

was Salem, Hartford the next, and Philadelphia the third. The first commission merchant to sell yarn was Elijah Waring. New York and Boston at first took hardly any, and much was sold at the mill.

As Slater boarded with the Wilkinson family, the women were naturally much interested in the cotton thread, and finally Hannah (Mrs. Slater) conceived the idea of twisting some fine Surinam cotton yarn Slater had spun, in place of the linen twisted yarn, on their own spinning wheels for sewing thread, and finally in 1793 made the first cotton thread made in America. A manufactory for the thread was established by the Wilkinson Brothers.

When Slater commenced his work, it was beyond the power of America to compete with English goods, but in fourteen months after Slater had perfected his machines Brown wrote the Secretary of the Treasury that machinery and mills could be erected within one year to supply the whole United States with yarn and render its importation unnecessary.

Within two years of Slater's starting to manufacture he had accumulated two thousand pounds of yarn, which so alarmed the careful and thrifty Moses Brown that he wrote Slater,—

“Thee must shut down thy gates or thee will spin all my farms into cotton yarn.”

STARTS HIS SECOND MILL; THE FIRST WITH ARKWRIGHT
MACHINERY IN MASSACHUSETTS

Slater's work was successful from the outset, and in 1799 he formed a partnership with Oziel Wilkinson, his father-in-law, Timothy Green, and William Wilkinson, his brother-in-law, under the firm name of Samuel Slater & Co., and built in 1799 on the east side of the river at Pawtucket, in what was Rehoboth, Mass., the mill called the “New Mill,” also “The White Mill,” which was the

first mill to use Arkwright's machines in Massachusetts. Slater superintended both old and new mills, getting \$1.50 a day per mill, or \$3 a day salary, in addition to his share of the profits. To the north of this mill was the Bleaching Meadow where, upon stakes driven into the ground, skeins of cotton were stretched and cloth was spread upon the ground for bleaching. "Mother Cole," who managed the bleaching, and her assistants sprinkled the cotton with watering-pots.

The cotton used by Slater was from Cayenne (French Guiana), Surinam (Dutch Guiana), and Hispaniola (Hayti), and brought from ninety cents to \$1.10 per pound. The cotton was cleaned and whipped by poor families, to whom it was put out at from four to six cents per pound, according to the cleanliness of the cotton.

FIRST COMMISSION HOUSES

The production of the mills was sold through agents in Salem, Boston, New York, Philadelphia, and Baltimore, and these agents grew to be the leading commission houses in these centres. The first of these early agents, as we have learned, was Elijah Waring, of Philadelphia; and another was Jeremiah Brown, of Philadelphia, a brother of Moses Brown. Many letters exist to show the business acumen of Slater in transacting his business with these agents. A Boston newspaper in May, 1809, contained the following advertisement, which shows that as early as 1809 Slater had begun the weaving of cotton:—

"Factory Cotton and Thread Store, 26 Court Street, opposite Concert Hall. George Connell, agent for Almy and Brown, of Providence and Pawtucket Manufactories, has now for sale from eight to ten thousand weight of yarn for weaving, etc., three thousand yards of cloth, such as checks, stripes, chambrays, gingham, bed-ticks, shirting, and sheeting cotton, etc."

Up to 1789 the construction of Arkwright's machines and the operation of the mills using them had been confined to Mr. Slater and his associates, but soon after 1789 several of Slater's men left his employ and erected mills for themselves or others.

SHEPARD STARTS MILL AT WRENTHAM

One of the first cotton mills that was started through the influence of Samuel Slater was that of Benjamin Shepard, Wrentham, Mass. Shepard was a farmer. He inherited the farm on which he lived from his father, and evidently had been engaged in the homespun industry some time previous to 1792, when he erected a mill and received a loan of three hundred pounds on June 20, 1793, from the legislature to carry on his business.

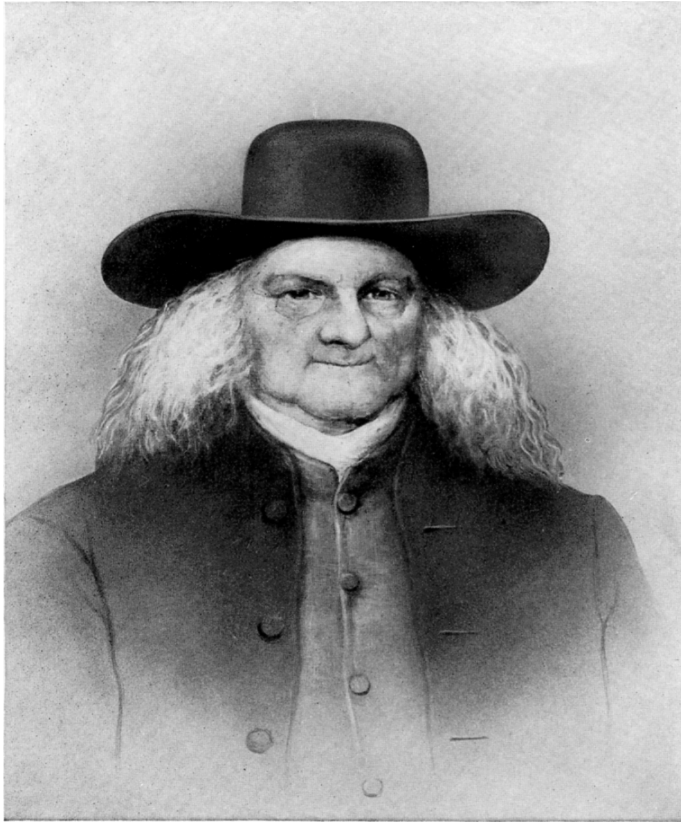
The mill was built on a brook which he had dammed on his farm, and here he manufactured fustians, cotton velvets, and similar fabrics. He colored his yarns in a dye-house, and wove them on a hand loom in a weave-shop that adjoined the factory. His factory was about fifty feet in length, twenty feet in width, two stories high, and was divided into compartments convenient for carrying on the business. It contained a carding machine, run by water, two spinning jennies, one roping machine, four looms, one warping mill, accommodations for singeing cloth, one calender, operated by a horse, and had also facilities for coloring and finishing cotton cloths, and many other small machines. He could card about one hundred pounds of cotton per week, spin from seventy-two to one hundred and twenty pounds, weave one hundred and twenty yards, and color and finish the material.

His wife conducted an industry on her own account for some years, taking yarn and waste from her husband's mill and working it up into various fabrics. A quaint document is a contract made by her with Stephen Olney,

of Providence, in which he agreed to furnish her a chaise for the value of a chaise in goods of her own manufacture. The business was carried on by Shepard's sons, and subsequently came into the possession of others, and has been in operation for over one hundred years. It has probably been longer in continuous operation than any other mill in the country.

Colonel Job Green, John Allen, and others in 1794 established at Centreville, in the town of Warwick, the second cotton mill in Rhode Island. It was not successful until 1799, when one-half of the property was bought for twenty-five hundred dollars by William Almy and Obadiah Brown. Full control was secured by Almy and Brown after buying the other half in 1801, and the story goes that Brown and John Allen visited Slater's mill at Pawtucket to see how things were run there and to get some useful hints. Slater, having no interest in the Warwick mill, was not at all pleased by Allen's investigation, and, when Allen attempted to measure some of the machines, took hold of him and threatened to throw him out of the window. Obadiah, who was a partner of Slater, as well as of Allen, took the measure from Allen, saying, "I will finish thy work, and I will see if Samuel will serve me as he did thee." Slater did not care to attack his own partner. The measurements were taken, and the Warwick mill was thereby equipped with better machines.

The second cotton mill in the Rehoboth part of Pawtucket was built in 1805 by those who took the name Pawtucket Cotton and Oil Manufacturing Company. As it was of wood painted yellow, it was known as the "Yellow Mill" to distinguish it from the "White Mill" of Samuel Slater & Co. just above it, and the "Green Mill" of Almy, Brown & Slater across the river. It started in the fall of 1805, and its business was so remunerative that its owners built a mill called the "Stone Mill" in 1823.



MOSES BROWN

OTHER MILLS START

Benjamin S. Walcott, who had worked on the construction of Slater's first mill, with Rufus and Elisha Waterman erected a mill at Cumberland, R.I., in 1802. Another workman, Charles Robbins, built the first mill for cotton manufacturing in New Hampshire at New Ipswich, on the Souhegan River, and it started on Dec. 15, 1804, four and one-half pounds of yarn being spun, which sold for \$3.42. The original proprietors of this first mill were Charles Barrett and Robbins. Daniel Brooks, who had been employed in the mill at New Ipswich, N.H., erected in 1807 the second cotton mill in New Hampshire, a short distance below the first mill. It subsequently came into the hands of Seth Mason, Jesse Holbin, and Samuel Batchelder. These two, the first cotton mills in New Hampshire, contained about five hundred spindles each.

Another employee at one of the first Pawtucket mills, B. S. Walcott, Jr., with his father erected the first cotton mill in Oneida County, New York, near Utica, in 1807 or 1808. Within three years of Slater's completion of his first mill in 1791, ten mills were completed or being completed in Rhode Island, and one in Connecticut, and before 1808 fifteen mills altogether had been put in operation, using in all about eight thousand spindles. By 1809 eighty-seven mills had been erected, using thirty-one thousand spindles.

The first cotton mill near Boston to use Slater's system, and the second one in Massachusetts, was a small mill in Beverly on the Bass River, which was opened in 1801 or early in 1802. It had six water frames of seventy-two spindles each, which had been built at Paterson, N.J., by a mechanic named Clark, who went to Beverly to install the machines. A lack of water power and other causes rendered the venture unsuccessful.

WHITTENTON COTTON MILLS

The Whittenton Cotton Mills at Taunton, of which Lawrence & Co. are the agents, was also started at the beginning of the nineteenth century. The mills are an offshoot of the Colonial Iron Works established there in 1653 by James Leonard, Sr. Iron had been discovered on the flats about Two Mile River and other localities near Taunton, and in 1652 James and Henry Leonard, of Braintree, entered into an agreement with the town of Taunton to set up iron works there. James Leonard went to Taunton and established the iron works in 1653, and for twelve years was the foreman in charge of the industry.

He subsequently bought ten acres of land with a water privilege on Two Mile River, built a forge which he called the Whittington Forge, and obtained permission to build a dam and flow a neighbor's land. At his death he left the Whittington Iron Works to his three sons. The grist-mill part of the interest, which had been erected on the land of the iron works, was sold in 1810 to Samuel Crocker, Thomas Bush, and Charles Richmond, who had been clerks in the iron business at Whittington.

They built a nail mill, and in 1807 added a story to the nail mill for machines to spin cotton yarn that the farmers' wives wove into cloth by domestic labor. The Whittington Nail and Yarn Mill was burned down in 1811, and a cotton mill was erected on the site from the trees which two months before had been growing on the timber lot of the tract.

Crocker and Richmond after the death of Bush in 1817 imported patterns of Slater's power loom and made the first good cotton cloth about Taunton. This cotton interest was incorporated January, 1823, in the Taunton Manufacturing Company, of which Samuel Crocker, Charles Richmond, and others were the incorporators. The incorporation was for two hundred thousand dollars in real

property and four hundred thousand dollars in personal property, and was for the purpose of rolling copper and iron and manufacturing cotton and wool. Among the real estate was the Whittenton Cotton Mill and the Nail Works.

In 1835 James K. Mills & Co., who had been associated with the original incorporators, withdrew, taking as the company's share the Whittenton Mills, the "g" having been dropped in the name of the mill and the "i" changed to an "e." The mills failed in 1857, and the business in 1858 was bought by Willard Lovering. In 1880 it was incorporated for six hundred thousand dollars, with William C. Lovering, president, Charles L. Lovering, treasurer, Henry M. Lovering, agent and clerk, since which time it has been in prosperous operation.

START OF THE INDUSTRY IN CONNECTICUT

An early effort to spin cotton was made in 1790 at Norwich, Conn., by Lathrop and Eells. The beginning of the textile industry in Norwich goes back to 1766, when Christopher Leffingwell commenced stocking weaving with William Russell, an Englishman, the first operator. For a time it was a small concern, working but two or three looms, but by 1791 nine looms were producing from twelve hundred to fifteen hundred pairs of hose made from worsted, cotton, linen, or silk, the silk hose selling from twelve to twenty shillings per pair. Gloves and purses were also made, five workmen being employed.

The business was later carried on by Jeremiah Griffing, and from Norwich the stocking industry spread in 1790 to Poughkeepsie, N.Y., Hartford, New Haven, Litchfield, and Wallingford, Conn., where stocking looms similar to those that were used in Norwich were employed.

This industry attracted the attention of Joshua Lathrop, who with his brother conducted a retail and wholesale general store in Norwich. He engaged in 1790 a man

named Herrick, who had been employed in the cotton factory in Beverly, to come to Norwich and start cotton manufacturing.

It is not known whether the machines were imported or made from the crude models that were used at Beverly. A building was erected, and one carding machine, six spinning jennies, and six looms like those in the cotton factory at Beverly were installed. Machines were added, and fabrics to the amount of about two thousand yards per year were being turned out.

An advertisement which appeared March 19, 1783, stated:—

“Lathrop and Eells have just finished a variety of cotton goods consisting of Royal Ribs, Ribdelures, Ribdurants, Ribdenims, Ribbets, Zebrays, Satinetts, Satin-stripes, Satincords, Thicksetts, Corduroys, Stockinetts, Dimotys, Feathered Stripes, Bird’s-eye, Denims, Jeans, Jeanetts, Fustians, Bed Tickings, that will hold feathers. The above goods are well finished, and for durability undoubtedly superior to European manufacture. Gentleman Merchants, and others, who feel disposed to encourage home manufactures, are invited to call and see for themselves, and may be assured they will be supplied as low as they can furnish themselves from any quarter.”

Although ample capital was back of the business, it could not be made profitable, and the business was not long continued.

SPREAD OF INDUSTRY THROUGH INFLUENCE OF SLATER

The arrival of John Slater, a younger brother of Samuel, from England in 1803, who had been urged by his older brother to come to this country and engage in business with him, led to the erection at Smithfield, now called Slatersville, in 1807 of the mills which John Slater managed. John, who had been apprenticed to the trade of a

millwright, had a thorough knowledge of mill construction in England, and furthermore was advised by his brother Samuel to visit, before sailing for this country, Manchester and Oldham to secure knowledge of the latest improvements in English machinery. This John did, so that, when he arrived here, he had a knowledge of Samuel Crompton's mule, which had been invented in 1779, but of which Samuel Slater knew nothing, so slow were the English mills to adopt the mule at the time that Samuel Slater left England.

John Slater entered the employment of Almy, Brown & Slater at Pawtucket, and, when it was decided in 1805 to begin cotton manufacturing in a new place, John Slater set out on a horseback journey to locate a site. He rode through the wilderness in the northern part of the town of Smithfield, and coming to a stream called by the Indians the Monhegan River, which was the southern branch of the Blackstone River, saw at once that water power possessed great possibilities. At one place it fell about forty feet from a series of natural reservoirs, which gave promise of water even in a dry season.

Sufficient land was bought to control the water power, and a partnership was formed by William Almy, Obadiah Brown, Samuel Slater, and John Slater, under the name of Almy, Brown & Slaters. The mill was completed in 1806, and spinning was begun early in 1807. The locality in which the mill was built is now called Slatersville.

GILMORE'S LOOM

It was to John Slater that William Gilmore presented his plans for building a loom. Gilmore had arrived in Boston in 1815, and, knowing how to build power looms and dressing machines, was advised to apply to the Slaters. He went to them, and offered to build machinery for power loom weaving, with the understanding that he was to re-

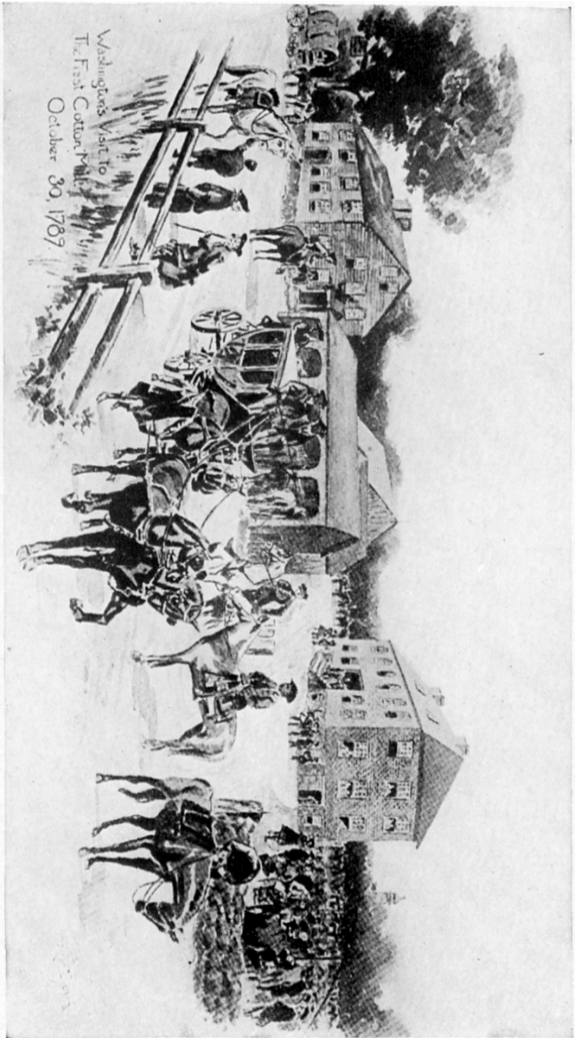
ceive nothing, should he be unable to put the looms into successful operation.

The conservatism of Samuel Slater could not be overcome, and the proposal was therefore turned down, although John Slater was in favor of the proposition. Had Samuel Slater accepted the proposal, he would have been the first not only to have introduced into Rhode Island cotton spinning, but also power loom weaving.

Gilmore, after being employed for a while in the machine shop of the factory at Slatersville, went to the Lyman Cotton Manufacturing Company, which had been started early in 1810 by Judge Daniel Lyman at North Providence, R.I., and made the same proposal to Judge Lyman that he had made to the Slaters. Gilmore's offer was accepted, so that the Scotch loom, which was invented by William Horrocks, of Stockport, England, during the years from 1805 to 1813, was first introduced into Rhode Island by Judge Daniel Lyman and Gilmore.

This loom differed from the Waltham loom of Francis C. Lowell, who introduced the latter into the mills of the Boston Manufacturing Company at Waltham, Mass., in this respect: in Gilmore's loom the lift and fall of the harness were accomplished by a crank, while in the Waltham loom the work was done by a cam. Then, too, it cost but seventy dollars to build a Gilmore loom, while the Waltham loom cost almost three hundred dollars. Judge Lyman did not restrict the use of the loom in any way by patenting it, but permitted Mr. Gilmore to sell to David Wilkinson for ten dollars the use of all his drawings, so that it was not long before the Scotch loom, as the Gilmore loom was known, was being used quite generally by the mills in the lower part of New England, looms being built by David Wilkinson and others.

The first mill to use steam was erected by Mr. Slater and his assistants in 1827 at Providence, and it was run with anthracite coal from the Schuylkill, producing yarn



WASHINGTON'S VISIT TO THE FIRST COTTON MILL, AT BEVERLY, MASS., OCTOBER 30, 1789
From an imaginary sketch in possession of Robert S. Runtz

No. 80, the cloth of which was said to be the finest in the country.

Slater's successful use of Arkwright's machines not only brought him and his associates great prosperity, but placed cotton manufacturing in the United States on a secure footing. By this time Slater had become interested in wool as well as cotton, and was the leading textile manufacturer of his era. The War of 1812 greatly increased his prosperity, as cotton cloth sold at forty cents a yard and the demand was unlimited.

Societies sprang up in most of the States to encourage manufacture, and Congress passed acts protecting the infant industry against foreign competition. By 1805 the total consumption of cotton in the United States was little more than 1,000 bales: in 1816 90,000 bales of cotton were used. In 1805 the mills of the United States could not furnish the army with 6,000 blankets: in 1816 there were \$40,000,000 invested in cotton manufacture and \$12,000,000 in woolen. In the same year the whole amount of goods made in the United States was \$50,000,000 or \$60,000,000: by 1836 \$250,000,000 was made, of which \$25,000,000 was exported.

Mills continued to increase rapidly, so that by the opening of the war with Great Britain in 1812 there were in Rhode Island thirty-three factories using 30,663 spindles and twenty factories in Massachusetts using 17,371 spindles, or fifty-three factories with 48,034 spindles in all. Each spindle produced enough yarn weekly to make $2\frac{1}{2}$ yards of cloth of a value then of about thirty cents a yard, or in all 128,635 yards of cloth, worth \$96,476.

The effect of Slater's influence on the woolen industry was soon seen in Rhode Island, where a number of attempts were made prior to 1800 to card and spin wool by power. At the time of Slater's death in 1835 the American textile industry was firmly established.

BEGINNING OF POWER WOOLEN MILLS IN RHODE ISLAND

The history of the starting of the woolen industry in Rhode Island on a scale worthy of being called manufacturing compasses the story of the business ability and foresight of Rowland Hazard. An attempt to card wool by water power had been made in 1800 by one Irvin, an Englishman, but it was a failure, and it was not until Mr. Hazard appeared that it was carried to success.

Mr. Hazard had been a commission merchant and importer in Charleston, and had married Mary Peace, the daughter of Isaac Peace, a wealthy merchant there. He bought in 1802 from John Warner Knowles one-half of a ten-acre property, including a mill privilege, dam, and a fulling mill which Benjamin Rodman had built a number of years before. Benjamin Rodman, who had inherited a mill privilege and saw-mill on Rocky Brook, a tributary of the Saugatuck River, from his father about 1790, built a fulling mill on the land, and it was conveyed with the ten acres in 1802 to his grandson, the aforesaid John Warner. Here Messrs. Knowles and Hazard commenced fulling and dressing cloth, and in 1803 wool carding was added to the industry. Later Joseph Congdon became one of the partners.

About 1808 Mr. Hazard, who had closed out his business in the South, commenced the weaving of cloth, employing the hand looms in the homes of his neighborhood. At first the fabric was a sort of linsey-woolsey, but had a warp of cotton. It was largely used for women's garments or for men's summer wear. The business grew, and Mr. Hazard in 1814 contracted with Thomas R. Williams to set up four looms of his own make. It is said that those were probably the first power looms successfully operated in America. It is also said that Mr. Hazard was the first one in this country to employ water power to operate the spinning jenny. Mr. Hazard finally retired, and the business was

carried on with great success by his enterprising sons and their children under the name of the Peace Dale Manufacturing Company, so called from that part of South Kingston which had been known for three-quarters of a century as Peace Dale, and was probably named from Mary Peace, the first Mrs. Hazard.

The stimulating effect of the growth of the cotton industry was further seen in the establishment in 1814 of the Lynn Linen Spinning Factory Company, which purposed to do for linen what had already been done for cotton. A factory of wood, three stories high, was erected on the east side of the Saugus River, and the manufacture of sail duck was completed. This factory was quite prosperous until the end of the War of 1812, when the large importation of linen forced it out of business.

Another attempt was made in 1816 by Nathaniel Perry, who built a dam over the brook in North Saugus, and erected a large wooden building to spin and weave a finer kind of linen; but this, too, was a failure.

SOUTHERN DEVELOPMENT

The spinning and weaving of cotton began in a desultory way in the South soon after it was found that cotton was a profitable crop and the growing commenced on a commercial scale, but home spinning and weaving of cotton for domestic use was early universal in the South. Thomas Jefferson speaks of employing in his household two spinning jennies, a carding machine, and a loom with a flying shuttle, by which he made the more than two thousand yards of cloth which his family and servants required yearly. In a letter written by him in 1786 we have learned that he wrote: "The four southernmost states make a great deal of cotton. Their poor are almost entirely clothed in it in winter and summer. It is as well manufactured as the calicoes of Europe."

The first cotton mill in South Carolina, as far as can be ascertained, was started by horse-power in 1787 on James Island, near Charleston. It is said to have contained eighty-four spindles and to have been first driven by horse-power. One of the earliest developments of manufacturing in the South was in Baltimore, Md., and was the outgrowth of a meeting of tradesmen, manufacturers, and others that was held Feb. 24, 1789, at which a petition to the United States Congress was presented. This petition recited that America was now freed from the commercial shackles which had long bound her and could become independent in fact as well as in name. The petitioners therefore hoped that the encouragement of American manufactures would receive the early attention of the Supreme Legislature of the land, as the United States had resources amply sufficient to enable them to become a great manufacturing country. The petitioners hoped, in conclusion, that the Supreme Legislature would place such duties on all foreign articles that can be made in America as will give a just and decided preference to domestic goods.

On May 2, 1789, a meeting of citizens was held at Stark's Tavern, Baltimore, for the purpose of establishing a cotton manufactory. A committee was appointed, which led to the organization of the Baltimore Manufacturing Company with a capital of ten thousand pounds, divided into a hundred shares of a hundred pounds each. A meeting was held on June 3, at which directors were elected and advertisements prepared for looms, spinning wheels, check wheels, etc., and for skilled manufacturers of cotton, flax, and wool. Joseph Low seems to have been made manager, for he subsequently advertised for weavers, and directed applicants, who would receive liberal wages, to apply at the factory, where a few women could be set to work winding yarn.

The last reference to this manufacturing company is on April 1, 1791, when an advertisement of the directors' meeting appeared in the *Maryland Journal*. It is thought

that the industry was not carried on with any great success, for no subsequent records of it have been found.

A later attempt was made at Elkton, Md., when the Cecil Manufacturing Company, the first mill for the manufacturing of woolen fabrics in Maryland, began business in 1795. The first industry in Baltimore had been confined to cotton goods, although the original resolutions spoke as if woolen as well as cotton goods were contemplated. The chief promoter of the Cecil Manufacturing Company was Colonel Henry Hollingsworth, of Elkton, Md., who purchased on July 31, 1794, ten acres of land on both sides of the Little Elk River, and organized the company about Nov. 1, 1794.

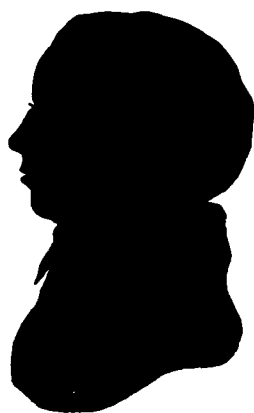
A factory of stone, sixty feet long, thirty-six feet wide, and three stories high, was constructed, and machinery installed that was imported from Europe. The mill was burned in 1796, and a new mill was immediately built. Five hundred and ninety-five acres of land adjoining the site of the property were subsequently purchased for pasturing sheep to supply the mill with wool, and in 1805 John Wilson, of Yorkshire, England, was engaged as manager. So excellent were the goods that cloth was made into a suit of clothes that was worn by President Jefferson at his inauguration. The enterprise was undoubtedly a success, and was carried on for a number of years. At the close of the War of 1812 the immense influx of foreign goods stopped its wheels, and for a long while the property remained idle. It was finally used as a paper mill, but was burned to the ground Jan. 9, 1853.

One of the most unique organizations for the encouraging of American industries was that organized by a number of gentlemen on the 17th of January, 1789, at Wilmington, Del. The organization was called the Delaware System for the Encouragement and Promotion of the Manufactories of the United States. The members agreed to appear annually on the first of the year in a full and

complete suit of American manufacture, to encourage the raising of sheep and the growth of hemp and flax, to discourage the importation of foreign articles, and always to give preference to American manufactures where there was a reasonable proportion between the price and the quality. Other organizations, as we have seen, were established in other centres, but none was quite so specific in its articles of incorporation as this.

A cotton mill was started in Wilmington, Del., by Jacob Broome in 1795, and six small horse-power mills for the spinning of cotton were started in 1809 in Kentucky. A water-power mill was put in operation the same year in Petersburg, Va., also at Nashville, Tenn., but the real development of cotton spinning in the South has been largely since the Civil War.

The cotton for the spinning process was prepared by the farm laborers, who picked the seed from the lint by hand, and it was not until the invention of Whitney's saw-gin in 1793 that cotton growing was materially increased. We have already learned how it started in the South in the story of cotton. The rapid development of the cotton growth after the invention of the gin is seen from the fact that in 1790 two million pounds were grown in the South; in 1796, ten million; in 1810, eighty million; and in 1820, one hundred and sixty million. By 1840 cotton production had so largely exceeded the consumption that the prices became very low, and in 1844 reached an average of 5.63 cents. At the beginning of the Civil War the South by means of cotton, which had become the staple product, had reached a degree of prosperity when its property valuation was \$5,200,000,000, or $43\frac{1}{3}$ per cent. of the total property valuation of the country, which was \$12,000,000,000. The Civil War and the subsequent blockade of the Southern ports cut down the supply of raw cotton enormously and ruined the South. The planters were bankrupt, and many ended their year in debt to their factors, only the most



Francis C. Lowell
DIED 1817.

(Courtesy of C. J. H. Woodbury)

The only likeness extant of Francis C. Lowell. This silhouette was found back of a picture in the office of the Boston Manufacturing Company, at Waltham, Massachusetts, by the late A. M. Goodale, who was long the agent of the company.

skilful farmers being able to work their way to a better financial condition.

Little by little cotton spinning began to establish itself in the South, and by 1880 had reached a point where the Southern mills were using 12 per cent. of the total amount consumed in the country, and in 1910 the amount consumed was 45 per cent. To-day the South practically controls the trade with China in cheap goods from this country.

Much of the Southern industry owes its development to New England capital, for many of the foresighted New England merchants, seeing the possibility of Southern mill development, invested their money in the promotion and erection of Southern mills.

CHAPTER VIII

ERA OF LOWELL, APPLETON, MOODY, JACKSON, AND BOOTT

FIRST COMPLETE COTTON MILL IN THE WORLD—LOWELL VISITS
ENGLISH MILLS—ORGANIZATION OF THE BOSTON MANUFACTUR-
ING COMPANY—CARE OF EMPLOYEES—SALE OF GOODS—WALTHAM
versus RHODE ISLAND SYSTEM OF MANUFACTURING—THE FOUN-
DATION OF THE CITY OF LOWELL AND THE STARTING OF THE
MERRIMAC MANUFACTURING COMPANY—NAMING OF LOWELL—
STARTING OF FIRST MILLS

The first mill in the world where the whole process of cotton manufacturing, from spinning to weaving, was carried on by power, was that of the Boston Manufacturing Company, which was incorporated Feb. 23, 1813, with a capital of four hundred thousand dollars and was erected later the same year at Waltham, from whence it took its better-known name of "The Waltham Company." The enterprise was the conception of Francis Cabot Lowell and Patrick Tracy Jackson, and it grew from investigations of textile manufacturing which Lowell had made in England.

Previous to the starting of the Waltham mill the processes of spinning and weaving were carried on in separate establishments in both England and America, those who wove buying their twist of those who spun. It was the original purpose of Lowell and his associates to construct a weaving mill to do solely by power what had previously been done by hand, but it was learned that it would be cheaper to spin the twist rather than buy it, and accordingly the mill was built with about seventeen hundred spindles.

LOWELL VISITS ENGLISH MILLS

Francis Cabot Lowell, a Boston merchant, who was born in Newburyport on April 7, 1775, and was graduated at Harvard in 1793, while visiting England and Scotland with his family in 1811, met at Edinburgh Nathan Appleton, and told him that he thought the cotton manufacturing then monopolized by England might well be carried on in America. He further informed Appleton that he had determined, before returning to America, to visit Manchester and obtain all the information to be had on the cotton machinery. Appleton urged him to do so, and promised his co-operation.

When Lowell returned to America in 1813, he had succeeded not only in seeing the closely guarded machines, but in getting a sufficiently clear idea of their construction to carry back to America the ability to make them. He talked over American conditions with Patrick Tracy Jackson, his brother-in-law, another prosperous Boston merchant, and the latter consented to engage in the enterprise with him.

Not only was machinery taking the place of manual labor in spinning, but Lowell knew that power looms had been introduced, although he had been unable to secure any accurate knowledge of these particular machines, owing to the secrecy which surrounded them. Skill and reputation, cheapness of labor and abundance of capital, were the advantages of the English manufacturer; but in favor of New England was the great abundance of superior water power and the opportunity to get raw material cheaper because of the nearness to the source of the cotton supply. It was also believed that the educational and moral superiority of the New England population and its enterprise would aid in the overcoming of English competition.

ORGANIZATION OF THE BOSTON MANUFACTURING COMPANY

With these thoughts in mind Mr. Lowell and Mr. Jackson bought the water power rights at Waltham, of John Boies' Paper Mill, and incorporated in 1813 the Boston Manufacturing Company, otherwise known as the Waltham Company, of which Mr. Jackson agreed to assume the management. Under the company's charter the authorized capital was four hundred thousand dollars, but only a hundred thousand dollars were to be raised until the experiment had been made. Most of the stock was taken by Mr. Lowell and Mr. Jackson and their friends. Mr. Appleton took five thousand dollars' worth.

As the war with England precluded communication with that country and no designs or models of looms could be procured, Mr. Lowell set about inventing a power loom, aided by Paul Moody, an expert mechanic of Amesbury. For months Lowell carried on experiments in a store on Broad Street, Boston, employing a man to turn a crank. A practical loom was completed and installed in the fall of 1814 in the new mill which had recently been completed at Waltham. The first mill was of brick, five stories high, ninety feet long, forty-five feet wide, had a roof of double pitch, known as the "factory" roof, which was trussed and braced to be very strong. It contained three thousand spindles, and turned out goods at the rate of four thousand yards per week.

According to Hurd's History of Middlesex County, the first record of the work of the Waltham mill is on the books of the company under date of Feb. 2, 1816, at which time the entry was made of "1242 yards, 4-4, or thirty-six inch wide cotton." So that this entry probably records the earliest date when the first cotton cloth was made in the world by power and the whole manufacturing process was under one roof.

The loom invented by Mr. Lowell was different from the

English loom that afterward became public in that the principal movement was by a cone revolving with an eccentric motion, that has given place to the crank motion. The power loom necessitated changes in the spinning process, particularly in sizing the warp. Drawings of Horrocks's dressing machine were secured from England, and a machine with improvements was made and installed at Waltham. To meet the need for winding the threads from the bobbins on to the beam, Mr. Moody invented the ingenious warper. Imperative necessity for a bobbin and fly, or jack, frame, arose for spinning roving, and Mr. Moody and Mr. Lowell invented the double speeder, which required the most careful mathematical calculations, and these Mr. Lowell could supply. William Bowditch, the mathematician, who was called into the patent litigation on the speeder, expressed great surprise that there was any one in the country except himself able to do the complex mathematical problems that the speeder entailed. Later, to overcome the great waste and expense in winding the thread for filling, or weft, from the bobbin on to the quills for the shuttle, Mr. Moody worked out the filling throstle.

The wooden rollers used in the first construction of the dressing frame had so swollen and warped, owing to the wool being constantly wet, that the rolls would not fit accurately, and the rollers were covered with metal by casting a coating of pewter on the outside, but these were also found impractical, owing to the difficulty of casting them. Moody at last thought of making a mould of soapstone in which to cast them, and his brother, to whom he told his trouble, said that he thought soapstone would make a very good roller, and Moody tried it and found it worked perfectly. All of which shows how much American textile manufacturers owe to Lowell and Moody, for most of their machines with improvements are in use to-day.

In Mr. Lowell's search for the best machines, accompanied by Mr. Moody, he visited a machinist named Shepard, of

Taunton, who had a patent for winding machines which were thought to be the best on the market, but Shepard refused to reduce his price, even though Mr. Lowell used them on a large scale.

"You must have them, you cannot do without them, as you know, Mr. Moody."

"I was just thinking that I can spin the caps direct upon the bobbins," said Mr. Moody.

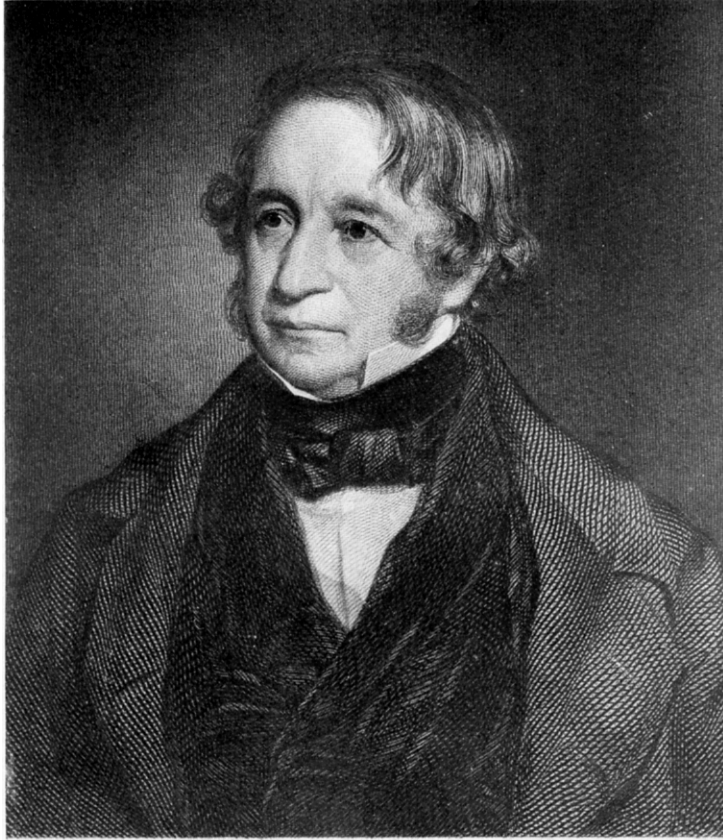
"You be hanged!" said Mr. Shepard. "Well, I will accept your offer."

"No, it's too late," interposed Mr. Lowell, and he withdrew the offer, deciding to spin the caps upon the bobbins.

The Waltham enterprise was a success from the start, and the needs soon required raising the full capital, four hundred thousand dollars, and the addition of two hundred thousand dollars for buying a place below Watertown.

CARE OF EMPLOYEES

Under Mr. Jackson's management much attention was given to the physical and moral care of the employees. Payment of regular wages at stated intervals was begun at the outset, and boarding-houses, at the head of which matrons of good character were placed, were built at the expense of the company. No boarders were taken except operatives, and the careful regulation of these boarding-houses so gained the confidence of the surrounding population that parents were not afraid to trust their daughters to work in the factory. Pains were also taken to have as agents and overseers men of character, so that the class of help was of the best, and that aided much in the production of good fabrics.



Yours truly
R. Appleton

SALE OF GOODS

At first the goods did not sell very rapidly, but, as there was but one loom, they did not accumulate fast. At the outset they were sold at a shop on Cornhill, Boston, kept by the wife of Isaac Bowers, who had the only place in Boston where domestic goods were sold. Mr. Lowell and Mr. Appleton had a talk with Mrs. Bowers, who said that, although every one praised the goods and none objected to the price, yet they did not sell. Mr. Appleton, who after the peace of 1815 had entered into partnership with Benjamin C. Ward to import British goods, suggested that Mr. Lowell send the next batch of goods to the store of B. C. Ward & Co., and he would see what could be done. The goods then made at Waltham were heavy sheetings of No. 14 yarn, 37 inches wide, 44 picks to the inch, and ran about three yards to the pound, the purpose being to imitate the unbleached yard-wide goods of India, which then crowded the market. Ward & Co. found a purchaser in Mr. Forsaith, an auctioneer, who sold the product at a little over thirty cents per yard, although Mr. Lowell had said he would be satisfied with twenty-five cents. The goods continued to sell at little variation in price.

These circumstances led to Ward & Co. becoming the permanent selling agents of the company, and this was the beginning of the very successful system of merchandising so generally employed to-day.

While the War of 1812 had a marked effect on stimulating the production of American textiles, its conclusion, owing to the influx of foreign goods which were sold almost at cost, was ruinous to the industry, especially as the power loom was not in use save in Waltham. Protection was sought from Congress, which in 1816, under the influence of Mr. Lowell who went to Washington, passed a duty of $6\frac{1}{4}$ cents per square yard.

While the tariff was under discussion, Mr. Lowell visited

Pawtucket, and found all the spindles idle and the manufacturers despondent. They told him they had been so busy turning out goods at a high profit during the war that they had given no thought to improving the machinery, considering only how quickly the goods could be made. Mr. Lowell informed them that the power loom would put a new face on the situation, but the mill owners were at first incredulous, though they soon came to his opinion and began installing the looms. Mr. Lowell was also the first person systematically to arrange the processes of manufacturing in a mill so that no labor would be lost in passing from one process to another, and few changes have been made in these arrangements since he first established them.

To his fertile brain the industry owes the mill organization of the present day, with a president as chairman of the board of directors and the treasurer as the executive head, with the responsibility of buying the raw material and through the selling house disposing of the finished product, which he initiated in the Waltham mills. The subdivisions of the departments of the mill under overseers, supervised by a superintendent who had charge of the help and their operations, while a master machinist had charge of the buildings and the machinery, both reporting to the agent for the proprietors, whose functions were those of general manager, is the type of organization which Lowell instituted, and which has continued to-day as the best method of operating a textile mill and selling its products.

WALTHAM *versus* RHODE ISLAND SYSTEM OF MANUFACTURING

As mule spinning had already been introduced in Rhode Island, the power loom and other machinery of William Gilmore, who, we have learned, perfected the loom which the Lyman Cotton Manufactory had adopted at Providence, completed the Rhode Island manufacturing system, so

that within three years of the operation of the power loom at Waltham, Rhode Island was also performing all its processes by machinery. But the improvements at Waltham having been patented and their use held at a high price, most of the mills built in Rhode Island adopted the crank loom, and instead of the patented speeder used the tube speeder invented by Danforth. As many of the mills in Massachusetts and New Hampshire adopted the Waltham machinery, two methods or systems of manufacturing sprang up, one called the Waltham and the other the Rhode Island system. In one the live spindle is used, in the other the dead spindle; one uses the mule for filling, the other the filling frame; in one case the crank loom is employed, while in the other it is the cam loom. One uses the Scotch dresser, the other the Waltham dresser, and many manufacturers are still undecided which is the best. Mule spinning was not introduced into the Waltham system until after 1830. The crank loom, however, came into use in Waltham about ten years after the crank loom had been installed in Rhode Island. The great difference which existed between the two systems of machinery was that that installed at Waltham was the work of ingenious merchants, who, having little knowledge of practical manufacturing, were guided more by the facility of making the machine than by its fitness for the use intended; while the system adopted in Rhode Island was adapted to its purpose by the practical knowledge gained in English factories.

Besides this difference in machinery there was a striking divergence in the method of treating the employees. In Slater's mills, which set the pattern for Rhode Island, the English plan of employing whole families, including children who were very young, was adopted, and it led to the bringing of families into the industrial centres that were wholly dependent upon the mills and that suffered severely when there was no work. Payments, too, were made in

goods supplied at a factory store instead of the cash method followed at Waltham. At Waltham wages were paid every week or two weeks, and boarding-houses in charge of a matron were provided for the employees, the conditions of which precluded the work of children or militated against the employment of whole families.

THE FOUNDATION OF THE CITY OF LOWELL AND THE STARTING OF THE MERRIMAC MANUFACTURING COMPANY

Although the cotton industry suffered from a marked depression from 1817-20, owing to the effect of the War of 1812, the factories at Waltham during this period had been uniformly successful, paying a dividend of 12 per cent. annually. The success of the Waltham enterprise caused Lowell, Jackson, and Appleton to turn their attention to establishing another mill at a place where there would be greater water facilities, and as early as 1820 they began inquiries for a suitable site.

The falls of the Souhegan River near its junction with the Merrimac were first examined, but it was decided the power would not do. A few days later Paul Moody accompanied his wife to Bradford to visit a daughter who was at school there and incidentally to meet some gentlemen and to examine the water power. It happened to rain, and the gentlemen did not appear, so Moody rode on to Amesbury, where he met Ezra Worthen, a mechanic who worked with him at Waltham.

"Why don't you go to the Pawtucket Falls?" said Worthen, when told what Moody was searching for. "There is a power there worth ten times as much as you will find anywhere."

Accompanied by Worthen, Moody went to Chelmsford and saw the Pawtucket Falls, where Lowell now is, and reported to Jackson and the others that the falls at Pawtucket would give the whole power of the Merrimac with

a fall of over thirty feet. Jackson and Kirk Boott, an Englishman who had consented to take the management of the projected enterprise, examined the site, and, deciding that it was advantageous, steps were quickly taken to secure the stock of the canal and to obtain sufficient land to control the water power. Boott had long been familiar with the territory, as he was in the habit of hunting over it, and he and Thomas M. Clark, agent of the Canal Company at Newburyport, were empowered to buy property.

The territory of Lowell comprised in 1821 about four square miles and had fifteen hundred inhabitants, mainly farmers, who lived by cultivation of the rough fields and by fishing the Concord and the Merrimac, which meet here in the towns of Chelmsford and Dracut; and from its situation at the junction of the two rivers the site was originally called Chelmsford Neck, or, by the Indians, Wamaset. Clark and Boott succeeded in acquiring about four hundred acres at about a hundred dollars per acre, acquiring for about forty thousand dollars land which sold later for a dollar per square foot.

It is said that Boott represented to the farmers that he wanted to raise wool and fruit, and, when they learned how they had sold valuable mill privileges for a song, their rage was furious, and found expression in a song which everybody sang:—

“There came a young man from the old cowntree,
The Merrimac River he happened to see.
‘What a capital place for mills!’ quoth he,
Ri-toot, ri-toot, ri-toot.”

Another verse related how Boott persuaded the shrewd Yankee farmers to sell their water power for nothing, and it continued,—

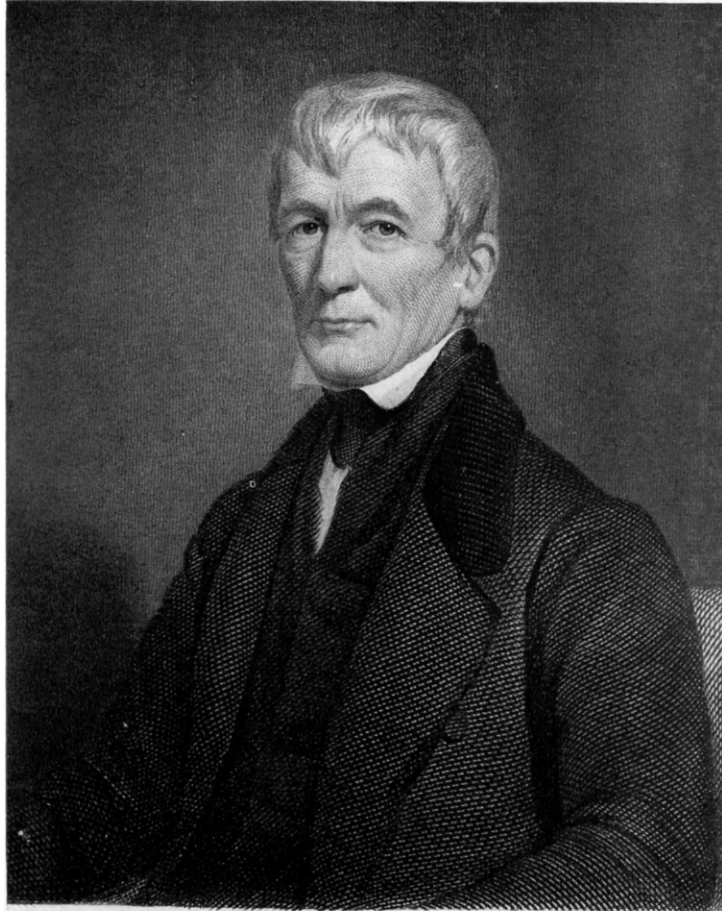
“And then these farmers so cute
They gave all their lands and their timbers to Boott,
Ri-toot, ri-toot, ri-toot.”

Boott was of strong English leaning, and on one Fourth of July raised the English flag above the stars and stripes and would not take it down. A mob gathered, and pulled it down. He was born in Boston in 1791, had studied at Rugby, England, and for a time was a student at Harvard. He served as an officer in the English army in the Peninsula campaign under Wellington, and at the siege of San Sebastian in 1813 he commanded with great bravery a detachment of troops. After his resignation from the army in 1817, he returned to Boston, where he engaged in business, spending much of his spare time shooting and fishing in the towns of Chelmsford and Dracut.

Boott's part in the establishment of the Lowell mills aroused the anger of English manufacturers, and this enmity went so far, it was reported, that emissaries were sent from England to take his life and attempts were made to kill him.

The Pawtucket Canal Company, the stock of which he and Clark were empowered to buy, had been incorporated in 1792 under the name of "The Proprietors of the Locks and Canals on Merrimac River" for the purpose of making the Merrimac River navigable to Newburyport. The construction in 1793 of the Middlesex Canal, however, which opened communication with Boston, was a barrier to the commercial success of the canal to Newburyport, so that the proprietors built only a small canal for the passage of wood and lumber around Pawtucket Falls. As the income to the original proprietors from the canal up to 1820 had hardly averaged $3\frac{1}{2}$ per cent. a year, it was easy for Messrs. Boott, Appleton, Jackson, and the others to purchase the six hundred shares which represented a paid in capital of sixty thousand dollars.

Patrick T. Jackson, Kirk Boott, Warren Dutton, Paul Moody, John W. Boott, and Nathan Appleton made their first visit to the property November, 1821, during a snow-storm. One of the company remarked that they might



P. J. Jackson

live to see the bleak, barren place which then had less than a dozen houses have a population of twenty thousand people. Articles of association were drawn up under the name of the Merrimac Manufacturing Company, Dec. 1, 1821, with a capital stock of six hundred shares, and Kirk Boott was appointed the treasurer and agent of the company at a salary of three thousand dollars. He was also authorized to buy the remainder of the canal stock, and the Merrimac Company took over from him such interest in the Canal Company as was deemed for their advantage to own.

The Merrimac Manufacturing Company was granted incorporation by the legislature, Feb. 5, 1822, and the following directors were chosen, who ordered an assessment of five hundred dollars per share: Warren Dutton, Patrick T. Jackson, Nathan Appleton, Israel Thorndyke, Jr., John W. Boott; and Kirk Boott was made treasurer and clerk, while Warren Dutton was elected president. The original shareholders were as follows: P. T. Jackson, 180 shares; N. Appleton, 180 shares; John W. Boott, 90 shares; Kirk Boott, 90 shares; Paul Moody, 60 shares. And later it was voted to permit the following to subscribe: Dudley Tyng, 5 shares; Warren Dutton, 10 shares; Timothy Wiggin, 25 shares; William Appleton, 25 shares; Eben Appleton, 15 shares; Thomas M. Clark, 2 shares; D. Webster, 4 shares; Benjamin Gorham, 5 shares; Nathaniel Bowditch, 4 shares; and the Boston Manufacturing Company, 150 shares. D. Webster was Daniel Webster, who is said to have never paid for his shares, and they were subsequently sold to some one else.

The shares in the Locks and Canals Company were paid to the several directors in trust, and a committee appointed, consisting of Patrick T. Jackson and Nathan Appleton, to settle Mr. Boott's account for \$18,399, which he had spent to secure for his associates the farm lands of Nathan Tyler, Josiah Fletcher, and \$30,217, paid for three hundred and thirty-nine shares in the Locks and Canals Com-

pany. The new proprietors of the Locks and Canals Company at once enlarged the canal to sixty feet wide and eight feet deep, at a cost of a hundred and twenty thousand dollars. Collateral canals were subsequently built, and a contract made with the Boston Manufacturing Company for machinery for two mills.

Finally, in August, 1823, the projectors of the Merrimac Manufacturing Company, who now also owned the Locks and Canals, paid the Waltham Company seventy-five thousand dollars for all their patterns and patent rights, and also for the release of the services of Mr. Paul Moody, who had been under contract to work for the Waltham Company. The mills of the Merrimac Company were placed where they could use the whole thirty-feet fall of the Merrimac, and the wheels were first started on Sept. 1, 1823, while the first dividend of a hundred dollars per share was paid in 1825. The first cloth made was so coarse in texture peas could be shot through it, and it cost $37\frac{1}{2}$ cents per yard.

The proprietors of the Locks and Canals erected a large brick machine shop and commenced the building of mill machinery. They soon undertook the complete construction of mills and the installation of machinery, selling land and water privileges to manufacturing companies, digging the necessary canals, erecting the mills, building and installing the machinery, and turning the whole over to the manufacturing company that had been formed. Enormous profits were made on the original cost of the land, and handsome profits were derived, not only from the construction of the plants, but also from the sale of the water privileges. Kirk Boott was the original agent of the Locks and Canals Company, as well as that of the Merrimac Manufacturing Company.

NAMING OF LOWELL

Such was the beginning of Lowell, which took its name from Francis C. Lowell, the originator of the first complete cotton mill in the world. Some difficulty was experienced in determining a suitable name for the new manufacturing town, and one day Mr. Nathan Appleton met Mr. Kirk Boott, who remarked to Mr. Appleton that the legislative committee was ready to report on the bill incorporating the town, and it only remained to fill the blank with the name.

"I consider the question narrowed down to two, Lowell or Derby," said Mr. Boott. Derby was suggested by Mr. Boott because of his family associations with that place, and also because it was in the vicinity of one of the earliest seats of English cotton manufacture.

"Then Lowell, by all means," replied Mr. Appleton, who considered the honor due Mr. Francis C. Lowell.

It was incorporated in 1824 into a town distinct from Chelmsford, of which it had formed a part. Lowell became a city in 1836. Its population in 1830 was 6,477; according to the census of 1910, it was 106,294.

The first cloth made by the Merrimac Manufacturing Company was gray, as the business of printing calico was entirely new in this country. Various methods had been used in experimenting in the printing of calico. The engraving of the cylinder, which had superseded the old method of printing by blocks of wood, had come into use in England, but knowledge of it was closely guarded from the public. Attempts at making copper printing cylinders at Lowell were unsuccessful, and engraved cylinders were imported from England. Finally, Mr. Boott went to England solely for the purpose of securing engravers. Through the efforts of the chemist Dr. Samuel L. Dana and John D. Prince, of Manchester, the task of engraving was finally accomplished, and the first calico printed had a width of twenty-

seven inches, which was two inches above the average of British prints. Only fast colors were used, and this, together with the greater durability secured from the use of the throstle in place of the mule spinning, combined to make the goods better than any others.

The first prints were poor in texture and color. The ground was a madder, and it had a white spot. As described by Mrs. Robinson, who wrote "Loom and Spindle," and, as a girl, worked in these early mills, "it proved a garb of humiliation, for the white spots washed out, cloth and all, leaving me covered with eyelet holes."

The calico printers who were brought over from England became dissatisfied with their terms, and left town, with their families, in a large wagon, with a band of music. New terms had to be made before they would return. The first enduring color printed was indigo blue.

Boarding-houses for operatives were early established by the mill corporations at Lowell, and these houses were strictly supervised. The dietary provided for fresh meat at least twice a week, and that they should not be obliged to eat fresh salmon more than once a week. It was further provided that a bed should be kept empty for a certain number of the occupants, so there would be a place for any one who might be taken ill. A report of illness was sent at once to the mill agent, so that, as it was before the days of hospitals in New England, skilled medical attendance could be provided. The boarding-houses, as well as the mills, were supplied from elevated tanks with running water. The place of these tanks was later taken by a special reservoir, which antedated the introduction of municipal water works. The paved brick sidewalks with granite crossings that were provided from the boarding-houses to the mill doors were probably the first continuous walks of their kind in New England.

The condition of the early employees of Lowell is thus described by Mr. Shirreff, an English farmer, who came

to America to learn if it would be best to allow a younger brother to emigrate:—

“Females engaged in manufacturing amount to nearly 5,000, and as we arrived at Lowell on the afternoon of Saturday we had an opportunity of seeing those connected with some of the largest cotton manufactories returning from labor. All were clean, neat and fashionably attired with reticules hanging from their arms, and calashes on their heads. They commonly walked arm and arm without levity. The general appearance and deportment were such that few British gentlemen in the middle ranks of life need have been ashamed of leading any of them to a tea party. Next day being Sunday, we saw the young females belonging to the factory going to church in their best attire, when the favorable impressions of the preceding evening were not effaced. They lodged generally in boarding houses, and earn eight shillings six pence sterling per week independent of board. Sewing girls earn about four shillings six pence. The recent introduction of large manufacturing establishments and this population account for the comfort and prosperity of the Lowell young women.”

Dickens, in his “American Notes,” describes a visit made to several of the factories at Lowell in 1842, such as a woolen factory, a cotton factory, and a carpet factory, and says that he reached the first factory as the girls were returning from lunch to their work, gave his comments upon their neat, well-dressed appearance, and their extreme cleanliness, and he noted, too, their healthy appearance and admirable manners and deportment. He learned there was as much fresh air and comfort as the nature of the occupation would permit, and declared that in all the crowd he saw in the factories on the day of his visit he could not recall one young face that gave him a painful impression, nor one young girl whom he would have removed from the works, had he had the power.

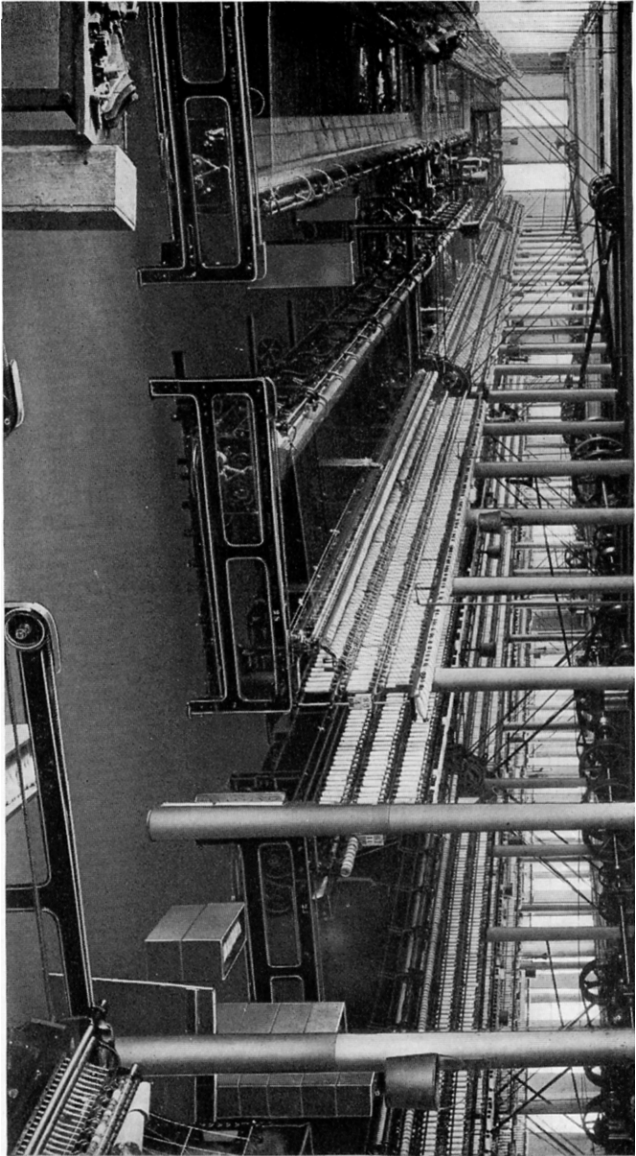
Dickens found a few children employed in these factories.

but not many, and even at this early date Massachusetts forbade their working more than nine months during the year. He also praised the boarding-houses, and speaks of there being a joint stock piano in many of them. He comments also on the girls subscribing to circulating libraries, and mentions the *Lowell Offering*, a repository of original articles written exclusively by women employed in the mills. In short, Dickens regarded the industrial conditions at Lowell as not only superior to those with which he was familiar in England, but quite above criticism.

Hurd's History of Middlesex County quotes Daniel Knapp as giving this account of the way cotton was cleaned: "In the spring of 1814 my parents were young laboring people, with five small children, the oldest not over eleven years old. We had the cotton brought to our house by the bale to pick to pieces and get out the seeds and dirt. We children had to pick so many pounds per day as a stint. We had a whipping machine made four feet square, and about three feet from the floor was a bedcord running across from knob to knob near together, on which we put a parcel of cotton, and with two whip sticks we tightened it up and got out the dirt and made it ready for the card. My mother was carrying on the bleaching business at the time. There was no chemical process. The bright sun, drying up the water, did its bleaching. This was the mode of bleaching at this time."

STARTING OF FIRST MILLS

The first sale made by the Locks and Canals Company after its reorganization by the promoters of the Merrimac Manufacturing Company was to the Hamilton Manufacturing Company in 1825, which started with a capital of six hundred thousand dollars. The mill made twilled and fancy goods, and the first cotton mill drill which played such a



A MODERN MULE SPINNING-ROOM
(Courtesy of the Palomiska Mills)

part in the trade with the East was made in this mill. The Appleton Company and the Lowell Company were started in 1828, and the Suffolk, Tremont, and Lawrence Companies began work in 1830 through the efforts of Amos and Abbott Lawrence, to whom the Locks and Canals Company gave reduced terms because of the stringent business conditions of 1829.

The Boott Company began operations in 1835, and the Massachusetts Company in 1839. Further improvements in the construction of a canal along the bank of the river and the rights to control the outlets of Winnepesaukee were established. Then, too, changes in the water power rights were effected, by which the corporations instead of being lessees of the water power became part proprietors, and from then on Lowell's development was continuous and rapid. In 1911 there were 871,900 spindles, 20,303 looms, and \$12,900,000 capital engaged in the textile business in Lowell.

CHAPTER IX

OTHER TEXTILE CENTRES

PHILADELPHIA THE GREATEST TEXTILE-PRODUCING CITY OF AMERICA—SILK INDUSTRY IN PHILADELPHIA—DEVELOPMENT OF THE WOOLEN INDUSTRY—TEXTILE MACHINERY—CARPET INDUSTRY—LATER GROWTH—FOUNDATION OF LAWRENCE—BEGINNING OF FALL RIVER—COLONEL DURFEE'S MILL—THE TROY AND FALL RIVER MILLS—EARLY LOOMS, WORK, AND WAGES—OTHER COMPANIES—PROVIDENCE—PATERSON, N.J.—NEW BEDFORD—MANCHESTER—AMOSKEAG LAYS OUT A TOWN—NEW YORK—AMSTERDAM—WOONSOCKET, R.I.—CONCLUSION.

The first quarter of the nineteenth century witnessed the firm establishment on a manufacturing basis of the textile industry in America, and the history of this development is that of the great textile centres, where, owing to either natural advantages or the enterprise of far-sighted merchants, the industry was planted and flourished. These centres in the order of the value of their production are Philadelphia, Lawrence, Fall River, New York, Paterson, New Bedford, Lowell, Providence, Manchester, Pawtucket, Woonsocket, and Amsterdam. Much of the story of some of these cities has already been told in previous chapters. To complete it, however, some further facts must be given about the growth of the industry in these cities.

To-day Philadelphia is the greatest manufacturing city of woolen hosiery and knit goods and carpets, New York the greatest centre for the cutting up trade or manufacturing clothier, while Fall River leads as a cotton-producing centre, New Bedford as the greatest producer of fine cotton goods. Lawrence is the greatest centre in the United States for worsted goods, and Paterson the great silk centre. Phil-

Philadelphia's manufacture of textiles exceeds \$153,000,000 annually, while that of the next two largest textile cities, Lawrence and Fall River, aggregates only \$126,000,000. Considering Lawrence, Fall River, Lowell, and New Bedford as cities of Boston's environment, the output of "Greater Boston" is \$211,000,000.

According to the United States Census the textiles include carpets, cordage, jute, linen goods, nets and seines, cotton goods, including cotton small wares, dyeing and finishing, hosiery and knit goods, shoddy, silk manufactures, woolen and worsted manufactures, wool pulling, wool scouring, felt goods, wool hats and fur felt hats.

The production of the twelve leading textile cities of the United States, according to the 1909 census, was: Philadelphia, Pa., \$153,000,000; Lawrence, Mass., \$70,000,000; Fall River, Mass., \$56,000,000; New York, N.Y., \$52,000,000; Paterson, N.J., \$50,000,000; New Bedford, Mass., \$44,000,000; Lowell, Mass., \$41,000,000; Providence, R.I., \$37,000,000; Manchester, N.H., \$23,000,000; Pawtucket, R.I., \$23,000,000; Woonsocket, R.I., \$20,000,000; Amsterdam, N.Y., \$17,000,000.

The total value of the output of the textile industries of the United States in 1909 was \$1,684,636,500, or \$200,000,000 more than all of Great Britain and Ireland. Philadelphia produced nearly one-tenth of all the textiles of the United States, or more than any other two cities combined, and the value of the textile product exceeds that of any other city of the world.

The earliest efforts at textile making in Philadelphia began soon after 1682, when the city's manufactures of coarse woolens excited the jealousy of England and led to prohibitive legislation. The proficiency was no doubt due to the premiums for the production of cloth offered by the proprietors of the province, one of the first being awarded Abraham Opdenrafe in 1686 for a piece of linen, and soon after Wigert Levering, a Germantown settler, is mentioned

as a weaver by trade. The first manufacturers of hosiery were those of the sect known as Mennonites, who about this time had set up in their homes in Germantown the stocking frames they brought from Germany, and thus started the industry for which Germantown was to become famous.

Wool was being made into druggets, serges, and camlets in 1698, and among the trades mentioned are dyers, fullers, comb makers, card makers, weavers, and spinners. Wool combers and carders received twelvepence per pound, and journeyman tailors twelve shillings per week and their diet. Charles Blackman, who enjoyed the governor's favor, was the first tailor mentioned. An evidence that the industry was already well established is the fact that Charles Lawrence, who had come from Carolina, offered for sale in 1721, at his place of business on Chestnut Street, "Very good sleys, tombles, and shuttles for weavers." John Cam, who had emigrated from Ireland, was spoken of in 1723 as a stocking weaver, as was also Alexander Mack, Jr., son of the founder of the religious sect known as "Dunkers," and Germantown had thus early become the headquarters in America of the hand stocking weavers, one hundred Germantown hosiers being referred to in 1777 as out of work.

The first knitting mill in America was started in 1825 by Thomas R. Fisher in Germantown, and it was known as the Wakefield Mill. Previous to this each man had worked his own frame in his own house, but Fisher persuaded a number of knitters to operate their machines under one roof. He offered to buy the frames; but, as the knitters refused to sell, he imported frames from England, and knitters too, and was soon able to operate his own frames with his own workmen. Already numbers of knitters from Leicester and Nottingham had settled in Germantown, and little by little the knitting industry grew until it took the leading position it now holds.

SILK INDUSTRY IN PHILADELPHIA

Influenced by the strenuous efforts made by the mother country to establish the silk industry in her colonies, Philadelphia turned her attention to the silk industry about 1750, and offered premiums for the growth of the silkworm as well as opened a filature. A London paper under date of Nov. 7, 1765, states that one hundred silk throwsters had started for New York and Philadelphia. Benjamin Franklin in 1769 influenced his adopted city to open another filature, and in 1771 twenty-three hundred pounds of cocoons were bought and reeled by a society formed to promote the industry.

Dresses of domestic silk were made and worn before the Revolution, some of which have been handed down as heirlooms to the present. But the Revolution terminated the industry, and it was not resumed until 1815, when W. H. Horstmann came from Cassel, Germany, and, having learned the art of silk weaving in France, established himself in Philadelphia as a silk manufacturer. He was the first to use the Jacquard loom in America, introducing it in 1824, and also inventing a number of machines used in different branches of the silk manufacture. His son, William J. Horstmann, in 1837-38 made power looms from his own design and introduced power loom weaving for narrow fabrics. Silk manufacturing in Philadelphia has since grown until in 1910 there were seventy-seven firms making silk goods of various kinds in Philadelphia.

DEVELOPMENT OF THE WOOLEN INDUSTRY

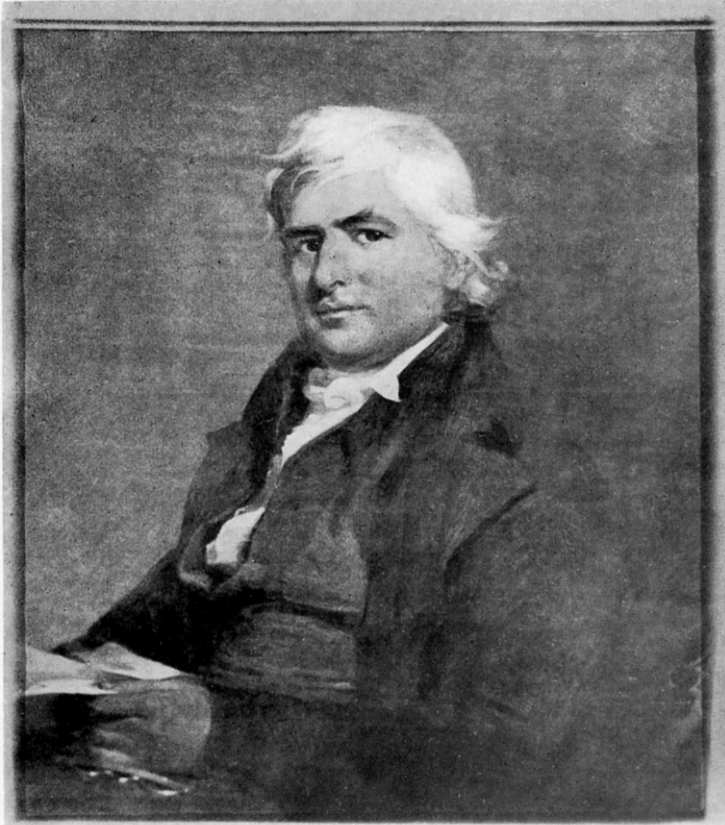
The woolen and flax homespun industry started in Philadelphia, as it did in the other colonial cities, immediately after the town's settlement, and little by little grew as the needs of the people required fabrics.

In 1760 there were twelve fulling mills in Philadelphia,

and in 1765 a number of citizens and butchers agreed not to eat or kill sheep under twelve months old for a period of two years. About the time the Stamp Act was repealed in 1766, Daniel Mause, a hosier, had set up a number of looms at the sign of the "Hand in Hand" Stocking Manufactory on the west side of Second Street, between Race and Vine Streets, where he made thread and stockings, and "hoped the good people of his and neighboring provinces would encourage the undertaking."

But so little had manufacturing grown in Philadelphia by 1767 that John Penn, in a letter to the Lord Commissioner for Trade and Plantation, on January 21 of that year said that very little encouragement was given manufacturing, and he only knew of two industries. One had been started three years ago by private subscription for making sail cloth, ticking, and linens, but the persons interested had not carried it on, but sank their money and discontinued the project, as the high price of labor made it impossible to compete with English goods. The other was a glass manufactory, which was started seventy miles from Philadelphia, in Lancaster County, to supply the demands of the villagers and small farmers in the neighborhood.

The approach of the Revolution, the growing needs of the colonists, and the time and expense it took to obtain goods from England led Philadelphia, as well as other colonial centres, to consider the question of home manufactures, and, when the convention of delegates from the Pennsylvania provinces was held in 1775, various newspaper writers recommended the establishment of woolen manufactures. One writer, who signed himself "Hibernian," proposed the formation of a patriotic society to manufacture woolen with a permit to raise one thousand pounds by lottery. Weavers, he wrote, could be had from Ireland. The expense of importing twenty-nine workmen with yarn and worsted, wheels, reels, looms, steel, three-pitched combs, a press, and bedding for the twenty-nine hands, was



Samuel Wetherill.
Born, April 27th 1764. Died, September 29th 1829.

estimated at five hundred and fifty pounds. Six thousand pounds of yarn could be bought for four hundred and fifty pounds, but the profits of manufacture were not calculated.

The first joint stock company in the United States was organized in 1775 in Philadelphia to make cotton goods, and was known as the United Company of Philadelphia for Promoting American Manufacturing. It was the progenitor of the American Manufactory, the earliest cotton and woolen manufactory in America. Samuel Wetherill, Jr., who was instrumental in the formation of the manufactory, had in 1775, on South Alley, a factory for woolens that supplied the Revolutionary army, and, when the price of wool rose so high that he could not avoid loss, he notified the Board of War that he would be unable to fill his contract.

The colonial government of Pennsylvania encouraged home industries by offering medals and money for the best cloth; and John Hague in 1778 received one hundred pounds for introducing machines for carding cotton. The same year John Hewson, the first calico printer, sought financial support from the Assembly, as did also Edward Clegg, of Great Britain, who was about to establish a mill for corduroys and jeans. By 1784 fulling mills were very numerous in Philadelphia, and by 1810 three woolen mills had been established in Philadelphia, and one in Germantown.

TEXTILE MACHINERY

Philadelphia has long been a centre for textile machinery. As early as 1777 Oliver Evans made teeth for cards by a machine of his own invention, which turned them out at the rate of fifteen hundred per minute. When the State rejected his proposal to erect a factory under State patronage, he disclosed his secret to individuals, and soon many were making cards. In 1788 Giles Richards & Co. began making them with machines. F. G. Richards, Amos

Whittemore, and Mark Richards turned out about twelve thousand annually.

From 1792 to 1794 a number of carding machines were made, and efforts exerted to build spinning frames on Arkwright's principle. At the Globe Mills, to which we have already referred, several mules of one hundred and twenty spindles were installed.

The first regular machinery for cotton manufacturing was established at Holmesburg in 1810 by Alfred Jenks, who had learned all he knew from Slater. In 1830 Jenks invented the power loom for weaving checks.

Little by little the industry became well established, and different societies were formed to stimulate it. The Philadelphia Premium Society, organized in 1801, did much to foster the industry by giving premiums for improvements in art and manufacture, and no longer did Penn's statement about the lack of manufacturing apply to Philadelphia.

Fairs and sales were held, one of the first sales being in 1789, under the auspices of the manufacturing committee of the Pennsylvania Society, when printed cottons, corduroys, federal ribs, jean, flax, and tow linens were offered. According to John Mellish, who wrote a description of his travels in America in 1806-07 and 1809-11, the manufactures of Philadelphia were rising into great importance, hats, stockings, and a great variety of cloth were being made, and an export trade had begun.

CARPET INDUSTRY

The carpet industry, for which Philadelphia has long been noted, began before the Revolution and gradually became a prominent industry. The first manufacturer mentioned was William Calverly, of Loxley's Court, whose carpets in 1774 were thought to be superior to those imported, and were shown as such at the Coffee House. Turkish and Axminster carpets were first made by William

Peter Sprague in 1791 in Northern Liberty. He wove a national pattern with device representing the crest and armorial achievements of the United States. Philadelphia floor cloths, oil cloths, and carpets began to attract wide attention soon after 1800. John Dorsey, a merchant, with two looms commenced making floor carpets and oil cloths in 1807 on Chestnut Street, and he wove a sail duck seven yards in width. One man could turn out thirty-two or forty-five yards of carpet a day, which sold for from \$1.50 to \$2.25 per yard, depending upon the colors used. Another factory was established by Isaac Macauley at Market Street in 1808, where he made oil cloths in one, two, three, and four colors. He bought out Dorsey in 1810, and began manufacturing on a wider scale. Setting up carpet looms and importing workmen from Kidderminster, England, he spun his own yarn and wove canvas twenty-one feet wide for oil cloth, as well as the first Brussels carpet in America.

In 1811 Philadelphia had 273 looms, 3,648 spinning wheels, 186 looms and fly shuttles, 4,423 spindles in factories, 165 stocking looms in hosiery factories, 8 print works, 4 print cutting establishments. The population of the city was in 1810 111,210, and the total value of all manufactures was \$16,103,389.

LATER GROWTH

The close of the war with Great Britain in 1815 brought such an influx of English goods that the domestic industries were threatened with extinction, and Thomas Gilpin and other Philadelphia manufacturers protested to the government against the ad valorem rate of duty, which led to false valuation, and asked for specific duties in hope of saving the home industry; but the introduction of the power loom did more than the tariff to save the struggling industry, and little by little it became prosperous again. There were in Philadelphia in 1815, 2,325 persons engaged in the

cotton industry, and 1,226 in the woolen. By 1821 four thousand looms were at work. In 1827 the Frankford Woolen Mills were established, and in 1829 the Conestoga Print Works, by Thomas Hunter. Andrew and William McCallum, two Scotchmen, started their carpet manufactory in 1830, and in 1831 the Germantown Hosiery Mills were started under the direction of John Button, whose father was a lace maker of Leicestershire, England. Button had at first but two small machines for knitting hosiery, which he had brought from England, and first made children's hose. As he was the only one who had this machinery, for several years he had quite a monopoly, but later made adult hose as well. Germantown knit goods rapidly became famous, and mill after mill sprang up.

The Oxford Carpet Mills were started in 1832 by William Hogg, and also the Hinckley Knitting Mills by Aaron Jones, who set up two old-fashioned knitting frames. The city and neighborhood in 1827 had 104 warping mills, 4,500 weavers, over 200 dyers, 3,000 spoolers, and 2,000 bobbin winders. The blue broadcloth known as Lafayette Blue, dyed in 1832 by F. Tassard with prussiate of potash, was the first use in America of Prussian blue.

The Keystone Knitting Mills were started in May, 1861, by Thomas Dolan, who had been a commission merchant, and since then the development of Philadelphia has steadily grown. According to the last census the gross value of Philadelphia's textile products was \$153,000,000.

FOUNDATION OF LAWRENCE

The history of the foundation and development of Lawrence bears close analogy to that of Lowell, save that one man instead of several conceived the enterprise and carried on the preliminary work necessary to its successful start.

That man was Daniel Saunders, of Andover, Mass., who had become interested in the project by the merest accident.

He came by chance some time before 1835 into possession of a plan showing the grades and locks for a canal from Lowell to the tide-water on the Merrimac, and, studying it closely, concluded there was considerable aggregate fall of water between the two points, though apparently there was little individual fall in the few slight rapids.

As Saunders had been engaged in the woolen business, he realized the value of the water power for mill work, and determined to investigate for himself. Accordingly, with a companion and equipped with only a straight edge and a spirit level he went over the falls between the two points, and discovered the great power hidden in the insignificant rapids. He kept the information from all but his immediate family, to whom he freely predicted the possibility of a great manufacturing city on the Merrimac in the towns of Methuen and Andover, and set about buying land sufficient to control the water power. In 1840 he began purchasing land at the head of Peters Falls, some distance above where the first mills were built, and also bought an island and some land lower down. Soon he had sufficient to control Peters Falls, and thus the whole power of the river. He had enough land by 1843 to deem it safe to lay his plan before J. G. Abbott, John Nesmith, and Samuel Lawrence, all residents of Lowell, and they formed the Merrimac Water Power Association, with Daniel Saunders, Jr., Abbott Lawrence, Thomas Hopkinson, and Jonathan Tyler, of Lowell, and Nathaniel Stevens, of Andover, as the other stockholders.

The company set about securing more land to protect their rights. Some adverse criticism of the scheme arose, and many of those sceptical of the success of the enterprise called the scheme "Saunders' Folly." It was proposed to call the new town Saunders, but Mr. Saunders objected, suggesting that, as it was on the Merrimac and there was no town in Massachusetts by that name, it be called Merrimac, and so it was called until April 17, 1847, when it

was incorporated as a town and took the name of Lawrence in honor of Abbott Lawrence, one of the subscribers to the enterprise.

Saunders in eighteen months had bought up all the land needed save a few parcels, and controlled in all between three and four thousand acres. On March 20, 1845, Daniel Saunders, Samuel Lawrence, John Nesmith, and Edmund Bartlett received a charter as the Essex Company.

In the privately printed Memoir of Abbott Lawrence, by H. A. Hill, it is said that on the day that the Massachusetts legislature passed the bill incorporating the Essex Company, successor to the Merrimac Water Power Association, all of the incorporators, among them Mr. Abbott Lawrence, were at the State House, and as soon as the measure was signed started to North Andover by rail, and thence proceeded to the falls at Lawrence by carriages.

The company consisted of Messrs. Abbott Lawrence, William Lawrence, Samuel Lawrence, Francis C. Lowell, John A. Lowell, George W. Lyman, Theodore Lyman, Nathan Appleton, Patrick T. Jackson, William Sturgis, John Nesmith, Jonathan Tyler, James B. Francis, and Charles S. Storrow, the engineer of the enterprise.

Under the direction of Mr. Daniel Saunders a careful examination of the neighborhood was made and the various plans for harnessing the water power were discussed upon the spot. Subsequently the party sat down to dinner at the Merrimac House in Lowell. After dinner, steps were taken toward a permanent organization.

Mr. Abbott Lawrence and Mr. John A. Lowell retired for a few minutes' consultation, and when they returned offered the Water Power Association for all of its rights and interest thirty thousand dollars over and above the reimbursement of all expenses previously incurred. It was also agreed to carry out all of the agreements of the Associates for the purchase of land to secure flowage rights and to head the



Abbott Lawrence

organization of the Essex Company by a large subscription of stock.

The proposition was accepted, and the preliminaries were signed the same day, March 20, 1845. Mr. Lawrence was the first and largest subscriber to the Essex Company, taking a thousand shares at a hundred dollars each, and was its first president. On April 16 stock to the amount of a million dollars was issued, with Abbott Lawrence, Nathan Appleton, Ignatius Sargent, and William Sturgis as directors. Charles Storrow was made agent and chief engineer.

A great dam was completed across the Merrimac Sept. 19, 1848, canals were dug, and the town site was laid out, work being begun Aug. 1, 1845.

The Washington Mill, built in 1846, was the first one completed, and E. A. Bourne was chosen president. It started the next year, when it took the name Bay State Mills, woolen, worsted, and cotton goods being made. The Bay State shawls, first made in 1848, and the blue flannel coatings, first turned out in 1859, were widely known. A few months later the second mill, the Atlantic, was started, and the first cotton arrived Jan. 12, 1849, consigned to the Atlantic Cotton Mills, of which Mr. Lawrence was also president and one of the largest stockholders.

The Pacific Mills, named from the Pacific Ocean, were incorporated in 1853, and at that time were the largest works of their kind in the world. Their original capital was \$2,000,000. Mr. Abbott Lawrence was president. The mills in 1857 had to ask an extension of credit, and Mr. Lawrence contributed several hundred thousand of his personal fortune to save the enterprise, upon which one-third of the people of Lawrence were dependent. Since the struggles of these early days the Pacific Mills have been very successful, and their products are known over the world. Other mills have since sprung up, one of which, the Wood Worsted, which is owned by the American Woolen Company, is the largest worsted mill in the world. The

population of Lawrence, which in 1845 was a few hundred, was 85,892 in 1910, and had 1,138,876 spindles in 1911. The Census Bureau reports that the value of its textile products is \$70,000,000 annually.

BEGINNING OF FALL RIVER

The greatest cotton manufacturing centre of America is Fall River, Mass. In one hundred years the cotton industry has transformed a high, rocky knoll on the shores of Mount Hope Bay, which was once the scene of many an Indian skirmish between King Philip's tribe and the Pequot and Narragansett Indians, from a town in 1800 of 2,535 people into a city in 1910 of 119,205 which hums with the whir of 3,936,944 spindles and with the clatter of 93,904 looms. Colonel Durfee's original mill when it started in 1811 contained not more than five hundred spindles.

The great development of Fall River is due to the fact that the moist climate of the neighborhood makes it one of the few places in America where the textile industry has that degree of humidity so needed in the weaving of cotton goods, and also to the fact that the headlong plunges which the stream of water known as the Quequechan River, or "The Stream," takes here over its rocky bed on its way to mingle with the ocean, furnished the water power so essential to the early mills.

COLONEL DURFEE'S MILL

The influence of Samuel Slater, who had been so successful in introducing to America English methods of manufacturing cotton, led Colonel Joseph Durfee, a Revolutionary patriot who lived in Tiverton Village, to organize and construct in 1811, in what was then the village of Fall River, the Globe Mill, the first mill built there. Colonel Durfee had been a selectman of his town and had served in the

Revolution. When the British, who during the Revolution held Newport, attempted to raid the territory of Globe Village, Durfee formed and led the home guard which repulsed them. At the time he organized the company he was sixty-one years old, and owned much of the land where Fall River now is, and thus controlled the water power.

The ownership of Durfee's mill was divided into 100 shares, which he sold to his neighbors and friends as follows: Joseph Durfee, of Tiverton, 40; Seth Simons (carpenter), of Providence, 40; Nathan Chase, Tiverton, 5; Boulston Brayton, Tiverton, 3; William Durfee, Tiverton, 2; Benjamin Brayton, Gray, 2; Elisha Fuller, Rehoboth, 1; Robert Hazard, Rehoboth, 1; and Nathan Cole, Rehoboth, 6. His argument in inducing his friends to buy the stock was that "cotton cloth would darn much easier than linen and ought to be popular in the home."

The original mill, a small one-story wooden building that stood on the north-east corner of Globe and South Main Streets, was burned, and later the old building now standing was erected. It is one hundred and twenty feet in length, thirty-two feet wide, with a projection on the west side about thirty-one feet by eight, and three stories in height. The original mill had a water wheel that was operated by the flow from the Globe ford which had been dammed, and contained only a few spinning frames, cards, and a calender, and had, as we have said, but five hundred spindles.

The cotton was sent out to the farmers' families to be picked and cleaned, and then was spun by the mill. The spun roll was then again sent out to be woven, and the cloth was finished by the mill. It is not known how much of the machinery was driven by power, although the mill had a tub wheel which gave such uneven power, according to the flow of the water, that the threads were not only constantly breaking, but the machines often went so fast they fell apart. The workmen were inexperienced, the hours of work averaging about sixteen, the pay about \$1.20 per day, and

the output was very crude. The finished goods were carted two miles to Fall River proper, whence they were shipped by schooner to Providence and the neighboring territory, where they were sold.

In spite of Durfee's persistency in constantly trying new devices to improve the crude machinery which was continually breaking, he was unable to make a success of the undertaking, and, although the mill was run by the residents of the little village until 1829, it was never a financial success, and Durfee died a poor man in 1843.

From 1829 to 1839 the plant was operated as print works, being known from 1835 to 1839 as the Tiverton Print Works. After many vicissitudes the mill came into the hands of the present owner, The Globe Yarn and Laurel Lake Mills Company, and is held by them because of the water power it controls. Many interesting mementos of the old mill are still in existence, such as time sheets that contain the names and pay of the old workmen. Among the names of the workers are those of the ancestors of some of the leading professional and business men of Fall River to-day.

THE TROY AND FALL RIVER MILLS

If Colonel Durfee's venture was not a success, he at least pointed to the direction of Fall River's real prosperity and led the way, for in 1813 other residents of Fall River followed the path which he had blazed. In this year two corporations for the manufacturing of cotton and woolen cloth were formed, known respectively as the Troy Manufactory Company, later called the Troy Cotton and Woolen Manufactory, and the Fall River Manufactory. The incorporators of the Troy corporation—so called because at that time Fall River was a village in the town of Troy—were A. Borden, Clark Chase, Oliver Chace, James Maxwell, Jonathan Brown, William Slade, N. M. Wheaton, Oliver Earl, Eber Slade, Joseph C. Luther, Sheffel Weaver, John Stock-

ford for Charles Wheaton and self, Nathaniel Wheeler, James Driscoll, Benjamin Slade, Daniel Buffington, Hezekiah Wilson, Benjamin Durfee, William Read, Robinson Buffington, John Martin, and Benjamin Buffington. The capitalization was fifty thousand dollars. The Fall River Manufactory with a capital of forty thousand dollars was incorporated by David Anthony, Dexter Wheeler, and Abraham Bowen. The Fall River Manufactory was organized Feb. 11, 1813, and the Troy Cotton and Woolen Manufactory March 8, 1813. The mill of the Fall River Manufactory was completed in October, 1813, and was about sixty feet by forty feet, three stories, the lower being of stone and the upper two of wood, as it was said "there was not enough stone in Rhode Island to finish it with." It started some time before the Troy mill, the erection of which was completed in September, 1813, though work at the Troy mill did not commence until the middle of March, 1814. The Troy mill was built of stone from the neighboring fields, was four stories in height, had a low hip roof, and was one hundred and eight feet long and thirty-seven feet wide. As compared with the mammoth mills of to-day, these mills were infants, but they were the forerunners of all that followed.

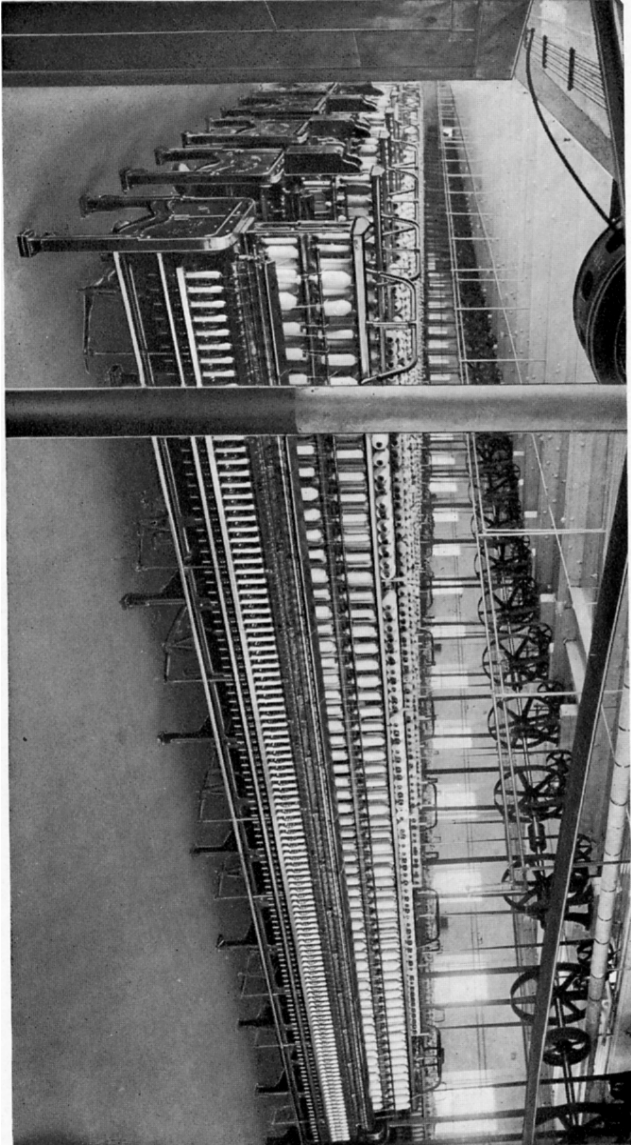
Strange to say, all of the original mills, Durfee's, the Troy and the Fall River mills, were burned, and the present structures were built on the old sites. Mill after mill sprang up, the cotton being brought to Fall River in small sailing vessels, having been hauled to the Southern coast by mules or horses or brought down the streams. Little cotton was then cultivated in the South at a distance remote from the coast, and a great deal was brought to New York and reshipped to New England. So bad was the condition in which it was received from the South that it had to be sent out by the mills to women in the neighborhood, who picked out by hand the seed that still clung to the cotton.

EARLY LOOMS, WORK, AND WAGES

In the beginning these mills spun only the cotton for the weaving, the yarn being put out to be woven on hand looms by women in the neighborhood. The first power weaving was done in the Fall River Manufactory in 1817, on a heavy, clumsy loom, invented by Dexter Wheeler, that frequently got out of order, while the dressing was so poor that often the yarn would mildew and rot on the beam.

The first loom is said to have been started by Sarah Winters, the second by Mary Healy, and the third by Hannah Borden. The cloth was woven a yard wide by weavers who received \$2.50 per week, and was sold for twenty-five cents in the stores that were often a part of the mills. In 1819 fifteen hands ran thirty looms in the Fall River mill. Three were employed in the dressing-room, ten in the carding-room. In all the mill had not more than thirty-five employees. The work began at 5 A.M. in summer, and as soon as it was light at other times. At eight o'clock there was a half-hour for breakfast, and at noon another half-hour for dinner. In some of the Fall River mills the male help at eleven o'clock were treated to New England rum. At 7.30 P.M. the work stopped and the mills shut down. On Saturdays the mills closed at four or five o'clock in order to allow the employees to prepare for Sunday. The workers were then all Americans. A mill superintendent drew \$2 per day; overseers, \$1.25 per day; male workers, from \$0.83 to \$1 per day; while women received still less, and boys or girls from \$1 to \$2 per week.

Power looms were not installed in the Troy mill until the latter part of 1820. The spinning frames had seventy-two spindles each, and the best spinners ran only a pair of frames, which produced two and one-half skeins per spindle a day. Blair's picking machine was first used by the Fall River Manufactory. Previously the mills had been paying four cents a pound for hand picking, and five or six pounds



INTERIOR VIEW OF A MODERN RING SPINNING MILL
Courtesy of the Harmony Mills

were considered a good day's work. The first dresser used in the Fall River mill warped the beam in sections of about an eighth of a yard at a time; while the roping until 1825 was made in cones with open tops or with tops that had to be wound by hand upon the bobbin, and very little of the yarn was over No. 16.

Here at first, as elsewhere in New England, linen was used for the warp and cotton for the filling, or weft, but the introduction of imported machinery soon produced cotton of sufficient strength to serve as the warp as well as the weft.

As there were no middlemen in these early days, the manufacturers were obliged to find their own market, and cloths were accordingly sold directly from the mill to the people of the surrounding country. The products were very coarse sheetings, and then plain cloths, and, when color was wanted, the yarn was dyed. Company stores were generally maintained by these earlier mills, so that the employees seldom received their wages in cash, but were generally paid in provisions and other supplies from the general store, over the counters of which the mills also sold their products.

OTHER COMPANIES

The Union Cotton Factory was started in 1813 in a small wooden building, on the site of the Laurel Lake Mills, in what was then Tiverton, by Edward Estes and others, and was the third mill in Fall River. It was burned in 1838.

The fourth company to be incorporated in Fall River was the Pocasset Manufacturing Company, which was organized in 1822 with a capital of one hundred thousand dollars, the principal owner being Samuel Rodman, of New Bedford, who became its president, while Oliver Chace, of the Troy mill, was engaged as agent. The mill, which was built of stone and was one hundred feet by forty feet and

three stories high with a long L at the south end extending over the river, proved too large for the company's business, and in 1824 Andrew Robeson, of New Bedford, hired a part, and started the first plant for printing calico in Fall River.

The printing was first done in the north end of the old Satinet Mill, which took its name from the class of woolen goods made there, and the first printing machine that Robeson used was made by Ezra Marble and a French immigrant who had obtained in France the necessary knowledge, and was set up about 1827, though it was some years later that machine printing superseded the hand and block process.

It was soon found that Robeson's shop could not fill the requirements of the growing industry, and in 1834 Holder Borden organized the American Print Works, the predecessor of the American Printing Company. With him were associated many of the stockholders of the Fall River Iron Works, another early industry of Fall River. The American Print Works started in January, 1835, with four machines, and handled from two thousand to twenty-five hundred pieces a week, and the company has since grown to be the largest print works in America.

Steam was first used in Fall River in "the Doctor's Mill," so called because it was later owned and run by Dr. Nathan Durfee. The mill was built in 1845 at the foot of Cherry Street. It was also called the Massasoit Steam Mill.

Fall River was the first American textile centre to use Sharp & Roberts self-acting mules. They were brought to America in 1838 by William C. Davol, who had succeeded in purchasing some of the mules in Manchester, under an agreement with the Sharp people that he would manufacture them for the Sharps under an American patent. It was one thing, however, to buy the machines but quite another to take them out of England, owing to the jealous restrictions that she placed about the exportation of textile machinery. To circumvent the law prohibiting the

machinery from leaving England, Mr. Davol arranged with agents in England to take the machinery down, saw it into small pieces, pack it in narrow boxes as if it were plate glass, and ship it to America by way of France, where it arrived safely two years after its purchase. It was easy for Mr. Davol's firm of machinists,—Haines, Marvel & Davol,—with their expert knowledge of mechanics and his familiarity with the machines, to put the machinery together again and duplicate its construction in other machines. It was not until 1846 that they installed the mules in the Metacomet Mill, which he and Major Bradford Durfee constructed in that year from plans they brought from England.

In 1832 the American Linen Company was organized to make the better grade of linen fabrics, the first of their kind in America, workmen as well as the flax being brought from England. At first the mill was very successful, but, as cotton fabrics took the place of linen, the business fell off, until finally in 1838 linen making was abandoned and the factory has since been operated as a cotton mill.

The development of Fall River has since been rapid, although its progress has been affected by the different financial depressions which have periodically hampered the American industry. Mill after mill has been established in Fall River until to-day the city is one of the leading textile centres of America, its annual product, according to the last census, being \$56,000,000.

PROVIDENCE

The beginning of the industry in Providence has already been briefly referred to in a preceding chapter. Fulling mills were in operation at an early date. One of the earliest references to the industry is in January, 1704, when William Smith, a weaver, received a piece of land forty feet square "to build a weaver's shop upon, he being desirous to follow

his weaver's trade"; and in December, 1700, Joseph Smith, a brother, was granted for the same purpose three acres of land near Wanskuck. In 1674 Moses Lippitt was indentured, by Edward Sairle and Anna Sairle, his step-father and mother, for fifteen years and a half and two months to William Austin to learn the trade of weaver.

The eighteen young ladies of Providence belonging to the "Daughters of Liberty," of whom we have already spoken, met by invitation at the house of Ezekiel Bowen in 1766, and spun linen from sunrise to sunset to encourage home industries. The organization increased rapidly, and held meetings at the Old State House on North Main Street, where they wove a handsome web of linen to be given as a prize to the farmer who might raise the most flax that year. The General Assembly for a time offered a bounty of one-third of the value of the finished product.

Soon after the peace of 1783 Rhode Island began turning its attention to manufactures, and in 1787 the first company in the State for the manufacture of cotton was formed at Providence. Its object was to make homespun cloth by hand. The first enterprise was begun, as we have related, under the auspices of Daniel Anthony, Andrew Dexter, and Lewis Peck. They built a jenny of twenty-eight spindles after the Orr models at Bridgewater, and set it up in a private house at Providence, and subsequently moved it to the market house and operated it there; after that a spinning frame having eight heads of four spindles each. The spinning frame constructed was afterwards taken to North Providence to be worked by water, but it was found to be too imperfect for use.

While the experiments were being made in the chamber of the market house, two weavers, Joseph Alexander and James McKerries, came from Scotland to Providence, claiming to understand the use of the fly shuttle. McKerries settled in east Greenwich, while Alexander took up his residence in Providence. A loom was built by Alexander

for making corduroys and set up in the market house. It was operated, as we have already seen, with more or less success, but no one knew how to cut the corduroy and give it the proper finish, so the manufacture was soon abandoned, when Alexander removed to Philadelphia.

A notice printed in the *Gazette and Country Journal*, Aug. 8, 1789, read, "Almost every family seems more or less engaged in this way" (promoting manufactures in this town).

"There are now also at work a carding machine with a three-foot cylinder, two spinning jennies of sixty spindles each, and one of thirty-eight spindles, and a mill after Arkwright's construction, which carries thirty-two spindles by water, from which machines, as well as large quantities spun by hand, Corduroys, Jeans, Fustians, Denims, &c., &c., are making. There are several other machines for the Wool Manufactory, among which the Wool Picker and Flying Shuttle are improvements every raiser of Sheep and Manufacturing Family should possess."

The arrival in 1790 of Samuel Slater greatly stimulated the industry in Providence, as elsewhere in Rhode Island, and the first cotton thread spun by machinery in Rhode Island was spun in the chamber of the market house in Providence. The first cotton thread spun by water in the United States was spun in North Providence.

John Fullem worked a stocking loom in Providence about 1788, and in March, 1790, a calendering machine worked by horse-power was set up there.

In 1790 Herman Vandausen, a German, began calico printing at East Greenwich, cut his own blocks, and printed for people generally cottons and the coarse cotton wove in families. But the first print works in the country did not prove profitable because of English and Indian goods.

In 1794 Messrs. Schaub, Tissot & Dubosque engaged in printing calicoes in a chocolate mill later occupied by the Franklin Machine Company. Dubosque, who had been in the French navy, learned calico printing in Alsace before

entering the navy. Calcutta cottons were used, and the printing was done with wooden blocks, while the calendering was done by friction with flint stone.

In 1797 Peter Schaub and Robert Newell began the same business, cotton cloths imported from the East Indies being used and wooden blocks employed to give the figures and colors. Previously calico printing had been carried on at East Greenwich. This is supposed to have been the first calico printing done in America.

In 1790, 30,000 yards of woolen cloth were made in and around Providence; and, in 1791, 25,265 yards of linen, 5,895 of cotton, 3,165 of woolen, 512 of carpeting, 4,093 pairs of stockings, 859 pairs of gloves, and 263 yards of fringe. In 1794 cotton twist was made at Providence, in Nos. 12, 16, 20, which were respectively sold at \$0.88, \$1.04, and \$1.21.

There were thirty-eight cotton mills in Rhode Island in 1812 with 30,669 spindles. The first duty on cotton goods was 10 per cent. In 1797 it was raised to 12½ per cent. At the close of the War of 1812 a gigantic petition was sent to Congress for protection, and in 1815 one cent a spindle was raised to pay the expenses of Agent James Burrill to represent Massachusetts and Rhode Island before Congress. In 1816 the duty was fixed at 25 per cent. ad valorem upon cotton and woolen.

At the close of the War of 1812, there were 99 cotton mills with 75,678 spindles in or near Providence, R.I.; Massachusetts had 57 mills with 45,650 spindles; Connecticut, 14 mills with 12,886 spindles; or 170 cotton mills in all with 134,214 spindles.

Owing to Slater's influence and the abundant water power about Providence, the industry developed rapidly, and to-day the territory within thirty miles of Providence is the greatest textile centre in America. According to the latest census the output amounted to \$37,000,000.



Tully

Anna Lawrence

PATERSON, N.J.

The enterprise of Slater at Pawtucket had also much effect in influencing some gentlemen of New York, New Jersey, and Pennsylvania to start a movement for the establishment of a cotton industry in or around New York. The result was an elaborate plan for the establishment of the textile industry on the Great Falls of the Passaic River and the consequent foundation of Paterson as one of the textile centres.

The prime mover in the enterprise was Alexander Hamilton, Secretary of the Treasury, whose interest in early American manufacturing did so much to promote it. Although he did not subscribe to any of the stock of the Paterson company, his advice and influence were most potent in assisting the men who were able to undertake the work.

The first meeting was held Nov. 22, 1791, at New Brunswick, N.J., and a company formed called the Society for the Establishment of Useful Manufactures. The following directors were elected: William Duer, John Dewhurst, Benjamin Walker, Nicholas Low, Royal Flint, Elias Boudinot, John Bayard, John Neilson, Archibald Mercer, Thomas Lowry, George Lewis, More Furman, and Alexander McComb, many of whom were not only prominent citizens of New Jersey, but several of whom had a national reputation.

The principal purpose was the production of cotton yarn and cotton fabrics, although the company contemplated the manufacture of other useful articles. Nehemiah Hubbard, Esq., of Middletown, Conn., was appointed general superintendent with a salary of two thousand dollars a year. Advertisements for sites were printed in the papers of New York, Philadelphia, and Trenton, and finally a committee was appointed to fix the seat of manufacture. It was finally voted by the committee, May 17, 1792, to locate

the new industry and the new town at the Great Falls of the Passaic, where the Passaic River breaks through the range of hills that rise about five hundred feet and are known as the Orange Mountains, and then flows into what is the lower part of New York Harbor.

The Great Falls had an elevation of one hundred and four feet above tide-water and were capable of driving two hundred and forty-seven water wheels. Here the company bought seven hundred acres of land for \$8,230, and, although some of the directors were in favor of calling the place after Hamilton, they named the future town Paterson in honor of William Paterson, Governor of the State of New Jersey.

Resolutions were adopted for erecting a cotton mill and buildings to accommodate workmen. Appropriations were made of \$20,000 for the construction of a canal, \$5,000 for the cotton manufactory and machinery, \$12,000 for the print works, and \$5,000 for the weave-shop and equipment.

The comfort of their employees was also considered by the directors of the company, for fifty houses for workmen, twenty-four feet by eighteen feet, with a cellar and garret, were to be built, at a cost of about two hundred and fifty dollars each. Any mechanic, married and of good character, was to have the privilege of leasing the house on a long term of years or of buying it on the instalment plan.

The company on the 18th of July, 1792, advertised for contracts to build a canal thirty feet wide and a dam above the Great Falls to be four feet high and for the erection of four stone mills and fifty houses, the units being two houses under one roof with a parting wall. According to the minutes of the meeting held Oct. 1, 1792, the paid in capital amounted to \$160,000.92, of which \$14,139.87 had been spent for the purchase of land, grist and saw mill, \$7,500 for machinery, materials, and implements, and \$12,545.43 for building materials, salaries, and wages.

Mr. Hubbard was soon succeeded by Major L'Enfant, a French engineer who had been with Napoleon and who

had surveyed and laid out the city of Washington. Major L'Enfant's ideas, however, were on such a grand scale and so impractical that he was soon succeeded by Peter Colt, who had been comptroller of the State of Connecticut and interested in the Hartford Woolen Manufactory. Colt took charge in February, 1793. A wooden building for temporary occupancy was built, the cotton machinery being run at first by ox-power until the water-power equipment could be completed, and so for many years the building bore the name the "Bull Mill."

The permanent mill, which was completed in the summer of 1794 and which was about on the site of where the silk mill of Hammel & Booth stood, was of stone, ninety feet long, forty feet wide, and four stories high. According to the *Connecticut Journal* of July 2, 1794, the spinning of cotton by water power began June 14 of the same year. The dam and canal had been completed, and the mill was opened with a parade and a ball, which was given at the factory. The equipment of the factory seems to have been four carding machines, twenty-five spinning jennies, and sixty single looms. It employed a hundred and twenty-five operatives.

The enterprise, however, was not a success. The extravagant constructive work, together with the mismanagement said to have been due to an improper use of the funds by some of the officers, led the stockholders to refuse to pay further instalments on their subscriptions, and finally on Jan. 26, 1796, a resolution was adopted that the superintendent be directed to stop all manufacture as soon as goods in hand could be finished and to discharge the help. Mr. Colt asked for his dismissal, and it was granted March 7, 1797.

The factory remained unoccupied until 1800. John Park then turned it into a mill for making candlewicking. According to James Beaumont, an Englishman who visited Paterson to buy machinery in the spring of 1801 and who

visited the cotton factory, it was nearly full of machinery of a costly kind, the billets of the carding cylinders being covered with mahogany. The machines did not seem to have been worked, and apparently John Clark, who later engaged in machinery manufacturing in Providence, was using the basement story for making textile machinery. Clark continued to occupy the basement of the factory until the factory was burned in 1807.

Since this date the Society for the Encouragement of Useful Manufactures has not operated any mill of its own, but the stock has acquired much value because the company has retained its real estate and rights to the water power, which have been used to develop the subsequent textile industries as well as other manufacturing operations in Paterson.

The establishment of the silk industry in Paterson has already been referred to in the chapter on silk, but these further details complete the story. The first silk mill started by Christopher Colt, Jr., of Hartford, was a small affair, and was bought in 1840 by G. W. Murray, of Northampton, who put in charge John Ryle, an English silk weaver from Macclesfield, England.

Ryle became a partner in 1843, the firm being Murray & Ryle, and in 1846 Ryle with his two brothers who came from England bought out Murray and began weaving dress goods. Although the silk was of excellent quality, it could not be made at a profit, and he devoted his mill to tram organzines, spool silks, and trimmings. Later, when his sons became associated with him, he successfully took up the making of twills and fancy silks. Ryle has been called the father of the Paterson silk industry. Other mills started in a small way in Paterson, and little by little the industry grew until the output has reached the present proportions, which, according to the last census, was \$50,000,000 annually.

NEW BEDFORD

The beginning of the textile industry at New Bedford, like the development at Lawrence, was due to the enterprise of one man, whose persistence in carrying out his purpose overcame all obstacles.

About 1840 Dwight Perry had left Fairhaven, which is across the river from New Bedford, and had started in Georgia a small cotton mill, having as one of his employees Thomas Bennett. Becoming desirous of having his own business, Bennett returned to New Bedford, and endeavored to interest New Bedford capital in starting a mill in Georgia. He persuaded William T. Russell in 1846 to go to Georgia with him to look into water power and mill sites, and on their return tried unsuccessfully to secure New York capital for the enterprise.

Meeting Joseph Grinnell, who was a Congressman from New Bedford, Bennett and Russell interested him, but he refused to take part in the plan unless the mill was built at New Bedford, where those who invested might watch the progress of the enterprise.

The opinion of David Whitman, who was a mill expert and was engaged in cotton manufacturing at Warwick, R.I., was sought, and his favorable opinion of the success of building a mill at New Bedford led Grinnell to back Bennett's project. It was decided to raise three hundred thousand dollars, and to build a mill with three hundred spindles. New Bedford's capital at the time was tied up in the whaling industry, which was then at its height and paying large profits, and the holders of money were very loath to put their capital into such an uncertain venture as a new cotton mill in New Bedford. Not only was the sentiment of the citizens against the project, but the mechanics of New Bedford were opposed to it, because they thought that mill work with its organized and regular business would be inimical to them. Only \$157,900 could be

raised, and that in small subscriptions ranging from ten to a hundred and fifty shares. Grinnell, who had subscribed for \$10,000, took \$2,100 more, making \$160,000, with which it was decided to start.

A charter was granted April 8, 1846, for the Wamsutta Mills, Matthew Luce, Jireh Perry, and Thomas S. Hathaway being the incorporators. Joseph Grinnell was chosen president; Edward L. Baker, treasurer; and Joseph Grinnell, David R. Greene, Thomas Mandell, Joseph C. Delano, and Pardon Tillinghast, directors. Thomas Bennett was made superintendent. Carpenters, mechanics, and operators had to be brought from Rhode Island, Connecticut, and the central part of Massachusetts; and all the material but the building stone, and some of that, had to be transported from Fall River. Boarding-houses and tenements were to be constructed for the employees. At a stockholders' meeting held June 9, 1847, it was voted to buy a tract of land with power, south of Benjamin Rodman's, for \$7,500, as fresh water and railroad and shipping facilities were at hand.

Mill No. 1, designed for fifteen thousand spindles and three hundred looms, was built, but only ten thousand spindles and two hundred looms put in. It was completed in 1848, and manufacturing began Jan. 1, 1849. Bennett recommended Wamsutta shirtings, and they have since been sold all over the world.

In 1849 the capital stock was increased to three hundred thousand dollars, and five thousand more spindles and one hundred more looms put in. The first dividend was declared Feb. 1, 1850. Slowly, but surely, the business increased, and even the Civil War did not close the mill. Although the mill was very successful, it was not until 1871, over twenty years after the starting of the Wamsutta Mill, that the second mill, the Potomska Mill, started. In the mean time, mill after mill had been added to the Wamsutta, and dividend after dividend had been



INTERIOR VIEW OF A MODERN WEAVE-ROOM
(Courtesy of the Chicopee Manufacturing Company)

paid, until the original stockholders had received over 300 per cent. on their money. The Acushnet followed in 1881, and the New Bedford and City Manufacturers in 1882. Mill after mill has been erected, until there are now over fifty mills which turn out the best grade of cotton goods, to which the climate of New Bedford is peculiarly adapted. It is said to be more like that of Manchester, England, than any other American city. In 1911 the city had 2,939,884 spindles and 54,282 looms, supplying 31,140 workmen. There were sixty-seven cotton mills with a capital of \$36,821,300. In 1912 the population of New Bedford was 105,000, which turned out, according to the last census, \$44,000,000 worth of goods.

MANCHESTER

Like Lowell and Lawrence, Manchester, N.H., was a "manufactured" town that was originally owned and developed by the mill which bought the water rights and first started its spindles in the locality. And, as Lowell and Lawrence had far-sighted and fearless merchants whose imagination could see the possibilities of a remote future, so Manchester had men of the same stamp, the first of whom was Samuel Blodgett.

Blodgett, who was born in Woburn, Mass., had served as sutler during the Revolution, had been a judge of the Court of Common Pleas and a merchant, when in 1793 he went to live at Derryfield on the east bank of the Merrimac, near Amoskeag Falls. He built a canal to carry lumber around the falls, and completed the work May 11, 1807. Appreciating the great power of the water, he endeavored unsuccessfully to interest Boston capital in mill development, which he saw could be readily compassed. He died soon after the completion of the canal, and it passed into the hands of the Middlesex Canal. In June, 1810, the name Derryfield was changed to Manchester in honor of Judge

Blodgett, who had said that the site would be the Manchester of America.

Early in 1809 Benjamin Pritchard, who had learned his trade at New Ipswich, and had come to Bedford and spun cotton on the old Goffe place, with Ephraim, David, and Robert Stevens built a cotton mill on the west side of Amoskeag Falls, in what was then called Goffstown. As the financial burden was too heavy for them to carry alone, a joint stock company was formed, and the first meeting was held Jan. 31, 1810, as "The Proprietors of the Amoskeag Cotton and Woolen Factory." In June of the same year they incorporated as the "Amoskeag Cotton & Wool Manufactory."

The incorporators were James Parker, Samuel P. Kidder, John Stark, Jr., David McQuestion, and Benjamin Pritchard. Parker was president, and Jotham Gillis was clerk, and later agent. The original mill was a pygmy compared with the great structures of to-day, for it was but forty feet square and two stories high. It had no cotton picker, the cotton being ginned in the neighborhood and by the farmers' wives at four cents per pound, and the machinery consisted of only spindles, the cotton spun being either woven for the mill by the housewives in the neighborhood or sold at the mill.

The machinery ran until 1816. Lack of business then stopped the spindles, and they remained idle until 1822, when Olney Robinson, of Attleboro, Mass., bought the property, and work was resumed. Subsequently it was sold to Larned Pitcher and Samuel Slater, of Pawtucket, and in 1825 they sold three-fifths of the property to Willard Sayles and Lyman Tiffany, of the firm of Sayles, Tiffany & Hitchcock. Dr. Oliver Dean became agent of the company, and in 1826 a new mill was built, called the "Bell Mill," and another on an adjacent island, and the company commenced to make the sheetings, ticking, and shirtings that since have made the Amoskeag Mills famous. The engineer who laid out the new mill was Ezekiel Straw, who also laid out the Amos-

keag Locomotive Works and who built the first fire-engine. He was agent of the Amoskeag Mills for a great many years, and did much to lay the foundations of their great prosperity.

The company was again incorporated July 1, 1831, as the Amoskeag Manufacturing Company by Ira Gay, Willard Sayles, Oliver Dean, Larned Pitcher, and Lyman Tiffany, who also acted with power of attorney from Slater, and the capital was a million dollars. Tiffany was chosen first president; Ira Gay, clerk; and Oliver Dean, agent and treasurer. Tiffany, Gay, and Sayles became directors.

AMOSKEAG LAYS OUT A TOWN

The new corporation bought all the water power along the Merrimac from Manchester to Concord and all the land available for building sites in Manchester. The town was laid out by the Amoskeag Company, streets and public squares being made; and in 1838 part of the land was divided into lots, and sales began for stores and dwelling-sites. Boarding-houses and tenements were built for their employees, and land was sold and water privileges leased to other corporations. And thus the city of Manchester, N.H., was founded by the Amoskeag Company. The pay of the early agents was \$180 per year, and outside weavers received thirty-six cents per day. The second mill, the Stark Mill, was incorporated Sept. 26, 1836, with Nathan Appleton as president. In 1830 Manchester had but 877 people, and by the 1910 census it had 70,063. The gross value of the total output of textile products during the year, according to the last census, was \$23,000,000.

NEW YORK

The burghers of early New York were as proficient in the handicraft of the home as were the Puritans of New England, and among these handicrafts homespun spinning and

weaving held the principal place. Throughout the colonial era, evidences of the industry in the homes of New Amsterdam are numerous, but, although the city early made strenuous efforts to compass the establishment of the industry in a sense that could be called manufacturing, the industry never obtained so strong a hold as it did in New England because of the lack of water power.

A society called the Society for the Promotion of Arts, Agriculture, and Economy was formed in 1764 to encourage the manufacture of linens. Another organization was formed later, the members of which pledged themselves neither to buy imported cloth nor to eat the meat of sheep or lambs less than two years old. Homespun raiment became quite the vogue. Governor Moore in 1767 reported for New York that there were two kinds of wool being made there: one class of all wool; the other linsey-woolsey, of linen in the warp and wool in the weft.

Soon after the Revolution the industrial development of the city engaged the attention of its residents, and late in 1788 an organization called "the New York Society for the Encouragement of American Manufactures" was formed to carry out this purpose. At one of the first meetings, held Jan. 5, 1789, at Rawson's Tavern, it was unanimously resolved to raise a fund to promote the objects of the society, and a constitution adopted at a later meeting designated the purpose of the society as that of establishing house manufactures in the city of New York, furnishing employment for the honest and industrious poor, and named the organization the New York Manufacturing Society. The treasurer was Alexander Robertson.

An advertisement was inserted in the *New York Journal* for a manager and superintendent to take charge of the manufacturing, and on the 3d of July, 1789, notice was given that the society was ready to do business on its bleach-ground at Mill Hall, Second River, N.J., and that linen cloth and yarn would be taken in to bleach either there or

at the factory, 21 Crown Street. It was further announced that good weavers would be furnished with looms at their own houses if they would apply at the factory.

A later advertisement shows that a Mr. Stevenson was then the manager, and that brown linen sheeting, linen yarn of the first quality, hatchelled flax, tow, and backings, were being sold at the factory in Vesey Street, to which it had been removed. By Dec. 23, 1789, fourteen weavers and a hundred and thirty spinners were at work. Cotton machinery had been started at this date.

In a letter Moses Brown received from Samuel Slater, who was employed in the factory during the months of November and December, 1789, Slater said that the factory had but one card, two machines, and two spinning jennies, and they were very inefficient. On the 3d of August, 1789, the directors ordered small notes to be struck off, of one, two, three, four, and five pence and up, which they issued to their employees and received in payment for goods purchased at the factory, and bound themselves to exchange at all times for gold or silver or paper currency of the State.

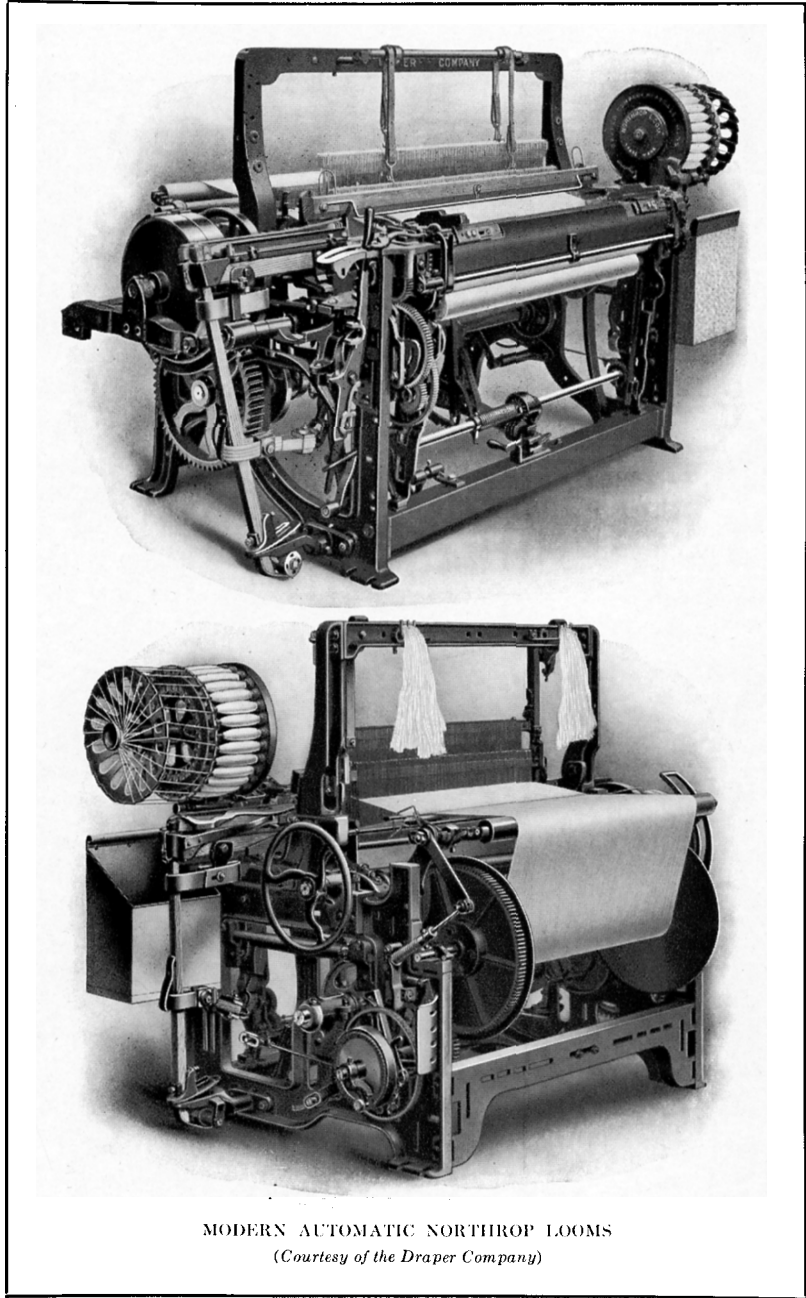
An advertisement which appeared on Dec. 11, 1790, shows that the manufacture of cotton yarns and cloth, as well as linen, was under way. The cotton and linen sheetings had undoubtedly a linen warp and cotton filling. The business, however, did not prosper, and for a number of months subsequent to May 9, 1793, the factory was offered for sale or lease.

There seems to have been no further effort at an establishment of the industry until about July 30, 1793, when David Dickson and others on New York Island, on the bank of the East River opposite Hell Gate, took steps to start the manufacturing firm of Dickson, Livingston & Co. by mortgaging for three thousand dollars twenty-eight acres of land with houses, mills, and buildings at this place. It is not known at what time they began manufacturing, but it may have been early in 1793. According to a description

given by an English clothier who visited the factory in 1794, it was known as Dickson's Cotton Factory, and was worked by a breast water wheel twenty feet in diameter. There were two large buildings, four stories high and eighty feet long. Twenty-six looms were at work, weaving fustians, calicoes, nankeens, nankinettes, dimities, etc. Ten looms were being operated in the neighborhood, and the Arkwright system of spinning was being worked by twelve or fourteen workmen from Manchester. There were twenty or thirty women and children at work. The women were making two dollars a week with their board and lodging. This shows that as early as 1794 not only was the Arkwright system being used, but the Crompton mule, at a date at least ten years earlier than most authorities have fixed the first use of the mule in this country. Already in 1793 John Daniel, a European mechanic, had established himself in New York City, where he had commenced the construction of carding machines of all kinds; also the new invented machines for cleaning seed cotton, etc.

The power supplied to the Dickson mill came from the breast wheel that was driven by water from a reservoir having a fall of some ten feet, the feeder of the reservoir being a brook flowing from the hills in the interior of Manhattan Island. If a tide wheel was used, it was solely for the purpose of pumping water into the reservoir during the dry season of the year. The business seems to have been conducted until the close of 1793 as the New York Cotton and Linen Manufactory. According to Samuel Batchelder the machinery was in full operation in 1795. The property was, however, sold Dec. 26, 1799.

These early attempts at the textile industry on the Island of Manhattan demonstrated that it was not feasible ever to establish much of a textile industry in the city of New York. As late as 1824 the county of New York contained but three fulling mills, five carding machines, and two cotton and woolen factories. Its greatest development has been in



MODERN AUTOMATIC NORTHROP LOOMS
(Courtesy of the Draper Company)

the cutting up trade and the manufacturing of clothing, to which lines of industry it owes its prominence as a textile centre to-day. According to the census these industries have grown to a size which makes New York to-day the leading city of America in the cutting up lines, the gross value of its textile products, according to the 1910 census, being \$52,000,000.

AMSTERDAM

The rugged figure of Sir William Johnson, the famous pioneer of middle New York, looms in the background of the history of Amsterdam, Montgomery County, N.Y. He it was who built the saw-mill on the Chuctenunda River, which was the beginning of the Amsterdam industry, and which later was one of the sites of the early textile mills. Johnson bought the property about Amsterdam in 1742, and utilized the water power of the river in the mill. The little hamlet, which was settled about 1775 and was called Veedersburg, grew slowly. In 1814 its present name was adopted, but it was not until 1885 that it was chartered as a city. In 1813 it had two carding and two fulling machines. In 1814 the Star Hosiery Mills of H. Pawling & Sons were commenced by Pawling and Jackson, in which woolen goods were manufactured.

Wait, Greene & Co. in 1840 had leased a small satinet factory at Hagaman's mills, near Amsterdam, and commenced to make ingrain carpets. Two years later the partnership was dissolved, and W. R. Greene went to Amsterdam proper, and in a small building set up the first carpet looms in the town. John Sandford became interested in the place, a larger structure higher up the creek was bought, and the business grew rapidly, particularly under the direction of Stephen Sandford, a graduate of West Point and son of the original owner.

W. R. Greene and John McDonnell commenced in 1857 the manufacture of knit goods with two sets of machines.

The same year Adam Kline and John Maxwell commenced making knit goods. Later Kline sold his interests to Maxwell, and started in business with his son. The Pioneer Hosiery Mills were built in 1868, and since then the textile industry in Amsterdam has grown rapidly. Its most important industries are carpets, rugs, hosiery, and knit goods. Its output, according to the last census, was \$17,000,000.

WOONSOCKET, R.I.

The falls of the Blackstone and its tributaries, the Mill and Peters Rivers, in the vicinity of what is now Woonsocket, offered an opportunity for an early establishment of the textile industry, as here the falls were about thirty feet. In 1810 the water rights were owned by James Arnold, Stephen Wilcox, and Joseph Arnold. The latter had inherited his land from his grandfather Daniel Arnold, one of the early pioneers.

On Oct. 24, 1810, a meeting was called, at which Ariel Abner, Nathan Ballou, Eber Bartlett, Job and Luke Jenckes, Oliver Leland, and Joseph Arnold formed the Social Manufacturing Company, and divided the stock into sixteen shares of a thousand dollars each, each stockholder taking two shares of stock. Cotton yarn and cloth were to be made. About four acres of land were sold to Mr. Arnold, and a small wooden mill erected that contained two thousand spindles.

James Arnold built a mill in 1814, and here Dexter Ballou began to spin cotton. The building was conveyed Oct. 8, 1821, to Daniel Lyman, and has since been known as the Lyman Mill. Dexter Ballou came to Woonsocket in 1817. Previously he and his father had been working at Ashton, near what was known as the "Sinking Fund." The machinery consisted of five cards made by Dexter Ballou, and three spinning jennies of eighty-four spindles each. The machinery was later removed to Lynn, Mass. When

Daniel Lyman bought Joseph Arnold's mill, he also bought Ballou's cotton machinery.

Jenckes sold out his interest in 1822, and built at Peters River, at what was Jenckesville, the first stone mill in Woonsocket. In 1827 the second wooden mill was built. Dexter Ballou became sole proprietor Nov. 12, 1841, and the following year the Stone Mill was enlarged and improved. It was very successful under the management of Orin A. Ballou, president, Henry Lippitt, treasurer, and Charles Nourse, superintendent. July 1, 1874, the mill was burned. Woonsocket became a city in 1888, and to-day its principal textile products are worsted and woolen yarns, woolen and cotton goods, and cotton yarn and silk. Its population is about thirty-eight thousand, and its output, according to the last census, was \$20,000,000.

CONCLUSION

The establishment of the textile industry in the textile centres of America marks the end of this brief survey of the methods by which man has clothed himself. The survey has dealt largely with the era from 1733, when Kay invented the fly shuttle, to about the death of Samuel Slater a little over a century later, because during this period the industry has shown its greatest development, and this century marks the transition of the industry from a handicraft in the home to a power production in the factory.

This transition has had a far-reaching effect on social conditions on both sides of the Atlantic. It has changed the face of Western England from an agricultural section to a great manufacturing centre, whose mills and factories have brought about a segregation of population in industrial centres, and has created the great middle class in England. It has given labor in England a dignity that it never possessed, and has placed many of the great captains of industry on a plane of equality with the nobility. Many of

the Lancaster mill owners who have played such a potent part in the politics of Great Britain for the last hundred years have risen from the ranks of the workers or have been descendants of workers in the textile mills.

The industry has been the leaven which has expanded the intellectual vision of the industrial worker to a point that has made him a factor in the politics of his nation and a coming power in the great movement for the betterment of the world; for the English textile worker has learned to sympathize with the fellow-worker of another nation as well as with workers in other classes of industry.

The transformation on this side of the Atlantic has been quite as interesting, though perhaps along somewhat different lines. It was during the colonial era and up to the beginning of the nineteenth century a handicraft in the home, as it was in England and on the Continent,—a handicraft that was limited in output and impotent in its influence on the social life of its time.

The introduction of machinery caused the harnessing of the rocky streams of New England to spinning frames and looms, and stimulated the inventive genius of the Yankee. The concomitant adoption of Arkwright's machinery and Lowell's and Gilmore's perfected looms in American mills caused an extension of the industry not only over the rocky face of New England, but even into the cotton-growing fields of the South and along many of the less rugged streams of the Middle Atlantic States.

The industry found New England a great maritime centre, sending its ships for trade to the uttermost parts of the earth. It stimulated and developed the great shipping interests during the middle of the nineteenth century; for its cotton goods found a ready market in the East, and at that time so much greater were the returns from the capital invested in the textile mills of New England that money was diverted from the shipping interests into mills, and during the end of the last century to the more profitable in-

vestments in transportation and in the fast-growing West. To-day the shipping has disappeared and the textile industry has dotted the face of New England with the great mill centres, which are beehives of production, whirring with millions of spindles, clattering with thousands of looms, and rumbling with thousands upon thousands of pulleys and shaftings, turning out millions of dollars' worth of fabrics of every description.

The growth in America has indeed been phenomenal, for prior to 1787 there were few spindles under one roof, and very few in the country as a whole. With the establishment of the Pennsylvania Society for the Encouragement of Useful Arts and the Beverly Cotton Manufactory, the two earliest cotton manufactories, there were not in all in 1788 more than 860 spindles in America. According to the 1910 census the number of spindles is now 33,998,648, of which 28,178,862 were employed in the cotton industry, 2,156,849 in the woolen industry, and 1,752,806 in the worsted, and 1,767,962 in silk, and on flax, hemp, jute, and allied fibres 142,169. The census ranks the textile industry on the basis of the value of output second only to that of food products; while, as to the number of employees, it gives it the first place; as to the number of establishments, fourth place; and as to capital, salaries, and wages, second place.

The total capital invested in the textile industry in this country to-day is \$1,343,324,605. There are 1,154 mills devoted to cotton, 1,213 to wool, 1,079 to knit goods, and 624 to silk. 739,239 wage-earners are engaged in the industry, who draw \$249,357,277. Its salaried officials and clerks number 24,116. The cost of the material used is \$745,783,168, and the value of the product is \$1,215,036,792.

Hardly less marvellous than the growth of the industry has been the increased production of the individual spinners and weavers. As Jonathan Thayer Lincoln well says, in the admirable little monograph "The Factory," of the con-

dition of the industry after the establishment of the factory system, "The amount of labor performed in a single factory was as great as that which formerly gave occupation to the inhabitants of an entire district." He says that while originally a good hand loom weaver could produce two pieces of shirting each week, by 1823 a power loom weaver was able to produce seven such pieces in the same time, while a factory of two hundred looms operated by one hundred persons could, it is estimated, weave seven hundred pieces a week. Under the old handicraft system at least 875 looms would have been required to weave the same amount of cloth. He estimates that the work done in a steam factory containing two hundred looms would, if performed by hand, give employment and support to a population of two thousand persons, and that a modern weave-room, containing two hundred power looms operated by twenty-five weavers, is equivalent to the labor of a community of sixty thousand craftsmen, their wives and children. So that to produce by hand the work now turned out by the Fall River factories alone would require a population of thirty million.

A further estimate by John S. Lawrence shows that the productiveness of the individual weaver and spinner as compared with the old handicraft workman has been increased over a thousand times, and, as the consumption continues to increase in equal ratio, we must in the future either increase the production of labor and machinery or employ a greater per cent. of the population.

The social changes brought about by the textile industry in New England have been almost as marked as those in England. At first the mills were made up almost wholly of the sons and daughters of native-born Americans, often neighbors and friends and almost always acquaintances of the proprietor. As the industry grew, calling for more help, Irish and French-Canadians came in, driving out with their cheaper labor the native-born, and this together with the offering of the mill stock on a wider scale resulted in a dis-

continuance of this close working relationship between employee and employer, until it was not long before the employers, or the stockholders, were entire strangers to the body of employees. The French-Canadians in turn were driven out by the hordes of emigrants from Russia, Poland, Bohemia, and the southern countries of Europe,—a class unfamiliar with American ideas or American standards of living. This last class of help has done a great deal to change the civic conditions of the factory towns and to lower the standard of living. Hours and conditions of work are, on the other hand, constantly improving. As more and more of the mill owners are showing a regard for their employees, outside as well as inside their factories, the general conditions in the mill towns are improving, and the day is rapidly approaching when the criticisms of the present mill town conditions will not apply.

The textile industry is so highly competitive and the development of machinery has produced such excellent work with but little skill that the textile mills of New England have become great training schools in industry for the most recently arrived immigrants from the less resourceful nations of the whole world; while in the South the industry has lifted to a plane of greater comfort and efficiency the natives who even before the war were completely poverty-stricken. Not only have the mills trained the employees and their children so that former textile employees now form the part of our great middle class which operate our industries everywhere, but they have also furnished the means by which they and their children have been fed, clothed, and educated.

The Statute Books of many of the more advanced States, such as Massachusetts, Rhode Island, and Pennsylvania, already contain admirable laws aimed to remove the causes of friction between the employees and the mill owners and the public. Many mills are taking steps not only to safeguard their employees while at work, but to promote their

happiness and to better their living conditions. And, as soon as a community is able to feed and clothe its children and endure taxation for education, the employment of children will cease. Many who have for hire, either capital or labor, are beginning to realize that theirs is a trust given them temporarily, not alone for their own benefit, but for the interests of the community; and employers and employees who act in accord with this realization are the effective forces in making the future of the country better for all.



Reproduction of the original engraved copperplate of Samuel Wetherill, of Philadelphia, the first manufacturer of velvets, jeans, fustians, and other cloths in America, used by him as early as 1782 to print cards and labels for his manufacture.

INDEX

- Abbott, J. G., stockholder, 219.
Acme Spinning Company, first to use electric power, 69.
Acushnet Mills, *New Bedford*, 239.
Adair, James, 113.
Addison and Stevens, of *New York*, patent a ring spinner, 109.
Agriculture, its relation to the English textile industry, 62, 64-65.
Alabama, consumption of cotton, 43.
Alcohol, used for fuel, 91.
Alexander, *the Great*, brings knowledge of silk-making to Europe, 46.
Alexander, Joseph, weaves corduroy at Providence, 162, 230.
Algonquin Indians, weaving by, 22.
Alizarine, produced artificially, 118.
Allen, John, establishes cotton mill at Centreville, R.I., 178.
Almy, Brown and Slater, *Providence*, partnership formed, 171; construct Arkwright machinery, 172; seek government aid, 173; use cotton warp, 173; build "Old Slater Mill" for spinning, 174; payment and discipline of employees, 174; markets for yarn, 174-175, 176; buy Centreville cotton mill, 178.
American colonies, silk industry in, 51-52.
American Linen Company, *Fall River*, 229.
American Manufactory, *Philadelphia*, earliest cotton and woolen manufactory in America, 215.
American Print Works, *Fall River*, largest in America, 228.
American Printing Company, *Fall River*, 228.
American Woolen Company, 221.
Ammianus Marcellinus, cited, 47.
Amoskeag Manufacturing Company, incorporated, 241; lays out Manchester, 241; wages of employees, 241; growth of the industry, 241.
Amsterdam, *N. Y.*, a textile centre, 210; value of product, 211; history of, 245-246; hosiery mills, 245, 246; carpet mills, 245; knit goods, 245; value of output, 246.
Aniline dyes, discovery and nature of, 118.
Anthony, Daniel, manufactures cotton in Rhode Island, 161, 230.
Anthony, Richard, makes textile machines, 161.
Appleton, Nathan, meets Lowell in Edinburgh, 193; sells Waltham goods, 197; names Lowell, Mass., 205; stockholder of Essex Company, 220, 221; president of the Stark Mill, 241.
Appleton Company, established, 209.
Apprentice system, 65-66; tried by Slater, 174.
Argentine Republic, production of wool in 1909, 31.
Aristotle, cited, 46.
Arkwright, Richard, the "father of the factory system," 68, 69, 73; erects first practical cotton mill in the world, 68; sketch of, 78-83; Carlyle's description of, 79; early life, 79-80; his spinning frame and other inventions, 80-81; his machines destroyed, 82; infringement of his patents, 82; knighted, 83; his machines first used in America, 173, 244.

- Arnold, Asa, invents Compound Gear, 108.
- Arnold, James, builds mill at Woonsocket, 246.
- Arnold, Joseph, starts Woonsocket cotton industry, 246.
- Arrian, mentions cotton, 36.
- Atlantic Cotton Mills, *Lawrence*, 221.
- Aurelian, *Emperor*, calls silk extravagant, 47.
- Australia, production of wool in 1909, 31.
- Bailey, John, makes textile machines, 161.
- Baldwin III., *Count*, establishes first weavers at Ghent, 22.
- Ballou, Dexter, constructs textile machines at Woonsocket, 246-247.
- Baltimore, *Md.*, manufacturers petition for duty on cotton, 188; cotton manufactory established, 188-189.
- Bancroft, Edward, perfects dyeing machinery, 118.
- Barbadoes, exchanges cotton and rum for slaves, 127.
- Barr, Robert and Alexander, receive aid from Massachusetts for textile machinery, 151, 152, 153; "The State Models," 153.
- Barrett, Charles, proprietor of New Ipswich Mill, 179.
- Bartlett, Edmund, founder of the Essex Company, 220.
- Basket weaving, in ancient times, 14, 15-16; at Wellfleet, 22.
- Basyer, produces artificial indigo, 118.
- Batchelder, Samuel, invents the stop-motion, 109; quoted, 244.
- Bay State Mills, *Lawrence*, 221.
- Bayeux tapestry, 26.
- Beaumont, James, cited, 235.
- Bell, John, invents power loom, 106.
- Bell, Thomas, discovers plate and cylinder printing, 120.
- Belts, leather, first used at Lowell, 110.
- Bennett, Thomas, tries to start cotton mill in Georgia, 237; decides to try New Bedford, 237; superintendent of the Wamsutta Mills, 238; success of his enterprise, 238-239.
- Berthollet, Claude Louis, his experiments in bleaching cloth, 114; experiments in dyeing, 117.
- Beverly, *Mass.*, early cotton mill, 179.
- Beverly Cotton Manufactory, may have been first cotton mill in America, 149, 150; instigated by the Bridgewater experiments, 153-154; incorporated, 155; raw cotton imported, 154; secures a trade-mark, 155; the mill erected, 155; described, 156; expenditures, 156-157; legislative grant, 157; visited by Washington, 157-158; first textile advertising, 159; Beverly corduroys, 159; the industry discontinued, 159.
- Bible, mentions textile art, 17; flax, 26; cotton, 36.
- Billston, James, earliest reference to English cotton manufacture, 37.
- Bishop, John Leander, his "History of Manufactures," cited, 131.
- Blackman, Charles, early tailor, 212.
- Bleaching, history of, 111-115; bleaching with milk, 112; in the sun, 113, 176, 208; laws against stealing of linen, 113; premium offered in Scotland, 113; Home's sulphuric acid process, 113-114; the chlorine process, 114-115; method of at Slater's mills, 176.
- Block printing, process of, 119-120, 232. *See also* Printing.
- Blodgett, Samuel, builds canal at Derryfield, 239; tries to develop the water power there, 239; Manchester named in honor of him, 239-240.
- Board, his experiments in dyeing, 117.

- Bombyx, 46, 47.
- Bonvoise, Anthony, introduces the distaff into England, 71.
- Boott, Kirk, secures water privileges for Lowell mills, 201; song written about him, 201; his life and personality, 202; attempts upon his life, 202; treasurer of the Merrimac Company, 203, 204; secures engravers in England, 205.
- Boott Company, established, 209.
- Borden, Holder, 228.
- Borden, William, receives bounty on duck, 133.
- Boston, Linen Manufactory House established, 134; Linen Men's House, 134; spinning craze, 135-137; Manufactory House on Tremont Street erected, 137; Society for Promoting Industry and Frugality raise money for spinning, 136; young women spin on the Common, 136; Frog Lane, now Boylston Street, 160; Holyoke, now Tremont Street, 160.
- Boston Manufacturing Company. *See* The Waltham Company.
- Boston Sail Cloth Factory, history of, 159-160; described by Washington, 160.
- Boulton, Mathew, partner of James Watt, 100.
- Bourne, E. A., 221.
- Bow, *Eng.*, early dye works there, 117.
- Bowditch, William, comments on the Waltham speeder, 195.
- Bowdoin, *Mr.*, examines textile machinery, 151.
- Bowers, *Mrs.* Isaac, sells Waltham goods on Cornhill Street, 197.
- Branch, Peter, his inventory mentions home-made cloth, 123.
- Brazil, production of cotton, 35; natives use cotton in 1519, 40.
- Brewster, Gilbert, invents the Eclipse Speeder, 109.
- Bridgewater, *Mass.*, early textile machines made there, 151-153, 161.
- Brooks, Daniel, erects cotton mill, 179.
- Broome, Jacob, his cotton mill, 190.
- Brown, Jeremiah, commission merchant, 176.
- Brown, John, directs Boston spinning school, 137; refuses to be dispossessed, 137.
- Brown, Moses, of *Beverly*, founder of the Beverly Cotton Manufactory, 155.
- Brown, Moses, of *Providence*, seeks the co-operation of the Beverly proprietors, 159, 173; buys textile machinery, 162; invites Slater to Providence, 170; quoted, on Slater's cotton warp, 173.
- Brown, Obadiah, buys cotton mill at Centreville, 178.
- Brown, Smith, buys Fullem's stocking loom, 162; forms partnership with Samuel Slater, 171.
- Buckram, manufactured in 1722, 132.
- Bush, Thomas, 180.
- Button, John, makes children's hose, 218.
- Byfield, Newburyport Woolen Manufactory established, 165-166.
- Cabot, Andrew, 155.
- Cabot, Deborah, 155.
- Cabot, George, letter to Alexander Hamilton quoted, 149, 154, 156; one of the founders of the Beverly Manufactory, 155; entertains Washington, 157-158.
- Cabot, Henry, anecdote of Washington's visit, 157.
- Cabot, John, purchases site of Beverly Manufactory, 155.
- Calico, brought from India, 36, 38; woven by Arkwright, 81; printing of, 119; first in America printed by John Hewson, 140, 215; printing in Rhode Island, 162; printed at Lowell, 205, 206.
- Cam, John, stocking weaver, 212.

- Cap Spinner. *See* Danforth, Charles.
- Capital, combination of, cause of modern factory system, 60, 66, 67.
- Carding machine, Kay's, 74; Paul's, 77; Crompton's, 86; constructed by Earl, 172; manufactured at Philadelphia, 215-216; constructed by John Daniel, 244.
- Carlyle, Thomas, his essay on Chartism cited, 69; quoted, 79.
- Caroline, *Queen of England*, has dress of Georgia silk, 52.
- Carpenter, Ezekiel, his fulling mill at Pawtucket, 172, 173.
- Carpet, industry in Philadelphia, 216-217, 218; first manufacturer of, 216; Turkish and Axminster, 216-217; floor carpets and oil cloths, 217; Brussels, 217; industry in Amsterdam, N.Y., 245, 246.
- Cartwright, Edmund, 69, 73; sketch of, 88-92; his power loom, 88-90, 91; early life and education, 90-91; his personality, 91; his other inventions, 91-92; his machines set on fire, 92.
- Cecil, *Sir William*, 49.
- Cecil Manufacturing Company, Elkton, Md., its history, 189.
- Centreville, *R.I.*, second cotton mill in Rhode Island, 178; machines copied from Slater's, 178.
- Chambers's "Book of Days," quoted, 100.
- Champlain, Samuel de, says Indians wear cotton, 41.
- Chapman, Isaac, 155.
- Chelmsford, original name of Lowell, 201.
- Cheney Brothers, their silk industry, 57.
- Chevreul, Michael Eugene, experiments in dyeing, 117.
- Chew, his "History of the Kingdom of Cotton," *etc.*, cited, 146.
- Children, in cotton mills, 69, 78, 81, 174, 199, 200, 207-208, 244, 252.
- China, method of hand weaving, 21; source of cotton industry, 35; early home of silk industry, 45.
- Chlorine, used in bleaching, 114-115.
- City Manufacturers, New Bedford and, 239.
- Clark, Thomas M., secures water privileges for Lowell mills, 201.
- Clarke, *Mr.*, examines textile machinery, 151.
- Clay, Henry, 56.
- Clayton, *Messrs.*, establish first printing plant in Lancashire, 119.
- Clegg, Edward, 215.
- Cochineal, use of, 117.
- Colbert, Jean Baptiste, his interest in French silk industry, 49; published instructions in dyeing, 117.
- Colchester, *Conn.*, duck manufacture, 160-161.
- Colchester, *Eng.*, early woolen mill there, 68, 74.
- Colonial Assembly offers bounties for raw silk, 51.
- Colt, Christopher, his silk industries, 56, 236.
- Colt, Peter, 163; superintendent of the Paterson mills, 235.
- Columbus, Christopher, first mentions cotton in America, 39.
- Commission merchants, first ones, 175, 176.
- Compound Gear, invented by Asa Arnold, 108; English patents stolen, 108.
- Conestoga Print Works, 218.
- Confraville, perfects dyeing machinery, 118.
- Connecticut, its silk industry established, 52-55; start of the cotton industry in, 181-182.
- Connecticut, General Assembly, orders the raising of hemp and flax, 125; encourages the textile industry, 163, 165.
- Connecticut Courant*, quoted, 164, 165.
- Connecticut Journal*, quoted, 235.

- Connecticut Silk Manufacturing Company, 56.
- Constantinople, its silk industry, 47-48.
- Corduroy, manufacture of attempted in Rhode Island, 162.
- Cornbury, *Lord*, quoted, 132.
- Cornish, John, establishes the first worsted mill, 130.
- Cortez, Hernando, brings cottons from Mexico, 40-41; brings silkworms to Mexico, 51.
- Corticelli silk, 57.
- Cos, Island of, 46, 47.
- Cotton, known to the Egyptians, 17; used by Incas, 19; raised and woven by Malays, 21; crop in 1910, 34; derivation of name, 34; history of, 35-43; plant, 34, 35; Sea Island cotton, 35, 145; upland cotton, 35; by-products of, 35; cotton producing countries of the world, 35; known in England at an early date, 37; exported from England, 38; mentioned by Columbus, 39; first mention of in United States, 41; great stimulus given by American Revolution, 41; first manufactory of in America at Rowley, 42; statistics of cotton industry, 42-43; first cotton mills, 68; first use of water power, 68; whole operation of spinning first carried on in one mill, 68, 81; separated from the seed by hand, 101, 208; invention of the cotton gin, 101-105; American colonists exchange slaves for West Indian cotton, 123, 127; "Desire" and "Trial" bring cotton to New England, 123; Massachusetts General Court encourages its manufacture, 124; finer grades brought from England, 138-139; statistics of in England, 142-143; its cultivation in the Southern States, 143-144, 146, 225; origin and spread of Sea Island cotton, 145-147; exported to England, 146-147; laid by hand, 173; thread first made in America, 175; manufacture of in the South, 187-191; first cloth made entirely by power, 194; tariff on, 55, 197, 217, 232. *See* Spinning, Weaving.
- Cotton gin, invented by Eli Whitney, 101-105; increases cotton production, 146.
- Coutrai, *Belgium*, produces best prepared flax, 27.
- Coxal cloth, 71.
- Coxe, Tench, his attempt to secure English textile machines, 141-142; encourages cotton raising in the South, 143-144, 146; organizes The Pennsylvania Society for the Encouragement of Manufactures, 148.
- Crabbe, George, quoted, 91.
- Cranch, Richard, examines textile machinery, 151-152.
- Crank, *or* Scotch, loom. *See* Loom.
- Crocker, Samuel, manufactures cotton at Taunton, 180.
- Cromford, mills there first to have whole process of cotton spinning, 68, 81.
- Crommelin, Louis, 27.
- Crompton, Samuel, 73; sketch of, 83-88; his "mule," 83, 84-86; hides his machine, 85; makes his inventions public, 86; invents carding machine, 86; receives grant from Parliament, 87; his personality, 87-88; his mule first used in America, 244.
- Cromwell, Oliver, grants charter to hosiery trade, 93; prohibits export of wool from England, 128-129.
- Cumberland, *R.I.*, cotton mill there, 179.
- Cylinder card machine, used in Arkwright's mill, 68.
- Dambourney, perfects dyeing machinery, 118.
- Dana, *Dr.* Samuel L., 205.
- Dandy loom. *See* Loom.

- Danforth, Charles, invents the Cap Spinner, 108; his English patents stolen, 108-109.
- Danforth, George, invents the Taunton Speeder, 109; his speeder used in Rhode Island, 199.
- Daniel, John, constructs cotton machinery, 244.
- Daughters of Liberty, *Providence, R.I.*, adopt spinning, 138, 230.
- Davenport, James, receives first American patent on textile machinery, 108; establishes the Globe Mills, 108.
- Davol, William C., smuggles English mules to America, 228-229; installs them in Fall River, 229.
- DeFoe, Daniel, quoted, 65.
- Delaware, its silk industry, 53.
- Depouilly, develops the mercerizing process, 121.
- Derby, *Eng.*, silk mill erected, 1719, 51; hosiery mills there, 95.
- Derwent River, supplies power for cotton mills, 68, 81.
- Design, Art of, among Incas, 19; among hand weavers of China and India, 21-22.
- "Desire," *ship*, brings cotton to Salem, 123.
- Devonshire kerseys, 71.
- Dexter, Andrew, manufactures cotton in Rhode Island, 161, 230; sells machines to Moses Brown, 162, 172.
- Diaper, origin of word, 26.
- Dickens, Charles, describes Lowell mills, 207-208.
- Dickson, David, began cotton manufacture in New York, 243-244; his mill described, 244; employees and wages, 244; uses Arkwright machinery, 244; water power of his mill, 244; enterprise a failure, 244.
- Dimity, 37; made by American colonists, 126.
- Dionysius, cited, 47.
- Distaff, used in remotest times, 71; description of, 71.
- Distaff side, 73.
- Dorsey, John, makes carpets and oil cloths, 217.
- Double Speeder, invented at Waltham, 195.
- Draper, George & Sons, *Hopedale, Mass.*, instigate the invention of the Northrop loom, 110-111.
- Draper Company, *Hopedale, Mass.*, 110.
- Drebels, Cornelis van, discovers method of dyeing with cochineal, 117.
- Dressing machine, constructed at Waltham, 195; rollers made from soapstone, 195.
- Drop-box, invented by Robert Kay, 76.
- Duck, woven on eight looms in 1724, 132; bounty on granted, 133; manufactured in Boston, 160; other attempts, 160-161.
- Dufay, experiments in dyeing, 117.
- Durfee, Joseph, *Col.*, organizes the Globe Mill, 222, 223; served in the Revolution, 223; his mills described, 223; his undertaking a failure, 224; dies poor, 224.
- Dutch boy, improved by Kay, 74.
- Dyeing, evidences of in earliest times, 16-18; among Incas of Peru, 19; its history, 116-119; knowledge of brought to Europe from the Orient, 116; cultivation of dye plants, 117; discovery of cochineal dyeing, 117; discovery of aniline dyes, 118; perfection of dyeing machinery, 118; process of, 118-119.
- Dyer, *Mr.*, of Manchester, *Eng.*, patents the Taunton speeder, 109.
- Dyers' Company of London, incorporated, 117.
- Earl, Pliny, makes cards for Slater's mill, 172.
- East Greenwich, *Conn.*, stocking manufacture, 162; calico printing, 162, 231, 232.
- East India Company, controversy over calico, 38-39.

- Eau de Javel, used in bleaching, 114.
- Eclipse Speeder, invented by Gilbert Brewster, 109; used in England, 109.
- Edict of Nantes, revocation of, gives impetus to textile industries of Ireland and England, 27, 39, 49, 50.
- Edward III. restricts sheep raising, 33; restricts merchants to one line, 48; incorporates the Dyers' Company, 117.
- Edward VI., his silk stockings, 50.
- Egypt, production of cotton, 17, 35.
- Electricity, in textile mills, 69.
- Elizabeth, *Queen*, imports Flemish weavers, 23; permits free exportation of wool, 33; wears silk stockings, 50, 94; refuses patents to Wm. Lee, 93.
- Employees, early relation with employer, 65, 69; in Slater's mills, 174; care of at Waltham, 196; treatment of under the Waltham and Rhode Island systems, 199-200; care of at Lowell, 206-208; Fall River hours of work and wages, 223, 226, 227; plan for at Paterson, 234; increased production of the individual, 249-250; foreigners supplant the native-born, 250-251; lower standards of living, 251; improved condition of labor, 251.
- Employer. *See* Employees.
- England, progress of woolen industry, 23, 32-34; spinning schools, 27; a wool-producing country, 30; immigrations of Flemish weavers, 33; sheep raising restricted, 33; early references to its cotton manufacture, 37; trade in cotton, 38; silk industry in, 49-51; its textile industry in relation to agriculture, 62, 64-65; middle class formed, 70; export of wool prohibited, 128-129; export of wool from the colonies prohibited, 130; imports American cotton, 146-147; advantages for cotton industry, 193; economic and social aspects of the textile industry, 247-248.
- English Equation Box, 108.
- Essex Company, The, Lawrence, 220-221.
- Essex Gazette*, quoted, 128.
- Estes, Edward, 227.
- Europe, production of wool in 1909, 31.
- Evans, Oliver, manufactures cards, 215.
- Exeter, *N.H.*, duck manufacture, 161.
- Factory System, 59-70; English guilds forerunners of modern factory system, 59; skill, capital, and machinery causes of system, 60; Roman household embryo factory, 60; trace of in mediæval Italy, 60; John Winchcombe's factory first in England, 61; English farm first seat of textile industry, 62; its beginning appears in separation of processes, 62; artisans concentrate in hamlets, 65; relations of employer and employee, 65-68, 251; developed by era of inventions, 68; effect upon English society, 69-70.
- Fall River, leads in cotton production, 210, 222, 229; value of production, 211; growth since 1800, 222; development due to climate and water power, 222; the Globe Mill, 222-224; other mills started, 224-225, 227-229; cotton brought from the South, 225; market for and character of cotton products, 227; first print works there, 228; American Print Works, largest in America, 228; steam first used, 228; first to use self-acting mules, 228.
- Fall River Iron Works, 228.
- Fall River Manufactory, 224-225; power looms used, 226; hours

- of work and wages, 226; picking, warping, and roping, 226, 227.
- Feathers, woven by Algonquins, 22.
- Ferguson, James, his method of bleaching with lime, 114.
- Fernandina, Island of, natives use cotton, 40.
- Ferrero, Guglielmo, quoted, 60.
- Filling throstle, invented at Waltham, 195.
- Fire-proof mill, first ever built, 81.
- Fisher, Joshua, buys site for Beverly Manufactory, 155.
- Flax, known to the Egyptians, 17; one of first materials used in spinning, 24; flax plant, 24-25; preparation of, 25; Russia produces largest amount, 27; Belgian flax best prepared, 27; spun by machinery, 27; American grown for seed only, 28; production in various countries for 1909, 28; invention of machines for spinning, 98; its culture encouraged by legislative acts, 124, 125; imported by colonists, 128; raised by the colonists, 131. *See* Linen, Spinning.
- Florence, *Mass.*, silk industry established there, 56-57.
- Fly shuttle, invented by John Kay, 74-75; first used in America, 153; first used in Rhode Island, 162.
- Francis, James B., stockholder, 220.
- Frankford Woolen Mills, 218.
- Fullem, John, his stocking loom, 162, 231.
- Fuller, Thomas, his "Worthies of England" quoted, 61, 62.
- Fulling mills, erected in Massachusetts, 129-130.
- Fustians, made from both cotton and wool, 37, 38; made by American colonists, 126.
- Gazette and Country Journal*, quoted, 231.
- Gazette of the United States*, quoted, on Boston Sail Cloth Factory, 159-160.
- Gennes, *M. de*, tries to improve the loom, 73.
- Georgia, cultivation of cotton in, 41; fourth in consumption of cotton, 43; progress of its silk industry, 52.
- Germantown, 130; Mennonite stocking industry, 212; early woolen industry, 212; hand stocking weavers, 212; first knitting mill in America, 212; English knitters come, 212; knitting mills, 218.
- Germantown Hosiery Mills, 218.
- Gilmore, William, introduces power loom into Rhode Island, 184, 198; his loom compared with the Waltham loom, 184, 199; sells his drawings, 184.
- Globe Mill, *Fall River*, organized by Col. Joseph Durfee, 222-223; division of stock, 223; original mill burned, 223; second mill described, 223; cleaning and weaving done outside, 223; some power used, 223; wages and hours of labor, 223; product crude, 224; enterprise a failure, 224; mill used as print works, 224; present owner, 224.
- Globe Mills, *Philadelphia*, one of the first to use water power, 108; mules installed, 216.
- Globe Yarn and Laurel Lake Mills Company, 224.
- Gobelin Dye Works, Paris, 117.
- Golding, Edmund, helps to establish the Mansfield Silk Company, 54; builds second mill at Mansfield, 55.
- Goodhue, Benjamin, 154.
- Graebe, produces vegetable dyes, 118.
- Grain, grinding of encouraged, 125; decrease in value, 125.
- Green, *Col. Job*, establishes cotton mill at Centreville, R.I., 178.
- Green, Timothy, forms partnership with Slater, 175.
- Greene, *Mrs. Nathanael*, aids Eli Whitney, 103-104.

- Greene, W. R., sets up first carpet loom at Amsterdam, 245.
- Gresham, *Sir Thomas*, 49.
- Grimshaw, *Messrs.*, their factory burned by mob, 92.
- Grinnell, Joseph, aids New Bedford cotton industry, 237-238; president of the Wamsutta Mills, 238.
- Guilds, for weavers, 33; as a forerunner of the modern factory system, 59, 65.
- Gurleyville, *Conn.*, silk mills there, 54; silk dyers at, 55.
- Haarlem, a bleaching centre, 112.
- Hall, Samuel, manufactures buckram, 132.
- Hamilton, Alexander, 149, 154, 156; mentions the Slater Mill, 174; founder of Paterson, 233.
- Hamilton Manufacturing Company established, 208.
- Hanks, Rodney and Horatio, build first American silk mill, 54.
- Hargreaves, James, 34; his unsuccessful cotton mill, 68, 73; sketch of, 77-78; helps make carding machine, 77; his spinning jenny, 77-78.
- Hartford Woolen Manufactory, first large woolen mill in America organized, 163; receives State aid, 163, 165; weaves suit for Washington, 163-164; quality of its products, 163-165; sold at auction, 165.
- Harvard College, Senior Class wear homespun, 138.
- Hatchelling, 24.
- Haverhill, *Mass.*, duck manufacture, 161.
- Hazard, Rowland, starts a fulling mill, 186; begins weaving cloth, 186; first to use water power, 186; Peace Dale Manufacturing Company, 187.
- Heard, Augustine, establishes stocking mills at Ipswich, 95.
- Heathcote, Caleb, quoted, 132.
- Heckling, 25.
- Heliogabalus, *Emperor*, wears thin silk, 47.
- Hellot, Jean, 117.
- Hemp, products of in America in 1909, 28; the native product used by the colonists, 125; Connecticut General Assembly orders the raising of, 125; imported by colonists, 128; raised by the colonists, 131; bounties on granted, 133.
- Hemptinne, *M. Jean de*, quoted, 34.
- Henry II. inaugurates cloth fair at St. Bartholomew, 33; establishes weavers' guilds, 33; legislates for advancement of woolen manufacture, 33.
- Henry IV. of Navarre, establishes mulberry-trees in France, 49; invites William Lee to bring his inventions to France, 94.
- Henry, Thomas, discovers chlorine bleaching process, 115; perfects dyeing machinery, 118.
- Herodotus, makes first mention of cotton, 36.
- Herrick, Joshua, employed at Beverly, 156.
- Hewson, John, first calico printer, 140, 215; reward offered for his head, 140.
- Higginson, Henry, 155.
- High, Thomas, his claims to Arkwright's inventions, 80, 82.
- Hill, H. A., his *Memoir of Abbott Lawrence* quoted, 220.
- Hinckley Knitting Mills, 218.
- Hogg, William, 218.
- Holden, R., his method of bleaching with kelp, 113.
- Hollingsworth, *Col. Henry*, manufactures woolens, 189.
- Home, Francis, his method of bleaching with sulphuric acid, 113-114; perfects dyeing machinery, 118.
- Homer, first mentions weaving, 18.
- Hopkinson, Thomas, stockholder, 219.
- Horrocks, William, invents the crank, or Scotch, loom, 106; basis

- of the Waltham loom, 106, 195; his loom introduced into Rhode Island, 184.
- Horstmann, W. H., manufactures silk, 213.
- Horstmann, William J., constructs power looms, 213.
- Hosiery. *See* Stockings.
- Houldsworth, Henry, *Jr.*, takes out patent on Asa Arnold's invention, 108; patents Samuel Batchelder's stop-motion, 109-110.
- "Huguenot," *clipper ship*, lost off Java, 21.
- Humphreys, *Col.* David, brings merinos to America, 30.
- Hurd, Duane Hamilton, his *History of Middlesex County* quoted, 194.
- India, methods of hand weaving, 21; source of cotton industry, 36, 37; learns silk industry from Chinese, 46.
- India, British, second in production of cotton, 35.
- Indians, American, weaving, 20; Algonquin feather weaving, 22.
- Indigo, artificially produced, 118.
- International Congress of Cotton Manufacturers, 34.
- Ipswich, *Mass.*, John Manning's woolen mill, 166.
- Ipswich Mills, history of, 95-96.
- Jack of Newbury. *See* Winchcombe, John.
- Jackson, Daniel, makes textile machines, 161.
- Jackson, Patrick Tracy, establishes The Waltham Company, 192, 193, 194; care of employees, 196; shareholder of the Essex Company, 220.
- Jacquard, Joseph Marie Charles, sketch of his life and inventions, 96-98; his machine for making fish-nets receives gold medal, 96; his interview with Napoleon, 97; his loom, 97; his loom first used in America, 213.
- James I., of *England*, sends silkworms to Virginia, 51.
- Jarvis, William, brings merinos to America, 30.
- Jefferson, Thomas, letter to M. de Warville quoted, 144; cited, 147; inaugurated in American woolens, 189.
- Jenks, Alfred, makes cotton machinery, 216.
- Johnson, Edward, his "Wonder-working Providence" cited, 42; quoted, 126.
- Johnson, Thomas, invents the dandy loom, 106-107.
- Johnson, *Sir* William, his mill at Amsterdam, 245.
- Joint Stock Company, first one organized at Philadelphia, 215.
- Jones, Aaron, 218.
- Justinian, *Emperor*, his decree ruins silk merchants, 47; establishes silk industry in Europe, 47, 48.
- Jute, products of in America in 1909, 28.
- Kay, John, 34, 73; sketch of, 74-76; improves the reed, 74; his fly shuttle, 74-75; infringement of his patents, 75; mobbed because of his inventions, 75-76; English government refuses him aid, 76; dies in France, 76.
- Kay, John, *clock maker of Warrenton*, assists Arkwright, 78, 80; witness against Arkwright, 82.
- Kay, Robert, invents drop-box, 76.
- Kelp, used for bleaching, 113.
- Kendrew, John, inventor of machines for spinning flax, 98.
- Kentucky, cotton mills, 190.
- Knitting, early history of, 92-93; Rev. Wm. Lee invents knitting machine, 93; Queen Elizabeth refuses him patents, 93-94; Lee constructs a machine for making silk stockings, 94; Strutt's ribbed stocking frame, 94; first mill in America, 212; workmen brought under one roof, 212;

- English workmen come to Germantown, 212; mills at Philadelphia, 218.
- Labor. *See* Employees, Wages.
- Lafayette blue, 218.
- Lake Dwellings of Switzerland, ruins contain rude fabrics, 15.
- Lancaster, *Eng.*, 34; causes of concentration of textile industry in, 63-64.
- Lathrop and Eells, *Norwich, Conn.*, 181-182.
- Lawrence, Abbott, 209; stockholder of Merrimac Water Power Association, 219; Lawrence named for him, 220; founder of the Essex Company, 220, 221; memoir of, quoted, 220; buys rights of the Water Power Company, 220-221; president of the Pacific Mills, 221.
- Lawrence, Amos A., 56; operates his mills at a loss, 95, 209.
- Lawrence, Charles, offers woolens for sale, 212.
- Lawrence, John S., compares old and new methods of production, 250.
- Lawrence, Samuel, stockholder, 219, 220.
- Lawrence, William, stockholder, 220.
- Lawrence, *Mass.*, leads in production of worsted goods, 210; value of production, 211; Daniel Saunders discovers and secures the water powers, 218-219; Merrimac Water Power Association, 219, 220-221; naming the town, 219-220; the Essex Company, 220-221; great dam built, 221; town laid out, 221; the Washington Mill, 221; other mills started, 221; population and textile statistics, 222.
- Lawrence and Co., agents of Whittenton Cotton Mills, 180.
- Lawrence Company, established, 209.
- Lebermann, produces vegetable dyes, 118.
- Lee, *Rev.* William, his stocking machines, 93-94; Queen Elizabeth refuses him patents, 93-94; goes to France, 94.
- Leffingwell, Christopher, weaves stockings, 181.
- Leigh, Lewis, first successful silk dyer in United States, 55.
- L'Enfant, *Major*, superintendent of the Paterson Mills, 234-235.
- Leonard, James and Henry, employed at Beverly, 154, 155; establish Iron Works at Taunton, Mass., 180.
- Levering, Wigert, early weaver, 211-212.
- Lewis, Joseph, his weaving mill at Waterbury, Conn., 132.
- Lilly, Alfred, makes silk machinery, 54.
- Lincoln, Jonathan Thayer, his "The Factory" cited, 70; quoted, 249-250.
- Lindly, Joshua, makes textile machines, 161.
- Linen, known in prehistoric ages, 25-26; introduced into Europe and Asia, 26; mentioned in early writings, 26; manufacture of in France and Germany in eleventh century, 26; exported from Flanders in 1250, 26; among the Anglo-Saxons, 26-27; weaving of in Ireland, 27; weaving of in Scotland, 27; weaving of a Puritan domestic industry, 27; in America only coarse forms successful, 27, 28, 131; finest produced in Scotland, Ireland, and Belgium, 27; best yarn from Holland, 28; great linen-producing countries, 28; use of cotton decreases demand for, 98; printing of at Auersburg, 119; its manufacture encouraged by colonial legislation, 124-125, 126; manufacture of at Germantown, Pa., 130; fabric most used by the colonists, 131, 132; manufactured at Lynn, 132; bounties on, 133, 138; factories erected, 187; made in

- Fall River, 229; manufactured in New York, 242, 243. *See* Flax, Spinning.
- Lodge, Henry Cabot, his "Some Early Memories" cited, 157-158.
- Lombe, John, builds silk mill at Derby, 50.
- Loom, used in Bronze Age, 16; of Incas, 19, 20; Chinese legend regarding, 45; loom for piece goods built, 55; Jacquard loom first used in Philadelphia, 55, 213; owned by weavers, 66; Cartwright's power loom, 69, 89-90, 106; attempts to improve it, 73-74; Kay's improvements, 74-75; looms invented, 106; the dandy loom, 106-107; Horrocks's basis of first practical American loom, 106, 184; extended use of power loom, 107, 184; invention and characteristics of the Northrop loom, 110-111; comparison of Gilmore's and the Waltham loom, 184, 194-195; Horstmann's power loom, 213; Jenks's power loom for checks, 216; in early Fall River mills, 226. *See* Weaving.
- Lowe, H. A., discovers a method of procuring silk lustre, 121.
- Lowell, Francis Cabot, his Waltham loom compared with Gilmore's, 184; establishes The Waltham Company, 192, 194; birth and education, 193; brings home knowledge of English textile machines, 193; his power loom, 194, 195; his other inventions, 195; interview with Mr. Shepard, of Taunton, 195-196; secures a tariff on cotton, 197; urges Rhode Island mill owners to use power loom, 198; his arrangement of textile processes, 198; his system of mill organization, 198; shareholder of the Essex Company, 220.
- Lowell, John A., stockholder, 220; buys rights of the Merrimac Water Power Association, 220-221.
- Lowell, *Mass.*, mill privileges bought by Boott, 201, 202; Merrimac Manufacturing Company established, 203-204; naming of, 205; growth of, 205; other cotton mills started, 208-209; cotton statistics for 1911, 209; a textile centre, 210; value of textile products, 211.
- Lowell Company established, 209.
- Lyman, Daniel, introduces power loom into Rhode Island, 184, 198; his mill at Woonsocket, 246.
- Lyman, George W., stockholder, 220.
- Lyman, Theodore, stockholder, 220.
- Macauley, Isaac, makes oil cloths, 217.
- Mack, Alexander, stocking weaver, 212.
- McKerries, James, weaves corduroy in East Greenwich, 162, 230.
- Macquer, his experiments in dyeing, 117.
- McRae, John, makes silk fringes, *etc.*, 56.
- Madison, James, quoted, 144; inaugurated in American broadcloth, 167.
- Magellan, Ferdinand, 40.
- Malays, method of weaving cotton, 21.
- Manchester, *Eng.*, a textile centre, 34, 38, 39; climate favors textile industry, 63; weavers wear five-pound notes, 87; steam looms used there, 107.
- Manchester, *N.H.*, a textile centre, 210; value of production, 211; its history, 239-241; named in honor of Samuel Blodgett, 239-240; Benjamin Pritchard's cotton mill, 240; Amoskeag Cotton and Wool Manufactory, 240-241; Amoskeag Manufacturing Company, 241; town laid out, 241; wages, 241; growth, 241.
- Mansfield, *Conn.*, its silk industry, 53-55.

- Marble, Ezra, makes printing machine, 228.
- Marquesas Islands, natives make Tappa cloth by beating, 20.
- Maryland, its silk industry, 53; first woolen mill, 189.
- Maryland Journal*, cited, 188.
- Massachusetts, leads in consumption of cotton, 43; appoints committee to investigate textile machinery, 151-152; grants to inventors, 152-153; acquires "The State Models," 153; its textile industry just before Slater, 167; first use of Arkwright's machines, 176; textile statistics for 1812, 185.
- Massachusetts Bay Colony, General Court passes acts to help the textile industry, 124-125, 129, 136; sheep raising in, 129; wool exported in 1675, 130.
- Massachusetts Company, The, established, 209.
- Massasoit Steam Mill, 228.
- Mause, Daniel, hosier, 214.
- Mellish, John, cited on Philadelphia industries, 216.
- Mennonites, start hosiery industry at Germantown, 212.
- Mercerizing process, its history and application, 120-121.
- The *Mercury*, Salem, quoted in regard to the Beverly Cotton Manufactory, 154, 155-156.
- Merino sheep, breeds of, 30; brought to America, 30.
- Merrimac, first name for Lawrence, 219.
- Merrimac Manufacturing Company, established at Lowell, 203; shareholders, 203; canal system improved, 204, 209; mills fitted up with Waltham machinery, 204; first cloth of poor texture and color, 204, 206; builds mill machinery, 204; cylinder printing, 205-206; printers leave, 206; establish mill boarding-houses, 206; condition of employees, 206-208.
- Merrimac Water Power Association, 219, 220-221.
- Metacomet Mill, *Fall River*, 229.
- Mexico, its cotton industry, 41; its silk industry, 51.
- Mill, arrangement established by Lowell, 198; organization, 198.
- Miller, Phineas, 105.
- Miller, Robert, invents power loom, 106.
- Monteith, John, equips his mill with power looms, 106.
- Moody, Paul, first to use leather belts, 110; constructs power loom for Waltham, 194; his other inventions, 195; visits the Pawtucket Falls, 200, 202-203; employed at Lowell, 204.
- Moore, Gov., of New York, cited, 135, 138, 242.
- Moors, of Spain, first to raise cotton in Europe, 37.
- Mount Nebo Silk Mills, 57.
- Mulberry-tree, its seeds brought to Constantinople from China, 47, 48; mulberry-tree in France, 48-49; Chinese mulberry-tree brought to United States, 55; the "Mulberry Craze," 58.
- Mule, The, invented by Samuel Crompton, 83; self-acting first used in Fall River, 228; first used in America, 244.
- Murray, G. W., his silk mill, 236.
- Muslin brought from India, 36; East India muslin made in England, 85.
- Mussey, T. M., builds loom at Exeter, N.H., 106.
- Navajo blankets, 20.
- Naz, sheep of, 30.
- Nearchus, cited, 47.
- Nesmith, John, stockholder, 219, 220.
- New Bedford, produces finest cotton goods, 210, 239; value of production, 211; beginning of its cotton industry, 237; prejudice against the industry, 237; capital raised, 237-238; Wamsutta Mills started, 238; success of

- the enterprise, 238-239; Potomska Mill, 238; other mills built, 239; recent textile statistics, 239.
- New England, textile industry in, 122, 138-139; slave traffic with the West Indies, 123, 127; silk culture in, 138; capital develops Southern industries, 191; advantages for cotton manufacture, 193; effect of textile industries on shipping, 248-249.
- "New England's First Fruits," quoted, 125-126.
- New Hampshire, consumption of cotton, 43; first cotton mills in, 179.
- New Ipswich, first cotton mill in New Hampshire erected, 179.
- New Jersey, its silk industry, 53.
- New York, its silk industry, 53; Society for the Promotion of Arts established, 138, 242; linen manufacture in, 138; Society for the Encouragement of American Manufactures, 170; greatest centre for cutting up trade, 210, 245; value of production, 211, 245; Manufacturing Society, 242-243; Dickson's Cotton Factory, 243-244; not suited for textile industry, 242, 244.
- New York and Northampton Silk Company, The, 56.
- New York Manufacturing Company, employs Samuel Slater, 169; history of, 170, 242-243; its object, 242; character of the product, 243; factory described by Slater, 243; enterprise a failure, 243.
- New Zealand, production of wool in 1909, 31.
- Newcomen, Thomas, his steam-engine perfected by James Watt, 99-100.
- Newell, Robert, calico printer, 232.
- News Letter*, quoted, 137.
- Nickerson, *Capt.* Sylvanus, describes Malay method of weaving cotton, 21.
- Nonatuck Silk Company, 56.
- North Carolina, consumption of cotton, 43.
- North Saugus, linen factory built, 187.
- Northrop, James H., invents a loom, 110-111.
- Norwich, *Conn.*, early stocking weaving there, 181; Lathrop and Eells cotton manufactory, 181-182.
- Oglethorpe, *Gov.* James Edward, gives silk to Queen Caroline, 52.
- Oil cloths, made in Philadelphia, 217.
- Oldham, brings wild hemp from Connecticut, 125.
- Oneida County, *N.Y.*, first cotton mill erected, 179.
- Opdengrafe, Abraham, receives premium for linen, 211.
- Orr, *Col.* Hugh, early textile machinery made at his works, 151, 153; makes first cannon in America, 151; first in America to use the fly shuttle, 153.
- Ottolengi, *Signor*, establishes a silk filature in Georgia, 52.
- Oxford Carpet Mills, The, 218.
- Pacific Mills, *Lawrence*, 221.
- Panic, first one in New England, 125.
- Parkinson, Adam, perfects printing method, 120.
- Paterson, *N.J.*, its silk industry, 55, 210, 236; value of production, 211; founded by the Society for the Establishment of Useful Manufactures, 233-234; naming of, 234; water power secured, 234; plans for mills and workmen's houses, 234; factory equipped and opened, 235; enterprise a failure, 235; mill used for other purposes, 235-236; water rights valuable, 236; first silk mill, 236; character of silk products, 236.
- Paul, Lewis, 73; his inventions, 77.

- Pawtucket, Slater's mill, 171-175; industries affected by the War of 1812, 198; a textile centre, 210; value of production, 211.
- Peace Dale Manufacturing Company, its history, 186-187.
- Pearson, John, erects first cloth mill in United States, 126.
- Peck, Lewis, manufactures cotton in Rhode Island, 161; sells machine to Moses Brown, 162, 172.
- Peel, Sir Robert, offers partnership to Crompton, 86.
- Penelope, goddess of weaving, 18.
- Penn, John, quoted on Philadelphia industries, 214, 216.
- Pennsylvania, its silk industry, 53; Society for the Encouragement of Manufactures, history of, 148-150; may have established first American cotton mill, 149; its textile industry just before Slater, 167; encourages home industries, 215.
- Pepys, Samuel, quoted, 39.
- Perrot, his process of block printing, 120.
- Perry, Nathaniel, his linen mill at North Saugus, 187.
- Philadelphia, its silk manufacture, 55; societies for the promotion of manufactures established, 139-140, 148-150, 215; leading textile city in United States, 210; greatest producer of hosiery and knit goods, 210; annual production, 211; stocking industry, 212, 214; woolen industry, 212, 213-215; first knitting mill in America, 212; silk industry, 213; filatures established, 213; English silk throwsters come, 213; Jacquard loom first used, 213; sheep killing prohibited, 214; the "Hand in Hand" Stocking Manufactory, 214; home manufactures encouraged, 214, 216; first joint stock company organized, 215; a centre for textile machinery, 215-216; its carpet industry, 216-217; textile statistics, 217-218; merchants ask for textile tariff, 217.
- Picking machine, Blair's, first used, 226.
- Pierpont, John, erects mills in Roxbury, 129.
- Pioneer Hosiery Mills, *Amsterdam*, 246.
- Plate speeder, an American invention, 109.
- Pliny, quoted, 36; cited, 47, 112; cited, on art of dyeing, 116.
- Pocasset Manufacturing Company, 227.
- Polo, Marco, describes cotton, 37.
- Porthouse, Thomas, invents machines for spinning flax, 98.
- Potomska Mill, *New Bedford*, 238.
- Potter, Nathaniel, receives bounty for linen manufacture, 132, 133.
- Prince, John D., 205.
- Printing, its history from the earliest times, 119-120; first print works in England, 119; block printing, 119-120, 232; Perrotine, plate, and cylinder printing, 120; cylinder printing at Lowell, 205-206.
- Pritchard, Benjamin, starts mill at Goffstown, N.H., 240; it becomes the Amoskeag Company, 240.
- Proprietors of the Locks and Canals on the Merrimac River, 127; its stock sold to the Merrimac Company, 202, 203.
- Providence, *R.I.*, beginning of cotton industry, 161-162, 230; uses Beverly models, 161, 230; attempt to make corduroy, 162, 231; arrival of Samuel Slater, 171, 231; Almy, Brown & Slater, 171-175; first steam mill, 184; great textile centre, 210; value of production, 211; cotton industry in 1789, 231; early thread and stocking industries, 231; calico printing, 231-232; textile statistics, 232.
- Prussian blue, 218.

- Rehoboth, *Mass.*, the Slater mill, 175-176; second mill built, 178.
- Revolution, American, effect on American textile industry, 53, 140-141, 213, 214.
- Rhoades, Alonzo E., invents a shuttle-changing loom, 110.
- Rhode Island, consumption of cotton, 43; beginning of the cotton industry, 161-162; use Beverly models, 161; attempt to make corduroy, 162; manufacture of stockings, 162; calico printing, 162; its textile industry just before Slater, 167; Samuel Slater's mills, 171-175; second cotton mill in, 178; introduction of power loom, 184, 199; textile statistics for 1812, 185; beginning of power woolen mills, 186-187. *See also* Providence, Woonsocket.
- Rhode Island System *versus* the Waltham System, 198-200.
- Ribbons, manufactory at Baltimore, 56.
- Richards, F. G., 215.
- Richards, Mark, 216.
- Richmond, Charles, manufactures cotton at Taunton, *Mass.*, 180.
- Richmond, first print works in England there, 119.
- Ridgeway, *Mr.*, improves the bleaching processes, 115.
- Ring spinning, developed, 109; ring spinner invented by John Sharp, 110.
- Rixford, Nathan, builds silk machines, 54.
- Robbins, Charles, builds cotton mill, 179.
- Roberts, Lewis, his "Treasures of Traffic" cited, 38.
- Robeson, Andrew, starts first print works in Fall River, 228; mill develops into the American Print Works, 228.
- Robinson, *Mrs.* Harriet Hanson, her "Loom and Spindle" quoted, 206.
- Rock Day, 73.
- Rogers, Ezekiel, settles at Rowley, *Mass.*, 126.
- Rogers, Richard, his duck weaving mill, 132.
- Rope-making machine, invented by Cartwright, 91.
- Rowley, *Mass.*, site of first cloth mill in the United States, 42, 126-127.
- Royal Society of London, publish "An Apparatus, *etc.*, to assist Dyers," 117.
- Rucellai, of Florence, make purple dye, 116.
- Runge, Ferdinand Friedrich, discovers aniline dyes, 118.
- "Runs of stone," 127.
- Russell, William, 181.
- Russia, produces largest amount of flax, 27; its production of cotton, 35.
- Ryle, John, "father of American silk industry," builds first loom for piece goods, 55; his silk mills at Paterson, 236.
- St. Aubon, Guipape de, brings white mulberry-tree to France, 48.
- St. Distaff's Day, 73.
- Salem, *Mass.*, duck manufacture, 161.
- Sargent, Ignatius, director of the Essex Company, 221.
- Saunders, Daniel, discovers and secures water power of the Merrimac, 218-219; forms the Merrimac Water Power Association, 219; names Merrimac, 219; forms the Essex Company, 220.
- Saunders, Daniel, *Jr.*, stockholder, 219.
- Savannah, reeling establishment founded there, 52.
- Schaub, Tissot & Dubosque, begin calico printing in Providence, 231-232.
- Scheele, C. W., discovers use of chlorine for bleaching, 114.
- Scholfield, Arthur, comes from England, 165-166; employed

- by Newburyport Woolen Manufactory, 166; his woolen mill at Pittsfield, 167.
- Scholfield, John, comes from England, 165-166; employed by the Newburyport Woolen Manufactory, 166; builds first woolen mill in Connecticut, 166; his mill at Stonington, Conn., 167; weaves broadcloth for the President, 167.
- Scotland, linen weaving in, 27; bleaching, 113.
- Scrutching, 24.
- Seaconnet Mill, *Fall River*, adopts the Northrop loom, 110.
- Semiramis, *Queen*, 18, 36.
- Shakespeare, William, refers to the bleaching process, 112.
- Sharp, John, invents the ring spinner, 110.
- Sheep, coat changed from hair to wool by breeding, 29; breeds of, 29-31; first mention of in England, 30; merinos brought to America, 30; Lincoln rams, 31; number raised in 1910, 31-32; domestic in Britain before the Roman Conquest, 32; raising restricted in England, 33; raising of among American colonists, 123, 126, 129; their exportation from England prohibited, 129; killing restricted in Philadelphia, 214. *See also* Wool.
- Shepard, Benjamin, starts cotton mill at Wrentham, Mass., 177-178.
- Shepard, Silas, of *Taunton*, makes winding machines, 196.
- Shepard, *Mrs.*, exchanges goods for a chaise, 177-178.
- Si-ling-chi, the "Goddess of Silk-Worms," 45-46; said to have invented the loom, 46.
- Silk, derivation of name, 43; thought to grow upon trees, 43; secreted by spiders and silkworms, 43-44; statistics of production, 44-45; history of, 45-58; Chinese legend of origin of silk making, 45; from China the art spreads to Japan and Europe, 46, 47-48; used by higher classes in Rome, 47; used in England, 48; importation of prohibited in England, 48, 50; trade in France, 48; silk industry in England, 49-51; industry in America, 51-58, 138; England removes duties on American silk, 51, 52; the Revolution suspends the silk industry, 53; American silk inferior, 53; first mill in America at Mansfield, Conn., 54; mills at Paterson, N.J., 55, 210, 236; first successful dyeing in United States, 55; English weavers come to United States, 55; tariff of 1861, 55; "Mulberry Craze" checks industry, 58; raw silk used in United States imported, 58; industry in Philadelphia, 213. *See also* Ribbons.
- Silk machinery, that first used in England crude, 50; copied from Italian, 50.
- Silk throwing mill, first in England, 50.
- Silkworm, described, 44, 46; eggs brought from China, 48.
- Skinner, William, his silk industry, 57.
- Slater, John, brings knowledge of English improvements in textile machines, 183; helps establish mill at Slatersville, 183.
- Slater, Samuel, early history, 168; emigrates secretly to America, 169; finds employment in New York, 169; corresponds with Moses Brown, 169-170, 243; goes to Providence, 171; partnership with Almy and Brown, 171; constructs machines on Arkwright's models, 172; makes Earl's cards work, 172; starts mill at Pawtucket, 173; uses cotton warp, 173; reduces price of cloth, 174; payment and discipline of employees, 174; establishes first Sunday-school,

- 174; markets for his yarns, 174-175, 176; rapidity of production, 175; Samuel Slater and Co. build mill at Rehoboth, Mass., 175; begins weaving cotton, 176; his influence on cotton industry, 179, 185, 222, 233; erects first steam mill, 184; buys the Amoskeag Mill, 240.
- Slatersville, *R.I.*, cotton mill, 183.
- Slaves exchanged for West Indian cotton and rum, 123, 127.
- Soapstone, used for rollers, 195.
- Social Manufacturing Company, Woonsocket, 246.
- Society for the Establishment of Useful Manufactures, founds Paterson, 233-234, 236.
- Somers, Thomas, petitions the Massachusetts legislature for aid, 152; constructs textile machines, 153; "The State Models," 153; employed at Beverly, 154, 156.
- South Africa, production of wool in 1909, 31.
- South Carolina, cultivation of cotton in, 41, 146; consumption of cotton, 43; silk industry, 52; first cotton mill, 188.
- Southern states, produce largest amount of cotton in the world, 35; beginning and growth of its cotton crop, 41, 144-147, 190; Sea Island cotton, 145-147; development of cotton manufacture in, 187-191; supply Fall River cotton mills, 225.
- Southwark, early bleachery there, 112.
- Spear side, 73.
- Spider, silk-producing, 43-44.
- Spindle, found in ruins of Swiss Lake Dwellers, 15; used in Bronze Age, 16; of the Incas, 19; description of, 71.
- Spinning, evidences of in prehistoric times, 13-16; traditions as to origin, 17; progress of art from East to West, 22; machinery first used in Ireland, 27; schools for in England, 27; Britons taught by Romans, 32; Angles and Saxons had knowledge of, 32; a by-product of farm life, 62; separated from agriculture, 64; spinners becoming a separate class, 66; method of in early times, 71-72; construction of spinning wheel, 72, 73; whole operation under one roof, 68, 81; Crompton's "mule" makes fine spinning possible, 85; statistics of, for 1812, 87; introduction of ring spinning, 109; in American colonies, 123; classes formed, 129, 138; Boston spinning craze, 135-137; bounties offered, 138. *See* Loom, Textile industry, Weaving.
- Spinning frame, invented by Arkwright, 80-82; constructed at Providence, 161; constructed by Slater, 172.
- Spinning jenny, invented by James Hargreaves, 77-78; Christopher Tully's, 140.
- Spinning wheel, history of, 72; value of in colonial times, 123.
- Spinster, 73.
- Sprague, William Peter, makes carpets, 216-217.
- Springfield, *Mass.*, duck manufacture, 161.
- Star Hosiery Mills, *Amsterdam*, 245.
- Stark Mill, *Manchester, N.H.*, 241.
- "State Models, The," exhibited in Massachusetts, 153.
- Steam-engine, 60; first used for cotton manufacturing, 69; Cartwright's improvements, 91; Watt's improvements, 99-100; first used in Fall River, 228.
- Stevens, Nathaniel, stockholder, 219.
- Stockings, 49-50, 92; Queen Elizabeth's silk stockings, 50, 94; invention of stocking machinery, 93-94; Strutt's mills at Derby, 95; the Ipswich Mills, 95-96; industry at Germantown, Pa., 130, 212; woven at East

- Greenwich 162; industry in Connecticut, 181; hand stocking weaving, 212; made in Philadelphia, 214; industry at Amsterdam, 245, 246.
- Stockport, *Eng.*, steam looms used there, 107.
- Stop-motion, invented by Samuel Batchelder, 109.
- Storrow, Charles S., engineer of the Essex Company, 220, 221.
- Stratford, *Mass.*, duck manufacture, 161.
- Straw, Ezekiel, engineer of the Amoskeag Mills, 240-241.
- Strutt, Jedediah, 81; invents ribbed stocking frame, 94; his stocking mills at Derby, 95; Slater his apprentice, 168.
- Sturgis, William, shareholder, 220; director of Essex Company, 221.
- Suffolk Company, established, 209.
- Suffolk County Court Records, quoted, 123.
- Sulphuric acid, used in bleaching, 113-114.
- Surnames, English, derived from the textile industry, 63.
- Swivel's loom, 74.
- Taft, Royal C., cited, 165.
- Tappa cloth, made from cloth tree by beating, 20.
- Tariff, of 1816, 197, 232; of 1861, 55; ad valorem duty, 217.
- Taunton, *Mass.*, the Whittenton Cotton Mills, 180-181.
- Taunton Speeder, invented by George Danforth, 109; used in England, 109.
- Teake, Richard, letter quoted, 146; first to raise cotton extensively in the South, 146.
- Tenant, Charles, his bleaching process, 115.
- Textile cities, in order of production, 210.
- Textile industry, in America, its history, 122; first settlers bring knowledge of from England, 122; climatic conditions and distance from England foster it, 122; colonial legislation aids it, 124-125, 128, 129, 132-133; first cloth mill at Rowley, *Mass.*, 126; textile mills began in stone water mills, 123, 127; English efforts to hamper it, 128-129, 130; at the beginning of the Revolution, 137-139; greatly developed during the Revolution, 140; just before Slater, 167; statistics of, about 1812, 185; the great textile centres, 210-211; nature of the products, 211; amount and value of the output in 1909, 211; its economic and social aspects, 248; statistics of growth, 249. *See* Cotton, Silk, Spinning, Weaving, Wool.
- Textile machinery, era of invention, 71-121; England prohibits its exportation, 139; Christopher Tully's spinning jenny, 140; American efforts to secure English machines, 141-142; made in Philadelphia, 215-216.
- Textiles, in prehistoric times, 13-16; found in barrows of early Britons, 16; among Cliff Dwellers of America, 16; among ancient Peruvians, 19; English products inferior, 33. *See* Cotton, Silk, Spinning, Weaving, Wool.
- Thorndike, Israel, 155.
- Thread, cotton, first made in America, 175.
- Throckmorton, *Sir* John, has a suit made on a wager, 100-101.
- Tiberius, *Emperor*, prohibits men from wearing silk, 47.
- Tiverton Print Works, 224.
- Toad, *Mr.*, invents a loom, 106.
- Toby, *Mr.*, of Lynn, gets bounty on cloth, 128.
- Trade-mark, first one, used at Beverly, 155.
- Tremont Company, established, 209.
- "Trial," *ship*, brings cotton to Boston, 123.
- Troy Cotton and Woolen Manufactory, 224-225; power looms installed, 226.

- Troy Manufactory Company, 224-225.
- Tyler, Jonathan, stockholder, 219, 220.
- Union Cotton Factory, *Fall River*, 227.
- United Company of Philadelphia, *etc.*, history of, 139-140, 148; first joint stock company, 215.
- United Kingdom, production of wool in 1909, 31.
- United States. *See* Textile industry in America.
- Uruguay, production of wool in 1909, 31.
- Vallentine, Edward, first successful silk dyer in United States, 55.
- Vandausen, Herman, first calico printer in Rhode Island, 162, 231.
- Vaucanson, Jacques de, his automaton's furnish ideas to Jacquard, 97.
- Virgil, cited, 47.
- Virginia, cultivation of cotton, 41; attempt to establish silk industry there, 51, 53.
- Wadsworth, Jeremiah, stockholder of Hartford Woolen Manufactory, 163; buys the business, 165.
- Wages in Slater's mill, 174; paid in money at Waltham, 196, 200; paid in merchandise, 199-200; in Col. Durfee's mill, 223; in other Fall River mills, 226; of the Amoskeag Company, 241; in New York, 244.
- Walcott, Benjamin S., builds cotton mill, 179.
- Walcott, Benjamin S., *Jr.*, erects cotton mill in New York, 179.
- Waltham Company, establishes the first cotton mill run completely by power, 192; incorporated, 194; capital, 194; Lowell's power loom, 194-195; description of the mill, 194; first cloth made, 194; textile machines invented by Moody and Lowell, 195; enterprise extended, 196; regular wages paid employees, 196, 200; mill boarding-houses, 196, 200; character of employees, 196; sale of goods, 197; the Waltham system compared with the Rhode Island system, 198-200; children not employed, 200; success of, 200.
- Waltham System *versus* the Rhode Island System, 198-200.
- Wamsutta Mills, *New Bedford*, 238-239.
- War of 1812, its effect upon the textile industry, 197, 200, 217.
- Ward, Benjamin C., and Co., selling agents for Waltham Mills, 197.
- Waring, Elijah, commission merchant, 175.
- Warp, supplied by employer, 67; warping mills established, 67; improved by Arkwright's inventions, 79, 82; of cotton, used at Pawtucket, 173; warper invented at Waltham, 195; cotton replaces linen, 227.
- Washington, George, brings spinners, weavers, and sheep from England, 30; visits the Beverly Cotton Manufactory, 157-158; describes the Boston Sail Cloth Factory, 160; inaugurated in suit of Hartford manufacture, 163; letter quoted, 163-164; Washington Mill, *Lawrence*, 221.
- Water frame, used in Arkwright's mill, 68; wide use of in England, 143. *See* Spinning frame.
- Water power, used for cotton mills, 68; of New York mill, 244.
- Waterman, Rufus *and* Elisha, build cotton mill, 179.
- Watt, James, his steam-engine first used in cotton manufacturing, 69; his improvements upon Newcomen's steam-engine, 99-100; uses chlorine process for bleaching, 114.

- Weaving, in prehistoric times, 14-16; traditions of its origin, 17, 18; by Malays, 21; by hand weavers of India and China, 21; machinery first used in Ireland, 27; immigrations of Flemish weavers to England, 33; weavers' guilds established, 33; a by-product of English farm life, 62; separated from agriculture, 64-65; women replaced by men, 67; legal terms, 73; Kay's improvements change method of, 75; among American colonists, 123, 129, 133. *See* Cotton, Loom, Textile industry, Wool.
- Weft, made by weavers, 67.
- Wells, Obadiah, his linen manufactory, 138.
- West Houghton, steam looms used there, 107.
- West Indies, exchange cotton and rum for slaves, 123, 127.
- Wetherill, Samuel, Jr., aids American manufactures, 139-140; organizes The Pennsylvania Society for the Encouragement of Manufactures, 148; contracts to supply the army with woollens, 215.
- "Whiting time," 112.
- Whitman, David, 237.
- Whitmarsh, Samuel, builds silk mill at Florence, Mass., 56.
- Whitney, Eli, sketch of his life and inventions, 101-105; his cotton gin, 101-105; his invention stolen, 104; obtains a grant for his invention, 105; manufactures firearms, 105; marriage and death, 105.
- "Whitsters," 112.
- Whittemore, Amos, 215, 216.
- Whittenton Cotton Mills, *Taunton, Mass.*, history of, 180-181.
- Wilkinson, David, builds power looms, 184.
- Wilkinson, Hannah, makes first cotton thread in America, 175.
- Wilkinson, Oziel, constructs Slater's machines, 172; forms partnership with Slater, 175.
- Wilkinson, William, forms partnership with Slater, 175.
- William the Conqueror, 33, 39.
- Willowing, 67.
- Wilmington, *Del.*, society organized for the encouragement of American industries, 189-190; early cotton mill, 190.
- Winchcombe, John, his factory the first in England, 61.
- Winding machines, made by Silas Shepard, of Taunton, 196.
- Winthrop, John, *Governor of Massachusetts*, orders establishment of runs of stone, 125; his sons promote trade with the West Indies, 127.
- Winthrop, John, Jr., quoted, 125.
- Wolcott, Oliver, stockholder, 163.
- Women in industry. *See* Employes, Wages.
- Wood Worsted Mill, *Lawrence*, largest in the world, 221.
- Wool, used in Stone Age, 14; fabrics of found in ruins of Swiss Lake Dwellers, 15; woolen cloth in barrows of early Britons, 16, 32; probably first material used for weaving, 16, 29; known to the Egyptians, 17; used by Incas, 19; manufacture highly developed in Flanders, 22; manufacture of in England, 23, 32-34; of animals other than sheep, 29; grades of, 30-31; production of in sheep raising countries in 1909, 31; manufactures of in America in 1909, 32; exportation of in England, 33, 34; sources of for New England colonists, 123; first worsted mill established by John Cornish, 130; production of in New England, 127-128, 133; nature of New England products, 135; finer grades brought from England, 138-139; manufacture of in Philadelphia, 212. *See* Sheep.
- Wool-combing machine, invented by Cartwright, 91.

- Woonsocket, *R.I.*, a textile centre, 210; value of production, 211; fine water power, 246; Social Manufacturing Company formed for making cotton, 246; its mill and machinery, 246-247; other mills started, 247; character and value of output, 247.
- Worcester, *Mass.*, early attempt at cotton manufacture, 151, 160.
- Working classes. *See* Employees.
- Worsted, first mill built by John Cornish, 130.
- Worthen, Ezra, 200.
- Wrentham, *Mass.*, Benjamin Shepard's cotton mill, 177-178.
- Wyatt, John, 73; his inventions, 77.
- Yarn, how made in Peru, 19; best comes from Holland, 28; made from cotton, 82. *See* Spinning.

ERRATA

- Page 16. For Bretons read Britons.
Page 73. For James Crompton read Samuel Crompton.
Page 162. For McKerris read McKerries.
Page 231. For Henry Vandausen read Herman Vandausen.