CHAPTER IV.

INDUSTRIAL DEVELOPMENT.[1]

Agriculture is the first industry, the one upon which all others rest, and yet it cannot do without the assistance of its co-laborer—manufacture. The pioneer who fells the tree and tills the virgin soil must pay tribute to the mechanic and the artisan. He must have clothes, he must have household utensils, and he must have tools. Hence the shoemaker, the blacksmith, the sawyer and the carpenter are each and all necessary to the farmer.

The early New England pioneers were obliged in a certain sense to be jacks-at-all-trades. Every man made his own log hut, and the housewife made the clothes for her family—often from the skins of wild animals, but it was not long before men began to follow the callings for which they were best adapted, as necessity arose for their practice. The blacksmith, the miller, the shoemaker, the tanner, the carpenter, the lime burner, the charcoal burner, the tar-maker and the shipbuilder soon became as necessary to the welfare and comfort of the colonists as the minister and the doctor.

Transportation was a difficult problem in early Rhode Island days. It was simplified somewhat in winter, but at other seasons of the year everything possible was transported by water.

Most of the early settlements were in close proximity to Narragansett Bay or its affluents, and shipbuilding was one of the first of the colony's manufacturing industries. But as lumber is a necessary concomitant of the construction of sailing craft, it is altogether probable that the saw-mill antedated the shipyard. Just when the first sawmill was set up in the colony is not known, but the Colonial Records

[1]In preparing this chapter the writer has avoided, as far as possible, encumbering the pages with foot notes. Among the authorities consulted and the individuals to whom he is indebted for assistance are: Bishop's History of Manufactures; Census and Statistical Reports of the United States; Rhode Island Colonial Records; Arnold's History of Rhode Island; Staples's Annals of Providence; Providence Plantations; Peterson's History of Rhode Island; Bayles's History of Providence County; Fuller's History of Warwick; Publications of Rhode Island Historical Society; Rider's Historical Tracts; the Providence Gazette; the Providence Journal; the Manufacturing Jeweler; Dockham's Textile Annual; the State Census and Industrial Statistics Reports of Rhode Island; and the Early Records of the Town of Providence.

declare that at a general meeting (of the freemen) in Portsmouth, on the 16th of the ninth month, 1638 (the first year of its settlement), it was "ordered that John Porter and John Sanford shall treate with Mr. Nicholas Esson, and shall fully agree with him in allowing of him sufficient accommodations for foure cowes, and planting grownd as they shall think meett, all which is for the setting up of a water mill, which the said Mr. Esson hath undertaken to build for the use and good of the plantation". At a court held in Newport, on the 7th of the eleventh month, 1639, it was decreed that, "Whereas complainte was made by the secretarie on the behalf of the town of Nieuport against Ralph Earle for his falling of timber contrarie to order, and suitt made accordinglie in the courte, by the courte it is ordered that

LITTLEFIELD WIND MILL, BLOCK ISLAND.
Erected 1815.

said Ralph, and Mr. Willbore, his copartner shall serve the towne with good sufficient stuff, viz.; with sawn boards att eight shillings the hundred, and half-inch boards at seven shillings, to be delivered at the pitt by the waterside, and clapboard and paile at twelve pence a foot by the stubb, sound and sufficient merchantable ware; and it is further ordered that the said Mr. Willbore and Ralph Earle shall not make sale of any of the timber within ye bounds of the towne of Nieuport, nor transport any of it (eyther whole or broken) to any other plantation without license, as they shall answer at their perill". It thus appears that the first mills were run by water, but some years later windmills were introduced, and they seem for a time to have displaced the water-mills, both for the grinding of grain and the sawing of lumber.. The

first windmill in the colony was erected in Newport in 1663 by Governor Easton and his sons. It was blown down in 1675. The old stone mill, about which so much controversy has taken place—many savants believing it to have been erected by the Northmen more than a thousand years ago—is supposed to have been built for a windmill by Governor Benedict Arnold after the destruction of Governor Easton's windmill. Windmills are still often seen in this State, and they are quite numerous in the town of Portsmouth, where they have been much in evidence for more than two centuries.

The first record we have of the building of ships in Rhode Island is found in Trumbull's "Complete History of Connecticut," which states that in 1646 the New Haven colony built a ship of one hundred and fifty tons at Rhode Island (probably at Newport).

As the business of shipbuilding must have been established some little time to have obtained fame in other colonies, it is probable that it had already been carried on several years by the builder who received this Connecticut order. Before the close of the seventeenth century shipbuilding had become an important business at Newport, and it was also carried on at Warren, Bristol and other coast settlements, including Providence and Warwick. In answer to a request received from the British "Lords of Trade," in 1680, regarding various matters, Governor Sanford's answer so far as it related to shipping was: "We have no shipping belonging to the colony, but only a few sloops." The colony had been accused of lawlessness, and as there was danger of its chartered privileges being taken away, the governor's answers were framed in such a guise as to convey the impression that the settlers were living under very humble conditions. It was probably a fact that at that very time the colony was well supplied with shipping, and was carrying on a thriving trade with the other colonies and the West Indies. At all events, there was considerable shipbuilding done here about two centuries ago. One hundred and three vessels were built in the ten years from 1698 to 1708, eight of which were ships. In 1704 the colonial General Assembly imposed a tonnage duty on all vessels not wholly owned by its inhabitants.

In 1709 Edward Wanton, a shipbuilder from Scituate, Massachusetts, came to Newport and established a shipyard, and the colony purchased one of his vessels—the sloop Diamond—for £400, and chartered another, and fitted them up as ships of war to take part in the expedition against Port Royal in Nova Scotia. The shipping interests of Newport assumed very large proportions. In 1739 more than one hundred vessels were owned there, and its West India trade for many years was very large. At one time as many as eighteen West Indiamen were known to arrive within twenty-four hours. Several of the warships of the Revolution were of Rhode Island build. Among them were the 28-gun ship Providence, which was captured by the British

at Charleston, S. C., in 1780, and the 32-gun ship Warren, which was burned by its crew on the Penobscot, in 1779, to prevent it from falling into the hands of the British. These ships were two of the lot ordered by Congress in December, 1775, and were both launched at Providence in the following May. The George Washington, a 624-ton ship, which was purchased by the government in 1798 at Providence, is supposed to have been built either there or at Warren. The General Greene, a ship of 645 tons, which carried twenty-eight guns, was built at Warren in 1799. Another war vessel, the Chippewa, a 14-gun brig, was built at Warren in 1815.

Newport's commercial development was very marked just before the Revolution. In 1769 the port employed two hundred vessels in foreign trade, and between three and four hundred in the coasting trade. It then ran a regular line of packets to London, and also had many ships engaged in whaling. Newport enjoyed a bright future at this time, and its inhabitants were confident it would become the commercial metropolis of the colonies. The Revolution, however, ruined the town. It was occupied by the British throughout the greater portion of the war, and its commerce and shipbuilding ceased for the time being and never recovered from the blow, as, after peace was restored, the town's supremacy was gone and trade had been diverted to other ports.

Providence, on the other hand, was more happily situated, as it was never in the hands of the British, and its ships had access to the sea for most of the time through the West Passage. It became a port of shelter and equipment for the Colonial Navy, and several of our first war vessels, as before stated, were built there. After the war it had quite a boom in shipbuilding and its ships were often seen in other lands. A few years after the restoration of peace a ship of 950 tons—a large vessel one hundred years ago—was built there for the East India trade. In 1791 one hundred and twenty-nine sail, with a total tonnage of 11,943, were owned in that port. Bristol was also for some years quite a shipbuilding port, and quite large vessels were constructed about a century ago in Pawtucket. One of them, the ship Tyre, built between 1780 and 1785, sailed around the world in 1790. The ship Washington, built in Providence, also circumnavigated the globe in the year 1800. The ship Ann and Hope, built in Providence for the famous trading house of Brown & Ives, made several voyages to the Orient. It was a fast sailer and there was said to have been but one American vessel on the waves that could show its wake to it.

The extensive shipbuilding and commerce of the colony led to the establishment of certain other lines of industry. In 1769 there were seventeen or more sperm oil and candle manufactories in Newport, and also five or more rope-walks. The slave trade, in which many Rhode Island ship owners were interested, was coincident with the establish-

ment of many distilleries for the manufacture of rum, which was a staple article in bargaining for slaves on the African coast. The production of duck or sail cloth, also, was a natural accompaniment of the colony's commercial development. In 1722 the General Assembly voted to give William Borden of Newport a bounty of twenty shillings for each bolt of duck manufactured by him of hemp grown in the province, and equal in quality to good Holland duck. This bounty was to last ten years, but it appears that even with such assistance this "infant industry" was not able to go alone, for in May, 1725, in response to a petition from him £500 was granted him from the colonial treasury, "if there be so much to spare." Still the business did not pay, and in 1728 he again asked the General Assembly for assistance, whereupon it was voted to issue £3,000 in bills of credit at his expense, and loan the amount to him, without interest, upon receiving surety from him that it would be paid at the expiration of ten years. By the terms of the resolution he was required to manufacture one hundred and fifty bolts every year, of good merchantable duck. In 1731 the General Assembly relieved Borden from the requirement to produce the stipulated quantity, but continued the bounty upon such quantities as he might make. Bounties were also paid about this time to the growers of flax and hemp to encourage the making of linen. The burning of pot, pearl and soap ashes, of lime and brick were among the earliest of colonial industries. In 1648 William Hawkins of Providence was granted the privilege of setting up a kiln to burn lime in front of his own lot, during the town's pleasure. This is believed to be the first kiln erected in New England for the burning of limestone. The so-called lime used at first in the colonies was obtained by burning oyster shells. The wording of the foregoing order would seem to indicate that Hawkins's kiln was for burning limestone rather than oyster shells, but it is not absolutely certain that such was the case. Staples's "Annals of Providence," citing a town order, passed (as supposed) in 1662, by which one Thomas Hackleton was given permission to burn lime on the common "near about", and to take stone and wood for the purpose, says that "this is the earliest notice of the manufacture of that important article".

At the "Monthly Court Meeting" of the town of Providence, January 1, 1646, it was "agreed that John Smith shall have the valley where his house stands, in case he sets up a mill, as also excepting sufficient highways." Staples's Annals, which erroneously give the date of this order as in 1746, says: "This valley comprehended all the land between the west bank of the Mossassuck river and the hill to the east of Jefferson plains, from Smith street on the south to Orms street on the north." Charles street now passes along this valley. This mill was for grinding corn and other grain. In 1649 an agreement was entered into between the town and Alice Smith, widow of John,

regarding this mill. In consideration of its always being in good condition for grinding, she and her heirs were to have a certain amount of land. The same year it was agreed that the corn of the town should be ground on every second and third days of the week.

The first record we have of the manufacture of brick in the colony is in 1681, when permission was given for its manufacture in Newport. In 1723 Thomas Staples of Providence was given liberty by the town to dig clay at Weybosset hill to make brick.

The shoemaker, as before stated, must have been one of the earliest settlers in Rhode Island. The first cobblers undoubtedly were compelled to import their leather from over the sea, but the tanner soon followed the shoemaker. In many cases, undoubtedly, the shoemaker tanned his own leather. An instance of this kind is found in the "Early Records" of Providence, one Zachariah Matheson of that town having, in 1698, bound himself to teach Benjamin Tailor, apprentice, "to tan leather and make shoes." Tanning, however, was carried on in Providence many years previous to this date, as these "Early Records" show that on June 24, 1655, a town order was passed regarding Thomas Oliver, Jr., that his houselot be laid out by "ye stampers, provided he follow tanning," etc. And still earlier—on November 3, 1652—it was ordered that Edward Inman shall not be liable to lose his houselot for not building thereupon, because he hath built in another more convenient place for his trade of dressing fox gloves. In February, 1707, the General Assembly passed a law for "preventing of deceits and abuses by tanners, curriers, and shoemakers."

The early colonial blacksmith was of necessity a more skilled workman than his modern successor. In addition to making shoes for horses and oxen and the iron work for the rude sleds and carriages of the pioneers, he was called upon to forge a great variety of articles used in the houses and on the farms. The discovery of iron ore near Lynn, Massachusetts, was the cause of the immigration from England of Joseph Jenks, in 1642, and he sat up near the mine the first foundry and forge in the country. Iron ore was also found near Pawtucket Falls, soon after the settlement of Providence, and the establishment of a foundry to utilize the ore was earnestly discussed. The earliest mention on record of the project is contained in a letter written by Roger Williams on November 22, 1650, to the Providence Town Council, in which he says: "I have bene sollicited & have promised my help about iron worcks, when the matter is ripe," etc. It is probable, however, that no iron works were built at this time, and that the first establishment of the kind was built by Joseph Jenks, junior, within the bounds of the present city of Pawtucket. The young man had learned the business with his father, at the Lynn forge, and hearing of the Rhode Island mine, he came in 1655 and built a house and erected a forge near the mine. He made domestic utensils and iron

tools, and found a ready market for his products in Providence and nearby towns in Rhode Island and Massachusetts. The forge was destroyed by the Indians in 1675, during King Philip's War, and was rebuilt after peace was restored. Besides his forge Mr. Jenks carried on a saw-mill and a carpenter's shop. It is worthy of note that some of his successors have been engaged in some branch of the iron industry up to the present day.

The Greene family, to which General Nathaniel Greene belonged, established an anchor forge on Potowomut, between 1720 and 1730, at which anchors for most of the shipping of the colony were made up to the time of the Revolutionary War. In 1735 Daniel Waldo purchased an ore bed in the town of Scituate and erected a furnace and foundry on the Pawtuxet river, near where the village of Hope is now located. It became famous as the Hope Furnace. Cannon were cast there, as well as large bells and other castings. Iron tobacco pipes were made at this foundry by one Jabez Hopkins, and swords of excellent quality were afterwards made by Hopkins's son, Ezekiel, and a few years after the Revolutionary War a steam engine was constructed at the furnace under the direction of Joseph Brown, of Providence, for the purpose of draining the ore pits. Other Providence residents beside Brown were financially interested in this mill, and at the beginning of the Revolutionary War the State contracted with its managers to furnish sixty cannon for local defense at a price not to exceed £35 per ton. The company agreed to deliver the ordnance within four months, but insisted on a guarantee from the State that it would take the cannon and pay for them, even if peace should be arranged before their delivery.

This was not the beginning of cannon manufacture in the State, however, as they had certainly been made as far back as 1745, for service against the French. In a report upon coal and iron made to the Rhode Island Society for the Encouragement of Domestic Industry, it is stated that John S. Brown of Pawtucket claimed that as early as 1703 his grandfather, Philip Brown, commenced casting cannon from iron made from the mixed Cumberland and Cranston ore. The foundry was in Cumberland, where he cast part, at least, of the cannon used in the celebrated Louisburg expedition in 1745. By an accidental explosion of the furnace he lost his life in 1763, when the manufacture of iron at that place was abandoned. There were two other iron furnaces in Cumberland some time previous to the Revolution. A siege battery of eight heavy guns cast, as is supposed, at the Hope furnace, was forwarded to General Washington at his request in 1781, and they were used effectively at Yorktown. Small arms were also made at the beginning of the Revolutionary War by Stephen Jenks of North Providence and others. Prior to the Revolution most of the domestic utensils and farm implements were made in the colony. One

of the most capable of its iron workers was Jeremiah Wilkinson of Cumberland. It is recorded of the latter, who was engaged in the manufacture of hand cards when the Revolution began, that, owing to the high price of tacks used in the business, occasioned by the war, and the labor of making them by the old process of hammering, he adopted the plan of cutting them from a sheet of iron with a pair of shears, and afterwards heading them in a vise. This process he afterwards applied to cold or cut nails, and he is said to have been the first to employ that mode of making tacks and nails. The Wilkinsons, like the Jenks family, produced many ingenious mechanics. They made anchors and heavy iron implements, screws, heavy oil presses, farming implements, stoves, pots and other castings. Oziel Wilkinson built a small furnace for casting iron, in which he made the first wing-gudgeons known in America. He and his family of five sons and four daughters removed from Smithfield to Pawtucket about the close of the war, and established an anchor mill there about 1784, making also farming tools and household utensils. Oziel's son David, who, as well as his four brothers, was a blacksmith, forged the iron work and turned the spindles and rollers for some of the machinery used in the first cotton factories. In 1797 he invented a gauge and sliding lathe, but as the patent expired before he had realized any profit from it, Congress, fifty years afterwards voted him $10,000 as a partial recompense.

In brief, it may be said that while Rhode Island was in its infancy, before the inauguration of the factory system, before the adoption of labor-saving machinery, before the drafting of steam to lessen the necessity of muscular expenditure, nearly everything necessary to the comfort and well-being of its people was made within its borders.

The following letter from Moses Brown of Providence to a Newport friend will give a good idea of the state of manufacturing in and around Providence eight years after the close of the Revolutionary War:

"Providence, 19th, 11th Mo., 1791.

"Respected Friend:

"I intended writing thee before now in answer to thine respecting manufactures, but my attention has been much otherwise drawn, and tho' it may be late, I tho't I would make some essay to manifest I had not wholly neglected that attention which I owe to my friend.

"The spermaceti manufactory, thou art sensible, has been long standing in the State, and was the second at least in the State before the war, but the interruption of the whale fishery and impoverishment of Nantucket (from whence the heads mostly come) during the war, has wholly deprived this town, and almost yours, of that once profitable branch of business. None of it has been done here since the peace.

"The distilleries are also ancient. Two have been erected since the peace, one of them for gin, which, thou art sensible, is made of grain

and juniper berries. One of our old distilleries of spirits is turned into a gin distillery, so that large quantities of that article are now made. The remains of the wort fattens large quantities of pork.

"We had one sugar house before the war, one erected in and toward the close of it, and one since. The latter only is now improved, for want of stocks of brown sugar.

"We have in this county one furnace for making pig iron in Scituate, the ore bed in Cranston. The water from the pit is discharged by a steam engine, also made here and at the furnace. We have 12 or 13 forges which make bar iron out of pig ore, scrap iron and black sand. The latter is bro't from the south shore of the State mostly. A slitting mill has been lately erected in this neighborhood. It also plates iron, makes hoops and rails, shovels and spades, of which articles many are made for exportation. Anchorsmiths are ancient, but as the business has increased, divers have set up the business, and many are made for exportation. The steel manufactory is perfected, as to the kind blistered and drawn equal to imported, and is made so low that the importation has mostly ceased. Ten per cent. on a cwt. of bar iron turns it into good blistered steel, weight for weight.

The making of all kinds of screws for paper mills, clothiers, and etc., is carried on to advantage, and New York, Connecticut, etc., have been supplied with them. The making of cold nails, from card tacks to shingle nails, and some up to 10 p's is largely carried on. Ten penny nails and downward are made so cheap and plenty as to prevent their importation from our neighbor States, who furnish hot-made nails in plenty. The cotton and woolen card making is well-perfected in this town, and many are made in every part, from the leather, tanning, making the backs, the engines for cutting the wire (except the wire is imported from England and Germany), and bending the teeth fit to set, which is done with amazing facility by an engine that cuts and bends 800 or upwards in one minute, by a lad turning a crank by hand, and easy work, save the quickness of his motion must be wearisome when such numbers are turned out. The machines for pricking the leather are improved in the neighborhood. The setting is by children and the business is a neat, useful manufactory.

"We have two paper mills that do much business. They make some good writing paper, press paper, bonnet paper, sheathing and etc., etc. We have hand and water mills for ginning cotton, of which much has been done since the Southern States have raised that article. But they raise it so badly by mixing ripe and unripe, good and bad, clean and unclean together that renders it useless in general for machines, tho' it answers a good purpose for hand spinning.

"We have in this neighborhood increased in fulling mills, upwards of a dozen of which are working in our county. I intended an account of the amount of cloth made in this town, which our Mechanical Society is collecting, but have not yet, I believe, completed it. The goods made by Almy & Brown's factory of all cotton and cotton and linen, tho'

chiefly the former, for the last 12 months is about 780 yards a month of velvets, thicksets, corduroys, fancy goods, royal ribs, denims, jeans, fustians, etc. The business is increasing, as they learn apprentices to weave, etc., and was it not for the effects of British manufacturers sending out agents, and selling on a long credit of 18 months, or depositing on commission their goods, to prevent the manufactury here, as well as promote their own, whereby ready pay as is required to pay workmen, etc., the country could soon be supplied. The warps for their goods are spun by water, upon Arkwright principles, from which mills yarn is furnished to other manufactories in this State and Connecticut, as well for stocking weaving as making cloth.

"We have many chocolate mills and snuff mills, which go by water, besides the usual mills for sawing, grinding, etc., by water, and the usual manufactures of hats, girt webs, saddle fringes, and the common mechanical and manufacturing business makes the principal on this subject.

"I may now mention that we have talked of a duck and twine manufactory, in addition to our rope, line &c., walks, of which we have three, but on hearing you at Newport had it in contemplation, some of us tho't it best to defer the matter till we heard further about you. I believe it would suit your situation, and prove more publicly useful with you than with us, as our poor of both sexes are, or may be, employed in the various branches of business carried on already, and yours, I understand, are not, and as your part of the State is well-calculated for raising flax a duck factory could be supplied. You have public lands near your poor house. The poor may be employed, if a house for spinning was erected. The filling may be spun all over the town, and many poor families might get their bread by the business, that may be now dependent on daily charities.

"Thy friend,

"Moses Brown."

Among the manuscripts of the Rhode Island Historical Society at Providence are certain memoranda, written on the backs of election tickets and lottery sheets, which show that salt works were operated during the Revolution—from 1776 to 1785—at Pawtuxet village, now a suburb of Providence.

The establishment doubtless owed its origin to the necessities of the people, whose supply of salt from its usual sources had been cut off by the war. The proprietors—Daniel Owen, Dr. Mason, Elisha Bowen, Jr., Samuel Clarke, Enoch Hopkins, John Wells, Elijah Hawkins, Amos Winsor, Nathaniel Phillips, Asahel Harris, Samuel Cole, Jonathan Hopkins's son Timothy, and William Page of Glocester, each paid £3 toward the enterprise, while Caleb Arnold is credited with an assessment of £4 1s., "part for a former sum." Whether the enterprise was a paying one, we are not informed. The promoters seem to have divided the salt between them, as the memoranda shows that

Esquire Williams is of opinion that Asahel Harris's share of the pan be allowed at 750 (pounds), at 18*s.* 6*d.* per hundred, or 6£ 18*s.* 9*d.* This would be nearly four and a half cents a pound for what was probably a coarse and inferior article. Salt is now worth about a cent a pound by the hundred—coarse or fine.

An undertaking of considerable magnitude for the times was begun in 1772 at Providence, when a company was organized and a charter secured from the General Assembly for the purpose of supplying a portion of that town with water. On the west side of the river at what was known as Eddy's Point, shipyards and industries connected therewith had been established and many homes had been erected for the convenience of the workmen. Eddy's Point was formerly an island, and was connected with the mainland by an artificial embankment, and there was no source of water supply. On the land adjoining this point belonging to Capt. John Field, was a large and permanent spring of water; this spring was located at a point on Clifford street, a short distance south of Chestnut street. Here a fountain or reservoir was constructed from which pipes made from logs were laid to the Eddy's Point district. Capt. Field generously donated one-half of the land with the water privileges to the company for a period of nine hundred and ninety-nine years. The work of introducing this system was completed in four months, and in a letter of thanks, addressed to Capt. Field on the 26th of August, the committee in charge of the undertaking wrote: "We are supplied with fresh water in a more convenient manner than any of the inhabitants of the colony; and, to use the language of Scripture, our situation was, before, pleasant, though our waters were naught; but, now, through your bounty and beneficence, we have at command a spring shut up, or fountain, opened at pleasure." It is stated that this aqueduct was capable of supplying one hundred gallons per minute.

EARLY CLOTH MAKING—COTTON MANUFACTURE.

Up to about a century ago, Rhode Island was essentially an agricultural and commercial State. Its manufactures, such as they were, were almost entirely for home consumption, and were largely the result of muscular expenditure. The State's prosperity as a manufacturing centre is owing in great degree to the adoption of the factory system, resulting from the invention of labor-saving machinery, by means of which water and steam power is made to take the place of muscular energy, and the rapidity of manufacture is greatly increased.

A factory has been defined as "an establishment where several workmen are collected for the purpose of obtaining greater and cheaper conveniences for labor than they could procure individually at their homes; for producing results by their combined efforts which they could not accomplish separately; and to prevent the loss occasioned

FIELD FOUNTAIN, CLIFFORD STREET, PROVIDENCE.

ESTABLISHED IN 1772 FOR THE PURPOSE OF SUPPLYING A PORTION OF THE TOWN WITH WATER. BUILDING DEMOLISHED IN 1900.

by carrying articles from place to place during the several processes necessary to complete their manufacture." The factory is, therefore, in broad terms an association of separate occupations conducted in one establishment. In its practical results it has relieved housewives of much of the burden which formerly devolved upon them of carding and weaving the cloth and making the clothes for their families. Prior to 1767 all yarn used in the manufacture of textiles of all kinds was spun in single threads by the fingers of the spinners upon the domestic spinning wheel. The process of spinning and weaving was generally performed in the same cottage, the weaver continually pressing upon the spinner for a supply of weft or warp, but the weaver's own family could not respond with a sufficient quantity, and he had much difficulty in collecting it from neighboring spinners. As the supply did not equal the demand, the spinner often put up the price of the yarn. While much of the weaving was done by the housewife for her own family, professional weavers were always in evidence. They went from house to house, or they set up weave shops at some central point.

The Early Records of Providence contain many references to weavers. In January, 1704, the town granted William Smith, weaver, a piece of land forty feet square, "to build a weaver's shop upon, he being desirous to follow his weaver's trade." William was a son of the John Smith to whom the town gave a grant of land, near Charles street, Providence, in 1646, in consideration of his starting a grist-mill. The Records show that Joseph Smith, weaver, another son of the miller, was granted three acres of land near Wanskuck, in the right of his deceased father, in December, 1700. And even earlier—in 1674—two residents of "Maushantatuch," in the town of Providence—Edward Sairle and Anna Sairle, respectively the step-father and mother of Moses Lippitt—indentured the latter "for fifteen years and a half and two months" to William Austin, to learn the trade and occupation of a weaver. The weaver must have been one of the earliest of the colony's handicraftsmen.

Fulling mills for the fulling of the weavers' webs were in operation at quite an early date. The Providence records show that the town was called upon in the year 1700 to settle a misunderstanding between Daniel Williams and William Hawkins, who had built and carried on a fulling mill in town for some time.

Prior to the Revolution the cloth made in this country was chiefly produced from wool, silk, flax and hemp. A little cotton was raised in the Southern States, but the difficulty of separating the seed from the fibre, which was done by hand at the rate of about a pound of cotton a day, prevented its general use. At the time of the non-importation movement, just prior to the war, attempts were made to encourage

domestic manufacture in most of the colonies. Arnold's History relates how eighteen young ladies of Providence, belonging to an organization known as the "Daughters of Liberty," met by invitation at the house of Ezekiel Bowen and spun linen from sunrise till sunset to encourage home industry and assist in securing the industrial independence of the colonies. Their organization increased so rapidly in numbers that they held their next meeting in the Old State House, on North Main street, where they assembled to weave a handsome web of linen to be given as a prize to the farmer who would raise the most flax that season. It is worthy of note that the General Assembly had previously attempted to encourage the production of flax and hemp and wool growing, and the manufacture of these staples into cloth by offering premiums equal to one-third the value of the finished product. An act to this effect was passed at the March session in 1751, but was repealed in the following June, because the legislators feared the offering of a bounty on colonial manufactures would rouse the anger of the mother country, and because previous offers of premiums for the raising of flax and hemp had produced no result.

Previous to the introduction of the spinning frame in New England, cotton, carded and spun by hand, had only been used for filling, with linen or woolen warp. The cotton yarn produced by hand spinning was not considered strong enough for warp. An imperfect spinning jenny was smuggled over from England just previous to the Revolution, and was set up in Philadelphia. Hargreaves had invented a carding machine, to take the place of hand cards, in 1760, and his spinning jenny in 1764; Arkwright erected his first spinning frame in 1769; an improved mule jenny was produced by Crompton in 1775; the power loom by Cartwright in 1784; the adaptation of the steam engine to the spinning and carding of cotton was made by Watt at Manchester in 1783; cylinder printing was invented by Bell in 1785; and the use of acid in bleaching was introduced at Glasgow by Watt in 1786 and at Manchester in 1788. All of these inventions were jealously guarded by the British government, and the exportation of any of the machines was forbidden under heavy penalties. All efforts during the Revolution and for a half dozen years after its close to engage in cotton manufacture were, therefore, seriously handicapped. A spinning jenny of the Hargreaves model had, however, been smuggled across in the early seventies, and had been set up in Philadelphia. One or two other spinning and carding machines were probably imported soon after the close of the Revolution, and three carding, roping and spinning machines were made at East Bridgewater, Massachusetts, in 1786, by two Scotch mechanics, who had obtained some knowledge of cotton machinery before coming to this country. Attempts at the manufacture of cottons by the use of machinery were thus enabled to be made at Philadelphia, and at Worcester and Beverly, Massachu-

setts, but the honor of successfully inaugurating the factory system of manufacture belongs to Rhode Island.

A model and descriptions of an imperfect form of an Arkwright machine were brought over from England, in 1785, by Thomas Somers, and, at the instance of the Massachusetts legislature, were placed on exhibition for the inspection of manufacturers. Several of the latter, and among them Moses Brown and Daniel Anthony of Providence, and John Reynolds, a woolen manufacturer of East Greenwich, availed themselves of the privilege of inspecting the models. Anthony, who had made hand cards during the Revolution, and had made an engagement with Andrew Dexter and Lewis Peck to make jeans and other homespun cloth of linen warp and cotton filling, to be spun by hand, made a draught of the machine. After obtaining this draught Mr. Anthony, in 1787, had a spinning jenny of twenty-eight spindles built on the model of the one in use at Beverly. The wood work was made by his son Robert, and the brass work by Daniel Jackson, a coppersmith of Providence. It was set up at first in a private house, but was soon removed to an upper room in the market house, where it was operated. A carding machine was also made for him by Joshua Lindley of Providence, from patterns of the one at Beverly. The rolls, eighteen inches long, were roped on a hand wheel, as in wool carding. A spinning frame, with eight heads of four spindles each, operated by a crank, turned by hand, was next built from the draught taken by Mr. Anthony of the Massachusetts machine. John Bailey, a clockmaker of Providence, assisted in its construction. In 1788 Joseph Alexander and James McKerries, weavers, who had emigrated from Scotland, and understood the use of the fly-shuttle, came to Providence to weave corduroy. McKerries went to East Greenwich, but Alexander superintended the construction of a loom with a fly-shuttle, which was set up and put in operation in the market-house. This is believed to have been the first fly-shuttle ever used in America. As the making of corduroy was not fully understood by Alexander, the enterprise proved a failure. He removed to Philadelphia, and the spinning frame, which was too heavy to run by hand, was sold to Moses Brown, who removed it to Pawtucket and attached it to a water wheel. Mr. Brown also purchased the carding machine and jenny, an additional spinning frame, made from the Massachusetts model and unsuccessfully tried at East Greenwich, and a stocking-loom from John Fullem, an Irish stocking-weaver, who had also made a failure at East Greenwich. The spinning frames, which were of imperfect construction, could not be successfully worked by unskilled hands, and were soon laid aside. These two unused Arkwright machines, one of thirty-two and the other of twenty-four spindles, a carding machine, an eighty-four and a sixty spinning jenny, and a doubling and twisting jenny, constituted the principal machinery of Almy & Brown at Pawtucket,

SAMUEL SLATER.

THE FOUNDER OF THE COTTON INDUSTRY OF THE UNITED STATES.

when Samuel Slater arrived. It may be of interest to know that one of these spinning jennies, built by Andrew Dexter, cost Mr. Brown, in 1789, £24 4*s*. 10*d*.; and that he paid Dexter and Lewis Peck, in 1790, £139 15*s*. for a jenny and a carding and spinning frame. These two ironworkers also appear to have made a machine for calendering goods about this time. It was put up in Mr. Brown's barn, and was worked by a horse. One of the jennies purchased by Mr. Brown had been operated about two years at Newport by Joseph Anthony, son of Daniel Anthony, previously mentioned.

Practically the machines were a failure, but Mr. Brown did not despair. Receiving in December, 1789, a letter from Samuel Slater, a young man who had had several years' experience as a clerk and overseer in a cotton mill in Derbyshire, England, and who had just arrived at New York, claiming that he could make spinning machinery, Mr. Brown invited him to come on to Providence, and made him liberal offers if he was able to do as he claimed. Slater came on and entered into an arrangement with Messrs. Almy & Brown, by the terms of which he was to build a series of Arkwright machines and was to receive one-half of the profits resulting from their use. The machines were built, and on December 20, 1790, he started three cards, drawing and roving frames, and two frames of seventy-two spindles, which were worked in an old clothiers' building by an old fulling-mill wheel. They were worked there twenty months and turned out more yarn during the time than the company could either weave or sell. In 1793 the three partners built a small factory in which they set up their machinery and carried on an increasing and profitable business. Thus was started the first successful cotton factory in the State, and in America as well.

During this time experiments were made in cotton spinning in other sections of the country; but the goods turned out, when not pure woolen or linen were mixed goods of linen and cotton, the warp for which was spun from rolls prepared by hand cards in dwelling houses. When goods wholly of cotton were desired the warp was obtained from Almy & Brown, as the jenny was not adapted to hard twist. No sheetings, shirtings, checks or ginghams were made prior to 1790.

The cards for the Slater carding machines were made by Pliny Earle of Leicester, Massachusetts. The rest of the machinery was constructed by Slater and Sylvanus Brown of Pawtucket. They worked in secret in an old building on Quaker lane, Samuel making the lines with chalk, and Sylvanus carving wooden models. Samuel was a stalwart, handsome, rosy-cheeked youth of twenty-one when he came to America. Moses Brown sent him to Oziel Wilkinson's, in Pawtucket, as a suitable place for him to board. When he entered Wilkinson's house Hannah and another of Oziel's daughters were working in the kitchen. Seeing a stranger, girl-like, they fled to an

inner room; but Hannah, with maidenly curiosity, looked through a hole in the door and was favorably impressed with the young Englishman's appearance. Samuel saw the eyes and resolved to win them. The young people were both smitten, but the Wilkinsons were Friends and did not approve of Hannah's marrying a man of another faith. They proposed to send her away to school, but Samuel declared he would follow the girl to the ends of the earth if need be. The parents wisely concluded to withdraw their opposition and the lovers were allowed to marry. In the words of Slater's biographer, Hannah was a "loadstone" that kept him in Pawtucket. Had it not been for her influence and sympathy, he might have given away to discouragement at the many difficulties he was obliged to encounter in making the new machines and running them successfully. In telling the story of Slater we must not forget the woman who assisted him in winning his great success.

The machines are supposed to have been started up temporarily in October, 1790, but the first record of their work commences with December 20, 1790. The following memoranda, preserved among the voluminous papers left by Moses Brown, showed the improvement made by the new machines over former methods, as well as the styles of cotton goods then made, and the prices obtained for them:

"An account of the cotton goods manufactured by Almy & Brown of Providence, State of Rhode Island, since the commencement of the business, say about the 11th of 6th month (June 11), 1789, to the 1st of the 1st month (January 1), 1791:

Corduroy	45	pieces.	1,090	yds.	sold from 3s. 6d.	to 4s.	per yd.
Royal Ribs, Denims &c.	25	"	558	"	" " 3s.	" 4s.	" "
Cottonets	18	"	824	"	" " 2s. 6d.	" 3s.	" "
Jeans	79	"	1,897	"	" " 2s.	" 2s. 6d.	"
Fustians	26	"	687	"	" " 1s. 8d.	" 2s.	"
Total	188	"	4,556	yds.			

"From the 1st day of the 1st month (January 1), 1791, to the present date (October 15th, 1791):

Velverets	80	pieces.	669	yds.	sold from 4s.	to 4s. 4d.	per yd.
Thicksets	30	"	745	"	" " 3s. 6d.	" 4s.	" "
Corduroy	45	"	1,001	"	" " 3s. 6d.	" 4s.	" "
Fancy Cords	26	"	664	"	" " 3s. 6d.	" 4s.	" "
Royal Ribs, Denims &c.	55	"	1,284	"	" " 3s.	" 4s.	" "
Jeans	74	"	1,769	"	" " 2s.	" 2s. 6d.	" "
Fustians	66	"	1,691	"	" " 1s. 8d.	" 2s.	" "
Total	326	"	7,823	yds."			

Under the old system it had taken over eighteen and a half months to produce 4,556 yards, while 7,823 yards had been turned out with the new machinery in nine and a half months. It should be understood that the goods were woven by hand in both cases, and that the

improvement was mainly in carding and spinning. It is to be inferred from these memoranda that the firm attempted at first to weave the yarn as fast as it was spun, and that the weavers were not able to keep up with the spinning frames. In fact, the manufacturers could not dispose of all the yarn to other mills, although they were for some time the only firm in the country which could produce cotton yarn with a hard twist suitable for warp. The unsalable yarn accumulated so fast that Moses Brown, who furnished the capital upon which the firm was doing business, became alarmed. When the unsold stock reached 500 pounds, the prudent old Quaker wrote to the firm: "Thee must shut down thy gates, or thee will spin up all my farms into cotton yarn."

About 1790 one Herman Vandausen, a German, began calico printing at East Greenwich. He cut his own blocks and printed India cottons and the coarse cottons woven in families for the people generally. This was the first print-works in the country, but the business did not prove profitable, owing to the abundance and cheapness of English and Indian cotton goods. Some of Vandausen's blocks and samples of the goods printed from them are preserved in the Rhode Island Historical Society building at Providence.

Another impediment to the successful operation of the new cotton factories, besides the competition of foreign cottons, was the great quantities of textile goods produced throughout the country by household manufacture, a result due to the efforts made, especially during the Revolution, by the patriotic societies to make the feeble colonies industrially, as well as politically, independent of England. In nearly all of the States there had been a great increase in both the quantity and quality of household goods. Bishop states that in 1790 in Providence and vicinity, 30,000 yards of woolen cloth were made, 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 were made, all of which were household fabrics.

One great impediment to success at the beginning of the factory system in this country, was the want of skilled artisans. It required experience to work the new machinery to the best advantage, and when a skilled workman came over from Great Britain, he could command the highest wages. The first operatives of the Slater mill appear to have been local residents. It began with four spinners and carders whose names were Charles and Torpen Arnold, Smith Wilkinson and Jabez Jenks, to whom were soon after added Ann and Eunice Arnold, John and Varnus Jenks and Otis Barrows. They were all children from seven to twelve years of age, and they worked the full time of six days, and doubtless at least twelve hours each day.

The building in which the Slater machines were put in operation was inadequate to the increasing business of the firm, and a new one

was erected in 1793. It is still standing, and is known as the "Old Slater Mill."

Cotton manufacture was begun in America before American cotton could be procured to supply the mills. Southern planters were experimenting with it, but it was imperfectly cleaned and was considered of inferior quality. The cotton used in home manufacture throughout the Northern States was obtained from the West Indies or from the Guianas, while the British mills were largely supplied from Brazil. The New England ship owners would send cargoes of fish, flour, rum or other commodities to the West Indies in exchange for the latter's goods, of which cotton was a leading article of export. When Slater first began to spin he used Cayenne and Surinam cotton, but after a

OLD SLATER MILL, PAWTUCKET.
As it appeared in 1793.

few years he began to mix about one-third of Southern cotton; and this yarn was designated as second quality and sold at a price accordingly. In 1791 Moses Brown stated in a letter to J. S. Dexter, that Slater could not be induced to use American cotton because it had been so badly cleaned. After Eli Whitney's invention of the cotton gin in 1793, cotton soon became a profitable crop at the South, and it, especially the Sea Island variety, soon began to displace foreign cotton in the domestic mills, while the market for it abroad continually increased. The price of domestic cotton at the port of export, in 1791, was twenty-six cents a pound.

The first calico printing in the State to be put in successful operation was commenced at Providence in 1794 by Messrs. Schaub, Tissot & Dubosque, in a chocolate mill on the site afterward and now occu-

pied by the Franklin Machine Company. Mr. Dubosque, who was formerly in the French navy, had learned the art in Alsace, before entering the navy. The cottons used were imported from Calcutta. The printing was done by wooden blocks, and the calendering by friction on a hard substance with flint stone—metal rollers then being unknown. A calendering machine had been put in operation in Providence in 1790.

The first sewing thread ever made of cotton was produced by Samuel Slater in 1793. It appears that Mrs. Slater, noticing the smooth and even appearance of some yarn spun from Surinam cotton, became impressed with the idea that it would make good thread. With the aid of her sister, she twisted some of it on an ordinary spinning wheel, making No. 20 two-ply thread. On testing it with linen thread in making seams, the cotton thread proved the stronger. The introduction of cotton stocking yarn in America is also ascribed to Mr. Slater. The prices for cotton twist yarn at Providence in 1794 were, for numbers 12, 16 and 20, respectively, 88 cents, $1.04 and $1.21.

The second cotton mill in the State was established at Centreville, in the town of Warwick, in 1794 by Colonel Job Greene and others, but it was not fully successful until 1799, when William Almy and Obadiah Brown purchased one-half of the property for $2,500. In 1801 Messrs. Almy & Brown bought the other half and took full control.

According to tradition, after Messrs. Brown & Almy had purchased an interest in the mill, Brown and John Allen, one of the other owners, went to Pawtucket to look over the Slater mill, "to observe how things went and get some useful hints." Slater, who had no interest in the Centreville mill, was little pleased at having Allen spying around; and when the latter attempted to measure some of the machines, he ordered him to desist, and threatened to throw him out of the window. But as Obadiah was a partner of both Slater and himself, and stood looking on, he paid no heed to the threat. Finally Slater laid violent hands upon him. Obadiah then took the measure, saying, "I will finish thy work, and I will see if Samuel will serve me as he did thee." Samuel did not feel like attacking his own partner, and the measurements enabled the Centreville partners to equip their mill with better machinery. In 1807 a second mill was erected by them on the east side of the river (Flat River, or the South Branch of the Pawtuxet). The original Green mill was purchased in 1852 by the late Benedict Lapham. A large stone mill erected by him just before his death (1883) was declared at the time to be the largest cotton mill in the country owned by a single individual.[1]

In 1799 Samuel Slater severed his connection with the firm of Almy & Brown, and in company with his father-in-law, Oziel Wilkinson, and

[1] The accuracy of this claim is not vouched for.

his brothers-in-law, Timothy Greene and William Wilkinson, organized the firm of Samuel Slater & Company, Mr. Slater owning one-half of the stock. They erected a mill known as the "New Mill" on the Massachusetts side of the river, within the present limits of Pawtucket. Mr. Slater, however, still acted as superintendent of the old mill, dividing his time equally between the two, and receiving a salary of $1.50 a day from each.

Soon after the new mill commenced running a strike occurred in it, and several of the hands left. They went to Cumberland and persuaded Elisha Waterman and Benjamin S. Walcott, who owned a fulling mill at Robin Hollow, to erect a mill for the manufacture of cotton. When the mill was finished and ready to start up—in 1801—the operatives marched by the Slater mill in a spirit of bravado, each with a bunch of cotton yarn wound around his hat. The Mathewson mill was rebuilt in 1824, was burned in 1850, again rebuilt, and burned again in 1860, after which it again rose from its ashes. It is now known as the Cumberland Mills.

In referring to the strike at the Slater mill, Slater's biographer says, "that by these men (the strikers) and their connections several factories were commenced in various parts of the country;" most of the establishments erected from 1790 to 1809 having in fact been built by men who had directly or indirectly derived their knowledge of the business from Pawtucket, the cradle of the cotton manufacture. Slater's patterns and models were stolen by his servants, his improvements thus became extended over the country and the business was rapidly introduced in other places.

In 1805 the third cotton mill in Pawtucket was erected on the east side of the river. The persons engaged in the enterprise were Ebenezer Tyler, 2d, Eliphalet Slack, Oliver Starkweather, Nathaniel Croade, Benjamin S. Walcott, John Walcott and Elijah Ingraham. The mill, which was of wood and painted yellow, was known for many years as the "yellow mill." It was finished and went into operation in the fall of 1805. Its business was remunerative, and its owners built another mill of stone in 1823. Another cotton mill was built in 1805 on a site at Central Falls known as the chocolate mills. Stephen Jenks, the projector of this last enterprise, took Benjamin S. Walcott and Elisha Waterman into partnership, and the firm was styled the Smithfield Cotton Manufacturing Company.

After Samuel Slater's mills had been in successful operation some years he sent to England for his younger brother John, who came over in 1803, and immediately entered into the employ of Almy, Brown & Slater. Being desirous of enlarging their business, John was sent to inspect certain water privileges up the Blackstone and its tributaries. He made several journeys on horseback, during one of which he discovered a point on Branch River where there was at one point a fall

of forty feet, with ponds above it forming natural reservoirs, and promising an ample supply of water at all seasons of the year. This was the site of the future Slatersville. Three purchases of land were made, comprising in all more than one hundred and fifty acres, controlling the stream and providing sites for mills and tenements. A partnership was formed by William Almy, Obadiah Brown, Samuel Slater and John Slater, under the style of Almy, Brown and Slaters, and a mill was built in 1806, beginning operations early in 1807.

A cotton mill was erected in the village of Anthony, in Coventry, in 1806, by Richard and William Anthony and others. It was one of the largest mills in the State at the time. Another mill was built in 1811, a short distance east of it. A large brick mill was erected by the Coventry Company in 1874, upon the site of the original mill. The manufacture of cotton goods was commenced at the village of Crompton, in Warwick, in 1807, by the Providence Manufacturing Company, which erected a stone mill known as the "stone jug." The mill now standing on that privilege is one of the largest in the State.[1]

A company was formed at Natick, in Warwick, in 1807 for the manufacture of cotton, and a mill was built known as the "Natick reel mill." It came into the possession of the Spragues in 1852, and after the failure of the great cotton manufacturing house was purchased by the present owners, who connected the detached buildings, and instituted many improvements, making the establishment one of the largest, if not the very largest cotton mill in the country. It contains 100,000 spindles. The cotton mill at Hope village, Scituate, was built in 1806, and a mill at Lippitt, in Warwick, was started in 1809; that at Phenix in 1810-11, and one at Riverpoint in the same town by the Greene Manufacturing Company in 1812. Several other cotton mills were built in the State before the last war with Great Britain. An old record, bearing the date of 1812, states that there were thirty-eight cotton mills in operation in the State at that date, containing in all 30,669 spindles. They were located as follows: Warwick 9, North Providence and Coventry 5 each, Cranston 4, Smithfield and Scituate 3 each, Johnston, Cumberland and Glocester 2 each, Providence, Exeter and South Kingstown 1 each. The mill of Almy, Brown & Slater was for many years, and probably up to the beginning of the War of 1812, the largest and best equipped cotton mill in the country. British operatives, knowing that skilled workmen could command high

[1]A story, the authenticity of which may be considered as not fully established, is told of a little yarn mill erected on a brook emptying into Flat River, near the Crompton mill, above described. There was but little water power at the best, and the mill was finally abandoned. But one day, while it was running, the machinery suddenly stopped. The operatives ran out of the mill to ascertain the reason, and discovered a cow drinking the water in the trench. When the animal had slaked her thirst, the trench filled and the wheel started again.

wages in America, emigrated to our shores in considerable numbers. Their first inquiry, on landing at Boston or New York, was regarding the facilities for reaching Pawtucket. The original cotton factory thus had the pick of expert help, and its owners were doubtless in constant receipt of inquiries from other mill owners who desired to engage factory hands. The quality of goods made at this mill in 1808 can be learned through an advertisement in Philadelphia, "that Samuel Slater and Company, cotton spinners of North Providence had on sale by Samuel Haydock, 38 South Second street, Philadelphia, cotton twist and filling, brown and bleached, three-threaded bleached yarn, numbers eight to forty, and bleached cotton sewing thread, numbers twenty to forty, also checks and stripes, and tickings of superfine and middling qualities."

According to the census statistics of 1810, the value of manufactured products in Rhode Island that year was $3,079,556. The returns were imperfectly made and the figures are thought to have been too small.

The price of cotton twist at Providence in 1800 was: Number 12, $1.03; number 16, $1.19; number 20, $1.36; an increase of fifteen cents upon the prices of 1794. In 1803 the prices for the three grades had fallen respectively to 94 cents, $1.10 and $1.26 per pound.

It should be understood that previous to 1817 the operations of the cotton factories in this State were confined to spinning yarn only. The yarn was put out in webs, and was woven by hand weavers. Mules for spinning filling had not yet been introduced. Although the power loom had been invented by Cartwright as far back as 1784, and had been improved by subsequent inventors previous to 1810, it was not extensively used even in England for some years. At all events, no power looms appear to have been brought to this country for more than a quarter of a century after their invention. As none could be obtained from England, the ingenuity of American inventors was taxed to produce an American power loom. Among those who labored to this end were Judge Daniel Lyman and John Thorp of Providence, and Mr. F. C. Lowell of Boston. The latter patented a machine which was set up in the Waltham cotton factory in 1815. That year William Gilmour of Glasgow, Scotland, landed at Boston, bringing with him patterns of the power loom and dresser machine in use in that country. On invitation of John Slater he went to Smithfield, but as Mr. Slater could not obtain the consent of his partners to pay for the construction of an experimental loom, Gilmour accepted the invitation of Judge Lyman to remove to North Providence, where he built twelve looms, in 1816, for the Lymansville mill at North Providence. Afterwards, for the sum of ten dollars, he allowed David Wilkinson & Company the use of his patterns for building twelve other looms, and they got their dozen looms started almost as soon as those built by Gilmour.

This power loom was put in operation early in 1817, two years after the American loom had been put to running at Waltham. The inventions and improvements in the machinery at Waltham having been patented, including the loom, the double speeder, warper, dressing-frame and filling-frame, and the right to the use of these patents being held at a high price, most of the mills already built in Rhode Island adopted the crank-loom made by Gilmour—otherwise called the Scotch loom—and introduced various plans in the process of making the roving, instead of using the patented speeder. Among them was the tube-speeder, invented by Danforth, and which was afterwards introduced to a considerable extent in Great Britain.

The introduction of the power loom completed the manufacturing system of the State. The mills could now individually employ all the various processes from the receipt of the raw cotton to the production of the finished web.

As previously stated, prior to 1817 the cotton factories of the State only produced yarn. In the days of hand spinning the spinners had not been able to keep up with the weavers, and the latter were frequently idle because of the want of yarn. After the introduction of mule spinning the hand-looms were fully employed, and yarn accumulated, waiting for the weavers. The Slater factory at Pawtucket, for many years the largest cotton factory in the country, was obliged to establish agencies in different cities, from Portsmouth, New Hampshire, to Baltimore, Maryland, for the disposal of its yarn.

The early customs duties upon cotton goods had but little effect in protecting the domestic product from foreign competition. They were but ten per cent. at first, but were raised to twelve and a half per cent. by an amendment of the existing tariff in 1797. While these duties doubtless helped the infant manufactures to take root, the chief impediment to their successful establishment was the lack of sufficient capital, the want of good machinery and the lack of skilled help. Still, mills mutiplied very rapidly during the last half-dozen years previous to the outbreak of the War of 1812. That war, while it prevented to a great extent the export of our breadstuffs and cotton to foreign takers, effectually shut out British textiles and other foreign importations, and thus insured the American manufacturer the monopoly of the home market, at a time when that market was stimulated by a suddenly created demand for food, clothing and the other appurtenances of war to supply large armies. Prices went up with a rush and manufactured articles sold readily at advanced figures. Hence the war, which lasted three years, was of great aid to the American manufacturer. But when the Americans and British ceased shooting at each other, an industrial war began. Great quantities of foreign textiles and other goods were rushed across the ocean and exposed for

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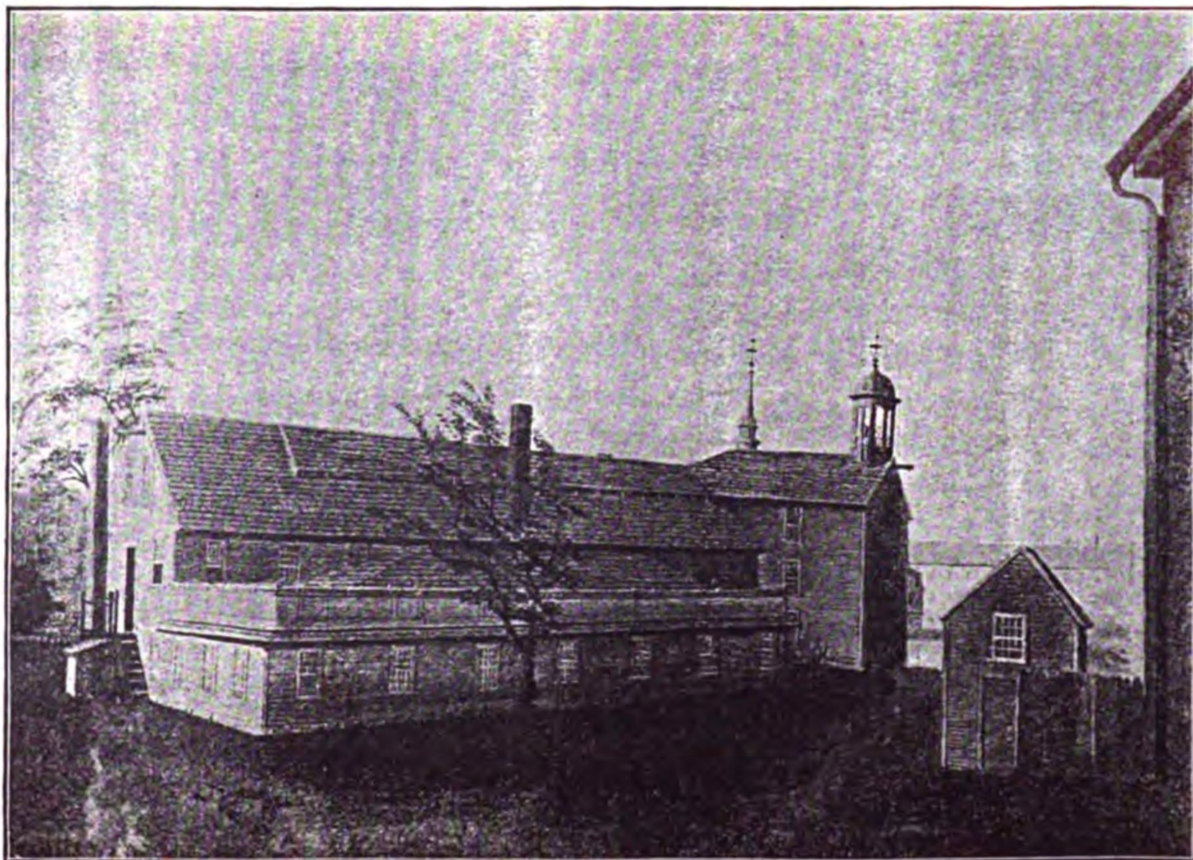
The introduction of the [illegible] completed the manufacturing system of the State. The mills [illegible] gradually employ all the various processes from the [illegible] cotton to the production of the finished web.

As previously stated, prior [illegible] cotton factories of the State only produced yarn. In [illegible] spinning the spinners had not been able to keep up with the weavers and the latter were frequently idle because of the want [illegible] after the introduction of mule spinning the hand-looms [illegible] employed, and yarn accumulated, waiting for the weavers. [illegible] factory at Pawtucket, for many years the largest [illegible] the country, was obliged to establish agencies in [illegible] Portsmouth, New Hampshire, to Baltimore, M[illegible] of its yarn.

The early customs duties [illegible] goods had but little effect in protecting the domestic [illegible] competition. They were but ten per cent. at first [illegible] twelve and a half per cent., by an amendment of [illegible] 1797. While these duties doubtless helped the [illegible] take root, the chief impediment to their success [illegible] the lack of sufficient capital, the want of [illegible] of skilled help. Still mills mutiplied [illegible] half-dozen years previous to the outbreak of [illegible] war, while it prevented to a great extent [illegible] cotton to foreign takers, effectually [illegible] and other foreign importations, and thus [illegible] manufacturer the monopoly [illegible] the home market [illegible] market was stimulated [illegible] suddenly created [illegible] and the other [illegible] nances of war [illegible] went up with a rush [illegible] manufactured [illegible] advanced figures. Hence the war, which [illegible] aid to the American manufacturer. [illegible] British ceased [illegible] great quantities of [illegible] the ocean, and [illegible]



OLD SLATER MILL, PAWTUCKET.

As it appeared in 1850. From a Painting in the rooms of the Pawtucket Business Men's Association.

sale at low prices and long credits. Mills were shut down generally for a brief period and Congress was appealed to for relief.

The enormous importations of coarse cottons and cheap calicoes from India was believed to be largely responsible for the condition of our cotton mills, and the mill owners of Massachusetts and Rhode Island united in sending a giant petition to Congress, asking for a prohibitory tariff on coarse cotton fabrics—especially those from beyond the Cape of Good Hope—and increased duties on others. An assessment of one cent on each spindle was made in 1815, to pay the expense of an agent to proceed to Washington and advocate the interests of the cotton manufacturers of Massachusetts and Rhode Island, and Hon. James Burrill was employed as such agent. Mr. John Waterman, in collecting the assessment and statistics, found the number of cotton mills "in and near Providence" to be as follows: In Rhode Island, ninety-nine mills, with 75,678 spindles; in Massachusetts, fifty-seven mills, 45,650 spindles; in Connecticut, fourteen mills, 12,886 spindles; total one hundred and seventy cotton mills and 134,214 spindles. About one-third of the cotton manufacturing of the country was done in these mills.

Congress finally, in 1816, decided upon an ad valorem duty of twenty-five per cent. upon cotton and woolen goods.

The immediate effect of the new tariff (which increased the duties generally, and which was the first really protective tariff) was to replenish the national treasury. The tariff bill was approved February 27, 1816, but the receipts from customs that year were more than double the entire receipts of the country, exclusive of loans, on any previous year. The exclusion of foreign products was defeated by the general advance in prices of the products of agriculture and manufacture. Raw cotton and tobacco more than doubled in price, and flour went up from $9.50 a barrel in 1814 to $14 in 1817. The exports of domestic products increased more than 50 per cent. in value in one year. The increase in the purchasing power of the farmers and those engaged in commerce, together with the adoption of the power loom by textile manufacturers, insured the latter a brief period of prosperity. Unfortunately it was of short duration. The British excluded American flour from their ports after November, 1817, and the increased importation of East Indian and Brazilian cotton into England forced down the price of the American product. Bishop, in commenting upon the situation in 1819, says: "Flour had also fallen off from its high price of ten to fifteen dollars a barrel in 1817 to five or six in the present year, in domestic ports; and tobacco from $148 in 1817 to $110 this year, and $75 in 1822." A like depreciation in other crops greatly diminished the power of a large portion of the population to purchase manufactures. A general paralysis now fell upon all branches of industry. "The distress became more general and

severe than had ever been known and but little alleviation was experienced for several years following. The banks suffered from lack of specie. Bankruptcies overtook the mercantile and shipping interests, whose merchandise lay on their hands, and whose ships could neither be employed nor sold save at ruinous losses. Rents and the value of real estate were enormously depreciated. Farms were mortgaged or sold at one-half or one-third their value. Factories and workshops were everywhere closed. Manufacturers were forced to abandon extensive and flourishing establishments, reared as if by magic in the last few years. . . . The suffering among manufacturers was more severe in Rhode Island, New York and Pennsylvania than elsewhere. The number of persons thrown out of employment since peace was variously estimated at from forty to sixty thousand, and with their families the number deprived of support was computed at from one hundred and sixty to two hundred and forty thousand." Many mills were put under the hammer and disposed of at a fraction of their original cost, and some establishments were permanently closed. The distress was generally imputed, especially in manufacturing districts, to the great importations of foreign goods, and Congress was importuned to increase the protective duties. Strong opposition was shown in Congress and elsewhere to an advance of tariff rates for several sessions. The cotton growers of the South and other agriculturalists, and the commercial interests were strongly opposed to an increase.

It is notable that during the debates Henry Clay, then speaker of the House, and at that time a pronounced Republican (Democrat), was an enthusiastic advocate of further protection, while Daniel Webster, of Federal antecedents, and from Massachusetts, was determinedly opposed to a higher tariff. Judge (Job) Durfee, a Congressman from this State in 1823, was also a stalwart opponent of further protection. A new tariff bill was finally passed and approved in May, 1824. The only change in the duties upon cottons was an increase of the minimum valuation from 25 to 35 cents the square yard, in order to protect fabrics of finer grades than the three lower grades, upon the importation of which the previous tariff was practically prohibitive. Many mills had been started, however, during the interval between the close of the war and the going into operation of the tariff of 1824.

From returns made by the secretary of state in 1824, in obedience to a resolution of the Senate, it is found that the value of dutiable articles manufactured annually in Rhode Island was $878,558. The returns of the census of 1820 showed that there were then 63,372 cotton spindles in the mills of the State, more than one-fourth of the number in the whole country, and nearly twice as many as were operated in any other single State. The fact is recorded that when President Munroe was inaugurated for his first term, in 1817, "following the example of

his predecessor, the President wore for the occasion a suit of American cloth from a Pawtucket manufactory."

In 1826 there were 110 cotton factories in the State. Pawtucket was then the fifth village in New England in cotton manufacturing, while Slaterville was eighth, and Pawtuxet—a village on both the Cranston and Warwick sides of the Pawtuxet River—the tenth. About one-third of the mills now had power looms, and a third hand looms, while the remainder spun yarn and twist for the Western States where, as in Philadelphia, it was woven by hand under contract, or in families. Calico printing was now carried on in Pawtucket.[1] The price of cotton machinery, which was worth in 1810 three or four hundred per cent. more here than in England, could be obtained now at prices only about fifty per cent. in advance of their cost in England.

Cotton mills had many ups and downs during the twenties, but their number continued to increase in this State. In 1829 there were one hundred and thirty nine within its small area, twenty of them being in Warwick, and twenty in Smithfield, which then included the present town of that name, a portion of the present city of Woonsocket, the towns of North Smithfield and Lincoln and the city of Central Falls. In 1826 a lace dress made in Pawtucket, which had taken a premium of ten dollars at the State Fair, was purchased by President Adams. A lace school about that time in Newport, according to Bishop, "employed five hundred young women."

The question of the further protection of American industries was hotly debated at every session of Congress, and the New England members, as manufactures increased among their constituents, ranged themselves on the side of protection, and one of the warmest and most effective supporters in the House of a new schedule of duties, adopted in 1828, was the famous Tristam Burges of Rhode Island. The duties on cotton bagging by this new tariff were raised from three and a half to four and a half cents on the square yard and after June 29, 1829, to five cents. Under the encouragement thus given the making of cotton bagging became profitable. In 1830 a good quality of it was made in Providence from factory waste. It was strong and heavy, weighing one and three-quarters pounds to the yard, or a quarter pound more than the best hemp bagging, and was sold at eighteen cents a yard.

The change in the tariff did not give the degree of relief that was expected by its advocates. Mills which still adhered to old methods found it difficult to keep running, nor were the best equipped and most

[1] Calico printing was begun on the site of the Dunnell Manufacturing Company at Pawtucket in 1824; William Sprague commenced block printing at Cranston Print Works in 1825; Philip Allen started the Allen Print Works at Providence in 1830; and printing was begun in the Clyde Print Works at Warwick by Greene and Pike about 1838.

wisely managed factories always able to run at a profit. Bishop says: "The Boston Daily Advertiser of the 2d March (1829), gave the names of twelve cotton factories destroyed by fire within one hundred and fifty miles of that city, since the first of January. . . . An unusual degree of distress prevailed at this time among the manufacturers of New England, particularly in the cotton branch, producing numerous failures and great depreciation in the value of stocks." A careful examination of the Providence Manufacturers' and Farmers' Journal of that period shows that only one Rhode Island cotton factory—that of the Jenks mill at Central Falls—was burned during the period specified. As this mill had no insurance whatever, the implication of fraud contained in the above quotation does not apply to Rhode Island manufacturers.

It appears from statistics compiled under the auspices of a National Tariff Convention in 1832, there were 116 cotton mills in the State, with a capital of $6,262,340. They used 10,415,578 pounds of domestic cotton, which was spun into 9,271,481 pounds of yarn, and woven into 37,121,681 yards of cloth, which sold at an average of ten cents a yard. The cotton industry gave employment to 8,500 persons, of whom 1,731 were men, 3,297 women and 3,472 children. Their wages amounted to $1,177,527 annually, of which sum they were believed to save five per cent. on the average. Mills having in the aggregate 141,000 spindles, used anthracite coal for heating purposes, while wood was burned by mills with 95,000 spindles. In addition to the regular cotton mills there were five bleacheries employing 300 persons—two-thirds men and one-third boys and women. There were also two print works employing 186 persons. The bleacheries paid $69,500 in wages and the print works $40,000. There were 1,246,000 cotton spindles in the whole country at that time, and Rhode Island with 235,000 stood second, Massachusetts being first with 330,000 spindles.

In answer to certain questions propounded by Samuel Slater regarding cotton manufacturing, in pursuance of a resolution of Congress, John Whipple, who, in company with Ephraim Talbot, was running the Hope mill in the town of Scituate, claimed that there was no money in cotton manufacturing. In the whole period since 1790, only four men in the State had become rich in the business. He cited the Hope mill as an instance of the condition of cotton manufacturing. Up to 1821, when they sold to Whipple and his partner, the original proprietors of the mill had expended $85,000 for building, machinery and repairs. Simple interest on this sum would amount to over $70,000. They sold for $21,000 and had only $8,000 left after paying debts. This $8,000, Whipple claimed, was all that the founders of the business had to show for the $155,000 paid out. This testimony of Whipple's was quoted all over the country in tariff circles and was published with editorial comments in Niles's Register, a publication

of great influence in political and industrial circles. Anti-tariff people, however, belittled Whipple's testimony, and declared that it was impossible to determine the profit or loss of a mill unless its running expenses and the value of its products were considered. Tariff discussion during the twenties and thirties was carried on with great bitterness, some of the Southern opposers of the protective system even threatening secession. In 1832 a so-called compromise tariff involving a gradual reduction of rates for a series of years was adopted. The duties upon cotton bagging by this tariff were reduced to 3 1-2 cents on the square yard, and under the reduction system the 25 per cent. duty upon cotton cloth, yarn, twist, thread, etc., fell to 24 per cent. in 1836, 23 per cent. in 1841, and 21 1-2 per cent. on June 30, 1842.

While the cotton mills of Rhode Island had their prosperous and depressed periods under this compromise tariff, on the whole they appear to have been fairly remunerative during the thirties. The Lonsdale mills at Lonsdale and several other factories in other sections of the State were started during the decade. The census statistics of 1840 showed that there were then 209 cotton manufactories in the State, besides seventeen dyeing and printing establishments. The mills contained 518,817 spindles, their products were valued at $7,116,792 and gave employment to 12,086 persons. The capital invested in the business aggregated $7,326,000. The cotton industry had evidently made great progress in the State since 1832. Rhode Island in 1840 was only exceeded by Massachusetts in the magnitude of its cotton manufactures. Its mills and print works were up to date in every particular. Bishop states that "in February, 1840, a new pattern of mousseline de laines arrived from France at New York, and was offered by the importer at fourteen cents per yard by the case. The agent of a Rhode Island calico-printing establishment forwarded a piece of the new style of goods to Providence the day after their arrival, and in sixteen days he had the same style of goods and of equal fabric in New York, selling at ten cents per yard. The manufacturer had but twelve days to engrave the new pattern on a copper cylinder then hardened and made ready for impression; the compound for ingredients for colors discovered by chemical experiments; the cloth printed, dried and cased for market."

The statistics of manufactures for 1840 were probably not entirely accurate. Many errors were exposed at the time, and the apparent gain in cotton manufactures may have been larger than the facts would warrant. The improvement in machinery has constantly lessened the cost of production, and hence the price of the finished product has fallen in a corresponding degree. The manufacturer who employed the best labor-saving machinery possessed a great advantage over those of small or involved capital who felt unable to discard their slow and obsolescent machinery. Consequently throughout the whole

period of the factory system in this and other states there have been constantly occurring failures and closing of mills. These failures have sometimes taken place during the most propsperous periods, but have been much more frequent during hard times. When the mass of the people have been short of money, goods have become unsalable and prices have fallen. Our cotton mills in the early stages of manufacture were unable to supply the domestic market, and the importation of foreign goods was necessary, but afterwards, when the multiplication of spindles made outside help unnecessary, the importation of foreign textiles tended to keep down prices and to lessen the income of both manufacturer and operative. The compromise tariff of 1832 does not seem to have been injurious to our cotton mills as a whole, but after the panic of 1837 business for a time was not good, and a movement was organized in high tariff circles to repeal or modify the agreement of 1832, so as to secure higher duties. It was called a "home league" and was generally endorsed by Rhode Island manufacturers. As the revenues of the National Government had fallen off, owing to the lessening of imports, the opposition to a slight increase of duties on the part of the anti-protectionists was not strong, and a new tariff bill was passed on August 30, 1842, which increased the duties upon cotton bagging to four cents a square yard, and upon cotton cloth, yarns, etc., to 25 to 30 per cent. The change had the effect of increasing customs receipts, but the agitation increased, and on July 30, 1846, a revenue tariff was adopted which reduced the duties on cotton goods generally from 30 to 25 per cent.

If the statistics of cotton manufacture of 1840 and 1850 are correct in each instance, the industry lost ground in this State during the decade. The figures for 1850 report 158 manufactories with a capital of $6,675,000, employing 10,875 persons, and producing goods valued at $6,447,120. The value of cotton products in the whole country had increased from $46,000,000 to $61,000,000, and the number of persons employed from 72,000 to 92,000. The secret of the diminished figures for this State may lie in the fact that woolen manufacturing here was largely increased during the decade, and it appears that some mills changed from cotton to woolen.

Manufacturing and nearly all other industries were very prosperous during the decade between 1850 and 1860. Factories were multiplied in number or enlarged. In this small State, where the water power of the streams had been generally put in use already, the tendency was to increase the capacity of old mills, rather than to establish new ones. Manufactures generally were so prosperous that the tariff, whose average rate had been reduced in 1846 from 33 per cent. to 24 per cent., was reduced still further in 1857 to about 19 per cent. The duties upon cotton fabrics, yarn, etc., were reduced from 15 to 24 per cent. The passage of this tariff bill was not strongly opposed by

manufacturers, and it is a notable fact that one of the two Rhode Island members of the House and all of the Massachusetts members voted for it.

The statistics of manufactures for 1860 show that there were then 135 cotton manufacturing establishments in the State with an invested capital of $11,500,000, employing 12,089 persons and producing goods valued at $12,258,677. The mills contained 766,600 spindles and 26,000 looms. The increase in the value of cotton products during the ten years had been 88.7 per cent., while the average increase in the whole country was only 75.78 per cent.

In an article upon cotton manufacture, prepared for the United States Census Report for 1880, Edward Atkinson says: "Since the year 1860 the cotton manufacture of the United States has been exposed to greater vicissitudes than any other important branch of national industry, and the wonder is not that there should have been some disasters, but that it should have survived at all in the hands of its original owners. From 1857 to 1860 the cost of constructing a spinning and weaving factory on medium fabrics, woven of No. 25 yarn, was from $16 to $20 per spindle. The value of a bale of cotton of 480 pounds was from $40 to $50. Then came the combined effects of war, paper money and scarcity of cotton. At one period more than two-thirds of the cotton machinery of the country was stopped; the value of a bale of cotton rose to over $900, and the price of some kinds of cotton goods was seven or eight times the present price. A little later new mills were constructed which cost from $30 to $40 per spindle. . . . At the date of the census (1800) the value of the bale of cotton was again from $40 to $50; the standard printing cloth, which reached 33 cents a yard during the war, was worth 4 cents; the No. 25 mill for spinning and weaving could be built for from $14 to $18 a spindle."

During this time the proportion of operatives to each 1,000 spindles had been decreased from 26 1-2 to 15, or 43 per cent., while wages had been increased.

In 1870 there were 139 cotton manufacturing establishments in Rhode Island, containing 1,142,000 spindles, employing 16,745 persons; with a capital of $18,836,300, and producing goods valued at $22,049,203.

In 1880 there were 115 cotton manufactories in Rhode Island with a capital of $28,047,331, employing 21,474 persons, and producing goods of the value of $22,875,111. While there appears to be but little gain in the value of products over the total of 1870, it should be understood that prices were inflated in 1870, and that our paper money, upon which the valuation was made, was then worth only about 85 cents to the dollar in specie. The aggregate weight of various manu-

factures of cotton of Rhode Island mills in 1880, was 60,905,602 pounds, and 1870 but 38,503,060 pounds.

The tendency for the past twenty years in Rhode Island factories has been to consolidate and enlarge existing establishments, rather than to start new ones. The prices of cotton products have gradually fallen, owing partly to improvements in machinery and partly to over production, and many failures have occurred. The largest cotton manufacturing house in the State (A. & W. Sprague) failed between 1870 and 1880, and some of the factories owned by this firm have been practically closed, while others have been enlarged by the manufacturers now in possession of them.

Great progress has been made during this period in the manufacture of cotton goods at the South, and grave misgivings have been manifested in manufacturing circles as to the ability of New England factories to compete with Southern mills, where labor is cheaper and the cost of transportation of the raw material less than here in New England. Thus far, by the employment of skilled labor and the best machinery; by providing every possible convenience for the economical handling of the raw material in the various stages of its change to the finished product; and by striving to produce a finer and better quality of goods than formerly, our mills have contrived to hold their own.

The census of 1890 gave the State 94 cotton factories, with a capital of $38,798,161. They employed 24,832 persons, used $14,347,672 worth of raw materials, and produced goods valued at $27,347,672. Besides the 94 factories making cotton fabrics, there were 22 dyeing and finishing establishments, which used a capital of $5,739,692, gave employment to 3,720 persons, and turned out calicoes and other goods valued at $4,743,561. The returns of the census of 1900 report 87 cotton establishments, employing 24,032 persons, to whom $8,023,007 are paid annually in wages, and whose products are valued at $26,435,675. The decreased value of the products compared with 1890 is owing to a fall in prices, as the quantity of the product was greater in 1900 than in 1890.

There were 24 dyeing and finishing establishments in 1900. They gave employment to 5,942 persons, paid $2,474,042 in wages, and turned out finished products valued at $8,484,878. There was a great gain in the number of persons employed and in the value of the product over 1900.

"Dockham's American Trade Reports," in its edition for 1901, gives information regarding 129 cotton manufactories of different grades in Rhode Island, of which number 13 are new establishments. To these 129 should be added two cotton mills in Tiverton—just across the line from Fall River, and which are credited to Fall River by Dockham. It should be understood that the 131 cotton establishments, to which allusion has been made as now in operation in the State, does not in-

clude the print works, bleacheries and dye works which finish textile fabrics. The State Census of 1895 enumerates 20 such establishments, employing 4,730 persons and producing goods valued at $7,957,151, with a disbursement in wages of $1,995,124.

In conclusion it may be said that Rhode Island cotton mills compare favorably with those of other manufacturing states and other manufacturing countries, in methods of manufacture, in the quality of their products, in wages paid, in regard for the health and well-being of their operatives, and in the intelligence and skill of the latter. The State contains some of the largest and most perfectly equipped cotton factories in the world.[1]

WOOLENS, WORSTEDS AND OTHER TEXTILES.

The sheep is of much greater antiquity in domestic economy than the cotton plant, and in America, as well as in the Old World, woolen cloth was made before cotton fabrics. The wool was at first carded by hand by the housewives, spun on spinning wheels, and knit into stockings and mittens, or woven into cloth to clothe the family. Every housewife and marriageable maiden must know how to card and spin; the spinning wheel was a necessary part of the household furniture; but hand-looms were less plenty, and not every woman knew how to weave. Hence it happened that weaving was virtually a trade of itself, and that every neighborhood had its professional weaver - often a man— who received the yarn of a customer at his own house or shop, or moved his loom from house to house, and wove the family yarn for so much a day and board. Fulling mills for dressing the cloth were established at different places in this State more than two hundred years ago, and some years before the use of power in spinning and weaving, some woolen mills had been established in the State to satisfy the growing demand for ready made yarn or cloth.

Reference has already been made to early fulling mills and weavers and need not be recapitulated. During the Revolution, however, and for some time afterward the bulk of woolen cloth made here was accomplished by domestic manufacture. It was several years after the introduction of power spinning in cotton mills that it was applied to woolen manufacture in this State. Prior to the advent of the factory system the only branch of woolen manufacture of any extent in the

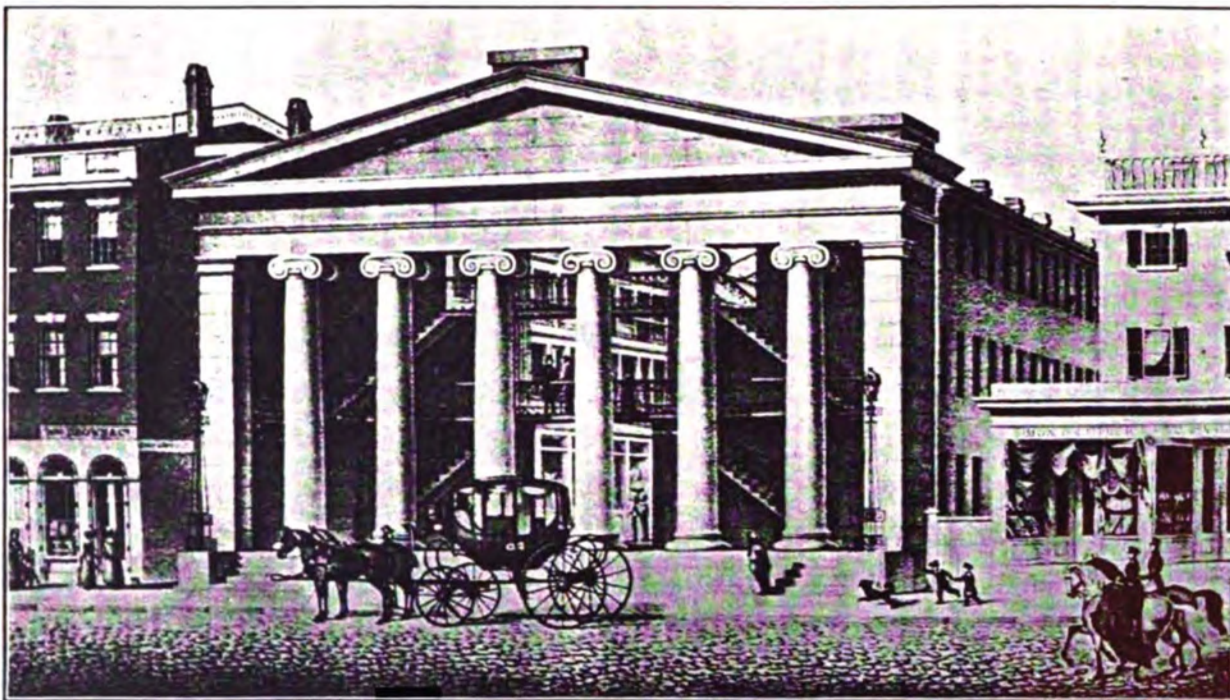
[1]Messrs. B. B. & R. Knight's mills contain about 300,000 spindles. The Lonsdale Company, Berkeley Company and Hope Company, of which the Goddard Brothers are agents, contain about 300,000 spindles; and the Manville Company, of which Col. H. F. Lippitt is agent, operates factories at Woonsocket and Manville containing about 225,000 spindles. The Conant Thread Mill, or the Pawtucket branch of the "J. & P. Coates Company, Limited", is the largest thread mill in the country. It contains 300,000 spindles and affords employment to over 2,100 persons. The Natick mill, owned and operated by B. B. & R. Knight, is the largest single cotton mill in the State, and contains 100,000 spindles.

State outside of household fabrics, was the making of hats. There were three hat factories at East Greenwich toward the close of the eighteenth century, and hats were also made in Providence and other towns.

Rolls of wool carded by hand when spun were very uneven, and consequently the cloth would be imperfect, the different parts shrinking unevenly in the process of finishing. A person clothed in homespun was therefore considered illy dressed.

The first woolen factory with power machinery was established at Byfield near Newburyport, Massachusetts, in 1793, by Arthur and John Scholfield, who had recently come over from England. The machinery for the mill was constructed by John Scholfield. Arthur removed to Pittsfield in 1801, and started a factory there in which he made, in 1804, the first broadcloth manufactured in this country. The first attempt at woolen manufacture in Rhode Island with power machinery was at Peacedale in South Kingstown by Joseph Congdon, John Warren Knowles and Rowland Hazard, who set up a carding machine in 1804. Mr. Hazard soon afterward took full control of the business. The first machine simply carded the wool into rolls, which were put out to be spun by hand. About 1812 Thomas R. Williams of Newport invented a power loom for weaving saddle girths and other webbing, and in 1813 or 1814 some of his looms were started at Peacedale. After they had been fully tested Rowland Hazard purchased four of them for $300 each, and in 1814 or 1815 they were in successful operation. The operation of power looms at Peacedale antedates those started in Judge Lyman's mill in North Providence by about two years, and the claim is made that they were the first to be successfully started in America. Isaac P. Hazard and Rowland G. Hazard, sons of Rowland Hazard, took charge of the business in 1819, and they with their successors in the family have made many additions to the property until it is now an extensive establishment.

The embargo previous to the War of 1812, the effect of which was to stop our commerce with England and its colonies, then as now the most liberal purchasers of American goods, had advanced the price of manufactured cloth, and after war was declared it went still higher. This called the attention of men possessed of capital to the fact that there was money in manufacturing. An experienced manufacturer from England came to Providence shortly after the declaration of war, and induced Sullivan Dorr, Samuel G. Arnold, Joseph S. Martin, Daniel Lyman and E. K. Randolph to form a company for the manufacture of broadcloths. This was the Providence Woolen Manufacturing Company. A large stone mill, with two wings and a dye house, was built where the Allen Print Works now stand. A high pressure steam engine, believed to be the first used in Rhode Island for manufacturing purposes, was obtained from Oliver Evans in Philadelphia.



THE "ARCADE," PROVIDENCE, IN 1850.
ERECTED 1828.

Apprehensions of its capture by British vessels induced the enterprising owners to arrange for its redemption at a liberal price, if necessary, but it arrived safely. The cards were arranged on the lower floor of the centre building, the hand-looms in the wings, and the spinning jennies, of forty spindles each, on the upper floors. The shearing machines were of the Mussy pattern, used by hand, but were arranged by the ingenious manager, Mr. Sanford, to be operated by steam power, with the cloth traversing under the cutting blades. A napping machine, made with pointed brass wires arranged on a revolving cylinder, was newly invented with adjustable parts to operate safely and efficiently. This machine and the fulling mills were placed in the basement. A skillful English dyer, who could operate wood vats for blue dying, had been secured, and the colors he made were highly admired and the cloths well made and very durable; but the quality of the wool being somewhat coarse, most of the products were not of fine quality. During the war a quantity of Spanish wool was captured in prizes, which gave them a finer article at comparatively low prices, and proved profitable for a time. They accumulated a large quantity of broadcloths and refused an offer of $8 per yard, with the expectation of a further advance. But the arrival of the ship Bramble, with news of an armistice, put an end to all their hopes in the further manufacture of broadcloths. Foreign broadcloths of a superior quality made their coarse goods unsalable except at a sacrifice, and the stock was closed out at a loss to the company of $150,000. The mill was closed for some years, and was afterwards sold to Philip Allen for a print works. The Providence Woolen Manufacturing Company when established was the largest woolen mill in the country.

In 1822 Zachariah Allen erected a mill at Allendale, North Providence, for the manufacture of broadcloths, in which he used the first power loom operated in the State upon the manufacture of this class of goods. Mr. Allen continued the business until 1839, using, as they appeared, the improved condenser for the carding machine, the improved English teazel cylinder, the extension roller (his invention), and other improvements in machinery. The first introduction of steam rolling to give a gloss to the finished cloth was in this Allendale mill. In 1839 Mr. Allen sold his woolen machinery and changed the mill to a cotton factory.

There were twelve woolen mills in the State in 1810, but most of them were small affairs in which the work was done mainly by the old hand-looms. The War of 1812 gave an impetus during its continuance to woolen manufacture, but the sudden fall in prices immediately after the close of the war, owing to the great importation of woolens and of a better quality than those of domestic make, closed for the time being nearly all the woolen mills in the country. The American woolen mills were badly handicapped at this time in competition with foreign

competitors, by the want of capital and skilled labor, by inferior machinery, and by being obliged to use a coarse quality of wool. The early tariffs did not aid them very much. The act of 1816 provided for a duty of 25 per cent. upon most woolen goods until June 30, 1819, after which it was to be 20 per cent. The law of 1824 raised these duties to from 30 to 33 per cent. and imposed a duty of 25 per cent. on worsted stuffs. The increase was of no help to manufacturers, because a duty of from 15 to 30 per cent. was levied upon raw wool of foreign growth. In 1828 duties were raised on both wool and woolens. In 1832 they were lowered on raw wool and on worsteds, but increased on common woolens; while in the falling tariff of 1832 a reduction was made in the customs charges on both wool and woolens.

In 1820 the Pawtucket Worsted Company was formed for the manufacture of fine vestings, and the next year, when Hon. Nehemiah R. Knight was elected United States Senator, the company presented him with a vest of its own manufacture, which attracted considerable attention as the first specimen of worsted goods of American make. But even as late as 1832 there was but little woolen manufacture in the State. The canvass made that year, under the auspices of the National Tariff Association, disclosed but 19 woolen mills in Rhode Island. These factories employed 383 persons; paid $68,500 in wages; used 225,000 pounds of domestic, and 200,000 pounds of foreign wool; 54,000 pounds of cotton warp; and produced $215,835 worth of woolen goods.

This branch of manufacture was considerably increased during the remainder of the thirties, as the census statistics of 1840 gave a total of 41 woolen mills, employing 961 persons, with a capital of $685,350 and producing goods valued at $842,572. Among the most important of the woolen mills started during the decade were those of the Valley Worsted mill, in Providence, and the Harris mill at Woonsocket. Edward Harris commenced the business there in 1831 with a capital of only $3,500. The first years were not profitable, and he came very near abandoning the business. Afterwards, however, profits were made and for a long series of years his productions constantly improved in quality and quantity and his goods became so popular that the "Harris label" upon them was a recommendation that required no further proof. Mr. Harris was a strong advocate of free raw materials—at least in wool—and pamphlets issued by him to promote such a desideratum were often quoted by the opponents of protection. The mill which he founded has gone out of business.

The tariff of 1846 lowered the duties upon woolen and worsted goods and upon wool, and they were reduced still more by the tariff act of 1857. The census of 1850 showed a great increase in woolen manufactures since 1840. The figures were as follows: Number of establishments, 45; persons employed, 1,758; capital, $1,013,000; value of raw

FALLS AT WOONSOCKET.

material used, $1,463,900; value of products, $2,381,825. The business had more than doubled since 1840.

Great as was the gain, however, it was less than that of the next decade. The census statistics of 1860 show 57 establishments in operation with a capital of $3,168,500; there were then 4,229 persons employed, to whom $1,069,176 were paid in wages. The cost of raw materials used was $4,370,224, and the value of the product was $6,915,205. The increase in production during the decade had been 176.8 per cent.

Most of the large woolen and worsted mills in the State have been established since the close of the Civil War. The statistics of each census show a gratifying increase. The war and after war tariffs during the sixties raised the duties on both wool and woolens, and the industry was not handicapped—as was the case with cotton manufacturing by a scarcity of raw material during the Civil War. In fact, the war was beneficial to the manufacturers of woolen goods because of the large amount of clothing required by the army.

The census of 1870 divided the products of woolen manufacture into two classes—woolen and worsteds. There were then 65 woolen and 11 worsted establishments in the State, employing respectively 6,363 and 1,531 persons, and producing woolens valued at $12,558,117 and worsteds worth $2,835,950. At this time, thirty years ago, Rhode Island stood second in cotton manufacturing, yielding precedence to Massachusetts only; fifth in woolens, being surpassed by Massachusetts, Connecticut, New York and Pennslyvania; and third (after Massachusetts and Pennsylvania) in worsted goods.

In 1880 this State had 50 woolen establishments, which employed 7,699 persons and produced goods valued at $15,410,450. Its worsted establishments, which were 11 in number, employed 3,757 persons and produced goods valued at $6,177,754. The woolen establishments proper had made a healthy gain during the decade, but not as large as that of the worsted mills. Providence was then the third city in the country in the magnitude of its woolen manufactures of all kinds including worsteds.

Since 1880 there has been a great increase in the product of worsted goods, especially in Providence. Rhode Island in 1890 produced more worsted goods than any other State in the Union, and Providence ranked first among the cities. Nearly all of the Providence woolen mills are now running exclusively upon worsteds or upon hosiery or knit goods, while a majority of those in the State at large are producing ordinary woolen cloths.

According to the figures of the census of 1890, Rhode Island then had 40 woolen mills, 16 hosiery and knitting mills, and 28 worsted mills. These three branches of manufacture employed respectively 6,028, 1,538, and 11,757 persons, and their total products were valued

at $9,884,945, $2,516,641 and $22,319,684. Providence then had but one mill making ordinary woolens, while it had four devoted to hosiery and knit goods, and fourteen to worsteds. In 1880 the city had four worsted mills employing 1,966 persons. In 1890 it had fourteen mills employing 8,887 persons, and their production had increased in value from $3,537,000 to $17,605,831. Woonsocket had four worsted mills at this time. They employed 590 persons and produced $1,033,000 worth of goods.

The manufacturing returns for 1900 show that the worsted goods industry in Rhode Island is now larger than that of cotton. There are fifty-one establishments, which employ 14,896 persons, disburse $5,537,169 in wages and produce goods valued at $33,341,329. There were at the same time twenty-six woolen establishments and fifteen devoted to hosiery and knit goods. The woolen mills employed 2,710 persons and the hosiery and knit goods establishments gave employment to 1,594 persons. The woolen product was valued at $5,330,550, and the hosiery and knit goods product at $2,713,850. There was a slight increase in the hosiery business and a large decrease in the product of the woolen mills. The change of many mills from woolen to worsted fabrics is probably accountable for the loss.

Dockham's American Trade Reports for 1901 gives the following statistics of woolen and worsted manufacture: Woolen and worsted mills, 97; hosiery and knit goods, 20. The mills contained 9,465 looms, 450 wool cards and 237 worsted combs. At the same time there were 4 silk mills and 1 mill at Manville making fabrics of flax and jute.

Providence is more largely engaged in the manufacture of worsteds than any other locality in the country. In 1890 it had 14 establishments giving employment to 8,887 persons and producing goods valued at $17,605,831; Philadelphia, at the same time, with 32 worsted establishments, gave employment to only 7,904 persons and its product of worsted goods was valued at $14,737,000. Lawrence stood third as a centre of worsted manufacture, its product aggregating $9,970,000. Woonsocket had four worsted establishments in 1890. They produced goods valued at $1,030,000.

Several of the largest and best equipped mills in the country are located in Providence and there are also large mills devoted to this line of business in Pawtucket, Central Falls, Woonsocket, Burrillville and South Kingstown.[1]

Great efforts have been made at different periods to develop the pro-

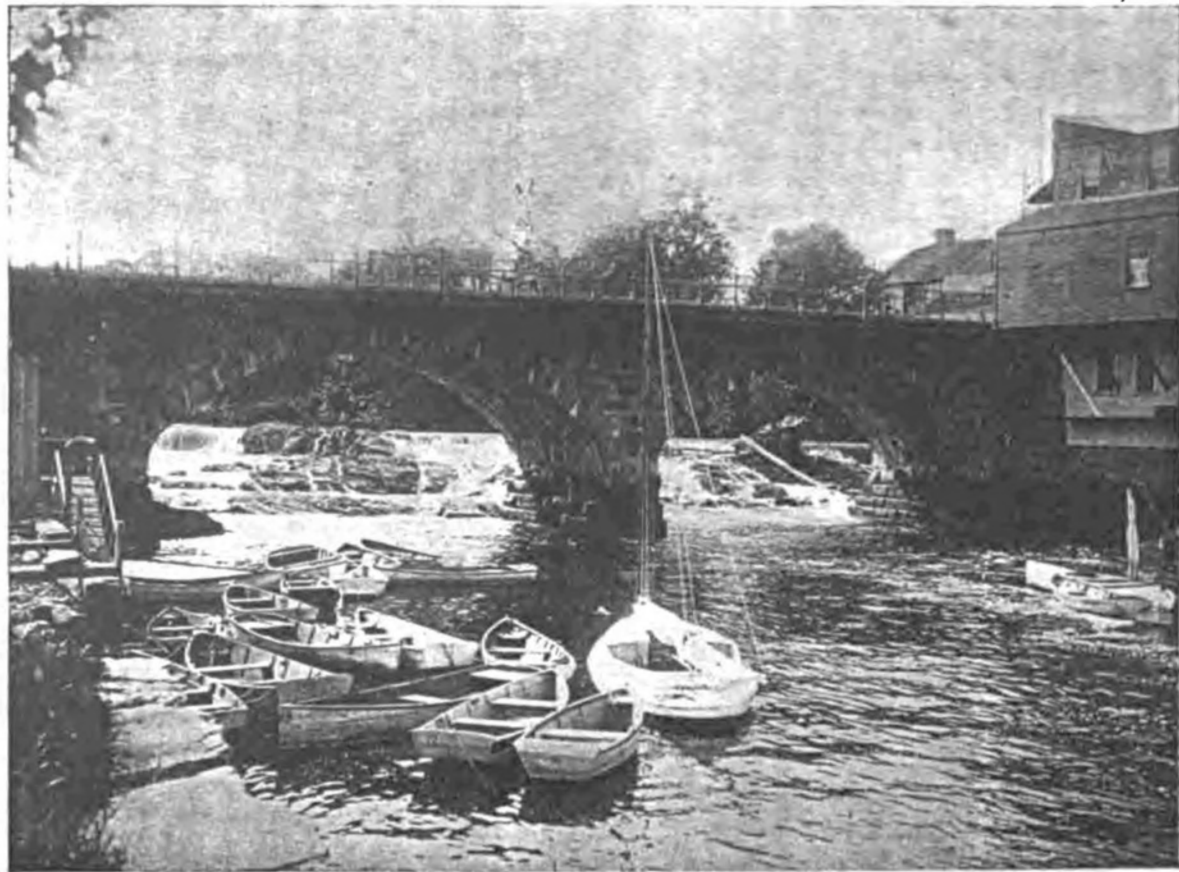
[1] The number of employees in the largest woolen and worsted mills of the State, according to the Seventh Annual Report of the Factory Inspectors was as follows: Providence—Atlantic Mills, 2,746; National and Providence Worsted Mills, 2,065; Riverside Worsted Mill, 1,607; Wanskuck Mills, 849; Weybosset Mills, 608. Pawtucket—Lorraine Worsted Mill, 667. Central Falls—Farwell Worsted Mills, 611. South Kingstown—Peacedale Manufacturing Company, 572.

duction and manufacture of silk. The people of Newport became interested in the industry more than a century and a half ago, and silk was raised and sold there at least as far back as 1758. Although the industry received but little attention in the State for several years, a few individuals in different towns planted mulberry trees, bred silk worms in a small way, partly as a diversion, probably without expectation of reaping a profit. They took pride in appearing at times in silks of their own raising and fabrication. An instance of this kind occurred in 1823, when Dr. Benjamin Dyer, a local physician, appeared at a fair in Providence dressed in a complete suit of silk made from materials produced and manufactured in his own family. The subject of encouraging the propagation of the silk worm and the manufacture of its product was discussed frequently in Congress, and in 1828, Mr. Rush, secretary of the treasury, in accordance with a resolution of the House, rendered a report accompanied by a valuable manual upon the management of silk worms and the manufacture of silk. Six thousand copies were printed and distributed. The same year William A. Vernon of this State published a translation of the work of M. de Labrousse on the cultivation of mulberry trees, with valuable notes by the translator. A silk craze seemed to spread all over the country during the next few years. Great expectations were entertained of being able to produce large quantities of raw silk for exportation. Large sums were paid for plants of a new species of mulberry, which were brought from the Philippines, and considerable money was made in raising and trafficking in the young shrubs.

The Valentine Silk Company was formed in Providence for the raising and manufacture of silk, with a capital of $100,000. It was conducted by Messrs. Dyer, and had a cocoonery one hundred and fifty feet long, and a big nursery of mulberry trees. A new method for winding silk upon spools or bobbins, instead of reels, invented by Gamaliel Gay, of Poughkeepsie, N. Y., was introduced into this mill in 1835, and ten or twelve different fabrics of silk or cotton and silk woven in this establishment upon the Gay loom were exhibited in the following March at Albany, N. Y. By 1839 the Valentine Silk Company had sunk all its capital and gone out of business. But little silk manufacturing is now done in Rhode Island.

The manufacturing statistics of 1900 report six establishments devoted to silk manufacture in this State. They employed 455 persons, paid $166,675 in wages, and produced silk and silk goods valued at $1,311,333. The product in 1890 was valued at $229,062. This shows a healthy increase during the decade.

Before the advent of domestic cotton and previous to the inauguration of power spinning and weaving, linen and fabrications of hemp were common articles of domestic manufacture. Allusion has already been made to these industries in describing cloth making in colonial



BRIDGE AND FALLS AT PAWTUXET.

times. The Rhode Island General Assembly, previous to 1728 and in that year, and several times afterwards during the colonial period, offered bounties to encourage the raising of hemp and flax. In 1731, when the "Fourth Bank" of paper money was issued, bounties were ordered for hemp, flax, whale oil, whalebone and codfish. For every pound of good water-rotted hemp, well manufactured, nine pence was to be given and the bounty upon flax was four pence. The Colonial Records show that in 1733 the colony paid bounties upon 1,589 pounds of manufactured hemp, and 19,013 pounds of flax. Jonathan Sprague of Providence, but of that part afterwards set off as the town of Smithfield, collected a bounty upon 1,249 3-4 pounds of flax, while Stephen Hopkins who came from the Scituate portion of the Plantations, was second with 916 1-4 pounds. The largest growers of hemp were "Nikle's Shelding," Pardon Tillinghast and Benjamin Greene, who brought in respectively 401, 430 and 300 pounds. But in the long run the payment of bounties upon these productions did not produce the favorable results expected. The Revolution, however, acted as a stimulus for the time-being upon the manufacture of linen and hempen fabrics. As late as 1791, after cotton manufacturing was fairly established, we are told that 25,265 yards of linen were made in Providence. But little linen has, however, been made in this State for a hundred years past.

Hats were made at several places in the colony in the latter part of the eighteenth century. There were three shops at East Greenwich that gave employment to a large number of hands, and three different grades of hats were made at Providence in 1790. Statistics of that year, collected for Alexander Hamilton, show the output of hats in the town that year to have been as follows: Beaver hats, worth $8 each, 121; castor hats, $18 to $48 a dozen, 1,327; felt hats, $5 to $12 a dozen, 4,564. The hat business was said to have been started in Providence in 1730. Colonel William Barton, who led the force which surprised and captured the British General Prescott, was a Providence hatter. In 1810, 50,000 hats worth $5 apiece, exclusive of felts, were made in the State.

According to Staples, the manufacture of straw plait or braid for hats and bonnets was originated in 1798 in Providence. As the story is told, "Miss Betsey Metcalf, afterwards Mrs. Baker, at the age of twelve years, without previous instruction succeeded in making from oat straw, smoothed with her scissors, and split with her thumb-nail, a bonnet of seven braids, with bobbin inserted like open work, and lined with pink in imitation of the English straw bonnets, then fashionable and of a high price. It was bleached by holding it in the vapor of burning sulphur. The article was much admired and many ladies came from neighboring towns to see it, and to order bonnets for

themselves, at half the price of the imported. Young women were gratuitously instructed in the art of the inventor, and this laid the foundation of an extensive branch of business in Providence, Dedham, Wrentham, and other towns in New England and throughout the country."

MANUFACTURES OF IRON AND STEEL.

At the beginning of the Revolution no colony of the thirteen was better provided with expert iron workers and other skilled mechanics than was Rhode Island. It suffered more than any of its New England sisters from the presence and hostile movements of the enemy, and it was well that its people were able to manufacture the munitions of war for the emergency. Many cannon, as has already been told, were cast for Rhode Island defences and for Washington's army at the Hope furnace in Scituate, and small arms were made by Stephen Jenks at Pawtucket, and at several forges. Jenks made and supplied several of the miltary companies with muskets before the beginning of the war, and soon after news came of the battle of Lexington, a number of iron forgers in Providence and other towns were hard at work, fitting out the troops which were being rushed to the front.

Nathan Miller of East Greenwich was an excellent bayonet maker. Jeremiah Sheffield and George Tefft of the "Kingstown Reds" were recommended to their officers to be excused from duty, as they were then employed in making and stocking guns. Elihu Peck of Providence made gun stocks, and Edward Martin, Stephen Jenks, Thomas Bicknell, Prince Keene and others made gun barrels, bayonets and ramrods for the town of Providence. Twenty of these gun barrels with bayonets and ramrods cost, as "per bill rendered," £28, or 28 shillings a set, while Peck's bill, presumably for twenty gun stocks, was £15, 15*s.* 11*d.* Early in January, 1776, the firm of Jacob Greene & Company supplied the colony with "six new, double-fortified, four pound cannon with their carriages, together with one hundred and thirty round shot, six bags of grape shot, some sliding and bar shot, with ladles, rammers, sponges, worms," etc. The whole order was valued at £100. Jacob Greene was a brother of General Nathaniel Greene, and the forge where these guns were made was in the town of Coventry, near the present Quidnick railroad bridge.[1] It was established some years previously by Nathaniel Greene, sen., and sons, and the future Revolutionary hero removed to Coventry in 1770 to assume direction of it. Jacob was then a trader at the village of Apponaug, in Warwick, and the forge was probably placed in his name just before the beginning of the war by his Quaker father, who did not wish to be titularly at the head of a firm which made warlike implements.

[1]Field's Revolutionary Defences in Rhode Island.

Some attempts had been made in Connecticut to make steel previous to the Revolution, and the Rhode Island General Assembly, in 1777, deeming it advisable to encourage efforts to that end, offered a bounty of £60 for every ton of steel, "as good as German steel," that should be made in the State. The offer seems to have failed in its purpose, as no steel was manufactured in the State for several years. The fame which the Hope furnace obtained as a cannon foundry during the Revolution led to the placing of a large order in Providence for cannon for the new frigates, which were ordered by Congress during President Washington's last administration. John Brown, one of the owners of the furnace, appears to have been instrumental in obtaining the order, and he employed Sylvanus Brown—who had assisted Slater in making his first spinning machines—to superintend the castings. Some of the cannon were cast at the Hope furnace and a part at Easton, Massachusetts. Brown used the Cranston and Cumberland ores in equal portions, and they were carted by ox-teams to the furnaces. The Providence Gazette of February 14, 1795, says: "The workmen at the Hope furnace have already cast seventy-six cannon for the frigates and fortifications of the United States. They are ornamented with the American eagle, and are allowed by good judges to be equal to any guns from the foundries of Europe. They are cast solid and bored by water." The famous frigates Constitution, Constellation, United States, President, etc., were then in process of construction, and it is not improbable that the guns of the Constellation, which, in 1799 and 1800, taught the French to respect the American flag upon the ocean, and those of "Old Ironsides", which lowered the proud flag of Britain upon the sea in the War of 1812, were cast in Rhode Island. At least we may well believe that they were made of good Rhode Island ore, under the supervision of an expert Rhode Island iron worker.

The old cannon formerly used as posts at the corners of several Providence streets, a few of which are still to be seen, are said to have been defective castings from Easton and Hope, made about a century ago.

Cannon were also cast in Rhode Island for the National government during the War of 1812, and it is related of Isaac Wilkinson—one of Oziel's sons—that, at the age of seventeen, he had charge of the "Cupola"—subsequently the Franklin foundry—in Providence, and that during that war he cast cannon sixty days in succession, two heats a day.

We have seen that the machinery used in the early cotton mills of the State was made within its borders. The local iron workers speedily adapted their works to the new conditions and engaged in the manufacture of the machinery and tools used in the various industrial trades. The Jenks and Wilkinson families of expert mechanics were the means of developing many of these earlier iron works, through

their own direct efforts, and by means of the machinists schooled under their tuition. Nor were the representatives of these two families the only skilled mechanics that worked in iron a century ago in Providence and Pawtucket. The Browns have already been mentioned, and there were many others. In 1794 David Wilkinson, a son of Oziel, in company with Elijah Ormsbee, built a steamboat, in which they made a trip of three and a half miles, from Winsor's Cove to Providence. They did not seem impressed with the idea that the scheme could be made of practical value and after their "frolic" (as Wilkinson called it) was over, they dismantled the boat. In the course of his reminiscences, sent, in after years, to the Society for the Encouragement of Domestic Industry, Wilkinson says that while they were engaged in the construction of this steamboat a young man from Connecticut, who gave the name of Daniel French, came to his shop in Pawtucket, and asked and obtained leave to look over the steamboat. He examined everything carefully, and seemed greatly interested. Many years afterward, while riding by rail from Utica to Albany, Mr. Wilkinson says, he fell into conversation with a gentleman regarding Fulton's steamboat, and the gentleman declared that Fulton never would have succeeded had he not kept an ingenious Connecticut Yankee locked in for several weeks to draw plans for him. On inquiring the name of the Connecticut Yankee, Mr. Wilkinson was told it was "Daniel French."

For many years Pawtucket supplied New Bedford and Nantucket with heavy presses for pressing out sperm oil. So widespread was the fame of Pawtucket for skillful iron workers that in 1794 Colonel Baldwin came there from Boston after machinery for a canal, in process of construction near that city. The patterns were made, and the wheels, racks, etc., were cast at Oziel Wilkinson's establishment. The same year the iron work for a draw-bridge between Boston and Cambridge was also cast by Wilkinson. In 1804 he made all the spades, shovels and picks used in the construction of the Norfolk and Bristol turnpike, which was laid out four rods wide from Pawtucket bridge to Boston. The foundry established by Oziel Wilkinson and his son David was situated in the old coal yard at Pawtucket. Oziel died in 1815, and David continued the business until 1829. In 1832 one of his abandoned furnaces was started up by Zebulon White. In 1835 the firm of which Mr. White was the head was known as the Pawtucket Cupola Furnace Company. The present firm of J. S. White & Company are the lineal successors of the original Wilkinson establishment. Speaking of the establishment while he was its manager, David Wilkinson said: "We built machinery to go to almost every part of the country," the places he enumerated including manufacturing establishments throughout the North and South as far as Louisiana.

In 1816 a man by the name of Dwight Fisher came to Pawtucket and

began the manufacture of nails, but soon failing, his machines were purchased by David and Daniel Wilkinson, and the business was carried on by them until 1829, their output being about four thousand pounds of nails daily. Eleazer Jenks built a machine shop in Pawtucket in 1813 for heavy forge work and the construction of mule spindles. John Thorp, another ingenious Pawtucket mechanic, took out a patent for a power loom in 1814. It stood upright and performed its work by perpendicular action, but was soon superseded by the Scotch loom introduced by Gilmour. Thorp afterwards invented several other machines and appliances, including a machine for winding quills or bobbins, a very ingenious braiding machine, and a spinning ring which is now in general use.

Larned Pitcher started a machine shop in Pawtucket in 1813. Mr. P. Hovey and Mr. Arnold were soon taken into partnership, but in 1819, when the establishment was the largest manufacturer of cotton machinery in Pawtucket, the firm was Pitcher & Gay. The latter was succeeded by James S. Brown, one of the most famous of Rhode Island's iron workers and inventors. He bought out his partner in 1842, and greatly enlarged the works. Since his death, in 1879, the business has been conducted by his son, James Brown.

The extensive bolt, nut and screw manufacturing establishment of the W. H. Haskell Company of Pawtucket was commenced on a small scale by Colonel Stephen Jenks in 1820. Alvin Jenks, of the original firm of Stephen Jenks & Sons, which was broken up by the industrial panic of 1829, went to Central Falls and entered into partnership, in 1830, with David G. Fales, in the manufacture of cotton machinery. In 1833 they began making Hubbard's patent rotary pump, which was considered the best pump in use for many years. This firm made the first ring spinning frames in 1845, and it was the first establishment to make ring travellers. Several years ago the company made for and sent to J. & P. Coats, the celebrated makers of Coats thread, at Paisley, Scotland, some twisters, dressers and winders, which were superior to anything in Europe, and they were made the models for machines made for other establishments of the great thread manufacturers. In 1865 the establishment was removed to Pawtucket, where it has been continued on a larger scale.

Allusion has already been made to several of the early ironworks during the Colonial period. There was a forge at Saxonville in Burrillville as early as 1773. A furnace to cast hollow ware is believed to have been erected during the reign of Charles II (1660-1685), near the Blackstone river, between Cumberland Mills and Abbott Run in the town of Cumberland. An old foundry and smelting works, a half mile south of East Cumberland, was erected in 1736, and furnished cannon for the Rhode Island contingent at the siege of Louisburg in 1745. A nail factory was operated before the Revolution on the west

side of Diamond Hill in Cumberland, by the Tower family, and the Wilkinsons had a furnace at Manville in that town, where many varieties of hollow ware were cast before the war. Stephen Jenks built a machine shop at Central Falls, in 1763, for the manufacture of ship bolts and other ship iron work. Scythes and other edge tools were made at that place about the close of the Revolution by Charles Keene. Brand's Iron works at Wyoming, in the town of Hopkinton, were famous before the Revolution, and there were iron works at Kenyon's Mills in Richmond in 1772, and at Hope Valley in 1778. The Hope furnace, at Hope, Scituate, the Greene forge at Potowomut, Warwick, and another Greene foundry, near Quidnick, Coventry, also antedate the Revolution. The "Old Forge" at Woonsocket was erected by the united efforts of several Quaker families in 1720. In brief, it may be said that nearly every neighborhood had its blacksmith at an early day, and that many of these added small furnaces to their smithies and cast and forged nearly all the iron utensils and tools used in the farmers' houses and on the farms.

Cromwell and Perez Peck went to Anthony in Coventry in 1805, and after looking over the machinery in the Almy & Brown mill at Centreville, made similar machines for the cotton mill then building at Anthony. They erected their machine shop in the latter village in 1812. Perez Peck was an ingenious mechanic. He assisted Job Manchester of Coventry in the construction of the first bed-tick loom ever invented. Daniel Owen made ploughs, harrows, etc., in Glocester soon after the Revolution, and Oliver Owen carried on a nail factory in that town early in the nineteenth century. In 1795 Elijah Bartlett began the manufacture of scythes at Branch Village in North Smithfield, and Nathan Darling started a scythe manufactory at Forestdale in the same town in 1824. During the Rebellion his successors in the business, Mansfield & Lamb, made 30,000 sabres for the government, and they were officially declared to be as good as any ever made for the army and navy. David Bartlett made scythes and edge tools at Woonsocket in 1820. In 1811 Stephen Jenks obtained a contract from the government to make 10,000 muskets at $11.50 each. The work was done at Central Falls, and the building in which they were finished was afterwards used as a machine shop.[1] A machine shop was established at Washington village in 1817. In 1825 Joseph and Ebenezer Metcalf built a machine shop at Arnold's Mills in Cumberland, and entered into the manufacture of spinning frames and other cotton machinery. The Nichols & Langworthy Machine Company, at Hope Valley, is an old foundry which dates from about 1825. About the first large order which it filled was the construction of looms, in 1826, for the Hazard Woolen Mill at Peacedale. The Lanphear Machine Shop was another

[1]One of these muskets is shown in the illustration of the various arms used by Rhode Island soldiers, in the chapter The Wars and the Militia.

old foundry, which was formerly an important establishment in the Pawtuxet Valley. It was started before the middle of the last century.

From a report prepared in 1791 by the Providence Association of Mechanics and Manufacturers for Alexander Hamilton, secretary of the treasury, considerable can be learned about the iron industry in and around the town at that time. Nails were manufactured in 1790 to the number of 3,000,000, those below four-penny in size being cut, while the larger ones were wrought. Slitting mills were in operation sufficient in capacity to supply the whole country with rods. Of edge tools, 4,500 scythes, axes and drawing knives were made, and fire engines, cotton and woolen cards, moulding tools and iron shovels were also turned out at various establishments. The edge tools were made by John Lindenberger. Charles Keene manufactured scythes and axes on Bark street, and Samuel Gorham shovels and spades on a wharf between the church and Mill bridge. In 1812 cotton machinery was made on Bark street, near Charles, by Samuel Ogden, and a large force of experienced mechanics were trained in his shop.

The oldest of the large iron foundries in Providence is the Franklin Machine Company on Charles street, which was started by Stanford Newell, Isaac Thurber and others about the year 1800. The old establishment seems to have been known as the "Cupola" at the time of the War of 1812, and to have then been in charge of one of the Wilkinsons, then a youth of seventeen.

The Thomas Phillips Company has existed nearly a century; it was started in 1804 by Josiah Keene. The Builder's Iron Foundry, which began business prior to 1820 and was formerly known as the High Street Furnace, sustained the reputation of the State—acquired by the Hope Furnace and other foundries in former times—during the Rebellion and the Spanish War as a producer of cannon and their accompaniments. It cast hundreds of cannon of the largest calibre, including 11-inch columbiads and 13-inch mortars for use during the Rebellion. Within the last fifteen years it has assembled and built up scores of big 12-inch rifled breech-loading mortars, with their carriages, for the rearmament of our forts, and during the late Spanish War, the establishment turned out shot and shell, firing fuses, and 7-inch seacoast howitzers.

Small arms were also made in Providence during the Rebellion by the Rhode Island Tool Company, which made rifled muskets, sabres, etc. The firm filled a large order of Peabody-Martini rifles for Turkey in 1877, when that empire was at war with Russia. The Household Sewing Machine, which was formerly made by this company, now does its own manufacturing in Providence.

More screws are made by the American Screw Company than are manufactured by any other firm in the country. In fact its product

exceeds that of all other screw makers in the United States. It began business in 1838. The Nicholson File Company of Providence, established in 1864, is also practically without a rival.

The Brown & Sharpe Manufacturing Company, established in 1833 by David and Joseph Brown—father and son—has attained a world-wide reputation as a manufacturer of steel rules, gauges, callipers and small wares. Even as late as 1853, when Lucian Sharpe became a member of the company, the firm employed only fourteen persons, and had only 30 by 60 feet of floor space. It commenced making the Wilcox & Gibbs sewing machine in 1858, and in 1865 employed three hundred persons. Its working force now numbers over two thousand persons.

All kinds of stationary and portable steam engines, fire engines and locomotives as well, are made in Providence by different establishments. The Corliss steam engine, constructed by the late George H. Corliss, was considered one of the most valuable inventions of the time a generation ago. Bishop's History (1864) says of it: "Of all the inventions that have been made during the last twenty years there are few, if any, that have attracted a larger share of public attention than Mr. Corliss's improvements in the steam engine—none probably, unless it be the inventions in India rubber, that have passed through ordeals so costly and trying, or which have more triumphantly vindicated their claim to a high rank in the list of American inventions." The object of Mr. Corliss's improvement was to secure a more equable motion to stationary engines than had been before obtained, by rendering the regulator purely automatic and practically perfect, and to save fuel by applying and utilizing the entire expansive force of the steam. Mr. Corliss received the highest prizes at the Expositions at Paris and Vienna in 1867 and 1873, and one of his engines was used at the Philadelphia Centennial in 1876 to drive the machinery.

William Corliss, a brother of the late George H. Corliss, invented a burglar-proof safe, which he formerly manufactured at Auburn in the town of Cranston, but this industry was absorbed some three or four years ago by a combination of safe manufacturers which removed the business elsewhere.

The American Ship Windlass Company make improved ship windlasses and capstans that have come into general use both in the navy and the merchant marine. It is the standard windlass used by the United States navy, and no battleship or cruiser is without it. The windlass is the invention of Joseph P. Manton of Providence.

Stoves were formerly made in Pawtucket by the Rhode Island Stove Works. Spicer & Peckham, afterwards the Spicer Stove Company, made stoves for many years in Providence and carried on a large business. It is now consolidated with the Barstow Stove Company, an

old and successful stove foundry, which is now the only one in the State.

Nearly all kinds of machinery, light and heavy castings and iron ware are made in Providence foundries and machine shops. Its iron works constitute one of its largest industries and they furnish steady and remunerative work to large numbers of skilled mechanics.

The manufacturing statistics of 1900 give the following figures regarding the foundries and machine shops of Rhode Island: Establishments, 144; average number of persons employed 8,799; wages paid, $4,638,507; value of products, $13,269,086.

JEWELRY MANUFACTURE.

While the matrons and maidens of the stone age doubtless wore ornaments of some kind, as perhaps did, also, their husbands and lovers, jewelry, in the common acceptation of the word, is a product of a later civilization. It is an indication of some degree of opulence. As long as the colonists in America were absorbed in the struggle for food and raiment there was little encouragement for the establishment of industries whose products were purely ornamental. Hence it happens that the manufacture of jewelry in this country did not begin until after the close of the colonial period. Of course watch and clock repairers, especially the latter, were necessary to the comfort of the early settlers. Although not a universal household asset, many of the first comers brought clocks with them from over the sea, and clock tinkers found employment in every settlement. Some of the colonists also carried watches, and as the colonial villages grew in size and became centres of traffic, watchmakers from the old country jewelry shops came over and set up shop in them, and they gradually began to make rings and ordinary ornaments of bead and metal work.

These things were a matter of course, but the establishment of shops devoted mainly to the fabrication of articles of jewelry were unknown in this country previous to the Revolution, and it is a singular fact that the first mention of the jewelry manufacture in this country recorded by our industrial chroniclers is regarding a Providence artisan, Seril Dodge, whose shop was two doors north of the "Baptist meeting house" (which stood on the site of Roger Williams's house of worship), on North Main street, made silver shoe buckles for feminine adornment about the time of the Revolution. Other jewelers who made a specialty of the making of ornaments of a similar character in the years immediately following the Revolution were Calvin Wheaton, Ezekiel and William Burr, Caleb Wheaton, Edward Spaulding, John Gibbs, David Vinton and William Hamlin. But Nehemiah Dodge may be considered as the real pioneer of jewelry manufacture in Providence. He opened a shop near the Roger Williams spring on North Main street in 1794, and announced himself as "a goldsmith and

jeweler, clock and watchmaker." Previous to that time gold jewelry was made eighteen carats fine, but Dodge turned out a cheaper quality which sold readily. He made gold necklaces, knobs and twists, gold rings and miniature cases. His products sold readily, but in a little while parties from Attleboro, Massachusetts, succeeded in learning the secret of their manufacture (by false pretences, as he claimed), and they proceeded to make goods of a cheaper quality even than his.

In 1805 Providence contained three other firms of manufacturing jewelers, namely: John C. Jenks, Ezekiel Burr and Pitman & Dorrance. These establishments together with Dodge's employed altogether about thirty workmen, and made breastpins, eardrops, watch keys, and similar articles.

Information in regard to the early manufacture of jewelry is somewhat meagre. The only references to the industry in Bishop's History, up to 1860, are given in full in the following quotations: (1810) "The jewelry manufacture of Providence employed about 100 workmen, and the product amounted to $100,000 annually." (1815) "The jewelry manufacture of Providence employed at this time about one hundred and seventy-five workmen, and the value of the products for the year was $300,000. It was nearly abandoned during the next two years, but was revived in 1818." (1820) "The manufacture of jewelry in Providence, which had been nearly abandoned in the last two years, was revived this year, and in two more years reached double its former product, or $600,000 per annum." In 1825, besides Nehemiah Dodge, the pioneer of the industry, who lived to be ninety years of age, the manufacturing jewelers of the city included Joseph Veazie, who made gold chains, seals and keys in a little shop still standing on the east side of North Main street, about half way up Constitution Hill; Arnold Whipple, on the corner of Stampers and Hewes streets; Frost & Mumford, makers of diamond, pearl and paste jewelry, Cady's Lane; Davis & Babbitt, on Cheapside; G. & A. Richmond, Hydraulion, now Exchange street; Jabez Gorham, who was first located on the opposite corner of Steeple street from the Gorham Manufacturing Company's late quarters; William Greene & Company, George street; Whitaker & Greene, on the corner of North Main and Thomas streets; Sackett & Willard, North Court street; and Bassett Nichols on Clemence street.

The statistics of jewelry manufacture collected in 1832 by request of the National Tariff Convention, show that there were at that time in the State (probably all in Providence) twenty-seven establishments with a capital of $100,200; giving employment to 282 persons and producing $228,253. If these figures were reliable, and if those previously given of 1815 were also approximately correct, the fact that 175 persons at the earlier period made goods of a greater aggregate value than did the 282 workmen in 1832, would seem to indicate that

the shops were turning out a much cheaper class of goods in 1832 than they were making in 1815. Even if this were the fact, Providence jewelers in 1832 were undoubtedly making larger profits than were those of 1815.

The census statistics of 1840 show that 172 men were then employed in the county of Providence in the manufacture of the "precious metals" and that their products were valued at $277,900. Whether these totals included all of the cheap jewelry establishments of Providence, it is of course now impossible to determine.

The National Census of 1850 also failed to definitely give the status of the jewelry manufacturing industry. The tables of occupation, however, showed that Rhode Island then contained 729 jewelers, exclusive of lapidaries, watchmakers and gold and silversmiths, a larger number than were at work in any other state save New York and Pennsylvania.

The business in 1825 was quite different from what it is now. The heavy work was done with hand rolls and foot lathes, and there was no gilt work made. Arnold Whipple, Jabez Gorham (founder of the Gorham Manufacturing Company), and Sackett & Willard were the only firms making solid goods, which were made of red gold. No shop had more than twenty persons. The most active members of each firm used to go to New York by stage or packet two or three times a year. The Richmonds, who were located on the corner of Westminster and Hydraulion (now Exchange) streets, with whom the late Hon. Thomas Davis learned his trade, were very progressive people and used to go even to New Orleans on drumming excursions in the winters.

The period from 1825 to 1857 was a prosperous one for the jewelry business. Men who began as apprentices, who were possessed of good artistic taste, were able in a few years to set up for themselves and acquire a competence. The increase in the number of manufacturing concerns was mainly the result of this tendency of skilled employees to start in business on their own account. Two journeymen jewelry men would form a partnership; one would manage the shop, often doing more work himself than any of his men; while his partner would sell the goods, keep the books and do the shipping. In 1850 the industry had grown to forty or forty-five shops. As a peculiar faculty, an artistic sense, and the ability to do rapid and accurate work were very desirable qualifications in jewelry makers, the man who could fill the bill could almost name his wages. No mechanical industry paid as high wages as did the jewelry business. Five dollars a day for a skilled workman was not unusual and some who worked by the piece made as much as ten dollars. As journeymen jewelers were as a rule free with their money, the industry added greatly to the prosperity of Providence.

But, as jewelry is a luxury rather than a necessity, it has always

been one of the first industries to feel hard times and has consequently had many "ups and downs." Before 1850 the establishments had begun to cross the great bridge to the West Side of the city, and by 1857 a majority of them were located upon Broad, Pine, Friendship, Orange, Eddy and Page streets. The panic of 1857 caused many failures among jewelry manufacturers, but the industry quickly recovered and by 1860 there were eighty-six shops, or thirty shops more than there were before the panic. The demand for jewelry fell off during the Rebellion, and by 1864 the number of establishments had dwindled to fifty-two. The war, however, was a help to some firms, especially to those which happened to have large stocks of gold on hand when it began to rise, and to those establishments which made belt buckles, brass buttons and other military goods, including medals, badges, and articles of a similar character.

The census of 1860, which only found seventy-seven jewelry manufacturing establishments in Providence county, although the Providence directory discovered eighty-six, showed the total value of the products of the industry to be $3,006,678, including silverware and gold refining. There were 1,498 male and 263 female employees, who were paid $697,692 in wages during the year.

In 1870, according to the census, there were seventy-one establishments making jewelry in the state. They employed 1,579 persons, paid $948,201 in wages and produced goods valued at $3,043,846.

In 1880 Rhode Island took its place at the head of the States as the center of the jewelry industry, both in the value of the goods produced and in the number of persons employed and amount of wages paid, although New York had two hundred and sixty establishments to Rhode Island's one hundred and forty-eight, the latter were all in Providence county, and all but six in the city of Providence. The products of the industry in that city exceeded in value those of any state in the country aside from Rhode Island. The one hundred and forty-two manufacturing establishments in Providence employed 2,411 men, 675 women and 178 children; $1,614,836 were paid in wages; and the products amounted to $5,444,092 in value.

In 1890 Providence had one hundred and seventy jewelry establishments, which furnished employment to 4,380 persons, and produced goods valued at $7,801,000. There were six establishments in Pawtucket at the same time; their product was valued at $132,000, and they furnished employment to 108 persons. These statistics do not include those of silverware, which was considered a separate industry.

The State Census of 1895, showed an increase on all counts. There were then one hundred and eighty-eight jewelry establishments, employing 4,851 persons, disbursing $2,423,158 in wages, and producing goods valued at $8,641,451. Providence contained one hundred and eighty of the one hundred and eighty-eight establishments, while

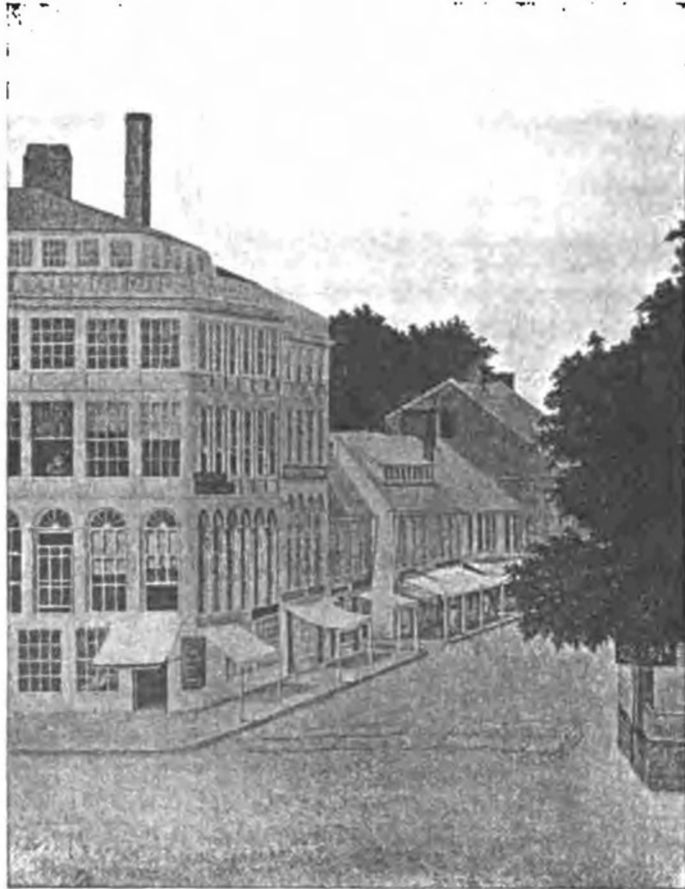
Pawtucket had five and Central Falls one. The Providence establishments employed an average of 4,711 persons, disbursed $2,372,434 in wages, and produced goods valued at $8,488,215.

The Bureau of Industrial Statistics of this State made an official investigation of the jewelry and silverware industries, and lines of business incident thereto, in 1899. Under this inquiry the classification included jewelry, silverware, jeweler's findings, refining, electroplating, enameling, engraving and chasing, die-sinking and lapidaries. The investigation resulted in the most complete and accurate statement yet obtained of these industries. Returns were received from two hundred and forty-nine establishments, with an invested capital in all lines of $10,655,227, with an annual product valued at $19,445,-327, disbursing in wages and salaries $4,612,889, and furnishing employment to 8,767 persons.

The oldest firm now doing business in Providence is that of Palmer & Capron at 167 Dorrance street. John S. Palmer, the senior member and founder of the firm, was born in 1824 and began his trade with G. and S. Owen in 1840. After acquiring a knowledge of the business he went into partnership in 1845 with Christian C. Stave. The latter withdrew four years later, and Lucian P. Lamson became the junior partner. In 1852, upon Mr. Lamson's death, Charles S. Capron, a brother-in-law of Mr. Palmer, entered the firm, which has been known since that time as Palmer & Capron.

All grades of jewelry are made from the richest to the cheapest by the different firms. The most successful Providence manufacturers are men who came up from the bench, men who understand the details of manufacture and are quick to note the ever-changing vagaries of the popular taste. There is less machinery and more brain-work required of workers in this industry than in the textile factories, and they have on an average fewer employees than are required in the latter. Two or three of the larger jewelry establishments in the city, however, each employ over two hundred persons.

Providence has the distinction of excelling all other American cities in several lines of manufacture. Some of these have already been noted, and another is silverware. The Gorham Manufacturing Company, of which Jabez Gorham was the founder, is the most extensive maker of silverware on the continent. In fact, it is probable that the products of this house nearly equal in value those of all other manufacturers of silverware in the country. Jabez Gorham, the founder of the company, who was born in 1792 and died in 1869, learned his trade as a jeweler, and engaged at first in company with four others, about 1813, in the manufacture of jewelry at the corner of North Main and Steeple streets. In 1831 a journeyman silversmith from Boston by the name of H. L. Webster came to Providence and in company with Mr. Gorham began the manufacture of silver spoons. Since then the



VIEW OF "CHEAPSIDE," OR NORTH MAIN STREET, FROM MARKET SQUARE.

TAKEN FROM THE STEPS OF THE FRANKLIN HOUSE IN 1843. FROM AN OLD PAINTING BY GEORGE W. HARRIS, IN THE POSSESSION OF THE RHODE ISLAND HISTORICAL SOCIETY.

business has gradually grown to its present mammoth proportions. About a dozen years ago, the Steeple street establishment having been outgrown, the company removed to larger quarters in the Elmwood section of the city. The equipment of the works is most complete, every mechanical device being brought into use. More than twenty different trades are carried on in turning out the finished product. A "century vase," which attracted much attention at the Philadelphia Centennial in 1876, made of solid silver, is five feet in length and over four in breadth, and weighs 2,000 ounces. Another specimen of the Gorham product was the Hiawatha barge, which was purchased by General Grant. A silver statue of Columbus, made for the Chicago World's Fair, has also attracted wide attention. The establishment employs 1,500 persons, and its ordinary annual product exceeds two million dollars in value.

There were eight firms engaged in the production of silverware in 1900. They furnished employment to 1,549 persons, paid $978,198 in wages, and produced goods valued at $3,834,038. There was a great increase in this business over 1890.

One of the largest of manufacturing industries, that of boots and shoes, for some reason has never met with much encouragement in Rhode Island. Small attempts have been made from time to time to start factories, but they have failed to realize the expectations of their projectors and have soon retired from business. At the present time (1901) there is not a single leather boot and shoe manufactory in the State, although there are many shoemakers who make footwear to order.

The manufacture of rubber goods has been carried on many years in the State. Boots and shoes and all kinds of rubber goods are made. The mills are chiefly located at Bristol, Providence and Woonsocket, and include some of the largest rubber establishments in the United States. One of them employs 1,200 persons.

The production of rubber boots and shoes in the State in 1900 amounted to $8,034,417 in value and that of rubber and elastic goods to $2,518,268.

Butterine is made in large quantities in Providence. In 1890 the city's production was second only to that of Chicago, and it is supposed to hold the same relative position to-day. The production of butterine by the three Providence establishments, in 1900, equaled $1,345,133 in value, a sum more than double that of the butterine factories of the State in 1890.

The Rumford Chemical Works in East Providence is a special manufactory which has no competitor in the State. It was established in 1855 by George F. Wilson of Providence and Professor E. N. Horsford of Harvard University for the purpose of manufacturing chemicals. The products of the works, which are located in Rumford, East Provi-

dence, comprise general and special chemicals, particularly preparations of the phosphates suitable for food and medicine. Among their products most generally known are the Horsford and Rumford baking powders, Horsford's cream of tartar, Horsford's acid phosphate, and phosa. Some of the preparations, particularly the acid phosphate, are sold all over the world, and their accompanying circulars have to be printed in several different languages. The establishment employs a large number of persons.

The brewing business has been carried on many years. Beer was made during the colonial period, but it was generally made by the housewives from malt, the manufacture of which was carried on in many of the towns. The oldest of the present breweries is the James Hanley Brewing Company on Jackson street, whose manufactory stands on the site of an old wooden one run by Holmes & Company about half a century ago. The brewing business was formerly quite an important one in Newport, and about the time of the Rebellion the ale brewed by W. Hill & Son of that city had a large sale throughout the State. After changing hands several times it went out of business about 1883. There are four breweries now in Providence, two just over the line in Cranston, and one in Pawtucket. They brew porter, lager beer and ale, and collectively do a large business. There were six malt liquor establishments in the State in 1900. They employed 296 persons, and manufactured $1,880,171 worth of ale, beer and porter.

Distilleries were an important industry in colonial days. Large quantities of West India molasses were imported. Considerable of it was turned into rum, and cargoes of the latter were taken to Africa to be exchanged for slaves. The last distillery was located in the Fox Point section, at the corner of India and Traverse streets. Darius Sessions carried it on sixty or seventy years ago and for some years before the Rebellion it was run by John Dyer & Company, and the last owner was Asa Blanchard, who went out of business about 1874. No whiskey has ever been distilled in this State, the labors of Rhode Island distillers always having been confined to rum and gin.

A sugar refinery was started in Bristol in 1849 by Cornelius R. Dimond & Company. It did a fair business at first, but its sales fell off about the time of the beginning of the Rebellion, and the refinery was sold to Camp, Bronson & Sherry, a New York company, which did a large business for several years, at one time employing 225 workmen and turning out 350 barrels of refined sugar daily. Its prosperity did not last long, however, and it changed hands several times, and finally discontinued business about twenty-five years ago, its firm name then being "The Phenix Sugar Refinery." Sugar refining, or rather sugar making, was carried on in Providence in the early days of the last century in an old building standing on the site of Lowe's

(Keith's) Opera House. It fronted on Clemence street, which was then known as Sugar Lane. The sugar produced at this establishment was brown or muscovado, made from molasses. The last sugar house in Providence was on Gaspee street, about where the State Normal School now stands. It was called the "Park Sugar Refinery", and was managed by L. P. Mead. This establishment discontinued business about 1872. Mr. Mead, it seems, proposed to substitute a steam process, instead of the usual method of boiling. The fact that the establishment was a short-lived one would seem to indicate that his method was not found to be practicable.

Brass founding is one of the oldest of Rhode Island industries. It dates back in Providence to 1762, and is now carried on by several establishments in Providence, and also in Pawtucket, Woonsocket, Newport, Central Falls and at Pascoag, in the town of Burrillville.

Brick making was also a colonial industry, but the oldest existing brick-making establishment of the State was started in Barrington in 1846. All of the brick-making in that town is under one management.

Ship building, except of small steam and sailing vessels is not now carried on in this State. The Herreshoff Manufacturing Company has obtained world-wide fame as the builders of fast sailing yachts. It has built several sloops which have successfully defended the American Cup against the best British boats, and it has constructed several of the government's fastest torpedo boats. This company began building yachts and sailboats at Bristol in 1863, and in 1873 commenced the construction of steam yachts.

The first mill in the country for the manufacture of cotton seed oil was established in Providence to develop a process invented by the late Lyman Klapp. It is known as the Union Oil Mill. The manufacture of menhaden oil and fish guano is an important industry in Portsmouth and Tiverton.

Davis's Pain Killer was almost an indispensable household panacea a generation ago, and in other countries as well as in our own. It was discovered by Perry Davis, who commenced making it in Providence more than a half century ago. Mr. Davis died in 1862 and the business was removed to New York several years ago.

In a report regarding the manufactures of Providence, prepared at the request of Alexander Hamilton, in 1790, glass works were mentioned. John Brown owned a glass factory at India Point about that time, but the business was probably closed out soon afterwards, although no memoranda is obtainable of its fate. The Providence Flint Glass Company was started about 1830. The Providence Journal of January 31, 1833, speaks of the concern as "an establishment which produces some of the best and most elegant ware in America," and instances as "corroborative of this assertion, the beautiful

lamps suspended in the hall of the City Hotel, and the general table-ware of the establishment."

It will be impossible in this chapter to describe in detail the myriad of separate industries large and small in this State. No other State is so extensively engaged in manufacture in proportion to its area and population as is Rhode Island. Nearly everything needed in the household, in the shop, on shipboard and in outdoor labor is made within its borders. Besides the industries to which reference has already been made it has manufacturers of alarm tills, aluminum novelties, ammonia, arc lamps, artificial ice, artificial work, art needle work, asbestos covering, athletic goods, automobiles, badges, baskets, blackboards and blackboard material, blacking, blank books, boiler and pipe covering, boiler punches, bologna sausages, macaroni, boots and shoes, brooms and brushes, burglar alarms, buttons, butter and cheese, cameras, candy and confectionery, cardboard, card cloths, carriages of all kinds, cash registers, chemicals of all kinds, chewing gum, cider and cider vinegar, cigars, clocks, combs, corsets and hoop-skirts, cop tubes, cotton cans, curtains and curtain fixtures, cutlery and hardware, doors, sash and blinds, screen doors, drums, drain-pipe, dye-stuffs, elastic stockings, electric devices of various kinds including novelties, elevators, emery wheels, fire escapes, flags and banners, flavoring extracts, furnaces, furniture of all kinds, galvanized iron and copper cornices, gas fixtures, gas generators, gas governors, German silverware, gold and silver castings, haircloth, handkerchiefs, harnesses and saddles, hats and caps, horn goods, horse shoes, hose, hydrants, indelible and other inks, iron and wooden fencing, knee-caps, trusses, labels, lathes, lawn tennis goods, lawn vases, letter and newspaper files, lightning rods, lime, looking glasses, loom-pickers, lubricating oils, maps, mattresses, metallic figures, monuments, headstones and statuary, mustard, pickles and preserves, net, fish lines and seines, nickel castings, oil clothing, organs, paints, oils and varnishes, paper and wooden boxes, pen and pencil cases, ring travellers, rubber and leather belting, sails and awnings, shirts and collars, show cases, shell goods, shafting, shuttles, soap and candles, lard and tallow, surgical instruments, spring beds, tanks and vats, tiles, tin ware, tools of all kinds, top roll coverers, trunks and valises, tubing of all kinds, torpedoes and torpedo accessories, umbrellas and parasols, water, naphtha and electric motors, washing powders, washing and wringing machines, wigs and hair work, wire work of various kinds, wooden ware of all kinds, yeast and novelties of every description.

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