English or Irish coast within twenty months, at a cost of three millions of dollars, using gutta-percha to insulate the wires. This use of the material, which is one of the most important, Mr. Armstrong claims to have originated, although his claims are disputed by Dr. J. J. Craven, of Newark, New Jersey, who, early in the same year, proposed such a wire, which was afterward laid across the Passaic and Hudson rivers between New York and Philadelphia. The first machinery for this purpose was put up in the autumn of 1848 at the works of the American Gutta-percha Company in Brooklyn, whence the design is believed to have been carried to England and used there a year after such cables had been used in this country. In August, 1848, the first wire thus prepared was laid across the Hudson river, at Fort Lee, by the Morse Telegraph Company. Up to this time chemists and manufacturers had unsuccessfully labored to impart to gutta-percha the elasticity and pliability of India-rubber. Various processes and materials were used for this purpose, among which may be mentioned those patented in England in 1847 by Charles Hancock and by Thomas Hancock, of Stoke Newington, and that patented in the United States by Stephen C. Moulton, which last consisted in mixing with gutta-percha hypersulphate of lead and calcined magnesia, and subjecting the whole to a temperature of 250° to 300° for several hours. After repeated experiments of a novel character, a process of vulcanization was at length successfully applied to gutta-percha by Wm. E. Rider and John Murphy, of New York, and patented in November, 1854. By this method, subsequently improved by Emory Rider, gutta-percha was rendered permanently flexible and elastic, like India-rubber, without liability to decompose, soften, or change by change of climate, or the action of acids or fatty substances, while it retained its natural lustre or polish. The article received at once a wide range of applications.

The North American Gutta-percha Company, in 1855, adopted gutta-percha exclusively as a cement, and was enabled to produce a quality of boots and shoes exceeding in lightness, pliability, and durability their highest expectations. Millions of boots and shoes are now annually made in Europe and America of India-rubber and gutta-percha, especially in the United States, where those materials employ several very large establishments.

In 1855 two factories at Providence, Rhode Island, made about 750,000 pairs of India-rubber shoes, valued at half a million dollars. Two others at New Haven, Connecticut, made about the same quantity annually.

A simple enumeration of the useful applications now made of these two substances would occupy pages.

The manufacture of gutta-percha goods was carried on in 1860 by two establishments in New York, whose united capital amounted to $100,000; the cost of raw material consumed, to $69,000; and the annual wages paid to 34 hands, $21,600. The value of their product in manufactured goods was $125,750.

The increase in the manufacture of caoutchouc and gutta-percha in Europe and America is further illustrated by the increased importations of the raw materials. The total export of caoutchouc from Brazil in 1828 was only 20,000 pounds weight, valued at 4,000 milreis. In 1845–6 it amounted to upwards of 8,000,000 pounds, in addition to 415,953 pairs of shoes, the whole valued at 500,000 milreis. The importations into France amounted—

From 1827 to 1837 to	44,000	pounds.
1837 to 1847 to	180,000	do.
1842 to 1852 to	266,000	do.
1853 to 1854 to	1,261,000	do.
1855 to 1856 to	2,139,328	do.

The importations into Great Britain were inconsiderable previous to 1830, in which year they amounted to 52,000 pounds. During the year ending 5th of April, 1833, the quantity entered for consumption was 178,676 pounds. The price varied from *6d.* to *2s. 6d.* sterling per pound. The duty was afterward reduced from *5d.* per pound to *1s.* per cwt., and subsequently withdrawn altogether, which favored an increased consumption. In the year ending 5th of January, 1854, the importations amounted to 7,326 cwt., and from January 1 to June 1, 1858, to 9,155 cwt. of caoutchouc.

The value of caoutchouc imported into and exported from the United States in the years 1856 and 1857 was as follows:

	For year ending January 30, 1856.	For year ending January 30, 1857.	
Imports of manufactured caoutchouc	$97,796	$180,585	
Imports of unmanufactured caoutchouc	1,045,576	832,056	
Total importations from foreign countries	1,143,372	1,012,641	
Re-exported of foreign imports of manufactured caoutchouc	$18,379	$62,593	
Re-exported of foreign imports of unmanufactured caoutchouc	120,802	64,492	
	139,181	127,085	
Exports to foreign countries of domestic manufactures of caoutchouc in the same years:			
Caoutchouc shoes, (685,220 pairs)	427,936	331,125	(537,328 pairs.)
Of other manufactures of caoutchouc	665,602	312,387	
	1,232,719	770,597	

The importations of crude India-rubber in the fiscal year ending June 30, 1863, amounted to 2,125,561 pounds, valued at $616,372, of which quantity 447,600 pounds, worth $208,094, was re-exported.

Of domestic goods we exported in the year last named only to the value of $143,856, in which were included 35,116 pairs of shoes, worth about as many dollars.

Of gutta-percha, the first shipment to Europe was made as an experiment, from Singapore, in 1840, to the amount of two hundred weight. In 1845 the exportation from that port amounted to 160 piculs, of 133⅓ pounds each; in 1846 to 5,364 piculs; in 1847 to 9,296; and in the first seven months of 1848 to 6,768 piculs; making a total in the first four and a half years of the trade of 21,598 piculs, valued at $247,190. It all went to England except 15 piculs to the Mauritius, 470 to the continent of Europe, and 922 piculs to the United States The price at Singapore was originally $8 per picul. It afterward rose to $23, but fell again to $13 about the summer of 1848, in which year the importations into Eng-

land reached about 3,000,000 pounds. In 1852 the importations amounted to 30,580,480 pounds, a rate of increase which gave rise to serious apprehensions that the supply would, ere long, fall short of the demand, although many portions of the Indian continent and islands produced the trees from which it was obtained. The tree is one of slow growth, requiring from 80 to 120 years to reach maturity, and the first supplies were improvidently obtained by the natives by the total destruction of the tree. A method of tapping the trees has since been introduced, which prevents this wasteful sacrifice.

Under the tariff act of 1846 gutta-percha and India-rubber, in the unmanufactured state, paid a duty, the former of 20 and the latter of 10 per cent. ad valorem. In 1857 it was reduced on each to 4 per cent., and in 1861 both were admitted, as raw materials in the crude state, duty free, manufactures of India-rubber paying 20 per cent. In February, 1862, unmanufactured gutta-percha and India-rubber were charged with a duty of 10 per cent. ad valorem, and the latter in the milk double that rate, while its various manufactures were subject to a duty of 35 per cent.

Of crude gutta-percha, free of duty, the amount imported into the United States in the fiscal year ending June 30, 1862, was 333,260 pounds, valued at $111,858.

STATES.	No. of establishments.	Capital invested.	Cost of raw material.	NUMBER OF HANDS EMPLOYED.		Annual cost of labor.	Annual value of product.
				Male.	Female.		
INDIA-RUBBER GOODS.							
Massachusetts	5	$563,000	$532,900	224	74	$107,832	$803,000
Rhode Island	2	156,000	105,111	69	44	28,208	246,700
Connecticut	9	1,265,000	1,426,330	612	197	278,436	2,276,000
New York	5	675,000	351,069	480	243	155,094	1,002,000
New Jersey	5	870,000	636,150	405	412	222,168	1,303,000
Pennsylvania	1	5,000	4,800	5	3	2,832	12,000
Total in United States	27	3,534,000	3,056,360	1,795	973	794,570	5,642,700
GUTTA-PERCHA GOODS.							
New York	2	100,000	69,000	34	.....	21,600	125,750

WOMEN'S READY-MADE CLOTHING.

The manufacture of ladies' apparel has been greatly augmented within a few years. The increase of the trade has built up some very large establishments with heavy capitals. It has very much enlarged the area of female employment, and promoted the comfort and convenience of all classes. As in the production of men's clothing, the sewing machine has been a principal auxiliary in the extension of the business. The increased facilities for commercial intercourse between our large cities, where the manufacture is principally carried on, and the smaller towns and villages of the interior, has also given an impulse to the trade by enabling merchants and retailers everywhere to obtain and replenish at short intervals goods in every style and fashion suited to the market.

This branch of the clothing trade divides itself into the manufacture of cloaks and mantillas, of corsets and similar furnishing goods, of hoop skirts, and of millinery.

CLOAKS AND MANTILLAS.—This department of the ladies' clothing trade employed on the first of June, 1860, 96 establishments, producing annually over $5,000,000 worth of goods. The capital employed by them amounted in the aggregate to $473,400. They gave employment to 1,532 female and 46 male hands, whose annual wages cost $301,428, the cost of raw material amounting to $1,178,875. The aggregate value of cloaks and mantillas made was $2,261,546, an average product of $23,557 to each establishment, and of $1,433 to each hand employed.

Of these establishments the New England States contained 24, the middle States 58, the western 6, and the southern 8.

The returns from New England were received for 14 establishments in Massachusetts, 6 in Connecticut, and 2 each in Maine and New Hampshire. The total capital employed in them was $115,900, the number of hands 421 females and 17 males, who received annually in wages $83,484, and produced goods to the value of $698,361, an average of $29,098 for each establishment, and $1,594 per hand. The 14 establishments in Massachusetts aggregated a capital of $90,800, and consumed raw materials worth $235,375, producing, with the labor of 285 women and 12 men, costing annually $57,324 in wages, a product amounting to $475,460, or upward of one-fifth the whole value made in the Union. The average product of each factory was $33,961, and of each hand $1,600 per annum. New Hampshire had two establishments, with 102 female hands, who received in wages $18,360 per annum. The product amounted to $201,826, an average of more than $100,000 each, and of $1,978 to each operative.

The capital invested in the middle States was $320,750, and the number of persons employed was 975 females and 27 males, who received in wages $189,360 annually. The value of the manufacture in that section was $1,376,955, in the proportion of $23,557 to each establishment, and $1,374 to each person employed. The returns were from 22 establishments in New York, 32 in Pennsylvania, and 4 in Maryland. The New York manufacturers had invested a capital of $91,000 and 453 persons, of whom 19 were male hands. Their wages cost $99,732 per annum, and the cost of material was $401,920. The product was $685,600, or nearly equal to that of all New England, and averaged $31,163 to each factory, and $1,513 to each hand. The 32 establishments in Pennsylvania had, collectively, a capital of $217,550; paid yearly for raw materials $306,055, and for the wages of 500 women and 7 men $83,892. The value of the manufacture in that State was $662,930, equal to $20,716 for each establishment, and $1,307 for each hand.

In Maryland 4 firms, with 42 hands, made cloaks and mantillas to the value of $28,425. Two establishments in Ohio made returns of $27,000 invested as capital, and of 80 women employed in this business, which yielded a product valued at $74,000. In Wisconsin there were 4 concerns, having $8,000 invested, and giving employment to 31 hands, the product of whose labor was $67,400, making the total value of cloaks and mantillas returned from the western establishments $141,400, an average of $23,566 each, and of $1,273 to each hand employed.

From the southern States returns were made by two small establishments in Virginia and six in Tennessee, the former employing nine hands and making goods to the value of $8,330, and the latter, with 18 hands, producing $36,500 per annum. The product was an average of only $5,966 to each establishment, and of $1,660 to each hand employed in that section. In Tennessee the value above given was in part of ladies' dresses made in the State.

This branch of the domestic clothing trade, which thus employs nearly half a million dollars in capital, and with the labor of less than 1,600 hands produced upward of two and a quarter million dollars worth of cloaks and mantillas annually, is one of quite recent growth, and has received its principal development within the ten or fifteen years preceding the last census. The manufacture has its principal seat in the city of New York, which has 15 large establishments, one of which employs 100 girls, and makes goods to the value of $120,000 per annum. Two others employ 70 and 40 hands, respectively, and make each about $100,000 worth. The whole value of cloaks and mantillas made in that city in 1860 was $618,400. A large manufacturer in that city who commenced business in 1849 was the first to introduce sewing machines in the business, as well as the first to employ young women in the retail sales department. The largest establishment in Boston also employs 100 females, and makes $150,000 worth of ladies' cloaks and mantillas annually, while two others in that city employ each about 75 hands, and manufacture to the value of $125,000 each. All but $13,000 of the product in Massachusetts was made by ten factories in Boston.

Of the total value of these goods made in Pennsylvania, only $6,130 was produced outside of Philadelphia, in which the largest manufacturer makes about $150,000 worth yearly, another $75,000 worth, and two others to the value of about $60,000 each.

In Maryland, Ohio, and Wisconsin, in like manner, the business is exclusively carried on at Baltimore, Cincinnati, and Milwaukie.

Sewing machines are now extensively employed in this manufacture, particularly in New York, where the operatives have heretofore been paid about $6 per week, hand-sewers receiving about $4. The average annual wages paid to the employés in this branch of trade, according to the census returns, was, in Boston, $193; in New York, $220; in Philadelphia, $165; in Baltimore, $136; in Cincinnati, $202; in Milwaukie, $209. The manufacturers of talmas, cloaks, and mantillas are generally retail dealers in dress goods, and sell imported as well as domestic goods.

Corsets.—The returns of this manufacture were from 14 establishments in the four States of New York, Pennsylvania, Maryland, and Louisiana, and, like the last, were confined to their principal cities. The amount of capital employed in it was $24,400; the cost of raw materials, $19,130; the number of hands 96, of whom 6 were males; and their annual wages was $13,644. The value of the manufactured goods was $54,460, of which value $19,000 was produced by 4 establishments in New York, and $22,600 by 8 manufactories in Philadelphia. One establishment in Baltimore produced corsets to the value of $9,360, and one in New Orleans $3,500 worth. The manufacture of corsets has been recently commenced at Meriden, Connecticut, and corset braces are made at Middletown, in that State. A loom has recently been patented for weaving irregular goods, such as corsets, in which gores are required. There is no reason why we should not be wholly independent of importations for this article of ladies' wear.

Hoop-Skirts.—This branch of the ladies' furnishing trade was very greatly extended in the ten years preceding the last census. Like the cloak and mantilla manufacture it is one of recent growth, and in 1860 employed 78 establishments, having an aggregate capital of $923,850, and which paid annually for raw materials $2,125,330, and for wages $877,960, the number of hands employed being 837 men and 3,228 women. The value of the annual manufacture was $4,865,033. The average capital of each establishment was $11,844, its number of hands 52, whose annual wages averaged $201 each, and the value of the product of each factory was $62,372.

The New England States of New Hampshire, Massachusetts, Rhode Island, and Connecticut, numbered 33 hoop-skirt factories, having a capital of $547,100, and employing 1,264 female and 562 male hands, at an annual cost for labor of $436,232. The product of these States was valued at $2,303,341. Connecticut was the leading producer of this article, having 15 establishments, with a collective capital of $424,100, and 426 male and 1,038 female hands, whose wages amounted to $358,332 per annum. The value of the goods made in that State was $1,693,600, or more than one-third of the total product of all the States. Several of these factories were at Meriden, Connecticut, where a single establishment, which commenced in 1855, sold, in less than one year after, hoop-skirts to the value of $300,000, and makes about 400 dozen daily, in addition to making its own tape and corsets, and Balmoral skirts, the manufacture of which has been recently added, and, together, employ from 700 to 800 work-people. Another factory in the place employed 80 women and 10 men in the manufacture of hoop-skirts, which are also made at Birmingham and other places. A factory at Bridgeport makes nearly $50,000 worth of hoop-skirt springs, which are also made at Middletown.

Massachusetts contained 10 hoop-skirt factories, with a capital amounting, in the aggregate, to $117,600, and an annual product of $588,800, in the production of which 128 male and 206 female hands were employed. There were 2 factories in New Hampshire and 6 in Rhode Island.

This manufacture was carried on in all the five middle States, in which the establishments numbered 44, the total capital $376,400, the cost of material $986,490, and of labor $439,328. The number of hands was 275 males and 1,949 females, and the product of their labor was valued at $2,557,022, or upward of 52 per cent. of the whole. This was principally the product of factories in New York, which

numbered 34, and had a combined capital of $320,500. They paid for raw materials $854,907, and for the labor of 233 men and 1,697 women, $400,592 per annum. The value of hoop-skirts made in these was $2,238,617, which was nearly equal to that of all New England, and amounted to 46 per cent. of the total product of this industry throughout the Union. It was all produced in the city of New York, except about $167,000, the value made in Brooklyn and Williamsburg.

Four establishments in Pennsylvania manufactured to the value of $14,930, and three in New Jersey, with 255 hands, produced $288,100 worth of hoop-skirts, being, next to those of Connecticut, relatively the largest, in their average capital and product, of any in the country.

One establishment in Virginia, employing 15 women, made hoop-skirts to the value of $4,670.

Sewing machines are very extensively used in the manufacture of hoop-skirts. A single firm in New York has employed as many as 150 machines, at a cost of $15,000, each of which was calculated to do the work of ten hand-sewers. The whole number of hands employed was 300, and the materials used weekly were 275 pieces of muslin, 2,000 pounds of jute cord, 600 dozens of spool cotton, and $6,000 worth of whalebone, made flexible by being boiled in oil. Twenty-five looms in the city were also kept employed in making hair-cloth for the inflation of ladies' garments, and producing 3,000 yards weekly, besides 100 looms on other fabrics, and the product was about 3,000 skirts per diem, exclusive of woven goods. Many improvements have since been made in the manufacture of this article, and steel and brass hoops have almost entirely superseded whalebone and rattan.

Statistics of ladies' clothing produced in the United States during the year ending June 1, 1860.

STATES.	No. of establishments.	Capital invested.	Cost of raw material.	NUMBER OF HANDS EMPLOYED.		Annual cost of labor.	Annual value of product.
				Male.	Female.		
CLOAKS, MANTILLAS, ETC.							
Maine	2	$700	$630	.....	4	$588	$1,275
New Hampshire	2	15,200	101,075	.....	102	18,360	201,826
Massachusetts	14	90,800	235,375	12	285	57,324	475,460
Connecticut	6	9,200	6,125	5	30	7,212	19,800
Total in New England States	24	115,900	343,205	17	421	83,484	698,361
New York	22	91,000	401,920	19	434	99,732	685,600
Pennsylvania	32	217,550	306,055	7	500	83,892	662,930
Maryland	4	12,200	17,450	1	41	5,736	28,425
Total in Middle States	58	320,750	725,425	27	975	189,360	1,376,955
Ohio	2	27,000	41,225	.....	80	16,200	74,000
Wisconsin	4	8,000	41,620	2	29	6,480	67,400
Total in Western States	6	35,000	82,845	2	109	22,680	141,400
Virginia	2	300	2,500	.....	9	2,400	8,330
Tennessee	6	1,450	24,900	.....	18	3,504	36,500
Total in Southern States	8	1,750	27,400	.....	27	5,904	44,830
Total in United States	96	473,400	1,178,875	46	1,532	301,428	2,261,546
CORSETS.							
New York	4	5,800	4,820	6	33	6,192	19,000
Pennsylvania	8	16,100	9,630	.....	53	6,444	22,600
Maryland	1	500	4,000	.....	2	288	9,360
Louisiana	1	2,000	680	.....	2	720	3,500
Total in United States	14	24,400	19,130	6	90	13,644	54,460

Statistics of ladies' clothing produced in the United States, &c.—Continued.

STATES.	No. of establ-ments.	Capital invested.	Cost of raw material.	NUMBER OF HANDS EMPLOYED.		Annual cost of labor.	Annual value of product.
				Male.	Female.		
HOOP SKIRTS.							
New Hampshire	2	$400	$2,067	.....	4	$708	$5,025
Massachusetts	10	117,600	236,030	128	206	73,592	588,800
Rhode Island	6	5,000	7,063	8	16	3,600	15,916
Connecticut	15	424,100	892,180	426	1,038	358,332	1,693,600
Total in New England States	33	547,100	1,137,340	562	1,264	436,232	2,303,341
New York	34	320,500	854,907	233	1,697	400,592	2,238,617
Pennsylvania	4	4,900	6,968	6	20	4,800	14,930
New Jersey	3	46,500	121,132	32	223	31,344	288,100
Delaware	1	2,000	809	2	3	1,032	4,125
Maryland	2	2,500	2,674	2	6	1,560	11,250
Total in Middle States	44	376,400	986,490	275	1,949	439,328	2,557,022
Virginia (Southern)	1	350	1,500	.....	15	2,400	4,670
Total in United States	78	923,850	2,125,330	837	3,228	877,960	4,865,033

MILLINERY.—This is a very ancient and important branch of the ladies' clothing trade, and, like dress-making, with which it is sometimes combined, employs, in every country, a more mixed class of the community than any other calling. Among these are to be found the wives and daughters of clergymen, military and naval officers, surgeons and physicians, farmers, and tradesmen of every description. In all large cities this class is numerous, and in the city of London, in 1840, the milliners and dress-makers, together, numbered 20,780, of whom 3,480 were females under twenty years of age, and 117 were males.

Milliners' work includes the making and trimming of bonnets, caps, scarfs, and all outward attire worn by females except the gown. It is supposed to demand a higher exercise of skill and taste than that of dress-making.

In the United States there were, on the 1st of June, 1860, 940 establishments, producing milliners' work, severally, to the value of $500 and upwards. Their aggregate capital was $1,379,777, and the number of persons employed by them 4,746, of whom 132 were males. The annual cost of raw materials used amounted to $2,156,192, and of labor, to $887,702. The value of the manufactured articles was $4,543,284. Each establishment, on an average, employed a capital of $1,467, and 5 hands, at an average yearly compensation of $187 to each hand. The annual product of each shop averaged $4,833.

The eastern States contained milliners' establishments, which reported a total capital of $214,650, and an expenditure for raw materials of $366,636, the cost of labor for 34 males and 778 females being $150,540. The aggregate value of the work done was $765,998, an average of $5,246 each. The average investment of each establishment was $1,470, and each hand received annually in wages an average of $185. In Massachusetts there were 40 establishments, which employed 398 hands, (25 of them males,) or nearly ten each, at an average salary of $197 each. They produced milliners' work to the value of $8,884 each. Eighteen of the largest of these shops were in Boston, and employed 167 hands, producing $238,450, the medium product of each being upward of $13,000 annually.

In Rhode Island and Connecticut there were 28 establishments each, and in New Hampshire 19, and the value of millinery made in each State exceeded $100,000.

In Maine there were 24 shops, making over $70,000 worth annually, and in Vermont 7, whose product was $31,750.

The middle States and District of Columbia reported 601 establishments, aggregating a capital of $852,510, 2,926 hands, including 77 male hands, and a product in millinery work valued at $2,692,338. The annual cost to these shops for raw materials amounted to $1,301,651, and for labor $530,766. Their average capital was $1,418, the number of hands nearly 5, and the average wages of each hand $181 per annum, the medium product of each being $4,479.

In the State of New York there were 248 millinery establishments, chiefly in the cities of New York and Brooklyn. They represented a capital of $492,520, and gave employment to 1,501 hands, of whom 51 were males, whose aggregate labor cost $298,134, the cost of materials being $867,209, and the value of the work done $1,733,688, an average of $6,990 each. The average capital was $1,986 to each shop, and the wages of each hand about $198.

From Pennsylvania returns were made by 281 millinery shops, whose capital was $293,215, and the product $761,881, the number of hands being 1,171, at an average annual salary, including that of 24 males, of $165 each.

In the western States these establishments numbered 170. Their collective capital was $223,820, or an average of $1,316 each, and they employed 21 male and 812 female hands, at a total cost for wages of $156,500, or about $187 for each hand. The annual cost of raw material amounted to $346,337, and the total annual value of millinery made was $770,169, or upward of one-sixth of the whole product of the Union, and in the proportion of $4,530 to each establishment. Ohio was the largest producer, having 59 millinery establishments, which employed 366 persons, and made annually $281,546 worth of millinery, of which value more than two-thirds was the product of about thirty shops in Cincinnati. Illinois was next to Ohio in the value of millinery made, having 27 shops, with 130 hands, whose work was valued at $178,810, the greater part of it made by 12 establishments in Chicago. Missouri ranked next, 11 establishments having made millinery worth $90,523; all but about $2,000 of which was produced by 9 shops in St. Louis. In Indiana, Wisconsin, and Kentucky, the value of milliners' work exceeded $56,000 each, and in Michigan it was nearly $34,000.

From five of the southern States reports were made of 22 millinery establishments, having a total capital of $87,797, and 173 female hands employed, at an average annual compensation of $284 each. The value of the millinery made was $309,779, an average product of $14,080 by each establishment, of which the average capital was $3,990. The cost of material was $137,568, and of wages $49,176. The largest establishments were in Louisiana and in the city of New Orleans, three shops in that State having, with 99 females employed, at a cost of $32,556 per annum, made millinery to the value of $188,425, although their capital amounted to only $16,400. Four establishments in Georgia, with double the capital above named, employed only 19 hands, and produced work valued at $55,904. In Virginia 11 milliners' establishments, with $22,647 in capital, and 42 hands, to whom were paid for labor $6,876, reported a product of $52,450. The average cost of wages in Virginia was $284, in Georgia $374, and in Louisiana nearly $329 annually to each hand.

California contained one establishment for millinery, with a capital of $1,000, and 2 hands, which produced work to the value of $5,000, the cost of material being $4,000, and of labor $720.

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

STATES.	No. of establishments.	Capital invested.	Cost of raw material.	NUMBER OF HANDS EMPLOYED.		Annual cost of labor.	Annual value of product.
				Male.	Female.		
Maine	24	$28,500	$37,490	1	82	$11,736	$70,169
New Hampshire	19	30,800	38,952	5	87	20,856	104,042
Vermont	7	6,650	19,445	.....	22	3,720	31,750
Massachusetts	40	76,450	183,338	25	373	78,360	355,380
Rhode Island	28	45,150	44,354	1	123	18,168	102,307
Connecticut	28	27,100	43,057	2	91	17,700	102,350
Total in New England States	146	214,650	366,636	34	778	150,540	765,998
New York	248	492,520	867,209	51	1,450	298,134	1,733,688
Pennsylvania	281	293,215	333,938	24	1,147	194,100	761,881
New Jersey	27	23,200	34,215	1	101	14,664	70,719
Delaware	1	75	447	.....	4	564	1,237
Maryland	21	14,300	20,449	1	72	9,828	47,472
District of Columbia	23	29,200	45,393	.....	75	13,476	77,341
Total in Middle States	601	852,510	1,301,651	77	2,849	530,766	2,692,338
Ohio	59	77,600	119,473	7	359	59,748	231,546
Indiana	22	18,200	31,170	3	84	13,116	58,150
Michigan	12	15,350	14,685	.....	37	7,944	33,950
Illinois	27	53,720	95,820	4	126	32,784	178,810
Wisconsin	20	20,500	35,407	.....	74	11,336	56,580
Minnesota	1	500	400	.....	2	240	2,000
Iowa	7	7,200	4,375	.....	28	4,104	12,410
Missouri	11	17,450	27,257	5	53	16,320	90,523
Kentucky	11	13,300	17,750	2	49	10,908	56,200
Total in Western States	170	223,820	346,337	21	812	156,500	770,169
Virginia	11	22,647	30,618	.....	42	6,876	52,450
North Carolina	1	750	100	.....	2	288	500
Georgia	4	33,000	37,500	.....	19	7,116	55,904
Mississippi	3	15,000	6,000	.....	11	2,340	12,500
Louisiana	3	16,400	63,350	.....	99	32,556	188,425
Total in Southern States	22	87,797	137,568	.....	173	49,176	309,779
California	1	1,000	4,000	.....	2	720	5,000
Total in United States	940	1,379,777	2,156,192	132	4,614	887,702	4,543,284

MILLINERY GOODS.—This branch embraces the manufacture of such articles as ruches for bonnet borders, joined blonds, and other trimmings, and bonnet frames, and also that of artificial flowers, the last being the largest item in the business.

The production of all kinds of millinery goods employed 35 establishments in the United States in 1860. Their total capital was $365,900, and they employed 111 male and 923 female hands, at an annual cost of $202,508. The cost of raw materials for the manufacture was $739,965, and the value of the goods made was $1,483,154.

Statistics of millinery goods produced in the year ending June 1, 1860.

STATES.	No. of establishments.	Capital invested.	Cost of raw material.	NUMBER OF HANDS EMPLOYED.		Annual cost of labor.	Annual value of product.
				Male.	Female.		
Massachusetts	2	$2,700	$2,956	.....	15	$2,400	$10,400
New York	9	31,500	104,796	44	265	60,300	238,154
Pennsylvania	3	57,500	117,096	15	95	28,344	181,000
Total	14	91,700	224,848	59	375	91,044	429,554
ARTIFICIAL FLOWERS.							
New York	16	237,200	505,317	35	390	84,284	984,500
Pennsylvania	4	36,500	8,800	16	156	26,220	66,500
Louisiana	1	500	1,000	1	2	960	2,600
Total	21	274,200	515,117	52	548	111,464	1,053,600
Total millinery goods	35	365,900	739,965	111	923	202,508	1,483,154

ARTIFICIAL FLOWERS.—The manufacture of these beautiful ornaments for the head-dresses of females is believed to have been first produced with any degree of perfection by the Italians. For many years past, however, the French have been unrivalled, particularly in the permanency and delicacy of the tints imparted to their flowers, and both the climate and the waters of the Seine have been supposed to contribute to this end by fixing the dyes. The materials used were originally silk, and in South America feathers were employed with much effect by the natives, but the latter are not easily dyed. Velvet, thin shavings of whalebone, and the finest cambric are now used in France for the petals, taffeta for the leaves, and whalebone or wire covered with silk for the stems. The leaves and petals, having been cut with a metal stamp or with the scissors, are glued together with a solution of gum-arabic, and the colors are put on with a fine hair pencil, as drawings are colored and shaded. Carmine is used for red and pink colors, a tincture of turmeric for the yellow, verdigris for the green, indigo for the blue, and a tincture of logwood with oxide of tin for the purple colors. Much taste and skill are required in grouping the separate flowers and in tying them together in a natural manner.

This manufacture in the United States in 1860 employed 21 establishments, of which 16 were in New York, 4 in Pennsylvania, and 1 in Louisiana. Their total capital was $274,200, and they paid for the materials worked up $515,117, and for labor $111,464. The number of hands engaged in the business was 600, of whom 52 were males, and they made artificial flowers to the value of $1,053,600. With the exception of one small establishment in New Orleans, which made $2,600 worth, these establishments were all in the cities of New York and Philadelphia In the former city were some very large establishments, and the business there employs a capital of $237,200, and 390 female and 35 male hands. The materials cost annually $505,317, and the wages of labor $84,284. The value of the manufacture amounted to $984,500, an average of $61,531 to each establishment. The average annual wages of the hands was $196 each. In Philadelphia four manufacturers of artificial flowers had invested a capital of $36,500, and employed 16 male and 156 female hands, at an annual cost for wages of $26,220, or an average of $152 each. The cost of materials was only $8,800, or less than one-third the cost of labor, while in New York the materials used cost about six times as much as the labor. The product in Philadelphia was $66,500. The artificial flowers made in these establishments are not generally equal to the French. One enterprising firm in New York brought over from France several hundred flower-makers and established a large manufactory. As the labor and materials were entirely French, and the quality of the flowers made were equal to the imported, it was no misnomer to call the product "French flowers," though made in America. One establishment in that city made flowers to the value of $300,000 in a year. Included in the returns of another large establishment in that city

were bonnet frames and other "millinery goods," which, if separated, would lessen the aggregate value of flowers made and increase that of—

MISCELLANEOUS MILLINERY GOODS.—These, in the States of Massachusetts, New York, and Pennsylvania, employed 14 establishments, and a capital of $91,700. The expenditure for material was $224,848, and for labor $91,044. The latter sum was the annual wages of 59 men and 375 women and girls, the product of whose labor amounted to $429,554.

Of these articles, as of artificial flowers, the city of New York was the principal producer, having 9 factories, with 44 male and 265 female hands, who made ruches, bonnet-frames, &c., to the value of $238,154. The capital invested by them was $31,500, and they paid annually for materials $104,796, and for labor $60,300.

The largest establishment, however, in this country was in Philadelphia, and employed 70 females, making $140,000 worth in 1860, when the price of such goods was very low. This was a decline from its former business, when it employed 200 hands in making ruches alone, aided by machinery that enabled one man to goffer six or seven hundred dozens in a day, and the establishment to turn out daily 1,000 dozen of finished ruches, besides other millinery. This was the first to make an almost exclusive business of ruches. Three manufactories of milliners' goods in Philadelphia had a total capital of $57,500, and employed 110 hands, whose labor cost $28,344. They used materials to the value of $117,096, and produced goods valued at $181,000. Bonnet-frames, bonnet-wire, silk bonnets, &c., were made by several firms in Philadelphia. Two establishments in Massachusetts employed 15 persons, and made millinery goods to the value of $10,400 in 1860.

The total value of artificial flowers and feathers imported in the year ending June 30, 1860, was $776,743, chiefly from England and France. In 1862 the value of the same articles imported in a finished state was $253,134, at a duty, after April 1 of that year, of 30 per cent., which was the next year raised to 40 per cent. The imports of millinery and millinery goods cannot be exactly stated. Millinery of all kinds, by the act of February, 1862, was charged with a duty of 35 per cent.; but on June 30, 1864, the duty on ready-made silk clothing was 60 per cent.

STRAW GOODS.

This manufacture not only supplies a large amount of milliners' stock, such as women's and children's bonnets, hats, braid, and trimmings of straw, but includes also the production of men's and boys' hats to a large amount.

The business in 1860 employed 40 establishments in the United States, and a total capital of $1,276,700. It gave employment to 826 male and 6,863 female hands, whose labor cost annually $1,407,092, and who wrought up materials to the value of $2,589,416, producing straw goods to the value of $4,499,616. This includes, however, the value of some hats and bonnets imported or bought in the rough state and finished according to the prevailing style, which employs one very large and one or more smaller establishments in Connecticut.

The manufacture of straw hats and bonnets is principally carried on in Massachusetts, where it was commenced in the beginning of this century. It employs in that State 26 establishments, having a capital of $925,200, and employing, at an annual cost of $1,096,164, the labor of 617 male and 5,601 female hands, nearly 200 pressing machines, and a considerable number of sewing machines. The cost of domestic and foreign braids and other materials cost $1,895,616, and the product amounted in value to $3,398,466. It included the value of about 2,238,320 bonnets, and 2,071,000 hats, and 4,845 dozens of buttons, cords, and garlands, valued at one dollar per dozen. The principal seat of the manufacture was in Norfolk county, which returned a manufacture of upward of 1,250,000 bonnets, and over 1,500,000 hats, together valued at more than $2,000,000. The largest establishment is at Foxboro, which village, with the country around, is almost supported by it. In 1860 the average number of hands employed was 225 males and 2,020 females; but the whole number of girls who worked at the factory and at their own homes was fully 5,000. The wages paid was upward of $271,000, and, with a capital of $500,000, they turned out 1,800,000 bonnets and hats, to the value of $1,200,000. In the same county there were five others, making over 100,000 hats and bonnets each.

One of four establishments in Worcester county made straw goods to the value of $375,000, and another in Plymouth $180,000. In Hampden county one manufactory, with 28 male hands and 500 females, made bonnets to the value of $300,000; and another in Bristol county, with 40 male and 500 female hands, made $225,000 worth of bonnets and hats. The finer braids or plaits used in the manufacture of bonnets and hats are imported from Italy, Switzerland, China, and Great Britain, and some coarse straw for men's hats from Canada. The number of factories employed on straw goods in Connecticut was 7, with an aggregate capital of $269,700. They employed 160 male and 1,013 female hands, whose labor cost $257,400. The cost of materials was $581,500, and the value of the product $896,350.

There was 1 factory at Buffalo, New York, with a capital of $15,000, which employed 21 persons, and made straw goods to the value of $12,000 annually, and included with hats are straw goods valued at $18,500, made in New York city. The principal part of the New England straw goods are sold in that city. An establishment at Newark, New Jersey, having invested $20,000, and employing 25 males and 60 females, manufactured hats, chiefly, to the value of $104,000. Five small establishments in Pennsylvania reported a capital of $46,800, and a force of 23 male and 169 female hands, making straw goods to the value of $88,800, which was less than its value in previous years.

PALM-LEAF HATS were made in 30 establishments, of which 23 were in Massachusetts. Their manufacture employed a total capital of $80,600, and the labor of 186 male and 690 female hands. The cost of labor amounted to $169,068, and the cost of raw materials was $351,188 per annum. The value of the manufactured goods was $760,287. Of this sum $606,687 was the value made in Massachusetts by 129 males and 565 females employed, at a cost of $123,828, and working up $73,700 worth of imported materials annually. Twenty-one of these establishments were in Worcester county, one of which made hats to the value of $100,000. The largest concern was in Hampshire county, and, with 15 male and 60 female hands, made palm-leaf hats to the value of $66,000, and hoods, or Shaker bonnets, worth $68,000, a total product of $134,000. In 1855 the official returns of these goods made in that county was of the value of $184,189, and the total value made in the State was $293,208. The manufacture was widely distributed throughout the county, but was principally carried on at Barre, Fitchburg, Athol, Petersham, Royalston, Dana, Sterling, Princeton, Hardwick, &c. In Hampshire, the next largest producer, palm-leaf hats were made at Enfield, Greenwich, Pelham, Plainfield, Cummington, Hadley, Ware, and other towns; nearly all the females in some places, as Greenwich, being employed in the business, which was often carried on as a household industry.

From New Hampshire, in 1860, reports were made by 7 establishments for making palm-leaf hats. These gave employment to 57 male hands and 125 females, whose annual wages were $45,240, and whose labor produced a value of $153,600.

In the year ending June 30, 1860, palm-leaf hats of domestic manufacture were exported chiefly from New York, Boston, and San Francisco, to the value of $92,832. They went principally to Cuba and South America, England, and the British provinces, and West India islands. The amount was nearly equal to the value of unmanufactured palm leaf imported, chiefly from Cuba and Tuscany. In 1862 the imports of crude palm leaf was only $25,865, duty free.

HISTORY AND STATISTICS.

Of these two branches—straw and palm-leaf goods, which together amounted to upwards of $5,250,000 in value annually—the former is much the older and more important industry in the United States, and is altogether the growth of the present century. As early as July, 1717, one Thomas Masters, of Philadelphia, petitioned Governor Keith, and was allowed to record in the province two patents granted him by the King, one of which was for weaving palmetto, chip, and straw hats by a new method which he had invented at great expense. Hats made of palmetto are still earlier mentioned in a history of Carolina, where their use afterward became quite common in consequence of the negroes, when newly imported from Africa, of their own accord, taking themselves to the manufacture of hats from the inner lamina of the bark.

Although the plaiting of round straw hats and bonnets has been carried on for nearly 200 years at Dunstable, and still longer in Italy, it appears to be tolerably well authenticated that the straw bonnet manufacture in the United States, and particularly the manufacture of split straw goods, was an original invention on the part of Mrs. Baker, still living six years ago at Dedham, Massachusetts. In 1798 Miss Betsy Metcalf, at the age of twelve years, having seen a Dunstable bonnet in a store, set to work without instruction or any opportunity of unbraiding a plait, and by perseverance succeeded in making for herself a bonnet of oat straw, which she cut and smoothed with the scissors and split with her thumb-nail, and bleached in the vapor of sulphur. An exact fac simile of her first bonnet, which was one of seven braid, with bottom inserted like open-work, and lined with pink satin, was made by Mrs. Baker a few years since and deposited in the collection of the Rhode Island Society for the Encouragement of Domestic Industry. Having, in subsequent years, gratuitously imparted a knowledge of the art to the young women of Dedham, Wrentham, Providence, and other towns, the business has gradually extended throughout that and neighboring States until it has reached its present magnitude. In early times the straw was generally split and flattened by a hot iron and then pasted upon cloth or paper. The plait thus formed was cut into patterns and made up and trimmed according to the prevailing mode.

The introduction into New England of a more durable style of straw plait made of unsplit straw, in closer imitation of the Scotch, has been attributed to a young merchant of Taunton, who, during a short residence in a southern State, made the acquaintance of two English females who made up and sold bonnets of the celebrated Dunstable braid. Having observed that females were carefully excluded from their workshop, he noted all the processes from the straw to the finished article, and carried home the details to the straw workers of his own county. Other improvements were subsequently made, particularly in the art of bleaching, and by the introduction of machinery for cutting and smoothing the straw, shaping and pressing the bonnets, &c. In 1801 the business was commenced at Wrentham, which was long a principal seat of the manufacture, and in 1810 made about $100,000 worth, which was supposed to be nearly one-half the product of the county, exclusive of the value of hats and bonnets worn by those who made them.

The national census of that year reported straw bonnets to the value of $551,988 made in seven counties of Massachusetts, of which Norfolk county produced $217,424; Middlesex, $93,794; Bristol, $90,671; Worcester, $77,780; and Hampshire, $63,750; the balance being made in Plymouth and Essex. In Rhode Island 9,260 bonnets were made, valued at $25,800, and in Connecticut a value of $27,100 was reported. A few were also made in Vermont and New Jersey. The total value of straw bonnets was $606,058. Nearly half the value of bonnets made in Massachusetts was exported to New York, Philadelphia, Charleston, New Orleans, and other southern cities, and to the West Indies. In a few years the processes of cutting, smoothing, bleaching, and braiding, and the sewing and trimming of straw bonnets, became separate branches of trade. Rye straw was principally used as a domestic material, and when cut in the green state yielded the farmer nearly double the profit that the ripened grain would.

Under the tariff of duties established in April, 1816, straw bonnets and hats with artificial flowers and millinery paid an ad valorem duty of 30 per cent. on a minimum valuation at the place of packing. In consequence of the heavy importations of bonnets and hats manufactured by the cheap labor of Italy, which came into fashion about 1820, the domestic manufacture of straw goods was checked, and many females turned their attention to imitating the Leghorn bonnet. A Miss Woodhouse, of Weathersfield, Connecticut, in April, 1821, sent to London a bonnet, accompanied by samples of the raw and bleached materials, made of the culm of the indigenous spear, wire, or meadow grass, a species of *poa*, and which was laid before the Society for the Encouragement of Arts and Manufactures in that city. The bonnet was admitted by dealers in London to be equal to the best Leghorn in fineness and color; and the society awarded Miss Woodhouse its large silver medal and twenty guineas. Miss Lucy Burnap, of Merrimack, New Hampshire, about the same time, made a bonnet in imitation of Leghorn, which sold at auction for $50 in New York, where premiums as high as $20 were offered for the best specimens of straw

bonnets. Miss Burnap, in February, 1823, took out letters patent for weaving straw and grass for hats and bonnets. Many samples of bonnets made in different places from New England wire grass or straw sold at this time for $30 to $50 each, which cost the females who made them two or three months' labor. In the year last mentioned it was computed that 300,000 straw bonnets were made in Massachusetts, and valued at $875,000, affording, however, but little profit, although much of the braiding was done by children in families, at a small cost for wages.

In 1824 the duty on foreign hats and bonnets of straw, chip, or grass, including Leghorn hats and bonnets, and on all flats, braid, or plaits for making them, was raised to 50 per cent. ad valorem, but in 1832 was again reduced to 30 per cent.

A straw plaiting school was established in Baltimore in 1824 to instruct poor girls in the various branches of the bonnet manufacture.

About 1830 many rye straw bonnets were made at Boxford, Massachusetts, which sold in New York as imported articles for $10 to $15 each, which cost but two or three to make. In 1834 the town of Franklin made straw hats and bonnets to the value of $80,000, and in 1855 it had 6 shops, which made 579,160, valued at $405,000, besides $2,000 worth of straw braid not made into bonnets. A silk establishment in Boston employed, in 1835, from 150 to 200 looms in weaving Tuscan braid in a great variety of elegant patterns. The warp consisted of domestic silk manufactured on the spot, and the filling was chiefly Tuscan straw, imported at a cost of one dollar or upward per pound. Manilla grass was occasionally mixed, its whiter color and shining appearance producing an agreeable effect. Fine thin strips of whalebone were also occasionally mixed in with similar effect. From 800 to 1,200 bonnets per week, of a great variety of forms and patterns, were made and sold by wholesale at $2 50 to $14 each, and children's hats at $2. At Hartford, Connecticut, a similar establishment employed upward of 100 looms in weaving Tuscan braid.

The total value of straw bonnets and hats made in the United States, as returned by the census of 1840, was $1,476,500, the value reported from Massachusetts being $821,646, and from Connecticut $236,730. The value made in New York was $160,248, and in Pennsylvania $80,512. A greater or less value was made in twenty States. In consequence of large importations of Leghorn, Panama, and Manilla hats under the reduced tariff, the manufacture was declining in 1842, when the duty was raised once more to 35 per cent., to be again reduced in 1846 to 30 and in 1857 to 24 per cent. It has since been raised to 40 per cent. or upward.

In 1845 Massachusetts turned out 1,046,954 straw bonnets and hats, valued at about as many dollars, and of straw braid to the value of $102,237, besides palm-leaf hats. In 1855, according to the State census, 42 establishments in Massachusetts, in addition to palm-leaf goods, made 3,326,030 straw bonnets, and 1,907,485 straw hats, and straw braid worth $94,137. The total value of these articles and of palm-leaf hats was estimated at $4,905,553, and the number of hands employed at 14,511. Boston is the principal market for these goods, and had before the war a large trade in straw and palm-leaf hats and bonnets with the south, where the demand was large and constant.

The greater part of the domestic straw plait or braid manufactured is produced in New England by children from 6 to 12 years of age, of home-grown or foreign materials. These are split straw, the narrow and fine qualities being nearly equal to the English, a wide straw of inferior quality, called Devon, and imitations of English "patent" and whole straw. But the principal part of the materials, as already observed, are imported from Europe and China, with some coarse straw for men's hats from Canada. The Canton straw or braid is largely made up for the southern markets, and much of it is sewed in New York, and thence shipped coastwise or distributed by land to other cities.

We import these goods to a large amount annually, but there is no reason why the country should not be independent of foreign producers in straw goods, if not in the raw material.

Palm-leaf hats began to be made in Massachusetts in 1826, and five years after the number made in that State was about two millions. Nearly one-half of these were made in Worcester county, which has been the principal seat of their manufacture ever since. The materials were imported free of duty from Cuba, and made up chiefly by little girls from four years old and upward. In 1845 the number

made in Massachusetts was 2,845,264, and their value $489,237. This and the straw manufacture at that time employed three cotton mills in New England exclusively in the manufacture of thread for sewing them. In 1855 the product of palm-leaf hats in that State had fallen off to a value of $293,208. Several of the Shaker communities manufacture bonnets and hoods of this material.

The value of hats and bonnets of Leghorn, straw, chip, grass and other vegetable materials imported into the United States in the fiscal year ending with June, 1860, was $1,603,239. These were entered chiefly at New York, and came principally from Tuscany and other Italian states, England, and France, and some from Bremen, South America, and China. The value of these foreign articles exported in that year was $99,434, leaving one and a half million for consumption. In 1862 the value of hats and bonnets imported was only $143,963, and of straw goods, laces, braids, and ornaments of vegetable substances $80,523. The value of these exported was $39,786.

The value of unmanufactured palm leaf imported in 1860 was $99,557. In 1862 the value of crude palm leaf imported duty free was $25,865, chiefly from Cuba and Tuscany.

The value of palm-leaf hats of domestic manufacture exported in 1860 was $92,832, chiefly from New York, Boston, and San Francisco. They were shipped to Cuba and South America, England, and the British Provinces, and West India islands.

In 1862 the value of straw and palm-leaf hats exported was $55,446.

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

STATES.	No. of establishments.	Capital invested.	Cost of raw material.	NUMBER OF HANDS EMPLOYED.		Annual cost of labor.	Annual value of products.
				Male.	Female.		
Massachusetts	26	$925,200	$1,895,616	617	5,601	$1,096,164	$3,398,466
Connecticut	7	269,700	581,500	160	1,013	257,400	896,350
New York	1	15,000	6,000	1	20	2,288	*12,000
New Jersey	1	20,000	60,000	25	60	22,800	†104,000
Pennsylvania	5	46,800	46,300	23	169	28,440	88,800
Total	40	1,276,700	2,589,416	826	6,863	1,407,092	4,499,616
PALM-LEAF HATS.							
New Hampshire	7	6,900	48,725	57	125	45,240	153,600
Massachusetts	23	73,700	302,463	129	565	123,828	606,687
Total	30	80,600	351,188	186	690	169,068	760,287

* Included with "hats" in New York city, are straw goods to the value of $18,500. † In Newark—makes straw hats.

SILK MANUFACTURES.

SEWING SILK, TWIST, &c.—The manufacture of silk from the raw state is neither extensive nor general in the United States. It is chiefly confined to the production of sewing silk, twist, fringes, laces, &c. These employed on the first of July, 1860, in three eastern and three middle States, 42 establishments, having an aggregate capital of $1,675,900, and giving employment to 583 male and 1,996 female hands. The material used was 455,660 pounds of raw silk, valued, with other materials, at $2,378,521, and the cost of labor expended upon it was $387,312. The total product was 409,429 pounds of sewings, twist, &c., of which the value was $3,596,249, or an average of $8 78 per pound.

The principal producer in this branch was Connecticut, in which State the growth and manufacture of silk first obtained a permanent foothold in the United States, and where sewing silk was first made in this country by machinery upward of twenty-five years since. There were 19 establishments in the State, whose aggregate investments amounted to $957,900. They employed 226 male and 833 female hands, at a total annual cost for wages of $128,256, and from 150,060 pounds of wound silk, costing,

with other materials, $797,720, or nearly $5 per pound, made 145,835 pounds of sewing silk, twist, &c., valued at $1,223,400. The product was more than one-third the total value made in the Union, and was of the average value of $8 38 per pound. Of the total product in that State nearly one-half was the value made by two establishments in Hartford, one of which is probably the largest in the United States, and in the production of sewings, twist, and woven goods, that city and South Manchester employ a capital of $600,000. The sewing silk of this company, which has been for some time in the business, is not inferior to any imported.

Next to Connecticut in this industry was the State of New Jersey, having 6 establishments, with a total capital of $203,000. These employed 141 males and 548 females, whose wages amounted to $105,120, and they consumed 121,500 pounds of raw silk, at a total cost for raw materials of $621,675. The product was $107,310 pounds of sewings, twist, &c., worth $950,900, or $8 86 per pound. Four of these mills were in the city of Paterson, which has about 10 establishments engaged in the several branches of silk manufacture, and produces goods to the value of upward of $800,000 annually, a large proportion of these being sewing and embroidery silk, twist and floss silk. Two or three establishments in that place now make, tram and organzine, one of them being exclusively devoted to that manufacture.

Pennsylvania contained 8 silk establishments, employing 409 persons, and producing from 66,000 pounds of raw silk 61,500 pounds of sewing silk, &c., valued at $598,000, an average of $9 13 per pound. The principal establishments were in Philadelphia, where one house has been about twenty-five years engaged in the business, and a larger amount of silk goods of various kinds is produced than in any other city of the Union.

Four establishments in Massachusetts, having 240 hands, spun and twisted from 83,000 pounds of raw silk, costing $391,800, 63,900 pounds of sewing silk, &c., worth $579,950, an average value of about $9 per pound. The annual labor cost $55,152.

In New York 3 silk-spinning mills gave employment to 159 persons, and made from 29,100 pounds of raw silk 25,444 pounds of sewings, twist, &c., worth $207,519, equal to $8 15 per pound.

Two factories in New Hampshire employed 23 hands, which converted 6,000 pounds of raw silk into 5,440 pounds of sewing silk, valued at $36,480, or about $6 75 per pound.

The principal part of the material used in this and other branches of the silk manufacture was reeled and floss silk imported from abroad, and amounted in all of them to not less than half a million pounds of raw silk annually.

The value of raw or reeled silk imported in 1852 was $360,836, and in 1853 $712,092. In the fiscal year ending June 30, 1860, the value of silk, raw or reeled from the cocoon, imported free of duty, was $1,235,976, and of raw silk, subject to ad valorem duty, $104,700, in addition to floss silk of the value of $12,903, paying a duty of 19 per cent. The reeled silk was principally from China and England, and the floss from England, France, and Germany.

In 1862 the importations of raw silk free of duty amounted to $413,972, and on raw silk paying duty $75,554, in addition to a small value of floss silk.

The value of sewing silk imported in 1852 was $173,799; in 1853, $238,525; and in 1860 the value of sewing silk and twist imported was $234,986, subject to a duty of 30 per cent.

Silk Goods.—In 1860 only one establishment was reported as making woven silk goods, which was at West Newton, in Massachusetts. It employed a capital of $25,000 and 53 hands, all but 3 of them females. The total cost of materials was $77,450; the annual wages $12,168; and the value of the product, under the name of fancy silk goods, was $118,000, which was about double its product in 1855. The goods made are understood to have consisted, in part, of ribbons and silk braid, the former woven on the braid-loom, with Jacquard attachment.

Since that time ribbons have been made in Philadelphia and at Hartford, Connecticut, and perhaps elsewhere, and some pongee handkerchiefs also at Hartford; cut and uncut silk velvets are said to have been made also at Valley Creek, Chester county, and at Economy, Beaver county, Pennsylvania, and woven goods also at Paterson, New Jersey.

SILK TRIMMINGS, FRINGES, RIBBONS, &c.—These and other narrow textile fabrics, including cotton tapes, braids, &c., are known in England under the name of "small wares;" in France, of "passementeries," and in the United States are generally denominated "trimmings." The latter term includes ladies' dress trimmings, carriage laces, curtain trimmings, cords, tassels, braids, fringes, ribbons, military trimmings, &c, &c.

Exclusive of coach lace, which is made a separate business by a number of factories, these articles, in 1860, were made by 90 establishments in one New England, four middle, and one western States. Their aggregate capital amounted to $1,183,280, and the hands employed were 919 males and 1,788 females, whose annual wages cost $618,380. The cost of material was $1,416,819, and the value of the manufactured goods $2,804,322.

Pennsylvania was the largest producer in this branch of the silk manufacture, having 27 establishments, all of them in Philadelphia and its vicinity, with a collective capital of $708,700, and 1,150 hands, about two-thirds of whom were females. These expended yearly for raw material $537,367, and for wages $241,464, and produced silk goods to the value of $1,169,845.

New York contained a large number (39) of establishments for making trimmings. Their capital amounted to $241,780, and they employed 664 female and 333 male hands, whose wages amounted yearly to $235,096. The raw material cost $495,261, and the finished products were valued at $944,377.

Fifteen establishments in Massachusetts, with 488 hands, one-third males, produced fringes, &c., to the value of $599,100. The cost of material was $345,720, and of labor $124,400 per annum.

Two establishments in New Jersey made silk goods of this class to the value of $10,000 annually; three in Maryland made $39,800 worth, and four in Ohio produced a value of $41,200.

Included in the product of this branch is more or less coach lace made by one large establishment in Philadelphia, and some in other places who make ladies' dress trimmings, from which it is not separated in the returns.

The quality of the dress trimmings made in these establishments is probably equal to any imported, and the designs in many cases are original with the manufacturers. The largest establishment is in Philadelphia, and, besides 130 coach-lace looms, employs 60 power-looms, 50 hand-looms, and upward of 150 Jacquard machines, ranging from 40 to 800 needles, 100 plaiting or braiding machines, and 336 silk spindles, with other complete machinery, much of it of original design.

COACH LACE.—The manufacture of coach lace employed, in 1860, according to the returns of six establishments, of which three were in Connecticut, two in New York, and one in New Jersey, making coach lace exclusively, in addition to what was made in several establishments engaged principally in dress trimmings, fringes, &c. The aggregate capital devoted to this manufacture was $42,800, and it employed altogether 96 persons, of whom 16 were females, at a total annual cost for wages of $32,364, and for material, (including 1,305 pounds of raw silk,) of $28,987. The value of coach lace made was $89,200.

Of these amounts, $40,000 in capital, 62 male and all the female hands were returned by three establishments in Connecticut, which also reported $78,000 of the total products as the yearly value of their manufactures. These factories consumed 1,131 pounds of raw silk, costing, with all other materials, $24,087, and paid for labor $27,504. Two of these establishments were in Bridgeport, and, with 50 hands, of whom 9 were females, produced coach lace and trimmings to the value of $55,000, and the same articles were made at Hartford to a considerable amount. Two in New York made coach lace to the value of $2,400; and one in New Jersey, employing 15 hands, produced a value of $8,800.

HISTORY AND STATISTICS.

In Virginia, Carolina, Georgia, and some of the middle and eastern States silk husbandry was introduced and liberally encouraged almost with their first settlement. These attempts, although from various causes unsuccessful in establishing the production and manufacture of silk as extensive or permanent branches of industry, have fully shown that in soil and climate the United States is adapted to

the raising of silk equal in strength and fineness to any in the world. Various knitted and woven fabrics, as well as sewing silk, have been produced from a very early period from home-grown silk, even with the rude appliances of household industry, and goods are still made in regular establishments, which clearly prove that the possession of a cheap raw material is alone wanting to render the manufacture of silk a profitable industry.

The public attention has, at different periods in our past history, been much more strongly directed to the subject of silk than at present. A revival of a portion of the interest formerly manifested in the culture and manufacture of silk seems to be desirable, in view of its beauty and excellence as a material, the facility with which it may be raised, and the very heavy importations of foreign products annually required to meet the demand.

Heretofore, the low tariffs of duty, and the absence of suitable machinery for carrying forward the manufacture of silk from the cocoon to its more elaborate products, have restrained our manufacturers from investing their capital in competition with the cheap labor of Europe and China, and at the same time have prevented any general attention to silk husbandry in the United States. To this may be added the revulsion created in the public mind by the failure of speculative measures put forth about thirty years ago in connexion with the Chinese mulberry, or *multicaulis*, which proved to be unsuited to our soil and climate, and involved many in utter pecuniary ruin, without in anywise proving that silk-growing was either impracticable or profitless. With the abundant protection now furnished by the financial system, which has become a necessity, and which must continue for a considerable time to be the policy of the nation, the present seems to be a fitting time to revive attention to silk-raising, which will doubtless one day become a remunerative branch of agriculture in the United States.

The amount of raw silk imported during several past years has already been stated in connexion with the manufacture of sewing silk.

According to the census of 1850 the quantity of silk cocoons produced in 27 States of the Union in that year was 10,843 pounds, of which amount Tennessee, New York, Kentucky, and Ohio were respectively the largest producers in proportions approaching an equality.

In 1860 the total weight of cocoons returned was 11,944 pounds, including 120 pounds raised in Nebraska. Ohio was much in advance of all others, having produced 7,394 pounds, of which upward of one-half was raised in Tuscarora county. Illinois was next, and produced 1,547 pounds of cocoons, chiefly in Edgar and Randolph counties.

As early as 1623 all settlers in Virginia were ordered to plant mulberry trees for silk worms, and silk made from material grown in Virginia is said to have been worn by Charles II at his coronation in 1651, which was only about thirty years after the introduction of silk-weaving in England. In 1662 every proprietor of land in Virginia was required by the assembly to plant and fence ten mulberry trees for each hundred acres of land owned by him, and 50 pounds of tobacco was at the same time offered as a premium for every pound of wound silk produced. Two years later the bounty was claimed by several persons, including a member of the assembly, who had 70,000 mulberry trees growing. In 1666 all acts for the encouragement of silk in Virginia were repealed.

In Carolina silk-raising was early attempted under the direct patronage of the King, and in 1693 was revived in the parish of St. Thomas by Sir N. Johnson, whose plantation long bore the name of "Silk Hope." A Swiss colony, which settled at Purrysburg, in South Carolina, in 1733, made silk-growing a principal object, and persevered for some time. Silk was also raised by the French settlers of that State and wrought up with their wool. It was a fashionable occupation with ladies in that province down to the Revolution to raise silk, which they sent to England to be manufactured. Small quantities of raw silk, said to have been of excellent quality, and amounting to 251 pounds, are mentioned among the exports in several years between 1742 and 1755. In the last of these years the mother of the two Generals Pinckney is said to have had three dresses made in England from silk raised and spun by herself near Charleston, one of which was presented to the Princess of Wales and one to Lord Chesterfield. Ten years later 630 pounds of cocoons were raised at Silk Hope, and in the following year, in consequence of bounties offered by the Society of Arts in London for colonial silk, one

thousand pounds was voted by the assembly of Carolina to establish a filature for reeling silk in the province. Several hundred pounds were paid by the society in premiums previous to the withdrawal of the bounties in 1772.

The cultivation of silk and indigo was introduced into Louisiana by the French in 1718, and also at New Bordeaux, in Georgia.

It was a prominent object in the settlement of Georgia by the English to raise silk, and very liberal appropriations were made by Parliament and by private subscription for its encouragement. Lands were granted on condition of planting ten white or Italian mulberries for each acre, and were augmented in proportion to the increase beyond that number. The public seal of the colony bore a representation of silkworms at work, and an appropriate motto; Italian silk reelers were sent thither to take charge of a filature. The first raw silk was sent thence to England in 1734, followed by other lots, which were organized by Sir Thomas Lombe, at his famous silk mills, established at Derby, in 1719. In 1738 a rich brocade silk was woven from Georgia, at the request of Queen Caroline, who wore it as a court dress at her next levee. Indeed, so successful were the first efforts to promote silk growing in Georgia, that samples of silk from the province were pronounced, by silk weavers in Europe, to be equal to the best Italian, and it occasionally sold higher in London than any other silk. In 1749 Parliament admitted silk from Georgia free of duty, and two years after a public filature or silk house was established at Savannah, to instruct the people in the management of private filatures. In about seven months of 1751, 6,300 pounds of cocoons were received at the filature. Silk to the value of $8,880 was exported from the province in 1750 and the three following years. And in 1759 about 10,000 pounds of raw silk were exported, which sold two or three shillings a pound higher than other silk. The filature was destroyed by fire in 1758, but was rebuilt the next year, and received during the next eight years 100,000 pounds of cocoons, much of which came from the German settlement at Ebenezer. These essays in silk raising in Georgia, which were the most extensive and successful in colonial times, were much the fruit of liberal bounties by Parliament and by societies in England and the province. On the reduction, in 1766, of the bounty paid by government for cocoons, from three shillings to half that sum per pound, the production of raw silk in Georgia fell off, from 20,000 pounds of cocoons in that year, to 290 pounds in 1770. But, in 1769, a bounty of twenty-five per cent. on the value of all raw silk imported from the colonies during the next seven years, to be reduced to twenty and fifteen per cent. during the next two terms of seven years, again stimulated the cultivation of silk, especially among the saltzburgers at Ebenezer, who annually sent to England several hundred pounds of raw silk, until the Revolution put an end to it nearly altogether. The last silk offered for sale in Georgia was in 1790.

Silk was the subject of legislation in Connecticut as early as 1732. In 1747, Governor Law, of that colony, wore the first coat and stockings made of New England silk; and, in 1750, his daughter wore the first silk dress of domestic material. In 1760, Nathaniel Aspinwall, of Mansfield, commenced the silk culture at that place and New Haven, with white mulberries from Long Island. In 1763, Mansfield produced 273 pounds, and the growth and manufacture of silk have ever since been a prominent industry of the place. In 1767, William Hanks, of the same place, raised sufficient silk to make three dress-patterns; and, with others, owned large nurseries of mulberry trees in Windham county. A filature had already been erected at Lebanon. President Stiles, of Yale College, Rev. Jared Eliot, Mr. Aspinwall, and others, labored zealously for many years to direct attention to silk growing, and their own and many other families had various fabrics of silk woven in England, or spun and knit by themselves from domestic silk of their own raising. Though nearly suspended by the Revolution throughout the country, silk raising was never quite abandoned in Connecticut. After the return of peace, bounties were offered for mulberry trees and raw silk, and a company was incorporated, in 1788, to manufacture silk fabrics in the State. Mansfield, the next year, produced 200 pounds of raw silk, worth $5 a pound. About fifty families, at New Haven, were engaged in raising cocoons in 1790; and

twenty-nine families in Norfolk raised and spun 1,200 run of silk the same year. A woman and two children could make ten or twelve pounds in five to seven weeks.

Silk was also raised at Newport, Rhode Island, in 1758; and, in 1769, a gentleman of Boston offered premiums of ten to forty dollars, each, for the largest lots of mulberry trees raised in that colony, where a manufactory of silk was established about the same time. Fine samples of sewing silk were made in Worcester county and elsewhere in Massachusetts in 1790; and 40,000 yards of silk and thread lace at Ipswich, which had carried on that business for some years.

In New York, New Jersey, and Pennsylvania, the silk culture was early recommended and encouraged, and a filature was opened at Philadelphia in 1750, under the patronage of Dr. Franklin and other prominent men in those provinces. Considerable quantities of cocoons were brought to it by the people of the neighborhood, to be sold or reeled for the owners, but it appears to have been abandoned during the Revolution. Much sewing silk was made in families, and, among others, by Susanna Wright, a Quakeress, of Lancaster, who was awarded a premium, in 1770, for sixty yards of mantua dress silk, made from cocoons of her own raising. A manufactory of bolting cloth, from Georgia silk, is said to have been established at Wilmington, Delaware, in 1796, previous to which time, Mr. Aspinwall, of Connecticut, endeavored to revive the mulberry culture in the middle States.

The *manufacture* of silk in the last century was chiefly of domestic material, which was more plentifully produced than at present, and with the exception of a lace mill at Ipswich, Massachusetts, and one or two other less successful attempts, was chiefly of sewing silk, hosiery, &c., though ribbons, handkerchiefs, buttons, &c., appear to have been made to a small amount in Connecticut.

The first mill in America for making sewing silk and twist by water-power is said to have been built by Rodney Hanks, in Mansfield, Connecticut, about fifty years since. Two other mills, on the same stream, have since been erected and operated by successive generations of the same family, each mill larger than its predecessor, and with improved mechanism for the winding and twisting of sewings and twist, which are still produced of a quality probably equal to any in the world. The first manufacture of sewing silk by machinery in the United States has also been attributed to Messrs. Conant & Atwood, of Mansfield, about the year 1829.

The census of 1810, in addition to the product of one silk manufactory in Burlington county, New Jersey, which made 1,800 yards, (probably of coach lace,) valued at as many dollars, reported a manufacture of sewing silk and raw silk in Massachusetts and Connecticut, to the value of $29,121, the greater part of it made in three counties of the latter State, which was nearly the only one that continued to produce the raw material. In 1814, when silk rose to $30 a pound, the Newark, New Jersey, lace factory obtained all its floss silk from Connecticut.

The value of raw and sewing silk made in Windham county, in 1825, was $54,000, or double its product in 1810. Three-fourths of the families in Mansfield were engaged in raising and spinning silk, the sewings being made in families with no other implements than the common spinning wheel, large or small, and common reel. In 1831, the value of sewing silk made there was $81,000. Silk fabrics were occasionally woven in common domestic hand looms. Sewing silk was also made in Kentucky and some other States at that time. About that time a machine was introduced at Philadelphia for winding silk from the cocoons and doubling and twisting it at the same time, operations never previously combined in one machine.

In 1835, Gamaliel Gay, of Baltimore, patented an invention for winding silk from the cocoons upon bobbins or spools instead of reels, which came into general use as an improvement. During the same year he also patented a power loom for weaving silk goods, which was deemed a valuable invention. Several improved reels were introduced about the same time by Mr. Cobb, of Massachusetts, Mr. Smith, of Baltimore, and others.

Previous to this time a growing interest had been excited in the silk culture and manufacture by the introduction of the morus multicaulis, which was asserted to be superior to any other species of mulberry as food for the silkworm. In 1830 an experimental filature, with all the latest improve-

ments, was established at Philadelphia, by Mr. D'Homergue, a French manufacturer, P. S. Duponceau, and others, who publicly advocated a system of filatures throughout the country as the only effective means of promoting the silk industry in the United States.

The production of a good quality of ribbons in Baltimore, of silk handkerchiefs, cravats, and other woven goods in Connecticut, led to the introduction in Congress of the celebrated silk bill, drawn up by Mr. Duponceau, and designed to encourage silk husbandry and manufactures. It was debated for one or two sessions, and finally rejected, although specimens of gros de Naples dress silks, woven in England, and other fabrics made in France, and a silk banner made in Philadelphia by Mr. D'Homergue, were produced as evidences of what could be done with domestic silk. Excellent black silk plush was made in Philadelphia, in 1831, by Mr. Joseph Ripka, and figured silk vestings and other woven goods at Economy, Pennsylvania, by Mr. Rapp, about the same time.

Although the proposed aid was not obtained from Congress, the imposition of a duty of twenty-eight per cent. on imported sewing silk, the introduction of the power-loom, local bounties, and the general excitement on the subject of the mulberry culture and silk raising, led to the organization of silk companies in several parts of New England, New York, and other States. In 1833, it was stated that one dozen silk mills had been erected in the United States, chiefly in New England, since 1828, for the manufacture of silk goods from imported raw silk, in the expectation that the general interest in silk growing would soon produce a domestic material in abundance. One factory at Mansfield, at that time, employed thirty-two spindles for soft silk winding, and had apparatus for winding hard silk, and two broad silk looms, and one fringe loom. Its machinery was sufficient to employ thirty broad silk looms and fifty hands. About 30,000 sticks of twist, worth $4 50 per hundred, were made by one manufacturer in that place. The New England Silk Company, at Dedham, with a capital of $50,000, employed, in 1835, sixteen sewing silk machines, and made preparations to produce 200 pounds weekly. In the following year it produced $10,000 worth of silk and silk mixed fabrics. A manufactory at Boston, employing 300 females and between 100 and 200 looms in weaving Tuscan braid for ladies' bonnets, a business which, at this time, created quite a demand for sewing silk, also contained a ribbon loom, with one dozen spring shuttles, weaving twelve ribbons at a time, with the aid of a single operative. It also included a throwing mill for making organzine and tram for warp and filling, and manufactured *gimp* and *galloon* on a loom with twelve shuttles, managed by a single hand. The Rhode Island Silk Company, at Providence, previously known as the Valentine Company, about this time erected power looms, of Mr. Gay's pattern, to manufacture about 300 yards per week of rich and heavy silk goods by steam power.

A national silk society was organized in 1838, which established a national silk journal, devoted to this interest. But, during the following year, the multicaulus speculation, from an originally healthy trade in mulberry trees and a proper interest in silk raising, had degenerated into a ruinous competition in the cultivation and sale of trees. Although much raw silk was raised, and either made into sewings, hosiery, and other fabrics in families, or sold to the regular establishments, and one gentleman, at Germantown, Pennsylvania, was supposed to have the largest cocoonery in the world, the supply of raw silk was inadequate to the wants of the manufacturers, and many of the companies previously formed sunk nearly their whole investments. Foreign manufactures of silk, except sewing silk, were admitted free of duty, and our manufacturers could not sustain themselves against the enormous importations, while dependent on the foreign materials, or the uncertain supply of domestic silk.

In the twenty-one years from 1821 to 1841 inclusive, the total importations of foreign silks amounted in value to $210,541,051; of which value, only $26,827,285 was exported, leaving for home consumption an average of $8,748,274 annually. In 1839, these imports amounted to nearly $24,000,000, or about double the value of any other article imported. It included sewing silk to the value of $809,534. The value of raw silk imported in the last five of these years (1837 to 1841) was $769,227, whereof $620,719 was exported.

In 1842, Congress laid a duty on raw silk imported, and on all other kinds not more advanced than singles or tram, of 50 cents a pound, except floss silk, which paid 25 per cent. ad valorem. Sewing silk was charged with a duty of $2 per pound; silk lace, gloves, mits, hat bands, caps, cords, tassels, ribbons, and piece goods, $2 50 per pound; silk hosiery, 40 per cent.; and other silk goods, 30 per cent. ad valorem. In 1846, the rates of duty on several articles were reduced; and in 1857 still further reduced. Raw silk, which in 1846 was charged 15 per cent., was, in 1857, placed on the free list.

In 1842, considerable quantities of silk and worsted vestings were made at a large factory in Baltimore, which employed fifteen or twenty Jacquard looms, and used domestic silk. But such was the prejudice in favor of foreign goods, that these articles could not be profitably placed in the market as American manufactures. The silk manufactory of J. W. Gill, at Mount Pleasant, Ohio, erected about 1838, and claiming to be the first regularly organized silk factory in the United States, under the superintendence of Mr. Fox, an English manufacturer of thirty-five years' experience, had made, within two years, thirty-five pieces of velvet, of ten to twenty yards each, and worth $4 to $6 a yard; ten pieces of plush, from which were made twenty-four dozen silk hats, worth $48 per dozen; 100 pieces of dress silks, flowered vestings, &c., in length from ten to thirty yards each, and valued at $1 to $3 a yard; and about sixty dozen cravats and pocket handkerchiefs, worth $1 to $1 75 each, besides lustrings and other articles. All of these goods sold readily. All but the weaving machinery was propelled by steam-power, and the goods were made at a profit of ten per cent. There were still other manufactories of sewing silk, fringes, tassels, gimps, coach lace, &c. The uniform testimony of those employed in the factories (some of whom had followed the business for twenty or twenty-five years in England) was, that they never saw finer or as fine silk as the American when properly prepared. It was said to make a stronger thread than foreign silk, and by many manufacturers was altogether preferred.

Under legislative protection the manufacture of sewing silk in the United States continued to increase until about the year 1844, when the whole quantity reported was 396,790 pounds, exclusive of what was made and used in families; of that quantity 176,210 pounds were made in Connecticut. The quantity reported as made in Massachusetts the next year was 22,509 pounds, valued at $150,477; that of raw silk being 194 pounds, worth $952. A duty of fifteen per cent. was laid on imported raw silk, which caused the manufacture of sewings to decline for a number of years, although it was never abandoned. In 1855, Massachusetts made 44,000 pounds of sewing silk, worth $300,000, in the three counties of Hampshire, Essex, and Norfolk. That quantity was exclusive of fringe and tassels, made chiefly at Roxbury, to the value of $433,000; and of ribbons and dress trimmings, &c., to the value of $38,000, by one establishment, at Newton.

The State census of New York, for the same year, reported six sewing silk factories, three of them run by steam power, which made, with the labor of 236 hands, $212,000 worth of sewings; seven fringe and tassel establishments, all but three of them in the city of New York, making together a value of $280,500; and two ribbon mills, whose product was of the value of $15,900, all but $900 of which was the product of one mill in the city. The silk mills at Mansfield, Willimantic, South Coventry, and elsewhere in Connecticut, each made, at that time, from 100 to 300 pounds of silk, for sewing machines, saddlers' and embroiderers' silk, machine twist, fringes, &c., of all colors and of superior qualities. Excellent dress silks have since been made in that State by at least one factory, at Hartford, which afterward abandoned it for the manufacture of silk handkerchiefs. There were, at the same time, sewing silk mills in other parts of the country, the most considerable of which was at Paterson, New Jersey. A small factory, at Newport, Kentucky, about the same date, employed five or six looms in weaving silk dress goods, handkerchiefs, and cravats, chiefly the last mentioned; and silk braid, fringes, and ribbons, were made at Philadelphia. The weaving of brocatelles by the power loom had been recently commenced at Seymour, Connecticut; but, we believe, did not succeed.

The manufacture of silk and thread lace and edgings, &c., was carried on at Ipswich, Massachusetts, quite extensively in the last century. In 1790, nearly 42,000 yards were made at that place by

women and children and sent to Boston for sale or exportation. Samples of thirty-six different styles of these articles were exhibited on pattern cards The census of 1810 reported 743,090 yards of web lace and fringe, worth $109,540, made in the United States, chiefly in Pennsylvania, Massachusetts, and Rhode Island, but the materials are not given. In 1824, the Boston and Ipswich Lace Factory, at Ipswich, was incorporated, with a capital of $150,000, to make bobbinet lace by machinery. It employed for a time about 800 young women on lace work, but was compelled, about three years after, to discontinue the business Lace was also made to a large amount at Medway, Massachusetts, in 1823, with machines which would each turn out, daily, fifty yards, five inches wide, worth $2 a yard. A lace factory, at Newport, Rhode Island, in 1827, employed about five hundred females. Three years later the value of domestic lace made in the country was estimated at fully $500,000.

In 1833, the New England Lace Manufactory, at Newburyport, Massachusetts, was incorporated, but also proved unsuccessful.

Coach lace was made before and during the last war with Great Britain, at Newark, New Jersey, from Connecticut floss silk, which was thought to be superior for that purpose to any imported. At that time only two patterns, known respectively as the "Jefferson" and "Monroe" patterns, were made in the country. In 1815, Mr. W. H. Horstmann commenced the manufacture of trimmings in Philadelphia, and, in 1824, introduced from Germany, where he had acquired a thorough knowledge of the business, the braiding and plaiting machines, and in the following year the Jacquard loom. The establishment has since become the most extensive, complete, and varied, in its products of silk and worsted trimmings and narrow textile fabrics, anywhere to be found, and was one of the first in this country to apply the power-loom in making several articles of this class, gold laces having been made by power in Philadelphia several years before it was attempted in Europe Previous to 1837, however, coach lace was altogether made on hand-looms. About that time, Mr. Erastus B. Bigelow, of Massachusetts, who had previously devised a hand-loom for weaving suspender webbing, a machine for making piping cord, and a power-loom for weaving knotted counterpanes, after only six weeks study over a piece of coach lace, brought forward the loom for weaving coach lace by power, then deemed an impossibility by the principal manufacturers and dealers. It was patented in April of that year, and was afterward modified and matured into the Brussels and tapestry carpet looms mentioned elsewhere. The "Clinton Company," at Lancaster, Massachusetts, was organized, and one hundred of the curiously automatic and very ingenious coach lace looms, during the next twenty years, made annually between one and two million yards of coach lace, of worsted, cotton, and silk, variously combined, according to quality, the best qualities being almost wholly made of silk. In 1857, the stock, looms, and patent rights of the Clinton Company, then the largest manufacturers in the United States of coach lace, became the property of the Messrs. Horstmann, who have since employed 130 coach lace power-looms, in addition to 100 power-looms on other fabrics, 336 silk spindles and other very complete silk machinery, 400 plaiting or braiding machines, 50 hand-looms, using upward of 160 Jacquard machines, &c., constituting one of the most interesting establishments in any country for the production of ladies' dress trimmings, coach laces, upholstery trimmings, regalia, and military trimmings and equipments.

At the present time the silk manufacture is probably on the increase in the United States. Under the efficient protection afforded by the present revenue laws, it is to be hoped that both the raising of raw silk and its ultimate manufacture may be greatly extended throughout the country.

Statistics of silk manufactures in the United States during the year ending June 1, 1860.

STATES.	Number of establishments.	Capital invested.	Raw silk used.	Cost of raw materials.	NUMBER OF HANDS EMPLOYED.		Annual cost of labor.	Annual value of product.	Sewing silk and twist.
					Male.	Female.			
SEWING SILK, TWIST, ETC.			*Pounds.*						*Pounds.*
New Hampshire	2	$9,000	6,000	$28,000	5	18	$3,780	$36,480	5,440
Massachusetts	4	123,000	83,000	391,800	70	170	55,152	579,950	63,900
Connecticut	19	957,900	150,060	797,720	226	833	128,256	1,223,400	145,835
New York	3	81,000	29,100	148,750	69	90	32,688	207,519	25,444
Pennsylvania	8	302,000	66,000	300,576	72	337	62,316	598,000	61,500
New Jersey	6	203,000	121,500	621,675	141	548	105,120	950,900	107,310
Total in United States	42	1,675,900	455,660	2,378,521	583	1,996	387,312	3,596,249	409,429
SILK GOODS.									
Massachusetts	1	25,000	6,000	77,450	3	50	12,168	118,000	.....
SILK FRINGES, TRIMMINGS, ETC.									
Massachusetts	15	182,700	.....	345,720	161	327	124,400	599,100	.....
New York	39	241,780	.....	495,261	333	664	235,096	944,377	.....
Pennsylvania	27	708,700	.....	537,367	388	762	241,464	1,169,845	.....
New Jersey	2	3,000	.....	6,050	4	8	2,352	10,000	.....
Maryland	3	35,800	.....	18,121	22	13	9,336	30,800	.....
Ohio	4	11,300	.....	14,300	11	14	5,732	41,200	.....
Total in United States	90	1,183,280	.....	1,416,819	919	1,788	618,380	2,894,322	.....
COACH LACE.									
Connecticut	3	40,000	1,131	24,087	62	16	27,504	78,000	.....
New York	2	1,200	40	900	3	.....	840	2,400	.....
New Jersey	1	1,600	134	4,000	15	.....	4,020	8,800	.....
Total in United States	6	42,800	1,305	28,987	80	16	32,364	89,200	.....

LINEN MANUFACTURES.

With the exception of cordage, the manufactures of hemp and linen in the United States have never been general or extensive. At present they are confined chiefly to two States, and to the production of a very limited number of products.

In 1860 this industry employed, in the two States of Massachusetts and New York, ten establishments, having an aggregate capital of $639,795, and 528 hands, of whom 277 were females. The total cost of labor was $113,048, and of material, $327,770 per annum. The latter sum embraced the value of 998 tons of flax used, from which were manufactured woven goods, twines, and thread, to the value of $699,570.

The number of establishments returned from Massachusetts was three, which represented a capital of $490,000, and consumed 695 tons of flax, costing, with all other materials, including some hemp and cotton, $228,575. They gave employment to 159 male and 167 female hands, whose labor cost annually $73,800. The manufactured product was chiefly crash towelling, of which 6,200,000 yards were made, and valued at $515,000.

One of these establishments was at Dudley, in Worcester county, and ran five sets of machinery by water-power, consuming 300 tons of flax, and making 2,000,000 yards of crash, worth $150,000. The Hampden flax and hemp mill, at Ludlow, manufactured linen, hempen, and cotton goods to the value of $65,000, of which $18,000 was of flax; and the American Linen Company, at Fall River, which was the largest, ran 4,000 spindles and 200 looms by steam-power, producing, from 350 tons of

hemp and flax, 4,000,000 yards of crash, &c, worth $300,000. This product was exclusive of some twine and shoe thread made in the State from flax, tow, and Manilla hemp, which is included in the statistics of cordage.

The linen mills in New York numbered seven, and were of smaller extent, aggregating a capital of $149,795, and a total cost for material of $99,195, and for labor of $39,248. These establishments gave employment to 92 males and 110 females; and consumed 303 tons of flax, from which were manufactured goods valued at $184,570. The products included 518,000 pounds of sewing thread, twine, and shoe thread. One establishment, the American Linen Thread Company, made 160,000 pounds of linen thread, valued at $80,000, an average of fifty cents a pound. It employed 50 male hands and 60 females.

The cultivation of flax in the United States for the sake of its fibre is much less general than formerly. With the increase of the cotton culture and manufacture, and the improvements in cotton and woollen machinery, cotton has been extensively substituted for flax and hemp even in household manufactures, which have generally been abandoned for the products of regular factories, either domestic or foreign. Large areas in some of the western and middle States are still devoted to the cultivation of flax for the production of oil from the seed, which has made it a remunerative crop.

The quantity of hemp and flax raised in the United States in 1840 was 91,251 tons. In 1850, the weight of dressed flax produced was 7,709,676 pounds, or 3,854½ tons, of which Kentucky produced 2,100,116 pounds, and Virginia upward of 1,000,000 pounds. The product of hemp was 34,871 tons. The value of the flax fibre was $770,967, and the quantity of flaxseed produced in the same year was 562,312 bushels, valued at $843,468. The area of land cultivated in flax was estimated at 100,000 acres. In 1860, the total weight of flax reported was only 4,720,145 pounds, and of flaxseed 566,867 bushels, a decrease in the former of 2,989,531 pounds, or upwards of 38 per cent. Only two States, New York and Ohio, showed an increased production of flax, while the product of Kentucky alone fell off to 728,234 pounds. The product of flax in 1850 was in the proportion of less than 5½ ounces to each inhabitant of the Union, and in 1860 was less than 2½ ounces to each person.

Since the taking of the census, and particularly during the late war, the home production of flax has probably been increased, as its manufacture undoubtedly has been, and will be still further increased by reason of improvements in flax-dressing machinery, and in the various processes by which its filament has been assimilated to that of cotton, so as to be spun on cotton machinery, either unaltered or slightly modified. With a soil and climate admirably adapted to the culture of flax and hemp, and with the increased price of all textile materials, we may confidently look for a notable increase in the production of flax and hemp, which can be made profitable crops in nearly all the States and Territories. It will be required by our manufacturers for incorporation with wool and cotton in various mixed fabrics not included in the foregoing statistics, as well as for pure manufactures of these materials, now subject to high duties.

In the fiscal year ending June 30, 1852, the importations of unmanufactured flax, chiefly from England, Russia, and Holland, and subject to a duty of 15 per cent. ad valorem, amounted to 3,162,208 pounds, valued by the custom-house at $175,342; and of codilla or tow of flax and hemp, 686,224 pounds, worth $35,717.

In 1860, the value of flax imported in the unmanufactured state, duty free, was $213,687, and in 1862 it was $175,870, or about the same as in 1852; for less than half the quantity imported in that year, or 1,421,628 pounds, entered at a duty of $15 per ton.

Of manufactured flax, the total value imported in 1852, subject to a duty of 20 per cent., and including bleached and unbleached linens alone to the value of $7,603,603, was $8,516,109. And of hempen manufactures, exclusive of cordage, $391,608. In 1860, the value of linens imported was $9,245,816; and of all other manufactures of flax, $1,490,519; the duty on which was about 15 per cent. ad valorem. The manufactures of hemp, exclusive of thread and twine, imported the same year, amounted in value to $767,135.

In 1862, 15,456,358 yards of linen, valued at $2,894,314, and other manufactures of flax to the value of $3,173,672, were imported, the latter sum including thread and twine valued at $876,057. Of hempen manufactures, exclusive of cordage, the value imported was $1,471,193. The duty on all costing less than 30 cents a yard was 25 per cent., and when costing over that price, 30 per cent.

HISTORY AND STATISTICS.

As flax and hemp, in former times, held relatively a much more important place among textile materials than at present, the first colonists of America, many of whom were from the flax-growing and linen districts of the British islands and of Germany, encouraged their cultivation from the outset, and chiefly as a material for household stuffs.

Flax was cultivated in New Netherlands as early as 1626, and three years later the seeds of flax and hemp were sent to Massachusetts. In 1640, a public order was made in Massachusetts respecting the manufacture of linen cloth, by ascertaining how much seed there was in every town, and what persons skilled in breaking, spinning, and weaving; and, also, what means should be taken for teaching all boys and girls to spin. Later in the same year, a bounty of 3*d.* for every shilling's worth of linen, woollen, and cotton cloth, made in the province, was offered and paid the next year to several persons for 83 yards, valued at 12*d.* a yard, which was probably of flax, and possibly the first products of the loom in this country. About the same time, flax and hemp were ordered to be sown by each family in Connecticut to preserve seed, and, as the act reads, "that we might in time have supply of lynen cloath amongst ourselves." Inspectors of linen and woollen yarn, with power to regulate their price, were appointed in the latter colony in 1644.

In 1641, the authorities of Salem, Massachusetts, set apart an acre of ground to Samuel Cornhill for the cultivation of flax, in a locality which, until near the present date, has borne the name of the Flaxponds. The heads of families were, at the same time, required to instruct their children and servants how to gather and improve the wild hemp, "growing wild all over the country," probably the *apocynum canabinum*, or Indian hemp, a species of dogbane, from which the Indians made clothing, bow-strings, nets, mats, lines, &c.

In 1670, the people of New York were said to make all their own linen, in which they excelled; and three years later the collector of customs reported that no linen was made in New England worth above 2*s.* 6*d.* a yard. Materials for linen were plentiful in New Jersey in 1684, flax, twice heckled, selling for 9*d.* a pound; and the German settlers of Pennsylvania had already commenced the making of linen and hosiery, which afterwards became noted products of that province.

Queen Elizabeth is said, by an early writer, to have worn some fabric made of a native fibrous material called silk grass, growing abundantly in Virginia. Captain Matthews, an early settler of that colony, cultivated and manufactured flax and hemp quite extensively previous to 1650. In the following year premiums were offered for the cultivation of hemp, and in 1657 for flax. In 1662, two pounds of tobacco were offered for every pound of these materials prepared for the spindle, and three pounds for every yard of yard-wide linen made; every tithable person being, at the same time, required to produce annually two pounds of dressed hemp or flax.

An act of Parliament, passed in 1704, for encouraging the importation of naval stores from the plantations in America, gave a bounty of £6 on each ton of water-rotted hemp sent to England, which secured considerable attention to the production of that staple, and the domestic manufacture of linens was discouraged by allowing a drawback on all foreign linens imported into England on their reshipment to America, and also by bounties on the export of British and Irish linens.

The first considerable improvement made in the domestic manufacture of flax and hemp, which though altogether of the household kind was quite extensive, was by the introduction of the linen or foot spinning wheel for spinning flax. It was introduced in New Hampshire about the year 1719 by the Protestant Irish, who settled at Londonderry, and also brought with them a better knowledge of the flax culture. and, it is said, introduced that valuable esculent, the Irish potato. Some of these

people also settled in Massachusetts, and their success in the linen manufacture induced the assemblies of Massachusetts and Rhode Island each, in 1722, to grant bounties of 20*s.* for each bolt of sail duck made in these provinces from domestic materials. These were paid by the former to John Powell, and by the latter to William Borden, each of whom received as additional encouragement a loan of $3,000 from his government. Richard Rogers, of New London, Connecticut, also, in 1724, received a patent for making canvas for shipping, of which he presented excellent samples; but in 1735 he was refused like privileges for the manufacture of "fine linen cloth." Liberal premiums were also offered in these colonies for raising flax and hemp; and in Massachusetts, in 1734, surveyors were appointed of these commodities, which were so generally cultivated that for several years they were received at the public treasury in payment of taxes, flax at 6*d.* and hemp at 4*d.* a pound. About the same time, a large "spinning school" for the poor was inaugurated in Boston, with great public enthusiasm, and sustained by subscriptions and by a tax on carriages.

Similar bounties and encouragements were given in Pennsylvania and Maryland for the culture and manufacture of flax and hemp, and were continued in various forms in all down to the Revolution. In 1751, upward of 60 wagon loads of flaxseed entered Baltimore for exportation. And in the following year, as testified by Dr. Franklin before the House of Commons, 10,000 hogsheads or 70,000 bushels of flaxseed were exported from Philadelphia, and all the flax grown was manufactured into coarse linens. In 1771, the quantity thence exported was 110,412 bushels, and from New York in 1755, 12,528 hogsheads. In 1791, the exports of that article from the United States were 292,460 bushels, an amount never since equalled, and upward of one-half the total quantity produced in the United States in 1860, which was 566,867 bushels.

The diminished importations from Great Britain for several years preceding and during the Revolution, and the various measures adopted to supply their place by domestic products, including liberal bounties by Congress and by local committees for the production and manufacture of every kind of raw material and the construction of improved machinery, gave a new impulse to the flax and hemp culture. The household manufactures of linsey woolseys and other mixed fabrics, of wool and flax or cotton and flax, of tow cloth, osnaburgs, brown hollands, for women's wear, dowlas, bagging, &c., which formed a large part of the ordinary inner and outer clothing and household stuffs of the people, were very much extended and went far to supply the demand. Many small factories of sail cloth and other kinds of linen were organized in different places.

Of the latter article a large manufactory was erected in Boston about 1788, by an incorporated company, who were encouraged by a bounty on its manufacture, which it is said to have produced of a quality superior to any before made in America, and sold lower than imported sail cloth. The sails and cordage of the ship Massachusetts, of 800 tons, built about 1790, were wholly made in Boston, and two years after the factory referred to employed 400 hands, and made 2,000 yards of duck weekly. Its annual product for a number of years was between 2,000 and 3,000 bolts of 40 yards each, worth $13 per bolt.

A manufactory of sail cloth was commenced at Haverhill, Massachusetts, in 1789, and others near the same time at Salem, Springfield, and Nantucket, Massachusetts, at Exeter, New Hampshire, and Newport, Rhode Island. Those at Salem and Newport, which were prosperous seaports, became flourishing concerns.

In 1796, the Globe mill, for spinning and weaving flax, hemp, and tow by water-power with patent machinery, was put in operation in Philadelphia by James Davenport. The labor was done chiefly by boys, each of whom was able to spin in ten hours 97,333 yards of flaxen or hempen thread, using 20 to 40 pounds of hemp according to fineness, and another could weave on the machinery 15 to 20 yards of sail cloth per diem. It was suspended in 1798 by the death of the proprietor. Several patents were recorded in the United States in connexion with this branch before the close of the last century. Kentucky supplied nearly the whole cotton country with baling linen in 1809.

The census of 1810 returned 21,211,262 yards of flaxen cloths made in families, &c., of which

the value of about 12,214,867 yards only is given, which amounted to $4,507,571. About one-fourth of the whole quantity was made in New York, where the value of such cloths made was $2,014,742. Virginia was next in the number of yards produced, which was nearly 5,000,000, but the value was not given. Connecticut manufactured upward of 2,250,000 yards, valued at $800,359, and Pennsylvania almost 3,000,000 yards, of which the value was not returned. In Vermont 1,859,931 yards were made; and in New Hampshire and Ohio, upward of 1,000,000 yards each. The returns of that year also embraced 22,131,553 yards of blended and unnamed cloths and stuffs; 1,821,193 yards of mixed and hempen cloths chiefly mixed; 802,718 yards of tow cloth; 453,750 yards of bagging made of hemp for packing cotton, chiefly the product of thirteen establishments in Kentucky; besides some mixed and flaxen cloths, chiefly the former, made in Carolina and Georgia. There were also reported, as the product of manufacturing establishments, 3,025 pieces of sail duck made in Massachusetts and valued at $80,813; other hempen cloths, to the value of $12,148, made in Connecticut; and 36,714 yards of the same, probably bagging, manufactured in Philadelphia, besides 26 tons of hempen and flaxen yarn spun in six mills in that State.

Although labor-saving machinery, for spinning as well as doubling, trebling, and twisting, was then used to some extent both by water and steam-power in regular establishments, and some of these had been introduced into families, this extended manufacture of flax and hemp was almost wholly, as it then was in foreign countries, a household industry. Flax and hemp had for some years been regularly imported under a high duty in considerable amount to supply the demand, although the culture of these crops was quite general, as shown by the number of flaxseed oil mills, of which returns were made from fourteen States to the number of 383. They made 770,583 gallons of oil annually, valued at $848,809, nearly two-thirds of which was the product of 171 mills in Pennsylvania. The quantity of hemp returned was 5,755⅛ tons, valued at $690,625. In Connecticut, where the cotton manufacture was already somewhat advanced, the value of linen cloths of various kinds returned (exclusive of sewing thread, linen chain for mixed goods, tapes, bobbins, fringe, lace, webbing, &c.) was equivalent to 3.05 cents per capita of its population; and in Vermont linen was produced in about the same proportion, at an average value of 35 cents per yard. In the latter State and Pennsylvania, which made the fullest returns of spinning wheels, the number of these machines amounted to 200,000, of which two-fifths were supposed to be employed in flax.*

The subsequent decline of the linen manufactures of the Union in relative value was undoubtedly attributable to the rapid growth of the cotton culture and manufacture, which furnished a more profitable crop to the southern agriculturist and a more available material to the manufacturer. The introduction of merino sheep about the same time, and of regular manufacturing establishments for both wool and cotton, also contributed to the decline of household spinning and weaving, into which flax and hemp entered largely as a material. The manufactories of sail duck previously established at Salem, Massachusetts, and in Connecticut and Rhode Island, had been abandoned or suspended on account of the high price of hemp, which rose in 1814 to $275 per ton. The substitution of cotton duck about this time also operated against the extension of that branch of the linen manufacture.

In 1812 a patent was taken out in the United States by Mr. Charles Whitlow, of New York, for the manufacture of an indigenous perennial plant, found abundantly in western New York and other States, which had been occasionally used for making thread. It was supposed to be a species of nettle, and in honor of Mr. Whitlow, who claimed to have discovered its valuable textile properties, was called *urtica whitlowi*. About 500 pounds of dressed fibre could be produced from an acre, which was spun into six hank yarn, valued at $11 per pound, at a profit of 50 per cent. A company was incorporated in New York the next year to manufacture the yarn, but with what success we are not informed. With the present increased demand for fibrous materials and improved modes of treating them, this plant, then thought superior to flax or hemp, may be deserving the attention of manufacturers.

* Coxe's Statement of the Arts and Manufactures of the United States.

Since 1801 flax had been extensively cultivated on the German flats in Ontario county, in that State, and during the war its cultivation on an extended scale was commenced in Washington and Rensselaer counties, which have since been the principal flax-growing region of the State. It was found to be a profitable crop at 18¾ cents a pound, the current price; and in 1845 about 46,000 acres in the valley of the Hoosac were occupied with flax, producing 2,897,062 pounds. An incorporated linen company was in operation at Schagticoke in 1814, and some others elsewhere in the State.

Many attempts have been made in Europe and the United States to introduce machines and processes by which flax could be dressed, spun, and woven with a facility and cheapness approximating those with which cotton is manipulated. A principal obstacle to the general use of flax as a textile material has been the expense of harvesting and preparing the fibre for the spindle. Instead of being pulled by hand, as in former times, the harvesting of hemp and flax is now done by the scythe or cradle or other machinery, which the cost of labor in this country renders indispensable. The former rude processes of breaking, scutching, and heckling have also given place to labor-saving machinery. The "boon" or woody envelope is broken and separated from the "harl" or textile filament which it encloses by means of fluted cylinders, and the "shives" afterward shaken from the straw, while the scutching is effected by a series of swingling knives attached to a shaft and revolving rapidly in close proximity with the scutching board on which the flax is held. More expensive machines are also in use, which break and scutch the straw at the rate of one to two tons in ten hours, by a process of grinding and fanning, and are used in the preparation of flax cotton. These as well as several of the flax brakes and scutching machines with fluted rollers are adapted as well to unrotted as to rotted flax, though some loss of fibre occurs in the former case. A "portable flax and hemp dresser," of recent American invention, breaks and scutches the flax at the same time by means of fluted rollers of peculiar shape, and in its most improved form, it is said, enables five men and two boys with the power of two horses to prepare one thousand pounds of clean fibre daily. It is equally adapted to rotted or unrotted flax, and to the preparation of long-line flax and tangled flax or tow, and by many is considered the best in use. Other machines are in operation designed more especially to utilize the tangled straw of flax raised only for the seed, by converting it into short stock or tow of different qualities, and into "*fibrilia*" and "*erolin*," or flax wool, &c., in which the fibrils are so broken up and separated as to be carded and spun on cotton machinery. There are still others for preparing the fibre of other native or tropical plants, as the *Agave Americana*, &c., for textile uses.

Mechanical means alone, however, have never fully succeeded either in separating the filaments of flax from its cortical epidermis and woody core or boon, or in so "cottonizing" the fibre as to fit it for automatic spinning machinery. Other means have been long used for aiding the separation, by partially dissolving the glutinous substance by which the several tissues are united and the bast cells, which compose the separate fibres, are cemented together. Chief among these means are the processes known as dew-rotting, water-rotting, and steeping, in which a partial disintegration is effected by the aid of moisture. The simple immersion of the straw in a tank of soft water, as in water-rotting, produces an incipient fermentation, and sufficiently overcomes the adhesion of the parts for the subsequent operations of breaking and scutching. The process may be more expeditiously and perfectly effected by the aid of chemical solvents and of hot water or steam.

Of the latter description was the patented process of Mr. Schenck, an American, which consisted in steeping the flax in water warmed to 80° or 90°. This method, which has been extensively adopted in Ireland, favored the fermentative process, and reduced the time of preparation from two or three weeks to three or four days, (72 to 96 hours,) according to the quality of fibre, which was thereby improved and its product increased. The first rottery on this principle was established at Mayo, in 1848.

Chemical agency has also been used in China and Europe from an early period for disintegrating the fibres of flax and facilitating its preparation. The process which has attracted most attention is that of Chevalier Claussen, patented in England in 1850. By boiling the cut and crushed flax straw

first in a solution of caustic soda and afterward in dilute sulphuric acid, and then soaking it a short time in alkaline and acid baths, he was able in 12 to 24 hours to transmute it into a light, cotton-like material called flax cotton, adapted to the cotton spinning mill, and capable of being combined with wool, cotton, or silk, and also of being dyed like those materials.

This problem of preparing flax for spinning economically on cotton or other machinery had been long sought, and as early as 1840 Mr. Sands Olcott, in this country, operated machinery which enabled him to prepare unrotted flax for carding and spinning at eight cents a pound, and soon after he gave lectures on the subject of his improvements, which were suspended by his death. Mr. Slack, of Renfrewshire, in Scotland, also patented, in June, 1849, a chemical process somewhat analogous to Claussen's, which enabled him to make samples of excellent flaxen goods, spun and wrought on cotton machinery.

In January, 1852, the New York Agricultural Society offered a premium of $100 for the best experiment in that State in the preparation of flax as a substitute for cotton. Near the same time the American Linen Manufacturing Company purchased the right of using Claussen's process in the United States; and prepared to put it in operation at Lockport, in that State, with a capital of $500,000, of which $350,000 was paid in and invested in buildings and machinery. They offered the highest price for prepared flax. Flax cotton prepared in this way and by other modes has been produced in different parts of the country, and several small cotton mills have been adapted for using short flax stock and hemp stock prepared by chemical agency, by the steam processes of Watt and of Buchanan, of Glasgow, or by mechanical means, separately or in combination, in the manufacture of coarse fabrics of flax or mixed materials. The cheapness of cotton, however, and certain defects still found in the Claussen method, prevented its general adoption. In July, 1861, when cotton had risen in price, the Rhode Island Society for the Encouragement of Domestic Industry, in addition to premiums previously offered, without conditions, for the first and second best bales of prepared flax cotton of fifty pounds each, offered a premium of $500 for samples of that article with especial reference to its practical use as an economical substitute for cotton. In September, Stephen Randall, of Warwick, J. C. Butterworth, of Providence, and J. Knowles, presented bales of flax cotton; Hale & Farrar, of Jamaica Plains, samples of fine flax cotton and also of fine and coarse flax wool; and Mr. Anderson, of Louisville, Kentucky, specimens of carded flax, &c. Among manufactured products presented were 15 samples of colored flax and pieces of 37-inch sheeting containing 25 per cent. of flax, and other fabrics with 30 per cent. of that material.

Among the numerous producers and manufacturers of flax cotton, and cotton from hemp, from asclepias, cotton-grass, &c., is S M. Allen, of Boston, who commenced experiments in cottonizing flax in 1851; and in 1858, with J. C. Butterfield and others, established at East Greenwich, Rhode Island, a mill with machinery adapted for working up *fibrilia* or fibrilized flax. The next year he fitted up a small mill at Watertown, Massachusetts, where calicoes and sheetings, half cotton and half flax, were made. H. McFarlane, of Rocky Hill, New Jersey, commenced making flax cotton by the Claussen process, on a commercial scale, in 1854, with such success as to be able to organize a company with a capital of $200,000, whose product was chiefly sold at Lawrence, Massachusetts. Fuller & Upham, of Claremont, New Hampshire, R. Fletcher, of Oswego, E. Towne, of Utica, and C. Beach, of Penn Yan, New York, the last using mechanical means chiefly; H. Burgess, of Reyer's Ford, Pennsylvania; S. Roberts and George C. Davies, of Cincinnati; O. S. Leavitt, of Louisville, Kentucky, and many others, have been engaged in making or working up cottonized flax and other fibres. Among the mills that have been altered or established to manufacture this material are the Hope and Penn mills, at Pittsburg, Pennsylvania, which make the best quality of flax grain bags, and stock for batting for upholsterers; the Lockport mills, which make flax cotton twines of a high grade, brown and bleached stock for upholsterers, waddings, and coarse yarns; the Medina Flax Company's mills, at Medina, New York, producing similar goods to the last and of superior quality; the mills of Governor Smith and others, at Warwick, Rhode Island, making excellent grain bags, carpet warps, twine, rugs, &c.; the Fibrilia

Manufacturing Company, at Lawrence, Massachusetts, making printed carpetings, rugs, and crumb cloths, &c., from prepared flax and wool; the American Felting Company and the Mystic mills, at Winchester, Massachusetts, making carpetings, &c.; the Flax Leather Company, at Natick, Massachusetts, making fibrilia leather for inside soles, heel stiffenings, &c.; the Berkeley Company, which makes carpet linings, &c.

The flax cotton prepared by Messrs. Fuller & Upham has been spun on cotton machinery into yarn as fine as No. 24, (cotton gauge,) and also woven as weft or filling into print cloth. The greater part of the flax cotton stock as now prepared by machinery is spun and woven into crash, osnaburgs, burlaps, and sugar cloths. It makes excellent twine, and when doubled for warp makes the best kind of grain bags. There are mills at Pittsburg, Pennsylvania, and some in Canada for preparing the flax fibre for the manufacturers.

In February, 1863, Congress appropriated $20,000, to be expended under the direction of the Commissioner of Agriculture, for "investigations to test the practicability of cultivating and preparing flax or hemp as a substitute for cotton."

The commission appointed under this act have made a report, just published, which presents, on the whole, an encouraging view of the subject; but the commission, from the limited investigations it has been able to make of the subject, does not consider the preparation of flax cotton sufficiently developed to enable them to predict decidedly its ultimate success.

In the spinning of long-line flax by machinery, for which a large reward was offered in France in 1808, the first successful results were attained by the brothers Girard, at Paris, about two years later. At Leeds, Dundee, and Belfast, much greater perfection has since been attained in that respect. In 1826 a valuable machine for spinning flax, invented by the late Walter Hunt, was patented by Hunt & Haskins, of New York, which promised excellent results.

In 1849 the American Institute awarded Henry H. Stevens, of Webster, Massachusetts, the Talmadge gold medal, offered in 1847 by the president of the institute for the first and best piece of American linen spun by machinery and woven on the power-loom ever exhibited at its fairs. Linen thread of superior quality, spun by machinery, had been previously exhibited.

In 1855 the American Linen Company, of Fall River, Massachusetts, the first and only regularly equipped manufactory of linens on a large scale from long-line flax in the United States, exhibited at the New York exhibition a variety of power-loom linen fabrics of excellent quality, such as tablecloths, napkins, diaper sheeting, pillow-cases, towelling, coatings, crash, &c. The American Linen Thread Company, at Mechanicsville, New York, exhibited their patent thread, said to be equal to any imported.

Shoe thread and sewing twine are now made extensively at Andover, Massachusetts, where 650 tons of flax and tow, chiefly imported, are annually used; American flax being used for coarse yarns chiefly.

It is to be hoped that the experiments now in progress in cottonizing flax, hemp, and other fibrous materials, may result in a cheap and economical mode of utilizing the vast amount of flax fibre now annually wasted in the western States, where the plant is principally grown for its seed or for seed and lint. With the extension of our agriculture in the grain, cotton, and sugar regions of the south and west, the demand for cotton bagging, grain bags, sugar cloths, &c., will be immense, and the present tariff will so protect both the flax and hemp growers and the manufacturers, that we may hope ere long to be independent of foreign countries both for raw material and for nearly every product of the linen manufacture.

Statistics of linen goods manufactured in the United States during the year ending June 1, 1860

STATES	Number of establishments.	Capital invested.	Tons of flax used.	Cost of all raw materials.	NUMBER OF HANDS EMPLOYED.		Annual cost of labor.	Annual value of product.	Quantities produced.
					Male.	Female.			
Massachusetts	3	$490,000	695	$228,575	159	167	$73,800	$515,000	*6,200,000
New York	7	149,795	303	99,195	92	110	39,248	184,570	†518,000
Total	10	639,795	998	327,770	251	277	113,048	699,570	.....

*Yards of crash. †Pounds of thread, twine, and shoe thread.

HEMP AND MANILLA CORDAGE.

The manufacture of ropes and cordage in the United States is mainly confined to a few large establishments, although there are many small ones scattered throughout 18 States of the Union.

This industry on the 1st of June, 1860, employed in all 190 establishments, having invested an aggregate capital of $2,938,289, and giving employment to 2,860 male and 618 female hands. The annual cost of raw materials used was $5,665,520, and of labor on the same $966,216. The total product of the manufacture returned was 40,346 tons of cordage, valued at $7,843,339.

Of the whole number of establishments, 34 were in New England, 80 in the middle, 67 in the western, 7 in the southern, and 2 in the Pacific States.

Of the eastern factories, 30 were in Massachusetts, 3 in Maine, and 1 in Vermont. Their total capital amounted to $762,400, the number of hands to 919, of whom 160 were females, and the annual product was 9,223 tons of rope and other cordage, worth $2,163,316. The cost of material was $1,616,097, and of annual labor, $272,524.

The 30 rope-works in Massachusetts had collectively a capital of $717,600, and employed 725 males and 152 females, at an annual cost for wages of $260,096, and for material of $1,538,442. They made 8,804 tons of cordage, valued at $2,069,816. They consumed 8,783 tons or 17,566,000 pounds of hemp and flax, &c., at an average cost of 8¾ cents a pound. These establishments included several of the largest establishments in the country. Three establishments in Norfolk county, which produced the largest amount of cordage, &c., consumed upward of 6,500,000 pounds of hemp and flax and cotton, and made 6,800,000 pounds of cordage, (including some cotton twine and thread,) valued at $700,000, of which more than one-half, or $390,000, was the product of the Day Cordage Company, at Roxbury. It employed a capital of $200,000 and 183 hands, and wrought up by steam-power 3,000,000 pounds of Manilla, 700,000 pounds of Russian, and 400,000 pounds of American hemp, making 4,400,000 pounds of cordage, valued as above stated, in addition to 170,000 pounds of oakum, worth $8,000, made from 200,000 pounds of junk. Another establishment, in the same county, made 1,200 tons of cordage, valued at $300,000. Four factories in Plymouth county consumed upward of 5,500,000 pounds of hemp, and manufactured tarred and other cordage and lines to the value of $665,242. The largest in the county was the Plymouth Cordage Company, having a capital of $150,000, which consumed 300 tons of Russian, 250 tons of American, and 11,000 bales of Manilla hemp. It employed 120 spinning jennies and as many male hands and a steam-power of 200 horses, and made 1,800 tons of cordage, valued at $390,000. The Hingham Cordage Company also made 914 tons of cordage, worth $153,142, and the New Bedford Cordage Company, in Bristol county, about 1,200 tons of cordage, valued at $240,000. The Marblehead Cordage Works, in Essex county, made 1,297,300 pounds of cordage from Manilla, Russian, and American hemp, valued at $110,725. The largest establishment in that county was that of Smith, Dove & Co., at Andover, which manufac-

tured small cordage, twines, and shoe thread, chiefly the latter, to the value of $213,900, consuming 650 tons of flax and tow.

The total product of Massachusetts embraced a considerable value of cod and mackerel lines, bed cords, clothes-lines, twine, and thread, made from hemp, flax, flax cotton, cotton, and cotton yarn. Cotton twine, &c., is made at the Rochdale mills, in Worcester county; by Whitman & Co., in Hampden county; by several small mills in Essex county; at Walpole and Mansfield, in Norfolk county; and at Swansey, in Bristol county. Much of the value of "cotton cordage," which is extensively used, is, however, included in the returns of cotton manufactures of Massachusetts and other States.

The 3 cordage factories in Maine reported a manufacture of 400 tons of cordage, valued at $83,500; and 1 in Vermont produced 19 tons, worth $10,000—included in the latter was the value of some shoe thread made.

The 80 establishments in the middle States represented an aggregate capital of $1,105,159, and employed 1,144 males and 301 females, whose annual wages cost $323,744, and consumed raw materials of the value of $1,644,237. They produced 13,495 tons of cordage, valued at $2,565,485, or nearly one-third the total product of the Union.

The State of New York was the largest producer, 33 factories in that State, with a capital of $680,559 and 721 male and 251 female hands, having manufactured 9,600 tons of cordage, valued at $1,719,094. The cost of material used was $1,049,734, and of labor, $211,556.

The principal establishments are those of Brooklyn and Williamsburg, in Kings county, which contained 12 factories, with a capital of $577,500 and 708 hands, making cordage of the value of $1,390,196 annually. The establishments of Lawrence, Waterbury & Co., and William Walls' Sons, in Williamsburg, and of Tucker, Cooper & Co., in Brooklyn, are the most extensive, and among the largest in the United States.

One of these manufactories employed a capital of $250,000, consumed raw material to the value of $371,500, and made by steam-power, with the labor of 153 male and 43 female hands, 5,656,000 pounds of cordage, valued at $515,000. It was the largest cordage factory in the United States. Another steam cordage factory of 110 horse-power, employing 90 hands, consumed 12,000 bales of hemp and made 3,240,000 pounds of rope, worth $270,000. A third factory, with a capital of $200,000, made from 1,600 tons of Manilla hemp, costing $210,000, and other materials to the value of $101,650, 1,600 tons of Manilla and 690 tons of other rope, the former valued at $256,000 and the latter at $132,500. Two other rope-works in the county made rope and cordage to the value, respectively, of $99,708 and $60,000. There were other large factories at New York, Poughkeepsie, Albany, Troy, Lansingburg, &c.

From Pennsylvania 37 cordage establishments were reported, but their aggregate product was less than one-fourth the value made in New York. The capital invested was $269,500, and the manual force 241 persons, of whom 9 were females. The cost of material was $230,167, and of labor, $62,004 per annum. The product was 2,140 tons of cordage, the value whereof was $381,901.

The principal manufactories were in Philadelphia, which contained two large and several smaller establishments, making altogether upward of $250,000 worth of every description of small rope, cordage, twines, spun yarn, &c. The largest establishments were those of Weaver, Fitler & Co., one of the oldest and best equipped in the country, and that of Sproat, McIntyre & Co., (now McIntyre & Schlichter,) each of which had two factories. The former was capable of turning out annually 4,500,000 pounds of rope, or about 7 tons weekly; and the latter, in addition to other materials consumed weekly in the manufacture of small rope, twines, and lines of every kind by patent machinery, about 50 bales of jute hemp, which they were one of the first to employ in making twine for securing the corks in mineral water bottles, and other kinds of twine.

New Jersey numbered 5 cordage factories, with a capital of $120,000, and employed 136 males and 41 females, producing 1,475 tons of cordage, worth $396,400. The largest in the State was that of the Elizabethport Cordage Company, which was among the principal establishments in the country.

Maryland had the same number of manufactories as New Jersey. Their combined capital was $34,900, and the number of hands was 55. They made 280 tons of cordage, valued at $68,090, of which all but $1,600 was the product of 4 establishments in Baltimore. Considerable Manilla cordage is made in each of the middle States reported.

Sixty-seven cordage establishments in 7 of the western States produced a larger aggregate value of manufactures, including bale rope, than those of any other section of the Union. Their capitals amounted collectively to $887,080, and they employed 842 male and 140 female hands, whose wages cost annually $255,756. The cost of the raw material used was $2,085,786, and the weight of cordage made 15,206 tons, valued at $2,700,888, or more than one-third the total value made in the United States.

Missouri, Kentucky, and Ohio were the largest producers of bale rope and other cordage, only 101 tons having been made outside of those States. This manufacture employs about 7 establishments in Cincinnati, making cordage to the value of about $120,000 annually. Missouri numbered 21 establishments, with capitals aggregating $398,505, and giving employment to 277 male and 87 female hands, for whose labor was paid annually the sum of $101,808. The cost of material was $1,014,010, and the total value of the manufactures was $1,232,840, which was the value of 7,245 tons of cordage, chiefly bale rope, made in St. Louis, an amount exceeding that of all other States except New York and Massachusetts. Kentucky held the third rank in the Union in the value of cordage returned. It had 16 establishments, and a total capital of $351,500 employed in the business. The number of hands was 323 males and 44 females, the cost of wages $88,836, and of material $963,712, and the product was 6,839 tons, valued at $1,240,800. In Ohio 22 factories, combining a capital of $129,475, made, with the labor of 223 hands, 1,021 tons of cordage, worth $200,103. The total value of 101 tons of rope, &c., made by 8 factories in Indiana, Illinois, Michigan, and Wisconsin, was $27,145.

From the southern States returns were received of 7 establishments in Virginia, Louisiana, and Tennessee, with an aggregate capital of $133,500, and employing 81 male and 17 female hands, at an annual cost for wages of $94,992, and for material of $211,500. They manufactured 1,620 tons of cordage, which was valued at $260,650. This was principally the product of Louisiana, in which 3 establishments employed $123,500 in capital, 56 male and 16 female hands, and produced 1,512 tons of bale rope and cordage worth $228,500, at a cost for raw material of $192,000, and for labor of $88,800. The other States named had each 2 small establishments, producing together 108 tons of cordage, worth $32,150.

In California 1 large manufactory, with a capital of $50,000 and 32 male hands, made 800 tons of Manilla cordage exclusively, which was valued in the sum of $150,000, the cost of material being $106,000, and of labor, $18,000. There was also a small establishment in Utah which reported 2 tons, valued at $3,000.

In the foregoing statistics is embraced a small proportion of cotton cordage, which is now extensively used for ropes and especially for small lines, cords, and twines, but the greater part of the value is included in the products of the cotton manufacture. It is made at several factories in the southern States, and on a larger scale at Norwich, Connecticut, and elsewhere in New England.

HISTORY AND STATISTICS.

As long ago as 1620, our early annalists inform us, directions were given by the association under whose auspices Virginia was colonized, for the making of cordage and the growing of hemp and flax, and especially of silk grass, an indigenous plant which had been found, on experiment, to make the best cordage and lines in the world. Ten years previous Sir Thomas Gates directed attention to the value of the native hemp, flax, and silk grass of the country as a material for cordage, and in 1620 each family was required to set out 100 plants of the latter and the governor himself 5,000 plants. It then sold for 6*d.* a pound, hemp being worth in the colony 10 to 22 shillings, flax 22 to 30 shillings, and cordage 20 to 24 shillings per hundred weight.

The encouragement given in colonial and later times to the culture of flax and hemp has been referred to in connexion with manufactures of the former.

Rope-making appears to have been commenced in Boston about 1641, some 12 years after the first culture of hemp in New England. It was undertaken by John Harrison, who came from Salisbury, England, for that purpose, at the suggestion of several gentlemen of the town, and for 20 years or more maintained a large family by his industry. In 1662 John Heyman, of Charlestown, was permitted by the selectmen to make ropes in Boston, but in the following year was ordered to desist from "making fishing-lines, during the pleasure of the town." On further consideration he was prohibited from making ropes, and had liberty to make fishing-lines only, and finally was ordered to take up his posts and depart the town, because he was found to "interfere with Mr. Harrison's income." The business of the latter was also limited by the scarcity and high cost of material.

The making of ropes was then carried on in the open field, and with the rudest appliances. The business, however, steadily increased in Boston, which was the principal commercial port of the country, and in the federal procession in 1788, rope-makers, preceded by William McNeil, numbered 75, and outnumbered any other class of mechanics. Between the hands employed in McNeil's, Gray's, and other ropewalks in the vicinity of Atkinson street occurred the first collision between British soldiers and American citizens, in 1770, which soon ripened into revolution. In 1794, when there were 14 large ropewalks in Boston, (and a company that manufactured twines and fishing-lines considered equal to the Bridgeport lines of England,) seven, in the neighborhood just mentioned, were destroyed at one time by a disastrous fire, the larger ones, at the west end, escaping the conflagration. From that time ropewalks were not allowed to be built within the city, and on the flats west of the common, which were assigned for that purpose, free of rent and taxes, six ropewalks were erected, which were burned in 1806, rebuilt, and again destroyed by fire in 1819. Several ropewalks were also burned at New Boston in 1796, when Boston contained eleven, and Charlestown three lately erected. There were others in the seaports of Massachusetts, which then owned more than one-third of all the shipping of the United States, and more than three times as much as any other State.

Petitions were laid before Congress, in 1808, from 10 manufacturers of twines and lines in Boston, Charlestown, Salem, Beverly, and Plymouth, Massachusetts, asking for an increased duty on those articles, of which they annually made from hemp 46,000 dozen lines and from flax 27,500 pounds of twine.

In Newport, Rhode Island, which, at the Revolution, rivalled Boston in trade, and was much ahead of New York, there were five or more ropewalks in operation in 1769. Much of the hemp and yarn used by the New England rope-makers was imported.

A ropewalk was first erected in New York, in 1718, along Broadway, between Barclay street and Park Place, then a part of the "common." There were a number in that city in 1755, and the business constituted a profitable trade. A covered ropewalk was put in operation at Hudson city previous to 1786, and in 1810 there were 20 in the State, 16 of which, including several in New York, Brooklyn, and Williamsburg, made upwards of half a million dollars' worth of cordage, valued by the marshals at an average of $400 per ton.

An English traveller makes mention, in 1698, of "several rope-makers having large and curious ropewalks, especially Joseph Wilcox," in Philadelphia, where rope-making in later years became quite an extensive business, deriving support from the commercial pre-eminence of that city. An act of the provincial assembly, in 1730, for continuing encouragement to hemp-growers, imposed penalties for manufacturing unmerchantable hemp into cordage, and added to the parliamentary bounty on hemp three half-pence a pound on that material.

In 1790 there was in operation in Philadelphia complete machinery to sliver, rove, and spin hemp and flax by water-power, not only into strands and yarn for cordage, but also into yarn and thread for coarse linens of 30 cuts to the pound. In June, 1794, George Parkinson, of Pennsylvania, who had previously patented a flax and hemp spinning-machine, recorded the first American patent for the manufacture of cordage, in which he was followed the next year by John Pittman, of Rhode Island,

who took out several patents of that nature. Two years later there were 10 ropewalks in Philadelphia, which manufactured, annually, about 800 tons of hemp. In 1810 there were 15 in the county and 35 in the State, the former making cordage to the value of $330,113.

Previous to 1803 a ropewalk was erected in Pittsburg by John Irwin, and others within a year or two. In 1836 the first mentioned was run by steam, and made annually, by patent machinery, $100,000 worth; and another new one had a capacity for $120,000 worth of cordage annually, being one of the largest in the western country.

Rope-making was commenced in Baltimore early in the last century, by William Lux, a ship-owner, and in 1771 a Mr. Smith had a ropewalk near Bond street. The manufacture of cordage in that place kept pace with the rapid growth of the city, and with the ship-building interests of the State, which, in 1790, built as many vessels as any two of the States of New York, Connecticut, and Rhode Island, and even exceeded New Hampshire. In 1794 Maryland and Virginia had more manufactories of cordage and cables than any two of the States of New Jersey, Connecticut, New York, and New Hampshire, insomuch that Virginia laid a duty of two-thirds of a dollar on imported cordage. Large ropewalks and much shipping, &c., were destroyed by Arnold, in 1781, at Warwick, Virginia, and a few years later there were ropewalks at Winchester, in that State, and at Wheeling, on the western waters.

In 1796 James Clamorgan, a merchant of St. Louis, obtained from the Spanish government a grant of nearly half a million acres on the west bank of the Mississippi, below New Madrid, for the purpose of establishing there, by the aid and instruction of Canadian farmers, the culture and preparation of hemp for an extensive manufacture of rope and cordage for his Majesty's navy and for Havana. The hemp culture was not commenced there, however, until after the cession of Louisiana to the United States, in 1803, previous to which a number of small bale rope, bagging, and cordage works had been set up in the western country, particularly in Kentucky. Long before the close of the last century American cordage was preferred by our ship owners to the imported article.

In 1810 the number of ropewalks in the United States, according to the official returns, was 173, exclusive of those in Massachusetts, which was the largest producer, New Hampshire, and East Tennessee, the number in which was not reported. The total value of cables and cordage made was $4,243,368, of which sum $1,068,044 was the value of 2,846½ tons made in Massachusetts. Maryland was next in the value of this manufacture, of which $561,800 was returned as the value of 1,080 tons made in 21 ropewalks in that State. New York and Connecticut each numbered 18 cordage works, the former producing 1,345 tons, worth $538,000, and the latter a value of $243,950. Kentucky reported the largest number of ropewalks, and next to Massachusetts, the greatest weight of cordage having 38 factories, producing 1;991½ tons, of which the value was only $398,400, while 35 ropewalks in Pennsylvania returned 933¼ tons, worth $357,498. There were 13 ropewalks in Rhode Island, 11 in Maine, 5 in Virginia, 6 in the District of Columbia, (chiefly at Alexandria,) and 2 each in Delaware, North Carolina, West Tennessee, and the Territory of Orleans. Although none were returned from Ohio in that year, the ship-building of the neighboring States supported three large ropewalks at Marietta in 1806, and ten years later there were two large ropewalks at Cincinnati, producing cables and cordage for exportation, and several others at Chillicothe.

The domestic cultivation of hemp had been much increased within a few years by the interruptions to foreign commerce, but the various manufactures of hemp, of which rope-making was the principal, required at that time an annual importation of about 6,200 pounds of foreign hemp. During the year 1,378,944 pounds of hemp and spun yarn, worth, at 15 cents a pound, $206,000, passed through Pittsburg, to Baltimore and Philadelphia for sale, and in the two months following November 24, 20,784 pounds of bale-rope, 154,000 pounds of rope yarn, 479 pounds of tarred rope, 27,700 yards of bagging, besides tow cloth, thread, &c., were shipped down the Ohio from factories chiefly at Louisville, Lexington, Shelbyville, Frankfort, Danville, and Shippingsport, Kentucky.

Although a number of patents were granted for making cordage, including one in 1808, by Robert Fulton and N. Cutting, of New York, which Fulton had previously patented in England, the manu-

facture of ropes, previous to 1819, was principally done by hand labor, except that in laying up the strands into rope, the twisting was done by horse-power at one end of the walk. In that year and the following Robert Graves, of Boston, took out several patents for improvements in the manufacture of cordage by machinery. Winslow, Lewis & Co., of that city, in 1821, had two ropewalks 1,200 feet long, with this machinery, worked by horse-power, and employing 100 men and boys at a cost of $32,400. They sold 746 tons of patent cordage for $18,000. This machinery was adopted in several rope-works in the country, including one in Philadelphia and two large ones in Pittsburg. In 1836 Tiers & Myers, of Philadelphia, the former of whom was also the patentee of machinery for laying ropes and cordage, having purchased the patent right, proceeded to erect large steam works on that principle at Wheeling, Cincinnati, Louisville, and St. Louis, that at Louisville having a capacity to make about $120,000 worth of patent cordage annually.

The improvement of Graves consisted, in part, in winding the threads upon revolving spools, from which they were conducted through an iron plate perforated with holes, and afterward through a cast-iron tube of a diameter suitable for the size of rope required. In the opinion of officers of the United States navy and others the cordage made by the Graves machinery was stronger than that made by the old method.

In October, 1831, Daniel Treadwell, of Boston, was granted letters patent for a method of spinning hemp and flax, and three years later recorded several other patents for improvements in the spinning and roping of these materials and in the manufacture of cordage. These contributed to the present improved condition of the manufacture.

A new machine for spinning rope yarn for cordage from flax and hemp without previous heckling was introduced in 1833 by Joseph Westerman, of New York. The machinery to spin a ton of hemp per diem, including 4 breakers, 6 finishers, 2 spinning, 3 doubling frames, and a 4-horse power steam-engine, &c., cost about $9,000. It was claimed that a saving of 8 to 10 per cent. in material was effected by it, and that a ton of hemp could be spun at a cost of $17 50. A combination among the spinners is said to have prevented its introduction into the large rope-works of Brooklyn and vicinity.

Moses Day, of Roxbury, Massachusetts, in 1836 and 1838, patented machines for spinning rope yarns and twisting the strands, by which a great saving of labor was effected.

A rope-making machine was introduced some 10 or 12 years later, by Slaughter & Perry, of Virginia, which, though not larger than a bale of cotton, received the flax, hemp, or cotton, at a hopper, heckled, roped, twisted and laid the strands, and completed the rope at one operation, at a cost for one inch rope of one cent a pound for making. It was well adapted for making bale-rope, and in 1853 the patent right for Missouri and western Illinois was purchased by the manufacturers of St. Louis at a cost, including machinery to turn out 100 coils of rope and 3 tons of heckled hemp per diem, of $30,000.

Many other improvements have been made in cordage machinery, in the processes of scutching, lapping, drawing, and spinning the material, among which may be mentioned the scutching cylinders introduced by Mr. Salisbury, of West Troy, New York, and the machines of Mr. Wall, of Bushwick, Long Island. These and the more complicated machinery for twisting and laying the strands have silently revolutionized the manufacture, assimilating its operations to the automatic and labor-saving contrivances of the cotton mill. As a consequence, the business is now chiefly concentrated in a few large establishments, in which machinery, attended mainly by females, performs the principal part of the labor. The character of American cordage has also improved with improved mechanism, and it is now exported to almost every part of the world, including the British Provinces, the East Indies, and even Great Britain. Many of the American improvements have been adopted in Europe, and the machines have been exported to Canada and Great Britain.

Machinists include in a set of improved machinery 1 scutcher, 1 lapper, 2 drawing frames, and 5 jennies, which are estimated to produce, on an average, with the labor of 3 men and 6 girls or boys, 1,250 pounds of No. 20 yarn in 10 hours. One girl can tend 5 bobbins and spin out of good hemp,

which works most easily and is the heaviest, about 1,100 pounds of yarn daily, or 925 pounds of fine yarn, and 750 to 800 pounds of very fine yarn, for which she is paid at the rate of 11 cents per 100 pounds for very fine yarn, and 10 cents for other kinds.

According to the national census of 1840, the manufacture of cordage in the United States, including bale-rope, cotton bagging, &c., employed 388 establishments, with an aggregate capital of $2,465,557, and 4,464 hands. The value of the product was $4,078,306. Of the whole number of establishments no less than 111 were in Kentucky, where the value of the manufacture, consisting doubtless in a large degree of bagging and bale-rope, amounted to $1,023,110. Massachusetts was the second in the extent of the manufacture, having 51 establishments making rope and cordage to the value of $555,100.

In 1850 the bagging, bale-rope, and cordage factories in the United States numbered 417, and their capital amounted to $3,341,506. They paid annually for raw materials $5,612,247, and employed 5,258 male and 799 female hands, at an annual cost for wages of $1,192,788. The total value of the manufactures was $8,002,893. Kentucky was still the largest producer, having 159 establishments which made bagging, bale-rope, and cordage to the value of $2,311,199. New York came next, having produced cordage to the value of $2,010,850 in 50 establishments; and Massachusetts, in 35 factories, manufactured to the value of $1,459,968. The two States last named, which are the largest producers of rope and cordage, in 1855 officially reported the following statistics of this branch: Massachusetts had 44 cordage manufactories, having a capital of $636,400 and 1,000 hands, which made 20,653,418 pounds of cordage, estimated at $2,478,410 in value, an increase of $1,572,089 over the same manufacture in 1845. The largest number of establishments (13) were in Essex county, making chiefly lines; but the counties of Plymouth, Norfolk, and Suffolk produced the principal values, the first two exceeding 6¼ million pounds of cordage each. New York in the same year had 29 rope factories, with 872 hands, nearly one-half boys and girls under 18 years of age. The capital invested was $493,884, value of raw materials used $1,550,624, and of product $2,448,798. Seven factories used steam and 2 water-power. Of the whole number, Brooklyn contained 10 factories, which produced, with the labor of 677 hands, the value of $2,205,153.

In 1861 a novel but by no means a new manufacture of rope was carried on in California by Messrs. Seabert & Shaw, who had a large ropewalk, 1,400 feet long, situated between Nevada and Grass valley, for manufacturing ropes and cordage from raw hides. The process was similar to that employed in making hemp cordage by hand labor, save that the strands were composed of strips of rawhide. The manufacturers sold 2-inch rope at 56 cents a foot, 1½-inch at 42 cents, 1-inch at 28 cents, and ½-inch at 14 cents a foot. This rawhide cordage was found to be stronger and more flexible than hempen cordage, and worked well in the water.

By the tariff act of 1816 the duty on tarred cables and cordage imported was laid at 3 cents a pound, and on untarred and coir ropes, cordage, yarns, twine, packthread, and seines, at 4 cents, unmanufactured hemp paying $1 50 per cwt. In 1824 the duty on all kinds of cordage was raised one cent a pound, and that on hemp to $35 per ton. And in 1828 all cordage was made subject to a duty of 4½ cents a pound, and dressed hemp to $3 per cwt.; from which last $1 per hundred was abated in 1832. In 1842 the duty on tarred cordage was raised to 5 cents a pound, and that on hemp to $40 per ton, Manilla hemp paying $25. These rates were changed in 1846 to ad valorem duties of 25 per cent. on cordage of all kinds and Manilla hemp, and to 30 per cent on other hemp; which duties were further reduced in 1857 to 19 per cent. on the first two articles and to 24 per cent. on hemp. In 1862 Congress again returned to specific duties of 2¾ cents on tarred, 3½ cents on untarred, and 2¼ cents on Manilla cordage per pound, the raw material to pay the same rates as in 1842. These duties have been since somewhat modified.

The total value of hemp and cordage imported into the United States in the 24 years from 1821 to 1843, inclusive, was $15,386,693, an average of $641,111 per annum. From 1838 to 1842 the quantity and value of untarred cordage imported was 2,374,373 pounds, valued at $113,024; of tarred

cordage 7,665,226 pounds, worth $451,673; of twine and packthread 2,735,733 pounds, valued at $550,598; and of hemp 41,769,056 pounds, valued at $2,620,409.

In the fiscal year ending June, 1860, the importations of tarred cables and cordage, chiefly from Russia, amounted to 1,239,750 pounds, valued at $98,386; and of untarred cordage from Russia, England, Hamburg, &c., to 403,090 pounds, worth $34,341; and of twine to the value of $49,238. Of unmanufactured hemp the quantity imported was 45,471 cwt., valued at $325,846. In the fiscal year 1862 we imported 362,102 pounds of jute and coir yarns, valued at $32,144; of cables and tarred cordage 362,833 pounds, worth $28,539; and of other cables and cordage 16,514 pounds, valued at $656. The weight of Manilla and other hemp from India; of Russia hemp; of jute, sunn hemp, and coir, Sisal grass, and other cordage materials, was 14,838¼ tons, valued altogether at $1,281,377.

Of domestic cables and cordage, the amount exported in 1860 was 26,053 cwt., valued at $246,572. It was shipped chiefly to Cuba, the British Provinces, South America, and China.

Statistics of hemp and Manilla cordage produced in the United States during the year ending June 1, 1860.

STATES.	Number of establishments.	Capital invested.	Cost of raw materials.	NUMBER OF HANDS EMPLOYED.		Annual cost of labor.	Annual value of product.	Tons of cordage.
				Male.	Female.			
Maine	3	$36,800	$71,700	30	.....	$7,220	$83,500	400
Vermont	1	8,000	5,955	4	8	2,208	10,000	19
Massachusetts	30	717,600	1,538,442	725	152	263,096	2,069,816	8,804
Total in New England States	34	762,400	1,616,097	759	160	272,524	2,163,316	9,223
New York	33	680,559	1,049,734	721	251	211,556	1,719,094	9,600
Pennsylvania	37	269,500	230,167	232	9	62,004	381,901	2,140
New Jersey	5	120,200	318,000	136	41	39,744	396,400	1,475
Maryland	5	34,900	46,336	55	.....	10,440	68,090	280
Total in Middle States	80	1,105,159	1,644,237	1,144	301	323,744	2,565,485	13,495
Ohio	22	129,475	93,529	214	9	58,032	200,103	1,021
Indiana	2	1,300	8,000	11	.....	3,120	14,800	57
Michigan	2	1,800	2,195	5	.....	900	3,720	16
Illinois	3	2,000	2,840	8	.....	2,100	6,125	18
Missouri	21	398,505	1,014,010	277	87	101,808	1,232,840	7,245
Kentucky	16	351,500	963,712	323	44	88,836	1,240,800	6,839
Wisconsin	1	2,500	1,500	4	.....	960	2,500	10
Total in Western States	67	887,080	2,085,786	842	140	255,756	2,700,888	15,206
Virginia	2	4,500	13,000	12	1	4,536	21,000	50
Louisiana	3	123,500	192,000	56	16	88,800	228,500	1,513
Tennessee	2	5,500	6,500	13	.....	1,656	11,150	58
Total in Southern States	7	133,500	211,500	81	17	94,992	260,650	1,630
California	1	50,000	106,000	32	.....	18,000	150,000	800
Utah	1	150	1,700	2	.....	1,200	3,000	2
Total in Pacific States	2	50,150	107,700	34	.....	19,200	153,000	802
Total in United States	190	2,938,289	5,665,320	2,860	618	966,216	7,843,339	40,346