



A CHRONICLE OF  
TEXTILE MACHINERY  
1824-1924

A CHRONICLE OF  
TEXTILE MACHINERY

1824 — 1924

ISSUED TO COMMEMORATE  
THE ONE HUNDREDTH ANNIVERSARY  
OF THE  
SACO-LOWELL SHOPS



PRIVATELY PRINTED

SACO-LOWELL SHOPS

BOSTON, MASS., U. S. A. MCMXXIV



**LOWELL IN 1855**

From an Old Colored Print in the Possession of the Proprietors of the Locks and Canals, Lowell

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**SACO-LOWELL SHOPS**

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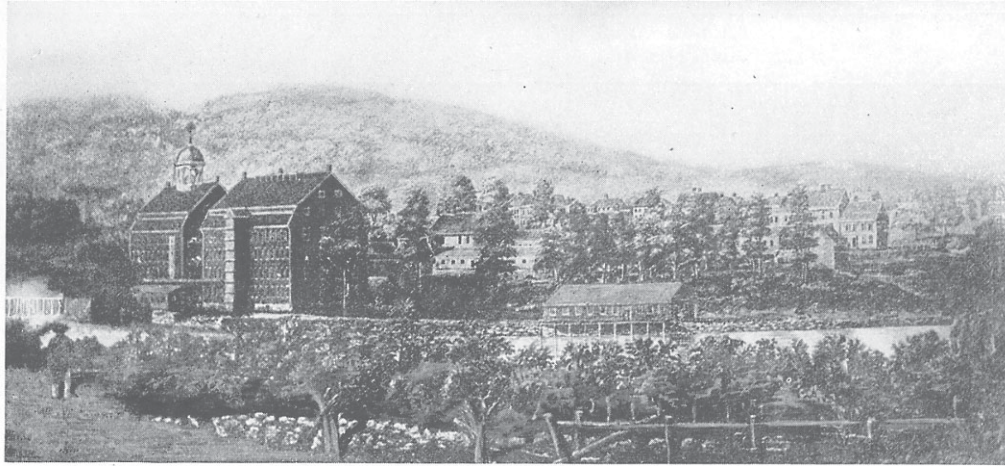
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A CHRONICLE OF  
**TEXTILE MACHINERY**  
1824—1924





BOSTON MANUFACTURING COMPANY, WALTHAM, MASS.  
From an Old Print

## A CHRONICLE OF TEXTILE MACHINERY



### INTRODUCTION

**I**T is difficult to realize that the main inventions and developments of textile machinery have taken place within the last century, and all the more surprising when we consider that weaving is one of the very oldest human arts, far older than the art of writing, so that we have no record of when and how it began.

When we cross the threshold of history, we find spinning and weaving in an advanced stage of development in India, China, Egypt, and Babylon. The oldest books of the Bible are full of references to weaving and to cloth; thus, Job compares the passing of man's life to the flight of a weaver's shuttle, and Moses is commanded to wrap the Ark of the Lord in fine linen. In the glimpses Homer gives us of pre-historic Greece, women are often shown at their looms. When the clamor caused by Hector's death first alarms Andromache, she is weaving a double web of shining purple cloth decked with flowers, while Penelope's web, which she unravelled every night to gain time with her impatient wooers, is probably the most famous in literature.

The ancients wove at an upright loom, and spun with the distaff and spindle, though the wheel had been used for the spinning of cotton in India since pre-historic time.

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## *A Chronicle of Textile Machinery*

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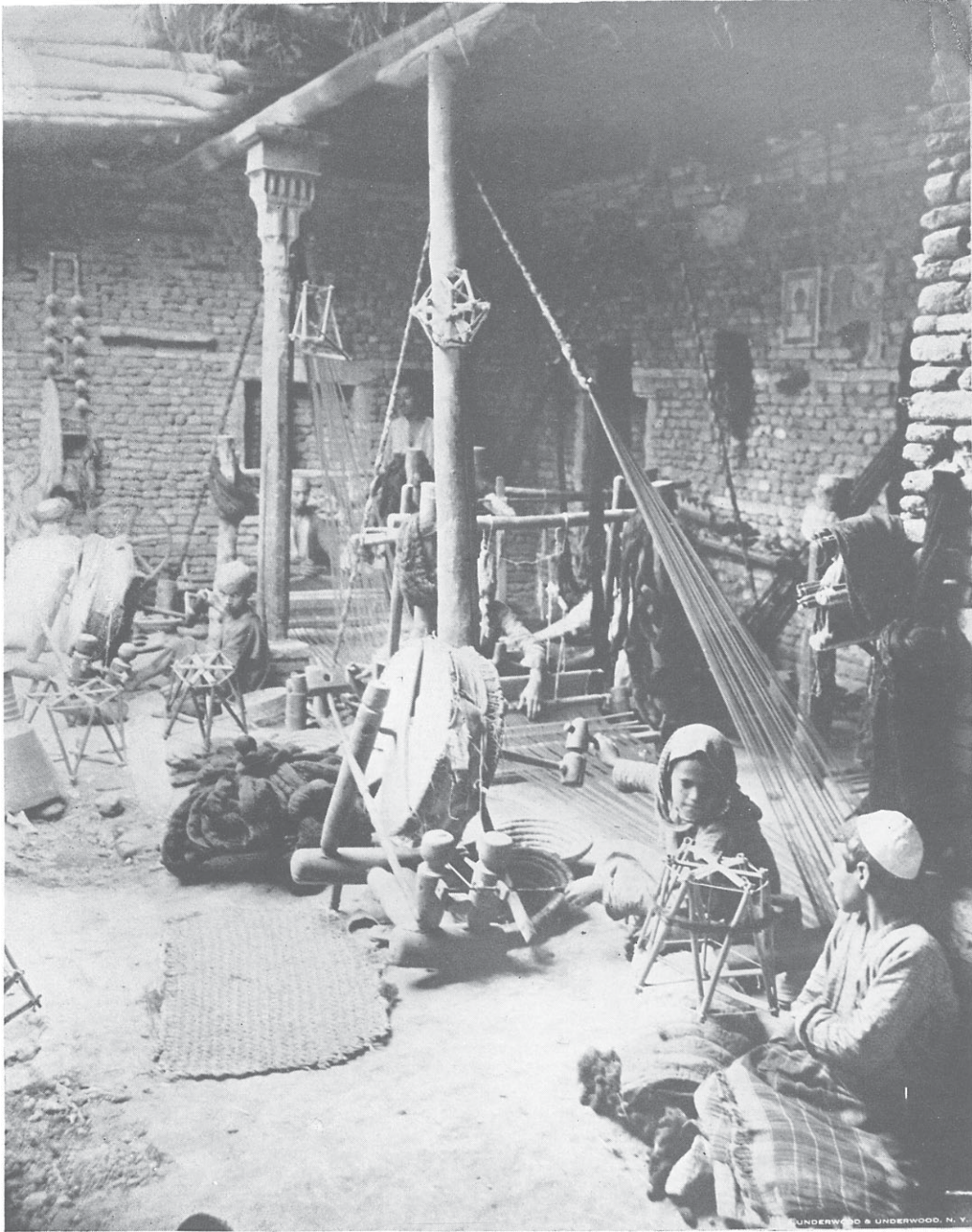
These simple methods served mankind down through the middle ages and even to within two hundred years. It is, perhaps, not an unreasonable surmise that the retarded development of textile machinery, in common with that of all other known arts, may be ascribed to the obstacles in the way of swift exchange both of ideas and of commodities.

The spread of all knowledge was slow until long after the invention of printing in 1453, and the impetus which printing gave to the paper industry was another means of developing the human race, by providing an inexpensive medium for the exchange of ideas.

As far as methods of spinning and weaving were concerned, cloth was made at the opening of the eighteenth century in England, much as it had been made in Egypt when Joseph found Pharaoh clothed in a robe of fine linen. Then a series of inventions, substituting mechanical power for human strength and skill, revolutionized every process in the industry, and increased the supply and cheapness of cloth to an almost incredible extent. These inventions began in 1733 with John Kay's flying shuttle. This device, which worked by springs and levers, left the hands of the weaver free from throwing the shuttle, thus greatly increasing the speed at which he could work. Kay's machines were destroyed by frightened workers who saw their means of livelihood taken away from them by this new-fangled device.

The problem was now to develop some method of speeding up spinning to keep pace with the accelerated power of the looms fitted with Kay's shuttle. This was done by James Hargreaves. One day when spinning, his wheel was upset by his little daughter, Jenny. To his surprise the spindle continued turning in this vertical position. This gave Hargreave the idea for his "Jenny," a contrivance consisting of several upright spindles all of which could spin at once. Spinning could now be done as rapidly as the improved weaving. The thread, however, was not strong enough for the warp, which still had to be woven in the old fashion. Richard Arkwright, a poor barber, contrived the next improvement in spinning by inventing a machine which could make thread strong enough for the warp. His spinning frame spun the thread by passing it between rollers moving at different speeds. Arkwright was the first of these inventors to turn his machines to his own advantage. He set up a mill at Nottingham which was run by horses, and another shortly afterwards (1771) at Cromford run by water power. From the use of his spinning frame in this latter mill it became known as the "water frame." Arkwright by his enterprise and organizing ability soon built up factories all over the northwest of England.

The fabrics woven, however, were still coarse. Thin stuffs such as muslin, which got its name from Mosul whence it came originally, were still imported



PRIMITIVE METHODS OF SPINNING AND WEAVING, BAGDAD, MESOPOTAMIA

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largely from the East. Samuel Crompton's "mule," so-called because it was a cross between the jenny and the water frame, made it possible to spin fine thread in England. Anxious to accelerate his work that he might get more time for the music in which he delighted, he devised a contrivance which stretched the threads before they wound on the spindle, hence making it possible to spin much finer strands. He found it impossible to keep his invention a secret, and since he had no money to patent it, he was forced to sell it for a few pounds.

It remained for Edmund Cartwright to produce the power loom. A clergyman, with no technical knowledge, he happened to fall into a conversation with some Manchester manufacturers which touched on weaving. He rashly expressed the opinion that it might be done by power, and to prove his point had a model made which worked after a fashion. This he improved upon until he succeeded in making it really practicable. The important feature of this loom was that it stopped automatically when a thread broke.

The power needed to operate these new machines was supplied when Watt improved the steam engine, which, up to his time, had been used only in a very crude form as motive power for pumps in the mines. Improvements in bleaching, dyeing, and printing had kept pace or followed rapidly after the improvements in spinning and weaving, and the production of cloth was completely revolutionized. Knitting machines, first invented in the time of Queen Elizabeth, were also perfected during this stirring period.

Meanwhile, on the Continent, various French inventors had been investigating a means of making figured cloth with greater ease and speed. The cap was put on their efforts by a weaver named Jacquard who was brought to the notice of Napoleon and allowed to study and experiment at the Conservatoire des Arts. The result of his labors, known as the Jacquard Loom, although he only perfected a machine already invented, made it possible to weave patterns with ease and speed by mechanical means by cutting out specific warp threads at will.

The enormous increase in cloth production began to put a severe strain on the world's supply of raw material. This was felt most acutely in the case of cotton to which the new machines were especially adapted. The labor and time consumed in cleaning the seeds from the cotton bolls by hand made the supply which could be put on the market very limited. Whitney's invention of the Cotton Gin was therefore of vital importance to the textile industry. Like Cartwright, Whitney had no knowledge of textile production, but he had always been very handy at "rigging up" labor-saving contrivances in his own home on a New England farm. While he was staying, as a tutor, on a southern plantation, his attention was called to the great laboriousness of cotton clean-



PRIMITIVE METHODS OF SPINNING LAMB'S WOOL, CASHMERE, INDIA

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ing, and it was laughingly suggested that he make a machine to do the work. He took up the suggestion and worked out the Cotton Gin, of which the rough principle was the substitution of the wires for the fingers of the negro mammies in clawing the cotton fibers away from the seeds.

As has been seen, the majority of the new inventions were made by Englishmen, and this gave English industry an invaluable head start of which it took full advantage. For many years, she had no effective rivals; Europe, busy with the Napoleonic Wars, was left far behind in the race, and the United States was still a very young and struggling nation.

The textile industry in America had many obstacles to overcome before it succeeded in establishing itself on anything like a paying basis. The first colonists had brought their spinning wheels from England, and all during Colonial and Revolutionary times homespuns were made both on the farms of New England and the plantations of the South; indeed, there are still old women in most country districts who as girls knew how to spin and weave, and who can sometimes be induced to get down their spinning wheels from their attics. The colonists, however, had no great skill as cloth makers and fine goods had to be imported from England, or from the Far East. This dependence on England for cloth was always resented, and with the friction which resulted in the Revolution, feeling on the subject grew acute.

Efforts were made to encourage domestic cloth making very early in the history of the colonies. Spinning schools were set up, and spinning bees held on the Common to teach the young women of Boston skill in the art. More picturesque methods were sometimes taken to give the question "publicity." In 1753 a procession of three hundred young girls, accompanied by a band and a platform on which a weaver dressed in spotless white homespun stood working at his loom, marched to the Common, set up their wheels, and sat spinning before an admiring crowd. Bounties were frequently offered by the Assemblies for pieces of well-made cloth of American production. Leading citizens began to form societies to promote American industry. The first of these, organized in Boston in 1751, was "The Society for Encouraging Industries and Employing the Poor," the members of another, founded at Wilmington in 1789, pledged themselves to appear at least once a year in a full suit of American manufacture.

To a similar society, organized in Philadelphia, in 1787, must probably be given the credit for establishing the first cotton mill in America to be run by power machinery (April 12, 1788). A few days later the first cotton mill in New England was opened in Beverly, Mass. Washington, in his diary, mentions with great approval this mill, which he was shown over on his New England visit in 1789. At almost the same time the first woolen mill in America was

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## Introduction

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OLD SLATER MILL, PAWTUCKET, RHODE ISLAND

opened at Hartford. At his inauguration, Washington — to say nothing of the Vice-President and the Senators from Connecticut — was dressed in a suit of fine cloth produced at this mill.

In spite of Yankee business enterprise, patriotic enthusiasm, and the grants and favors of the Government, these first mills led a struggling existence. Their great difficulty was the lack of skilled workers and of good machinery. For long it was almost impossible to get any accurate knowledge of the new English inventions, and without such knowledge America could not hope to compete with the well-established English industry. England took every precaution to guard her secrets. No machines were allowed to be exported, and everything possible was done to prevent the emigration of textile workers. Curious attempts were made to smuggle men and machines out of England, sometimes the machines were even taken entirely apart, and the pieces shipped to France labelled “agricultural implements,” but they were all failures until the arrival of Samuel Slater.

Slater, the real founder of the American textile industry, was an English mechanic familiar with the processes and machines used in the Lancashire mills. Chancing to read in an American newspaper of the bounties which the government was offering for good cloth, he realized the opportunities there must be in the new country for such skilled workers as he, and resolved to emigrate. On

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his arrival, he offered his services to Moses Brown — a rich Quaker merchant of Rhode Island who was much interested in the textile industry. Brown realized his value, took him into partnership, and in 1790 they set up at Pawtucket the first cotton mill in America to be equipped with proper Arkwright machines. The enterprise flourished, and was the foundation of the Rhode Island textile industry.

The first mill in the world where the whole process of cotton manufacturing, from the spinning to the weaving, was completed under one roof was established at Waltham, Mass., by the Boston Manufacturing Company in 1813. The leading spirit in this enterprise was Francis Cabot Lowell. While on a visit to England, Lowell conceived the idea of building up cotton manufacturing in America, and managed on this same trip to obtain a sufficiently clear knowledge of the English machines to be able to reproduce them in America. He was unable, however, to produce any designs of the Power Loom, then just beginning to come into general use even in England, and was obliged to work out a Loom for himself. Many other details of his machinery, Lowell had to contrive as best he could, and to this day there are differences between the Waltham System of Manufacturing, worked out by the ingenuity of Lowell and his partners, and the Rhode Island System, which Slater had modelled more directly on the English factories.

As we shall see, the impetus to making textile machinery in America as a separate industry was given by these pioneer New England cotton manufacturers, who, having been forced, first, to build their own machinery, were prompted to form new companies for the express purpose of making textile machinery.

In this way, the Lowell Shop, the Kitson Shop, the Pettie Shop, and the Saco Shop, now the major units of the Saco-Lowell Shops, came into existence. To a very large extent, the history of the Saco-Lowell Shops is the chronicle of textile machinery in America, and the one hundredth anniversary of the founding of its earliest unit, which is the oldest textile machinery shop in America, is the occasion for publishing this narrative.



# THE LOWELL SHOP



## CHAPTER I

### THE LOWELL SHOP

*Formerly the Lowell Machine Shop*



THE history of the Lowell Machine Shop is more than the account of how an individual business enterprise grew and prospered, for it is tied up not only with the history of Lowell itself, but with the very foundation of the American textile industry. It begins ten years before the first mill was built on the Merrimack, when the city of Lowell was still the tiny village of East Chelmsford, with a population of a scant two hundred white settlers, and Francis Cabot Lowell had just returned from England with his bold scheme for building a cotton mill in America. Something has already been said of the difficulties of the first American manufacturers, how they long struggled in vain to obtain any knowledge of the new English machinery, how Samuel Slater first brought such knowledge to Rhode Island, and how Francis Cabot Lowell contrived to acquaint himself with the principles of the closely guarded English machines.

When Lowell began the construction of machinery for the Boston Manufacturing Company's mill at Waltham, his first need was for a practical mechanic capable of carrying out his designs. The most suitable man he could hear of was Paul Moody, to whom he accordingly offered the position of Superintendent of the Machine Shop at Waltham. Moody was born at Byfield Parish, Newbury, Mass., on May 23, 1779. He had some experience already with textile machinery, first when only sixteen as a weaver on a Hand Loom, and later as part owner of a small mill, the Amesbury Manufacturing Company. He decided to accept the offer of the Boston Manufacturing Company, sold out his interests with the Amesbury Company, and moved to Waltham with his family in 1814.

The difficulties that must be overcome by the new enterprise were enormous. Not only had the machinery for the mill to be constructed from the patterns Lowell had managed to bring from England, pieced out by his memory and ingenuity, but the very machines for constructing this new machinery had first to be devised and set up. But Lowell and Moody were able to meet these difficulties. Lowell supplied besides a knowledge of English methods, an understanding of the mathematical principles involved in the construction of machinery which at that time was probably unparalleled in the western hemisphere, while Moody had a thorough knowledge of practical mechanics, together with a wonderful quickness in understanding Lowell's ideas, and an



PAUL MOODY

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## *The Lowell Shop*

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equal ingenuity in working them out. Their most notable achievement was probably the construction of a Power Loom. Lowell had been unable to obtain any knowledge in England of this invention, just coming into general use even there, and he was obliged, therefore, to work out a pattern of his own, with Moody's assistance, at a little shop in Boston.

The following story admirably illustrates their difficulties and their methods. While Moody was visiting him in Boston, Lowell told him that they must have a "governor to regulate the speed of the wheels." Moody had never heard of such an apparatus, and all Lowell could tell him was that he remembered seeing one in England, and that it had two iron balls suspended on two rods connected at one end like a pair of tongs; when the wheel was in too rapid motion, these balls would be driven apart, producing a partial closing of the gate; when the motion was too slow, the balls would approach each other and the gate would be opened more widely, letting in a larger volume of water and increasing the speed of the wheel. It was understood when Moody left the house that a governor should be ordered from England, but on his ride back to Waltham he could think of nothing but the governor, and next morning he chalked out a rough sketch of his idea as a model for his workmen. Not long after, Lowell visited Waltham and asked if the governor had been ordered from England. He was shown Moody's governor which was at once set up in the mill where it did service until 1832. It was the model of those used afterward at Lowell.

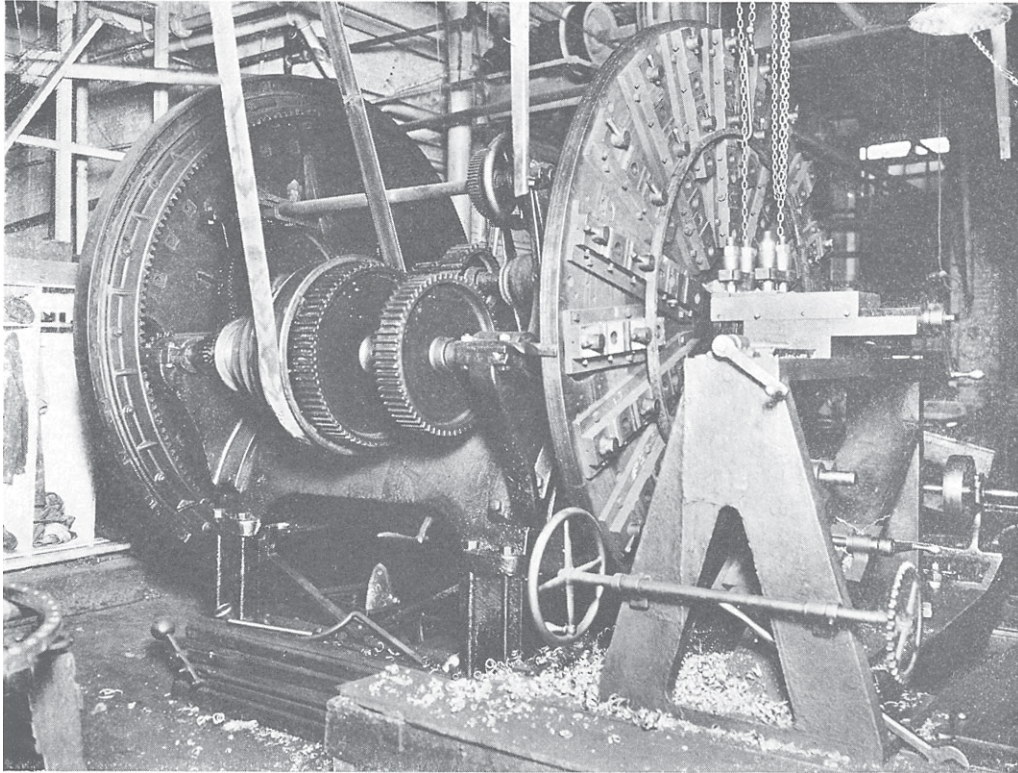
When the machinery for the Waltham mill was constructed, Moody turned his attention to the improvement of special adjustments, and the invention of new machines for particular processes. In this work he was much assisted by his close connection with the mill, which enabled him to watch the machinery in operation and to realize its needs and defects. Many of his patents have become permanently incorporated in the "Waltham System" of textile machinery, while others did valuable service in their time, and prepared the way for later inventions. Besides this work, and the regular building and repairing of the machinery for the Waltham Mill, Moody also developed a large business in supplying other cotton mills that were now beginning to spring up.

About 1823, he became interested in a plan developed by Messrs. Patrick Tracy Jackson, Nathan Appleton, and Kirk Boott for setting up mills at East Chelmsford (later Lowell) which should utilize the power of the Merrimack River there. The machinery for the new Company's first mills was built by Moody at Waltham, and when it became evident that the immense water power at East Chelmsford would soon be applied to other mills, and that machinery for these could be built more advantageously on the spot, it was decided to establish a machine shop on a large scale there, and to secure the services of

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LATHE AT THE LOWELL SHOP, BUILT IN 1820, WHICH TURNED THE TURRETS FOR THE MONITOR

Moody for its planning and supervision. Accordingly, the Merrimack Manufacturing Company, having decided to build another mill, made a contract with the Boston Manufacturing Company to release Moody from his engagement at Waltham, and to allow the use of its patterns and patent rights. The sum of \$75,000 was paid as a consideration. Moody moved at once to East Chelmsford, and started the Machine Shop in 1824. From that time until his death in 1831, most of the machinery used by the Lowell mills was built and set up under his supervision.

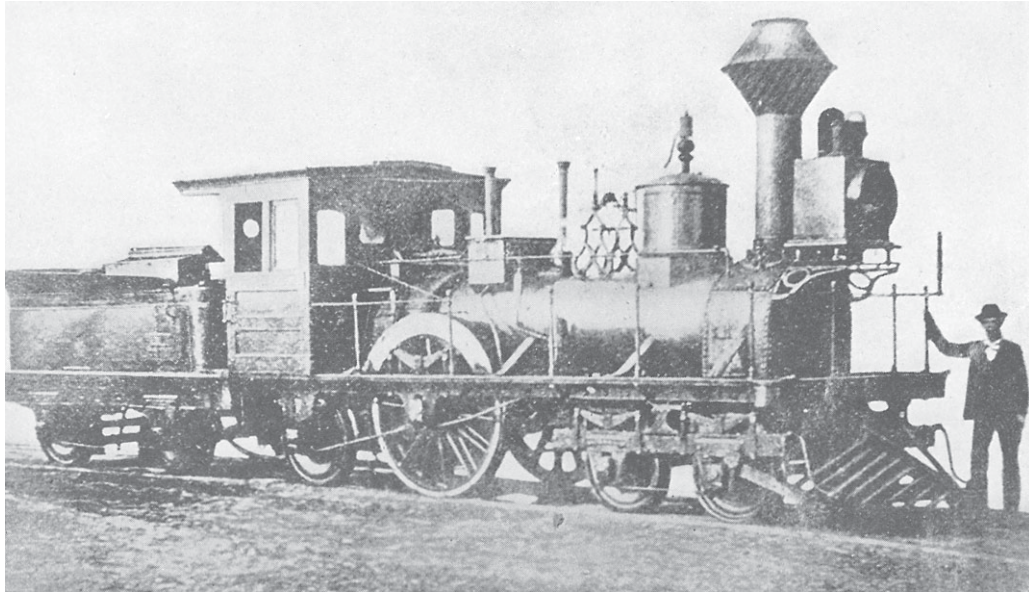
In 1825, upon the completion of the machinery for the Merrimack Manufacturing Company, the shop was sold to the proprietors of the Locks and Canals on the Merrimack River, who undertook the building of all kinds of machinery. Mr. Kirk Boott was made agent and treasurer, and Mr. Moody, superintendent.

During these early years, the shop manufactured not only textile machinery, but also other machines of various kinds. The Swain turbine wheel was the invention of one of the employees, and was first manufactured there. The first

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## *The Lowell Shop*

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THE ROGER WILLIAMS LOCOMOTIVE, BUILT BY THE LOWELL SHOP ABOUT 1840 FOR THE PROVIDENCE AND STONINGTON RAILROAD

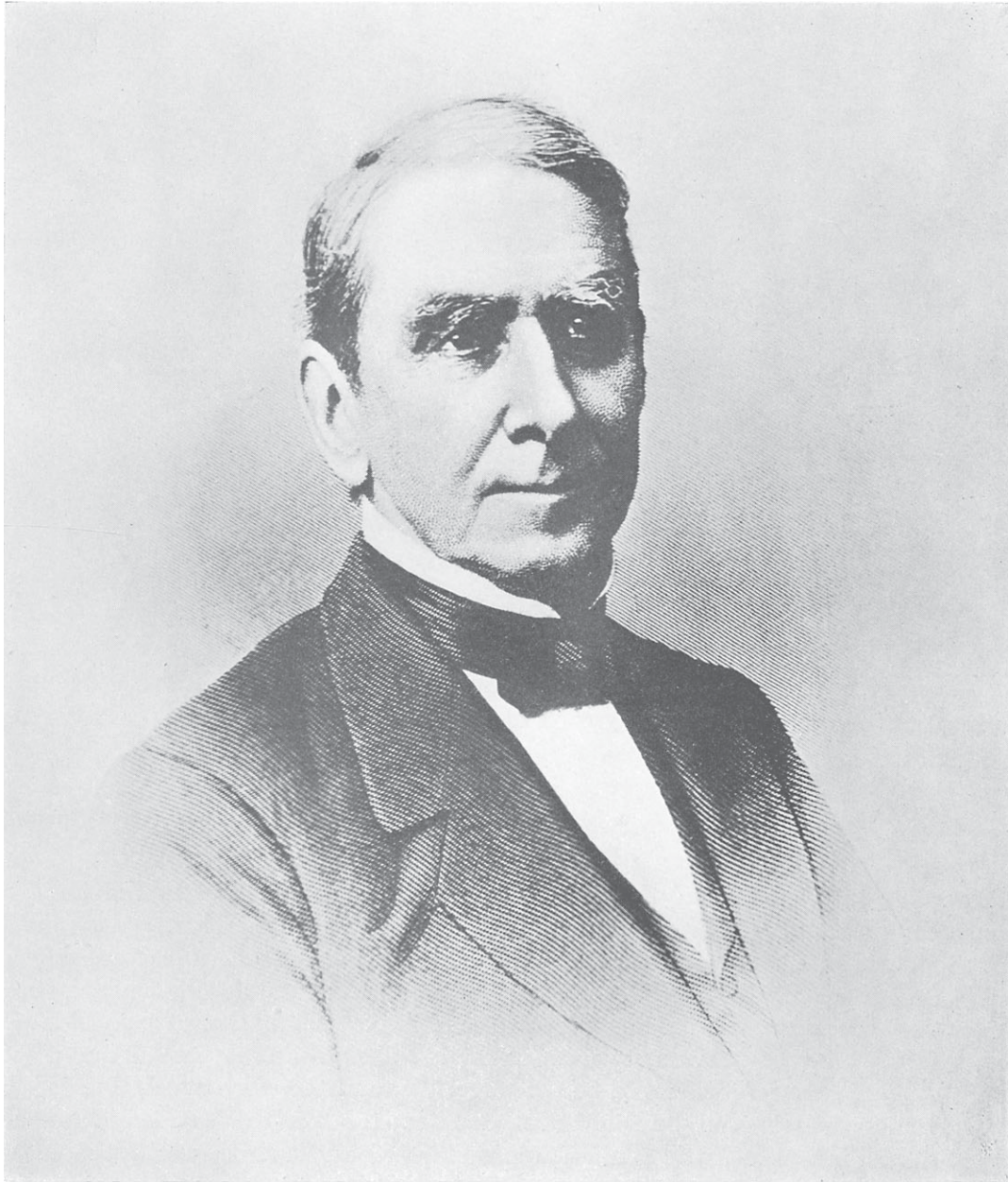
American locomotives were also made at the Lowell Shop. A letter from Kirk Boott ordering wheels and other locomotive parts to be sent out from England is interesting for the light it throws on the enterprise of these early builders, and the difficulties in their path.

MRSS. THORNLEYS

LOWELL, *July* 18, 1834.

DR SIRs—

We are about commencing the manufacture of Locomotive Engines and Cars. I am undecided what kind of wheel to adopt. The wheels on the Engine lately sent out by Mr. Stephenson for the Worcester Road are unlike those on the Engines he sent to us and having no experience to guide us, we are at a loss to determine which are the best. Under these circumstances we have concluded to import some from England. I wish you, therefore, to procure for us two sets of Engine Wheels suitable for Engines  $6\frac{1}{2}$  or 7 tons weight. The fore wheels to be three feet dia. and the hind wheels five ft. We sh<sup>d</sup> like to have one set from Bury of Lpool. similar to those on the Engine he furnished to Mr. Robinson for the Little Skuilkill and the Petersbury Railroads, with this exception that we intend to have the bearing on the out instead of the inside. The other set of the same size on the plan most approved by Experience on the Liverpool & Manchester road. We want the wheels alone, but finished in the best manner without regard to cost. At the same time, send us 12 sets of 4 wheels ea. 3 ft. dia. suitable for passenger Cars without axles but the entire wheel entirely finished. We understand there are



WILLIAM E. BURKE,  
Agent of the Lowell Shop, 1845



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## *The Lowell Shop*

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small manufacturers of these & we sh<sup>d</sup> prefer to have a portion of the various constructions now in use and approved on the L. & M. Road. The earlier these can be shipped the better & please inform me at what price the several kinds can be furnished by the quantity. If you can procure us drawings of the cars generally preferred we sh<sup>d</sup> be glad to have them & indeed any information or works that have recently appeared. The best engines we have seen are fr. Mr. Stephenson & his plans are adapted by the Builders here with some slight alterations none of which however appear to us to be improvements. Still as this Act is in its infancy it is reasonable to suppose that various modifications & improvements will be effected of which we shall be glad to secure the earliest intelligence & for which we shall always be willing to pay liberally. Let me know how soon this order can be completed & when it is, draw upon Mr. Wiggin whom I have advised.

Very truly

KIRK BOOTT, *Agt.*

For about twenty years, the shop continued to be owned by the Locks and Canals. There were few changes in the personnel. Mr. Moody, as has been said, held the office of superintendent until his death in 1831. George W. Whistler then took his place until 1837, when he was succeeded by George Brownell who held the office until 1845. Kirk Boott, the first Agent, was succeeded by J. Tilden for a brief period (1837–1838) and then by his son William Boott who held the position until 1845.

By 1845, the Shop consisted of four shops, a smithy, and a foundry, employing in all an average of 500 men, with an annual production in machinery of \$230,000. The employees worked on an average of 73 hours a week, and had only four holidays in the course of the year — Fast Day, July 4th, Thanksgiving, and Christmas.

At this time begins a new phase in the history of the Shop, through its sale in 1845 by the proprietors of the Locks and Canals to a company organized by Messrs. Abbott Lawrence, Nathan Appleton, and John Lowell. They incorporated it as the Lowell Machine Shop, with an authorized capital of \$500,000. James Stevenson was made treasurer, and William E. Burke, agent. Their aim was to provide complete equipment for cotton mills. They began at once to enlarge their plant, and improve their entire facilities. In the power plant, the Swain turbine water wheels were substituted for the old-fashioned breast wheel, and cast-iron pulleys for wooden drums. Enlargements and improvements followed one another from time to time as the growth of the business warranted, and in 1882, the main shop was rebuilt without the loss of a single day of production.

The output of the Company included the following cotton machinery, Open-

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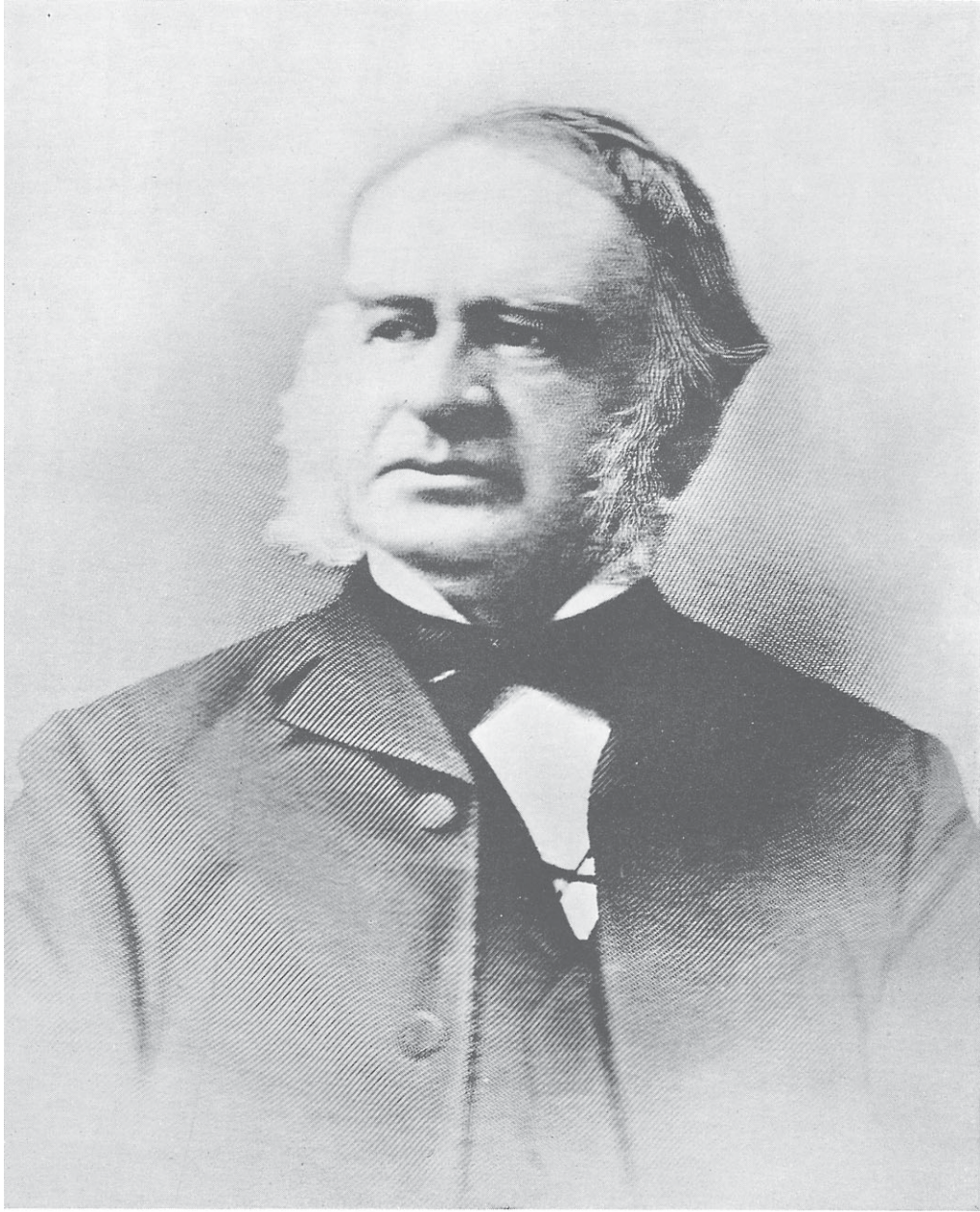
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ing and Picking equipment, Cards, Spinning Frames, Warpers, and Looms. In addition mill gearing, shafting, and water wheels were made at this time. It also comprised steam boilers until 1870, Paper Machinery from 1858–1862, and machinists' tools until 1854. Here was built the first locomotive used by the Boston and Lowell Railroad in 1847, and the Shop continued to put out locomotives of the heavier type then coming into demand, until 1861.

At the World's Columbian Exhibition in 1892, the Company's Looms received the highest awards for being strong and durably built, and adapted to high speed and high production. At this period under Robert L. Stevenson, treasurer, and Charles L. Hildreth, agent, the Lowell Machine Shop developed into the most extensive and best equipped shop in America for the manufacture of all cotton textile machinery. By 1897, the plant included shops, foundry, and boarding houses, and covered some 13 acres of land, with the floor surface of the shops, foundry, etc., exceeding seven acres. The output had increased 12 times since 1845. The shop employed 1200 men as against 500 in 1845.

About this time, a new field opened itself to the management of the Lowell shop. Before 1897, several unsuccessful attempts had been made by American manufacturers to build worsted machinery in competition with the British, who had kept a strong hold on the trade. In January, 1898, the Lowell Shop, feeling that its past experience in building up-to-date cotton machinery warranted its branching into the worsted machinery line, decided to enter upon the manufacture of worsted spinning frames. It was decided not to depart from the lines of design and principles of construction which had been followed successfully by English builders for many years, and which were satisfactory to all spinners of worsted yarns. After a careful canvass it was easily seen that Prince, Smith & Sons were the foremost manufacturers of spinning frames, and that any immediate attempt to improve their frames would not meet with success. A large corps of draftsmen and pattern makers were employed and in a few weeks a frame was completed. This frame was sold to the Massachusetts Mohair Plush Company of Lowell, Massachusetts, in whose factory it is still running. It proved so successful that immediately orders were received from several of the leading worsted yarn manufacturers in the United States for similar frames. In time a complete line of worsted machinery was made. It was necessary that this machinery agree in every respect with that built by British manufacturers as it was not an easy matter to persuade the mills to adopt worsted machinery which differed in any marked degree from that to which they had been accustomed, and with which their mills were equipped. By sticking to the English designs the Lowell shop was able to take over satisfactorily a large amount of the repair order business which had previously been

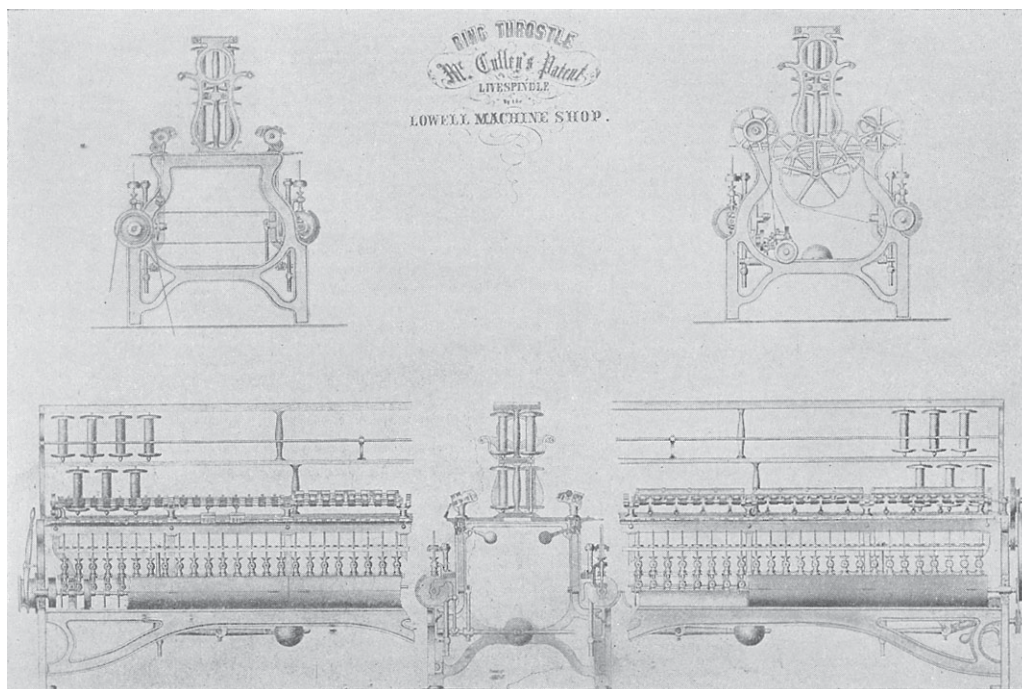


CHARLES L. HILDRETH  
Agent of the Lowell Machine Shop, 1879-1905

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## *A Chronicle of Textile Machinery*

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RING THROSTLE, McCULLEY'S PATENT

sent to England, and at the same time, was in a position to replace or supplement equipment already in the mills with identical machinery.

The importance of this innovation can be seen from the comments with which it was greeted by the leading trade journals. An extract from the bulletin of the "National Association of Wool Manufacturers" is typical of many others.

### ASSOCIATION OF AMERICAN WORSTED MACHINERY

For many years past this bulletin has commented upon the fact that all the worsted preparatory and spinning machinery in use in the United States is of foreign manufacture. It has urged that here was an unoccupied field of industry promising large returns to the establishment with the courage, the capital, and the brains to enter and possess it. The achievements of our builders of all forms of cotton and woolen machinery have proved that we are able to accomplish results in this class of mechanism which cannot be excelled in any European country; no reason exists why worsted machinery of a character equally superior should not be manufactured here for the equipment of our own mills. The obstacles have been the large capital required for the plant, and the doubt whether the demand for this class of machinery was sufficient as yet to justify its investment.

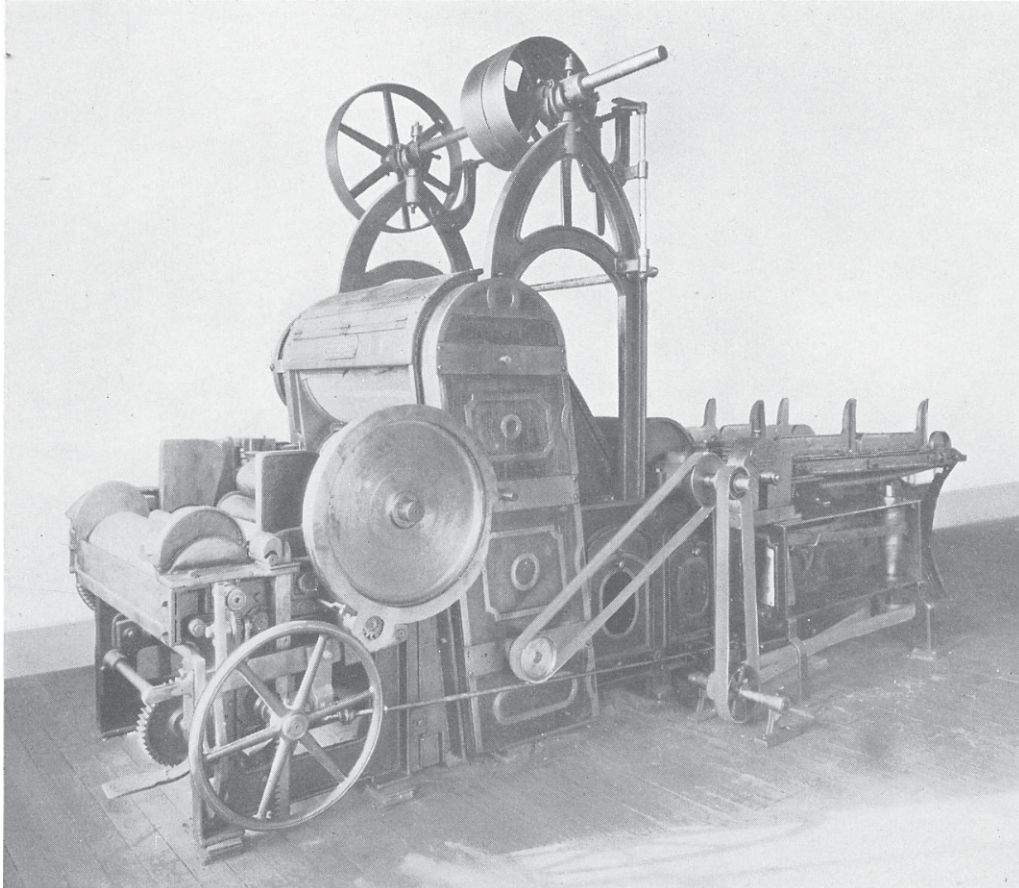


M. RICHARD KITSON, FOUNDER OF THE KITSON SHOP

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FIRST FINISHER PICKER BUILT AT KITSON SHOP, 1871

These doubts have now been happily solved by the decision of the Lowell Machine Shop to add a worsted machinery department to the Works, announced in our advertising pages. The fifty years' experience of the establishment in the building of cotton machinery has equipped it to make a success of its new undertaking from the very start. It has a large force of trained mechanical experts and there is nothing in the spinning frame of 144 spindles, just completed by the Lowell Machine Shop, that does not show a construction which compares at every point most favorably with the best English made frames, and it has proven, in some important details, to be superior. Our worsted manufacturers will commend the plan of the Lowell Machine Shop to attempt no radical departure from the established lines of English makes of these machines, but to build frames which are interchangeable with the best already in operation in our mills. The Company is also prepared to take orders for open can and two spindle gill boxes, weigh boxes, drawing boxes, and dandy roving and reducing frames with any

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## *The Lowell Shop*

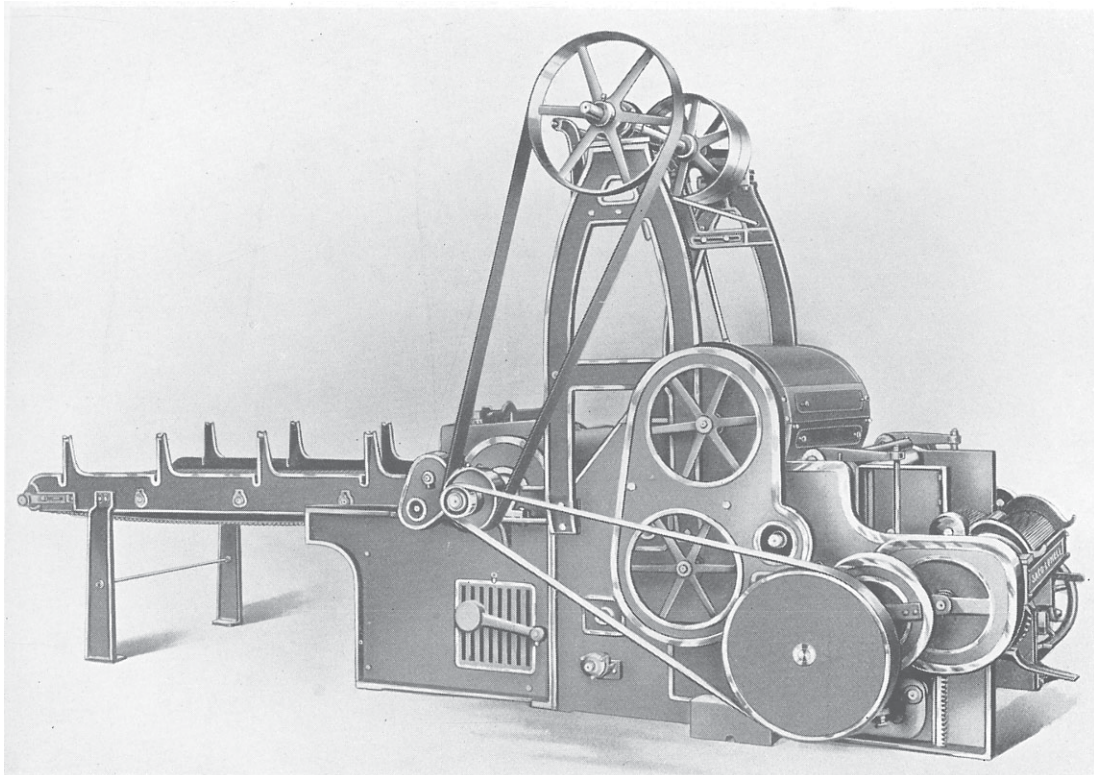
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number of spindles. We may now look forward to the time when our most progressive worsted mills shall be equipped throughout with American built machinery.

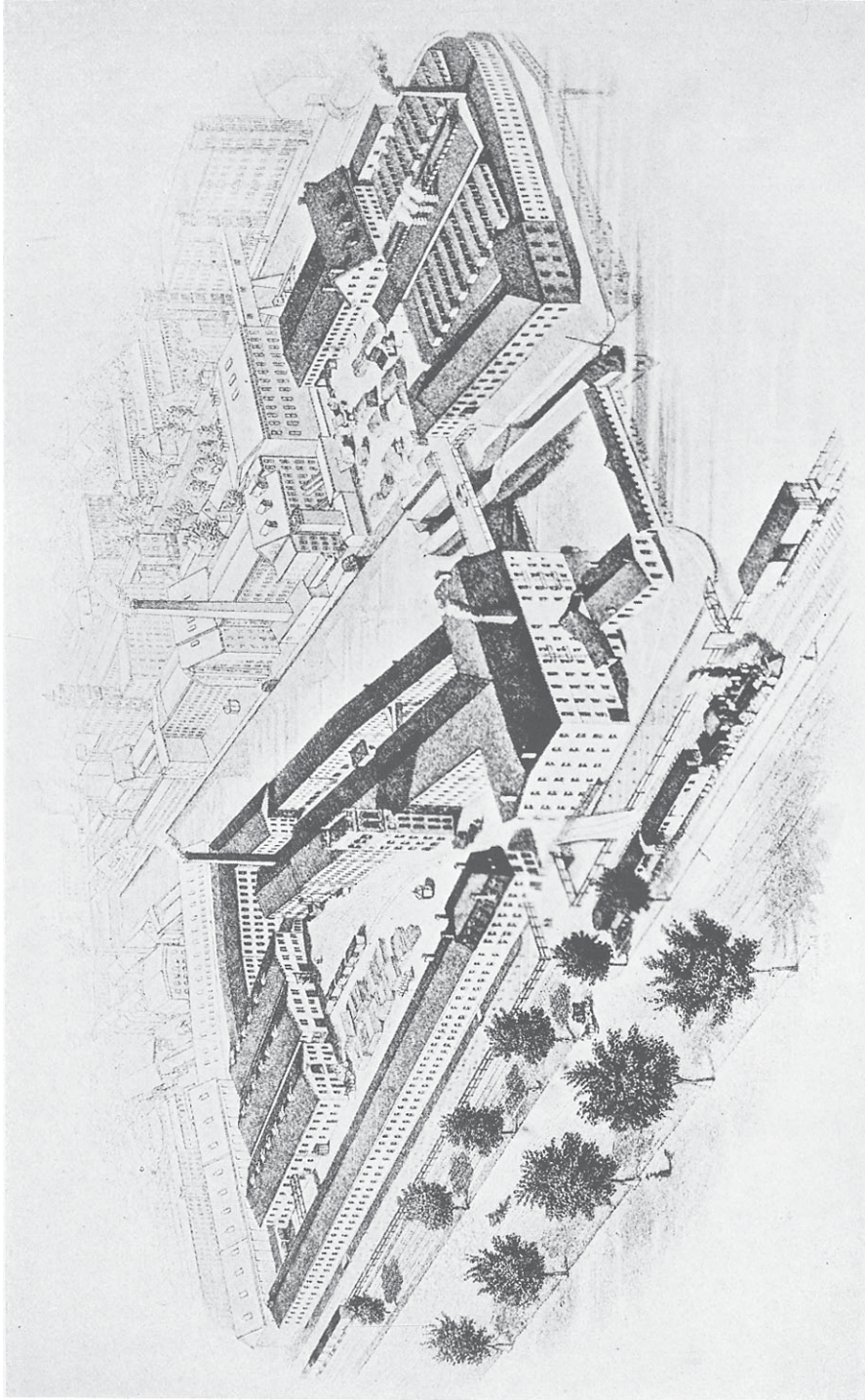
Under the direction of Messrs. Stevenson and Hildreth improvements were made from time to time on the worsted machinery and readily approved and accepted by the trade.

Up to the year 1905, the Lowell Shop had not specialized in the manufacture of Picking machinery, but in this year they secured control of the Kitson Shop which was recognized by the trade as a leader in this field and which had been founded by M. Richard Kitson in 1849.

Kitson, an Englishman, was born in 1814, the son of John Kitson, a card clothing manufacturer. The son, when he had become grounded in the father's business, sought a field in which he might develop more rapidly, and consequently came to the States in 1849. He settled in Lowell where he opened a shop on Broadway which turned out the first needle-pointed card clothing to be manufactured in America. His mechanical genius kept him from concen-

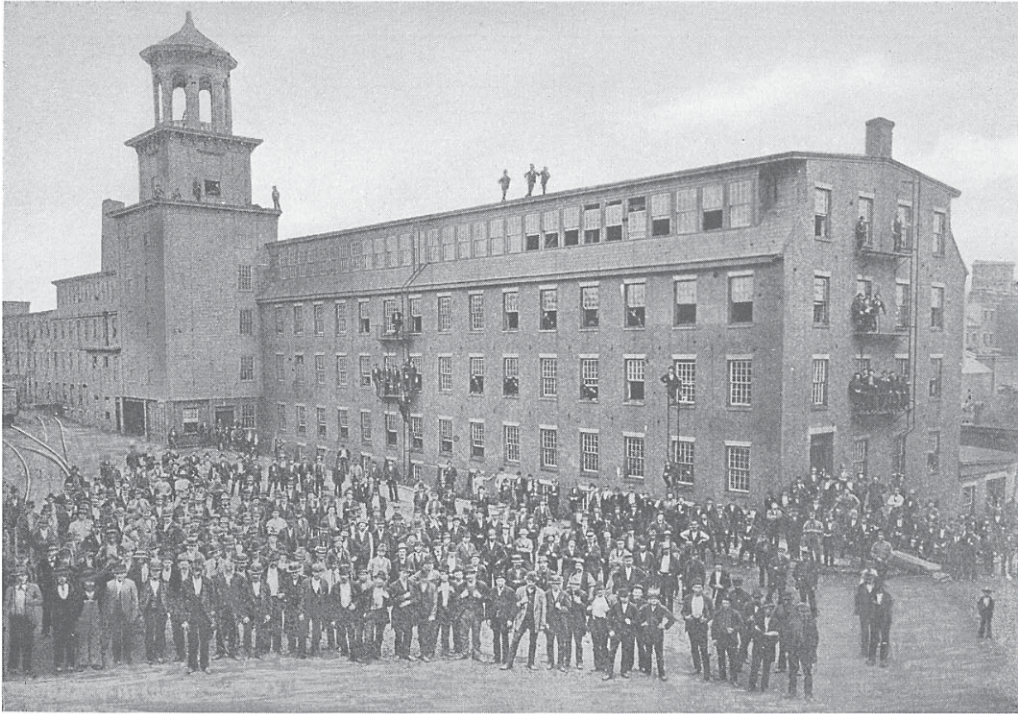


NEW MODEL FINISHER PICKER BUILT AT KITSON SHOP, 1923

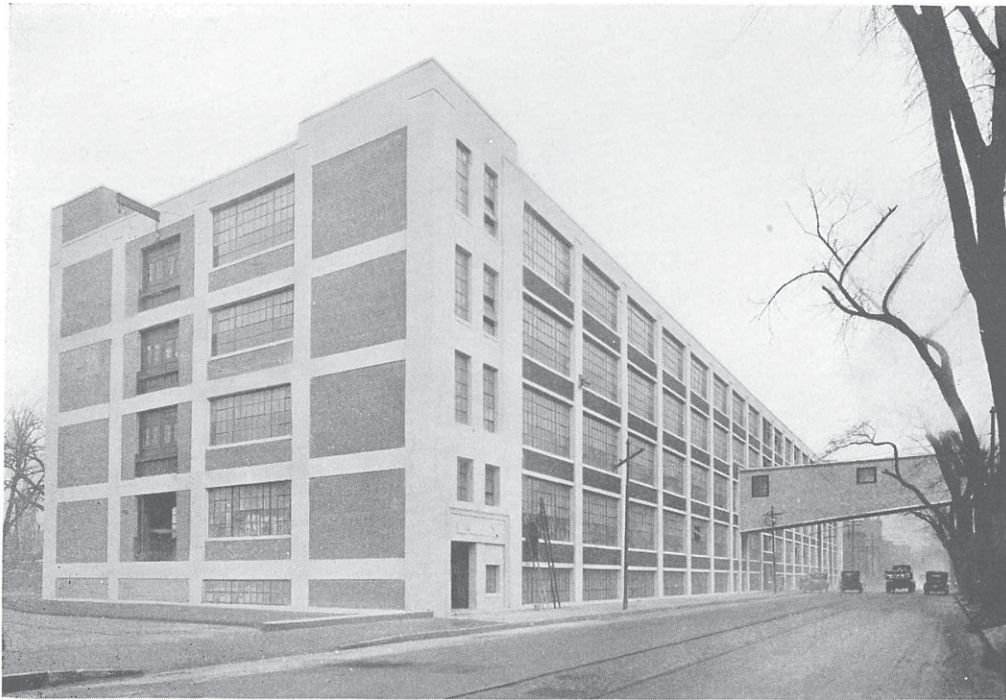


THE LOWELL SHOP IN 1902





LOWELL SHOP, 1840



LATEST ADDITION TO THE LOWELL SHOP COMPLETED IN 1923

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trating solely on this line, so that he soon turned his attention to the Picker which he remodelled and improved after some experimentation. His first real invention, however, came in 1852 when he devised a single cotton opener. His introduction of the needle-pointed cylinder in place of the beater in cotton pickers was a notable advance, and he was one of those who helped in the development of the "Trunk System" which has been extensively used.

At first, as Mr. Kitson's means and equipment were limited, his machinery was made by outside companies, but as his business and the demand for his product increased, in 1860 he purchased some land to the rear of the present Kitson Shop with a view to building a plant of his own. A portion of this land was taken by the city for an extension to Worthen Street, so that he was forced to acquire that on which the present works are located, and there he began the erection of the Kitson Shop.

By 1874, this end of his business had grown to no inconsiderable dimensions, and, following the trend of times, it was incorporated under the name of the Kitson Machine Company. Mr. Kitson was President of the new corporation until his death in 1885, and he had an extremely able lieutenant in Haven C. Perham, under whose control as Treasurer and Manager, the Shop achieved great success.

The name of the Company was changed to The Kitson Machine Shop in 1905. Mr. Perham, who was also Treasurer of the Lowell Machine Shop, retained his position to his death in 1911.

In 1908 the Lowell Shop was again the pioneer in a new industrial field. In November of that year it received an order from the American Silk Spinning Company of Providence, R. I., for 12 long silk, and 6 short silk spinning frames. Draftsmen were sent to the mills in Providence, and drawings from which the orders were constructed were made of the imported frames. Since then the activities of the Lowell Shop have been extended so as to include the manufacture of practically all the preparatory machinery for spun silk.

In 1912, the Lowell Shop and the Saco-Pettee Works, which had gained a reputation in cards, roving and spinning frames, were combined under the name of the Saco-Lowell Shops, and the central offices were moved to Boston.

Since this consolidation, many extensive improvements have been made at the Lowell Shop. In 1921, a most up-to-date concrete building was erected, and is almost exclusively devoted to the construction of all kinds of Flyers, being the only product of its kind in the world manufactured by machinery.

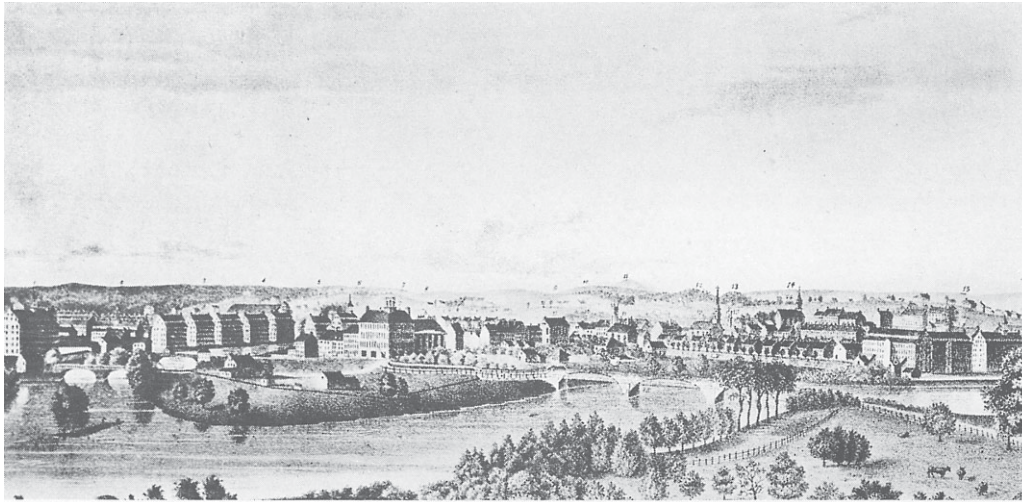
The progressive policy of the Company was manifested again in 1922 by the introduction of the French worsted style of machinery which has a tremendous demand in America.

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*The Lowell Shop*

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Finally, the last year of the first century of the Lowell Shops finds the completion of another sizable addition to the Plant which would indicate that the initiative responsible for the inception of the first textile machinery shops in America is still unabated, and the Company may justly be characterized as "one hundred years young."



LOWELL IN 1835

# THE NEWTON SHOP



OTIS PETTEE

## CHAPTER II

### THE NEWTON SHOP

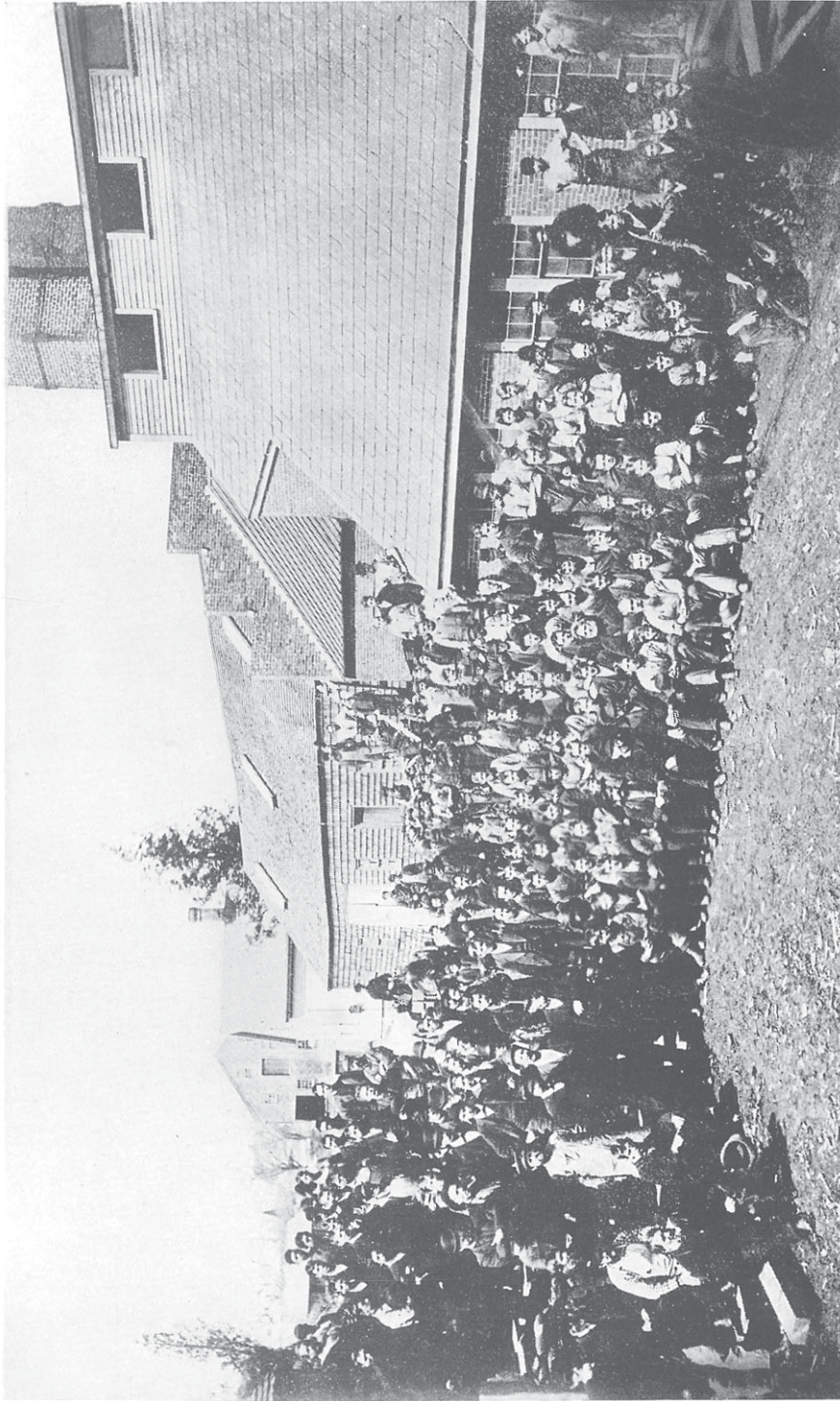
*Formerly the Saco-Pettee Machine Shops*



THE early history of Newton is intimately connected with some of the most interesting and important events in the settlement of the New England colonies. In 1631, the people of Boston, fearing the attacks of hostile Indians, decided to build a fortified place to which they and the settlers of the neighboring plantations might retreat in case of need. After considering various locations, they finally decided to erect this fort on the north side of the Charles River on the site of the present city of Cambridge. Accordingly, a new town was laid out, and the next year a tax was levied by the General Court for building a palisade about it. This was probably the first state tax to be levied in New England. The town was first known as the new town or "Newtown," but upon the founding of Harvard College there, the name was changed to Cambridge out of compliment to the English University where so many of the New England fathers had received their education. Not satisfied with the original limits of their town, the people of Cambridge petitioned the General Court for further territory, and succeeded in obtaining a large grant of land on the south bank of the Charles, including the site where Newton now stands. This was at first a part of Cambridge, known as Cambridge Village, or by the Indian name of Nonantum, but the men who had settled there early resented this dependence, and after various petitions, succeeded in being set off as a town by themselves. In 1691, they were given full town rights, and at this time the name of the settlement was changed to Newton.

A few extracts from the Records of the Colony throw much light on the life and ideals of the stern, God-fearing Puritans, who made up most of the early settlers in Newton. At the court held in Newtown, September 3, 1634, it was ordered that "no person should take tobacco publicquely under the penalty of eleven shillings." A later court forbade any person to sell cakes and buns except at funerals and weddings, and in 1660 it was held that "None are to be freemen but such as are in full communion with the church of Christ."

The Reverend John Eliot preached the first Protestant sermon to the Indians at Newton, then Nonantum, and succeeded by his eloquence in converting them to Christianity, so that later, during the period of the Indian Wars, the people of Newton, though they thought it wise to establish garrison houses,



A GROUP OF EMPLOYEES AT NEWTON ABOUT 1882

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## *The Newton Shop*

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were never troubled by the tribes in their neighborhood. Because of its close proximity to Boston, Newton took an active part both in the events that led up to the Revolution, and in the war itself. In these early days, most of the people were farmers, but even then the value of the water power at the upper falls was realized, and as early as 1688 a certain John Clark built a sawmill there. This mill changed hands several times, and a grist and fulling mill were added. In 1782, a Mr. Elliott of Boston, bought the property and added snuff mills, which he operated until 1814, when he sold his interests to the Elliott Manufacturing Company who proposed to erect a cotton factory there. This led to the building of textile machinery at Newton Upper Falls.

What has already been said of the difficulties which confronted the pioneers in the manufacture of American machinery enables us to reconstruct something of the history of struggle and achievement that lies behind this bare statement of fact. Ignorance of English inventions, difficulties of transportation, lack of trained workmen, all had to be overcome at Newton when young Otis Pettee arrived there one hundred years ago to take charge of the construction of buildings and machinery for the cotton mill which the Elliott Manufacturing Company was planning to build. In common with other mills of the period, this new Company had to begin, literally at the beginning, by building its own machinery in its own machine shop; but while in this it was no exception to the general rule, it *was* exceptional in the good fortune which led it to secure this particular young man for carrying out the task.

The son of a blacksmith and gunsmith, who had become famous in his native village of Foxboro both for mechanical skill and sound judgment, Otis Pettee was brought up in the atmosphere of the forge. It was clear from his childhood that he had inherited the paternal skill and interest in mechanics; the events of later years were to prove that the blacksmith's sound judgment had also been passed on to his son. "As the twig is bent, so the tree is inclined" is a maxim that well applies to his career. It is related that during his childhood he went one day with his father to visit a grist mill where a carding machine had been set up. When the time came to return, the boy had disappeared; he was finally found intent upon the examination of the carding machine, which so fascinated him that he declared long afterwards he could still have reconstructed it from his memory of that single inspection.

The practical skill which he acquired at his father's forge, the boy supplemented by an eager study of whatever books on the theory of mechanics he could secure; while this theoretical knowledge was reinforced in its turn by his early apprenticeship in the methods of the textile factory. When only nineteen years old, he took a position in a small factory in Foxboro, and five years later,



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*In witness whereof the said parties have  
hereto set their hands and seals, this twenty  
fifth day of January in the year eighteen  
hundred fifty three.*

*Witnesses  
Thos. A. Sprague*

*Otis Pettee*

*W. A. Merrick*

*James S. Amory  
Jackson & Co*



OTIS PETTEE'S AUTOGRAPH

in 1819, he was called to take charge of a cotton mill which a certain Rufus Ellis had set up at Newton Falls. There he obtained a knowledge of cotton machinery and of the processes of cotton manufacturing which was to prove invaluable to him in his later work.

The Elliott Manufacturing Company had been fortunate indeed in securing the services of a young man of such experience and ability, and the connection proved equally advantageous to Pettee since it supplied him with the impetus for his life's work. So excellent was the machinery constructed under his direction, that the shops of the Company, after completing the equipment of their own mills, began to turn out orders for other new factories which were growing up in Lowell, Waltham, Dedham, and the rest of New England. Such a contract, undertaken for the Jackson Company, of Nashua, New Hampshire, proved to be a turning point in Pettee's career.

This contract was a large one for those days, and at a time when the work was half completed the directors of the Elliott Manufacturing Company, who were not practical mechanics, and who could not therefore appreciate the progress that had been made, became discouraged and voted to cancel the contract in spite of the assurance which Pettee gave them that he could complete the work in time. Thereupon, Pettee assumed all the responsibility himself, and fulfilled the contract with such satisfaction to the Jackson Company that they presented him with a silver service on which was inscribed: "Presented to Otis Pettee by

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## *The Newton Shop*

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the Jackson Company in token of their appreciation of the machinery he built for their mills in the year 1831.”

For some time there had been a certain friction between Pettee and the directors of the Elliott Manufacturing Company, and this incident brought matters between them to a climax. Realizing the folly of continuing to work under men who had no understanding of his difficulties, and little sympathy with his schemes, Pettee decided to sever his connection with the Company, and at about the same time, the directors voted to discontinue the manufacture of machinery, and to dispose of their tools and machine shop. When it became known that he was at liberty, Pettee received many flattering offers from Companies who hoped to induce him to settle in their vicinity, in Nashua, Lowell, and elsewhere. But after careful deliberation, he decided to set up a business at Newton. The considerations which weighed most heavily with him in making this decision give us an interesting glimpse into the personal character of the man: “My home is here,” he remarked to a friend, “my land is in a good state of cultivation, fruit trees are beginning to bear, flower gardens and green houses are in a flourishing condition, my family is comfortably situated, and I know of no reason why I cannot do as well here as anywhere else.”

Accordingly, about 1832, he bought for \$100 per acre some twelve acres of



NEWTON OFFICE IN 1882

Reading from left to right: Messrs. F. J. Hale, Henry Billings, Pres.; Otis Pettee, Richard Daley

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## *A Chronicle of Textile Machinery*

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land on the bank of the South Meadow Brook, a stream tributary to the Charles River. Here he built a dam with a head of about twenty-five feet, and set up a small workshop, forge, and water wheel, equipping the plant largely with machinery bought from the Elliott Manufacturing Company. This little shop, the germ of the large Pettee plant, occupied a three-story building about sixty-nine feet by twenty-seven and a half feet. Conditions were very primitive; at first a large part of the work was done by hand, and it was only in 1838 that steam power was introduced as an auxiliary to the water power. Pettee's experience in textile mills made him thoroughly alive to the needs of the manufacturers, and his inventive genius enabled him to supply them. In 1835 he obtained his first patent for a "new and useful improvement for producing any required change in the velocity of machinery while in motion." This double speeder was a great success. Professor Readwell, a celebrated philosopher and engineer, pronounced it "Absolutely perfect, having its principles eternal, it could not be improved." Although this enthusiastic appraisal was a bit overdrawn, nevertheless, the new invention held its place in cotton mills for a quarter of a century.

About this time, Mexico, realizing the prosperity which the factories were bringing to her northern neighbor, had begun a policy of building up her home industries by prohibiting the importation of foreign goods, and at the same time, doing all in her power to encourage the introduction of machinery. Ithamar Whitin, a native of Dover, Massachusetts, but then living in Mexico, was sent to the United States to procure machinery for the new cotton mills. Whitin gave this important order to Pettee, since his inventions, experiments, and careful tests had won wide reputation for his shop, not only in the United States, but in foreign countries. The contract signed in 1837 by Mr. Pettee for supplying machinery to the first Mexican mill has now become a document of historical interest. Among the stipulations were the following:

"We want machinery that will produce 750 yards of sheeting from No. 16 yarn in a day; including all supplies of whatever kind to put it in operation, including water wheels, shafting, plans for factory buildings, window frames, sashes and glass, door frames and locks. The machinery when finished, must be taken apart and packed securely in strong boxes to be shipped via Cape Horn and the Pacific Coast to San Blas; and as far as possible the gross weight of each package must not exceed 175 pounds for convenience of transportation on mules' backs from the port of entry to Tepico, a distance of about sixty miles."

In spite of the difficulties which this contract reflects, cotton mills sprang up in Durango, Santiago, Coluna, and several other Mexican cities. Pettee supplied the machinery for all of them, and sent them, in addition, the experienced machinists and cotton spinners, without which that machinery was little more



**HENRY BILLINGS**  
President, Pettee Machine Works, 1883



DAVID NEVINS  
President, Pettee Machine Works, 1887

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## *The Newton Shop*

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useful than so much waste junk. Besides this foreign trade, the demands of the mills in New England and Georgia which were then increasing led to the continual expansion of the business.

A set-back occurred when on November 25, 1839, the entire plant was burned with a loss amounting to at least \$100,000, of which only \$20,000 was covered by the insurance. But so sound was the business, that even this severe disaster was powerless to shake it. A new plant was started at once, and the shops continued to prosper.

Otis Pettee was a man of wide interests and activities, the flower of that type of business men who have built up the industrial supremacy of the United States. His business enterprises were not confined to the construction of machinery. His early work in cotton mills had given him a keen interest in the manufacture of textiles, and a vision of the possibilities it presented, so that, when in 1840 the Elliott Manufacturing Company decided to close down their mill, Pettee welcomed the opportunity to buy it. He put in 250 new looms, remodelled the plant, and built it up into the largest producer of cotton cloth in New England. He realized, too, the vital connection between transportation and industry, and the consequent importance of securing adequate railroad facilities for the town in which his interests lay. It was through his influence that the Woonsocket Division of the New York and New England Railroad (then the Charles River branch) was brought into the southern section of the towns of Newton Upper Falls and Needham. Pettee's mechanical skill gave him his start, his executive ability enabled him to expand his business, and his public spirit led him to devote the leisure which wealth brought him to the service of the community. In his later years, he was actively associated with many reform movements. He was an ardent Abolitionist, and a delegate to the Liberty Convention which met in Buffalo in 1847. He died in 1853 aged fifty-eight, after a useful, busy life, beloved for his honesty, energy, and industry.

The property was sold to his sons, Otis and George Pettee, and his son-in-law, Henry Billings, who formed a partnership which continued until January 1, 1880, under the name of Otis Pettee & Co., when it was dissolved. Billings then purchased the entire property and continued the business under the old name until, in January, 1882, he organized a joint stock company with a capital stock of \$200,000, and changed the name to the Pettee Machine Works. On July 1, 1882, Billings became President, and R. P. Snelling of Dedham, Treasurer of this Company, which continued under their management until 1887, when Billings died and David Nevins of Boston succeeded him as President.

About this time, a revolution was taking place in cotton carding machinery.