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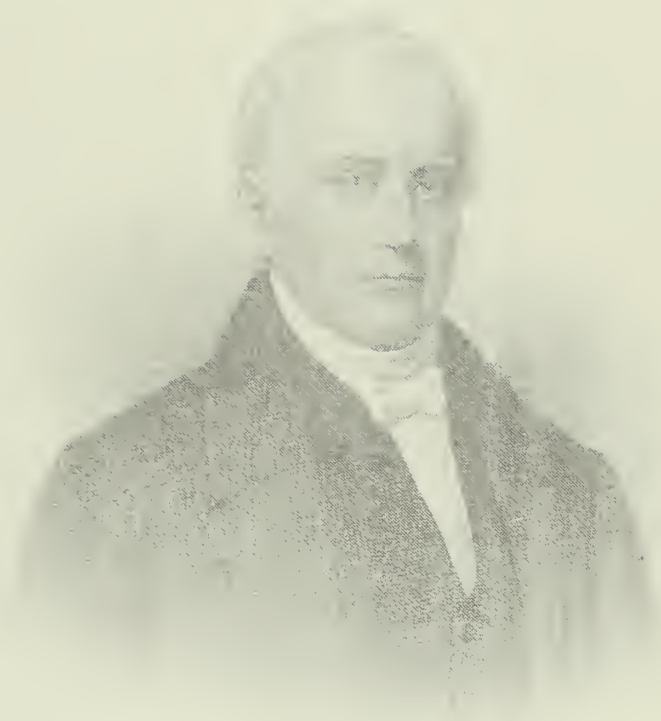
REPRESENTATIVES

OF

NEW ENGLAND.







Van Slyke & Co. Boston



*Samuel Slater*

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REPRESENTATIVES  
OF  
NEW ENGLAND.  

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**MANUFACTURERS.**

ILLUSTRATED BY PORTRAITS AND VIEWS ON STEEL.

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IN TWO VOLUMES :

VOL. II.

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THE FIRST IN A SERIES OF CHOICE PUBLICATIONS, WITH SUB-CLASSIFICATIONS INTO  
"MANUFACTURERS," "COMMERCE," "LITERATURE," ETC., TO CONSIST OF FULL  
BIOGRAPHICAL SKETCHES AND PORTRAITS OF THE MOST EMINENT MEN  
IN EACH DEPARTMENT.

By J. D. VAN SLYCK.

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*EACH ISSUE OF THE SERIES TO BE COMPLETE IN ITSELF.*

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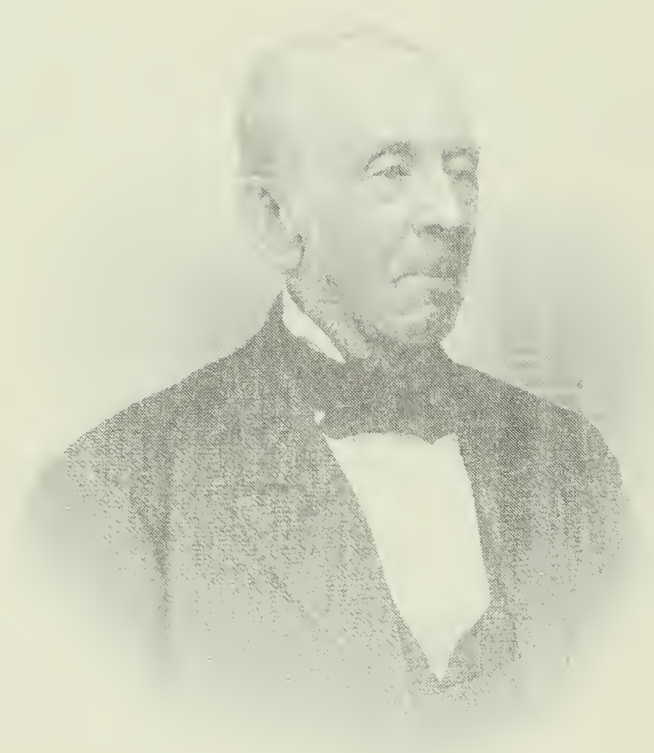
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MANUFACTURERS.







Van Slyck & Co Boston.



*Geo. B. Holmes*



PLYMOUTH COLONY, as well as north-western Connecticut, has long been a chief seat of the manufacture of iron from the ore. In these two localities of the iron manufacture, the ore differs essentially in its character and location. In the Old Colony, the ore is of the two kinds known as bog ore and pond ore, being found in the swamps and numerous ponds or small lakes of Plymouth and Bristol Counties. That of north-western Connecticut is the brown oxyde of iron, or hematite, and is quarried in the limestone and slate-rock of that region. A little more than twenty years after the first settlement by the Pilgrims, the reduction of ore was begun at Braintree, a grant having been made in town-meeting, on "the nineteenth of the eleventh month," to John Winthrop, Jr., and his partners, of about three thousand acres of the common land, "for the encouragement of an iron-work to be set up about Monoteot River;" and in 1652 the manufacture was also begun at Raynham, then a part of Taunton. Within the same century, forges and furnaces—wrought iron being made in the former and cast-iron in the latter—were established in several other places in Plymouth Colony. One of these was Kingston, at that time a part of Plymouth, and known as the "North End;" here a forge was established by Joseph Holmes, grandson of William Holmes. The latter came from England before 1641, settled first at Scituate, and removed thence to Marshfield. His son was the Rev. John Holmes, pastor of the church in Duxbury from 1656 to 1675. The second son of the latter, Joseph, was born in Duxbury, July 9, 1665; and, probably soon after attaining his majority, removed to the vicinity of Jones River Pond, in Kingston, and commenced the manufacture of iron from the ore. In this business his descendants, to the sixth generation, have continued the Forge established by him, nearly two centuries ago, having been owned and operated by them successively. About 1751 a large body of bog ore

was discovered by Joseph Holmes, probably grandson of the other of the same Christian name, while fishing in Jones River Pond. From this bed large quantities of ore were taken, for several years, for the use of the forge. The iron made there gained an excellent reputation as "Holmes's Iron," and furnished material for cannon-shot during the Revolution. The Forge is now owned by Frank H. Holmes, a son of Alexander Holmes, who preceded him as its proprietor. Alexander Holmes was a man of wealth and influence, and, for several years before his death, was president of the Old Colony Railroad. From Joseph Holmes was descended, in the fifth generation, George B. Holmes, the first agent, and, at the present time, treasurer, of the Phœnix Iron Foundry, of Providence, R. I.

George B. Holmes was born in Kingston, Mass., April 16, 1794. His father, Heman Holmes, had an interest in the old Forge, and also carried on a shop for the making of anchors, and other iron-work for ships; the town of Kingston being, in those years, largely engaged in ship-building. He died when his son George was about eleven years of age. The latter then became a member of the family of his uncle Charles, who was an iron manufacturer, and at that time was running the Holmes Forge. When about fourteen years of age, George began work as a regular apprentice with his uncle, having before this time attended the district school. He served a full apprenticeship, and, on attaining his majority, was placed in charge of the carding-room, and afterward of the weaving-room, of the Kingston Cotton Factory, in which his uncle was a stockholder. There he remained about two years. The next five years he was employed in the Iron Works at Kingston, connected with the Forge, in the manufacture of nails and similar articles. In 1822 he bought an interest in the Forge, and was its superintendent for two years. Two years later he removed to Providence, R. I., and took charge of the Providence Iron Foundry, owned by Samuel Slater, David Wilkinson, of Pawtucket, and Benjamin and Charles Dyer, of Providence. The foundry building then stood on a part of the ground now covered by the western end of the Providence Steam Mill. The business, under the care of Mr. Holmes, earned large profits during the next three years; and in 1827 the Company decided to erect a large mill for the manufacture of cotton goods, with power furnished by a steam-engine. This was the first cotton-mill operated by steam, in New England, and, perhaps, in the country. The foundry building was removed some distance eastward, and the erection of the western half of the steam-mill was begun, and completed in the same year. The next year the prospects for business were so good that the foundry was removed still further eastward, to its present location, and the cotton-mill was enlarged to twice its original length. A great crisis occurred in the manufacturing interests of New England, and especially of Rhode Island, in 1829, in which David Wilkinson failed. Samuel Slater, and

others of the stockholders, were, for a while, seriously embarrassed, and the operations of the foundry were temporarily suspended. Mr. Holmes, early in the next year, determined to engage in a new enterprise on his own account, and began operations in April, 1830, associating with him John McKie, Benjamin Dyer, Charles Dyer and Paris Dyer, as stockholders. This Company organized the Phoenix Iron Foundry. John McKie was a physician, and the other three were members of the firm of B. and C. Dyer & Co., commission merchants in the cotton trade. Mr. Holmes alone managed the business, the rest only investing capital. This was in the form of their notes, which they were not called upon to pay, as the business at once became so successful that the notes were paid at maturity out of the shares of the profits belonging to the parties. A charter was granted in 1832, and the capital was fixed at \$14,000. Dr. McKie was elected president, and Mr. Holmes agent and treasurer. The latter office he has held to the present time. As agent, he was for some years executive manager; and, under his administration, the business has been steadily prosperous and progressive. The capital has increased tenfold, being now \$140,000, divided into two hundred and eighty shares, and having a par value of \$500, but commanding a premium of at least \$300 per share. The entire capital has been earned, as the original subscription was the only one ever made.

The original buildings were erected in 1830, on leased land; but in 1863 this land, with additional lots, was bought, and a new foundry and other buildings were erected, to meet the requirements of the business, which had outgrown the old accommodations. The buildings are situated on Elm, Butler and South Streets, and consist of the original machine-shop, 30 by 100 feet; the foundry, 70 by 160 feet, with an ell; a fire-proof brick pattern-house, 30 by 130 feet, of two stories; a brick building for wood-work, 35 by 95 feet; a blacksmith's shop, 40 by 60 feet; and a stone machine-shop, 65 by 200 feet, two stories high. The last-named building is on Elm Street, and was built in 1848, its power being furnished by a Corliss engine of seventy horse-power. There are also various store-houses, for coal, sand and similar purposes. The whole constitutes a group of conveniently-arranged buildings.

The products are twofold—those of the foundry, and those of the machine-shop. An important item in the former branch are castings for gear-wheels, many of them of large size, and the collection of gear patterns, which has greatly increased during nearly half a century. An important specialty of manufacture in the machine-shop has been a great variety of machines, many of them very large, for dye-works, print-works and bleacheries. The principal establishments of these classes in Rhode Island, and the adjoining parts of Massachusetts and Connecticut, were furnished throughout by the Phoenix Iron Foundry. Hydraulic presses, shafting, pulley and

mill-gearing are other of the important products of the establishment. The construction of machines patented, or to be patented, has entered largely into the operations of the machine-shop.

The ordinary operations of the works give employment to about one hundred and seventy-five men, machinists, pattern-makers, molders, and so on. Improvements in methods and machinery have been introduced from time to time, and have added to the efficiency and productiveness of the works.

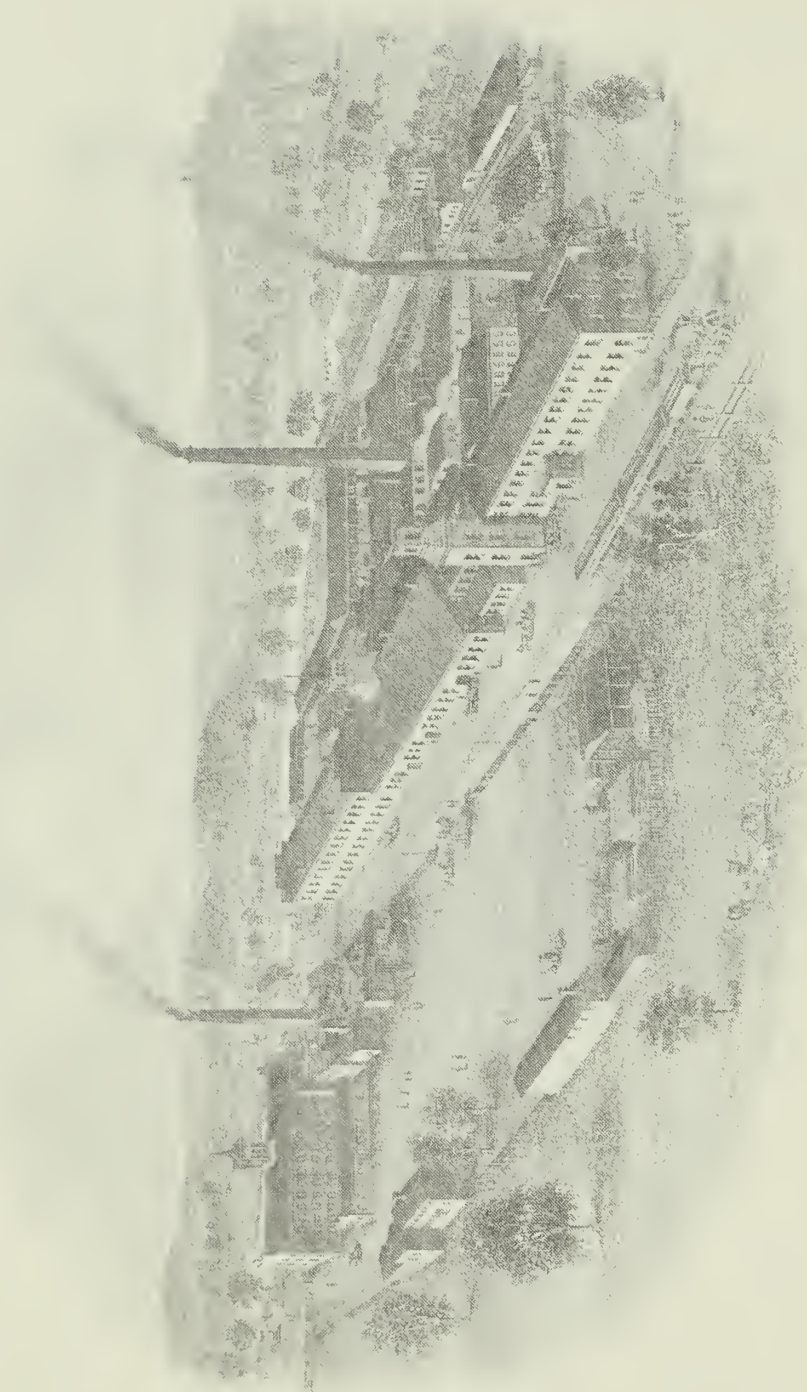
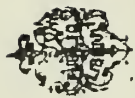
Mr. Holmes, on account of increasing age and a desire to be partly relieved from the executive responsibility, resigned the office of agent some years ago. He was succeeded by James S. Anthony, who now holds the office, and is also president of the corporation. Mr. Holmes is still treasurer, but is assisted in the actual duties of that office by Benjamin C. Gladding, who is also the secretary. These gentlemen, with William H. Holmes, the superintendent of the wood-working department, and Arnold Peters, the mechanical engineer, constitute the Board of Directors.

Mr. Holmes was a townsman of Ichabod Washburn, and a contemporary of, and intimate with, Samuel and John Slater, David Wilkinson, the first Governor Sprague, Philip Allen, and other eminent manufacturers.

A man of accurate judgment, and broad views regarding the iron trade and manufacture, he was consulted by the committee on the tariff of 1842, and gave them valuable advice.

Mr. Holmes has been several times a member of the General Assembly of Rhode Island, and has been a director in several banks and insurance companies. At more than fourscore years of age he retains much of his physical activity and his mental powers, but is gradually relieving himself from the personal care of the business, and committing its direction and control to younger men.





Wm. Lloyd Garrison

**EDWARDS, BOOTH, & FLANDERS.**

WATERBURY, CONN

## HOLMES, BOOTH AND HAYDENS.



THE firm of Holmes, Booth and Haydens, brass manufacturers, was organized at Waterbury, Conn., on Feb. 3, 1853. The gentlemen associated in it were Israel Holmes, John C. Booth, Henry H. Hayden, Hiram W. Hayden, and Henry Hotchkiss. Of these, Mr. Hotchkiss had no practical acquaintance with brass manufacture, and only invested capital. Sketches have been given of Mr. Hotchkiss, Israel Holmes, and John C. Booth in other portions of this work. Henry H. Hayden had been connected, for several years, with the trade in brass and articles made from it. Hiram W. Hayden has been connected with the company through the greater part of its history, mainly in its manufacturing department. He was born in Waterbury, Feb. 10, 1820, and was the son of Joseph Shepard Hayden, an inventor and tool-maker. Joseph's father, Daniel Hayden, held an honorable position among the mechanics of New England early in this century. He was a native of Attleboro, Mass., and was bred to the trade of a machinist. In his early manhood he went to Pawtucket, and worked on the machinery for the first cotton-mill of Samuel Slater. Remaining at Pawtucket for nearly twenty years, and working with David Wilkinson and others, he became expert in the cotton manufacture; and, in 1808, removing to Williamsburg, Mass., he built, about three miles west of the center of that town, the first cotton-mill erected in Western Massachusetts. The prosperous village which grew up around it was named after him, Haydenville. In 1817, he sold the factory to his nephews, Joel and Josiah Hayden, who became wealthy manufacturers. Removing to Waterbury, where, since 1808, his brother David had been a member of the firm of Abel Porter and Company, and of Leavenworth, Hayden and Scovill (the predecessors of Scovill Brothers), he hired a room in their factory, and began the manufacture of brass lamps, of a pattern invented by him; and of this he made a profitable business. In 1830 he and his son, Joseph S., began the manufacture of cloth-covered buttons by machinery.

Hiram W. Hayden, at fifteen, entered the employ of Scovill Brothers, and was engaged in chasing buttons, and afterward in die-sinking. He continued with that firm until about 1847, when he removed to Wolcottville, and went into the service of Wadham & Co., manufacturers of buttons. At Wolcottville was the factory of the Wolcottville Brass Company, a speciality of this company being the manufacture of brass kettles by the battery method. Mr. Hayden's attention was soon drawn to this method, and it occurred to him to devise a more effective way of making the kettles. The result of his invention was patented Dec. 16, 1851, and sold to the Waterbury Brass Company; a full description of this is given in the sketch of that company. In the battery method, there was a tendency to make the metal thinner at the angle, formed by the bottom and sides of the kettle, than elsewhere; so that there was most weakness at the very place where the greatest strength was needed. By Mr. Hayden's process, the metal was thickest on the bottom, at the angle, and on the lower part of the sides, and diminished in thickness gradually to the top, where there would be the least exposure to heat, and the least wear, and where, also, thinness was desirable, in order to finish the kettle easily, by turning the metal over the wire forming its upper periphery. When Mr. Hayden made this invention he was ignorant of the similar process, already in use, for spinning hollow-ware of pewter, britannia and other metals, less rigid than brass.

Mr. Hayden remained at Wolcottville until early in 1853, when he joined Mr. Holmes and others in the organization of the new company. Its capital stock was at first \$110,000; but it has since been increased, until it is now nominally \$400,000, and, with its surplus, has about \$1,000,000 in its business. The first five stockholders constituted the first board of directors. Israel Holmes was elected president, and John C. Booth, secretary and treasurer. In his official capacity, Mr. Holmes was nominally the executive head of the Company; but his real task was to superintend the internal operations of the "mill," as that part of a brass manufactory is called where the metal is rolled into sheets and drawn into wire. Hiram W. Hayden was in charge of the "factory," the part of the establishment devoted to the making up of the metallic sheets, or wire, into various articles. Henry H. Hayden had charge of the selling agency in New York. Mr. Holmes used his wide influence to induce other gentlemen already prominently connected with the business to invest in the Company's stock at an early period of its history. Among these were Gordon W. Burnham, of the Benedict and Burnham Manufacturing Company, Benjamin De Forest and A. W. Welton. On Oct. 3, 1853, Messrs. Burnham and Welton were added to the board of directors. For the purpose of increasing the business, a half interest in the retiring brass concern of Brown and Elton was bought of John P. Elton and Abram Ives in 1863; and they became

stockholders in the new corporation of Holmes, Booth and Haydens. The pin-wire business of Brown and Elton was divided equally between them and Brown and Brothers, then recently formed.

Holmes, Booth and Haydens engaged, like other brass companies, in rolling and drawing brass and copper. They also made the brass art-planished ware; and, as a specialty, they made sheets of copper plated with silver, for daguerreotypes and other purposes. When kerosene oil was introduced for lighting purposes, the Company added the manufacture of lamps and burners especially adapted to its use. Mr. Hayden has taken out various patents relating to the burning of kerosene oil, many of which have been a source of profit to the Company. Mr. Booth was secretary of the corporation during the greater part of the period from 1853 to 1868. The names of Benjamin De Forest, as secretary and treasurer, Dyer Ames, Jr., secretary, and Robert Crane, secretary, appear on its records as holding office for short periods in its earlier history. Elizur D. Griggs was treasurer from 1859 to 1867, when he retired, and, with Mr. Holmes and others, formed the Holmes and Griggs Brass Manufacturing Company, in New York. Mr. Holmes and Mr. Griggs had sold their stock in Holmes, Booth and Haydens the previous year, though Mr. Holmes remained until 1869, when he left, and joined in the formation of another brass concern in Waterbury, which took the name of the Holmes, Booth and Atwood Manufacturing Company. This name was afterward changed to the Plume and Atwood Company. In 1866 a concern organized by Messrs. Booth, Haydens and others, for the manufacture of buttons, was taken by Holmes, Booth and Haydens, and the manufacturing of silver-plated ware was added to their business.

Henry H. Hayden, the principal manager of the New York agency retired in 1871; and his brother, James A. Hayden, who succeeded him, retired in 1875. James M. Abbott was elected treasurer in 1867, and held the office until 1869, when, on the appointment of A. S. Chase to be president and treasurer, he was made secretary, and continued as such until within a recent period. Several changes in the board of directors occurred in January, 1869, and the following gentlemen were elected: Gordon W. Burnham, Henry E. Russell, Elisha N. Welch, A. S. Chase, Henry H. Hayden, James A. Hayden, Samuel A. Chapman and Henry Hotchkiss. H. H. Hayden retired in 1872, and his place was filled by Hiram W. Hayden. At the same time James S. Elton was elected director, in place of Henry Hotchkiss, deceased. In 1878 the board comprised A. S. Chase, Gordon W. Burnham, Henry E. Russell, Elisha N. Welch, Charles Benedict, James S. Elton and Samuel H. Willard. Since June, 1869, Edward C. Huxley has had charge of the Boston house of the concern; and its New York house has been managed by Samuel H. Willard since 1875, who had been engaged in its business for several years before. The business of the concern has been enlarged from time to time.

Augustus S. Chase, who has been connected with the active management since April, 1868, is the son of Seth Chase, of Pomfret, Conn., and was born Aug. 15, 1828. Obtaining his education in the public schools of his native place and at Woodstock Academy, he taught school one winter in Brooklyn, N. Y. At nineteen years of age he entered the store of Joseph D. Bates, in Killingly, Conn., where he remained until April, 1850, when he went to Waterbury, and entered the Waterbury Bank as book-keeper. The following year he was appointed assistant cashier, and in July, 1852, cashier, of the bank. He held that office until November, 1864, when, on the death of John P. Elton, he was elected president of the bank, and Augustus M. Blakesley succeeded him as cashier. Both have held these positions to the present time. Mr. Chase became interested in several manufacturing concerns, and, in 1864, a stockholder in the corporation of Holmes, Booth and Haydens, of which firm he was made a director in 1867. He accepted the office of secretary, to which he was elected on the resignation of John C. Booth, in March, 1868. At the annual meeting of the corporation in January, 1869, he was elected president, and treasurer on the retirement of Israel Holmes; and he has held these offices since that time. As director, or nominal officer, he has held advisory positions in several other concerns, and intimate relations with the general business of the place.



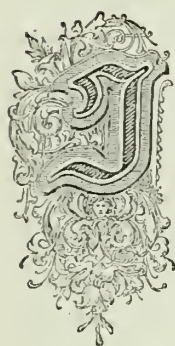


Van Slyck & Co. Boston



*Israel Holmes*

# ISRAEL HOLMES.



ISRAEL HOLMES was born in Waterbury, Conn., Dec. 19, 1800. His father, also named Israel, went from Greenwich, Conn., to Waterbury, in 1793, and married Sarah Judd. Her ancestor, in the sixth generation, was Deacon Thomas Judd, of Farmington, who came from England, in 1633, settled first in Newtown, now Cambridge, Mass., and was one of those who, with Rev. Thomas Hooker, made the settlement at Hartford, in 1636. In 1643 he and others founded the town of Farmington, and he was a deacon of the church in that town. His second son, Lieut. Thomas Judd, was one of the thirty original settlers of Waterbury. Of the sons of Israel and Sarah Judd Holmes, the eldest, Reuben, entered the United States Military Academy, at West Point, and graduated in June, 1823, at the head of his class. Before his graduation he had been employed as an assistant teacher in drawing and mathematics. He was commissioned as second lieutenant in the army, and continued in the service until his death, on Nov. 4, 1833. He served in the Black Hawk War, in 1832, as colonel of a regiment of Illinois volunteers.

Israel Holmes, the younger, received a common-school education, and became a teacher in the West Center district school of his native town. His first connection in business was as clerk with Horace Hotchkiss, then a manufacturer of hats, afterward his partner in the brass manufacture. He then went to Hamburg, S. C., where he engaged for a short time in trade on his own account. Returning to Waterbury, in 1827, he entered the employment of J. M. L. and W. H. Scovill, and was in charge of their store until 1831. He was sent by his employers to England, in 1829, to procure workmen and machinery. At this time the brass manufacture of Waterbury, though it had been in existence a quarter of a century, had progressed but little beyond the making of buttons; and, in the two concerns engaged in this industry,

only about \$25,000 of capital was employed. Mr. Holmes, believing that the manufacture of brass materials for the supply of makers of various articles gave good promise of success, entered, in 1831, into partnership with Horace Hotchkiss, Philo Brown, James P. Sommers, James Brown, Edward Field, Preserved W. Carter and Solomon B. Minor, under the firm-name of Holmes and Hotchkiss. Each partner furnished \$1000, and thus made up a capital of \$8000. Israel Holmes and Horace Hotchkiss were the agents and general partners. They bought a mill-privilege on Mad River, about two miles east of the center of the town, now owned and occupied by the Rogers Brothers Manufacturing Company, and began to build a small mill. While this was in progress, Mr. Holmes went to England, purchased rolling machinery, and engaged some skilled operatives. The rolls then procured were only eleven inches in diameter and twenty inches long, while many of those now in use are fifty-two inches long and twenty inches in diameter.

On the 16th of November, 1831, the mill was put in operation. In the following March John P. Elton joined the firm, investing \$1000. The mill was burned in September, and was not insured. This disaster did not dishearten the firm; but, obtaining a loan, on a mortgage from Dr. Samuel Elton, father of John P. Elton, they re-erected the mill, and added machinery for the manufacture of brass wire. The machinery for wire-drawing was put in operation about Jan. 1, 1832, and the first sale was made on the 12th of that month. On the 30th of January, 1833, the style of the firm was changed to Holmes, Hotchkiss, Brown and Elton, Mr. Sommers having sold his interest, and the other four gentlemen remaining as special partners.

Mr. Holmes sold his interest in the firm in January, 1834; his name, however, continued at its head until Feb. 1, 1837, when the style of the firm was changed to Hotchkiss, Brown and Elton. He entered into business arrangements, in 1834, with Israel Coe, who had, since 1826, been connected with the business of A. Benedict, and, since 1829, his partners, under the style of Benedict and Company. They removed to Wolcottville, and there started a brass-mill, their speciality being the manufacture of brass kettles, which they made by the English method, in use before the introduction of the spinning process, patented, in 1850, by Hiram W. Hayden, and described in our sketch of Holmes, Booth and Haydens. Mr. Holmes, on one of his visits to England, had seen the process of manufacture known as the "battery method," and now made a third voyage to obtain men skilled in it. In the sketch of the Coe Brass Manufacturing Company is a description of the "battery" method, or process.

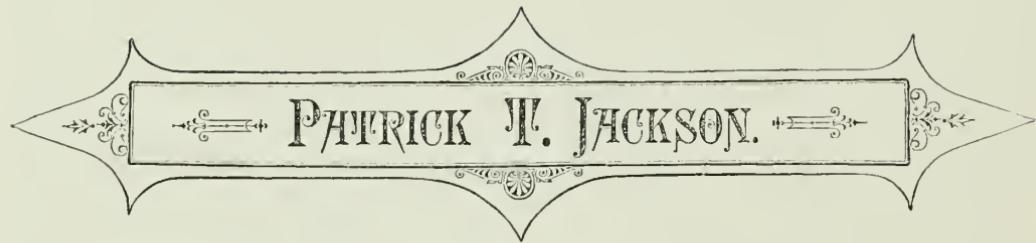
A new enterprise in the manufacture of brass was undertaken in 1845, at Waterbury; the old partners of Mr. Holmes, Philo Brown and John P. Elton, taking a

leading part in its formation, and Mr. Holmes being elected president and manager. Messrs. Brown and Elton only invested capital, and, of the other gentlemen interested, no one, except Mr. Holmes, was practically acquainted with the business. He invested some capital, and at once devoted himself to developing the new enterprise. The Waterbury Brass Company started with a capital of \$40,000, and in eight years had increased its capital to \$250,000 from its earnings. The Bristol Brass and Clock Company was organized in 1851, and Mr. Holmes took charge of starting its mills.

On the 21st of February, 1853, Mr. Holmes, with other gentlemen, inaugurated the enterprise now known as Holmes, Booth and Haydens, a sketch of which has been given in this work. He retained his interest and official relation, as its president, to that Company until early in 1869. On the 4th of February of that year, he organized, with others, the Holmes, Booth and Atwood Manufacturing Company, known, since Jan. 1, 1871, as the Plume and Atwood Manufacturing Company, an account of which is also contained in this work.

At the time of the organization of this Company, Mr. Holmes was nearly seventy; and during the remaining five years of his life, his relation to it was rather advisory than executive.

He married, in June, 1825, Ardelia C., daughter of Daniel Hayden; and his death occurred July 15, 1874. Of his sons, only one, Charles E. L., born at Waterbury, May 15, 1832, reached manhood. At fifteen years of age Charles went to an academy, at East Bloomfield, N. Y., intending to enter the Military Academy at West Point. He yielded, however, to the wishes of his father, and entered the employ of the Waterbury Brass Company, of which his father was then president. In 1851 he took charge of the Bristol Brass and Clock Company's mill, and remained there until 1853, when he returned to Waterbury, and was again employed by the Waterbury Brass Company. Later he went to Nebraska, and engaged in the manufacture and sale of lumber. Soon after the breaking out of the war, he was commissioned as colonel of the Twenty-third Regiment of Connecticut Volunteers, and served through the term of its enlistment, when he returned home, unable, on account of ill health, to resume military duty. He entered the employ of Holmes, Booth and Haydens; and, in company with his father and Elizur D. Griggs, of Waterbury, he formed the firm of Holmes, Griggs & Co., for the manufacture of brass, buying the property and business of the New York Brass Company from Jacob Hoppuck. The business was organized, in 1869, as the Holmes and Griggs Manufacturing Company. Mr. C. E. L. Holmes became, and still remains, the president and manager of this concern.



PATRICK W. JACKSON.



PATRICK TRACY JACKSON was born at Newburyport, Mass., Aug. 14, 1780. He was the youngest son of Hon. Jonathan Jackson, who graduated at Harvard College in 1760, was a member of the Continental Congress in 1782, and afterward United States Marshal for the district of Massachusetts, under President Washington. He also held successively the offices of Inspector and Surveyor of Internal Revenue; of treasurer of the Commonwealth for five years, and that of treasurer of Harvard College for the three years preceding his death. He married the daughter of Patrick Tracy, a rich merchant of Newburyport, who, coming from Ireland at an early age, by his own exertions raised himself to a position of wealth and influence. Of Mr. Jackson's sons, two graduated at Harvard College — Charles in 1793, and James in 1796; and each became eminent in his profession — the former in that of law, the latter in that of medicine. Hon. Charles Jackson, LL. D., was Judge of the Supreme Court of Massachusetts; and James Jackson, M. D., LL. D., was for many years at the head of his profession in Boston, and Professor of the Theory and Practice of Medicine in Harvard College.

Patrick Tracy, the youngest son, named after his maternal grandfather, received his education in the common schools, and afterward at Dummer Academy, and, at the age of fifteen years, became the apprentice of William Bartlett, then a prominent merchant of Newburyport. Young Jackson performed all his duties with so much alacrity and fidelity that he won the confidence of his employer; and before he was twenty years of age he was sent to St. Thomas, in one of Mr. Bartlett's vessels, in charge of a cargo of merchandise.

On or about the first day of the century, being then in his twenty-first year, young Jackson sailed for Calcutta, as the clerk of his brother Henry, who commanded a ship in the East India trade. He devoted himself diligently to the study

of navigation and seamanship, and became so proficient, that, on his return home, he engaged to make three voyages to the East Indies. On his last voyage his instructions from the owners required him to stop at the Cape of Good Hope. Cape Town had just been then captured by the English, and business was so disturbed that Captain Jackson was detained there a year. Meanwhile, he entered upon some personal enterprises, and did not return home until 1808, after an absence of four years. Mr. Jackson had now acquired capital; he relinquished his sea-faring life, and became a merchant in Boston in the East India trade. His commercial transactions had become large, when, in 1811, the relations of the country with Great Britain began to disturb the general course of trade. His credit was also seriously affected by the failure of a large house. He called his creditors together, and presented so full and clear a statement of his affairs as to satisfy them, and he was allowed to manage his business himself; and one of his largest creditors offered him pecuniary aid. Within a year his embarrassment passed away, and he was in a stronger financial position than before.

In 1812 his brother-in-law, Francis C. Lowell, started a new manufacturing enterprise, and invited Mr. Jackson to join him in the venture. The Boston Manufacturing Company was organized, and Mr. Jackson became its treasurer and managing agent. His duties as agent required him to spend most of his time at Waltham, and finally so engrossed his energies, that, in 1815, he closed up his mercantile business in Boston. After Mr. Lowell's death, in 1817, he became the full executive head of the Company.

The business of the Boston Manufacturing Company, within the next four years, increased so rapidly that additional mills were needed; and the whole capacity of the Charles River, in that vicinity, was exhausted. Mr. Jackson believed that the time had come for starting an enterprise on even a larger basis in some other locality; and with this view Mr. Appleton fully coincided. Besides his business as selling agent of the Boston Manufacturing Company, Mr. Appleton, had been for years connected with a firm, a large part of whose business was the sale of English cotton goods, among them, printed calicoes. These had not yet been made in this country, and Mr. Appleton proposed a new company which should have for its main object the manufacture and printing of these goods. They together engaged, in September, 1821, in exploring localities in New Hampshire, but without success. Some weeks later, Mr. Moody, returning from a visit to Bradford and Amesbury, informed Mr. Jackson that he had been prospecting about the falls of the Pawtucket, at East Chelmsford, and was satisfied that there was a water-power admirably fitted for a great manufacturing center. He drew, with chalk, upon the floor, a diagram of the river, the falls and the canal. Mr. Jackson at once conceived

the idea of obtaining the control of the whole water-power of the Merrimac at this point. He knew that both secrecy and prompt action would be necessary; as, if parties interested should hear of the project, a larger price than he wished to pay might be put upon the property. Without consulting with any one he commenced negotiations, and obtained the terms. He then informed Mr. Appleton; and, together with Kirk Boott, they completed the purchase, and inaugurated the enterprise which resulted in the creation of the industries of Lowell.

Mr. Jackson, having established the business at Waltham on a permanent basis, and having contributed much to laying the foundation of the future Lowell, decided to retire from active business. He resigned his position as treasurer and agent at Waltham, and was succeeded by John A. Lowell, nephew of Francis C. Lowell, but retained the offices of director, both in the Boston and in the Merrimac Manufacturing Company. His life of leisure was, however, of brief duration. His temperament was too active to be able to enjoy so early a retirement. Paul Moody had recently introduced some important improvements, and was satisfied that a great saving in expense and a higher rate of speed might be realized. With a view of adopting these improvements, Mr. Jackson engaged in securing subscriptions to the stock of a new company, to be named, after his early friend and coadjutor, the Appleton Manufacturing Company. The stock was readily taken up, and Mr. Jackson was appointed agent and treasurer. Under his supervision two large mills were built, and the improved machinery was started in 1828. He conducted the affairs of the company for nine years, with highly successful results.

In 1830 steps were taken which led to the construction of the Boston and Lowell Railroad. With the increase of manufacture, the question of transportation had become one of vital importance. The Middlesex Canal and the ordinary roads were the only avenues of transportation. In the season of winter, the former was wholly closed, and the latter greatly obstructed, by snow and mud. Mr. Jackson and Mr. Boott at first thought of constructing a macadamized road. The success of the Liverpool and Manchester Railroad, in England, under George Stephenson, was then attracting attention; and Messrs. Jackson and Boott decided that a similar road between Lowell and Boston must be built. Under their lead, the Proprietors of Locks and Canals voted to pay a bonus of \$100,000 on the completion of the road; and Mr. Jackson devoted himself to pushing both the preliminaries, and, afterward, the actual construction of it. His capacity and energy were shown in its speedy completion, with a double track. It was opened for travel earlier than any other railroad in New England, for its entire length, and, except the Camden and Amboy, earlier than any other in the United States.

In 1837 Mr. Jackson was disposed once more to relinquish active business. He

was fifty-seven years of age, and had conducted his varied enterprises to assured success. But misfortune now overtook him. While engrossed in enterprises in which he was the agent of others, he had invested largely in speculations to which he could give no personal attention. The disastrous issue of these, in the commercial crisis of 1837, deprived him of most of his property.

The death of Mr. Boott, in the spring of the same year, had been a severe loss to Lowell, and had especially affected the corporation of the Proprietors of Locks and Canals, of which he was the agent. The directors now invited Mr. Jackson to assume the agency, offering him a salary larger than had then been given in any similar position in the country. He accepted the office, and held it seven years, at the end of which period the affairs of the Company were closed up, the stockholders receiving \$1,600 per share—a gain of sixty per cent on its value at any time previous to 1837, and of about one hundred and thirty per cent on its value when Mr. Jackson assumed the agency.

In 1844 he was elected treasurer and agent of the Great Falls Manufacturing Company, at Somersworth, N. H. This corporation, organized in 1828, had not, for several years, been successful. On accepting the agency Mr. Jackson resolved to rebuild the dam, remove one of the mills, which was badly situated, and replace the whole machinery, of obsolete device, with that which was new and improved.

For some time after entering on his work at Great Falls, Mr. Jackson seemed to have all the elasticity and vigor of earlier years. He overtaxed his powers, however, and soon began to show signs of prostration. Attacked by dysentery, in the summer of 1847, he sank under the disease, dying at his sea-side residence, in Beverly, Sept. 12, 1847. In all of the enterprises in which Mr. Jackson was engaged, he exhibited remarkable sagacity and keenness in mastering details, and was noted for his promptness, accuracy, and courage in action.



**A**MONG those who, within the past half a century, have aided the progress of American industry by important inventions, an honorable place is held by Lucius J. Knowles, who was born July 2, 1819, at Hardwick, Mass. In his early boyhood he worked on his father's farm, at intervals attending the village school; and for three years he was a pupil in the academy at Leicester. While yet a boy he evinced a taste for invention and mechanical construction by devising and building some novel though crude machines in a workshop adjoining his father's house. At seventeen he left home, and obtained employment as a clerk, in a store at Shrewsbury. After serving in this capacity about two years, he became his employer's partner. He soon discovered, however, that mercantile pursuits were not congenial to him, while to construct machines was his delight. He spent more time, therefore, in studying mechanics than in serving customers; and among other devices which he contrived at this time were some improvements in the construction of organs and other reed instruments, since generally adopted, of several working models of steam-engines, and the invention of the mechanism afterward known as the safety steam-boiler feed-regulator.

Mr. Knowles severed his connection with the store in Shrewsbury in 1840, and began business as a mechanic. He now studied electricity and magnetism, hoping to find in these agents a new motive power. He succeeded in operating, by electricity, several engines of his own construction, when his attention was called to the discoveries of M. Daguerre, and he began some experiments in the same direction. Having, during two years, prepared the necessary apparatus and material, he devoted himself to the practice of the daguerreotypic art.

Near the close of this period Mr. Knowles invented a machine for spooling thread; and, leaving the business of a daguerreotypist, in the year 1844 he began the



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*L. J. Knowles*



manufacture of thread, at New Worcester. Soon after, he resolved to undertake the production of an article of thread that should equal the fine, six-cord, spool cotton which had then recently been introduced into the United States from England. Two years were spent in careful and successful experiments; but, for want of capital, he found himself compelled to abandon the undertaking, and now turned his efforts in another direction. He associated with him Harrison H. Sibley, and, in the year 1847, commenced, at Spencer, the manufacture of cotton warp, in a small factory built for the purpose. For two years the business was successfully carried on; but their water-supply then becoming inadequate, they transferred their operations to Warren. They secured a small mill on the Quinebaug River, and for several years carried on the manufacture of cotton warp with profit.

In 1853 Knowles and Sibley extended their business by adding to it the manufacture of woolen goods, in a mill which they built for the purpose half a mile below their cotton-mill. This enterprise they prosecuted successfully until 1860, when Mr. Knowles disposed of his interest in the woolen-mill to Mr. Sibley, and at the same time became the sole proprietor of the cotton-mill.

These changes in Mr. Knowles's business relations were due to his desire to confine his energies chiefly to the production of machinery of his own invention. While prosecuting the manufacture of cotton and woolen goods, he had devoted much time to experiments in this direction; and now he continuously engaged himself in the solution of new problems in practical mechanics. Between the years 1856 and 1877, nearly forty patents for new inventions were granted to him.

He had obtained, before his withdrawal from the woolen manufacture, several patents for improved machinery. Two of these, taken out in 1856, were granted for improvements in looms; and, in each, important advantages in construction and operation were secured. Another patent, issued in January, 1859, covered an improved method of operating the valve of pumping-engines. In 1862 Mr. Knowles erected a building on a branch of the Quinebaug, near his cotton-mill, in which he commenced the manufacture of his boiler feed-regulator; and in the following year he commenced, in the same building, the manufacture of his steam-pump, which had been constructed for him until then in Springfield.

In starting the manufacture of the steam-pumps, Mr. Knowles laid the foundation of an establishment whose products have since become well known, and widely distributed. More than 15,000 pumping-engines, from small locomotive-pumps to large pumps for draining mines, have been sent to many parts of the United States and to foreign countries; and agencies have been established in the principal cities of this country, and in London and Liverpool, in Cuba, Chili, Australia and the Sandwich Islands. Improvements have been added from time to time, by means

of which the pumps have been adapted to every purpose for which a steam-pump is required. In connection with mining, they are used both for the removal of water from deep mines, and for forcing air into them for ventilation; and they are employed in manufacturing and other establishments for pumping acids, and as fire-pumps. Mr. Knowles was the first American to produce a direct-acting pump, with the valve worked by steam. Among these, a pair of pumps, having the capacity of lifting 8,000,000 gallons of water per day are now used at the water works in Chicago; a single pump, with a capacity of 3,000,000 gallons per day, is in operation at Georgetown; and a third, of similar capacity, at Lyons, Iowa.

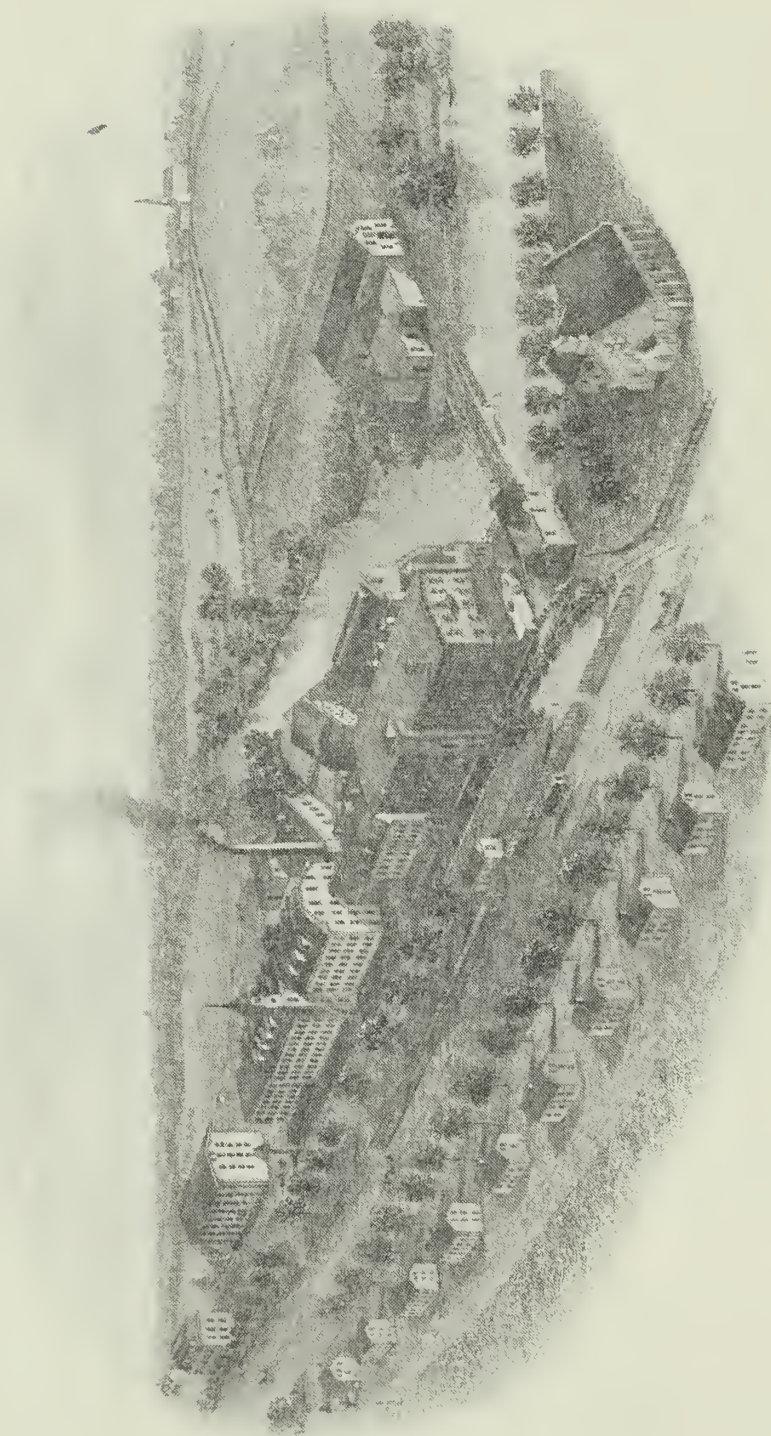
In 1862 Mr. Knowles, associating with him his younger brother, F. B. Knowles, under the firm-name of L. J. Knowles and Brother, commenced at Warren the manufacture of looms. The looms first made by the firm were constructed to weave tapes, bindings, ribbons and other narrow fabrics. These the firm still make, and they are now in general use by tape and ribbon manufacturers throughout the country.

Mr. Knowles has also devoted much time to perfecting his fancy cassimere loom, which is called an open-shed loom, in distinction from the closed-shed loom previously used. His first patent for this kind of loom was granted Feb. 24, 1863, and was issued for a loom for weaving checks and figured goods, employing cranks and toothed crank-wheels, in connection with revolving lifter and depressor wheels, so arranged and operated as to dispense with the cam, and thus to run the loom with greater economy of time and power. More recently, Mr. Knowles has adapted his loom to the weaving of many new fabrics; and he has devised mechanisms by which almost every kind of fancy textile fabrics, whether of cotton, wool or silk, can be readily produced; tapes, ribbons, webbing, galloons, suspenders with woven button-holes, Marseilles quilts and other articles. A permanent demand for this loom having been created, in 1866 the Messrs. Knowles removed their manufactory to Worcester, where the business has since been conducted.

Although having the chief management of this large business, in 1871 Mr. Knowles was elected a trustee of the Worcester Free Institute of Technology, and is now one of the directors of its mechanical department. In 1874 he went abroad to see the principal manufactories in Europe; and, while there, he visited the leading scientific schools in England and on the Continent.

In 1862 and 1865 Mr. Knowles was a member of the legislature of Massachusetts, and was a State senator in 1869. He has been a member of the city government, president of the Worcester Board of Trade, and is connected with various commercial and moneyed institutions of Worcester. In 1869 he received the honorary degree of A.M. from Williams College.



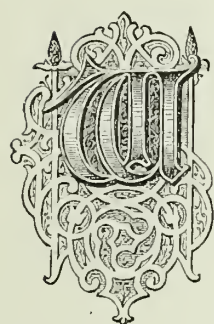


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# PONTIAC MILLS AND BLEAERY.

WARWICK, R. I.

## B. B. AND R. KNIGHT.



WHILE many of the cotton manufacturing enterprises of Eastern Massachusetts were started and are owned by corporations, the members of which have invested capital in them, but, pursuing other avocations, have deputed the practical management to salaried agents, those of Rhode Island are, to a large extent, in the hands of individuals or firms who personally supervise and devote themselves to their several industries. Of this character are the enterprises of A. and W. Sprague, of Brown and Ives, and of B. B. and R. Knight. Of the latter firm the present are the original partners, the firm having been formed in 1852, and having continued, from that time to this, in the same hands.

Benjamin Brayton Knight was born in Cranston, R. I., Oct. 3, 1813. Soon after attaining his majority, he began business on his own account, as a grocer, and continued it at Cranston about three years. He then removed to Providence, established himself, and continued successfully for eight years. In 1846 he began a commission business, mainly in flour, and soon gained a large trade. In 1852 he bought from his brother Robert an interest in the cotton-mill and bleachery at Pontiac, R. I.; and from that time he has been identified with his brother in the manufacture and finishing of cotton cloths.

Robert Knight was born in Warwick, R. I., Jan. 8, 1826. At eight years of age he was put to work in the Cranston Print Works, and two years later in the cotton-mill in Coventry, belonging to, and operated by, Elisha Harris, afterward Governor of the State. Robert Knight remained in this mill until he was seventeen years old. Early in 1843 he went to Providence, and entered the employment of his brother Benjamin, in his store, where he remained about two years. He then entered the Pawcatuck Academy, at Westerly, R. I., and pursued his studies about eighteen months. In 1846 he went to Warwick, and became a clerk in the

store of the factory. This locality was first known as "the great weir." Before the erection of mill-dams on the Pawtuxet River, different kinds of fish—salmon, shad, etc.—migrated from the ocean to inland ponds, to deposit their spawn. The demand for fish, after the settlement of the region, had led to the construction of "weirs." The first use of the water-power at this point was in 1810, when Henry and Dutec Arnold erected a saw and grist-mill. Horatio Arnold afterward carried on wool-carding and cotton-spinning in a small mill, which he built on the same privilege. This mill was also used, at different periods, for the manufacture of coarse woolen cloth. In February, 1827, Rice A. Brown, Jonathan Knowles, and Samuel Fenner bought the land and two-thirds of the water-power, and ran the cotton-mill for about two years. Its capacity was then one thousand spindles. In 1829, like most of the cotton manufacturers of Rhode Island, the firm failed; and the next year the property was sold to John H. Clark.

Mr. Clark was born in Elizabethtown, N. J., April 1, 1789. He was a lineal descendant from Dr. John Clark, the friend and associate of Roger Williams. His mother was the daughter of Esek Hopkins, the first commodore of the American navy. Graduating from Brown University in 1809, he at first practiced law at Newport, R. I.; but he relinquished it to engage in business as agent of the Providence Steam Mill. He continued in this position until the failure of one of its principal proprietors, David Wilkinson, and the temporary embarrassment of another, Samuel Slater, compelled the suspension of its business. In 1830 he purchased the cotton-mill at Arnold's Bridge, and gave the name of "Clarksville" to the village. Two years later he bought from the Arnolds the remaining one-third of the water-privilege, and erected a stone-mill with a capacity of about 3000 spindles. George T. Spicer, now the head of the firm of Spicers and Peckham, of Providence, was superintendent until 1845. In 1834 Mr. Clark built a bleachery having a capacity of twenty-two hundred and fifty pounds per day. Mr. Clark was elected, in 1846, a member of the United States Senate. He then leased the mill and bleachery for \$5,000 a year, to Zachariah Parker, who had been the superintendent, and Robert Knight, who had been clerk in the store, and they entered into partnership, under the style of Parker and Knight. Mr. Parker remained at Clarksville, in charge of the mill and bleachery, while Mr. Knight went to Providence, to take charge of the office and business there. On Oct. 4, 1850, Messrs. Parker and Knight purchased the whole property from Mr. Clark for \$40,000; and the next year Mr. Knight bought his partner's interest, and the firm was dissolved. In February, 1852, he entered into partnership with his brother Benjamin, and sold to him one-half of the property and business at Pontiac, the firm at that time taking the name of B. B. and R. Knight. On coming into possession of the property, Robert Knight gave to the village its present name of "Pontiac."

In July, 1853, the firm bought the mill property at Hebronville, in the town of Attleboro, Mass., where a wooden factory had been recently erected. The Messrs. Knight had begun to complete its equipment and start the machinery, when the mill was struck by lightning and burned. They rebuilt it of brick, and put it into operation on the 1st of July, 1854. It then had a capacity of 5000 spindles, which has since been increased to 21,000. In the same year they purchased the mill property on the privilege next above that at Hebronville, in the village known since 1822 as Dodgeville. The original factory at Dodgeville was one of the oldest cotton-mills in Massachusetts, having been established in 1809 by Eben Tyler, of Pawtucket, Nehemiah Dodge, Peter Grinnell and Son, and Abner Daggett, of Providence, and Elias Ingraham, and Edward Richardson, of Attleboro, under the style of the Attleboro Manufacturing Company. The first factory was 88 feet long by 31 feet wide, two stories high, with a basement. Eben Tyler was the first managing agent. In 1820 Josiah Whitaker and John C. Dodge bought an interest of one-half of the property, the mill at that time running 1320 spindles. The next year the name was changed to the Tyler Manufacturing Company, John C. Dodge being the agent. In 1822 Nehemiah and John C. Dodge purchased the interest of the other proprietors, and continued the business as N. and J. C. Dodge. The village then took the name of Dodgeville. Nehemiah Dodge was the first to manufacture jewelry in Providence, having commenced the business in 1795, and having as apprentices Jabez Gorham and others, since well known in what has become an important industry in Providence. John C. Dodge was a son of Nehemiah, and Josiah Whitaker, associated with John C. Dodge in the purchase of one-half the property in 1820, was also a manufacturing jeweler. The business of N. and J. C. Dodge was successful; and, in 1829, they built an addition to their mill of ninety-six feet, making it one hundred and eighty-four feet long. In 1834 it contained four thousand spindles, ninety-two power-looms, and employed one hundred and thirty hands. On the purchase of the property by the Messrs. Knight, in 1854, they rebuilt the mill, and put the tenements in thorough repair; and they have since enlarged the mill, increasing its capacity to twenty-three thousand spindles, and adding to the tenements in the same proportion.

In 1858 they enlarged their bleachery at Pontiac, giving it a capacity of five tons per day. The stone cotton-mill of 1832 was taken down in 1863, and a fine brick-mill, 250 feet by 66 feet, with an ell 90 feet by 40, and a capacity of 21,000 spindles, was built. In 1866 they also built, at Pontiac, a large brick building, its lower story being devoted to the factory store, and the upper containing a spacious hall for religious and social meetings.

The bleachery at Pontiac was burned in April, 1870. It was at once rebuilt,

and was finished by the 1st of September, and the bleachery resumed operations. The new building was 160 feet by 40, was equipped with all improved machinery for bleaching, and was capable of finishing ten tons of cloth per day, this being twice its former capacity.

In 1871 the Messrs. Knight purchased the Grant Mill, on Carpenter Street, in Providence. The building had been erected for the manufacture of hats, and had been afterward owned by William A. Howard, of Providence. On its purchase by its present proprietors, they filled it with cotton-machinery, to the capacity of 8000 spindles.

In October, 1872, the firm bought a controlling interest in the Manchaug Mills, originally built in 1826. These mills took their name from the pond in Sutton, Mass., from which they obtain their water-power. The first mill was owned by Jonathan Congdon, Randall H. Green and Samuel Congdon, of Providence. They did a successful business until 1829, when they sold the property to Samuel Shove, of Woonsocket. After its failure, in 1834, it passed into the hands of Dexter Thurber, Lewis Dexter and others. Various other persons owned an interest in the mills until Jan. 1, 1873, when they became the property of B. B. and R. Knight and Lewis Dexter, son of the gentleman above named, the former owning two-thirds and the latter one-third. During the fifty years of its history the capacity of the mills has been increased by additions and improvements in buildings and machinery, so that instead of 640,000 yards of cloth made in 1835, about 6,400,000 yards were made in 1876. The goods manufactured are those called "Fruit of the Loom."

In the spring of 1874, the Messrs. Knight became proprietors of their largest cotton-mill under one roof, the Whiterock Mill, in Westerly, R. I. This enterprise was started, in 1826, by James F. Simmons and others, who received a charter as the Whiterock Manufacturing Company in 1833, and in 1843 sold the property to Rouse Babcock, Jesse L. Moss and others. They built, in 1849, under the superintendence of David Whitman, a brick mill of 10,000 spindles. The Messrs. Knight renovated the establishment, furnishing it throughout with new machinery, and in 1877 rebuilt it, increasing its capacity to 26,000 spindles. They have also erected, for the benefit of the operatives and their families, a spacious building for religious social, and other uses.

In 1876 the firm bought an interest of more than two-thirds of the Clinton Mill, at Woonsocket, R. I. The land on which this mill stands was purchased, in 1827, by Benjamin and Thomas C. Hoppin, of Providence; and, between that time and 1830, they erected a small cotton-mill. On the 1st of November, 1830, the Messrs. Hoppin sold the property to Edward Carrington, also of Providence; and in 1832 John H. Clark became joint owner with General Carrington, the mill being at that

time known as the Carrington Mill. Mr. Clark bought out his partner's interest in 1845, and soon after sold the whole property to George C. Ballou, Oren A. Ballou, James T. Rhodes and Peleg A. Rhodes. In October, 1876, in the settlement of the estate of George C. Ballou, the property was sold to B. B. and R. Knight and others, the number of spindles being at that time 15,000. They have since been increased to 20,000; and the old machinery has also been, to a large extent, replaced by new and improved machinery.

The bleachery at Pontiac was again burned on Dec. 17, 1876; was again rebuilt, in two months; and operations were resumed Feb. 17, 1877. The capacity of the works, which had been, since 1870, increased from ten to fifteen tons per day, in the reconstruction was again increased to twenty-five tons per day.

The mill at Fiskville, in the town of Scituate, R. I., one of the oldest cotton-mills in Rhode Island, and in later years owned by Ex-Gov. Charles Jackson, was purchased by the Messrs. Knight in 1877. This mill has a capacity of 4000 spindles.

The aggregate capacity of all the mills owned or controlled by the firm is 172,000 spindles. This large combined interest, which has been built up since 1850, illustrates the energy and enterprise of the Knight Brothers, who have worked together, — the elder a trained merchant, the younger a trained manufacturer, — in attaining a prominent position among the representative manufacturers of New England.



It is only within the past half a century, that iron turbine-wheels have been substituted for wooden water-wheels in establishments where the machinery was run by water-power. The mill-wrights of the early part of this century were the only mechanical engineers. They were employed, not only in building the massive water-wheels, and in placing them in position, but also in superintending the putting up of shafting, the adjustment of pulleys and gearing, and the arrangement of machinery. Among those so engaged, in the early part of his career, was Estus Lamb; but, for many years, he has been connected with cotton and woolen manufactures, and is largely concerned in mills at Blackstone, Mass., and at Putnam, Conn., while a resident of Providence, R. I.

Estus Lamb is of Scotch descent; but his ancestors, for three or four generations, were residents of Charlton, Mass. His grandfather, Reuben Lamb, the fourth of five sons, was born in Charlton, in 1742, and died in 1819. He and his brothers were men of influence, and served the country in civil affairs, and as soldiers in the Revolution. They were all farmers except Reuben, who was a miller, as well as a carpenter and wheel-wright. To obtain the advantage of water-power, he moved, in early manhood, to North Oxford, where he built a dam and mill, and established himself in business. He had seven sons, of whom the fourth, Joshua, moved to the State of New York, and became eminent as a lawyer and judge. The fifth son, Joseph, was born in 1785, and died in 1867, at the age of eighty-two. On his marriage to Sallie Barton, of Millbury, Mass., he moved to Charlton, and was the father of three sons, of whom the subject of this sketch, Estus, was the eldest. Estus was born in Charlton, Sept. 3, 1809. In the next year his father returned to North Oxford, taking the homestead, and succeeding to his father's business.

In 1816 his mother died; and, soon after, his father, having married again,



ESTUS LAMB



*Estus Lamb*



sold the mill and privilege to a nephew, and opened a hotel. In 1822 Estus went to live with his cousin to learn the trade of mill-wright, which had been added to the other branches before carried on in the establishment. He worked here, however, only as a carpenter and as a wheel-wright, acquiring skill in the use of tools. At eighteen he left the employ of his cousin, and entered that of Israel Sibley and Ezra Davis, then engaged as mill-wrights at Oxford Plains, contracting to work two years for two hundred dollars. His father claimed this amount, relinquishing, however, his claim for the remaining year of his son's minority. At the end of the two years, by extra work, Estus had earned, besides the two hundred dollars, enough to purchase a good set of tools.

He now engaged to work as a journeyman for Sibley and Davis; and on the retirement of Mr. Davis, a year after, Mr. Lamb entered into partnership with Mr. Sibley. This relation continued about two years, when Mr. Sibley also retired. From that time Mr. Lamb carried on the business on his own account, until early in 1839. Meanwhile, he was employed on some of the largest mills then in Rhode Island, and the adjacent parts of Massachusetts and Connecticut, one of which was the great brick mill in Waterford, Mass., begun in 1832 by W. and D. D. Farnum, and now owned by the Blackstone Woolen Company. In 1839 Mr. Lamb took D. D. Farnum's place in charge of the mechanical and manufacturing departments of the firm's business. He then closed up his business as a mill-wright, and devoted himself to the woolen manufacture, in the place where he has remained for nearly forty years.

In 1847 he entered into copartnership with Henry S. Mansfield; and they bought the scythe-works in a part of North Smithfield, R. I., called Forestdale, belonging to Mansfield and Holman, previously Mansfield and Darling, the senior partner of both these firms being the father of Henry S. Mansfield. The partnership of Messrs. Mansfield and Lamb continued until 1870. During the Civil War the firm was engaged in the manufacture of sabers for the Government. In 1852 Mr. Lamb entered into partnership with Edward Seagrave and Joseph Chace, and hired the mill belonging to, and previously run by, Welcome Farnum, and now occupied by the Blackstone Woolen Company. Mr. Seagrave had been a partner of Edward Harris, at Woonsocket, R. I., from 1831 to 1837, and was afterward a merchant at Providence. In the new firm, the name of which was Edward Seagrave & Co., Mr. Seagrave was the financial manager and the purchasing and selling agent; while Messrs. Lamb and Chace had the management of the mill. In 1853 Mr. Seagrave sold his interest to Evans and Seagrave, of Providence, that firm consisting of Bailey W. Evans and Caleb Seagrave, son of Edward; and Mr. Chace sold his interest to Edward Delabarre, the business from that time being conducted as the Delabarre Woolen Company.

Welcome Farnum went into bankruptcy in 1855; and all his property at Waterford came into possession of the mortgagees, J. C. Howe & Co., of Boston, and Earl P. Mason, of Providence. After the division of the property, Messrs. Evans and Seagrave purchased from J. C. Howe & Co. the mills which had been known as Mill No. 1 and Mill No. 2, the former having twenty-two, and the latter five, sets of machinery. Mill No. 1 continued to be operated by the Delabarre Woolen Company, and Mill No. 2 by F. M. Ballou & Co., a firm consisting of Frederick M. Ballou, Bailey W. Evans and Caleb Seagrave, which had hired that mill from Welcome Farnum in 1847. On the 1st of January, 1876, a new company was formed to operate Mill No. 1, its style being the Blackstone Woolen Company, the stockholders of which were Earl P. Mason, Estus Lamb, Bailey W. Evans and Caleb Seagrave, Edward Delabarre having sold his interest.

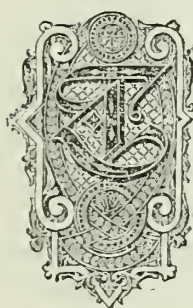
In 1859 Messrs. Mansfield and Lamb built, on land connected with the scythe-factory in North Smithfield, a stone mill of a size sufficient for 15,000 spindles; and in the next year, with Messrs. J. F. and W. S. Slater and George W. Holt, they formed a joint-stock company, called the Forestdale Manufacturing Company. This Company hired from Mansfield and Lamb, on a lease of ten years, the building and other real estate, and put in machinery for the manufacture of cotton goods, of the capacity of 10,000 spindles, which was afterward increased to 15,000 spindles; and the business was carried on through the term of the lease, with profit and success. At its termination, Messrs. J. F. and W. S. Slater purchased the interest of the other stockholders in the machinery, and of Mansfield and Lamb in the real estate.

Mr. Lamb, with Bailey W. Evans, George E. Seagrave (brother of Caleb) and Edward Delabarre, organized a new firm in 1871, under the style of Evans, Seagrave & Co., and purchased the interest of F. M. Ballou in Mill No. 2. The interest of Evans, Seagrave & Co. in Mill No. 2 has continued to the present time, the only change being the withdrawal of Edward Delabarre, January, 1876, who, on that date, sold his interest to his partners.

On the 1st of January, 1873, Mr. Lamb, with his former partner in the Forestdale Manufacturing Company, George W. Holt, and their sons, Augustus F. Lamb and George W. Holt, Jr., organized the Monohansett Manufacturing Company, for the manufacture of cotton goods. The mill is situated at Putnam, Conn., and has a capacity of 13,000 spindles. It is under the management of George W. Holt, as Resident Agent; George W. Holt, Jr., as Superintendent; and Augustus F. Lamb, as Treasurer and Selling Agent. The business office is at Providence.

Mr. Lamb married, in 1842, Mrs. Dency Farnum, widow of Darius D. Farnum. Their only living child is Augustus F. Lamb, who has the financial management of the Monohansett Company.

## LAMSON & GOODNOW MFG. CO.



THE Lamson and Goodnow Manufacturing Company, of Shelburne Falls, Mass., engaged in making cutlery and table goods, is the successor of the firm of Lamson, Goodnow & Co., which was composed of Nathaniel Lamson, Abel F. Goodnow and Ebenezer G. Lamson. This firm was employed for many years in the manufacture of scythe-snaths, the inventor of which, in the form made by them, was Silas Lamson, the father of the two brothers named above. He was born in Boylston, Mass, in which town his father, Nathaniel Lamson was a farmer and house-carpenter. Silas worked both on the farm and in the shop until he was about eighteen years of age. The scythe then in ordinary use was furnished with a straight handle, or snath. It occurred to young Lamson that it would be an improvement to have it bent, or crooked. Making one for his own use, he found that he could mow with it with much less labor and more rapidly than with the straight snath. He now resolved to devote his whole time to the manufacture of these handles, and began to do this in Boylston, but soon removed to the adjoining town of Sterling. He did not secure a patent; but, by a careful selection of material and skill, he secured a virtual monopoly in the market. Of Silas's sons, Nathaniel was born in Sterling, in 1805, and began in his youth to assist his father in his manufacture. He removed, in 1833, with his brothers Silas and Jeremiah, to Shelburne Falls, and there commenced business. In about a year Silas and Jeremiah went to the West, and became merchants. Nathaniel then formed a partnership with Dea. Cyrus Alden; and this connection continued until Mr. Alden's death, when his place was taken by Jonas B. Goodnow. The firm-style was then changed to Lamson and Goodnow. On the latter's death, in 1838, his nephew, Abel F. Goodnow, succeeded to his interest in the business; and Ebenezer G., brother of Nathaniel Lamson, was admitted into the firm in January, 1839. He had

accompanied his father, who had removed his business to Cummington, Mass., in 1832, and remained with him until 1837. He then engaged as a salesman for Lamson and Alden. On his admission to the firm, the style was changed to Lamson, Goodnow & Co; and, May 24, 1851, the Shelburne Falls Manufacturing Company was incorporated. The capital stock was fixed at \$300,000, and the partners in the firm were the original stockholders in the Company. On the 30th of April, 1853, by special act of the legislature, the name was changed to the Lamson and Goodnow Manufacturing Company.

The factory was situated at the north end of the village, opposite the present residence of E. G. Lamson. They remained there until 1844, when they purchased the mill-privilege which they now occupy, and erected shops on the east side of the river. Their business progressed rapidly, and was very profitable. About 1846 they engaged, to some extent, in the manufacture of butcher-knives. Up to this time Mr. Nathaniel Lamson had had the principal charge of the work at home, including the purchase of the stock and the supervision of the finances and accounts. Mr. Goodnow was in New York, and managed a store belonging to the Company; and Mr. E. G. Lamson was engaged personally in the introduction and sale of the goods in various parts of the country. In 1844 M. T. Clement was appointed superintendent of the manufacturing department, while Nathaniel Lamson took charge of the real estate, supervising the construction of the dam, and purchasing material.

In 1848 Lamson, Goodnow & Co. commenced the manufacture of table cutlery, which has since become their principal business. To this end they secured the services of the present manager and agent, Joseph W. Gardner. Born in Birmingham, England, July 5, 1823, Mr. Gardner was early apprenticed to the trade of a tool-maker, and became a master of it. During his apprenticeship he attended a mechanical school, where he received instruction in draughting, and in the principles of mechanical construction. When he was twenty years old he came to this country to spend a year. On his arrival in New York he entered into a contract with the late John Russell, the senior partner of J. Russell & Co., manufacturers of table cutlery, and went to work in their factory at Deerfield, Mass. He was at first employed as a cutter, then in making tools and samples, and soon afterward was placed in charge of the ivory hafting, running a shop by himself, and taking the job by contract. In 1847 he went to the West, and entered the office of an uncle to keep his books and accounts. He did not like this work, however, and, returning East, entered the establishment of Lamson, Goodnow & Co., at Shelburne Falls, in July, 1848. He was employed as a general mechanic, in making tools, until March 1, 1849, when he was appointed superintendent, with charge of the details of the work. Mr. Clement remained as agent. Under Mr. Gardner's management the manu-

facture of cutlery advanced so rapidly that, within a year, the number of men employed in this department increased from less than twenty, to about one hundred. The manufacture of scythe-snaths had, in 1848, been in part removed to Windsor, Vt., a contract having been entered into for the employment of the convicts in the State Prison at that place; and, in 1850, the whole establishment for this work was transferred thither. In August of the same year, the land on the west side of the river, the site of the present main factory buildings, was purchased, and preparations for their erection were at once begun. These involved a large amount of massive stone-work in the foundations, and the main factory building was completed in November, 1851. Other buildings were added from year to year, until 1866.

Mr. Gardner succeeded Mr. Clement as manufacturing agent in 1859; and, in March of the same year, he secured a patent for the device known as the "shell-bolster." He also introduced the system of "interchangeable parts," which had previously been successfully applied to gun-making.

On the 17th of October, 1862, their manufactory was burned, but was rebuilt so as to be occupied Jan. 1, 1863. The shops on the east side of the river were burned on March 5, 1864, and were at once rebuilt. In April, 1869, a freshet swept away several of the buildings on the west side of the river. These were also immediately restored. The area now occupied for yard-room, and by the buildings, is about six acres; and the floor-room exceeds one hundred and twenty-five thousand square feet.

Nathaniel Lamson died on Dec. 14, 1866. He was for many years a member and deacon of the Baptist Church in Shelburne Falls, and at one time represented that town in the legislature.

Mr. Albert Goodnow, who had been, since 1838, an active partner in Lamson, Goodnow & Co., and, after the organization of the Company, its selling agent in New York, retired from active relations with the firm in 1868. His department was always mercantile, and he contributed much to its success. He is still a stockholder.

Ebenezer G. Lamson has always sustained, at first to the business of the firm, and afterward to that of the Company, a purely mercantile relation. Since his brother's death he has been president of the Company, his work being supervisory.

J. W. Gardner was, from 1850 until March, 1877, really the executive officer of the Company, and the responsible head of its business. The present treasurer of the Company is Frederic A. Ball, and B. Buchanan Yale is the selling agent and a director.

## LANCASTER MILLS.

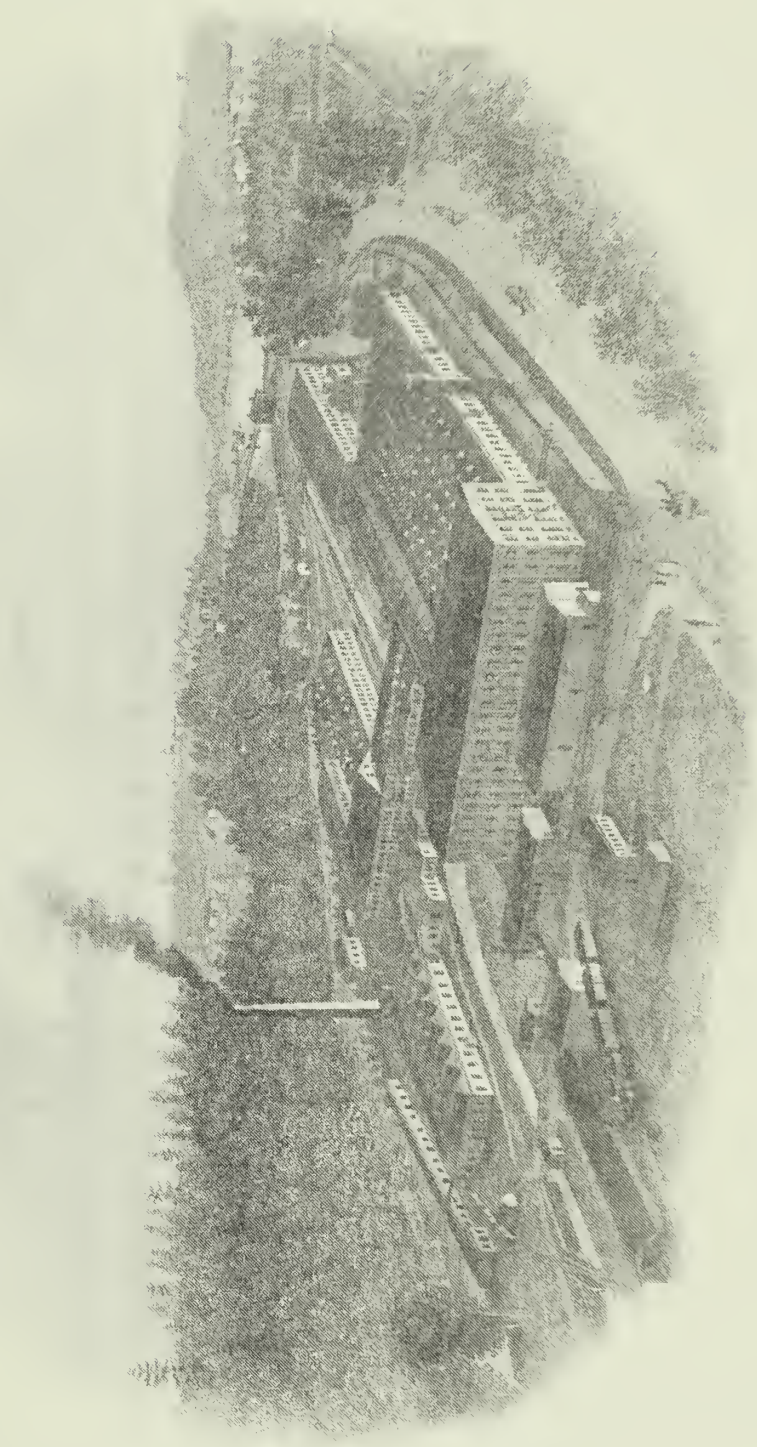


GINGHAM is a name applied to a class of cotton goods in which the pattern is invariably of plaids or stripes, and is formed by the use of yarns colored before weaving. They were introduced into Great Britain, late in the eighteenth century, from India. Like the fine cotton goods imported in the beginning of the century from China, the gingham were examples of the early high state of manufactures in the extreme East. It is said that Cortez found in Mexico, and sent to Barcelona, some cotton cloth resembling gingham, in that the threads forming the checks and stripes, were evidently colored before dyeing; but these colored threads were so inwoven with the fabric that they showed only on one side.

Up to about 1845, gingham were manufactured by the "handicraft system," whereby the yarn was spun and reeled into skeins by one person, and dyed and fabricated by another, the weaving being mainly done by hand-loom.

In 1843 Erastus B. Bigelow, who had established the manufacture of ingrain carpets at Lowell, and of coach-lace and counterpanes at Clintonville, now Clinton, by power-looms of his own invention, conceived the idea of organizing a mill on the factory system, whereby all the processes involved in the manufacture of gingham should be carried on in one establishment. For this purpose he purchased a mill-site, with water-power, on the Nashua River, in what is now Clinton, and in 1844 obtained an act of incorporation, under the name of the Lancaster Mills, with an authorized capital of \$500,000, which was soon subscribed. Erastus B. Bigelow, Stephen Fairbanks and Henry Timmins were the incorporators.

The first officers of the Company were: Stephen Fairbanks, President; William C. Appleton, Treasurer and Clerk; Horatio N. Bigelow, Managing Agent; and Stephen Fairbanks, Erastus B. Bigelow, Robert Appleton, Hugh R. Kendall and Henry Timmins, Directors.



Van Dyke & Co. Boston

# LANCASTER MILLS.

CLINTON, MASS.





To Mr. Bigelow was assigned the difficult task of planning and directing the erection and equipment of the mill. The loom, and the machinery for stretching, drying and finishing the gingham, had to be invented; and for many of the processes involved, known methods had to be modified and adapted to the new organization. In due time this was successfully accomplished, and the manufacture of gingham placed upon the same footing as other cotton manufactures.

The mills were sufficiently near completion in 1845 to commence the operations of carding cotton and spinning yarns, the number of cards at first employed being ninety-six. Early in 1846 the machinery for all the other processes, to the finishing, was completed, and put into running order. Before the close of the year, the room and apparatus for finishing the goods were also in readiness; and over thirty-three thousand yards of gingham were manufactured and made ready for the market.

Beginning with ten looms, the increase of capacity was so rapid that in five years the number of looms was five hundred and fifty; and the relative increase in production was more than twice as great, the number of yards of gingham produced being nearly four and a half million. In 1875 the number of looms was eleven hundred and fifteen, and the number of yards produced was over eleven and a half million. The increased product between 1850 and 1875 was about twenty-four hundred yards per loom—a gain of more than twenty-nine per cent during that period. The number of persons employed in the mill in 1846 was one hundred and forty-eight, of whom one hundred and eight were women and girls. The number of *employés* in 1875 was one thousand and forty-one, of whom four hundred and eighty one were women and girls. The motive-power was at first an ordinary water-wheel, with a diameter of twenty-six feet. Two other wheels of the same general style were afterward added. These have been superseded by Boyden turbine-wheels of three hundred horse-powers each. In 1848 two steam-engines, manufactured by the Corliss Steam Engine Company, were placed in the mills, to supplement the water-power in times of low water and drouth.

The capital stock was increased in 1849 to \$800,000; and the buildings have been increased, and additions to, and improvements in, the machinery have been made, until the capacity of the mills is now 30,000 spindles, and the numbers of looms is fifteen hundred and fifteen. The mills have nearly two hundred and fifty thousand square feet of flooring, of which more than one-third, or eighty-seven thousand feet,—the area of a floor of a single room,—is devoted to weaving. Nearly the same area is devoted to the two operations of carding and spinning; and more than seventy thousand square feet to the various operations of picking, reeling, winding, quilling, warping, dressing, dyeing, drying and finishing, and the store-rooms.

The Lancaster gingham early obtained a high reputation, which they still

maintain. The manufacture of gingham requires sixteen processes, while plain cotton goods require but six ; the difference in cost, however, between the two kinds of goods is much less than in the early years of the manufacture of gingham. This is due to the fact that better raw material is used than at first, the saving in waste and in work being greater than the additional cost of the raw material ; and also to the improvements in the machinery that have been introduced, both by Mr. Bigelow and Mr. Crompton, the latter of whom has devoted especial attention to this class of fancy looms.

In 1864 the capital was reduced from \$900,000 to \$800,000, a distribution *pro rata* of \$100,000 being made to the stockholders, it being found that \$800,000 was ample for the demands of the business. The large profits realized have enabled the Company to make extensive additions to their facilities, by improvements in machinery and buildings, while large semi-annual dividends have been made.

The present officers of the Company are : Samuel G. Snelling, President ; James S. Amory, Treasurer ; Samuel V. Goodhue, Clerk. Board of Directors : Samuel G. Snelling, John A. Burnham, Nathaniel Thayer, Augustus T. Perkins and Robert M. Mason.





Van Slyck & Co Boston.

Henry Lippitt

## HENRY LIPPITT.



THE name of Lippitt has been prominent in the annals of Rhode Island from the earliest settlement of the colony. John Lippitt, who joined Roger Williams at Providence, in less than two years after its settlement, was the first person of the name known to have come to this country. He was appointed, in 1647, one of the commission to organize the government of the colony, under the charter granted by the Parliament. In 1655 he removed to Warwick, R. I., where he purchased a large tract of land, and, like his descendants for several generations, engaged in farming.

His great-grandson, Christopher Lippitt, was the father of twelve children, two of whom, Christopher and Charles, were among the first to engage in cotton manufacturing in Rhode Island. Both were officers in the American Revolution, and Christopher especially gained distinction, as the commander of one of the Rhode Island regiments in the most critical period of the war. He returned to his farm when his commission expired; but in 1780, as Brigadier-General of the Rhode Island militia, he went to Newport, to defend that town from a threatened attack by a British expedition.

For nearly thirty years after, General Lippitt was engaged in husbandry, his brother Charles being, during the same period, a merchant in Providence. In 1809 the brothers were induced to invest in the cotton manufacture. The town of Warwick, through which flowed the river Pawtuxet, affording by its considerable fall within the limits of the town several excellent mill-privileges, had early attracted the attention of William Almy and Obadiah Brown, the partners of Samuel Slater; and no sooner had the first experiment at Pawtucket proved successful, than they aided in establishing the second cotton-mill in Rhode Island at what is now the village of Centerville, with Joseph Allen and other residents of Warwick.

In 1807 a second mill was erected, and was the nucleus of the present village of Crompton. On the 9th of November, 1809, Christopher and Charles Lippitt, with Benjamin Aborn, George Jackson, Amasa Mason and William H. Mason, all of Providence, associated and organized the Lippitt Manufacturing Company, with a capital of \$40,000. Of this sum the brothers Lippitt subscribed \$10,000 each, and the other gentleman \$5000 each. Christopher Lippitt was appointed the first agent, at a salary of forty-two dollars per month. The power-loom had not then been introduced into this country; and the yarns were given out to the wives and daughters of farmers, to be woven on hand-loom into cloth.

About 1820 they began the employment of looms and operatives in their factory, and introduced new methods and machinery. Charles Lippitt, son of Warren Lippitt, had been in early life a sailor, and was for several years the master of a vessel. He then became for twenty years a cotton merchant in Providence, and Savannah, Ga. Inheriting on the death of his father an interest in the Lippitt Manufacturing Company, he was chosen its treasurer in 1840, and retained that office until his death in 1850. Soon after, the interest of his estate in the Lippitt Manufacturing Company was bought by the heirs of Christopher Lippitt, who still hold the controlling interest in the Company.

The second son of Warren Lippitt, Henry, was born in Providence, R. I., Oct. 9, 1818. He received his education at the academy at Kingston, R. I., closing his course there when he was about fifteen years of age. He soon afterward became clerk in the store of Burr and Smith, in Warren, R. I., who were engaged in whale fishery, and dealt largely in the products of their ships' voyages. He remained with them until November, 1835, when he returned to Providence, to fill the position of book-keeper for Josiah Chapin & Co., then the largest cotton merchants in the city. In 1838 this house closed up its business; and Mr. Lippitt then formed a copartnership with Edward Walcott in the commission business, under the firm-style of Walcott and Lippitt, receiving Amory Chapin into the firm as special partner. This was the first special partnership formed in the State under the then recent law permitting the formation of such business relations. The transactions of the firm were principally in bale cotton and print-cloths. Two years later, Mr. Walcott retired; Mr. Chapin assumed an active relation, and the style of the firm was changed to Amory Chapin & Co., under which style the business was conducted until the death of Mr. Chapin in 1846. The surviving partner, Henry Lippitt, then received his younger brother, Robert, into partnership, the firm being H. and R. Lippitt. Robert L. Lippitt was born in Savannah, Ga., Dec. 7, 1823. On leaving school he entered, as clerk, the employ of Walcott and Lippitt, afterward Amory Chapin & Co., and in 1846, as has been said, became a partner with his brother.

In 1848 Henry and Robert Lippitt, with their father and other capitalists of Providence, joined in the purchase of a mill-property at Danielsonville, Conn., then known as the Tiffany Mill, before owned by Comfort Tiffany, the father of Charles L. Tiffany, now the head of the New York firm of Tiffany & Co. This estate included three hundred acres of land, the mill itself having a capacity of about 3,000 spindles. They organized the business the next year, under the name of the Quinebaug Manufacturing Company, and commenced the erection of a mill of 10,000 spindles. On the death of Mr. Warren Lippitt, in 1850, a controlling interest in the property was sold to Amos D. and Moses B. Lockwood. The new mill, which had not yet been put into operation, was now devoted to the manufacture of delaines, and was fitted up with machinery adapted to that purpose. The company was re-organized under the name of the Quinebaug Company. At about the same time Henry and Robert L. Lippitt hired the Coddington Mill at Newport, R. I., for the manufacture of cotton goods, and continued to operate it until 1853, when it was burned. In 1854 they purchased an interest in the Social and Harrison Mills, at Woonsocket, R. I., having previously disposed of their stock in the Quinebaug Company. The Social Manufacturing Company was organized in 1855, with a capital of \$600,000. An account of the Social Mill enterprise is given in our sketch of Dexter Ballou.

The commission business was pursued by H. and R. Lippitt until the death of the junior partner, which occurred June 29, 1858. Henry Lippitt at once arranged to close up the business of the firm, with the purpose of devoting his attention and his capital wholly to manufacturing interests. He purchased the interest of his brother's estate in the Social Manufacturing Company, becoming thereby the owner of a majority of the stock. In 1860 an addition was made to its buildings and machinery, increasing its capacity to 40,000 spindles. The mill was burned in 1874, and the present brick mill was erected and put in operation. It has a capacity of 60,000 spindles. In 1860 the Company purchased the Globe Mill, in Woonsocket, which had been erected in 1873 by George C. Ballou and Son. This mill is of stone, and has a capacity of 44,000 spindles; making an aggregate capacity of 104,000 spindles for the Social and the Globe Mills. The capital of the Company, which was originally limited to \$300,000, was increased by act of the legislature, January, 1870, to \$600,000, and in January, 1874, to \$1,000,000, which is its present amount. Mr. Lippitt has been the treasurer since the organization of the Company, and now owns a controlling interest in its stock. Its first president was Orren A., son of Dexter Ballou. On his resignation, in 1875, Charles Nourse, who had been since 1855 resident agent, was elected president, and holds both these offices at the present time.

Mr. Lippitt received into partnership, in 1859, Charles H. Merriman, the firm-

style being H. Lippitt & Co. From 1862 to 1866 Mr. Lippitt held a large interest in the Manville Company, the mills of which are situated in Lincoln, R. I. In 1865 the firm of H. Lippitt & Co., with others owning the Harrison Mill at Woonsocket, changed its business from the manufacture of cotton goods to that of woolen goods; and a corporation was organized, and called the Lippitt Woolen Company, with a capital of \$400,000. The cotton-machinery was removed and sold, its place being supplied by a full equipment of woolen-machinery, with twenty sets of cards. The goods manufactured are fancy cassimeres and overcoatings, in a large variety of popular styles, the number of operatives being about five hundred. Henry Lippitt has been president from the beginning, and Charles H. Merriman, of the firm of Lippitt & Co., has been treasurer since 1866.

In 1862 Mr. Lippitt bought a controlling interest in the Silver Spring Bleachery and Dyeing Company, which was chartered in May, 1864, with a capital of \$200,000, and purchased, as a nucleus for the present works, the old Silver Spring Bleachery, which first went into operation in 1850. Included in the purchase were eighty acres of land, one and five-eighths acres being within the walls of the buildings, of which the main structures are of brick. The Company takes its name from the copious and pure springs in the vicinity. The water filters through a stratum of the finest sand, twenty feet under ground, and is excellent for the uses of bleaching and dyeing. Collected in immense reservoirs from eight to eighteen feet deep, and from which the surface is wholly excluded, the supply is more than sufficient for the entire works. The Company produces various styles of colored cotton goods, beetled and elastic finished goods, and fine and medium grades of bleached goods. Printing-machinery has been recently purchased and set up. A genuine turkey-red had been previously produced, and arrangements have been completed for printing, on the basis of this color, a fast green, blue, yellow, pink, black and clear white, said to be equal to the colors produced at the famous Steiner Works, in England. About two hundred operatives are employed by the Company. The capital stock was increased in January, 1873, to \$500,000. Henry Lippitt is president, and his eldest son Charles W. Lippitt, is treasurer and agent, having in this latter capacity the management of the mills.

In 1861, on the outbreak of the war, the Governor of the State appointed Mr. Lippitt Commissioner of Enrollment for Rhode Island; and it was under his energetic control that the quotas assigned to Rhode Island were so quickly filled.

Mr. Lippitt was one of the chief promoters of the organization of the Providence Board of Trade, being its first vice-president and its second president. In 1875 and 1876 he was Governor of the State, serving through both terms with distinguished ability.





Van Eyck & Co Boston.



*Amos Lockwood*

## AMOS D. LOCKWOOD.



AMOS D. LOCKWOOD is a lineal descendant from Roger Williams. His grandfather, Benoni Lockwood, married the daughter of Resolved Waterman, whose grandfather, also named Resolved, married Mercy, youngest daughter of Roger Williams. Richard Waterman, father of the last-named Resolved, was one of the twelve associates of Roger Williams in the settlement of Providence.

The father of Amos, Benoni Lockwood, was, in early life, a sea-captain; and afterward settled in Providence, and became a surveyor and civil engineer. Amos was born at Pawtuxet, R. I., Oct. 30, 1811, and was six years old when his father removed to Providence. At sixteen he entered the store connected with the cotton-factory at Rehoboth, Mass., belonging to Benjamin Peck and David Wilkinson, where he remained two years. He then went into the factory as an operative; and, during the next two years, applied himself to mastering the details of cotton manufacture. On the 1st of February, 1832, he became assistant superintendent in the factory of Almy, Brown and Slater, at Slatersville, R. I.; and in 1835 he was appointed resident agent, Messrs. Almy and Brown having, in the meantime, sold their interest in the mills to Samuel and John Slater.

On April 1, 1843, the mills were leased for ten years to the firm then formed by Amos D. Lockwood, his brother, Moses B. Lockwood, and his brother-in-law, Rhodes B. Chapman, under the firm-name of A. D. Lockwood & Co.

In 1851 this firm purchased an interest in the Quinebaug Manufacturing Company, at Danielsonville, Conn., which had been organized, in 1848, by Warren Lippitt and his two sons, Henry and Robert. They had bought the Tiffany Mill, of about 3000 spindles, and had erected an additional building for machinery, of about 10,000 spindles. They had not started the new mill when their interest was bought by the Messrs. Lockwood; and the Company, which was now re-organized as the

Quinebaug Company, put in machinery adapted to the manufacture of delaines. The new mill was started on that class of goods, the old Tiffany Mill being still run on cotton goods. The entire management was in the hands of A. D. and M. B. Lockwood, the former being agent, and the latter treasurer.

A corporation was organized in (1863), by several gentlemen (all, except A. D. Lockwood, residing in Providence, R. I.), for the purpose of erecting and operating a mill of 10,000 spindles for making fine bleached shirtings. The capital was fixed at \$200,000; and the site of the mill was selected, and the land and water-privilege purchased, in Plainfield, Conn., on the Quinebaug River, five miles below Danielsonville. Orray Taft was elected President, Moses B. Lockwood, Treasurer, and Amos D. Lockwood, Agent. The establishment was called the Wauregan Mills. The dam was built, the factory erected, and the machinery bought and put in operation, under the personal superintendence of Amos D. Lockwood.

In 1855 Mr. Lockwood was employed to rearrange the Pacific Mills, at Lawrence, which had not been constructed and organized so as to produce satisfactory results,—a task which he successfully performed.

In the fall of 1858 he took the place of David Whitman, in charge, as mechanical engineer, of the extensive manufacturing operations of Boston capitalists, associated in the proprietorship of mills at Lewiston, Me., and in other places in that State, and in north-eastern Massachusetts. The first enterprise begun under his supervision was the Androscoggin Mills. The erection of the mills of this Company was commenced in 1860. They are among the largest mills in New England, having a capacity of more than 60,000 spindles. Mill No. 1 is devoted to the manufacture of the higher grades of sheetings, shirtings and jeans; and Nos. 2 and 3, to seamless bags. These mills were planned throughout by Mr. Lockwood; built, equipped and started under his immediate supervision; and were for several years under his personal management, as its resident agent. In 1860 the Lewiston Mills were built. This Company had been organized, and a mill built and started, in 1852, for the manufacture of seamless bags. The Company decided, in 1860, to re-organize, to increase the capital, erect large buildings, and to add machinery adapted to the manufacture, in addition to seamless bags, of colored goods of various grades—for making tickings, denims, chevots and similar goods. In 1861 Mr. Lockwood arranged and started Hill Mill No. 6; and in the same year, the Franklin Company, which owned all the water-power at Lewiston, had its dam rebuilt under his supervision. This dam is of granite, and is a substantial and permanent structure. After the first year of his employment at Lewiston, Mr. Lockwood was the agent of this Company.

In December, 1864, Mr. Lockwood and others purchased from Thomas J. Hill,

of Providence, R. I., the controlling interest in the Lewiston Foundry, and re-organized its business as the Lewiston Machine Company.

Mr. Lockwood continued, until 1871, his relation as consulting engineer to the several corporations at Lewiston, Me., to the Pepperell Mill, at Biddeford, Me., the James (now Masconomet) Mills, at Newburyport, Mass., the Naumkeag, at Salem, and others, visiting and supervising each at frequent intervals. During this period, as senior member of the firm of A. D. Lockwood & Co., of Providence, he also retained the general management of the Quinebaug Mills, the capacity of which is now 35,000 spindles. Having acquired a reputation as a mechanical engineer, and an expert in all matters connected with the cotton manufacture, he opened an office, in the autumn of 1871, in Franklin Street, Boston. At the same time he removed his residence to Brunswick, Me., and accepted the office of treasurer of Bowdoin College. In May, 1872, however, his brother, Moses B., died; and this event made a change in his plans necessary.

Mr. Lockwood sustained a severe loss in the great Boston fire, in November, 1872; the building in which his office was situated being entirely destroyed, many of his valuable plans and drawings were burned. The loss was an irreparable one. In the spring of 1873 he again removed to Providence; and, since his brother's death, the mercantile branch of the business has mainly devolved upon him. The mills of the Otis Corporation, at Three Rivers, Mass., were rebuilt in 1873, under his direction; and in the same year he superintended the improvements made to the buildings and machinery of the Boston Manufacturing Company, at Waltham, Mass. In 1875 he had charge of the construction of a cotton-mill of 10,500 spindles, at Piedmont, S. C., which was started in 1876; and in 1878 a cotton-mill of 10,000 spindles was begun at Vancluse, near Graniteville, in the same State, to be built after his plans and under his general direction.

In the spring of 1874 he commenced, for a corporation to the stock of which he was a large subscriber, the erection of the Lockwood Mills, at Waterville, Me. Taking his own name, and embodying the results of his long experience in the planning and construction of mills, it is, for its capacity of 32,704 spindles, a model mill, and is well adapted for the manufacture of its specialty — brown and bleached cotton cloths. In the care of his personal interests in the Quinebaug and Lockwood Mills, Mr. Lockwood has the efficient co-operation of his son-in-law, John W. Danielson, who has been his partner since 1874.

Mr. Lockwood is often employed in different localities of the cotton manufacturing interests, as a consulting and superintending engineer. At the Centennial Exposition, he was one of the American judges, in the group of cotton manufactures; and was elected, in 1878, president of the New England Association of Cotton Manufacturers.

Moses B. Lockwood, the brother, and, for about thirty years, partner, of the subject of the foregoing sketch, was born at Pawtuxet, R. I., Aug. 25, 1815. His education was received at the public schools, and at the Friends boarding-school, in Providence. He was then employed for two years as an assistant teacher; and during the next year he taught in an academy at Weston, Penn. In 1835 he returned to Providence, having been appointed principal of the Friends School—a position which he held until 1838. He at that time became associated with his father, as a civil engineer, and attained a high rank in the profession. In 1843 he became a partner, with his brother and brother-in-law, in the conduct of the mills at Slatersville, R. I., assuming charge of the office in Providence, where he continued to reside.

On the organization of the Quinebaug Company, in 1853, he was chosen its treasurer, and held the same office in the Wauregan Mills Company, organized later in the same year. The latter office he held until 1858, and the former until his death, which occurred May 13, 1872. During the twenty-nine years of his connection with manufacturing, he gained a wide and honorable reputation. He was for fourteen years, successively, a member of the school committee; for several years a member of the examining committee in mathematics in Brown University; and chairman of the Providence Water Board, from its organization until his death.

# HARRISON LORING.



THE diminution in the supply of lumber, resulting from the destruction of forests, has caused much anxiety to those in whose business lumber is largely used, and, among others, to ship-builders. One result of this has been to substitute iron for lumber in the construction of ships; and one of the first men to undertake this industry was Harrison Loring, the founder and proprietor of the City Point Iron Works, at South Boston, Mass.

Harrison Loring is a descendant, in the seventh generation, of Dea. Thomas Loring, who came to this country from Axminster, in Devonshire, England, and settled in Hingham, Mass., in 1635. He was the ancestor of many of the families of the name, both in the Old Colony, and in other parts of the country. He was a man of much influence in the town. His grandson, Lieut. Thomas Loring, removed in 1701 to Duxbury, where his descendants still live. Thomas's son, Benjamin, married Anna Alden, great-granddaughter of John Alden, the Pilgrim. The subject of this sketch was born at Duxbury, Oct. 25, 1822. His mother was Nancy, daughter of Hon. Seth Sprague, who was for many years a prominent citizen of Plymouth County. Her brother, also, Hon. Seth Sprague, succeeded his father in position and influence in the county and throughout the State. Another brother, Hon. Peleg Sprague, having studied for the bar, practiced law in Hallowell, Me. He was successively representative and senator in Congress from that State, and afterward, for many years, Judge of the United States Court for the Eastern Circuit. Harrison, having received a good education, went to Boston at the age of seventeen, and entered, as an apprentice, the machine-shop of Jabez Coney, adjoining Alger's Foundry, at South Boston. Mr. Coney was originally from Dedham, Mass., where he had been a mill-wright.

In addition to the ordinary practice in the use of tools, and in the routine-work

of the shop, young Loring learned drafting ; and, having served the full term of his apprenticeship, on attaining his majority, he went to Cuba. During a sojourn of six months in that island he superintended the crection of some steam-engines and sugar-mills. On returning to the United States he spent some time in New York, Philadelphia, Baltimore and Washington, where he visited the large machine-shops, and “prospected” for the best field for a business of his own.

He finally decided to settle down in Boston ; and, in 1847, he built a shop on First Street, near Turnpike Street as it was then called. He secured a loan of \$20,000 from his relatives, without security, and at once started his enterprisc. For several years he competed with the machinists of Boston and other cities, in the manufacture of stationary and marine engines and boilers, sugar-mills, machinery for paper-mills and bleacherics, and iron work for light-houses, and in a great variety of general jobbing work. Ten years later he determined to engage in building and equipping, with the necessary machinery, iron sea-going steam vessels.

In order to secure ample facilities for this enterprise, Mr. Loring bought from the city of Boston the then unoccupied House of Industry estate, agreeing to carry on the business of building iron vessels for a period not less than five years, and to employ at least three hundred hands. This purchase included seven acres of upland and a million feet of flats. He at once remodeled the old building, and converted it into his machine-shop, and erected two large ship-houses on the water-front, which is six hundred feet long.

These arrangements for work were scarcely completed when the financial erisis of 1857 came, prostrating for the time all business, and rendering it difficult for Mr. Loring to fulfill the condition of his contract to keep his works in operation ; but he succeeded in securing orders for vessels to go to India. The first vessel built by him was the “Sestos,” an iron steam-propeller of five hundred tons burden, for a firm in Calcutta. In this, as in all his subsequent vessels, he adopted the plan of construction of the Scotch and English iron ship-builders. Some ten years before, Messrs. Harlan and Hollingsworth, of Wilmington, Del., had begun the building of canal-boats of iron, the frame or ribs being made of flat bars, curved to conform to the desired shape, to which the plates forming the shell were fastened by straps of iron, rivetted to them, and passing like loops over the ribs. The same firm also built in 1860, two steam vessels, for the trade between Baltimore and Boston, on the same plan.

In 1840 Jabez Coney built the revenuc-cutter “McLean ;” and soon afterward the relief-ship of the Boston Marine Insurance Companies, the “R. B. Forbes,” was built under the direction of the gentleman whose name she bore. The two latter vessels were constructed on the same plan with the canal-boats before named. The

plan adopted in Great Britain, was to make the ribs of what is called angle-iron ; that is, a bar, or the combination of two bars, at right angles with each other, the iron being rolled in that form. It is of different dimensions, adapting it to various purposes ; in thickness it is from five to eleven-sixteenths of an inch, with one flange from two to four inches, and the other from two and a half to six and a half inches. A bar of angle-iron being bent into shape for a rib of the vessel, and placed in position, would have one of its flanges in such a relation to the plates forming the shell that they could be readily rivetted to it ; and the other at right angles to the shell, so as to give the necessary stiffness and strength to the hull. Other ribs of angle-iron are, in many cases, rivetted to the first set, but so that a section of the two would be composed of three lines and two angles, somewhat like a letter Z, only that its top and bottom should be at right angles with the vertical line. The inside sheathing of wood is then bolted to the flat parts of the second series of ribs. Although this is a more expensive and difficult method of construction, it is superior to the other for large sea-going vessels. Cornelius H. Delamater, of New York, built one iron vessel on this plan ; and, with this exception, Mr. Loring was the first builder of iron ships in America who adopted this method of construction. The first vessels built by Mr. Loring were, as has been said, for a foreign market. In 1860, however, he made a contract with the Boston and Southern Steamship Company, organized in 1860, to establish a line of steam-vessels between Boston and Charleston, for two iron steamships of eleven hundred and fifty tons each. These two vessels, the "South Carolina" and "Massachusetts," were completed and delivered on the day named in the contract. The business of the line was interrupted by the breaking out of the Civil War, in 1861 ; and both ships were sold to the United States, and were employed in the squadron blockading the Southern coast. They were, indeed, the first vessels purchased by the Navy Department for this purpose.


The Union Steamship Company, of Boston, was organized in 1860, to run a line of steamers between Boston and New Orleans, and Mr. Loring built for it two screw-steamships, the "Mississippi" and "Merrimaek," of two thousand tons each.

Before and during the war Mr. Loring executed a large amount of work for the United States, both in vessels and marine-engines. In 1858 he built the engines and machinery for the United States sloop of war "Hartford," which, at Mobile and elsewhere, became famous as Farragut's flag-ship. Early in the war he built the iron side-wheel steam-vessel "Winnipeg," for the United States service. When Ericsson's novel idea of the "monitor" proved successful, the Government decided to build other similar vessels, and gave an order for them to Mr. Loring. He began work at once on the "Nahant," which was the first monitor built in New England. While fitting her for sea, he laid the keel for a monitor of a larger class, called the

"*Canonicus*." This vessel embodied all the improvements suggested during the construction of the "*Nahant*," with a better deck, and thicker side-armor. She was also adapted to be a powerful ram, having twice the propelling power of the "*Nahant*." Though delayed in her construction by alterations demanded by the experience of the monitors in actual service, she was the first one of her class completed.

Mr. Loring also constructed during the war the engines and propelling machinery of a sloop-of-war and two gun-boats for the United States Navy.

At the close of the war the American ship-building interest, whether of wood or iron, became very dull. In 1866 and 1867, however, Mr. Loring built the engines and other machinery for the large propellers for the merchant service, the "*Eric*" and the "*Ontario*." They were of wood, of three thousand tons burden, and were built by George Jackman, of Newburyport. His works were also kept, in full operation until 1873, in a variety of productions for private persons and for the United States. For the latter, he built light-houses and iron light-house lanterns. When the panic of 1873 came, Mr. Loring adjusted his business to the new condition of affairs, and, for the first time since he began to conduct a mechanical establishment on his own account, adopted a thoroughly conservative policy, curtailing expenses, and reducing his force from an eighth to a half of his full complement. Meanwhile, he has busied himself with devising adjustments to remedy defects in the operation of machines which he has been engaged to build and set up. He has completed and received patents for two of these adjustments. The first is for an improved rotary bleaching-boiler, for the production of chemically prepared wood-pulp and other paper-stock. The patent, granted July 27, 1875, covers peculiarity of construction of the heads and gudgeons, which are made hollow, of large diameter, and rivetted to the heads, independently of the stuffing-boxes and induction-pipes. This is to give increased stiffness and strength to the head, and to relieve the journals of heat and pressure. The second patent, granted April 2, 1878, is for an improvement in presses for obtaining oil from menhaden and other fish, consisting in the interposition of mats, composed of iron wire, between the layers of fish, so as to permit a much greater pressure. By this improvement thirty per cent more oil was, in one instance, pressed out of a given weight, than could be obtained out of the old presses; while, in continuous work, it is certain that a gain of at least ten or twelve per cent will be made by this device.



## FRANCIS CABOT LOWELL.



ALTHOUGH inventions are generally the productions of men of mechanical talent and training, it is a noteworthy fact, that the power-loom was invented, both in England and in the United States, by men of liberal culture, who were not professional mechanics. The first patent for a power-loom in England was granted in April, 1785, to Rev. Edmund Cartwright, who had never seen a loom in operation. He took out his last weaving patent in November, 1788; this seems to have comprised all the movements and adjustments necessary for weaving by power. He obtained from Parliament, in 1809, a grant of £10,000, in recognition of his invention. His looms, however, did not supersede hand-weaving. This was no doubt mainly owing to the want of a suitable preparation of the warp, which, in power-weaving, requires a certain kind of dressing. A machine for this purpose was invented in 1802, by Thomas Johnson, of Bradbury, England, a weaver in the employ of Radcliffe and Ross, manufacturers at Stockport. The first American power-loom was invented, in 1813, by Francis C. Lowell, of Boston, Mass.

Francis Cabot Lowell was descended, in the sixth generation, from Percival Lowell, a merchant, who came from Bristol, England, in 1639, and settled in Newbury, Mass. His great-grandson, Rev. John Lowell, having graduated at Harvard College in 1721, was, for forty-two years, pastor of the first church in Newburyport. His son, Hon. John Lowell, LL. D., who graduated at Harvard College in 1760, began the practice of law in his native town. Removing thence, in 1777, to Boston, he soon attained a high position at the bar, and was elected a member of the convention held in 1780, for framing the constitution of Massachusetts. He was a member of the committee for drafting the "Bill of Rights," and inserted in it the clause, "All men are born free and equal."

He was afterward Justice of the United States Circuit Court for Massachusetts.

His sons were John, Francis C. and Charles. John graduated at Harvard College in 1786, and, like his father, attained eminence in the law. He was the father of John Amory Lowell, who graduated at Harvard College in 1816, and was at first associated with John W. and Kirk Boott, in mercantile business. In 1824 he succeeded Patrick T. Jackson as treasurer and agent of the Boston Manufacturing Company. Charles graduated at Harvard College in 1800, and was long the minister of the West Church, in Boston. He was the father of the poet and professor, James Russell Lowell. The second son of Judge Lowell, Francis Cabot Lowell, was born in Newburyport, Mass., April 7, 1775; graduated at Harvard College in 1793; and studied law, but preferred a mercantile career, which he pursued until 1810. He then went to England, where he became interested in the manufactures. It occurred to him that the more abundant water-power of New England, the greater facility of obtaining the raw material from the Southern States, and the ingenuity of our mechanics, would enable Americans to compete with Great Britain. He therefore resolved to inaugurate, on his return, the business of the cotton manufacture on a larger basis, and with methods that would accomplish greater results than had previously been attained.

Residing during the next two years mostly at Edinburgh, he visited the cotton-mills both of Scotland and England; and, as he had a natural taste for mechanics, he readily stored in his memory valuable ideas in the construction of machinery for the various processes of cotton manufacture. On his return to Boston he proposed to Nathan Appleton, and to his wife's brother, Patrick T. Jackson, that they should together engage in the establishment of a cotton-manufactory. Their first idea was to engage in weaving; and, as for this purpose a power-loom was indispensable, Mr. Lowell and Mr. Jackson undertook some experiments, and constructed a model of such a loom, working in a store on Broad Street, Boston, and employing a man to turn a crank. They soon achieved such favorable results that they proceeded to organize a company, and build a mill. A charter was granted for the Company, to be styled the Boston Manufacturing Company, with an authorized capital of \$400,000. The projectors, however, determined to raise only \$100,000 until the experiment should be fully tried. Of this amount, Mr. Lowell, and Mr. Jackson with his brothers, subscribed the greater part. They proposed to Mr. Appleton to take shares to the value of \$10,000; but he was unwilling to risk, at first, more than \$5000. The loom did not then work so satisfactorily that they were willing to have him see it, and it was not until the first building at Waltham was completed that the loom was ready for trial. Finally, after some delay, Mr. Appleton was invited to go out and see the loom operate; and it met with his hearty approval. A patent for this loom was issued to Messrs. Lowell and Jackson, as joint inventors, Feb. 23, 1815. It

differed in several particulars from the English loom which, in 1816, was introduced into Rhode Island, by William Gilmour. The movement of the English loom was by a crank, while the principal movement of the Lowell and Jackson loom was by a cam, revolving with an eccentric motion.

Mr. Lowell did not at first contemplate spinning the yarn. That was the business to which the cotton factories of Slater and others in this country and in England were generally devoted. The weaving was done by hand-loom, mostly in private houses. This practice continued in England for many years after the introduction of the power-loom, and, to some extent, exists at the present day. The managers of the Boston Manufacturing Company soon found, however, that it would be difficult to obtain yarns of the uniform quality to answer their purpose, and they then resolved to make their own yarns. For this purpose they built a spinning-mill, of 1700 spindles. Their goods soon acquired a reputation, and the success of the business showed Mr. Lowell's wisdom and foresight.

An account of the introduction, at Waltham, of machines for other processes than weaving is given in the sketch of Paul Moody, to whom, as the mechanic of the Company, was mainly due the excellence of their construction. Mr. Lowell, however, rendered important aid in the more complicated of these machines, by his accurate mathematical calculations.

Mr. Lowell made a new departure at Waltham, in the arrangement for the boarding accommodations of the operatives. The English system was to employ entire families, including often children at a very early age; and, instead of making payments in money, a factory store was established, from which the families were supplied with provisions and other necessities, in payment for work, increasing the dependence of the operatives on the employers. The result of this system in the English manufacturing villages, as a general rule, was poverty, ignorance and intemperance of both sexes. Mr. Lowell relied, as an element of successful competition with England, on the character, habits and intelligence of the operatives. He therefore established boarding-houses at Waltham,—which plan was followed by Lowell and other manufacturing communities,—none but females being admitted, and their wages paid at stated periods in money. Young children were not, moreover, to be employed in the factories. To work in a factory became a creditable means of support; and the business was thus enabled to be conducted without forming a permanent manufacturing population, or a separate caste, pursuing, generation after generation, a sedentary employment in the heated rooms of a factory.

The close of the war with England, in 1814, had a very injurious effect on the cotton industry of New England. During that war our manufacturers, by the interruption of commerce with Great Britain, had been relieved from competition

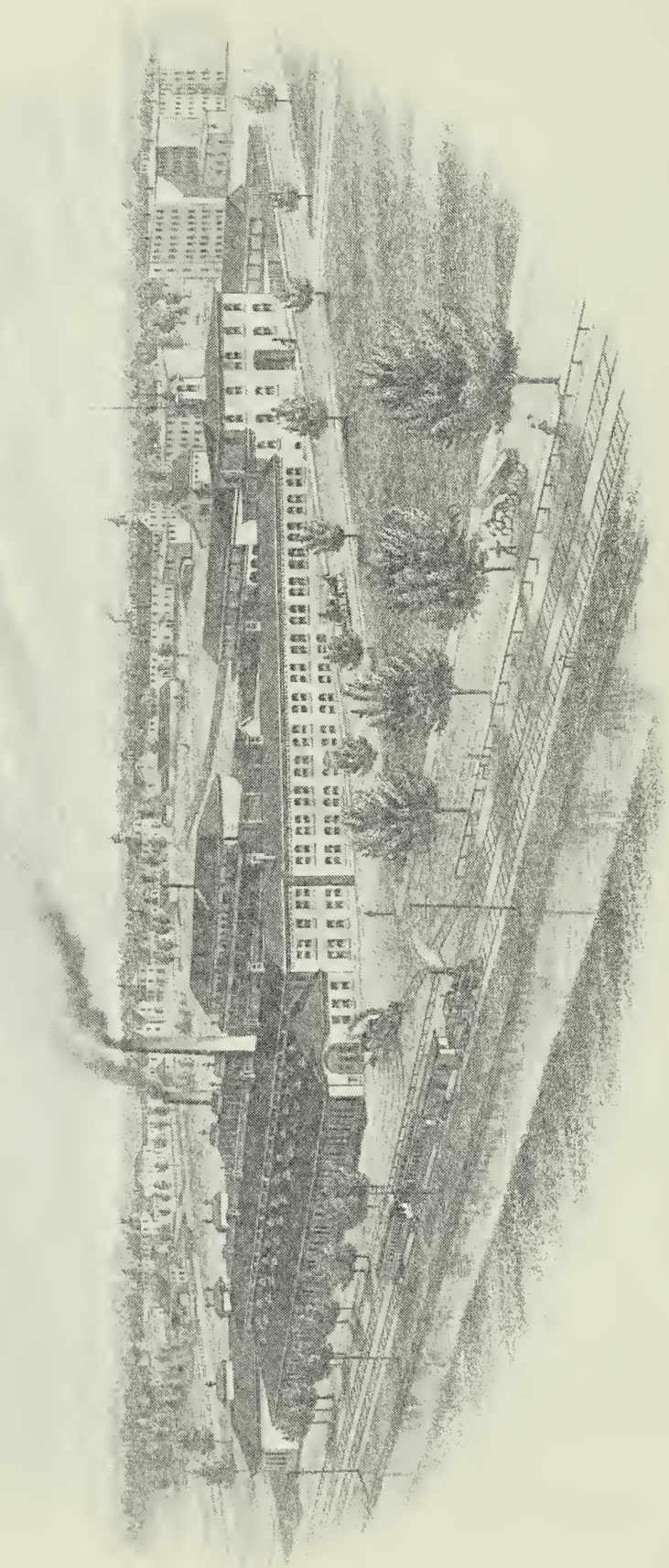
with the manufacturers of that country. They had not made such progress, however, as to compete in time of peace, even at home, with the foreign goods that crowded on the market. The result was that the mills in Rhode Island were generally stopped. At this juncture, Messrs. Lowell and Appleton visited the manufacturers there, and found them clamorous for a very high tariff.

In 1816 Mr. Lowell went to Washington, to aid in securing higher protection duties. He found the members from New England hostile to his scheme, as, at that period, the mercantile interests of that part of the country were more important than those of manufacture; and the New England merchants were deeply interested in the East India trade, in which a large item of importation was cotton cloth. Mr. Lowell, through the Southern members, finally procured a minimum duty of six and one-quarter cents per square yard, which proved sufficiently protective, and of great benefit to the cotton manufacturer.

Mr. Lowell died on Sept. 2, 1817, at the early age of forty-two years. To him, undoubtedly, as was said by Edward Everett, "more than to any other individual, is New England, or, rather, America, indebted for the permanent establishment of the cotton manufacture in this country." After his death Mr. Appleton suggested that the town which was destined to become the leading center of American cotton manufacture, should bear the honor of his name. His suggestion was adopted, and the town was called "Lowell."

Mr. Lowell married a sister of his college room-mate, Charles Jackson, and of his coadjutor at Waltham, Patrick T. Jackson. Their children were three sons and one daughter. Of these the eldest, though connected only by the investment of capital with manufactures, may be briefly referred to. He received the name of his great-grandfather, grandfather and uncle, being the fourth John Lowell who was a student at Harvard College. He pursued his studies at the High School of Edinburgh, Scotland, and entered Harvard College in 1813. His college course was interrupted by ill health, and he made a voyage to India. Returning with restored vigor he engaged in mercantile pursuits, continuing in them until 1832. During the two previous years his wife, and two daughters, his only children, had died. Having spent some time in travel in this country, he sailed in November, 1832, for Europe, having made his will, giving \$250,000 for the support of a course of lectures in Boston. He spent more than three years in traveling through Europe, Egypt, the Holy Land, and finally in India, and died in Bombay, March 4, 1836. By his munificent gift, the Lowell Institute, during a period of more than forty years, has maintained courses of valuable and instructive popular lectures.





**MANCHESTER LOCOMOTIVE WORKS,**

MANCHESTER, N. H.

# MANCHESTER LOCOMOTIVE WORKS.

**I**NATE in 1853 Oliver W. Bayley, Aretas Blood and others formed a partnership, under the firm-name of Bayley, Blood & Co., for the building of locomotives, assuming the designation of the Vulcan Works. The firm commenced operations in Mechanics Row, Manchester; but, early in 1854, they removed their machinery to Canal Street, where they had erected shops suitable for the business. In June, of that year, the members of the firm and others were incorporated as the Manchester Locomotive Works, for building locomotives and other kinds of machinery, with an authorized capital of \$300,000. An organization was effected by the choice of O. W. Bayley, as President, General Agent and Superintendent; and William G. Means, as Treasurer and Clerk. The corporation purchased of Bayley, Blood & Co. their new works, which, though completed, had not been set in operation. In the autumn of 1854 the manufacture of locomotives was begun; and the business was prosecuted continuously until May, 1858, when the corporation suspended operations. The shops were then leased to Aretas Blood, one of the stockholders, who carried on the business, in a small way, until October, 1864. The corporation then resumed operations, and from that time to the present have been uninterruptedly employed in the manufacture of locomotives. The period from 1865 to 1874 was prosperous; and the works were enlarged, from their original capacity of producing twenty engines a year, to their present capacity of one hundred and twenty.

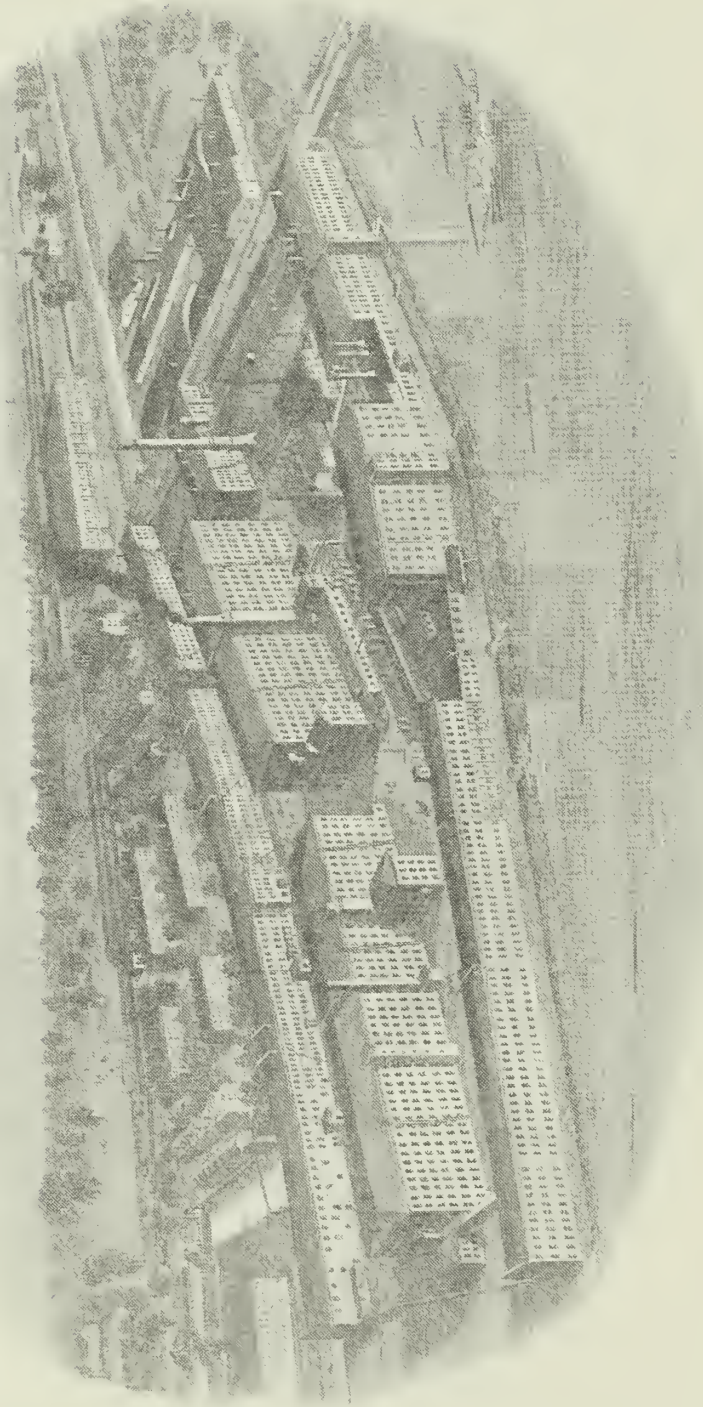
The corporation owns about five acres of land on Canal Street; and, on this site, the main buildings are located. These comprise a machine-shop, 400 feet in length and 84 in width, two stories high; a wood-shop, of the same height, 100 feet in length and 40 in width; a smith-shop, 330 feet in length and 50 in width; a boiler-shop, 250 feet in length and 52 in width; and a building used for making tanks.

These are all of brick, and substantial. The corporation also owns one acre of land on Elm Street, where stands the iron-foundry, in which two furnaces are used for the manufacture of iron from scraps collected in other parts of the works. All the iron castings and heavy forgings used, and every part of the locomotives constructed, except the boiler and tank iron and a few minor parts, are made on their own premises. Nearly eight hundred locomotives have been built at this establishment. Many of the railroad companies in the United States, among them the Boston, Concord and Montreal, the Boston and Maine, the New London Northern, the Michigan Central, the Lake Shore, the Chicago, Burlington and Quincy, the Hannibal and St. Joseph, the Carolina Central, the Wilmington and Weldon and the Grand Trunk Railway, are now using engines built at these works.

In 1877 the corporation purchased of the Amoskeag Manufacturing Company all the rights and interests of the latter in the manufacture of the Amoskeag steam fire-engines, and are now engaged in their production.

Mr. Bayley, the first president of the corporation, held the office until 1855, when the present president, John A. Burnham, of Boston, was chosen. W. G. Means, now of Andover, still retains the office of treasurer. Aretas Blood was chosen superintendent of the works in 1864, and since that time has had personal supervision of the business at Manchester. The establishment, when in full operation, employs about seven hundred men, and the monthly pay-roll for labor has at times reached \$32,000.

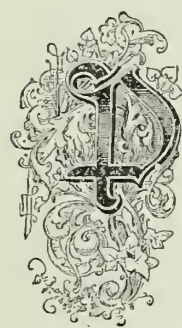




MANCHESTER MILLS.

MANCHESTER, N. H.

# MANCHESTER MILLS.



RIOR to 1839 the manufacture of the light fabric for ladies' dress-goods, known as *mousseline de laine* was carried on only to a small extent. A small mill at Hooksett, N. H., owned by the Amoskeag Manufacturing Company, and running from 6,000 to 8,000 spindles, was the only one then engaged in this industry. There being no facilities at the mill for printing the goods, they were sold to a firm in Taunton, Mass., who printed them on their own account. In 1839 a company was organized in Manchester, N. H., to engage in the business on a larger scale. The name of the company was the Manchester Mills, and the authorized capital was \$1,000,000, the subscriptions to it being made chiefly by stockholders in the corporations already in existence in Manchester. There was some delay in filling the list of subscriptions to the capital stock, and it was not until 1844 that effective operations were commenced. It was intended, not only to manufacture, but to print them; and the plan included the establishment of extensive works. In order to obtain thorough information of the machinery and methods in use in Europe, especially those pertaining to the finishing and printing of the goods, Ezekiel A. Straw was sent to England early in 1844. The information he obtained was the basis of the plans for buildings and machinery for the printing department.

In March, 1844, contracts were made with the Amoskeag Manufacturing Company for land, water-power, mills and machinery necessary for a manufactory of 30,000 spindles, a printery of corresponding capacity, and other buildings.

In 1846 the printery and Mill No. 1 were finished. James Peacock, an English printer, undertook the management of the printery—a position which he held until 1848. At the beginning of operations, the whole capacity of the works was devoted to the manufacture of delaines; but it was soon found necessary to use, between the thin woolen fabric and the pressure-rolls, or cylinders, cotton cloth. To meet this

need, a thin cotton cloth was made, one hundred and fifty looms being devoted to the purpose. This cloth was afterward dyed and sold as wigans. In a few months it was found to be more advantageous to use cotton cloth of a heavier fabric, and the manufacture of cotton cloth was discontinued, the heavier cloth being purchased.

In July, 1847, the Company sold all its property to the Merrimac Mills, a corporation chartered the previous year, with an authorized capital of \$1,500,000. Of this amount, \$500,000 had been subscribed up to the time of the purchase of the Manchester Mills. Additional subscriptions were then obtained, making the whole amount \$1,200,000. As with the Manchester Mills, the Company met with much difficulty, and the operation of printing delaines seemed to be still a matter of experiment. A part of the works were then devoted to the manufacture and printing of calico; and, in September, 1847, about one-half of the machinery was changed so as to weave cotton print-cloths. About the same time the difficulty of the proper drying of the goods was overcome, by the construction of what has since been known as the hot-room, now in use. The other difficulties were successively removed; and, early in 1849, results so satisfactory had been secured that the manufacture of cotton goods was abandoned, and all the looms, six hundred and eighty-one in number, were devoted to delaines. In March, 1849, the remaining \$300,000 of the capital were subscribed, the name of the Company having been changed the previous July (1848), to the Manchester Print Works.

The erection of Mill No. 2 was completed in 1850, so that the mill went into operation the next year. In addition to the manufacture of delaines, plain and twilled, the manufacture of the light, gauze-like fabric of worsted, or silk and worsted, styled barege, was commenced.

In December, 1850, the capital stock was increased to \$1,800,000; and the next year the manufacture of cassimeres and satinets was begun. In 1852 the number of looms running was twelve hundred, and in the printery were ten printing-machines. In the same year gas for lighting was first introduced into the mills and printery. The amount of goods then manufactured was such that there was a lack of machinery in every department of the printery; and, during 1852, its capacity was doubled, new machinery being added. Early in 1853 the manufacture of cotton print-cloths was resumed, requiring the change of about one-half of the machinery in Mill No. 1. On the 22d of September, 1853, the entire printery, together with goods to the value of about \$100,000, was burned, causing a loss to the Company of \$250,000 above the insurance. Temporary arrangements were made to meet the exigency, three printing-machines being set up, and operated night and day. In 1854 the present printery was completed. The Company again met with a heavy loss by fire, July 15, 1855, the southern half of Mill No. 1, containing 22,500 spindles and 515 looms being

burned, with a loss above the insurance of \$150,000. That part of the mill was rebuilt, and was again in full operation early the following year. In 1855 the manufacture of fancy cassimeres, flannels, stocking-yarn and hose was introduced.

The large building of brick and stone, designed, and since used, as a store-house for finished goods and for drugs was erected in 1859. During the latter part of 1860, and early in 1861, the Company thoroughly remodeled the two lower stories of Mill No. 1, securing thereby a large increase of available room. From that time until 1865 the business was successful. The whole period, indeed, from the beginning of 1848, had been marked by growth and prosperity; the first four years, from 1844 to 1848, having been years of experiment. The increase from 1850 is shown by the fact that, in that year, the mills produced 7,480,000 yards of delaines, bareges, etc.; while in 1865 the product was 16,060,000 yards of delaines, cassimeres, satinets and fancy woolen goods, 1,015,000 yards of cotton goods, and 72,400 dozen of hose.

The Company purchased in 1866 a mill-site on the lower canal, south of Granite Street, with the opportunity for sixteen mill-powers, or about 54,000 spindles, and the privilege of six of the mill-powers in connection with the works already in operation, adding to their capacity about 20,000 spindles. In 1868 new machinery for the manufacture of worsted goods was introduced, at an expense of \$65,000; and in 1869 a new turbine-wheel was put in the printery. These improvements, with the large additions of machinery made in 1871 and 1872, at an aggregate expense of \$400,000, did not arrest the decline in the affairs of the Company, which had reached the zenith of its prosperity in 1865; and in 1873 it was voted to reduce the capital stock to \$540,000, and to issue new stock. But, owing to the failure of some of the stockholders to take up and pay for their proportion of the new issue, the Company was obliged to sell, at public auction, all their real estate, machinery and other property, Samuel R. Payson being the purchaser. In the previous year a charter was granted to a corporation, under the name of the Manchester Print Works and Mills, with a capital stock of \$2,000,000. The Company was organized May 13, 1874, and purchased from Mr. Payson the property formerly belonging to the Manchester Print Works. In June, 1874, the name of the Company was changed to its present designation,—the Manchester Mills.

Since its re-organization in 1874, the Company has been engaged in the manufacture of cotton print-cloths, and of worsted dress-goods, the annual production of each being about 15,000,000 yards. It runs 68,000 cotton-spindles, and 10,000 worsted spindles. It leases from the Amoskeag Company forty mill-powers, affording a capacity of 140,000 spindles.

The real estate of the Company consists of forty-three acres of land, of which seventeen acres are occupied by the boarding-houses and tenements, and the

residences of the agent of the mills and the superintendent of the printery, and the remainder by the mill and printery-yards, laboratory and store-yards. In the main yard, consisting of thirteen and a quarter acres, are six mills and the printery, having about twenty-two acres of floor-room. In Mill No. 1 are two eight-feet turbine-wheels, of five hundred and fifty horse-powers each, driving the machinery of that mill, also of Mills Nos. 3 and 6. In Mill No. 2 is an eight-feet turbine-wheel of eight hundred horse-powers, driving the machinery of Mills Nos. 2 and 4. Mill No. 5 is used for pressing, folding and packing-rooms. Besides these six mills, there is a boiler-house containing fourteen boilers, with an aggregate of eleven hundred horse-powers, and a series of buildings of one story, used as a dye-house. The power of the dye-house is derived from a four-feet turbine of seventy-five horse-powers. To guard against fire, there is a fourteen-inch water-pipe, running through the yard between the buildings, on which are hydrants at short distances; stand-pipes in all the mills, with hose constantly attached; systems of sprinklers in the picker and waste-rooms; fire-pails, constantly filled in all the rooms; and three hose-carriages manned by a thoroughly organized fire department of the operatives.

The print-works are composed of a central building and two wings, the whole structure being in the form of the letter H. The central building is 160 by 65 feet, three stories, and is fire-proof, having floors composed of iron beams and masonry. On the first floor of this building are located the fifteen printing-machines and hot-rooms. The east wing is 220 by 60 feet, and four stories high. The west wing is 280 by 80 feet, and three stories high. There are supplementary buildings, consisting of a color-shop, where are manufactured the colors for printing; the madder dye-house, in which printed-goods are dyed; the bleachery, for bleaching print-cloths; the repair-shop, engine-room and the boiler-house, containing seventeen tubular boilers, and five upright Corliss boilers, with an aggregate of sixteen hundred horse-powers. The machinery in the print-works is driven by a seven-feet turbine-wheel, of three hundred and twenty-five horse-powers, seven small ten-inch turbine-wheels, of twenty horse-powers each, and a Harris-Corliss engine, of one hundred and fifty horse-powers. The capacity of the print-works is about fifty million yards annually.

South of Granite Street, in connection with the print-works, is an extensive laboratory, the buildings of which cover about three acres of land, and where a large amount of drugs and chemicals are annually manufactured.

The number of *employés* in the manufacturing department is one thousand males and two thousand females; and, in the printery, four hundred of both sexes.

The principal officers of the Company, in its successive organizations, have been as follows: of the old Manchester Mills Company (1839-1847), President, David Sears, until June, 1847, then Oliver Dean; Treasurer, William Amory, until 1845,

then Isaac Livermore ; Proprietors' Clerk, William G. Means, until 1846, George B. Upton, until January, 1847, then F. A. Hussey ; Directors, Willard Sayles, Oliver Dean, J. C. Howe, Nathan Appleton and George Howe—all of them through the whole period, except Williard Sayles, who was succeeded in 1846 by William Amory.

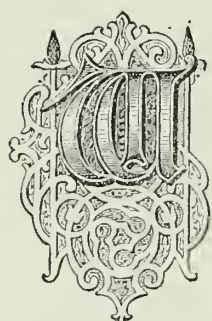
The officers of the Merrimac Mills (changed in 1848 to Manchester Print Works), 1847-1873, were : President, David Sears, 1847-8, Oliver Dean, 1848-71, William Mixter, 1871-3 ; Treasurer, William Amory, 1847, Isaac Livermore, 1847-52, Charles Amory, 1852-71, William H. Thompson, 1871-3, Charles H. Dalton, 1873 ; Proprietors' Clerk, John A. Burnham, 1847, F. A. Hussey, 1847-9, Oliver Macy, 1849-54, Josiah S. Shannon, 1854-73 ; Directors, David Sears, Jr., Amos Cotting and Nathan Appleton, 1847, Nathan Appleton, Jabez C. Howe, Oliver Dean, George Howe, William Amory, 1848, Nathan Appleton, David Sears, J. C. Howe, George Howe, William Amory, 1848-55, Samuel R. Payson, in 1855. From this time to 1873 there were numerous changes in the board, the following-named having been members at different times : Sidney Homer, James Ellison, Samuel W. Sweet, Thomas Wigglesworth, Charles W. Freeland, T. Jefferson Coolidge, Samuel Johnson, Nathan Parker, David B. Jewett, Walter Hastings, A. E. Hildreth, Caleb W. Loring, Samuel Fay and Gilbert R. Payson.

The officers of the Manchester Mills, under the organization, May 13, 1874, have been : President, Lyman Nichols ; Treasurer, Charles H. Dalton for a few months, then John C. Palfrey to the present time ; Clerk, Asa Fowler ; Directors, Lyman Nichols, Samuel Fay, William H. Hill, Moody Currier, Benjamin P. Cheney, Samuel R. Payson and William O. Grover. Lyman Nichols died Aug. 26, 1878, and S. R. Payson was then elected president, and Joseph H. White a director.

The agents have been : George B. Upton, who resigned about the beginning of 1846 ; William P. Newell, 1846-53 ; Waterman Smith, 1853-71 ; A. M. Wade, June to December, 1871 ; H. M. Thompson, 1872-4 ; Joseph Stone, from 1874 to present time. The print-works have been sometimes under the immediate management of the agent ; sometimes under a superintendent, independent of the agent ; and sometimes under a manager subordinate to the agent. James Peacock was its superintendent until 1848. From that time until 1852, Mr. Newell, the agent, had charge. John P. Lord was then superintendent for a year, and was succeeded by Charles H. Dalton, who held the office until 1864, Samuel Webber being manager under him from 1858. On Mr. Dalton's departure, John M. Ordway was appointed, continuing until 1866 ; when Waterman Smith, the agent, took charge, having A. M. Graham as manager under him until 1869. In that year James Dean was appointed superintendent, independent of the agent, and held the office until his death, Nov. 30, 1875. He was succeeded by the present superintendent, Benjamin C. Dean.

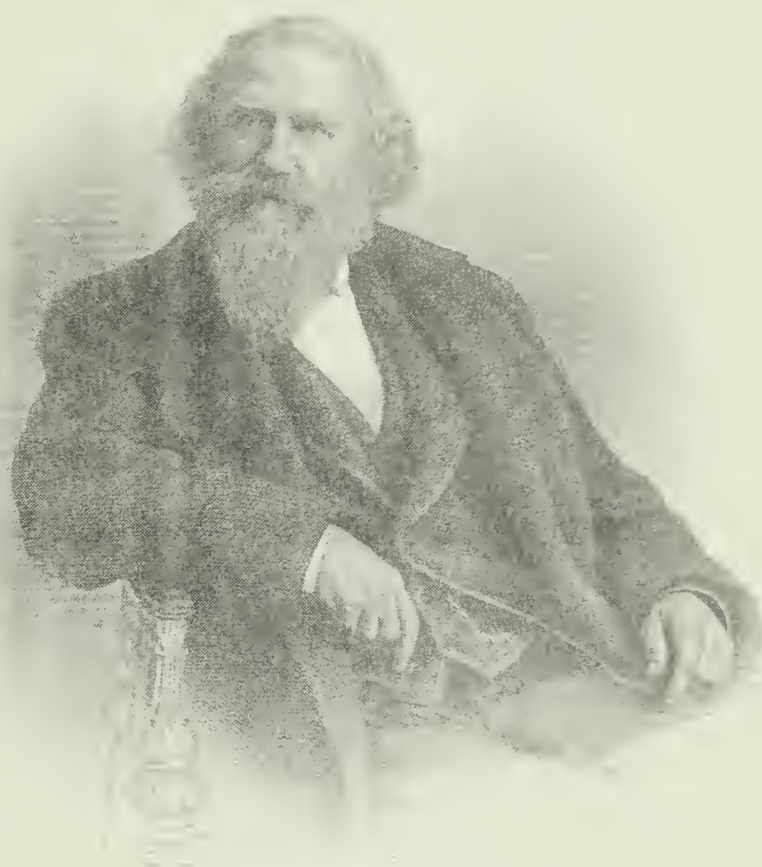
# THE MASON MACHINE WORKS.

WILLIAM MASON.



WILLIAM MASON, the inventor of the "self-acting mule," and improvements on other machines; the improver of the "ring traveler," from a clumsy device to a practical machine, which has worked a revolution in frame spinning; and the originator of the American type of the locomotive-engine — early earned a high place among the master mechanics of New England. He was born at Mystic, Conn., in 1808, and was the son of a blacksmith and small farmer. His boyhood was passed in his father's shop and on the farm two-thirds of each year, and the remainder in the country school. When he was three years old the family removed to a small island at the mouth of the Mystic River. Here they remained for three years, and then removed to Stonington, where the father cultivated a small farm, and worked at his trade as a blacksmith. William's mechanical aptitude early manifested itself. He fashioned his toys himself, using his father's jack-knife; and when eight years of age made jew's-harps, afterward some skates and sleds. He also succeeded in making musical instruments of various kinds.

At thirteen years of age he left home, and going to Canterbury, in Windham County, Conn., he entered the spinning-room of a small cotton-factory as an operative. William worked at cotton-spinning for about four years, spending one year at Lisbon in a cotton-thread factory. While at Lisbon, one of the more complicated machines needed repairs, and it was found that young Mason alone could make them. This fact becoming known at East Haddam, where a mill for the manufacture of thread was about to be established, he was sent for to start the machines, though only fifteen years of age. While employed at cotton-spinning at Canterbury, he amused himself by making a "hurdy-gurdy." This instrument is still retained by Mr. Mason as a memento of his early mechanical recreations.



Van Slyke & Co. Boston



*Wm. Mason*



At seventeen he entered the machine-shop attached to the cotton-mill at Canterbury, to learn the details of machine-work, and devoted himself to it three years, when he closed his apprenticeship, and went to New Hartford, near Utica, N. Y. Here he obtained work in a machine-shop ; but within a month the company failed, and the shop was closed. The business, however, was soon started again, though on a more limited scale, and young Mason was re-engaged. After having been here about six months, he returned to his old employer at Canterbury, and soon had finished and set up the first power-looms used in this country for the manufacture of diaper linen. He also constructed an ingenious loom for weaving damask table-cloths, the figures of the middle and borders being interwoven ; but this machine, unfortunately, had a short career, as his employer soon failed. Mr. Mason, who had always possessed a taste for art, especially for the art of painting, established himself for a short time as a portrait painter. This, however, was not to be his life-work.

In 1832 he received an order from John Hyde, of Mystic, for some diaper looms. He had neither shop nor means to warrant his taking the contract ; but, obtaining an advance on the job, he contracted for the necessary frames at a shop in Willimantic, with the privilege, for himself and an assistant, of working there. Thus he realized a profit of about ten dollars a day. This was the turning-point of his career, and he thenceforward devoted himself to the manufacture of machinery.

The reputation gained by the fulfillment of this contract with Mr. Hyde was the means of securing for Mr. Mason an engagement with Asell Lanphear, who had a machine-shop in Killingly, Conn., and was at work on a new device for spinning, which has become well known as the ring and traveler, or ring-frame. It was the invention of John Thorp, of Providence, R. I., by whom it was patented, Dec. 31, 1828. This invention had been attempted several times before, but without success. Mr. Lanphear soon failed ; and Mr. Mason took charge of the establishment, on account of the creditors, receiving a percentage on the business. In the ring-traveler, undeveloped and unskillfully made as it was, he saw the germ of a most important improvement ; and he at once constructed a machine for making it more perfectly and of an improved form. He remodeled and perfected the "ring," and designed a new and tasteful iron frame in place of the clumsy affair previously made. There was at first a limited demand, owing to the prejudice created by the failure of the old machine. The new device, however, soon acquired a reputation which it has retained to the present time.

Having remained at Killingly two years, Mr. Mason entered the employ of Crocker and Richmond, then doing a large business in the manufacture of cotton-machinery at Taunton, Mass. For the next twelve months he worked steadily on his ring-frames. In the financial crisis of 1837, Crocker and Richmond failed, and were

largely indebted to Mr. Mason. Undiscouraged, however, by this disaster, he at once devised a "speeder" or "roving-machine." Shortly afterward, the old machine-shop of Crocker and Richmond was started up again by Leach and Keith, and Mr. Mason was employed as foreman, with his patented speeder as a specialty. The building of this machine soon gave way to the manufacture of the great invention of his life, the "self-acting mule." On this he experimented about two years, and received his patent Oct. 8, 1840. About the same time the machine known as the "Scotch Mule" was introduced into this country; and a more formidable rival appeared in 1841, in the "Roberts and Sharp Mule," imported by Major Bradford Durfee, and patented in this country Oct. 11, 1841. The latter machine was in some respects superior to that of Mr. Mason's; and he set himself to make an entirely new mule. In this he succeeded, receiving a patent Oct. 3, 1846, for what is known among cotton manufacturers as Mason's self-acting mule. Just before completing this machine, in the winter of 1842, he was taken ill; and, to add to his trouble, Leach and Keith failed, owing him a large amount.

On his recovery, he determined to engage in business on his own account. James K. Mills & Co., of Boston, then a leading commission firm, interested in cotton manufacture, aided him in the purchase of Leach and Keith's machine-shop; and this was started up under Mr. Mason's sole management.

From that time he steadily progressed, soon attaining a high rank among the machinists of New England. During the summer of 1845 he erected new buildings, according to his own plans, arranged for the convenience of his work. His buildings now cover an area of ten acres. Mr. Mason's business had been so successful that, on the completion of these works, he was a half owner, and out of debt. His chief business was the manufacture of every variety of cotton-machinery, the specialty being his self-acting mule. He was also largely engaged in the manufacture of woolen-machinery, of machinists' tools, blowers, cupola-furnaces, gearing and shafting; and in these various branches of machine-work he has continued until the present time.

In 1852, having placed his business as a manufacturer of cotton and woolen machinery, and of the iron work just named, on a solid basis, he resolved on a new enterprise. The first locomotives were brought into this country from England, early in 1830, by Horatio Allen, of New York; and the first American mechanic to engage successfully in their manufacture was Matthias W. Baldwin, of Philadelphia, who built his first engine in 1832, and was followed by Thomas Rogers, of Paterson, N. J., in 1837. Both of these mechanics made important improvements in the details of their locomotives. These, however, were still built on the general plan and model of the English locomotives. Mr. Mason determined to contrive a new



Van Dyck & Co. Boston.

# WASON MACHINE WORKS

TAUNTON, MASS.





model; and in 1853 he brought out his first locomotive, which at once attracted attention for its taste and beauty, as well as for its workmanship. The general form, as well as numerous improvements, in details, presented by him, has since been adopted by locomotive-builders throughout the country. He had erected, in 1852, additional buildings; and he now entered vigorously into this new field.

In 1857 the firm of James K. Mills & Co., of Boston, for many years a leading house in the domestic commission trade, became insolvent. Mr. Mason was so connected in business relations with that firm, which had furnished him capital in 1842, and entered into a partnership with him, as has already been stated, that he, also, was compelled to suspend payments. The business of the works at Taunton, as a separate enterprise, had been successful, earning large profits for Mr. Mason and his partners. He was now compelled to start anew. This he did, on his own account, and soon placed the business on its old basis of success. After becoming thoroughly established he equipped a foundry for the manufacture of car-wheels; making his wheels with hollow or tubular spokes, instead of plate wheels, to insure more strength, and to make them uniform with the driving-wheels of the locomotives.

On the opening of the Civil War, the Government had at its command but 70,000 effective muskets. Mr. Mason, with others, at once set about preparing the necessary facilities for making fire-arms. He erected an armory, equipped it with the best machinery, some of which he improved by his own inventions, and soon had it in operation, manufacturing about six hundred Springfield rifled muskets a week. The demand, of course, ceased with the termination of the war. During its progress, Mr. Mason was engaged in at least five branches of business which are usually carried on in separate establishments — cotton-machinery, woolen-machinery, locomotives, car-wheels and fire-arms, besides much miscellaneous machine work. With the exception of fire-arms and woolen-machinery, he has continued them to the present time.

In 1873 the business was organized as the Mason Machine Works, a joint-stock company being formed, with a capital of \$800,000. Its officers are: William Mason, President; William H. Bent, Treasurer; Frederick Mason, Agent; and Charles R. Olney, Clerk.

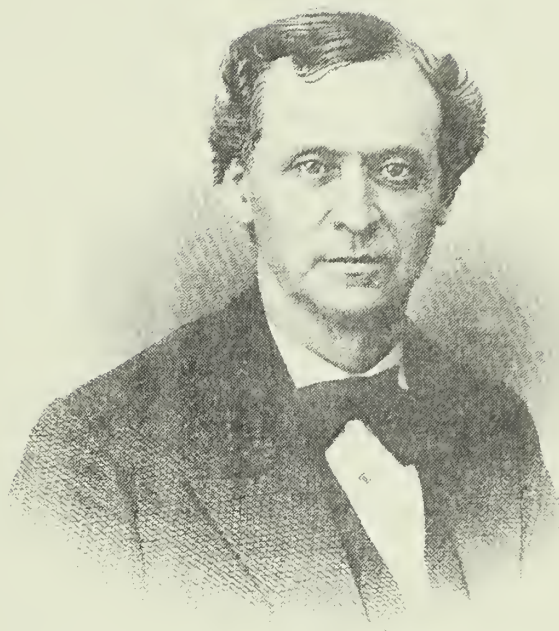


ISAAC C. LEWIS.



SILVER-PLATED ware was not, to any extent, manufactured in the United States until within the past half century. At first wares were made of pewter, and then of britannia-metal, the latter having been begun about 1825. Among those engaged in making pewter-ware were T. D. and S. Boardman, of Hartford, Conn., and Josiah Danforth, of Rocky Hill, Conn. At the same period Samuel Yale, of Meriden, was engaged in the manufacture of cut nails, pewter buttons and tin-ware. The best pewter was composed of four-fifths block tin and one-fifth lead; and the articles made were chiefly plates, platters, mugs, basins, teapots and spoons. These were molded or cast, and, excepting the spoons, which were scraped and burnished by hand, were turned and burnished in a lathe. The spoons were sold by the dozen, the other articles by weight, and so were called weight-ware. The manufacture of britannia-ware was introduced from England, about 1825, and probably nearly at the same time, by Isaac Babbitt, at Taunton, Mass., the Messrs. Boardman, at Hartford, Josiah Danforth, at Middletown, and by Charles and Hiram Yale (sons of Samuel), at Wallingford, Conn. This metal, or, rather, alloy, being usually composed of eighty-six parts tin, ten parts antimony, three parts zinc, and one part copper, was first made in England, in 1770, by Jessop and Hancock; and, very soon after its introduction into this country, entirely supplanted pewter in the manufacture of the articles referred to.

Of those who learned the business of Captain Danforth, at Rocky Hill, were his son Josiah, who established the business in Middletown, Conn., and Ashbel Griswold. The latter was born at Rocky Hill, April 4, 1784, and, after serving his apprenticeship, removed to Baltimore, engaging in business there. In 1808 he went to Meriden, Conn., where he worked for some years on pewter-ware, and very soon after the introduction of britannia-ware into this country, like other manufacturers of pewter,



Van Slyke & Co. Boston.



Isaac C. Lewis



engaged in making goods of the new metal. He continued in the business until 1842, when he sold out his interest to his partner, Ira Couch, who, in 1844, himself sold out the whole business to William W. Lyman. Mr. Lyman, in 1846, entered into partnership with Lemuel J. Curtis—a connection which continued until 1852. There were at that time, engaged in the manufacture of britannia-ware at Meriden, besides Messrs. Curtis and Lyman, Isaac C. Lewis and James A. Frary, and, in the adjoining town of Wallingford, John Munson, who had, in 1847, bought the business of Samuel Simpson. The latter, in 1835, had succeeded Charles Yale. There were also in Meriden two brothers, Horace C. and Dennis C. Wilcox, who had been for several years engaged as merchants in the britannia-ware trade, and had bought largely of the above-named manufacturers. Their office was at West Meriden. In the latter part of 1852, it was proposed to unite the manufacturing and mercantile interests of all these firms in a company, under the style of the Meriden Britannia Company. This organization was made in December, 1852, and the Company went into operation on the 1st of January, ensuing. The manufacture was conducted in the different shops at Meriden and Wallingford, except that of Curtis and Lyman, the machinery and tools of which were removed to the shop of James A. Frary. The office of the Messrs. Wilcox was made the office of the Company, and a room adjoining it was devoted to the silver-plating of spoons and forks, which soon became an important item in the business.

On the 1st of January, 1854, the business of Samuel Simpson, who, on selling out his britannia factory, at Yalesville, to John Munson, in 1847, had started a manufactory of wares plated by the electrotpe process, at the Humiston Mills, three miles below Munson's factory, was consolidated with that of the Meriden Britannia Company. Mr. Munson sold out his interest to the Company, and the machinery of his establishment was removed to Simpson's factory. At the same time, Jan. 1, 1854, James A. Frary disposed of his interest in the Company, and early in the next year the machinery and tools of the Frary shop were transferred to the shop of I. C. Lewis.

In 1856 the present plating-shop of the Company was erected, and all the plating, including that previously done at Wallingford, was removed to the new shop. Mr. Simpson sold one-half of his stock in 1861, and, in 1864, the remainder of it. Edward A. Mitchell became a stockholder in 1863, transferring to the Company the business which he had previously purchased of Messrs. Rogers, Smith & Co., of Hartford, the successors to the firm of Rogers Brothers. The Company now made a contract with Asa and William Rogers, for the use of their trade-mark of "Rogers Bros. A 1. 1847," and employed them in the plating department of their work. The process of plating by the use of the galvanic battery was discovered in 1803, by

Brynatelli, a pupil of Volta, who is said to have gilded copper by the use of the galvanic current ; but De La Rive was the first to make this process of plating with silver or gold really successful. Its present state of perfection is due to Elkington, Ruolz and others. The method of plating by soldering thin sheets of silver on copper or brass was known to the Romans, and was the only method used until the middle of the eighteenth century. The method of plating introduced about 1750 was by fusing a plate of silver on an ingot of copper or brass, and then rolling the ingot into a sheet. It was called English plating, to distinguish it from that previously in use, styled French plating. In this country among the first to attempt electro-plating was Asa Rogers, a silversmith, who, in 1842, started a small shop in East Granby, Conn. He made but slow progress at first ; but, early in 1847, he associated with him his brothers William and Simeon Rogers, and, removing to Hartford, engaged in the manufacture, as a speciality, of forks, spoons, and other flat silver-plated ware with success. The standard adopted at the outset was maintained, and the goods acquired a profitable reputation. The Meriden Britannia Company have not only become in law the successors of the Rogers Brothers, having the exclusive right to the trade-mark, but have kept up this standard. Asa Rogers, the founder of the firm of Rogers Brothers & Co., is now in the employment of the company, devoting himself especially to the plating of this class of goods.

The buildings of the Company were increased from time to time, until, in 1863, the main building (of brick) was completed to its present dimensions of 527 feet in length, and 70 feet in width. On the completion of this building, the machinery was removed from the shops of I. C. Lewis, at East Meriden, and of Samuel Simpson, at Wallingford, and the whole business was concentrated at West Meriden. The Company has been successful from its organization ; and the capital, which was originally \$50,000, has been increased to \$550,000, — mostly from the earnings, — and there is a large surplus. The enterprise, originally devoted to the manufacture of britannia-ware, has been gradually changed, until it is now almost wholly the manufacture of silver-plated goods, either of britannia-metal or of nickel. All those concerned in its establishment and progress have been practical men, each familiar with his special task.

Of the gentlemen who have been named, the eldest in years and the earliest in active business is Isaac C. Lewis, born in Meriden, Conn., Oct. 19, 1812. His father died when he was eleven years old, and he lived the next two years with Levi Yale and Moses Andrews, farmers, at Meriden. He then went to live with his grandfather, Jared Lewis, a trader and hotel-keeper in Wallingford. On the death of his grandfather, which occurred soon after, he returned to Meriden, and remained a short time with his elder brother, Patrick Lewis. In his fifteenth year he was

apprenticed to Hiram Yale, of Wallingford, to learn the britannia-ware trade. His employer dying when he was nineteen, he returned to Meriden, and worked about two years for Lewis and Holt, manufacturers of coffee-mills, of which firm his brother Patrick was the senior partner.

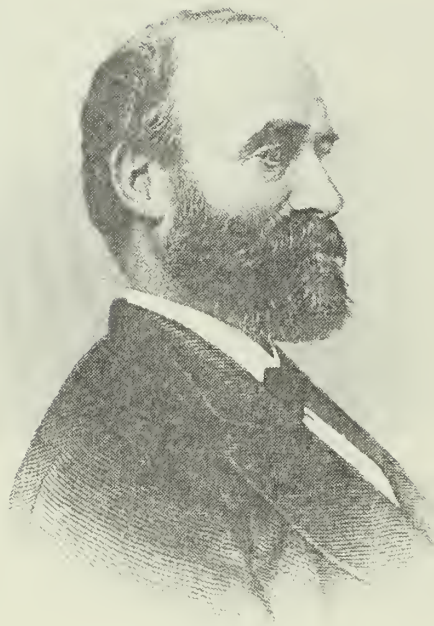
In 1834 Mr. Lewis formed a partnership with George Cowles, under the name of Lewis and Cowles, and engaged in the manufacture of britannia-ware, hiring for the purpose a room in a factory at East Meriden. The partnership was dissolved, and the business closed up, in 1836, in the summer of which year he went with Lemuel J. Curtis, of Meriden, to Edwardsville, Ill.; but they soon returned to Meriden, and entered into partnership, under the style of Lewis and Curtis, engaging in the manufacture of britannia-ware at East Meriden. This partnership continued about two years; was then dissolved, and Mr. Lewis soon after purchased an estate about a mile east of the center of Meriden, where he built a shop and put in a horse-power. The increase of business prompted Mr. Lewis to buy a small steam-engine. He next purchased the factory at East Meriden, a part of which had been occupied in 1834, by himself and George Cowles. In 1840 he received into partnership Daniel B. Wells, a former apprentice, the firm-style becoming I. C. Lewis & Co. This partnership was dissolved soon after by the death of Mr. Wells. From that time until the formation of the Meriden Britannia Company, in 1852, he continued the business alone. On the organization of the Company he was elected its president, and held that office for twelve years. He is still a director; and on the concentration of the business at West Meriden, in 1863, he was appointed superintendent of the manufacturing department.

Mr. Lewis married, in 1836, Harriet, daughter of Noah Pomeroy, of Meriden, by whom he has had six children. He has been Mayor of Meriden three successive terms, and has been connected continuously, since the organization of the city government, with one or other of its departments. He represented the city in the legislature in 1848, 1853, 1862 and 1866.

Lemuel J. Curtis having learned from his elder brother, Enos, at Meriden, the trade of making pewter spoons, and afterward that of making britannia-ware from Ira Yale, at Wallingford, first engaged in business with Mr. Elton, afterward of Hall, Elton & Co., under the style of Curtis and Elton. They bought out Ira Yale's business, and continued it one year. Mr. Curtis then entered into partnership with Isaac C. Lewis, and next with his brother Edwin, and from 1846 to 1852, with W. W. Lyman. On the organization of the Meriden Britannia Company, he and his partner went to James A. Frary's shop, and afterward to that of I. C. Lewis. When the business was concentrated, in 1863, at West Meriden, Mr. Curtis took charge of a department of the manufacture until 1868, when he retired from active cares, still continuing, however, to be a director.

William W. Lyman learned the britannia-ware trade in the shop of Griswold and Couch, and in 1844 began its manufacture on his own account, purchasing Mr. Couch's business. In 1846 he united his business with that of L. J. Curtis, and continued until the formation of the Meriden Britannia Company. Since 1858 he has had no active connection with the enterprise, but has retained his stock. He has been a director since Jan. 1, 1854, when he was elected in place of James A. Frary, who then retired from the Company. An account of Samuel Simpson, of Wallingford, is given elsewhere. Hon. Horace C. Wilcox was the original business head of the Company, and has been its president since 1864. He has had, since 1866, valuable assistance from his younger brother, Dennis C. Wilcox, who is now the selling agent of the Company in New York. The special charge of the finances has been in the hands of George R. Curtis, whose experience as teller of the Meriden Bank well qualified him for the office of treasurer, to which he was invited on the organization of the Company, and which he has since filled.





Van Slyke & Co Boston.

Gordon McKay.

A decorative horizontal banner with ornate, symmetrical scrollwork at both ends. In the center, the name "GORDON McKAY." is written in a serif font. The banner is flanked by small decorative elements resembling musical notes or stylized leaves.

GORDON McKAY, the principal inventor of the device for sewing boots and shoes known as the McKay Sewing Machine, was born in Pittsfield, Mass., May 4, 1821. His father was engaged in the cotton manufacture, and died when Gordon was thirteen years old. Gordon studied, and for four years practiced, the profession of civil engineering. In this capacity he was employed in the building of the Western Railroad, and the enlargement of the Erie Canal. Turning his attention to mechanics, he erected, when twenty-one, a machine-shop at Pittsfield, and continued to do general machine work for paper and saw-mills for the next twelve years, employing about one hundred men.

In 1852 he went to Lawrence, Mass., and became treasurer and agent of the Lawrence Machine Company — a concern which employed five or six hundred men, and took large contracts in both heavy and light work. He had, besides, a general control over the work done in the establishment. The production of locomotives, cotton-machinery and other kinds of mechanism was a part of his task as superintendent of the mechanical department. After remaining in this position four years, he retired from it.

In 1859 Mr. McKay purchased Blake's sewing-machine, which was simply a wax-thread sewing-machine with a stationary horn attached. This was intended to sew boots and shoes, and operated well on parts of the work, but would not stitch either the toes or the heels. He changed the feeding apparatus, introduced automatic contrivances, and finally succeeded in adapting it to all kinds of work. Various patents have been taken out by Mr. McKay for these appliances. Robert H. Mathies was associated with him in these inventions, and aided him in devising the mechanical forms.

The outbreak of the Civil War created a large demand for boots and shoes

adapted to the army ; and in 1861 Mr. McKay began to make army shoes. He set up five machines in Raynham, obtained a factory at Farmington, N. H., took Government orders, and manufactured on his own account. The result proved the practical utility of the machine ; and in June, 1862, these machines were first offered for sale. Mr. McKay adopted the plan of leasing, rather than selling, his machines, and in 1862 made contracts with sixty-two firms for their use ; and in 1876 fifteen hundred were in operation in the country. The royalty from these leases amounts to about \$500,000 a year. Foreign countries now employ the machines, seven hundred of which are in use in European factories, and two hundred in Canada. About thirty millions of boots and shoes are annually made in the United States upon this machine. There is a saving of twenty-five cents per pair in producing them in this way, which amounts in money to \$7,500,000 a year.

Mr. McKay has established at Lawrence a manufactory of his machines, in which one hundred men are employed. A corps of experts are constantly employed to visit the factories where the machines are leased, and to keep them in repair. In 1874 Mr. McKay invented a machine for pegging shoes and boots with metal, which, however, has not yet been introduced into the market. The business of the concern is conducted under the style of the McKay Sewing Machine Association.

The application of the principles of the common sewing-machine to the manufacture of boots and shoes was an important contribution to industrial progress, and entitles Mr. McKay to a high rank among inventors.

# PAUL MOODY.

**P**AUL MOODY, the mechanic of Waltham and of Lowell in the early years of the cotton manufacture in both places, was born in Byfield Parish, in Newbury, Mass., May 23, 1779. He was descended, in the sixth generation, from William Moody, a saddler, who came with his wife and four sons from Ipswich, England, to Ipswich, in New England, in 1634, and early in the next year, with others from Ipswich, settled at Newbury. His eldest son, Joshua, graduated at Harvard College, in 1653, was the first minister of the first church in Portsmouth, and in 1684 removed to Boston, as minister of the first church in that town. In 1684 he was elected president of Harvard College, but declined the office. He returned to the charge of his former church at Portsmouth, in 1692, and died in 1697. His son Samuel and his nephew, also named Samuel, graduated at Harvard College, the former in 1689, and the latter in 1697. Both became ministers, one of Newcastle, the other of York, Me. Of William Moody's descendants in the next century, fifteen graduated, nine of them from Harvard, and six of them from Dartmouth College. Among these was Rev. Samuel Moody, who was born in York, Me., and graduated at Harvard College in 1746. In 1763 he took charge of the Dummer Academy, founded in 1762, under the provisions of the will of Gov. William Dummer. He continued as its principal until 1790, and during this period he had, as pupils, many who afterward became distinguished in various walks of life.

The father of Paul Moody, whose name also was Paul, was a man of influence in the parish and town. He was the father of seven sons, of whom two, Samuel and Nathan, graduated at Dartmouth College, and afterward resided in Hollowell, Me., the former being a teacher, and the latter a merchant; Enoch was a farmer, in Newburyport; Sewell and William were also farmers, and remained in their native parish, Byfield; David, the youngest, was for many years the superintendent of the

iron works on the Boston Mill-dam; and Paul, the subject of this sketch, was the only one of the boys who did not attend the Dummer Academy. At the age of twelve he resolved to earn his own living. In June, 1794, a small woolen-factory was established at the falls of the river Parker, in Newbury, by John and Arthur Scholfield, English weavers, who had recently come to this country, the capital being furnished by William Bartlett and others, of Newburyport. This was the first woolen-factory in Massachusetts. The weaving was done on hand-looms, and young Moody soon found a workman who was willing to teach him the art of weaving; and, at sixteen, he had become a practical weaver.

About this time Jacob Perkins, of Newburyport, an ingenious mechanic, invented an effective machine for cutting nails, and put up a nail-factory in Byfield. In this factory Paul Moody obtained employment. It was soon removed to Amesbury, Moody going with it. He made himself a master in the construction of the carding-machine, and was employed for some time in making the machines, and putting them in operation in several places in New Hampshire and Maine. In 1798, in his twentieth year, he was married to Miss Susan Morrill, of Amesbury; and soon after he entered into a copartnership with Ezra Worthen and others, for erecting and running a cotton-mill in Amesbury. In this business he was engaged about fourteen years, and became a thorough, practical machinist.

These fourteen years embraced the period of the troubles of our Government with France, and, afterward, with England. The minds of our people were strongly directed to the subject of domestic manufactures, especially as a means of relief from dependence on foreign countries. The attention of capitalists in Boston was mainly given to the manufacture of cotton goods; and Francis C. Lowell and others had formed the Boston Manufacturing Company. Their works were in process of erection, and they were looking for a suitable person to superintend the setting up of the machinery and to start the mill. They first applied to Jacob Perkins; who, however, having decided to remove to Philadelphia (and, in 1818, to London, where he resided until his death in 1849), suggested Paul Moody for the situation. Mr. Moody accepted the place, and removed to Waltham with his family in 1814. His situation from that time was one of responsibility, and afforded ample scope for his skill and ingenuity.

In the machine-shop at Waltham, he not only repaired and manufactured machinery for the mills, but organized a large business in building machinery for other cotton-mills. His attention was soon directed to the improvement of special adjustments and to the invention of new machines for special processes. In some of these he made a new departure; and, together with the invention of the power-loom by Mr. Lowell, he matured what was known as the Waltham system of cotton manu-

facture, as distinguished from the Rhode Island system. In the power-loom invented by Mr. Lowell, an adjustment, very important to its effective operation, was suggested by Mr. Moody. After the loom, one of the first things to be done was to produce a machine for dressing. The machine then in use in England was that of William Horrocks, of which Mr. Lowell obtained a drawing. On putting it into operation Mr. Moody suggested an essential improvement, doubling its efficacy; and the result was what was known as the Waltham dressing-frame. In this machine they used at first wooden rollers for applying the sizing to the threads. These rollers, being constantly wet, would swell and warp. They then tried covering the rollers, with metal by casting around them a coat of pewter; but, whether cast in sand or iron, they were found to be imperfect. Mr. Moody then made his rollers of soap-stone, which accomplished the purpose. For this dressing-frame, a patent was granted to Mr. Moody Jan. 17, 1818.

The next improvement was that of the double-speeder referred to in the sketch of Mr. Lowell. Mr. Moody carried the mathematical calculations of Mr. Lowell into effect by constructing the machine in conformity with them. This improvement was covered by a patent issued Dec. 30, 1820. Another of his inventions was that of the dead spindle, so called from its slow revolutions as compared with those of the live spindle, introduced from England by Samuel Slater. Both of these spindles continued in use for many years. The dead spindle was employed at Waltham and Lowell, and in mills elsewhere modeled after the establishments in these places; and the live spindle mainly in Rhode Island. The process of spinning in which either the dead or the live spindle was used, known as throstle spinning, was first successfully competed with by the ring-traveler, perfected by William Mason, of Taunton, on the invention of John Thorp, of Providence, who patented it in 1828.

Mr. Moody also devised the method of spinning the filling directly on the cops. The filling had before been spun on the warp-frame, and wound on a different bobbin, to fit it for the shuttle. A machine invented by Mr. Stowell, of Worcester, was in use for this purpose. Mr. Shepherd, of Taunton, had taken out a patent for a machine for the purpose. Mr. Moody now turned his attention to devising a method for spinning the filling directly on the bobbin, and the result was the filling-frame, patented Feb. 19, 1820. He also invented a machine for roping cotton, which was patented Jan. 19, 1820.

Mr. Moody was actively interested with Messrs. Appleton, Jackson and Boott, in the enterprise at East Chelmsford, now Lowell. The machinery for the two mills of the Merrimac Manufacturing Company was built at the shops of the Boston Manufacturing Company, and was set up under Mr. Moody's supervision, in the summer of 1823. It was clear that the immense water-power would soon be applied

to running other mills, and that the machinery would be built to better advantage there; and it was decided to establish a machine-shop on a large scale, and to secure Mr. Moody's services in arranging and superintending it. In August, 1823, a contract was made with the Boston Manufacturing Company, to release Mr. Moody from his engagement with it, and to allow the use of its patterns and patent rights, for the sum of \$75,000. Mr. Moody at once removed to Lowell, and started the machine-shop there in 1824. From that date until his death, the machinery for all the mills was built and set up under his supervision. But his inventive genius does not seem to have been so fruitful of results here as in his earlier experience at Waltham. He, however, in 1828, introduced the use of leather-belts for transmitting motion to the main shafting of a mill. This was an important invention. It was original in its application to the transmission of fifty or a hundred horse-power, by a single belt; and has been generally adopted in the mills of New England.

The part which he sustained in the origin of Lowell enlisted his interest in the welfare of the community. He early introduced into his shops the principle of temperance, and was a warm friend of education.

Mr. Moody died, after an illness of three days, on July 7, 1831, aged fifty-two years. Like his early co-worker, Francis C. Lowell, and his later associate, Kirk Boott, he died in the meridian of his years and of his usefulness.





Van Slyck & Co. Boston.



*Wm F. Gayles*

## THE MOSHASSUCK BLEACHERY.

WILLIAM F. SAYLES — F. C. SAYLES.



SITUATED in the valley of the Moshassuck River, about two miles from Pawtucket, R. I., is this bleachery, built on the site previously occupied by the Pimbley Print Works. In December, 1847, these print works were bought at auction by William F. Sayles, of Pawtucket, who converted them into a bleachery of shirtings and sheetings.

William F. Sayles was born in Pawtucket, R. I., Sept. 21, 1824. His father, Clarke Sayles, was for many years a merchant in Pawtucket. William attended school first at Fruit Hill, and then at Seekonk, R. I.; and for about two years he attended the Phillips Academy, at Andover, Mass. On leaving Andover, in 1842, he entered a commercial house in Providence, being employed at first as a book-keeper, then as a salesman, and finally was intrusted with the management of the finances. It was while occupying the latter position that Mr. Sayles purchased the Pimbley Print Works, and established the bleachery, to which he gave the name of the river on which it is situated.

The buildings were small, and chiefly of wood. In the spring of 1848, however, Mr. Sayles began operations, on a limited scale, bleaching about one ton of cloth a day. Although he was then inexperienced, and had only a small capital, the enterprise proved successful from the beginning. The water of the Moshassuck River is especially adapted to bleaching purposes; and there is, besides, on the grounds of the bleachery, an almost inexhaustible supply of spring water, which is invaluable in the later processes of bleaching.

The steady increase in the amount of business induced Mr. Sayles to enlarge, from time to time, the capacity of the works, until, in 1854, four tons of cloth a day were finished. The reputation of the bleachery had now become established; but in June, 1854, the works were burned. By autumn, however, a new bleachery, with a capacity of producing six tons of finished goods a day, was completed and put in

operation. Even this increase of capacity was soon insufficient; and before the close of 1855 a further enlargement of the works was made. The establishment has now a capacity of bleaching forty tons, or 325,000 yards, of fine shirtings a day, and further enlargements are now in progress.

At first Mr. Sayles confined his operations to bleaching fine sheetings and shirtings; but some years ago, the bleaching and finishing of lawns was commenced, which now amounts to a daily average of about 20,000 yards.

The establishment is supplied with excellent machinery; and the principal buildings, which, excepting the dry-houses, are brick, comprise the bleach, dry, acid and packing-houses, the machine-shop and the office. Besides these, there is a fire-proof planing-mill, in which about three million feet of lumber are annually used in making cases for packing goods. To drive the machinery, there are, in addition to the water-power, thirteen steam-engines, two of which are Corliss engines, of three hundred horse-power. Their total consumption of coal exceeds seven thousand tons annually.

The buildings are lighted by gas made upon the premises. The apparatus for extinguishing fire consists of a large fire-engine and six force-pumps, two of the latter being operated either by water or steam, and the others by steam only. The springs are inclosed by a wall of cut granite, forming an artificial basin about three hundred feet in circumference. The number of operatives employed in the bleachery is between three and four hundred.

Several years ago, Mr. Sayles formed a partnership with his brother, Frederick C. Sayles, and they have conducted the business under the firm-name of W. F. and F. C. Sayles.

With a view of facilitating operations at the bleachery, Mr. Sayles secured the incorporation of the Moshassuck Valley Railroad Company, of which he is now the president and principal stockholder. This road runs from the bleachery five miles, until it forms a junction with the Boston and Providence road; and over its track all the freight to and from the works is transported.

While chiefly devoted to the management of the Moshassuck Bleachery, Mr. Sayles has become largely interested in other business enterprises. The Slater Mill, a cotton manufactory in Pawtucket, the erection of which was mainly due to Mr. Sayles's exertions, is now in large part owned by him, though operated by others. He is a stockholder and director in two other large manufacturing corporations; is president of the Slater National Bank, of Pawtucket; and he has served two terms in the General Assembly of Rhode Island. For many years a day school, and, since 1860, a Sunday School, have been maintained in the village near the bleachery, mainly at Mr. Sayles's expense; and he and his brother have erected a granite chapel capable of seating two hundred persons, in which religious services are held.



THE SAYLES & CO. BOSTON

SAYLES' BLEACHERY,

*W. F. & F. C. Sayles,*  
*Proprs. & Mfrs.*





WILLIAM T. NICHOLSON.



FILES, though a small and seemingly simple device, have for years resisted all attempts to successfully manufacture them otherwise than by the slow process of hand-work. The difficulties, however, of making this useful little tool are far from slight. The steel must be that kind of cast-steel known as crucible carbon steel, a better quality of which is found to-day in the American product than formerly was imported from England. It must be forged without overheating; annealed under a close and careful watch; ground so as to remove all oxide, preserving a true and unburnt surface; properly filed down, or stripped, until the most minute irregularities are gone; cut without the spoiling by "mis-cuts, shallow-cuts or dull-cuts;" hardened, with no detriment to the wearing qualities; and then handled with care, as injury is sure to follow the rubbing of one file roughly against another.

From an early date the attention of many inventors seems to have been directed to the cutting of files by machinery. The first attempt was made by one Duverger, in 1699; and several inventors followed in the eighteenth century. In 1800 a machine was brought out by a Frenchman named Raoul, to manufacture watchmakers' files. Early in this century, dentists', watchmakers' and other miniature files for nice work were generally wrought by machinery, both in France and Switzerland; while hand-labor, still performed, produced the larger files. The opposition to machinery of all kinds among artisans in England, where work in steel most abounded, discouraged capitalists and inventors; but, in the United States, where such opposition has been rarely encountered, several earnest efforts have been made to produce all kinds of files by machinery, capable of giving them a quality equal to the hand-wrought article.

Nearly thirty years ago the American File Works were organized, with a large

capital, and with a man of ability at the head. Their buildings at Ramapo, N. Y., were extensive, and their files were used in some of the largest shops in that region. But in a few years the project was abandoned.

In 1858 the Whipple File Company entered into the manufacture of machine-cut files, at Ballardvale, Mass., and, for a time, found a ready market for their entire product. They made their own steel, and were favored by the war premium on gold; but, in 1869, this concern failed, with heavy liabilities. In the spring of 1863 a charter was granted to the American File Company; and James S. Brown, a manufacturer of cotton-machinery, became its manager. Brick buildings were erected at Pawtucket, R. I., and the cutting-machinery of "Bernot" was adopted; but in the autumn of 1864, Mr. Brown withdrew, and since then the business of this Company has not been profitable.

Another attempt was made by the Weed File Company, who, in 1866, with a large capital, began operations in South Boston; but in April, 1868, they failed, and their entire assets were sold at public auction.

The main cause of these failures was not a lack of capital, but unskillful management, combined with the prejudice against a file as thus far produced by machinery; and the regularity of the machine work in most of their products was also a fatal defect. It gave a perfect uniformity of space, and an unvarying depth of cut in the file; and its teeth were of even length and of like angle—qualities which produced a grooving and ploughing in the work invariably avoided by the irregularities common to a hand-cut file. At length this difficulty was overcome by William T. Nicholson, of Providence, R. I., the present president of the Nicholson File Company, whose whole career as a mechanic is intimately blended with his valuable invention.

He is the son of William Nicholson, and was born in Pawtucket, R. I., on March 22, 1834. At the age of fourteen, after a limited schooling, he began to work with his father, then constructing cotton-machinery for P. Whitin and Son, of Whitinsville, Mass. At seventeen he went to Providence, R. I., and entered the machine-shop of Halsey Hadley, then engaged in making screw-machinery for the Eagle Screw Company. His first job was to run a hand-plane for twelve hours, five nights out of six, for four dollars a week. In 1852 he entered the machine-shop of J. R. Brown, afterward Brown and Sharpe. Here, engaged in making surveyors' instruments, steel and box-wood rules and squares, watch-clocks and miscellaneous jobbing work, Mr. Nicholson, in time, became a first class-workman, and in the year 1856 rose to be foreman of their shop, where thirty men found employment. His evenings were spent in study; and in a few years he mastered a system of mechanics and mechanical drawings, and became so expert that, as foreman, he made all the drawings needed in the work-shop.



Van Slyke & Co. Boston



W. T. Nichols



After leaving this employment, in the spring of 1858, he for the first time went into business on his own account. He leased and fitted up a general machine-shop at No. 85 Eddy Street, in Providence, and formed a partnership with Isaac Brownell, under the firm-style of Nicholson and Brownell. The firm contracted to build light machinery, machine tools used by jewelers, silversmiths and others, and did, besides, a general jobbing business. In 1859 Mr. Nicholson purchased his partner's interest; and a year later moved to No. 110 Dorrance Street, where he employed twenty-five hands, and added the latest improvements in machinery. The outbreak of the Civil War at first disarranged his business. He now made gun-machinery, and the great demand for war material which followed increased his business. He made another enlargement of his facilities, and purchased the tools, patterns and stock of Foster, Luther & Co. The quality of his work soon attracted the attention of those who had obtained Government contracts for small arms; and he found himself, in a short time, under contracts to make the "rear sight-bands, swivels and side-washers" for one hundred and fifty thousand Springfield muskets. He then formed a limited partnership with Henry A. Monroe, under the style of Nicholson & Co., and, in his own shop, devised and constructed machinery, for this special purpose, capable of producing ten thousand such parts of muskets a month.

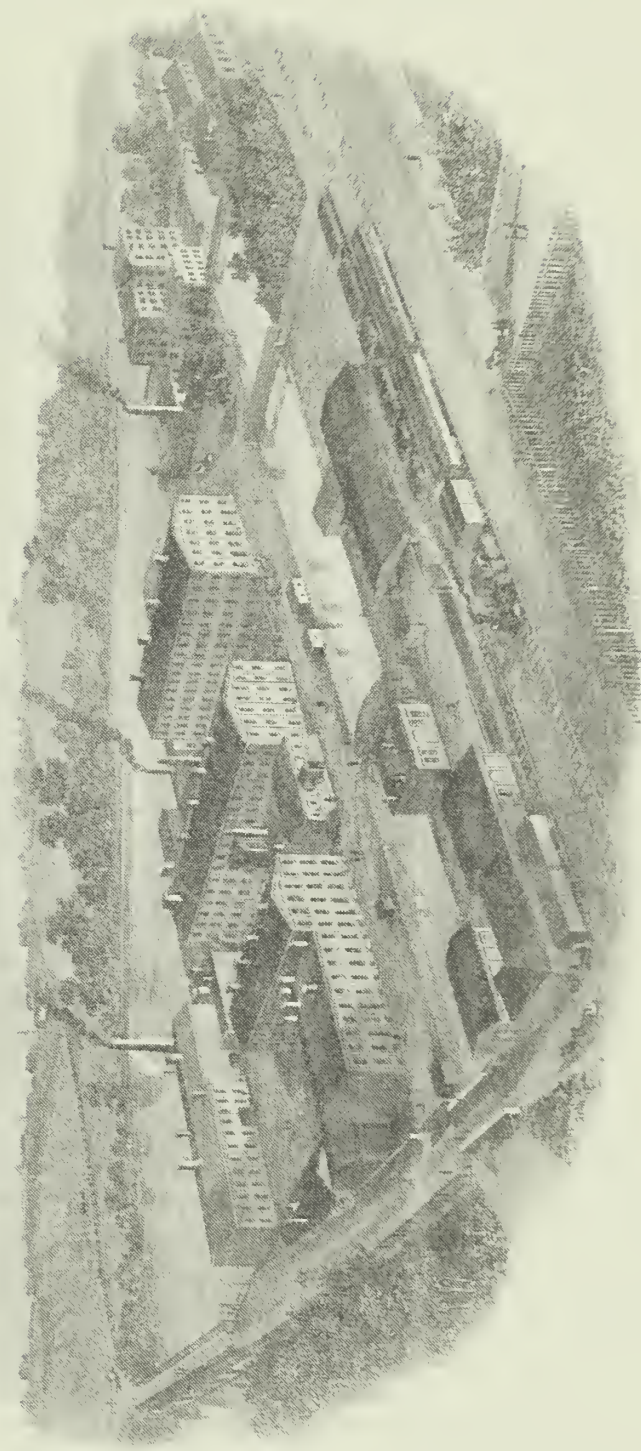
When the war was at its height, in March, 1864, Mr. Nicholson disposed of his share in the gun business, still retaining his machine-shop, and turned his attention to the perfection of his great invention. While at work for Brown and Sharpe, and in the midst of machinery used in dividing measuring-rules, the thought had occurred to him of the possibility of devising machinery for cutting files. His earliest experiments ended in failure; but he persevered, and was at last successful. The main principle involved in his invention is in the method of the machine in cutting the teeth of the files. It performs its work on the blank, by what is styled the "increment-cut." From the point to the middle of the file, the rows of teeth are widened by a regular progressive increment, and correspondingly narrowed from the middle to the heel, by the proper decrement. An element of irregularity to this law is cunningly imparted to the workings of the machine, whereby the no-two-teeth-alike principle, common to hand-work, becomes a quality of its file. This unlikeness extends not only to the position, but also to the angles of the teeth with respect to each other. Double-cut files, with any regularity of their teeth unbroken, are guilty of ploughing, grooving and scratching their work; but, made after the Nicholson invention, what a few teeth attempt in this direction is removed by their neighbors, and the operation of the file cuts smoother, and, also, with the same power applied, removes more material, than any other. While the cutting of the teeth of the file was Mr. Nicholson's main study, the other branches of the work, in making a file

by machinery, early engaged his attention. The preparation of the blank from the bars of steel, its forging, grinding and stripping, — a difficult operation, formerly done only by hand, — is now accelerated and improved by the arrangements which Mr. Nicholson has devised, and for which he has received patents. In making the Nicholson increment-cut file, machinery is used at every stage.

Mr. Nicholson obtained his first patent in 1864. A stock company was then formed, with a capital of \$300,000, afterward increased to \$400,000, and incorporated as the Nicholson File Company, with Mr. Nicholson at its head. To secure his undivided efforts in this new enterprise, the Company purchased his tools and machinery, and assumed his contracts, including one of some importance — the making of screw machinery for the Continental Screw Company. Substantial and convenient works have been erected on a four-acre lot, in the north-western part of Providence, R. I., equipped with machinery mostly invented by Mr. Nicholson. Here the Company has expended more than \$500,000, and make their files at one-half the cost of production by hand-labor. The forging, cutting, annealing, grinding, inspecting, packing and other departments occupy a floor space of 30,000 square feet. Two hundred and fifty skilled workmen are employed, who produce eight hundred dozen of files, of various kinds and sizes, a day, or two hundred and fifty thousand dozen a year. Competent inspectors are placed at each stage of the work, and no workman can draw his pay for a given amount of work until its quality has been attested. The files are tested as to their sharpness and hardness; rung, to see if they are free from fire-cracks; and thoroughly inspected, that there may be neither mis-cuts in the teeth, imperfection in the shape, nor minor blemishes. Successfully passing this review, they are branded with the Company's stamp, and warranted to the market.

The Nicholson File Company has been in existence about fourteen years, making more than four hundred different kinds of files, and introducing them into every section of this country and into Europe; and their product is now double the whole importation of foreign files into the United States. They have recently been experimenting, with a view of whetting the teeth of their finished files, with a gritty substance, by the aid of what is known as the "sand-blast" process, whereby they hope to obtain a higher degree of cutting power.

Mr. Nicholson has for many years been identified with the Providence Franklin Society, and of the association of mechanics and manufacturers. He represented the latter society in the committee which framed the act passed by the State legislature, in 1871, incorporating the Providence Public Library. In March, 1877, he was chosen one of its trustees, and since then has been a member of the executive committee. Mr. Nicholson is also director of the Rhode Island National Bank.



Wm. Day & Co. Boston.

NORWICH BLEACHING & GALVANIZING CO.

NORWICH, CONN.





MOSES PIERCE.



ABOUT the same period that power was substituted for hand-machinery, a marked advance was made in the method of bleaching and finishing cotton cloths. The old method of bleaching involved exposure to the sun and atmosphere for several weeks. The brighter climate of Holland induced English and Scotch manufacturers to send goods to that country to be bleached; and one kind of the linen thus treated became known as "Holland."

The method of bleaching now in use, was discovered in 1784. The Swedish chemist, Scheele, had, in 1774, discovered and described the gas afterward known as chlorine, supposing it to be a compound substance, which he called "dephlogisticated marine air." It afterward received the name of oxymuriatic acid, and was shown by Sir Humphrey Davy, in 1811, to be a simple substance; he gave it the name of chlorine, from its yellowish color. Chlorine, which belongs to the same natural group as iodine, bromine and fluorine, was found by Berthollet, a French chemist, in 1784, to have a strong bleaching power; and the next year he communicated the result of his experiments to James Watt, the inventor of the steam-engine.

In 1786 Mr. Watt introduced the use of chlorine for bleaching into Manchester, and soon after into the bleaching-yards of his father-in-law, Mr. MacGregor, of Glasgow. A difficulty in using it arose from its liability to injure the cloth; and improvements were made by several persons, the most important being that suggested and patented by Charles Tennant, of Glasgow, in 1798. This combined chlorine with lime, forming chloride of lime, which, under the name of bleaching-powders, soon came into, and still remains in, general use.

Owing to the obstacles, at that period, in the way of bringing machinery to this country, the old and tedious process of bleaching was pursued here for twenty-five years after Berthollet's discovery; and it was not until 1812 that any efforts toward

the new method were made. About that time some experiments in this direction were begun in Rhode Island. Bowen, proprietor of the Bowen Bleachery, went to England, to learn what he could of the process; but, before his return, the Providence Dyeing, Bleaching and Calendering Company had secured the services of a foreigner who knew the process. Early in the War of 1812, a privateer, belonging to James De Wolf, of Bristol, R. I., captured an English vessel, and brought her to Bristol. Among the prisoners was Duncan Wright, who had become expert in chlorine bleaching in Scotland. Mr. De Wolf owned a cotton-mill at Dighton, Mass., and engaged Wright to start a bleachery in connection with his factory. The process, soon after, came into universal use in this country.

Among the prominent gentlemen now engaged in this business, whose connection with it began at an earlier period than that of any other person in New England actively engaged in it, is Moses Pierce, the founder, and now president, of the Norwich Bleaching and Calendering Company. He was born in Pawtucket, R. I., July 3, 1808. His father, Benjamin Bentley Pierce, was born in East Greenwich, R. I.

Moses went to school until he was eleven years of age, when he was put to work in the spinning-room of the White Mill. A year after, he went into the yarn-room, where he learned to sort the yarn, and to make it into warps, to be woven on hand-looms in families. Power-looms for factories had been introduced about 1817, but had not yet come into general use. He remained at the White Mill until 1822, when he entered the store of Abraham and Isaac Wilkinson, at Pawtucket. He was employed by Holder Borden, their agent, who was just beginning the career that gave him so high a position among business men, in his connection with the manufacturing interests of Fall River. After a little more than a year Mr. Pierce entered the factory store of Samuel and Daniel Greene, of Pawtucket, in which he remained until the summer of 1826. In the autumn of that year he went into the store of the Valley Falls Company, at Valley Falls, where he remained two years, during which time he gained some knowledge of practical manufacturing.

In the summer of 1828 he was engaged by Gen. Joseph Hawes to take charge of a small cotton-factory at Willimantic, Conn.; and while employed there he devised and prepared a cost-sheet, embracing the items entering into the cost of goods. He went to Fall River, in June, 1829, and entered into partnership with Duncan Wright and Joseph Whittemore, the latter of whom had learned bleaching at Pawtucket.

The firm-style was The Fall River Bleaching and Calendering Company. Three years after, Mr. Whittemore sold his interest to his partners, who continued it under the same style until the summer of 1834, when it was closed. In these five years Mr. Pierce learned the art of bleaching, with its kindred branches; and, in the



Van Slyck & Co. Boston.



*Moses Pierce*



autumn of 1834 he was employed by John H. Clarke, of Providence, to establish a bleachery in connection with his mills at Arnold's Bridge, Pontiac, in the town of Warwick, R. I. Early in 1835 Mr. Pierce took the charge, as resident agent, of the whole business at Pontiac. The next year, with Daniel Greene, and others, he organized the Greendale Bleaching Company, at East Greenwich. The financial crisis of 1837 compelled the Company to suspend operations; and in 1838 Mr. Pierce hired the bleachery on his own account, and engaged in bleaching print-cloths, at that time a more difficult branch of the business than the ordinary bleaching of white goods for the market. In the autumn of 1839 he was invited by prominent business men of Norwich, Conn., to establish a bleachery there.

Associating with him George W. Brown, of East Greenwich, they went to Norwich in the spring of 1840, and started a calender at the Falls Mills, where they hired room and power, while buildings were being erected for them at Greenville. These were finished in September, 1840, and the necessary power was hired. This partnership, under the style of the Norwich Bleaching and Calendering Company, continued eleven years, at the expiration of which period Mr. Pierce bought Mr. Brown's interest, and continued the business alone until 1856. He then obtained subscriptions of capital from others, and organized a joint-stock company, with the same name as that under which, as a firm-style, the business had been transacted from the beginning. In 1857 the land and privilege now occupied were purchased; and in 1860 the company engaged in dyeing and finishing goods, in addition to bleaching; and a substantial brick building was erected, now the middle one of the three main buildings. The north building was erected in 1866, and the south building in 1873. The business has increased rapidly, and with good success. This has been largely due to the improvements made by Mr. Pierce's skill. One of these was the introduction of the article known as roll-jaconet, which, until 1860, had been wholly of foreign manufacture. As these goods were not manufactured in this country, the Company arranged with James M. Beebe & Co., of Boston, to import them unbleached. After some experiments, they succeeded in bleaching, dyeing and finishing the cloth so that it could not be distinguished from that which was imported. The importation of the unbleached cloth ceased on the breaking out of the Civil War, and Mr. Pierce would have been compelled to give up a business which had become profitable, had he not secured the manufacture of the cloth in this country. J. O. Waterman, of Warren, R. I., succeeded in doing this, so that the goods, when finished by the Norwich Bleaching and Calendering Company, were equal to those of foreign manufacture.

In the autumn of 1863, Mr. Pierce and Lucius W. Carroll, of Norwich, with the assistance of Henry T. Potter, entered into an arrangement for purchasing farms on

both sides of the Shetucket River, above its junction with the Quincbaug, in order to secure new mill-sites and water-privileges. Having secured all the necessary land, between Greenville dam and Baltic, on the 14th of October, 1864, a company was formed by them, with eighteen other persons, mostly of Norwich, each furnishing \$5,000, making up a capital of \$100,000. The company took the name of the Occum Company.

In 1864 the Ashland Manufacturing Company was incorporated, succeeding to the business, and occupying the premises, of Anthony and Adams; Moses Pierce, Daniel S. Anthony and Nehemiah T. Adams were the corporators. Mr. Pierce has been president of the Company since its organization. In 1866 at the suggestion of Mr. Pierce, and under his personal direction, this Company engaged in the manufacture of percale cloth, Mr. Pierce, in behalf of the concern, contracting to make them; and they succeeded in producing goods equal to those of foreign manufacture.

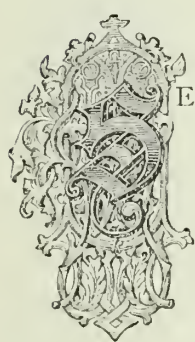
An act of incorporation of the company at first known as the Orray Taft Manufacturing Company, and, since 1872, as the Ponemah Mill, was granted, in 1867, to Edward P. Taft, Cyrus Taft, Moses Pierce and James S. Atwood; and in 1869 Mr. Pierce co-operated with the treasurer, Edward P. Taft, in securing the investment by prominent capitalists in the stock of the Company. He has been, from the beginning, one of its directors. Mr. Pierce is also president of the New York and Norwich Transportation Company, owning and running the steamers connecting with the New York and New England Railroad, between New York and Boston, and is a director of the Second National Bank of Norwich.





Chas. Parker

# CHARLES PARKER.



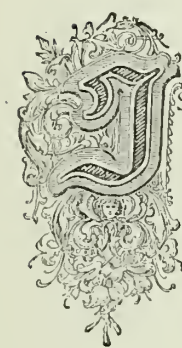
SEVERAL persons named Parker came to this country from England, soon after the first settlement of New England. Of these, William Parker was among the early settlers of Hartford, Conn. His third son, John, removed to New Haven, where his eldest son, also named John, was born in 1648. The latter, in 1670, became one of the first settlers of Wallingford, and owned what is still known as Parker's farms. His fifth son, Edward, born in 1692, settled in the town of Cheshire, then the Cheshire parish of Wallingford. Edward's fourth son, Joel, born in 1723, also lived in Cheshire. His fourth son, Stephen, born in 1759, married, as his second wife, Rebecca Stone, a widow, her maiden name having been Ray. Their children were: John, born Aug. 30, 1805; Betsey, born May 1, 1807; Charles, born Jan. 2, 1809; and Edmund, born Feb. 9, 1811. Stephen was a farmer, in moderate circumstances. When Charles was nine years of age, he lived for five years with Porter Curtiss, a farmer at Wallingford. He worked on this and other farms, attending school during the winter months, until he was eighteen, when he obtained employment with Anson Matthews, a manufacturer of pewter buttons, in Southington, from whom he received six dollars per month and board. At nineteen, he went to Waterbury, and was employed by Henry and Hiram Smith, manufacturers of buttons, for six months, receiving twelve dollars per month and board. In 1828 he removed to Meriden, and entered the employment of Patrick Lewis, in the manufacture of coffee-mills. In December, 1829, Patrick Lewis and Elias Holt contracted with Mr. Parker to make up for them, at a stipulated price, a certain quantity of coffee-mills, monthly. His capital was \$70, and at the end of the thirteen months he had made a profit of \$1800. Mr. Parker entered into partnership with Jared Lewis in 1831; and they continued the manufacture of coffee-mills, by contract, for Lewis and Holt. In January, 1832,

he sold his interest to his partner, and bought an acre of land, now included in the premises of his factories at Meriden Center. On this lot he built his first shop, and began, on his own account, the manufacture of coffee-mills and waffle-irons. In November, 1833, Mr. Parker associated with him in partnership his brother Edmund, and Herman White, under the style of Parker and White. In 1837 the firm lost heavily ; but, before 1842, they had paid all their debts with interest.

The firm was dissolved in 1843 ; and Charles Parker continued the business on the same premises, alone, as the Union Works, adding to his buildings in 1844, and putting in a Corliss steam-engine of eighty horse-power. He manufactures wood-screws, patent bench-vises, coffee-mills, spectacles, eye-glasses, and many similar articles. He also owns a large factory, at West Meriden, devoted to the manufacture of machinery, machinists tools, and the Parker Brothers' breach-loading, double-barreled shot-gun. During the war, however, this factory pursued also the manufacture of arms for the Government. At Yalesville, Mr. Parker carries on an extensive factory, making britannia, German-silver and silver-plated wares ; at another factory, at East Meriden, he makes tea, table and basting-spoons, ladles and iron flesh-forks ; and, at a fifth factory, two miles west of the Union Works, he makes scales, door-latches, handles, and patent hinges and fastenings for window blinds. In these establishments have been employed, at one time, more than six hundred women. Mr. Parker has also large investments in The Meriden Curtain Fixture Company, The Wilcox Silver-plate Company, The Hall Railway Signal Company, the firm of Parker and Whipple, at Meriden, and the Stiles and Parker Press Company, at Middletown, Conn.

Many years ago Mr. Parker joined the Methodist Episcopal Church, and fitted up a room in one of his shops for religious services. A church was built at a cost of \$6000, in 1847, for which Mr. Parker gave the land and three-fourths of the money expended in its erection. In 1866 the present church was erected, at a cost of \$80,000, one-half of which was given by Mr. Parker. He was the first mayor of the city of Meriden, and held the office two years.

Mr. Parker married, in 1831, Abi Lewis Eddy, of Berlin, Conn. Of their ten children, but four are living. Their three sons, Wilbur Fisk, Charles Eddy and Dexter Wright, are connected with their father's business. The daughter, Cordelia, married Theodore F. Breese, who has charge of Mr. Parker's office and store in New York.

A decorative banner with a central rectangular box containing the name "ISAAC PARKER." in a serif font. The banner is flanked by ornate, symmetrical scrollwork and floral designs.A large, ornate initial letter "I" with intricate scrollwork and floral patterns.

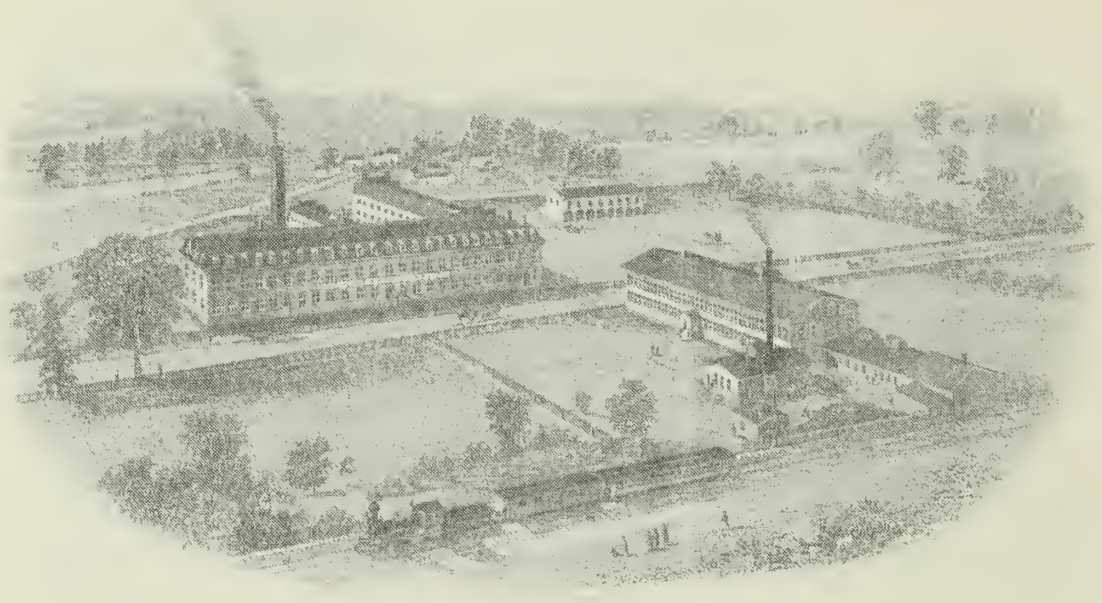
ISAAC PARKER was the fifth son of Hon. Abel Parker, one of the early settlers of Jaffrey, N. H., where Isaac was born April 14, 1788. His only education was that gained at the village schools, though three of his brothers were graduates of Dartmouth. When he was twelve years old he was employed to set card-teeth for a man who sold hand-cards in Peterboro. For this work he was paid six cents a pair, and, after some practice, was able to set from one and a half to two pairs a week. When he was fifteen he began his business life, by "tending store" for Capt. David Page, of Jaffrey, who had several stores, ran corn and saw-mills, made potash, and comprised, among his other avocations, that of a sort of commission-merchant, for disposing of, or exchanging, whatever was produced or manufactured in the neighborhood. When Isaac Parker was eighteen, he was sent by Captain Page to take charge of one of his trading establishments, at Middlebury, Vt. Among other articles sold then was cotton warps, all of which were imported. These were warped and woven in farmers' families, and returned in the form of satinets and similar fabrics; and it was to supply the demand thus created for cotton yarns, that our first cotton-mills were established.

When, in 1809, Mr. Parker reached his majority, by the aid of Samuel Smith, of Peterboro, he started a store, at Keene, under the firm-name of Isaac Parker & Co. At this time the Peterboro Company, chartered in 1808, was building its "Bell Factory;" and Mr. Parker soon became interested in it as an owner. The factory was started in 1810, being the second cotton-factory in New Hampshire; and the war with England which ensued enabled Isaac Parker & Co. to find at Keene a profitable market for such yarns as were not sold at the factory. When peace returned, and the English importations once more competed with American spinners, the business fell flat; and, in 1817, the Peterboro Company added looms to their machinery, so as to make a market for the yarns.

In the same year Mr. Parker moved to Boston, and began business as a commission merchant, representing the Peterboro Company and the Phoenix Factory at Peterboro, which had begun as a spinning-mill, in 1814, and started weaving in 1822. In 1823 the Union Manufacturing Company of the same town built their first mill; and Mr. Parker's firm distributed also its products. Mr. Parker afterward became a member of the successive firms of Parker and Hough; Parker, Blanchard & Co.; Parker, Blanchard and Wilder; Parker, Wilder and Parker; and Parker, Wilder & Co.; and lived to see the domestic-goods commission business reach large and important proportions. He was an owner in all the cotton-mills in Peterboro, and interested in others at Jaffrey, New Ipswich, Guilford, and other places in New Hampshire and Massachusetts. He was one of the originators of the Pepperell Company, at Biddeford, Maine, and was a shareholder in the Saco Water Power Company.

Outside of his immediate business relations, he occupied many places of trust. For six years he was a member of the City Council, of Boston, and for two years represented the city in the legislature. He was one of the original trustees of Mount Auburn Cemetery, and for sixteen years was president of the Traders Bank. He died on May 27, 1858, leaving behind him a character without stain and without reproach.






THE PLUMME & ATWOOD MINE CO.

Van Slyke & Co. Boston.



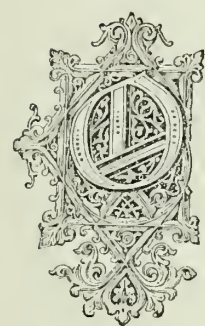
Van Slyke & Co. Boston.

THE PLUMME & ATWOOD MINE CO.



## PLUME AND ATWOOD MFG. CO.

J. C. BOOTH.



F the large brass manufacturing enterprises of the Naugatuck Valley, this Company is the youngest, having had a career of less than ten years. It was founded, however, by gentlemen of previous experience in other concerns, who united in it both skill and capital. The Company was organized in 1869, by Messrs. Holmes, Booth and Atwood, previously of the corporation of Holmes, Booth and Haydens, and David S. Plume, formerly of Newark, N. J., and for the three years preceding, manager of the Thomas Manufacturing Company, at Plymouth, now Thomaston, Conn. Of these four gentlemen the eldest was Israel Holmes.

Associated with Mr. Holmes, especially during the last twenty years of his life, was John C. Booth. Mr. Booth was born in Newtown, Conn., June 13, 1808. His father was a well-to-do farmer. He attended, in early years, the rural school at Newtown, and then, for two years, that at Danbury, Conn. For six years after leaving school he was a teacher. His earliest experience in business was gained in a village store in Newtown, where he was employed as clerk when not engaged in teaching. In the spring of 1832 he went to Meriden, and for two years was an agent for the sale of goods for manufacturers of that town. In 1835 he was engaged as a traveling salesman by Benedict and Burnham; and, on the establishment of the agency of that firm at New York, by Baldwin, Burnham & Co., he was employed to open a local trade in that city. In this he continued until the autumn of 1836.

Early in 1840, having since 1836 lived mostly in the West, he returned to Waterbury, where he took an interest in the firm of Benedict and Burnham, and assumed the charge of their store at Waterbury. On the organization of the Benedict and Burnham Manufacturing Company, in 1843, he was elected one of the five directors, and continued in that relation until the close of 1852. About the begin-

ning of 1853 he dissolved his official relation to that company; and on Feb. 21, 1853, he united with Israel Holmes and others in the organization of the company since known as Holmes, Booth and Haydens, with which he was actively connected until 1869.

Early in that year Messrs. Holmes and Booth, with David S. Plume, of Plymouth, and Lewis J. Atwood, of Waterbury, organized a new company, with a capital of \$400,000, for the manufacture of brass sheet and wire, and of articles made from these materials. The organization was effected Feb. 4, 1869, under the title of the Holmes, Booth and Atwood Manufacturing Company. On the 6th of May the Thomas Manufacturing Company was consolidated with the new corporation. The Thomas Manufacturing Company was organized July 21, 1853, its principal stockholders being Seth Thomas, clock-maker, and members of his family,—the business being the manufacture of brass sheet and wire. A mill was built near the railroad station, in Plymouth Hollow, now Thomaston, and business was commenced under favorable auspices. In 1866, Israel Holmes, with several other gentlemen prominent in the brass interest, purchased stock in the Company, and it was re-organized, under the executive management of David S. Plume. Additional buildings were erected, and the business gradually increased. May, 1869, as has been stated, the Company was merged in the Holmes, Booth and Atwood Company. The mills at Thomaston were devoted exclusively to the manufacture of sheet-brass, brass-wire, German-silver, and other products of a regular brass mill; and buildings were erected at Waterbury, near the railroad station, for the manufacture of kerosene-burners and other brass articles. The name of the Company was changed, on Jan. 1, 1871, to The Plume and Atwood Manufacturing Company. It has facilities for the manufacture of brass itself, in the sheet or wire, of copper and German-silver, and of a variety of articles made from these metals. The first officers of the Company were: Israel Holmes, President; John C. Booth, Secretary; and David S. Plume, Treasurer. On Mr. Holmes's death, Mr. Booth was chosen president, and was succeeded as secretary by Lewis J. Atwood. Mr. Booth sustained, during the first few years of the Company, an active relation to the business, and he contributed greatly to placing the Company on its present basis. At the close of 1873 he retired from active business, and since that time has had only an advisory relation to the Company, but still holds the offices of president and director.

The present executive manager of the Plume and Atwood Manufacturing Company is David S. Plume, who was born at New Haven, Conn., Aug. 22, 1829. In 1835 his father removed to his own early home, in Newark, N. J., where David lived until 1866, when he became interested in the brass manufacture at Plymouth



Van Slyce & Co. Boston




*John C. Booth*



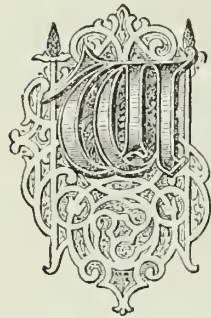
Hollow, Conn. He was employed as a boy in a manufactory of brass goods, and, on attaining his majority embarked in the same line of business on his own account, and has since been identified with this branch of industry. On becoming a member of the Thomas Manufacturing Company, at Plymouth Hollow, he removed to that place, and assumed the general management. When that Company was consolidated with the Holmes, Booth and Atwood Manufacturing Company, in 1869, he was elected treasurer, which position he still holds. In addition to his general executive duties, he superintends the mills at Thomaston.

Lewis J. Atwood has been associated with Messrs. Holmes, Booth and Plume in the organization and career of the Company, and from the beginning has been superintendent of the manufacture, at Waterbury, of the various specialties of brass goods. He was born at Goshen, Conn., April 8, 1827; and at the age of twelve was employed in a store in Watertown, where he remained until he was eighteen. He was then engaged as clerk in the store of Benedict and Burnham, under the charge of his future associate, Mr. Booth. On the organization of Holmes, Booth and Haydens, in 1853, he entered the employ of that Company. About 1859 the introduction of the petroleum oils into domestic use for lighting created a demand for mechanical devices for consuming it. Brass was the most suitable material for the burners, and a large business sprang up. Mr. Atwood assumed charge of this department, and he made it an important and profitable one. Mr. Atwood became a stockholder in 1863, and was soon after chosen a director, which office he held until 1868, when he sold his stock, and united with Messrs. Holmes, Booth and Plume in establishing the Plume and Atwood Manufacturing Company. He was elected one of the board of directors, and in 1874 was chosen secretary, in place of John C. Booth. The general charge of the manufacture of lamp-burners and other brass articles in the shops at Waterbury has been committed to him from the beginning. Many patents have been issued to Mr. Atwood for valuable devices, especially in kerosene burners.

Although its career has been so brief, the Company has established an excellent position and a substantial reputation.



## WILLIAM POLLOCK.



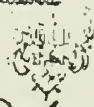
WILLIAM POLLOCK, late a leading manufacturer of Pittsfield, Mass., was born at Neilston, Renfrewshire, Scotland, in 1808. He learned in his youth the trade of a cotton-spinner, and became an adept in it. Having saved some money, he came to Canada in 1835, and purchased a farm of about one hundred and fifty acres. He spent some six months in labor on it, and then decided to seek employment at his trade. For this purpose he went to Brainard's Bridge, near Troy, N. Y., where he entered into the employ of Gershom Turner, the proprietor of a small cotton-mill. He here evinced so much capacity and industry that he was soon appointed superintendent of the mill. He was also employed by James Turner, son of Gershom, to start another factory at East Nassau, N. Y. Having remained in these two places about four years, he removed, in 1840, to South Adams, Mass., and hired a small mill, on the premises now occupied by the Adams Paper Company, then owned by George C. Rider, and previously by David Anthony. Mr. Pollock entered into partnership with Nathaniel G. Hathaway, the firm-style being Pollock and Hathaway. Their business was so successful that, on Feb. 23, 1842, they were able to purchase the mill. In 1845 they purchased the mill-privilege next below their factory, and early the next year erected what was known as the Stone Mill, now owned by the Renfrew Manufacturing Company. Since the death of Mr. Pollock it has been partially burned; and, in rebuilding, the upper two stories of brick have been added to the original structure.

In these early years of business on his own account, Mr. Pollock used to go to the mill two hours before the operatives, and, usually, himself started the wheel and spinning machinery.

Mr. Hathaway sold his interest in the business, in 1848, to Hiram H. Clark, and the style of the firm was changed to William Pollock & Co. The business was thus



FRANKLIN D. BROWN



Mr. Pollock



continued until July 28, 1855, when Mr. Pollock purchased his partner's interest, and changed the style of the business to William Pollock. In 1865 he received into partnership his nephews, James Renfrew, Jr., and James C. Chalmers, who had been in his employ for about ten years, and the firm-style became William Pollock & Co. The next year the mill-privilege and land now occupied by the large brick mill of the Renfrew Manufacturing Company were purchased from Alvan Anthony; and, early in the following spring, the foundations of the mills were laid.

Mr. Pollock removed, in 1855, to Pittsfield, where he lived the rest of his life. In addition to his interest in the South Adams mills, which was increasing yearly in value, he invested in other manufacturing interests, becoming a large stockholder in the Taconic Wool Company and the Pittsfield Wool Company, of Pittsfield; the Washburn Iron Company, of Worcester; and the Toronto Rolling Mill, in Canada. He was for several years president of the Pittsfield Bank, one of the trustees of the Berkshire Life Insurance Company, a director in the Western Massachusetts Fire Insurance Company, and a State director of the Western, now Boston and Albany, Railroad.

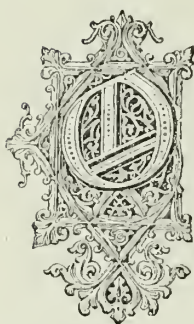
On the organization of the Forty-ninth Regiment of Massachusetts Volunteers, in 1861, Mr. Pollock equipped, at his own expense, one of its companies, which was known as the Pollock Guards. In 1866 he went to Europe, to visit the scenes of his childhood, and for the benefit of his health. Shortly after his return he died, at the Fifth Avenue Hotel, in New York, on the 9th of December, 1866, in his fifty-ninth year.

Mr. Pollock, by his untiring industry and great executive ability, achieved a distinguished reputation as a manufacturer and man of business, and accumulated a fortune, which was dispensed with a generous liberality.

His first wife, whom he married in Scotland, died before his removal to this country. She left a daughter, who died in early childhood. He married, the second time, Lucy Jillson, of South Adams, by whom he had one daughter, who is the wife of Benjamin Snow, of Fitchburg, Mass. He married as his third wife, Oct. 17, 1855, Miss Susan M. Learned, sister of Hon. Edward Learned and George G. Learned, Esq., prominent citizens of Pittsfield, and daughter of Edward Learned, contractor of the Boston Water Works.

# THE PONEMAH MILL.

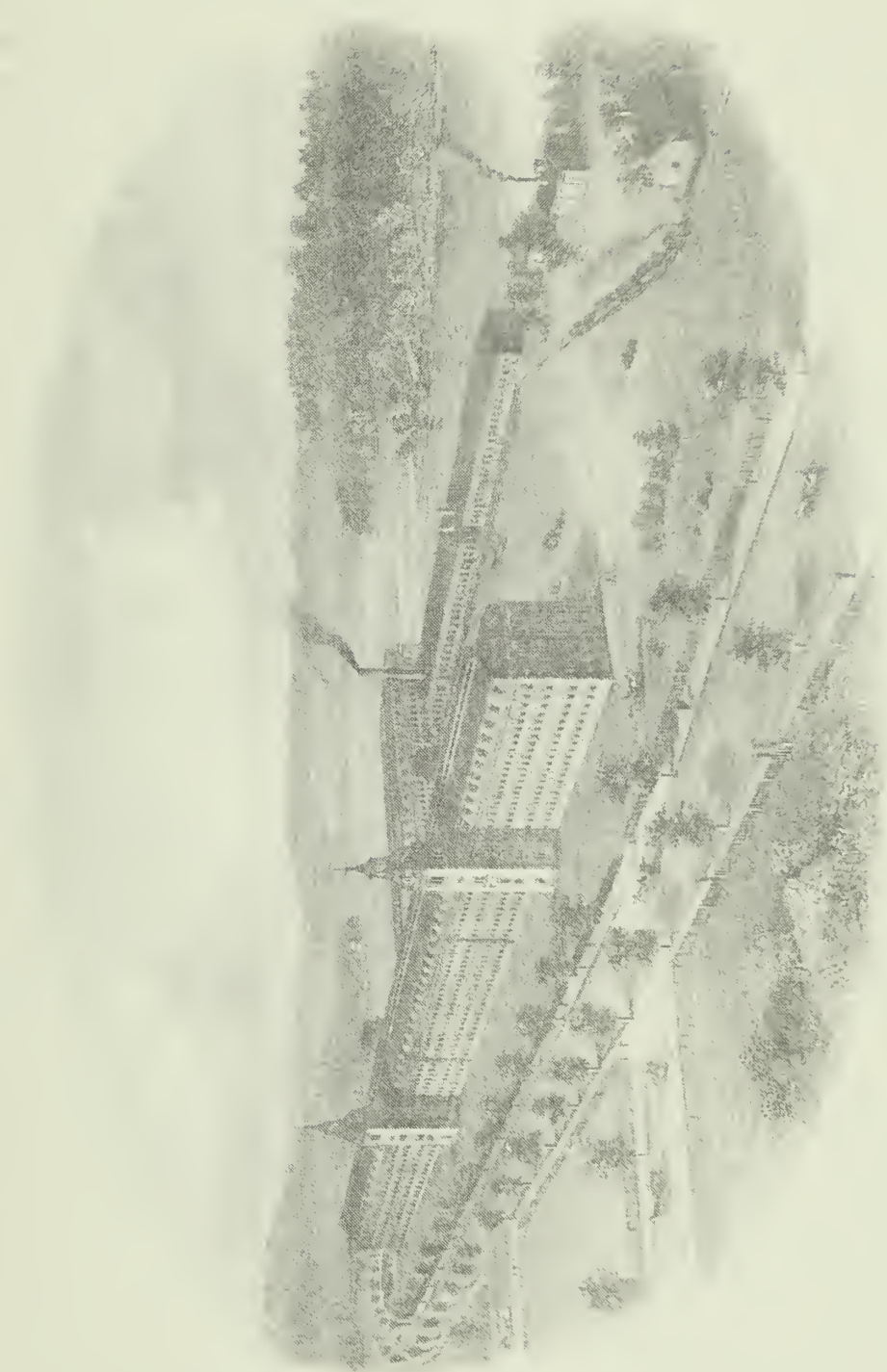
EDWARD P. TAFT.



F modern cotton manufactories, the Ponemah Mill, at Taftville, in the northern part of Norwich, Conn., ranks among the first in New England. This mill has a capacity of 160,000 spindles; and its main building is said to be the largest single building devoted to the manufacture of cotton goods now existing in the Eastern States.

Its plan and progress, from the purchase of the land and water-privilege to the completion of the mill and the successful starting of the machinery, occupying a period of about six years, have been due to the enterprise of its treasurer, Edward P. Taft, of the firm of Orray Taft & Co., of Providence, R. I. The founder of the firm, Orray Taft, in his early years went to Savannah, Ga., carrying with him shoes to sell, the proceeds of which he invested in cotton. This he sent to the North, and opened a profitable trade in both directions in the great staples of industry of the respective regions. His industry was so successful, that in 1829 he established himself in the cotton trade at Providence, R. I. In 1837 Cyrus Taft, who had been in his employ, was admitted to partnership, the firm taking the style of Orray Taft & Co. Mr. Taft died in 1865.

His son, Edward P. Taft, having graduated at Brown University, in 1854, received a mercantile training in his father's office, and became a member of the firm of Orray Taft & Co. in 1858. Since his father's death, he has been its active financial manager. In October, 1865, he purchased a mill-privilege and six hundred acres of land, lying on both sides of the Shetucket River, four miles above Norwich. There is at this point a fall of about thirty feet, affording ample water-power, while the close proximity to the Norwich and Worcester Railroad, and to tide-water navigation, furnishes good facilities for freight. The foundation of the new building was laid in cement; and the wheel-pit, two hundred and twenty-eight feet long, sixty-one feet wide, and forty-two feet deep, was blasted out of the solid rock. The dam across



View of the Mills & of the River

# GOVERNMENT MILLS,

TAIYUAN, CHINA

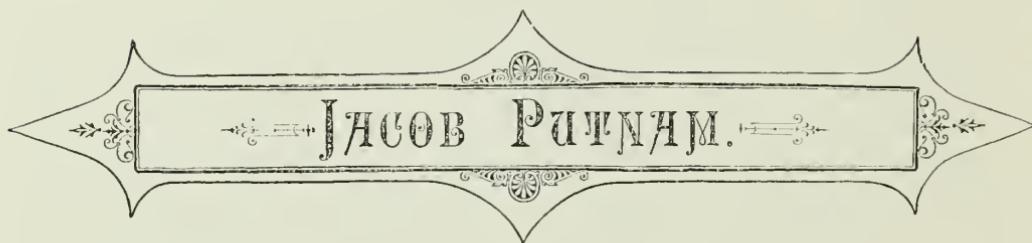


the river is of stone, laid in cement, four hundred and eighteen feet long, and twenty-four feet high; and its strength has been fully proved by a pressure of more than ten feet depth of water carried on its roll-way.

A charter was obtained June 19, 1867, Cyrus Taft, Edward P. Taft, Moses Peirce and James S. Atwood being the corporators. On the 23d of December, 1869, a company was organized,—the Orray Taft Manufacturing Company,—with a capital stock of \$1,500,000. Among the subscribers, in addition to the original corporators, were several large capitalists and successful manufacturers: John F. Slater and Lorenzo Blackstone, of Norwich; John C. Whitin, of Whitinsville; J. Wiley Edmands and James L. Little, of Boston; William F. Sayles, of Pawtucket; William S. Slater, Earl P. Mason, Truman Beckwith and Samuel Foster, of Providence. The name of the Company was changed, July 20, 1871, to its present one—The Ponemah Mill. The construction of the building and the putting in of the machinery were finished, and the mill started, Nov. 16, 1871.

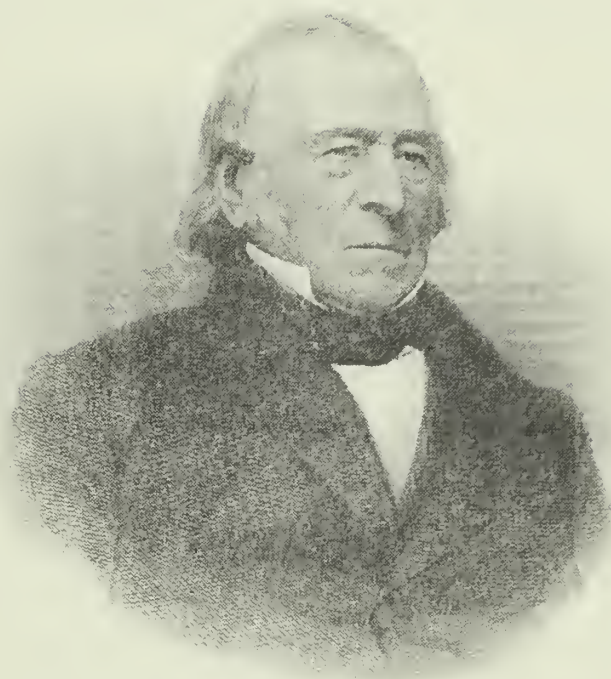
The length of the main building is 750 feet, and its width 75; and, including the attic story, which is available for machinery, it is five stories high. The mule-room occupies the entire fourth story. At right angles with the center of the main building, and in its rear, there is a wing 228 feet long by 61 wide, and six stories high. Also in the rear is a building 216 feet long by 45 wide and two stories high, devoted to the machinery repairs. The mill now contains 80,000 spindles, and has running 1,672 looms; the entire water-power is estimated at 125,000 spindles. Opposite the mill, not delineated in the accompanying engraving, are two buildings, also of brick, three stories high and 120 feet by 80; that to the west containing the offices and store, and, in the upper part, a commodious hall for the social and religious uses of the operatives. The other building, similar in size and external appearance, is the boarding-house. Beyond are the tenements of the corporation, affording accommodation for families.

It was at first intended to manufacture the finer fabrics, like lawns, cambrics and other goods, then largely imported; and the large interest which gentlemen connected with the Pacific Mills took at its organization determined at once the future product, and soon enabled the mills to make a reputation for its goods. Pacific percales took the lead. The importation of the foreign cambrics and percales, except as to a few novelties, ceased; and the American demand was supplied by the home manufacture. The stress of the times made a demand for a less expensive fabric; and the cretonne cloth, combining the merits of the percale cloth with cheapness, was furnished by the mills. Of other fine goods made by the Ponemah Mills are the Victoria lawns, Nainsook checks and stripes, cotton Italian cloths, satteens, cambric muslins, and cord jaconets.

A decorative banner with a central rectangular frame containing the name "JACOB PUTNAM." in a serif font. The banner has ornate, symmetrical flourishes at both ends and along the top and bottom edges.

JACOB PUTNAM, a prominent tanner and currier, of Salem, Mass. was born in Danvers, in the year 1782. He was the direct lineal descendant of John Putnam, who came from Buckingham, England, in 1640. His father, Stephen Putnam, born in 1742, also in Danvers, was a farmer. After attending in early years the district school, young Putnam, at the age of thirteen, was apprenticed to a Mr. Endicott, of Danvers, to learn the trade of tanner and currier. After serving out his term, he worked as a journeyman until 1805, when he made a voyage to Calcutta, returning after an absence of two years. He then took up his residence in Salem, and resumed his trade, in the employ of Joshua Pope, with whom he remained three years. Having saved up some money, he determined, in 1810, to enter into business for himself. He purchased a lot on Goodhue Street, in Salem, put down a number of vats, erected a small building, and commenced the tanning of sole-leather. Up to 1823 he confined his operations to this branch of his trade; but in that year he purchased a currying-shop on Boston Street, and added the manufacture of upper-leather.

About 1830 Mr. Putnam began to employ sea-going vessels, of which he was part owner, in the East India and South American trade, importing many of his hides from Pará. He purchased, in 1844, the property on Boston Street known as the Buffum estate, comprising about half an acre of ground, on which he erected, for offices and store-house, a three-story brick building, with an area of 2400 square feet; and a currying-shop, 40 by 50 feet. In the rear of this he built another currying-shop, three stories in height, and having a ground area of 28 by 32 feet. In 1855 he ceased to manufacture sole-leather, and turned his entire attention to the tanning and currying of upper-leather, which has since continued to be the special product of the concern. The following year he applied steam-power to his works.



Van Slyke & Co. Boston.



*Jacob Patnam*



The grounds occupied by his tannery, on Goodhue Street, measured about three-quarters of an acre; and during his active business life the few vats constructed in 1810 were increased to three hundred, and the entire area, excepting a space for the roadway, was covered with roofs and buildings. In 1865 every building and roof in the tan-yard, excepting the bark-house, was burned. They were, however, soon replaced by others, under the direction of his son, George F. Putnam, who had been received into partnership twelve years before, and upon whom had devolved, for five years, the general charge of the business.

Jacob Putnam died of disease of the heart on the nineteenth day of January, 1866, closing an active and successful business career of more than half a century.

George F. Putnam, the owner and present representative of this business, was born in Salem, on the 28th of July, 1832. He went to school at the Gates Academy, in Marlboro, Mass., finishing his course there at the age of sixteen. Soon after, he entered the counting-room of the late Arthur L. Payson, of Boston, where he was employed for about two years. He then made two voyages in one of his father's vessels to the East Indies, first as clerk, and then as clerk and third mate, acting, also, as supercargo. On his return, after an absence of three years, he entered his father's tannery, where, beginning with the simplest mechanical operations, he passed through the various grades of the work until he had gained a practical knowledge of the whole.

In 1853 he became his father's partner, and relieved him of much of the details of their operations; and, in 1860, he assumed the whole charge of the business. When his father died, George F. Putnam became the owner of the entire tanning interest; and under his management the business has been pursued with energy and success. He has enlarged the building used as a currying-shop to the dimensions of 100 by 40 feet, and three stories, and in the rear of the store-house has established a sheep-skin and morocco-factory. By introducing new and improved machinery, he has nearly doubled his capacity for manufacture. His productions range from \$200,000 to \$275,000 per annum, and he gives employment to a large number of ordinary and skilled laborers. Mr. Putnam was formerly a director of the Hide and Leather Insurance Company, of Boston, and is now a director of the Naumkeag National Bank, of Salem.

# THE PUTNAM MACHINE COMPANY.

SALMON W. PUTNAM—JOHN PUTNAM.



SALMON W. PUTNAM and John, his elder brother, were the founders of the Putnam Machine Company, of Fitchburg, Mass. They were descended, in the seventh generation, from John Putnam; who, with his wife, Priscilla, came from Abbot-Aston, near Aylesbury, England, in 1634, and settled in Salem, Mass. John Putnam's eldest son, Thomas, first settled in Lynn, but soon removed to Salem Village, now Danvers. His youngest son, Joseph, was the father of Gen. Israel Putnam. An elder brother of Joseph was Edward, whose son, Elisha, removed, in 1725, to Sutton, Mass., incorporated ten years before, where he purchased a large tract of land for a farm. His youngest son was Rufus, who, at nineteen, enlisted as a private in the French War, which closed in 1759. He learned surveying and engineering, from the engineers attached to the army, in Canada, and was, after the war, a land-surveyor, as well as a farmer, at New Braintree, Mass. At the beginning of the Revolution, he was commissioned as lieutenant-colonel, and joined the army at Roxbury, immediately after the battle of Lexington. He superintended the construction of fortifications at Brookline, Roxbury, and on Dorchester Heights, with so much skill as to compel the evacuation of Boston by the British troops. In August, 1776, he was appointed chief-engineer of the army, which office, with the rank of Brigadier-General, he held until the close of the war. In 1778 he superintended the construction of the fortifications at West Point, the principal one being named after him—Fort Putnam. He enjoyed the confidence and esteem of General Washington. His elder brother, John, lived all his life at Sutton, and was a scythe-maker. His son, John, the father of John and Salmon W., was also a scythe-maker. He removed, in early manhood, to Peterboro, N. H., and worked there at his trade for some years before the birth of the elder of the brothers, the date of which was Oct. 14, 1812. The brothers



*S. W. Pitman*



were thus identified, by natural descent, with working in iron and steel, being in the third generation of workers of this class. The elder Putnam removed, with his family, to Hopkinton, N. H., early in 1815, and there, on the 10th of December of that year, his son, Salmon W., was born. He removed again, in 1818, to Nashua, where he made scythes under a contract with a trader named Marsh, who furnished him with capital. Under this contract he worked four years, when Mr. Marsh failed, causing serious loss to Mr. Putnam. Returning to Hopkinton with his family, he resumed work at his trade, though without capital, and continued in it nearly up to his death, which occurred in 1828. His widow spent the latter years of her life in Fitchburg, where she died April 8, 1855, at nearly eighty-eight. They had thirteen children, of whom eleven—three sons and eight daughters—attained maturity.

In the spring of 1827 John, then fourteen years of age, who had for several years assisted his father in the shop, and in grinding scythe-blades, entered, as an apprentice, the shop of Loammi Chamberlain, a machinist, at Mason Village, N. H., for five years. He had, as his pay, his board, clothing and medical attendance, and was allowed to attend school four weeks in each year, being employed in the shop during working-hours, when not actually in school.

After completing his apprenticeship, John Putnam continued in Mr. Chamberlain's service, receiving one dollar a day as wages. In 1835 he hired a part of Mr. Chamberlain's shop and machinery, and began making, by contract, some kinds and parts of cotton-machinery, and continued in this business about three years. His brother, Salmon W., had, at eight years of age, left home to earn his own living. His brother-in-law, Christopher Whitney, was the overseer of a small cotton-factory in New Ipswich, N. H.; and into this factory Salmon entered, and worked for several years, as a bobbin-boy. Thence he went to Lowell, and obtained employment in one of the large manufacturing corporations of that town, being overseer of a spinning-room when seventeen years of age. He afterward repaired to the adjoining town of Dracut, and worked in a brush-factory, continuing there until he was about eighteen. His brother John, on starting business on his own account, sent for Salmon to go to Mason Village; and there he engaged in work with him.

At the end of three years, in 1836, the brothers went to Trenton, N. J., and entered into arrangements for starting a machine-shop there. A company which had purchased a water-power, formed by a canal from the Delaware River, contracted to erect a building for them, and to furnish them power. Returning to Mason Village, they went to work on the machinery and tools needed for their future business. They built all their machinery themselves excepting one lathe, which was built for them by Moore and Colby, at Peterboro, N. H., they being employed by that

firm during its construction. This lathe was a "double-header," having a capacity to swing twenty-four inches, the bed being of wood, with iron plates for the ways. The Messrs. Putnam had nearly finished their machines, and otherwise completed their arrangements for future business, when the revulsion of 1837 occurred, and the company at Trenton decided not to put up their building. The Putnams accordingly stored their machinery and tools at Mason Village; and each, for himself, sought employment elsewhere. John went to East Wilton, N. H., and obtained a situation in a cotton-factory as repairer of machinery; while Salmon found a similar task in a cotton-factory in Jaffrey, N. H. He remained there but a short time, and went thence into the factory of Samuel Woods, at Ashburnham, Mass. Here he was soon joined by John; and, for some months, both worked there on repairs. They then hired a room in the basement of the factory; and, moving their machines and tools from Mason Village, set them up and began business under the style of J. and S. W. Putnam.

Having remained at Ashburnham nearly a year, and not being satisfied with their prospects in that place, they removed to Fitchburg, then a town of about two thousand inhabitants, and having within its limits a few small manufactories, where they set up a machine-shop. Their business at first was mainly repairing, with the manufacture of some new machinery for various mills, and furnished only employment for themselves; but it soon increased so that they employed an apprentice. They now engaged in the manufacture of gear-cutting machines, after the model of one which they had made for themselves. This secured reputation and trade to the young firm. They also made some new kinds of machinery for paper manufacture, and a kind of gauge-lathe for making bobbins.

During the early years of the partnership, S. W. Putnam invented the universal, or self-adjusting, box and hanger, now much used, and conceived the idea of the feed-rod. This first, applied to shafting and engine-lathes made by the firm, was rapidly copied by others, and soon came into universal use. He also first suggested a change in the construction of the table for the upright drill, which had been fixed immovably on the arm supporting it; so that the table should revolve on its own center, and could also be moved with the arm around the upright pillar. Thus the workman was able to place any part of the work under the drill, without detaching it from the table. The present form of the back-rest in the engine-lathe, enabling the workman to lift the piece of work out of, instead of drawing it through, the rest, was also of his device. Mr. Putnam did not secure these important inventions to himself or to the firm, by procuring patents on them. He afterward invented and patented the frictional feed as used on machinists' tools, and also the revolving saw, both of which are of much practical value and extensively used.

Their business, from the outset, rapidly increased, requiring, from time to time, an addition to their floor-room. In 1845 they erected a brick building, 150 by 40 feet. This building, with its contents, was burned on Feb. 7, 1849, the loss of J. and S. W. Putnam being estimated at \$12,000. They were without insurance, and the accumulation of ten years was thus swept away. They, however, paid all their debts. Their large planer and large lathe, each of them being on stone foundations, were only partially injured; and they at once repaired them, and erected a temporary structure of boards over them, so that in two weeks their business was again in active operation. The next year the shop was rebuilt. They continued business as a firm until 1858.

In that year a stock company was formed, under the style of The Putnam Machine Company, with a capital of \$40,000, which was increased, in 1866, to \$160,000, and afterward to \$320,000. The Newton mill property, covering an area of twenty-five acres, was purchased by the Company in the same year, and the present buildings were erected. The main machine-shop, in which the working machinery and tools are located, is a building of brick, one story high, running north and south, 625 feet long and 48 feet wide, supported in the center by thirty-five iron columns, upon which the main line of shafting for driving the entire machinery is fastened. This building is devoted to seven different departments of work, but is without partition or any obstruction to the view from end to end. From its west side extend seven wings, six of them being 52 by 36 feet, and one 52 by 44 feet, each of them being devoted to the setting up and the delivery of work made in the corresponding department. Thus, one is devoted to steam-engines, another to planers, a third to lathes, and so on. All of these wings are furnished with powerful cranes, for handling the heavier articles. Opposite to them, and extending from the east side of the main building, are small wings 12 feet square, suitably fitted up as offices for the superintendents of the different departments. The large wings are furnished with folding-doors, opening on a roadway which extends the whole length of the shops to the main line of the railroad, passing by the southern end of the Company's premises, so that a machine, when completed, can be readily transferred to the cars, and then freighted, without delay, to its destination. Between the large wings are spaces for the temporary accommodation of castings, used in each department. Parallel with the main machine-shop, and divided from it by the roadway previously mentioned, are located the iron and brass foundries, pattern and wood-shops, store-houses, and other buildings for various purposes, all arranged systematically for the saving of labor and convenience of supervision. The general plan of the buildings and the most minute details of the arrangement of machinery were devised throughout by Mr. S. W. Putnam, and they combine facility, effectiveness, and economy of operation.

From the beginning Salmon W. Putnam was the active business manager of the firm, and the president of the Company, and died on Feb. 23, 1872. He was the guiding and controlling mind of the enterprise, a thorough mechanic and ingenious inventor, and a sagacious man of business. He represented Fitchburg in the State legislature in 1857, and was a director in the Rollstone National Bank.

Mr. S. W. Putnam married, March 10, 1840, Miss Harriet J. Whitney, of Ashburnham, born Dec. 8, 1820. Of their children, Henry O., born Jan. 4, 1841, is superintendent of the department of the works devoted to the manufacture of air and steam machinery, machinists' tools and so on, in the superior construction of which, with other specialties, the Putnam Machine Company has secured a high reputation.

Salmon W., born Oct. 15, 1843, is the superintending designer of the Company. The numerous machines of novel device and special adaptation, and the improved forms of standard machines, constructed for the Company within the last ten years, have been constructed after his designs and drawings; and numerous patents have been granted him for new machines and new adjustments.

Charles F., the third son, was born Aug. 5, 1845. He was educated at the Appleton Academy, at New Ipswich, N. H., the Wesleyan Academy, at Wilbraham, Mass. and at Comer's Commercial College, in Boston. After finishing these courses he entered the office of the Company, and became thoroughly conversant with its general business affairs. On the death of his father, he succeeded him as president of the Company. He is also a director in the Safety-Fund National Bank, of Fitchburg.

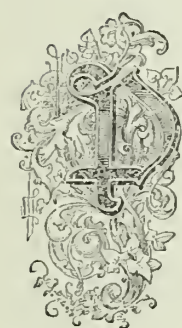
George E., the fourth son, was born Oct. 14, 1854. After receiving academic training at Leicester, Mass., he entered the Law School of the University of Michigan, and graduated, in 1875, with the degree of LL. B. In June of the same year he was admitted to practice in the courts of Massachusetts. He is the attorney of the Company, and is otherwise closely connected with its business.

The Company's career, since the increase of its capital and the erection of its buildings, has been one of prosperity. Even after the panic of September, 1873, it maintained a large proportion of its machinery in motion, and its full complement of men. The first two fully equipped machine-shops in China were furnished throughout by the Company, with steam-engines, shafting, hangers and other machines and tools.



## REVERE COPPER COMPANY.

### PAUL REVERE.



AUL REVERE, who made the famous ride to Concord and Lexington in 1775, was a Huguenot by descent. His father, when a boy, was sent from Guernsey, an Island in the English Channel, to Boston, where he afterward married; and Paul, his eldest son, was born in that city on Jan. 1, 1735. He was brought up to his father's trade of a goldsmith, which included, then, work in silver; and he was soon intrusted with designing and executing all the engravings on silver-plate produced in the establishment.

In 1756 Paul Revere enlisted in the expedition against Crown Point. He became a lieutenant of artillery, and was assigned to duty at Fort Edward, near Lake George. On his return home he married, and established himself in Boston as a goldsmith. Soon after, he learned copper-plate engraving, and, at the beginning of the Revolution, was one of the four engravers then in the American colonies. One of his first productions on copper was the portrait of Dr. Mayhew, whose church in Boston he attended. In 1766 he engraved and published a design emblematic of the "Repeal of the Stamp Act," which obtained great popularity; and, two years later, he produced another, entitled, "The Seventeen Rescindors." In 1770 he brought out an engraving of the Boston Massacre, a lithograph of which was afterward published; and in 1774 he depicted the landing of the British troops in Boston.

When the colonies began to issue paper, Paul Revere was employed by the Massachusetts Provincial Congress to engrave the plates, make the paper, and print the bills for the money ordered by that body. He was then sent to Philadelphia, by the same body, to learn the art of powder-making, for the benefit of the colony. The proprietor of the only mill for producing powder in the colonies refused to let him take any drawings or specifications of the works whatever, or any memoranda of the

operations, but finally consented to show him the full workings of the mill. From this observation he planned a mill on his return, erected it, and entered successfully into the manufacture of gunpowder. He was one of the party who threw the tea into Boston Harbor. General Warren, on the night of April 18, 1775, dispatched him, by way of Charlestown, to inform the people in regard to the British expedition to destroy the stores at Concord, and to warn Samuel Adams and John Hancock, whose capture was one object of the undertaking; and, in obedience to this command, he took the ride so well known in Revolutionary history.

When the port of Boston was closed, he was sent to New York and Philadelphia, to ask for co-operation; and after the British evacuated Boston, a regiment of artillery was raised for the defence of the State, of which Paul Revere was at first major, and, afterward, lieutenant-colonel. He remained in this service to the end of the war. In the army his mechanical skill was often called into service. The trunnions of the cannon were broken by the British, on evacuating Castle William; and General Washington placed these artillery pieces in the hands of Paul Revere to repair. He succeeded in the task, and provided them with new carriages.

At the close of the war he resumed business as a gold and silversmith — at first on the part of Cornhill which is now in Washington Street. He continued in this business, alone or in partnership with his sons, until about 1800, the name of the firm of Paul and J. W. Revere appearing in the "Boston Directory" for 1798. In the next volume of the directory, published in 1800, the name of the firm as engaged in that business does not appear. In the directory for 1796, however, is found the firm of "Revere and Son, goldsmiths, Ann Street," and in the same year appears, for the first time, the announcement, "Paul Revere, bell and cannon-foundry, Lynn Street." The foundry was continued on this spot until 1809. In 1801, that he might use water-power in the manufacture of copper-bolts and spikes, he purchased a privilege in Canton, Mass., and established there a shop, which has since grown into the large works of the Revere Copper Company.

A demand for copper-bolts and spikes in ship-building had arisen, from the introduction of copper sheathing to preserve the bottoms of vessels from worms; so that it became necessary to substitute copper for iron in fastening the planks to the ribs of vessels. Placing the copper sheathing in contact with the heads of iron bolts produced a galvanic action between the two metals which accomplished the purpose. For the profitable manufacture of bolts and spikes, trip-hammers, operated by water-power, were provided. A few years later, machinery for rolling copper into sheets was introduced into the works. About the time of the establishment of the works at Canton, Joseph W. Revere was received as a partner in the business, which was conducted until the death of the senior partner, under the style of Paul

Revere and Son. They added to the manufacture of bells and cannon, and of copper sheets, bolts and spikes, that of melting and refining copper from the ores. Early in the history of the works at Canton, its products were carried in wagons, drawn by oxen, to Philadelphia; while, within the last ten years, cars loaded with copper ores have come over the Pacific Railway, and its connecting roads, to the works, without breaking bulk; and, having then been reloaded with the manufactured copper, have returned to San Francisco.

Paul Revere died in Boston, May 10, 1818. He was one of the founders, and the first president, of the Massachusetts Charitable Mechanic Association, and an active member of other philanthropic organizations. The business of which he laid the foundations was continued with increasing success; and, in 1828, it was organized as the Revere Copper Company. Actively connected with Joseph W. Revere in its organization, and for many years in the prosecution of its business, was James Davis, who had been for a considerable period a brass-founder in a shop on Union Street, in Boston. The sons of Messrs. Revere and Davis are now executive officers of the Company, John Revere being treasurer, and James Davis president. Associated with them in the conduct of the business is Samuel T. Snow, who holds the office of agent.

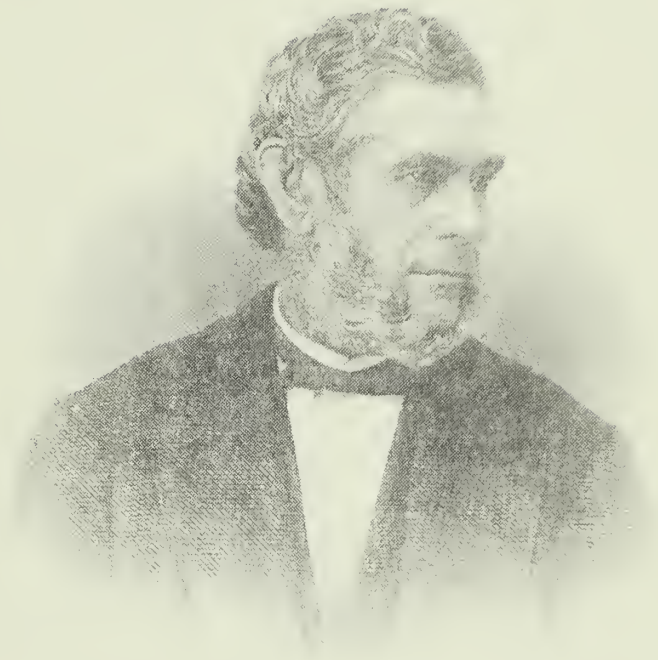


### HENRY G. REED.



RITANNIA, a metallic alloy, usually composed of tin about 88 parts, antimony 7, and copper 3, was invented in England, and was introduced into this country by Isaac Babbitt, at Ballard's Mill, Taunton, Mass., in 1824, who entered into partnership with William W. Crossman, for its manufacture. Babbitt and Crossman carried on its manufacture in a shop on School Street, Taunton, until about 1829, when Mr. Babbitt retired, his services being retained in the preparation of the metal. Later, in 1835, he retired altogether from the business, removing to Boston, where he was employed in the Alger Foundry. In 1839 he invented the metallic alloy, composed of nine parts of tin and one of copper, which has since borne his name, and has come into general use for the bearings of journals in machinery. On the dissolution of the old firm, a new firm was organized by Mr. Crossman, with William A. West and Zephaniah Leonard, under the style of Crossman, West and Leonard. This firm continued but a year, and was succeeded by the Taunton Britannia Manufacturing Company, incorporated in 1830. This company purchased a site, including a good water-privilege, in the northern suburb of Taunton, since known as Britannia-ville, and erected a large building upon it. Operations were continued here until 1835, when the enterprise became seriously crippled. The managing agent, Benjamin W. Pratt, then made a contract with two of the workmen, Henry G. Reed and Charles E. Barton, to continue it, with a just division of the profits. These names have since become identified with the manufacture of silver-plated ware.

Henry G. Reed was born in Taunton, Mass., July 23, 1810. He was descended, in the seventh generation, from William Reade, a passenger in the ship "Assurance de Lo," from Gravesend, England, to the new country, in 1635, and settled in Weymouth, Mass. The family of Reed, spelled variously Reade, Rede, Reid, Read and Reed, traces its lineage back to William the Conqueror. Among the names con-



Van Spector & Co. Boston

*W. F. Reed*



tained on the muster-roll of that monarch in 1050 was John Rede, or John of Rede. William Reade seems to have been a man of position. Immediately on his arrival at Weymouth, he purchased a house and land.

His son John was a house-carpenter, and removed to Taunton. John's son was William, and his grandson was John, who married Dorothea, daughter of James Pinnea, a French Huguenot, who had escaped to this country. The son of John and Dorothea Reed, also named John, was a man of influence in the church and town, and was a selectman and representative for many years. By reason of his sound judgment, he was often resorted to as an arbitrator or referee. His son John was the father of the subject of this sketch. He was for many years a dealer in dry-goods, and was respected as a merchant and for his personal traits. Henry G. Reed, the son, attended the public schools, and afterward the academy in Taunton. During the school vacations he helped his father in his store. In his early years he made a collection of wood-working tools, and spent much of his leisure working with them, making useful articles for the family and neighbors, and miniature vessels and other toys for his mates.

When eighteen years of age he entered the shop of Babbitt and Crossman, as an apprentice, and continued with that firm and its successors until he attained his majority, in 1831. During his apprenticeship he had become the master of his trade, so that, continuing in the employ of the Taunton Britannia Manufacturing Company as a journeyman, working at first at the lathe, and afterward in various departments, he was in time intrusted with the oversight of the work of others, and was appointed time-keeper and superintendent. These relations he sustained when, in 1835, the Company, as has been stated, was compelled to suspend operations; and the managing agent contracted with him and Mr. Barton to continue the business.

Charles E. Barton was born in Warren, R. I., in 1811. He received a common-school education, and at the age of sixteen went to Taunton, engaging as an apprentice with Babbitt and Crossman, the latter being his brother-in-law. He soon became expert, and on attaining his majority continued in the employ of the Taunton Britannia Manufacturing Company until its suspension in 1835, when his business connection with Henry G. Reed was formed, which continued until his death, in the fall of 1867.

Under the arrangement between Mr. Pratt and Messrs. Reed and Barton, the business was continued until 1837, when the latter entered into partnership with Gustavus Leonard, who had been employed in the Iron Works at East Taunton, his father being one of the proprietors. The new firm purchased the factory, stock and good-will of the Taunton Manufacturing Company, and continued the business under the style of Leonard, Reed and Barton. The factory was a single building,

100 by 40 feet, three stories high, with a small wooden building adjoining; but the goods manufactured had been only of plain britannia-ware, and had not gained any special reputation in competition with the wares of Dixon and Sons, of Sheffield, England, which were then the standard goods of the class. Leonard, Reed and Barton now determined to place the establishment on a substantial basis. Mr. Reed took the general direction of affairs, and the mercantile department; and Mr. Barton devoted himself wholly to the superintendence of the manufacture. They soon attracted attention by the quality of their goods, especially in artistic design and finish. In 1838 they established a selling agency in New York, and their goods were there received with much favor.

In 1844 Mr. Leonard died; and Reed and Barton, purchasing the interest of his heirs, continued the business. At this time Henry H. Fish became a special partner, investing capital; and in 1865 he assumed active relations with the business. He had been for twenty-seven years cashier of the Fall River Bank, and was a man of ability and financial experience. In 1859 George Brabrook, who had entered the concern as a clerk in the office in 1851, was admitted into the firm.

When silver-plated ware of American manufacture began to appear, and there arose a demand for it, Reed and Barton resolved to enter the field. The first plated-ware appeared in England about the beginning of the last century, in the manufacture of small articles. In 1742 Thomas Balsover, an ingenious mechanic at Sheffield, while employed in repairing the handle of a knife made partly of copper and partly of silver, accidentally fused the two metals together; and this gave him a hint to unite them, and thus form a cheaper article than could be made wholly of silver. Another Sheffield mechanic developed the idea in the manufacture of waiters, urns, teapots and candlesticks, which had been made of silver. The piece to be plated was filed all over, to make it clean and bright, then tinned, by dipping in a vessel of melted tin, and wiped over with hards, so that only a very thin coating of the tin remained. A foil of silver, beaten very thin, was then cut, of the size of the article, and folded closely upon it. In the flat parts, it was beaten very close, with a small hammer covered with cloth; and, on the moldings and in the hollows, the foil was rubbed down and in with a burnisher. The silver foil having been thus brought into close contact everywhere with the surface of the article, a heated soldering bit, similar to those used by tin-plate workers, was passed over every part, so that the tin and the silver were united, the pellicle of the precious metal adhering tenaciously to the baser metal.

Another method of plating, adapted to the making of sheets of copper with a surface of silver, which could then be cut up and made into various articles formed from very thin sheets, was the following: A piece of copper shaped like a brick,



Van Slyke & Co. Boston

WORKS OF REED & RANNEY.

*Portland, Mass.*

Published, 1824.



twelve by three by one and a half inches, was prepared, by cutting it from a bar of the pure metal of suitable width and thickness, or by casting it as an ingot, making an alloy of two pounds of brass with twelve pounds of copper. This block of copper was then filed bright and level, and on it was laid a plate of silver, which had been previously scraped clean with a tool and made perfectly flat, so that the two bright surfaces of the metals should be perfectly in contact. Between them was placed a little borax, to aid in the fusion. A plate of sheet-iron was laid on the silver, and around it and the copper block were passed iron wires, about an inch apart, and tightened by twisting them with pliers, bringing the silver-plate between the sheet-iron and the copper in the closest contact with the latter. It was next heated in a small reverberatory furnace. The chief condition of success was the withdrawal of the block at the precise moment, else the silver would run off into the fire, or the two metals would be imperfectly united. The block was next rolled into a sheet, care being taken to anneal it in the intervals of rolling. To produce ornaments, leaf-silver was stamped in iron molds with dies, so as to give the surface required; and, the dies being removed, the recesses were filled with an alloy of lead and tin, and the ornaments were then soldered to the article. Solid articles, like forks and spoons, were generally made of iron, the silver being soldered on the surface with soft solder, and the articles then polished.

The electro process, which has worked so complete a change in the manufacture of plated-ware, and created a distinct industry, was discovered about 1840. But as early as 1800, the experiments of Professor Volta, the Italian philosopher, whose name is associated with that of Galvani by his invention of the voltaic pile, and of Dr. W. H. Wollaston, an English chemist, had indicated that metals could be deposited by means of galvanism. No practical results, however, were reached until 1838, when Thomas Spencer, of Liverpool, made use of the galvanic process in the transfer of medals and coins; and, in the same year, Professor Jacobi, of the University of Dorpat, in Russia, discovered a process of gilding by galvanism, which he applied with success to the immense iron dome of the Cathedral of St. Isaac, at St. Petersburg, using for the purpose two hundred and fifty pounds of gold. Joseph Shore, of Birmingham, England, was the first to reduce the discovery to a practical result. On the 25th of March, 1840, a patent was granted to George R. and Henry Elkington, also of Birmingham, England, for a process of silver-plating, substantially the same with that now in general use. The Elkingtons have since gained the reputation of being the leading manufacturers of Great Britain, of silver-plated goods. The first attempt in this country to use the process was made by Asa Rogers, a silversmith of Hartford, Conn. In 1842 he removed to East Granby, Conn., and began to make silver-plated spoons. The business progressed slowly, as the process was regarded as

merely a kind of washing with the silver or gold, and as not likely to be permanent when compared with the old English method of plating by soldering, or the more recent French method by fusing. The electro-plated goods gradually grew in favor, however; and, in 1847, Mr. Rogers, with his brothers, William and Simeon, formed the firm of Rogers Brothers, which soon attained reputation for their silver-plated spoons and forks.

When Messrs. Reed and Barton entered upon the manufacture of silver-plated ware, the base of their goods was at first the britannia-metal of their previous manufacture; but in 1857 they adopted the metallic alloy known by various names as albata, argentine, nickel-silver and german-silver. A brief sketch of the history of its discovery and manufacture is given in the records of Robert Wallace, and the Benedict and Burnham Manufacturing Company.

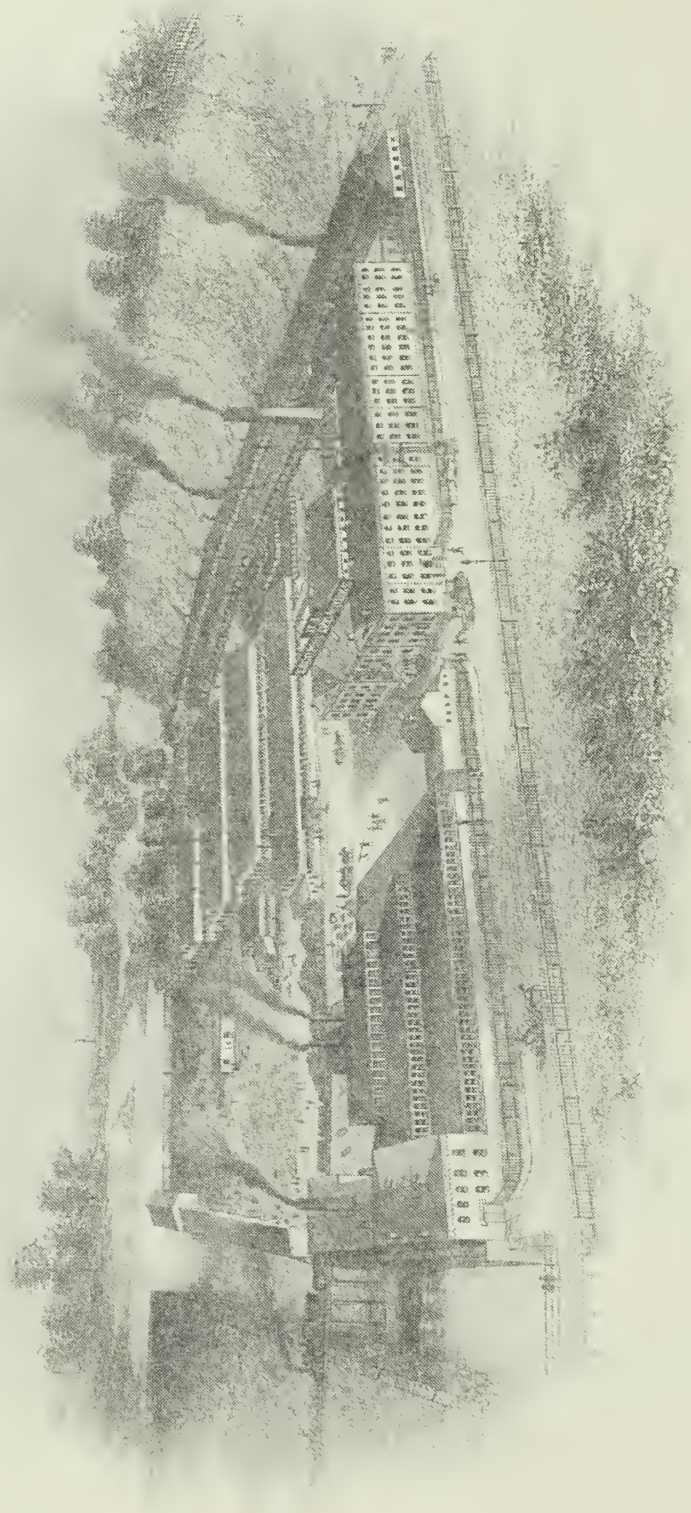
At first it was used for similar purposes as those for which britannia-metal had been used for ten years, but was of higher cost, and the articles made from it were, in some respects, of superior quality. Finding that better results could be obtained by the substitution of nickle-silver for britannia, as the base, Reed and Barton adopted it; and this has, since that time, been the base of their standard goods.

Soon after the firm entered upon the manufacture of this ware, silver-plated goods began to take the place of sterling-silver ware. There was increased activity of competition; and a demand was created for the highest order of artistic skill, and for the best experience available, both in the process of plating and in the making of dies and various tools. The firm accordingly sent to England for a number of skilled workmen, and made its equipment most thorough and complete. While developing the new enterprise, they also continued, and have to the present time, the manufacture of their earlier specialty, the britannia-ware.

During the forty years which have elapsed since Henry G. Reed and Charles E. Barton undertook to build up this enterprise, its growth has been such that the number of operatives has been increased from ten or twelve to more than five hundred persons; the buildings, from a single factory, 100 by 40 feet, to a group of buildings covering four and a half acres, within an enclosure of about nine acres; while the machinery and other appliances of the manufacture have been increased in a still greater ratio.

Mr. Barton died in 1867, after having been associated with Mr. Reed for more than thirty years. The interests of his heirs were purchased by the remaining partners, who have since continued the business under the same firm-name.





RHODE ISLAND LOCOMOTIVE WORKS.

*Providence, R. I.*

# RHODE ISLAND LOCOMOTIVE WORKS.

AMBROSE E. BURNSIDE — EARL P. MASON.



SUPPLEMENTARY to that of the Burnside Rifle Company is the history of this Company, which succeeded it in 1867. The former succeeded the Bristol Fire-Arms Company, which was incorporated in May, 1855, and was organized to manufacture the fire-arm invented by General Burnside, in 1851.

Ambrose E. Burnside was born at Liberty, Ind., May 23, 1824. His grandparents came from Scotland to this country, and settled in South Carolina. His father, a lawyer, removed to Indiana in 1813. Ambrose entered the United States Military Academy, at West Point, in 1842. Receiving a commission as second lieutenant of artillery, he joined the army, then engaged in the war with Mexico, but did not reach the main body until the battles near the city of Mexico had been fought, and that place had been occupied. On the return of peace he was ordered to Fort Adams, Newport, R. I.

In 1849 he was commissioned as first lieutenant of Briggs's Battery, and with it was ordered to New Mexico, being put in command of a cavalry company. While in New Mexico he was impressed with the idea that the carbine with which the troops were armed was a wholly inadequate weapon; and the result of his reflection being the invention of the breech-loading rifle which has since borne his name, he entered into negotiations with the Government for a contract to manufacture the same. While these were going on he went to Fort Adams, and there married, April 27, 1852, Mary R. Bishop, of Providence, R. I. He resigned his commission May 1, 1853.

Removing to Bristol, he erected a factory, completed his arrangements for the manufacture of his rifle, and, with William W. Bishop, Charles Jackson and others, obtained an act of incorporation in May, 1855, under the name of the Bristol Fire-Arms Company. The capital was \$144,000. The contract with the Government

was not completed; but a patent was secured, bearing date of March 25, 1856. Early in 1858 he became cashier of the land department of the Illinois Central Railroad, and removed to Chicago. About two years later he was elected treasurer of this Company. On the breaking out of the Civil War, in 1861, he took command of the first troops raised in Rhode Island; and his war record for the next four years and subsequent political career are too well known to need repetition here.

In January, 1859, the business of the Bristol Fire-Arms Company was transferred to Providence; and in May, 1860, the name of the Company was changed to the Burnside Rifle Company. The land now occupied by the Rhode Island Locomotive Works was purchased in 1861, and buildings were erected. The business received an impetus from the demand for the Burnside rifle and other arms; but, soon after the return of peace, it became evident that the demand for arms of any kind would diminish, and that the Burnside rifle would be superseded by others of superior device. The Company, therefore, decided to devote their buildings and machinery, as far as possible, to some other branch of manufacture. They engaged in the manufacture of locomotive engines; and in January, 1867, the name of the Company was changed to the Rhode Island Locomotive Works. Among its stockholders were William S. Slater and Earl P. Mason. Associated with them were Gen. A. E. Burnside, Hon. Charles Jackson, Hon. Seth Padelford, the firm of A. and W. Sprague, and the estate of George Richmond. The first president was William S. Slater; its treasurer, Earl P. Mason; and its secretary, Oliver P. Davis, until June 12, 1867. Charles H. Jackson was then elected, and served during the remainder of the year. At the annual meeting, Jan. 1, 1868, James G. Stowe was elected secretary, and served one year, when William H. Fenner, Jr., succeeded to that office, and is still the incumbent. William S. Slater and Earl P. Mason, from time to time purchased the interests of the other stockholders, and finally became the sole proprietors. Mr. Slater's business career is briefly mentioned in the sketch of his father, John Slater.

Mr. Mason was identified with many manufacturing interests in Massachusetts, Connecticut and Rhode Island; his connection with them, however, was mainly by the investment of capital and in financial relations. He was born in Providence, R. I., March 10, 1804, and was descended, in the fifth generation, from Sampson Mason, dragoon in Oliver Cromwell's army, and a member of the famous Ironside troop, which turned the tide of battle at Marston Moor. He came to this country in 1649, and lived for seven years in Dorchester. Being a Baptist, he removed with others of that sect to Seekonk, and settled on the bank of the Blackstone River. He afterward took up his residence at Rehoboth, within the limits of the Massachusetts Colony.

The father of Earl was a builder and contractor. Earl attended the public schools until he was fourteen years of age, when he was placed in the retail drug store of Dr. John H. Mason, then on Broad Street, opposite the site of the present City Hotel. During the next three or four years he studied, out of working hours, with the intention of entering college, but finally decided to remain in the store. Before attaining his majority, he took the main charge of the business, and he was soon afterward received into partnership. Earl P. Mason afterward formed a partnership with others, and increased the business, which gradually became wholesale in its character, including a large trade in dye-stuffs with manufacturers; and in 1849 he moved to Canal Street, to the store which has since been occupied by himself and the firm which he established.

As he acquired capital, he invested in various manufacturing interests. Mr. Mason was for many years president of the Rhode Island National Bank, and was at once a bold, patient and sagacious business man. He acquired a large fortune, and died Sept. 21, 1876.

On the death of Mr. Mason, William S. Slater was elected treasurer; and has held, since that time, the offices both of president and treasurer. The first superintendent was John G. Pusey, who held the position until Dec. 1, 1867, when he was succeeded by Benjamin W. Healy. In August, 1875, John A. Durgin, the present superintendent, was appointed.

The Rhode Island Locomotive Works have been successful, especially in the first half of the nearly twelve years of its existence. Since the panic of 1873, which caused the sudden suspension of railroad construction, it has shared in the depression which has affected all industries dependent on railroads for their employment; but, during this period, it has maintained its credit unimpaired.



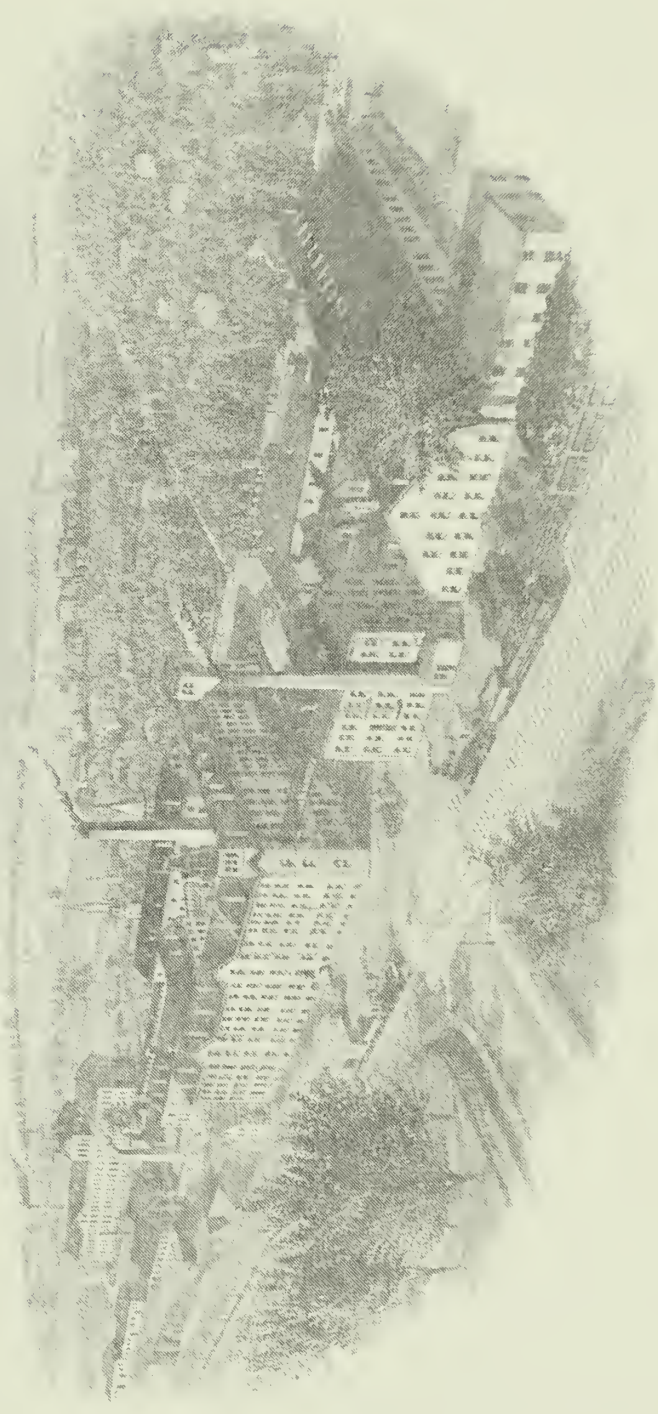
HENRY E. RUSSELL—CORNELIUS B. ERWIN.



BUILDERS hardware had not been manufactured in this country until within the past half century. Its chief seat is in Connecticut; and it was commenced in New Britain, which is still regarded as its center. A prominent position in this branch of manufacture has been attained by the Russell and Erwin Manufacturing Company, whose works are situated in that thriving city.

The germ of the business was a small lock-factory, which was started in 1832, by Frederick T. Stanley. Before that time, our hardware trade had been supplied with ordinary door-locks from Great Britain. There were in the large cities a few locksmiths, whose business was mainly the repairing of locks and fitting of keys, and in some cases the making of locks, for special purposes, to order.

The firm of Stanley, Clark and Waters had built, and were carrying on, a machine-shop; and in the year above mentioned, having collected samples of the various kinds of mortice, rim-plate and other locks, Mr. Stanley fitted up a small room in the machine-shop, and commenced, on his own account, the manufacture of plate-locks, which he sold through commission-houses. The next year he bought out his partners' interest in the machine-shop, and devoted the whole shop to lock-making. In 1834 he associated his brother, William B. Stanley, with him, under the style of F. T. and W. B. Stanley; and the next year a new firm, consisting of F. T. and W. B. Stanley, Truman and Norman Woodruff, of New Britain, and Emanuel Russell and Smith Mattison, of New York, was organized, under the style of Stanley, Woodruff & Co. Messrs. Russell and Mattison were special partners. Emanuel Russell was a native of Litchfield, Conn., where, in early life, he combined the business of a merchant with that of a farmer. He removed to New York in 1835, and engaged in trade there. In 1830 he received into partnership Smith Mattison, under the style of Russell and Mattison. Isaac D., the eldest son of Mr.



From a sketch of the Engineer

THE RUSSELL AND ERWIN MILLS,  
NEW HAVEN, CONN.



Russell, was admitted to the firm in 1832, the style being changed to Russell, Mattison & Co. In January, 1835, Mr. Russell retired from the firm, and removed to Middletown, Conn., and afterward to New Britain, where he and Mr. Mattison had invested capital in the firm of Stanley, Woodruff & Co.

On the organization of that firm, in 1835, a water-privilege was secured, and a brick factory, 80 by 33 feet and three stories high, was erected, and put in operation the next year. In the financial revulsion of 1837, the firm suffered large loss by failures; and on the 1st of January, 1839, the Company was re-organized; the Messrs. Woodruff and W. B. Stanley retiring, and Henry E. Russell and Cornelius B. Erwin becoming active partners. Emanuel Russell conveyed his interest to his son, Henry E., and was not afterward engaged in active business, but resided at New Britain, where he died in 1863, at the advanced age of eighty-four years. Smith Mattison remained as special partner. The style of the firm was changed to Stanley, Russell & Co. At the end of the year, F. T. Stanley sold his interest to his partners, the firm becoming Mattison, Russell & Co., and the active partners being Henry E. Russell and Cornelius B. Erwin.

Henry E. Russell was born in Litchfield, Conn., April 6, 1816. He went to school until he was eleven years of age, when, the family having removed to New York, he entered his father's store, in which he remained until he was sixteen. He then went into a retail hardware store in Maiden Lane, and soon afterward a wholesale store in the same line, where he stayed until the close of 1838. On Jan. 1, 1839, he removed to New Britain, Conn., and entered into the business connection above mentioned.

Cornelius B. Erwin was born in Boonville, N. Y., in 1811. His father was a shoemaker; and he learned that trade, and worked at it until he attained his majority. He then, in 1832, went to New Britain, and entered, as an ordinary workman, the employment of North and Stanley, manufacturers of various articles of cast-brass. He soon acquired familiarity with the business; and, in 1835, he became the junior partner of the firm of Belden, Lee & Co., brass-founders. In 1836 he went into partnership with George Lewis, under the style of Erwin and Lewis, in the same line of business as that of North and Stanley. This partnership continued about three years, most of the period being marked by great depression in business, owing to the financial crisis of 1837. As a result of this depression the manufactured stock of Erwin and Lewis had accumulated to a large amount, as compared with their means; and Mr. Erwin made a trip through the Southern States in the autumn and winter of 1837-8, selling his goods at a profit, and taking orders for the next season, when he repeated his trip. On the first of January, 1839, as stated, he entered the firm of Stanley, Russell & Co.

The firm at first occupied the brick-factory erected by Stanley, Woodruff & Co., in 1836, forming part of the building running at a right angle with the most modern building, erected in 1872, next the railroad, and fronting on the street which divides the main works into two groups. In 1852 this building was lengthened by about fifty feet, and an additional story and the square projecting tower were built. There was also a small brass-foundry. The leading branch of manufacture was door-locks of the cheaper grades, — chiefly plate-locks, — miscellaneous brass goods, such as andirons and other fire-place fixtures and utensils then in general use, sleigh-bells, and other small articles of cast-brass. The latter industry was the first important mechanical branch of industry engaged in at New Britain, and was the foundation of its prosperity. The first person who engaged in it was James North, Jr., who was born in New Britain in 1777. His father, Captain James North, was a blacksmith; his shop stood on the site of the present residence of his grandson, Henry North, in West Main Street. Desiring to introduce a new branch of business into the town, he sent his son James, with two other lads, Samuel Booth and Joseph Shipman, to Stockbridge, Mass., to learn the brass business, of Joseph Barton. Having completed their apprenticeship, James North, Jr., and Joseph Shipman returned to New Britain and engaged together in business, as North and Shipman, about 1798. They made the first sleigh-bells produced in the United States. They added the manufacture of other articles of cast-brass, and continued the business for several years. Mr. North then removed to Cherry Valley, N. Y., where, for a time, he carried on an extensive business. In 1818 he returned to New Britain, and died there in 1825, aged forty-eight.

For the year during which the firm of Stanley, Russell & Co. continued, the business was conducted, as to its sales, through commission-houses. But the experience of that year was not satisfactory; and, on the change to Mattison, Russell & Co., the new firm established a warehouse for the sale of their goods at 92 John Street, N. Y. It was removed thence, in 1850, to 24 Cliff Street, and, in 1854, to 55 Cliff and 87 Beekman Streets. Thence, in 1868, it was transferred to its present location, at 45 and 47 Chambers Street. Beginning thus, in 1840, to sell their goods in one small room, they have increased their business from year to year, adding lines of goods of other manufacturers of hardware, which in some cases they have purchased, and, in others, taken on commission.

On the 1st of January, 1841, a new agreement was entered into by Messrs. Mattison, Russell and Erwin, for a limited partnership of five years, under the same firm-style as during the previous year. Mr. Mattison died in September, 1841; but the interest of his estate in the firm of Mattison, Russell & Co., continued until the termination of the partnership by limitation, Jan. 1, 1846. The style of the firm

was then changed to Russell, Erwin & Co. Its business increased from year to year for the next five years; and on the 1st of January, 1851, it was organized as a joint-stock company, under its present style,—the Russell and Erwin Manufacturing Company. Its first officers were: Cornelius B. Erwin, President, and Henry E. Russell, Treasurer and Secretary. The capital was \$125,000, which was increased March 6, 1851, to \$150,000; on the 29th of September, 1851, to \$200,000; and on Feb. 10, 1864, to \$500,000, which is its present amount, a large surplus having also been accumulated.

At the organization of the Company, Isaac D. Russell invested in the stock, and became one of the directors in 1852. He had, in 1848, assumed the charge of the warehouse in New York, bringing valuable mercantile experience and ability to the Company's service. He was the eldest of the sons of Emanuel Russell who attained to manhood, and was born May 3, 1807, in Litchfield, Conn. On his father's removal to New York, and the establishment of his business there, Isaac, having spent the previous year in the store of his uncle, a wholesale merchant in Norfolk, Va., entered his father's store as a clerk, and continued in his employment, until 1830; then in that of the firm of Russell and Mattison until 1832, when he was admitted a member of the firm which became Russell, Mattison & Co., and, in 1838, Russell, Mattison and Taylor. After the dissolution of the firm in 1844, he did not have any active relation to business until 1848. During this interval, however, he invested capital in different manufacturing interests.

Mr. Russell died Aug. 18, 1874. For his position as manager of the warehouse of Russell and Erwin, subsequently the Russell and Erwin Manufacturing Company, he had excellent qualifications. He was a skillful accountant, and a competent salesman.

At the annual meeting of the Company, held Jan. 31, 1852, Lucius Woodruff, who had been for several years a successful physician in New Britain, on the invitation of Messrs. Russell and Erwin, took a position in the office at the works, became a stockholder, and, in September, 1851, was elected secretary. He held this position with ability until his death, in January, 1872.

Since the organization of the Company in 1851, its increasing business has compelled the addition of new buildings and machinery, which have been made from time to time. In 1848 some large wooden buildings had been erected, some of which are still occupied for various purposes. Two years later the foundry was built, 200 feet long and 75 wide, with an ell 75 feet long. From 1853 to 1860 the principal rear buildings of the main group, except the part previously referred to as erected in 1836, and subsequently enlarged, were erected; and, in 1871, the front building of the same group, 450 feet long and 50 wide, was finished. In October,

1875, a large brick-factory, which is devoted solely to the manufacture of screws, was built. From the manufacture, in 1832, of only the cheaper kinds of locks, the business has been extended so as to include all kinds of miscellaneous builders hardware. In some departments of production, especially as to hinges, door-latches, handles, knobs, escutcheons and bell-pulls, a more elaborate and ornamental style of goods has been introduced within ten years, than was before in use either in this country or Europe.

Some two years before the manufacture of bronzed hardware had been commenced, in place of the black Japan-varnish in use from the beginning of the manufacture, a process of finishing which consisted in heating the iron article to a certain degree, and then dipping it in oil, was adopted by several concerns. This process gave an effect somewhat resembling bronze as to external color, but liable to rust if any portion of the surface was free from the oil. In 1869 the Company made an important advance, by substituting genuine bronze for iron. A method of casting the metal, and subjecting it, before cooling, to a powerful compression, had been invented; and the Russell and Erwin Company invested in this patent, the result being a complete success. By this method the finest lines and the most delicate tracery were brought out with beauty and finish, and with freedom from the imperfections almost inseparable from hand-work. A large demand for these bronze-goods soon sprang up; but they have been superseded, to some extent, by goods cast, not under compression, but in molds of sand and clay, in which the Company now largely deals.

In 1875 the Company embarked in a new enterprise, in which, until within twelve or fifteen years, there had been a virtual and profitable monopoly to another corporation. Of that corporation the Russell and Erwin Manufacturing Company, and the firm preceding it, had been large customers. In 1865 the National Screw Company began operations at Hartford, Conn., and the Russell and Erwin Company took the agency of its goods, and subscribed to its stock. The National Screw Company was thus placed on a basis of assured success. Its manager, however, was induced to enter into an agreement by which the sales of the National Company were restricted to certain quantities and localities. This was followed by the sale to the American Screw Company of a controlling interest in the stock of the National Company. The Russell and Erwin Manufacturing Company thereupon, in October, 1875, built and fitted up the new screw factory previously mentioned; and they were able, within less than six months, to offer to the trade excellent goods. This enterprise has proved a marked success in spite of the hard times.

For the past few years the two gentlemen whose names are united in that of the Company have retired, to a large degree, from active responsibility in the concern.

Mr. Russell has for some years spent much of his time abroad, but has recently settled his residence in New York, where he is occupied in the care of his investments and property outside of the Company. Mr. Erwin, residing still in New Britain, is also largely concerned in financial business affairs other than those of the Company. He has been president of the New Britain National Bank since its organization in 1860; and is a director in the Willimantic Linen Company, the Wheeler and Wilson Manufacturing Company, and numerous other manufacturing and financial corporations. As president of the Russell and Erwin Company, and resident at New Britain, he has a constant general supervision of its affairs, while the immediate management of its works devolves on its secretary, Henry E. Russell, Jr. He was the son of William C. Russell, and grandson of Emanuel Russell, and was born in New York, Nov. 23, 1838. He entered, in February, 1851, the store of the Russell and Erwin Manufacturing Company, and there received a thorough business-training. In 1863 he went into the office of the company at New Britain. In 1872, on the death of Dr. Woodruff, he was elected secretary, and, in 1875, one of the directors, both of which offices he still holds. He is also the resident agent and manager.

The business of the Company at New York is in charge of Mahlon J. Woodruff, who was born at Sherman, Chautauqua County, N. Y., July 7, 1836, and spent his youth in Ohio. He went, in 1856, to New Britain, obtained employment in the works of the Russell and Erwin Company, remained for several years in the office, and thus gained a knowledge of the details, both manufacturing and mercantile. He was next chosen superintendent of the factory, and, in 1871, 1872 and 1873, visited California in the interest of the Company. In 1872 he was elected one of the directors, and in 1873 assistant treasurer, in which capacity he is also financial manager. In 1874 he took charge of the warehouse at New York — an important and responsible position.

In the interval between Isaac D. Russell's death and the appointment of Mr. Woodruff, the management of the warehouse at New York was in charge of James B. Ogden, a capable and faithful officer. He served the Company until failing health compelled his retirement.

In addition to its central warehouse, at New York, and agencies at different times in Baltimore, Boston and other cities, since 1851, the Company has had a large warehouse in Philadelphia. In 1852 this was placed in charge of James E. Terry, who has ably filled the position for more than a quarter of a century.



HENRY G. HUBBARD.



GEORGE HUBBARD, one of the ancestors of Henry G. Hubbard, who was born in Wakefield, England, and married Elizabeth Watts, came, with the first settlers, to Hartford, Conn., in 1636. Both he, his son Joseph, who was born Dec. 10, 1643, and married to Mary Porter, and his grandson, Robert, born Oct. 6, 1673, and married to Abigail Atkins, spent their lives in Hartford. The son of Robert, also named Robert, born July 30, 1712, married Elizabeth Sill, of Saybrook. The latter was the granddaughter, on her mother's side, of Richard Lord, whose wife Elizabeth was the daughter of Samuel Hyde, the son of William Hyde, who came to this country in 1633, and settled in Newtown (now Cambridge). William Hyde, with Rev. Thomas Hooker, the first pastor of the church in that place, removed, in 1636, to what is now Hartford. Mr. Hyde belonged to a family whose ancestor came to England with William the Conqueror, and from which have descended many distinguished English statesmen. Robert Hubbard, the younger, removed, after his marriage, to Middletown, and pursued the occupation of a farmer. His son, Elijah, born in 1745, married Hannah Kent. Engaging in trade at eighteen years of age, with a capital of nineteen cents, he became the wealthiest merchant in the town. He was largely interested in the West India trade, of which Middletown was, before the American Revolution, and for many years afterward, one of the most important centers. During the war of the Revolution, Mr. Hubbard rendered very effective service as commissary and superintendent of the stores provided by the State for the Continental troops. He resumed his West India trade after the war, and amassed a comfortable fortune. He was a justice of the peace, and, for twenty-eight years in succession, was a member of the General Assembly of the State. He was the originator and largest stockholder in



Hubbard & Co. Boston.

Henry G. Hubbard



the old Middletown Bank, incorporated in 1795, and was its president until his death, which occurred very suddenly, in 1808, at Hartford, where he was in attendance at the General Assembly.

His son Elijah, born July 30, 1777, graduated at Yale College in 1795, and studied law in the law school at Litchfield. He entered upon the practice of his profession at New London, and continued it until the death of his father, when he returned to Middletown. On the 26th of October, 1810, he married Lydia, daughter of Samuel Mather, of Lyme, a merchant engaged in the West India trade at that place. Mr. Hubbard took his wedding tour from Lyme to New York, on a sloop, the passage occupying a full week. Receiving his share of his father's property, he abandoned the law, and devoted himself to financial operations and to public affairs. He was for many years mayor of the city; for eight successive years a member of the General Assembly; and from 1822 to 1846, the year of his death, president of the Middletown Bank. He also held various other offices of trust.

His second son, Henry Griswold Hubbard, the subject of this sketch, was born in Middletown, Oct. 8, 1814. He attended, up to his fourteenth year, the schools of his native city, and then went to the celebrated Military Academy of Captain Partridge, at Norwich, where he remained a year. During the next two years he attended the Ellington High School; and afterward entered the Wesleyan University, at Middletown. His stay there, however, was brief; his health failed, and he abandoned college, to engage in more active pursuits. At the age of seventeen he entered the office of J. G. and S. Baldwin; thence going to New York, where he was employed for a year in the office of Jabez B. Hubbard, a commission merchant in woolen goods. Returning to Middletown in the spring of 1833, at the age of nineteen, he entered into partnership with Jesse G. Baldwin, under the firm-style of Baldwin and Hubbard, as manufacturers and dealers in fancy and dry-goods. Their sales were made largely through peddlers, who, in those times, carried their goods in trunks or wagons, from house to house, and to the country stores. Among the peddlers thus employed by Baldwin and Hubbard was Julius Hotchkiss, who afterward had a successful career as a merchant and manufacturer, acquired a large property, and represented the district in the Fortieth Congress of the United States.

At the end of two years the partnership was dissolved. In the winter of 1835-6 Mr. Hubbard went to Chicago, Ill., where his elder brother, Elijah K., resided, and owned a large tract of land, which he had purchased for \$5000, and now covered by stores and other buildings, representing, with the ground covered by them, many millions of dollars. Henry Hubbard found Chicago a town of some three thousand inhabitants; the dwellings and stores were mostly rude structures, with here and there a plank walk. His health was severely taxed

by fatigue and the severity of the weather, and he remained in Chicago but six weeks, returning then to Middletown. He was then twenty-one years old. At that time his uncle, Hon. Samuel D. Hubbard, who was a member of Congress from 1845-49, and in 1852-53 Postmaster-General of the United States, and Hon. Samuel Russell, a wealthy, retired China merchant, both residents of Middletown, owned nine-tenths of the stock of the Russell Manufacturing Company. This company had been organized in 1834, the former gentleman putting in the water-privilege at the South Farms, previously owned by him, and the latter erecting a factory upon it. Into this building they put the machinery and manufacturing material which they had taken in settlement of the insolvent estate of Spaulding and Collis, who had been engaged in the manufacture of webbing and non-elastic suspenders. They obtained a charter in 1834, and continued the business in which Spaulding and Collis had been engaged. The nominal capital was \$40,000, which represented the building, mill-privilege and the machinery, consisting of twelve looms, with the subsidiary machinery, a number of old-style, eighteen-inch carding-machines, about a thousand spindles with fliers, and some other cotton-machinery of little value. They had carried on the business about two years, with considerable loss from month to month, until the excess of their liabilities above the assets amounted to some \$20,000.

Dissatisfied with the results of the business, they now proposed to Mr. H. G. Hubbard to undertake its management. Just prior to this time, his father had purchased a note, signed by Samuel Russell, for \$5000, supposing it to be *bona fide*; but on presenting it, he was informed by Mr. Russell that the note had been given without any consideration, and that he was not disposed to pay it. He, however, offered to transfer an amount of stock of the Russell Manufacturing Company, representing \$5,000. Mr. Hubbard, in view of the conditions under which the note had been given, accepted the proposition; and his son, Henry G., on assuming the management of the Company, and having confidence in its future, purchased the stock, and gave to his father his own notes for the full nominal value. He was appointed agent on Jan. 23, 1837. In May, of the same year, began the great financial revulsion which so greatly embarrassed the mercantile and manufacturing interests of the country for several years. During this period, the Company was not prosperous, and Mr. Hubbard devoted himself to learning the business and laying the foundation of subsequent success.

In 1841 he resolved to engage in the manufacture of elastic suspenders, the weaving of the web for which, up to that time, had scarcely been attempted in this country. With this view he purchased, in New York, a single pair of suspenders, of foreign manufacture, for three dollars. Having pulled out the rubber threads, he

gave them to his foreman, and asked him to make a warp of them, and then to weave a strip of web. The weaver's reply was, that he could not do it. About the same time, Mr. Hubbard learned that a Scotchman, named George Elliot, was employed in a factory at New Britain, Conn., weaving elastic web in a hand-loom, a single strip at a time. Going to New Britain, he found that the factory was closed. He, however, saw Elliot, who claimed to have a valuable secret in the preparation and manipulation of rubber thread. He also learned, that, to secure the services of the man, he must purchase the property. He then contracted with Elliot to pay him one dollar and twenty-five cents per day for work at the Russell factory, and purchased the machinery for one hundred dollars. He then examined the method of preparing the thread, which was to cut it with shears, from sheets of India-rubber about twelve to fifteen inches square, and from one-sixteenth to one-eighth of an inch thick, beginning at the outside, and cutting continuously around the sheet until the center was reached. The thread was then put into a hot solution of whiting, so as to subject the rubber to heat, thereby increasing its elasticity, and to give it a thin coat of the whiting, thus preventing the threads from adhering to each other. Each thread was then drawn singly between the thumb and finger at tension, wound on a reel, and left until it became permanently elongated, being for the time deprived of its elasticity. It could then be made into warps, and woven, like cotton or any other non-elastic thread. The web, after being woven, would of course be non-elastic. On subjecting the web to heat, which was done by pressing it with hot flat-irons, the elasticity of the rubber threads were restored, contracting the web, and rendering it permanently elastic. The method of cutting the rubber with shears was very crude and unsatisfactory, as the thread was uneven; and Mr. Hubbard at once turned his attention to the construction of a cutting-machine, which he effected, producing, as compared with previous results, a beautiful and even thread. About the same time he substituted heated calender rolls for the hot flat-irons, to contract the web. Shortly afterward he purchased in New York, at a very low price, a large quantity of thin bottles of India-rubber, in which certain chemical materials had been imported, and which had been accumulating for several years. The machinery he had, however, would not make them into thread; and again he applied his inventive powers to the construction of machinery for this purpose, with success. The supply of this style of bottles having been exhausted, he purchased a supply of another kind, of greater thickness, and requiring yet another adaptation of machinery. This, also, he contrived. The result was, that the business of the company was not only placed on a firm basis, but became highly prosperous; and to Mr. Hubbard belongs the credit of having been the pioneer in the manufacture of elastic webbing in the United States.

In the spring of 1843 Albert Hotchkiss, who had been, for about eight months, employed as a book-keeper in the suspender department, resigned his position. Going to Waterbury, he interested his brother, Julius Hotchkiss, and Dr. David Pritchard, in starting the manufacture of suspenders in that place. This was the origin of the American Suspender Company, the Russell Company not being able to supply the orders of their agents, Messrs. Baldwin, Burnham & Co., of New York. This firm, who were also the agents of Samuel Williston, of Easthampton, Mass., in the sale of his buttons, suggested to Mr. Williston that he, too, should undertake the manufacture of suspenders. The result was the establishment of the Nashawannuck Company, at Easthampton.

In 1850 a man named Lewis Hope came from England to Paterson, N. J., and engaged there in the manufacture of India-rubber thread. Mr. Hubbard took occasion to examine Hope's machinery and methods, and saw at once that they were adapted to produce a much superior thread at less cost, and to utilize the clippings, which, in his own establishment, had been a very large percentage. He purchased the machinery, removed it to his own factory, and engaged the services of Mr. Hope and the operatives whom he had brought with him from England. This machinery was operated, with excellent results, till 1865. The material in use, up to this time, had been chiefly native rubber. Large quantities, however, of vulcanized rubber had been purchased of Horace H. Day. In 1865 Charles Goodyear's patent expired; and from that time the vulcanized rubber, a cheaper, and, for the purpose, a better article, was substituted for the pure gum. About the time of securing his patent, Mr. Goodyear had visited Middletown, and offered the whole patent to Messrs. Russell and D. Hubbard, the principal owners of the Russell Manufacturing Company, for \$10,000—an offer which they declined, so little did he or they then appreciate the value of an invention which has become the basis of so many and valuable industries, and has created so many great fortunes.

The buildings and machinery on the original site, at the South Farms, have been increased, so that instead of twelve looms, there are now three hundred. Buildings have also been erected at the two mill-privileges just above, and below, the original privilege. The former are devoted to weaving elastic, the other to webs, and the latter to spinning. The Company erected, in 1865, a large factory building at Staddle Hill, about two miles west of Middletown, for the manufacture of skirt-tape, which was so profitable, that in two years it paid the whole expense of erecting the mill. The demand for this article fell off with the changes of fashion, and the mill is now profitably confined to weaving non-elastic web, gaiter and stay-webs, cotton and linen boot-webs, girth and rein-webs, and slipper-webs. The Company has a mill at Higganum, six miles below Middletown, on the Connecticut River, devoted to

spinning cotton yarns. On the 5th of October, 1869, a furious storm occurred, causing a sudden rise in the mill-stream, that swept away both the upper and lower buildings, carrying them, with all the machinery, into the Connecticut River. This took place at about half-past twelve o'clock, when most of the operatives were away from the mills, and no lives were lost. A new factory building, of the capacity of both the old ones, was at once erected, and the business was resumed.

The sixth factory of the Company is at the falls in Middlefield, four miles west of Middletown, on the site of the old Starr gun-factory. The old buildings were burned in 1874. They were rebuilt on a larger scale, and were occupied in December, of the same year. This mill is also devoted to spinning yarns. For the various purposes of its business, about five bales of cotton per day are used, and a large amount of jute, worsted and linen. The manufacture of suspenders, and web for suspenders, amounts to about one-third of the business. The other articles manufactured are non-elastic webs, including gaiter and stay-webs, boot-webs, rein and girth-webs, slipper webs, and a very heavy linen web for making engine-hose.

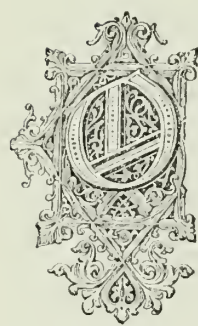
Mr. Hubbard, in 1853, purchased Hon. S. D. Hubbard's interest in the Company, and in 1857, that of Hon. Samuel Russell; and has been since that time the principal owner of the stock. Its successful career is mainly due to his personal skill, both as a mechanic and as a merchant. Since he took charge of the enterprise, he has not only amassed a fortune, but he has earned for the Company a large permanent capital, and made high annual dividends to its stockholders.

Mr. Hubbard has caused to be erected, mainly at his own expense, a chapel at Middletown, in which the services of the Episcopal Church are regularly maintained. He has also built a residence for the rector, and, in addition to the rent, contributes a regular amount monthly to his salary.

Mr. Hubbard married, on June 19, 1844, Rosella, daughter of Commodore Thomas McDonough, the hero of Lake Champlain. Their children are Margaret Sill and Lucy McDonough; the latter married Samuel Russell, son of George Russell, Esq., and grandson of Hon. Samuel Russell. He is vice-president of the Russell Manufacturing Company. Mr. Hubbard was a member of the Connecticut senate for 1866. He has been for many years a director in the Middletown Bank; has been president (and is now a trustee) of the Middletown Savings Bank; is a trustee of the Russell Library; and is president or director in various corporations, in which, partly for purposes of investment, and partly to aid other persons, and to develop the resources of his native city and State, he has placed considerable amounts of his capital.



CALVIN T. SAMPSON.



ONE of the company who, in 1620, crossed the Atlantic in the Mayflower, was Henry Sampson. He came with Edward Tilley, his uncle; and, not having attained manhood, did not sign the memorable compact made in Cape Cod Harbor, Nov. 11, 1620. His brother, Abraham, followed him in a few years, arriving at Plymouth about 1629. Both of the brothers, with Elder William Brewster and Captain Miles Standish, made their residence, in 1632, about six miles north of the first landing-place of the Pilgrims. This new settlement received the name of Duxbury, from Duxbury Hall, the seat of the Standish family in England. Abraham Sampson was one of the fifty-four original grantees of Bridgewater, in 1654, though he did not remove to that place. His son, Isaac, born in 1660, married Lydia, granddaughter of Captain Miles Standish. He, with others from Duxbury and Plymouth, made a settlement, about 1680, in what was at first called "the Western Precinct of Plymouth," and which, in 1707, was incorporated as the town of Plympton. His eldest son, Isaac, resided in Plympton until 1730, when he moved to Middleboro, where he died in 1750. His son Jacob, born in Middleboro in 1738, when but sixteen years of age enlisted in the troops raised by the Massachusetts Colony to serve in the French and Indian War, in 1754-9, and was present in the battle of the Monongahela, and at the defeat of General Braddock. After his return from the war he moved to New Salem, which was settled by families from Middleboro and Danvers, the latter town being then known as Salem Farms. Early in the Revolution he enlisted in the Continental Army, served as a sergeant through the war, and was with Ethan Allen at the taking of Ticonderoga. His son, also named Jacob, born in 1760, was a trader, in good circumstances, and took a prominent part in Shay's Rebellion. After its failure his property was confiscated, and a warrant issued for his arrest. He



Van Slyck & Co Boston.

*C. T. Sampson*



moved with his family to Stamford, Vt., a town situated in a mountainous region, sparsely inhabited, and covered mostly by forests. Here he engaged in farming; the land, however, being chiefly valuable for its growth of wood and timber. His son, Calvin, born in 1783, was also a farmer. He married Polly Millard, of Stamford. Their youngest son was Calvin T. Sampson, the shoe manufacturer of North Adams, Mass., and the subject of this sketch.

Calvin T. Sampson was born at Stamford, Vt., Oct. 2, 1826. He had but little schooling in his early years, and when seven years of age was set to cutting the wood and brush brought home by his father and elder brother. At eleven, he began to haul wood from the farm to North Adams, a distance of four miles; and three years later was strong enough to do the work of a man on his father's farm. He had a thirst for knowledge, and by working extra hours earned some money, with which he purchased text-books: these he studied by himself. At sixteen, he was able, with the aid of a sister, to attend the academy at North Adams, where he remained one term.

The father died when Calvin was about twenty years of age, and his elder brother, Chester, took charge of the farm. Mrs. Sampson had inherited a farm of about forty-five acres, and her daughter had purchased a small piece of land adjoining; these, with some land hired by Calvin, made up a farm of about a hundred acres, which he now cultivated. In May, 1849, he married Julia Hayden, of Clarksburg, Vt. The next year he had his first experience in the shoe business. His cousin, George Millard, had bought the odds and ends of the stock of a bankrupt manufacturer of boots and brogans, and Mr. Sampson was invited to look at it, and to undertake to sell it off. He took a load into his wagon and made a trip through the neighboring mountain towns, and in four days had disposed of his load for cash and for butter, making a profit of twenty-five dollars. He made other trips with similar results, until he had disposed of the whole lot. He then sold his farm, and, in September, 1850, with his family, moved to North Adams, with the idea of engaging in business, having now saved about three hundred dollars; but he found no suitable opening.

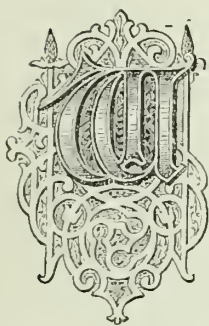
On the 24th of April, 1851, Mr. Sampson came to Boston, and repaired to the store of Atherton, Stetson & Co., of which firm he had heard through one of its customers at North Adams. To them he applied for a small invoice of shoes, on credit; with which they finally agreed to provide him, to the amount of one hundred and seventeen dollars for three months, with the condition that, if the amount was paid in thirty days, he should be allowed a discount of three per cent. A similar arrangement was made with W. N. Spinney, at Lynn; and he purchased of Christopher Robinson, also of Lynn, a bill of goods for nineteen dollars in cash. Thus supplied

with a stock, he returned to North Adams and began business. He carried his goods from house to house in a valise, and in less than ten days had sold them all out. He ordered larger invoices from Lynn and Boston, and in three months was able to purchase a horse and wagon.

On the 18th of the following November he opened a store in North Adams, which he carried on, with a retail trade, until 1858, passing successfully through the financial crisis of 1857. He then sold out his retail business, and began manufacturing in a small way, also jobbing his own goods and those of other manufacturers. This business was prosperous until the breaking out of the Civil War, when he had accumulated about \$16,000. He lost considerable sums from Southern debtors, so that his whole capital was sunk, and he became seriously embarrassed. He kept at work, however, and by 1863 had regained a substantial foothold. In that year, to secure a new and wider field of customers, he opened a store in Boston, which he gave up two years after; and has since filled orders directly from his factory.

Between 1868 and 1870, began Mr. Sampson's conflict with the labor organization known as the "Knights of St. Crispin." The object of this society was to enable boot and shoe operatives to combine for mutual support as against the manufacturers. Mr. Sampson at first yielded to its demands in regard to increase of wages; but at last resolved to resist it, and discharged such of his operatives as he knew to be active in the organization, and in stirring up discontent in his factory. He sent to North Brookfield for others, and succeeded in engaging forty-five on explicit terms; but these men were soon prevailed on by the St. Crispins of North Adams to throw up their contracts. He, therefore, resorted to the novel expedient of employing Chinese labor in the shoe manufacture; procured a number of Chinese from San Francisco, and, after some difficulty, established them in his factory at North Adams. The local operatives threatened trouble; but Mr. Sampson's firmness, and the prompt action of the officers of the law, averted it. The experiment has proved a successful one, and the St. Crispin lodge at North Adams no longer exists.

Mr. Sampson has not confined himself to the limits of his enterprise, but has occupied responsible positions, as a director of the Adams National Bank and a trustee of the North Adams Savings Bank. He is a member of the Baptist Church, in which he occupies the office of deacon; and he holds a high place in the respect and confidence of the community in which he resides.



WILLIAM PHILIP SARGENT, who for many years has been prominently connected with the manufacture of carriages, was born at Amesbury, in Essex County, Mass., on the 24th of November, 1819. He is the eldest son of Patten Sargent, of Amesbury, who started carriage-manufacturing in the town where he resided, and carried it on with enterprise during the larger part of his life. After he laid aside active business, he was made president of the First National Bank of Amesbury, which position he held with ability until 1872. He was also chosen to represent his town in the legislature in the years 1830, '31, '37 and 1862. He gave to William all the school advantages that were accessible in the town of their residence, and then sent him to academies at Atkinson, Hampton and Derry, in the State of New Hampshire, in which places severally, he was systematically instructed in the practical branches of the day. He then apprenticed him to the trade of carriage-building, in his own shop. He also applied him to traffic in a country store, of which he was proprietor, that he might come in contact with another form of life, and be more thoroughly prepared for its battle.

In 1840, at the age of twenty-one, Mr. Sargent was invited to a partnership with his father, in the manufacture of carriages—a pursuit very congenial to him. This relation was maintained for nine years, when a dissolution took place, and William P. Sargent formed a connection with a firm with warerooms at Providence, R. I., and Taunton, Mass., stipulating to travel for them and sell carriages. This arrangement brought him into contact with the entire trade. He formed an extensive acquaintance with the distributors of the products of carriage-factories throughout the country; and obtained that kind and amount of information procurable in no other way, and which gave him abundant mental capital for the establishment of his own great enterprise. In 1851 Mr. Sargent came to Boston, and procured a depot at

the corner of Sudbury and Friend Streets, where the fruit of his experience was embodied in the carriage repository there located. He formed a partnership with William Gunnison and William H. Haskell, under the style of Sargent, Gunnison & Co., and they quickly built up an extensive business and a reputation. This repository and factory has been enlarged, to conform to the demands of the trade, until they have a frontage on Sudbury Street of 170, and on Friend Street of 130 feet.

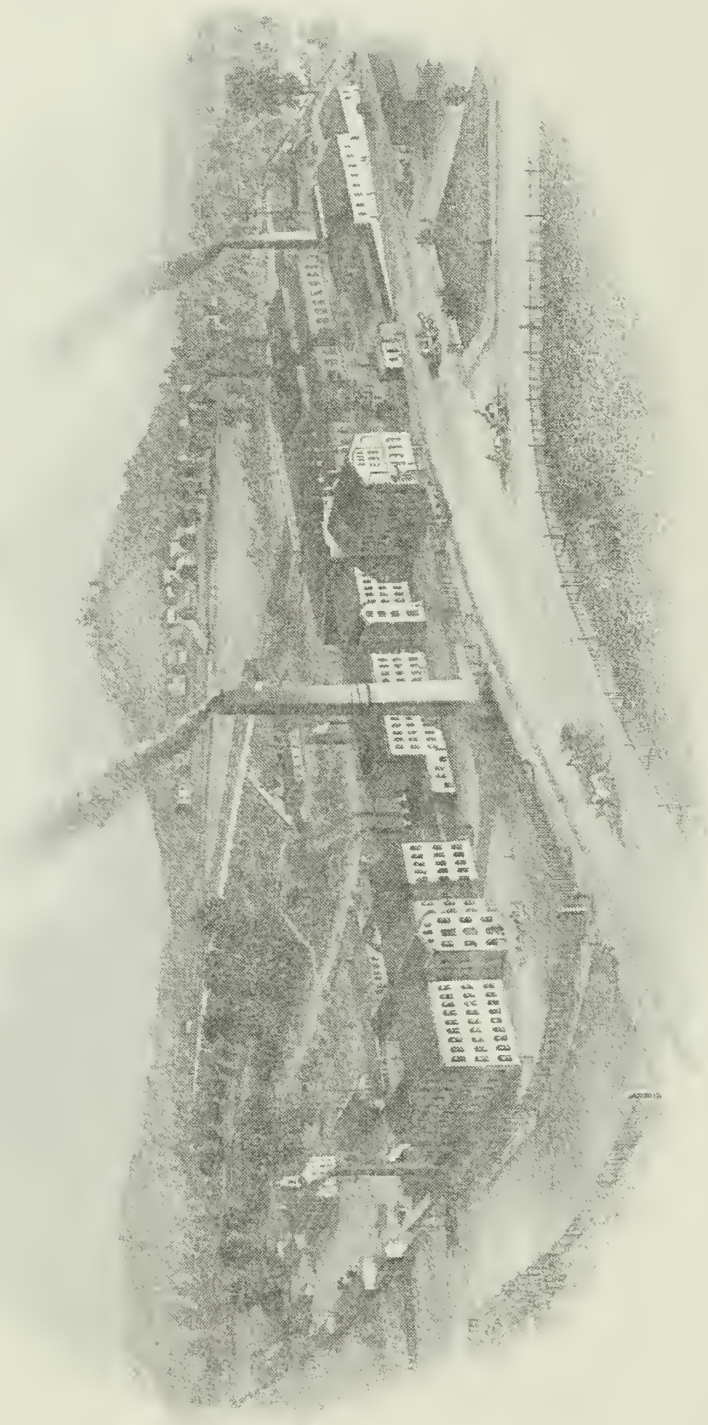
Soon after the start, the firm began to make carriages of superior elegance in form, structure and finish, and extended their manufacture to every kind of vehicle. Mr. Sargent was especially attentive to all the materials which entered into the construction of his carriages; and his imprint on a carriage in the trade at length came to be accounted a guaranty of conscientious thoroughness employed at every step in its building.

In 1867 he opened warerooms in the elegant marble block at 155 Tremont Street, where marble floors and costly finish correspond better with the ornateness and beauty of the carriages displayed, comprising coaches, clarences, landaus, landaulets, coupés, barouches, victorias, rockaways, phaetons, carryalls and buggies, which are exhibited in great variety and finish. The firm was then dissolved, and Mr. Sargent entered into business with Charles W. Bradstreet, Ferdinand F. French and his son, Horace M. Sargent, under the style of William P. Sargent & Co.

But even the extensive addition to their facilities on Tremont Street, which gave them a floor-area of fifty thousand square feet, did not fully meet the requirements of the trade; and they have since erected a capacious brick structure, at 55 and 57 Portland Street, designed and arranged to still further facilitate their business. Five factories are now briskly at work in building their various styles and kinds of carriages. They are located: one at Saco, Maine; two at West Amesbury; one in South Amesbury; and one in Boston, at the corner of Sudbury and Friend Streets.

During thirty years, Mr. Sargent has been engaged in the study and manufacture of every kind of vehicle; and his mechanical skill has been so employed as to lead to the invention and use of many important devices, which have been of value to the industry, to the development of which he has devoted his best energies.





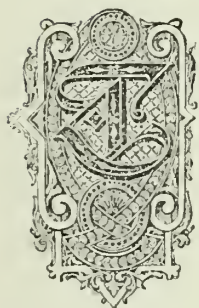
Wm. Lloyd Garrison

# THE SCOVELL MANUFACTURING COMPANY.

WATERBURY, CONN.



J. M. L. SCOVILL — WM. H. SCOVILL.



THE tendency of distinct industries to centre in certain localities finds a marked illustration in the manufacture of brass. Of this important industry the city of Waterbury, in Connecticut, is the chief seat. That Waterbury should have been thus selected for this industry is due to the fact that some individuals and concerns began it there as a new business, and developed it with such success that others started, as offshoots or as imitators, in the immediate vicinity. The manufacture of brass as a continuous enterprise at Waterbury began in 1802, the first article made being buttons.

The same metal had, indeed, been previously used there in manufacture ; Lieut. Ard Welton having, just before and during the American Revolution, made cannon of brass, as well as a few muskets, both of cast metal. Buttons had been made in the town for about half a century,—at first of silver, afterward of pewter. In 1750 Joseph Hopkins, having learned the trade of a silversmith, in Hartford, began to manufacture shoe and knee-buckles, and silver and silver-plated buttons. He was a grandson of John Hopkins, one of the first proprietors and settlers of Waterbury. The latter operated the first grist-mill in the town, which was located on the privilege now occupied by the Scovill Manufacturing Company. Joseph Hopkins, the silversmith, was a prominent citizen of the town, and entertained, at different times, Gen. Washington and Gen. Lafayette. His cousin, Samuel Hopkins, D. D., was one of the three great lights of New England theology in the last century. Jesse, the son of Joseph Hopkins, learned his father's trade, and for some years carried on the manufacture of silver and plated buttons.

In the latter part of the last century, Henry, Silas and Samuel Grilley were engaged in the manufacture of pewter buttons, at Bunker Hill, two and a half miles west of the center of the town. Henry Grilley, in his early manhood, went to

Boston, and learned to make buttons from an Englishman, who had introduced this trade from England. These buttons were at first made wholly of pewter, were cast in molds, and were an important article of manufacture in Meriden, Cheshire, Southington, and other neighboring towns. About 1800 the Messrs. Grilley introduced a useful improvement, by making the eyes of iron wire, instead of pewter. One of the brothers Grilley, Silas, entered into partnership, in 1802, with Abel and Levi Porter and Daniel Clark, under the firm style of Abel Porter & Co., for the manufacture of brass buttons. They commenced business on the east side of South Main Street, near what is now Meadow Street. The brass was cast into ingots, and carried to Bradleyville, in the town of Litchfield, where there was a small rolling-mill, the principal business of which was the rolling of iron. The brass ingots were there rolled into strips, and returned in a rough state to the shop in Waterbury, where they were rolled much thinner, and reduced to the uniform thickness required for making buttons, by being passed between two steel rolls, two inches in diameter, driven by horse-power. The rest of the work was done by hand. Levi Porter withdrew from the firm in 1806, and, with his brother Edward, entered into business with Eli Terry, the pioneer manufacturer of clocks by machinery, at Plymouth, Conn.

In 1808, David Hayden, who had learned the button-business at Attleborough, Mass., went to Waterbury, and became a member of the firm, and about the same time a new shop was built on a site included in the present premises of the Scovill Manufacturing Company. The next year Silas Grilley sold his interest; and in 1811 the firm was dissolved. A new firm was then formed by Frederick Leavenworth, David Hayden and James M. L. Scovill. Frederick Leavenworth was educated as a physician, and was for several years engaged in successful practice, acquiring a high reputation for his skill. He had, however, a distaste for its details, and was disposed to engage in other pursuits. At the suggestion of his brother Melines, who was a resident of Georgia, he went to that State, and was engaged in the purchase of cotton and of cattle for Northern markets. On entering into partnership with Hayden and Scovill, he devoted himself personally to the new business.

The senior partner of the firm, James M. L. Scovill, was descended from John Scovill, one of the original proprietors of Waterbury, who, like most of the original settlers, came from Farmington, Conn., where he was a landholder in 1672. His allotment of land was on the north-east corner of West Main and Willow Streets, and his lot comprised two acres. He conveyed his real estate in Waterbury to his son John, in 1696, and removed to Haddam, Conn., and was the ancestor of the several families of the name of Scovill, resident in that vicinity. His son John, on reaching his majority in 1689, received a grant of land from the town, and did not accompany his father to Haddam.



Van Slyck & Co. Boston

*J. M. L. Scovill*



The grandson of the second John Scovill was the Rev. James Scovill, born in 1732. He learned the trade of a weaver in his youth, but afterwards entered Yale College, where he graduated in 1757. He then went to England, and became a minister of the Episcopal Church. On returning to this country, he took charge of the missions at Waterbury, Northbury (now Plymouth), and New Cambridge (now Bristol), under the patronage of the "Society for Promoting Christian Knowledge." His ministry at Waterbury continued till 1788. When Great Britain acknowledged American Independence, the Society in England withdrew its patronage from all its missions in the United States. This deprived Mr. Scovill of a large portion of his salary, which the members of his churches were not able to pay. At the same time the English Society offered him an increase of salary, if he would remove to New Brunswick. This he did in 1785, becoming rector of the church in Kingston, N. B., where he died in 1808, in the fiftieth year of his ministry. His son James, born March 19, 1764, remained in Waterbury. He was a farmer, and carried on, besides, a store at the center of the town. He married, in 1788, Alatheia, daughter of Mitchell Lamson, of Woodbury.

Their oldest son was James Mitchell Lamson, who was born Sept. 4, 1789. Mr. Scovill's early education was obtained at the district school. According to his own account, he was "a wide-a-wake boy, and kept the pedagogues busy." At seventeen he entered his father's store as a clerk, where he remained till September, 1811, when he and Dr. Fred. Leavenworth purchased the factory, machinery and tools of Abel Porter & Co., and with David Hayden, of that firm, engaged in business, under the style of Leavenworth, Hayden and Scovill. Mr. Scovill took charge of the purchase of material, selling the goods, and other outside business.

The manufacture was at first only moderately successful. A principal obstacle was the difficulty of precisely imitating the color of the English buttons, with which their own buttons were brought into competition, the peculiar orange tint being regarded as of great importance by the trade. They also used a much larger amount of gold, which greatly increased the cost. Gold to the value of three dollars was used in gilding a gross of their best buttons, while three pennyworth of gold sufficed by the English method.

This difficulty was not overcome till 1821. In the previous year, Charles D. Kingsbury, father of the present president of the Scovill Manufacturing Company, who was then employed by Lewis, Grilley and Lewis, manufacturers of another style of metallic buttons at the adjoining town of Naugatuck, was sent as an agent to sell their goods in Philadelphia. While there he was introduced to James Croft, who had recently come from England, and who claimed to know the chemical process employed by Lewis and Thomes, of Birmingham, in securing the orange

color in their buttons, which goods then held the highest rank in the American market.

It seemed to Mr. Kingsbury that Croft was just the man needed by the Waterbury firm. The result was that Croft was engaged to go to Waterbury; and after reaching there he soon showed that he could do what he had claimed. He suggested to the firm that their tools were inferior to those used in the English shops, and was sent to England to obtain an expert tool-maker. He brought with him, on his return, Samuel Forest. The business, under these new conditions, made rapid progress. In 1827 Messrs. Leavenworth and Hayden retired from the concern. William H. Scovill purchased a half interest in the business, and the firm was reorganized, under the style of J. M. L. and W. H. Scovill.

William H. Scovill was the second son of James Scovill. In his youth he worked on a farm and in his father's store, and at seventeen went to the Episcopal Academy, at Cheshire, Conn. The next year he went to New Haven, where he served as a clerk until he was twenty years of age. He then returned to Waterbury, and opened a store, with a capital furnished by his former employer. His business did not succeed well, and after two years he went to Berwick, Penn., and entered the employment of his uncle, William K. Lamson, with whom he remained two years. He next went to Turner's Cross Roads, in North Carolina, and opened a store, where, besides his regular business, he operated to some extent in cotton. He remained at Turner's Cross Roads until 1827, and meanwhile accumulated about \$6,000. Visiting Waterbury in the summer of that year, he was induced by his older brother to close up his business at the South, and to enter into partnership with him. The new firm was prosperous until 1829, when they met with a severe loss in the burning of their factory. It was speedily rebuilt, however, and the business became more flourishing than ever.

In 1836, in company with John Buckingham, their brother-in-law, the brothers began the manufacture of patent brass butts. This enterprise was carried on at the privilege now occupied by the Oakville Pin Company, about three miles west of the center of the town. Their nephew, Scovill M. Buckingham, and Abram Ives, son-in-law of John Buckingham, received an interest in the button manufacture in 1840, and the business in that department was conducted for several years after as a separate interest, under the firm of Scovill & Co.

Abram Ives retired from the firm in 1843. He was born on Feb. 25, 1818. In 1837 he took up his residence in Waterbury, with his father; and soon afterward, though not yet twenty-one, he commenced business as a manufacturer on his own account. Mr. Ives married, on his twenty-first birthday, Mary, daughter of John Buckingham. He took a prominent part in the organization of the Citizens Bank,



Van Slyke & Co. Boston.

Wm H. Scoville



at Waterbury, in 1853, and was its first president. He resigned that office in 1855, and removed to New York, where he became the president of the Manufacturers and Merchants Bank at its organization, and retained this office until failing health compelled his resignation. He was a man of business ability, sound judgment, of wisdom in planning, and of energy in execution. Inheriting a considerable property, he increased it largely by his career as a manufacturer, and afterwards as a capitalist, investing largely in banks and railroads.

After the button manufacture had been set off as a separate interest, under the firm of Scovills & Co., J. M. L. and W. H. Scovill continued, under their previous style, the manufacture of rolled brass and brass wire. In 1842 they commenced making daguerreotype plates. The daguerreotype process being gradually developed, from the experiments of Niepce, a French chemist, in 1813, and of Daguerre, a scenic artist, who united his efforts with those of Niepce, in 1829. After Niepce's death, in 1833, Daguerre pursued his researches alone, and carried the process so far forward, that in 1839 it was hailed as a discovery of great interest and importance by the philosopher Arago, in the French Academy of Sciences. During the next year, 1840, the business of making daguerreotype pictures was introduced into America, and a large demand soon arose for the manufacture of the plates. These were of copper, plated with silver, and brought to a mirror-like surface. The Scovills undertook this manufacture; and until the plate-pictures were superseded by the ambrotype and the photograph, they were the largest manufacturers of the plates. This business naturally led to the manufacture of cameras, and other apparatus and supplies, in which the brothers Scovill soon attained a large business, which has continued to the present time.

All the interests were united in one concern, in 1850. A joint-stock company was organized, under the style of the Scovill Manufacturing Company, with a capital of \$200,000. The Messrs. Scovill held a majority of the stock, and some of their *employés* were admitted as stockholders. The manufacture of German-silver was soon after undertaken. This metal is rolled in the same manner as brass, but is more difficult to work, and requires more care and skill.

The company has also engaged in the manufacture of sheet-metal, plated with gold, silver or platinum, by a process invented by Eugene Martin, a native of Paris, France, who has been with the company for nearly twenty years. The invention was the result of his study and experiments for about fifteen years. The copper-plate is first made smooth and bright by scraping, and then an extremely thin annealed plate of richer metal is laid upon it, and made to adhere by a chemical process. The united plates are then drawn, cold, between rolls, and reduced to the required thickness. By this process it is possible to plate sheets of

metal two feet square, which, by the former method of soldering, or the more modern method, known as the English, of fusing the gold, silver or platinum on the copper, would be impossible. The galvanic method of silver-plating, admirably adapted as it is to small articles, such as forks and spoons, or to hollow ware, or any article which can be immersed in a liquid, would not answer the purpose attained by the Martin method, which was to plate sheets only on one side. The metal thus prepared is used extensively for the manufacture of coach-lamps, carriage and harness-trimmings, and similar articles.

The company make, besides buttons and hinges, a great variety of small wares. The buildings of the company, which have been erected at different times, comprise a large group, constructed mostly of brick, good architectural appearance, arranged conveniently for work, and in all the appointments, machinery and tools, well adapted to their purpose. The company owns a large manufactory in New Haven, where clocks and photographic cases are made, and one in New York, for the manufacture of cameras and other photographic apparatus. It also holds stock in the Wheeler and Wilson Manufacturing Company, at Bridgeport, the Russell and Erwin Manufacturing Company at New Britain, and in other companies of less note.

James M. L. Scovill married, in 1841, Mrs. Sarah A. Morton, daughter of William H. Merriman, an enterprising manufacturer and merchant of Watertown, Conn. She was the widow of a Mr. Morton, of New York. Their children were James M. L., who died young; Sarah A., who married Joseph Whittlesey, of New Haven, Conn.; and Henry W., who married Ella Hyde, of Westerly, R. I., now resident in Waterbury. Mr. Scovill died on May 16, 1857.

William H. Scovill married, in 1827, Eunice Davies, of Ogdensburg, N. Y. Of their four children two survived—Ruth, married to Frederick J. Kingsbury, of Waterbury, and Mary Ann, married to Judge William E. Curtis, of New York. Mrs. Scovill died in 1839. Mr. Scovill married again, in 1841, Rebecca H., daughter of Hon. Nathan Smith, who, in his time, was one of the most eminent lawyers of Connecticut, and who represented the State in the Senate of the United States. He was for several years interested in the manufactures of Waterbury, having been one of the special partners in the firm of A. Benedict. Of Mr. Scovill's three children by his second marriage, only one, William H., born in 1842, survives. Mr. Scovill died on March 27, 1854.

These brothers were among the most prominent manufacturers of Waterbury, and indeed, of the State. Both were men of excellent judgment, sagacity, enterprise and liberality. For many years both were active members of St. John's Church, William H. Scovill being its senior warden. They were contributors to the erection of the elegant stone church edifice belonging to that parish, which was

burned Dec. 25, 1869. They founded the Scovill Chair of Chemistry, in Trinity College, at Hartford.

William H. Scovill, who, on the organization of the Company, was elected treasurer, and held that office during his life, was succeeded by Scovill M. Buckingham. He was the son of John Buckingham, who married Betsey Scovill, sister of the Messrs. Scovill. Mr. Buckingham was born in Waterbury, Aug. 10, 1811, and in his youth and early manhood was a clerk in the store of J. M. L. and W. H. Scovill. With his brother-in-law, Abram Ives, he entered into partnership with the Messrs. Scovill, in 1840, under the firm name of Scovill & Co. He took charge of the button department of the business. On the organization of the Company in 1850, he was elected a director and the secretary of the Company, which office he held till the death of W. H. Scovill, when he was elected treasurer. He was succeeded as secretary by Edward S. Clark. On the death of J. M. L. Scovill, who had been president of the Company from its organization, in 1857, Mr. Buckingham was elected president, in which post, as also that of treasurer, he continued until 1861. Mr. Buckingham was succeeded as president, by Samuel W. Hall, and as treasurer, by Frederick J. Kingsbury.

Samuel W. Hall was the son of Capt. Moses Hall, of Waterbury. When sixteen years old he entered the employment of J. M. L. and W. H. Scovill, as a clerk in their store in Waterbury; and in a few years took charge of it, remaining in this relation to the firm and then to the Company, till the store was given up, in 1852. On the organization of the Company he became a stockholder, and was elected a director. In 1852 he became the manager of the Manhan Woolen Company, in Waterbury; but soon retired from that position, and established an insurance agency with J. W. Smith, as his partner. He did a very large and profitable business till 1861, when, on the resignation of S. M. Buckingham, he was elected president of the Scovill Manufacturing Company, and became its executive manager. He was elected president of the Citizens Bank, of Waterbury, in 1855, as the successor of Abram Ives. Mr. Hall resigned the presidency of the Company and that of the bank, in 1868, on account of failing health, and was succeeded in both offices by Frederick J. Kingsbury. He was not afterward engaged in active business, and died in Waterbury, March 5, 1877. Mr. Hall, was an able man of business, of quick perceptions, generous, outspoken, and scrupulously honest.

Frederick J. Kingsbury is the son of Charles D. Kingsbury, and of Eliza, daughter of Frederick Leavenworth, senior partner of the firm of Leavenworth, Hayden and Scovill. His grandfather was John Kingsbury, born in that part of Norwich, Conn., now included in the town of Franklin. He entered Yale College in 1780, but soon left college and enlisted on a privateer, and assisted in the capture

of two prizes. At the close of the war he re-entered Yale College, and graduated in 1786. He studied law at the Litchfield Law School, and in 1791 settled in the practice of his profession at Waterbury, Conn. He was appointed Judge of the Probate Court and of the County Court in 1801, becoming its presiding judge in 1820. His son, Charles D., born in Waterbury, Nov. 7, 1795, was trained in his youth for mercantile pursuits, in which he afterwards engaged, and continued till 1838, when, by reason of ill health, he retired, and has since been occupied in the care of his large landed interests. His son, Frederick J., was born in Waterbury, Jan. 1, 1823, and graduated with the first honors of his class, in 1846. Having pursued his professional studies at the Law School in New Haven, and in the office of Hon. Charles G. Loring, in Boston, Mass., he was admitted to the Suffolk County Bar, March 10, 1848. He soon removed to Hartford, Conn., and was for six months in the office of Hon. Thomas C. Perkins, a leading lawyer of that city. In the spring of 1849, he opened a law office in Waterbury, and the next year was elected to the Legislature of the State. He obtained a charter for the Waterbury Savings Bank, which he at once organized, and became its secretary and business manager. In 1853, in connection with Abram Ives, he established the Citizens Bank, was chosen its cashier, and succeeded Samuel W. Hall, as its president, in 1868.

The business of these two banks was his principal occupation till 1868, when he was elected president of the Scovill Manufacturing Company, and has held that office to the present time. He had been, since January, 1858, a director, and was the secretary of the company from March, 1862, to January, 1864, and treasurer from March, 1862, to January, 1866. Besides his connection with this Company, he is Secretary of the Detroit and Lake Superior Copper Company, organized on Feb. 12, 1867, by the consolidation of the Waterbury and Detroit Copper Company with the Portage Lake Smelting Company. The former concern was organized in 1850, mainly through the efforts of John R. Grout, a civil engineer of Detroit, Mich., who in 1850 secured the investment, by the leading manufacturers of Waterbury, of sufficient capital for putting into operation the smelting works at Detroit. The extensive deposits of native copper were discovered at Portage Lake, Mich., in 1860, and came into the ownership of leading Boston capitalists, who at once erected smelting works at Houghton. The two interests were united, in 1867, as the Detroit and Lake Superior Copper Company, under the management of Mr. Grout. Its officers are William Brown, of Waterbury, President; Frederick J. Kingsbury, of Waterbury, Secretary; and Horatio Bigelow, of Boston, Treasurer.

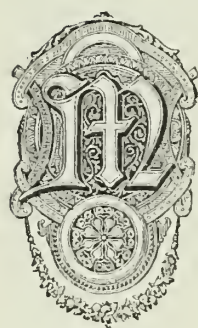
In addition to these business enterprises Mr. Kingsbury has been much interested in the development and prosperity of his native town, taking an active part in the con-

struction of the city water-works, in the establishment of a rural cemetery, and in the conduct of the Bronson Library, of which Mr. Kingsbury has been the treasurer and chairman of the Book-committee. He is also connected, as trustee or director, with various corporations, financial, railroad, and manufacturing, as well as those of a charitable and religious character. He has served three terms in the State Legislature.

Mr. Kingsbury was succeeded as treasurer in January, 1866, by Chauncey P. Goss, who had entered the service of the Company in 1862 as assistant book-keeper, and had been elected secretary in January, 1864. He was succeeded as secretary by Mark L. Sperry, who had been for some years connected with the office of the company, Jan. 1, 1869. Mr. Sperry is a grandson of Mark Leavenworth, who began the manufacture of clocks in 1810, and was engaged in that business and in the manufacture of brass buttons till his death, in 1849.



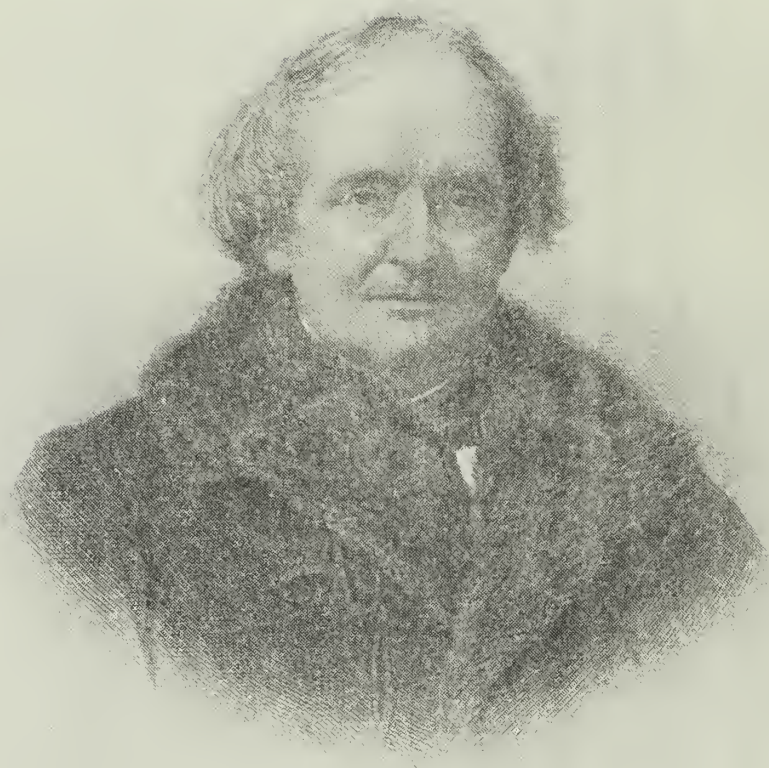
## MICHAEL H. SIMPSON.



MICHAEL H. SIMPSON, proprietor of the Saxonville Mills, at Saxonville, Mass., and of the Roxbury Carpet Factory, at Boston Highlands, was born Nov. 15, 1809, in Newburyport. His father was at first a sea-captain, and then a ship-owner ; and after retiring from a sea-faring life, he became a merchant engaged in foreign trade. Michael attended school and the academy at Newburyport, and at fourteen years of age went to Boston, and entered the counting-room of Adams and Amory, and afterward that of Jonathan Amory. Both of these houses were engaged in foreign trade. In their employ young Simpson received a thorough mercantile education. At twenty he entered into business on his own account, and soon became largely interested in trade with China, Calcutta and South America. A large portion of the trade with South America was in wool ; and a peculiarity of this wool was that it was full of burs, which must be removed to make it available for manufacturing. This work was done by hand, chiefly by inmates of poor-houses and houses of correction. Mr. Simpson, having imported a cargo, and sent it to be picked, estimated that the shrinkage, by waste and dishonesty, was at least fifty per cent. About this time a machine was shown him by its inventor, who claimed that it would effectually pick the wool ; but Mr. Simpson found it imperfect, and he himself invented a machine for the same purpose, and received a patent. He then observed that, while a part of the wool was short staple, and only suitable to be spun into woolen yarns, a part was of long staple, adapted to make an excellent worsted yarn. Manufacturers of carpets and worsted goods had been dependent on foreign importations for yarns adapted to their business, and these were costly. Mr. Simpson accordingly invented a machine for combing the fibers, so as to separate the wool of long from that of short staple.

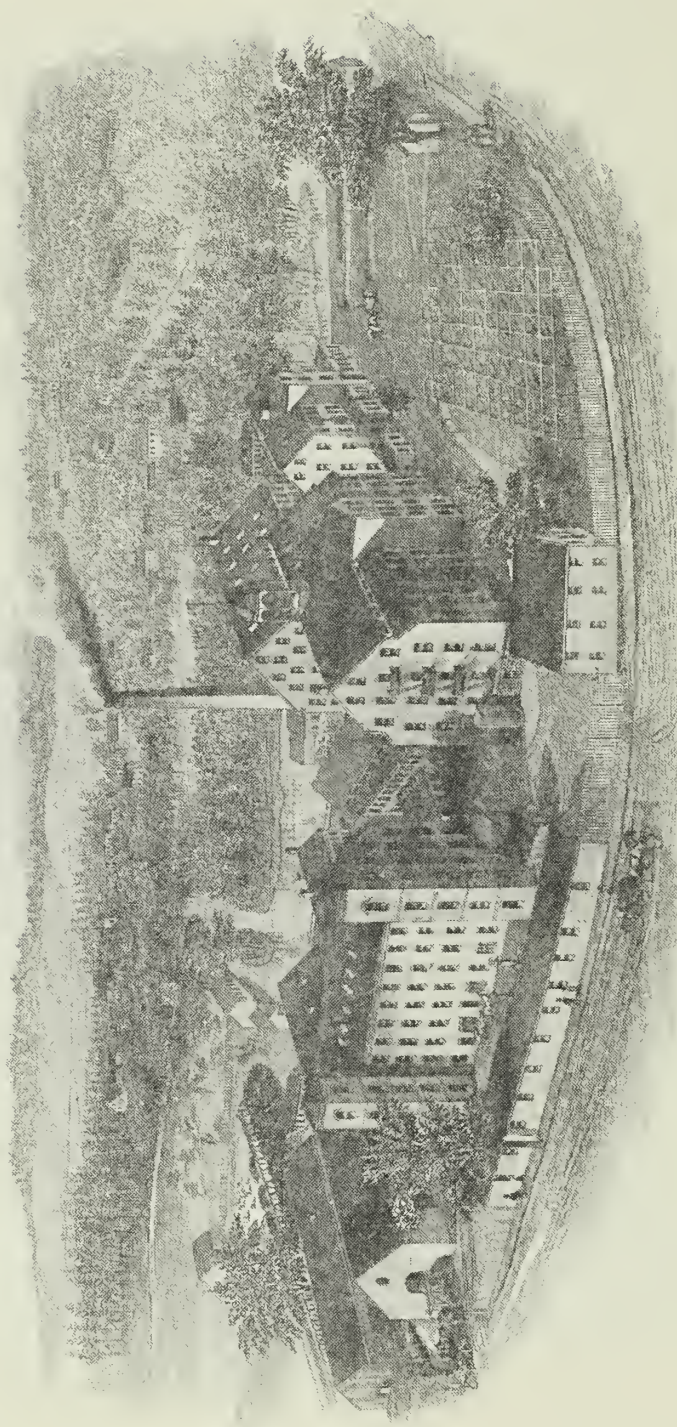
His success in the construction of these machines induced him, in 1837, with





*W. N. Simpson*





Van Dyke & Co. New York

**SAXONVILLE MILLS.**  
**SAXONVILLE, MASS.**

other merchants of Boston, some of whom, like himself, were importers of wool, to form the New England Worsted Company. This Company purchased the property then known as the Saxon Mills, in Framingham, Mass.,—which has given to the village which has grown up around it its present name of Saxonville,—and engaged in the manufacture of blankets and worsted yarns for which there soon arose a demand. In 1839, at the suggestion of Mr. Simpson, and with machinery adapted by him especially to the business, the Company engaged in the manufacture of bunting; and he was thus the first to manufacture that class of goods in this country. The first flag from American bunting was made at Saxonville, and was presented by Mr. Simpson to the Washington National Monument Association, at its inauguration, July 4, 1848.

In 1854 the New England Worsted Company bought the machinery of a carpet-factory in Troy, N. Y., and removed it to Roxbury, Mass. The machines invented by Mr. Simpson gave to the Company great advantages; and since the expiration of the patents, the machines, or those constructed on the same principles, have been generally adopted by carpet manufacturers. Mr. Simpson, with the aid of John Johnson, who had been engaged from boyhood in carpet manufacture, soon placed the Roxbury Carpet Factory in a prosperous position.

In 1858 Mr. Simpson, with Nathaniel Francis, of Boston, purchased all the property of the New England Worsted Company, including the Roxbury Carpet Factory, the former taking an interest of two-thirds, and the latter one-third. The property is now held in the same proportion by Mr. Simpson and the heirs of Mr. Francis. Since acquiring the control of the business, he has made it even more than before a success. He has continued his interests as a ship-owner and a merchant in foreign trade, and is still a large importer of wools, principally on account of the manufacturing interests under his ownership and control.

Mr. Simpson was married, on Dec. 24, 1832, to Elizabeth D. Kilham, of Boston. Their children have been: Helen, born July 6, 1840, and married to Dr. W. W. Secly, Professor in the Medical College of Ohio; Emmeline, born April 10, 1842; Grace, born April 27, 1845; Michael Henry, born Oct. 19, 1850; and Frank Ernest, born Feb. 5, 1859. Of these, Helen, Grace and Frank are living. Emma died in early childhood; Michael Henry died April 12, 1872. He was a young man of promise, having graduated at Harvard University in 1871, one of the first three scholars in his class. On his graduation he went to Europe, and died in Florence.

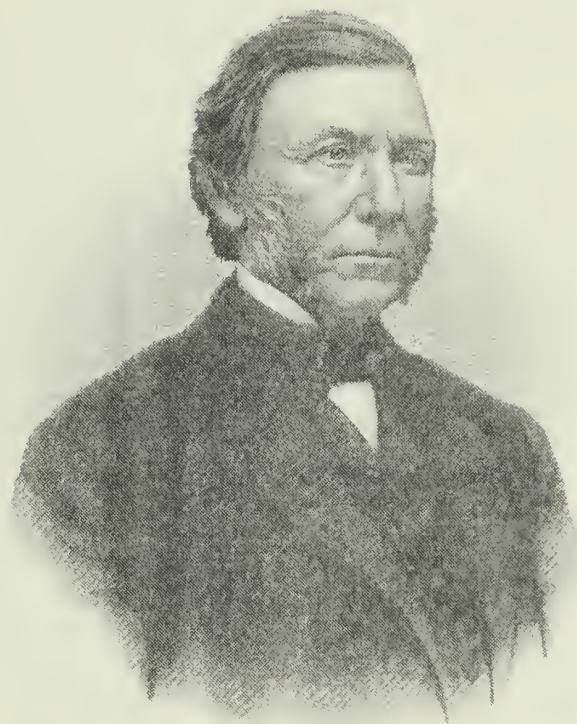
Mr. Simpson has taken an active interest in the welfare of his operatives, and purchased and laid out a large tract as a park for their recreation. As a manufacturer, Mr. Simpson owed his first inclination in that direction to a mechanical taste; and, to his inventive talent as a mechanic, he adds that of discovery and combination.

# SAMUEL SIMPSON.



SAMUEL SIMPSON was the grandson of Samuel George, a lieutenant in the English army, who came to this country with his regiment, in 1767, and who was soon afterward sent with a detachment to New Haven, Conn., to aid in enforcing the Stamp Act. While stationed at New Haven, he married Lydia, daughter of John Johnson, a large land-holder, left the army, and assumed the name of Robert Simpson. His only son received the name of Samuel George Simpson, thus combining his father's real and assumed names. Robert Simpson died in 1776. His widow married Josiah Merriman, of Meriden Parish, Wallingford. Samuel George Simpson married, first, Mary, daughter of John and Eunice Yale, of Meriden Parish, who died April 2, 1779; and then, Malinda, daughter of John and Lois Hull. John Hull was a farmer in Yalesville. His ancestors were, for three generations, physicians in Wallingford, and were descended from Richard Hull, one of the early settlers of New Haven. His son, Dr. John Hull, went to Stratford in 1661, and to Derby in 1668. He removed from Derby to Wallingford, living in the latter place from 1687 to 1711, in which year he died. His sixth son, Jeremiah, was a physician in Wallingford, dying there in 1736, and was succeeded in practice by his eldest son, John, who died in 1755. The latter's second son was John Hull, who married Lois Beadle, descended from Joseph Beadle, one of the original "planters" of Wallingford; and it was their daughter Malinda who married Samuel George Simpson.

From his first wife Mr. Simpson inherited some property; on his second marriage, he bought a farm. Here his sons, Alfred and Henry, were born. In 1806 he disposed of his farm, and, with other Connecticut farmers, bought a tract in the Western Reserve, in Ohio, whither he removed with his family. He built a log-cabin in the wilderness, thirty miles from any physician, store or mill. Here one son, George



Van Siver & Co. Engrs.

*Samuel Simpson*



Simpson, was born. After a residence there of five years, the family returned to Wallingford; and, soon after, two other sons, Harmon and Samuel, were born. Harmon died in his youth. George remained with his father on the farm, until old enough to go to a trade, after which he went to the West; and, selling the land which had been owned by his father, bought a more eligible location in the township of New Haven, Ohio. On his urgent invitation, his parents returned there in 1836, and remained three years, and then went back once more to Wallingford, where Mr. Simpson died in 1842, aged fifty-seven years.

Samuel Simpson was born in Wallingford, April 7, 1814. At eleven years of age he was placed in the office of Dr. Moses Gaylord, for many years an eminent physician in Wallingford, where he lived two years, assisting the doctor in his office and in work about the premises. Returning home he remained about two years; and then, April 1, 1829, he engaged as an apprentice for five years with Charles Yale, at Yalesville. Having completed this term, he was employed by Mr. Yale as a journeyman for four months, and was then appointed foreman of the shop. In this position he remained until Jan. 1, 1833.

He had now saved two hundred dollars, and, in company with Lorenzo L. Williams, who had, during his apprenticeship, been the foreman of the shop, he entered into a contract with Mr. Yale to manufacture the goods for him. At the end of six months this contract was sold to Messrs. Yale, of Meriden, and Henshaw, of New York, and extended for two years; but Messrs. Yale and Henshaw failed in 1837. They then purchased the machinery and tools from Mr. Yale's estate (he having died, Nov. 2, 1835), and continued the business on their own account until January, 1838, when their shop was burned, and the partnership dissolved. Mr. Williams went to Philadelphia; and Mr. Simpson put up a cheap building at the same privilege, and commenced work again in the autumn of 1838. In 1841 he entered into partnership with Darius Benham, and opened a store in New York, connected with which was a shop for the manufacture of japanned and plain tinware. This business was placed under Mr. Benham's charge, while that in Wallingford was continued by Mr. Simpson on his own account.

On the 1st of January, 1847, he sold out his interest in the store and shop in New York to Messrs. Benham and Whitney, and his britannia-ware business, in Wallingford, to John Munson. He soon afterward bought the Humiston Mill property, in Wallingford, and commenced the manufacture of wares plated by the electro-process, then recently introduced into this country. He compounded the metal by a new method, rolled it into sheets, and, from these sheets, spun various articles of hollow-ware. This was an improvement on the old method, by which articles previously cast in molds nearly of the desired form were placed in a lathe,

and shaped exactly to a chuck. The cast metal being of a porous nature, the stretching process in the lathe often opened holes in the article, which were afterward closed with solder. The method of rolling the metal into sheets, produced a compact texture, and obviated this difficulty. To form articles of an oval or other shape, which could not be turned in a lathe, he adopted presses of sufficient power to shape the articles by dies as he pleased, more rapid and effective than that of the screw-press already in use. He put up a large press, made by the Holyoke Machine Company, under the Dix patent; and, soon after, a still more powerful one, made under the Fowler patent. The business was thus carried on with satisfactory results for a period of six years. On Jan. 1, 1854, Mr. Simpson consolidated his business with that of the Meriden Britannia Company, and became one of the directors of that enterprise. The plating of the goods was removed from Wallingford to West Meriden, in 1856, when the plating-shop of the Meriden Britannia Company was completed.

On May 1, 1855, he entered into a contract for ten years with Robert Wallace, to manufacture german or nickel-silver spoons and forks, at Mr. Simpson's factory, the firm-style being R. Wallace & Co., and the capital \$12,000, the partners being equal in interest. On the fifteenth of the same month, Mr. Simpson's partners in the Meriden Britannia Company, entered the copartnership, and the capital was made \$14,000.

In 1861 Mr. Simpson sold out one-half of his interest in the Meriden Britannia Company to his partners, at 33 1-3 per cent premium on the par value, and agreed to bear his share of the loss of the previous year. The main factory building, of brick, was completed in 1863; and early the next year, the whole business, machinery and tools were removed from Wallingford to West Meriden. During 1864, Mr. Simpson sold the balance of his stock to his partners and others who became interested with them.

The copartnership of R. Wallace & Co. expired, by limitation, May 1, 1865; and Messrs. Wallace and Simpson entered into an agreement to renew their partnership, by the formation of a joint-stock company, and gave the Meriden Britannia Company the opportunity to become subscribers to one-third of the stock, Mr. Wallace and Mr. Simpson each retaining one-third. On these terms the Company was formed, under the style of Wallace, Simpson & Co., with a capital of \$100,000.

Early in 1866 Mr. Simpson decided to engage again in the manufacture of silver-plated ware. Messrs. Almer I. Hall and Friend Miller were at this time engaged in the manufacture of buttons, owning a water-privilege half a mile east of the village. Mr. Simpson united his new enterprise with theirs, and a stock company was formed, under the style of Simpson, Hall, Miller & Co., with a capital of

\$50,000. The original stockholders were : Samuel Simpson, Almer I. Hall, Friend Miller, Gurdon W. Hall (son-in-law of Mr. Simpson), Benjamin Church, William M. Whittaker and Gustavus Phelps. Messrs. Church, Whittaker and Phelps had been Mr. Simpson's apprentices and *employés*. Mr. Phelps soon retired from the partnership, his place being taken by Josiah H. Osborn. Mr. Miller died in 1872. In 1870 Hon. Charles D. Yale, late of Richmond, Va., became a stockholder. The Company has been very successful, its authorized capital stock having been increased, from time to time, to \$275,000, and its working capital to \$400,000.

In 1871 Mr. Simpson organized the Simpson Nickel Company, with a capital of \$50,000, associating with him other practical men, for the manufacture of nickel-silver spoons and forks. In the same year he organized the Wallingford Plate Company, also with a capital of \$50,000; its business, like that of the Simpson Nickel Company, being subsidiary to that of Simpson, Hall, Miller & Co. The store of the Company is at No. 676 Broadway, New York.

Mr. Simpson married, July, 1835, Martha Benham, of Cheshire, Conn. She was descended from Joseph Benham, one of the original "planters" of Wallingford, having removed thither from New Haven. Their children have been four sons (all of them dead) and two daughters : Elizabeth Malinda, married to Gurdon W. Hall, of Wallingford, and Martha Diette. He represented the town in the legislature, in 1846, 1859 and 1865. From early manhood he has been a member, and for twenty years senior warden, of the Episcopal Church in Wallingford.



## JOHN SLATER.



YOUNGER, by eight years, than his brother, Samuel Slater—a sketch of whose life is contained in following pages—was John Slater, who was born in Belper, England, Dec. 25, 1776. His father, William Slater, of Holly House, died when he was six years of age. John, like his brother Samuel, received a good education, and had the same mechanical taste. He served an apprenticeship as a mill-wright, a trade which, at that time, and for many years later, in England and in this country, involved both the construction and setting of water-wheels, and the putting up of the machinery and shafting; and on the mill-wright depended the effective working of the machinery. This training fitted him for his career of nearly forty years as a practical manufacturer. After spending some time at Manchester and Oldham, at the suggestion of his brother Samuel, in observing the improvements in the machinery and methods of manufacture that had been made since his removal to America in 1789, John Slater also came, late in 1803, to this country. Among other improvements of which he gained a knowledge was the mule invented by Samuel Crompton, which combined the features of the spinning-frame and the jenny. He was at once employed by Samuel, and remained at Pawtucket until 1806. In 1805 he spent some time in making arrangements to establish a new manufacturing enterprise; and at last decided to locate it on territory in the northern part of Smithfield, R. I., then a wilderness. There was, however, a large stream of water, supplied by numerous ponds, and having a fall, at this point, of some forty feet. A firm was formed by William Almy, Obadiah Brown, Samuel Slater and John Slater, under the style of Almy, Brown and Slaters, with equal ownership; and the first mill was completed, and put in operation, in 1806.

In 1807, having married Ruth, daughter of John Bucklin, of Pawtucket, John Slater removed to the new village, to which the name of Slatersville was given;



Van Slyck & Co. Boston.

*John Stutter*



and, from that time until his death, resided there, and personally managed the business.

On the 1st of January, 1833, with his brother Samuel, he purchased the interest of Almy and Brown; and they became owners, each of one-half of the property, under the firm-style of S. and J. Slater. They had, under the same style, in 1823, engaged in operating the mill at Jewett City, in the township of Griswold, Conn., purchased by them in July of that year. The water-power there had long before attracted attention; and Eliezer Jewett had built a saw-mill, grist-mill and fulling-mill at the point where the Pachaug River enters the Quinebaug. In 1781 he sold the fulling-mill, with the right to take water from the dam, to John Wilson, who then established, in addition to fulling, the business of finishing and dyeing woolen cloths. Mr. Wilson was the father of Increase Wilson, a well-known manufacturer of New London.

In 1806 a company was formed in Pawtucket, — consisting of the three brothers, James, Christopher and William Rhoades, Oziel Wilkinson, with his five sons, Abraham, Isaac, David, Daniel and Smith, and his two sons-in-law, Timothy Green and William Wilkinson, — with a capital of \$60,000, to engage in the manufacture of cotton yarns, at some point in eastern Connecticut. Smith Wilkinson, as agent for the Company, applied first, in Jewett City, to Jedediah Barstow, who, at that time, owned the privilege now occupied by the mills of John F. Slater, and used the power in operating two trip-hammers, in making axes and scythes. But the negotiation fell through.

In 1807 John Schofield, who, with his brother, Arthur, had come from England, about 1789, to Montville, Conn., and had there introduced machinery operated by power in the woolen manufacture, purchased from John Wilson a privilege further up the Pachaug River than Barstow's, and continued his business, but without much success, until 1813, when he sold the mill and privilege. It is now owned and occupied by the Ashland Manufacturing Company. Arthur Schofield had removed, before 1800, to Pittsfield, where he manufactured carding-machines and other woolen-machinery; and in 1808 he built, and began to operate, looms for the manufacture of broadcloth, the first made in this country.

In 1809 Nathan and Elisha Rose sold their property, consisting of a grist-mill, saw-mill and oil-mill, to John W. Tibbitts, of East Greenwich, R. I., and L. F. Tibbitts, of Warwick, R. I. This property included a mill-privilege and dam, about midway between the present dam of John F. Slater and that of the Ashland Company; and in one of the buildings was a carding-machine, for the accommodation of the neighboring families, in their manufacture of homespun and home-woven cloth. The next year the Messrs. Tibbitts associated with them seven other persons, one

of whom was John Wilson; formed a company, under the style of the Jewett City Cotton Manufacturing Company, and erected a small cotton-mill. A few months later, Jedediah Barstow sold his privilege to the Company, and John Wilson sold to the Company the old Jewett privilege, which he had bought in 1781.

On the 19th of June, 1811, fifteen other persons purchased stock in the Company, and a mill was erected on the Barstow privilege. Among these was Capt. James Treat, afterward interested in the mills at Voluntown, and one of the projectors of the Industry Manufacturing Company, organized in 1814. The name of the Company was changed, in 1813, to the "Jewett City Manufacturing Company." It was then operating the lower mill, on the Barstow privilege, having leased the upper one, on the Rose privilege, to James S. Simmons, who was afterward United States Senator from Rhode Island. An act of incorporation was granted on Sept. 20, 1816, and Christopher Lippitt, James Treat and Charles Fanning were elected directors. Mr. Lippitt became a stockholder May 13, 1813. He was the son of General Lippitt, of Cranston, R. I., an officer of Rhode Island troops in the Revolution.

No marked change occurred in the history of the Company for several years. It had struggled, with poor success, from the beginning; and in July, 1823, the property was sold at auction to Samuel and John Slater, who paid \$17,100 for it. They put the property into the best working condition, building a new and substantial dam twenty feet in height, thereby increasing the power and obliterating the old Rose privilege. This enterprise, in the hands of S. and J. Slater, was successful.

In 1825 John Slater bought, on his own account, the mill property on the Pachaug River, three miles above Jewett City, consisting of a woolen-factory, saw and grist-mills. The woolen-mill had been erected by Abel and Coit, in 1822, and operated till Oct. 11, 1824. Mr. Slater, on buying it, named it Hopeville, increased its capacity, and made the business profitable. He purchased the interest of his brother Samuel in the property at Jewett City, in 1831, and continued actively engaged in the superintendence of his personal interests, and those held jointly there with his brother, and, after Samuel's decease, with his heirs. Residing at Slatersville, he was aided in the business at Jewett City, especially after 1831, by his son, John F., who, before he had attained his majority, assumed its management.

John Slater died on the 27th of May, 1843. Like his brother Samuel, he was large of frame and striking in appearance. His business habits were methodical, punctual and exact. He was generous and hospitable, and took a deep interest in the welfare of his operatives and of the young.

Of his children, three lived to mature years. His daughter Elizabeth married Dr. Elisha Bartlett, for many years a prominent citizen of Lowell, having been its first mayor after its incorporation as a city. Dr. Bartlett was a professor in New

York University, the College of Physicians and Surgeons in New York City, the medical departments of Dartmouth College and of Transylvania University and the Berkshire Medical Institute.

Mr. Slater's sons, John F. and William S., received a practical training, and, on their father's death, united in a partnership, under the style of J. and W. Slater, and continued to run the mills at Jewett City and at Hopeville. The mill property at Slatersville had been leased by John Slater, before his death, to A. D. and M. B. Lockwood, the former of whom had been superintendent for some years before leasing the mills. In March, 1845, J. and W. Slater sold the Hopeville property in Griswold, Conn. ; and in 1849 they purchased the interest of Samuel Slater's heirs, in the Slatersville mills and village. The lease to the Messrs. Lockwood having expired in 1853, they put the buildings in thorough repair, and replaced the old machinery by new.

In 1862, with Estus Lamb, Henry S. Mansfield and George W. Holt, they formed a joint-stock company for the manufacture of cotton goods, under the style of the Forestdale Manufacturing Company. A mill was leased a mile below Slatersville on the same stream, belonging to Mansfield and Lamb, and was filled with machinery and operated for ten years. J. and W. Slater purchased, in 1872, the real estate and interest of the other three owners in the machinery. In October, of the same year, they dissolved partnership, and divided their joint property, John F. residing at Norwich, Conn., and taking the portion at Jewett City, which had been under his personal supervision ; and William S. taking that at Slatersville, of which he had had the main charge. These manufacturing interests, at both places, having been managed with ability and profit, have much increased, since 1843, in capacity, and greatly improved in buildings, appointments and machinery.

John F. Slater is president of the Ponemah Manufacturing Company, and is also a director in the Washburn and Moen Manufacturing Company, of Worcester, Mass. William S. Slater is president of the Providence and Worcester Railroad Company, and of the Rhode Island Locomotive Works. Both brothers have invested largely in aid of other manufacturing enterprises in New England and elsewhere, and in railroads and banks, holding prominent positions in their boards of direction and management. By their ability and enterprise, and by their investments in other industrial, financial and public interests, they have become wealthy, and have attained high positions among the manufacturers, merchants and capitalists of New England.

A decorative banner with a central rectangular frame containing the name "SAMUEL SLATER." in a serif font. The banner is flanked by ornate, symmetrical scrollwork and floral designs.

SAMUEL SLATER, in a sense in which the term cannot be applied to any other man, was "the father of American manufactures." He came to this country from England at a critical period in the early history of its manufactures; and, removing the difficulties which had long impeded its progress, he laid, on a substantial basis, the foundation of the cotton manufacture.

The attention of the colonists was early turned to manufactures; and, about the middle of the last century, petitions were presented to the British Parliament, complaining that they "are beginning to carry on trade—they will soon be our formidable rivals; they are already setting up manufactures—they will soon set up for independence." But their appliances were rude; and it was less than twenty years before the Revolution that the improvement in machinery began which laid the foundation for the immense manufacturing interests of both Old and New England.

When the fears of the English merchants and manufacturers were realized, and the colonists had successfully "set up for independence," public attention here was directed more earnestly to the development of manufactures by improved machinery. In 1786 the Pennsylvania legislature offered a premium for the introduction of Arkwright's system of machinery. In the same year Robert and Alexander Barr, natives of Scotland, came to Bridgewater, Mass., and were employed by Hon. Hugh Orr, to make machines for carding, roping and spinning cotton. The State legislature made an appropriation toward the expense of building the machines; and as these were only to be kept as models, they were styled the "State models."

In 1788 Daniel Anthony, Andrew Dexter, and Lewis Peck, of Providence, entered upon the manufacture of homespun cloth, intending to spin the yarn by machinery; and Mr. Anthony, first visiting Bridgewater, and taking drawings of the

"State models," with his partners constructed a spinning-machine at Providence. They also built a spinning-jenny, on the model of a very imperfect one which had been set up at Beverly, Mass., in a small cotton-factory started by John Cabot and others of Salem in 1787. They attempted only to spin yarn from rolls prepared by hand in families; but they soon became discouraged, and sold their machinery to Moses Brown, a merchant and capitalist of Providence, who furnished capital to his son-in-law, William Almy, and his cousin, Smith Brown, for the manufacture of jeans and other home-woven goods. The machinery soon proved too heavy, however, to be operated by hand, and it was removed to Pawtucket, where water-power was applied to it. But this, also, proved a failure, the machinery being too imperfect to admit the use of water-power. At this juncture Samuel Slater arrived in New York, from England.

Samuel Slater was born at Belper, in Derbyshire, England, June 9, 1768. He was the son of William Slater, a respectable yeoman, owning the estate known as "Holly House" (now the property of Horatio N. Slater, Esq., of Webster, Mass., son of Samuel), and received a good school education. His father died in 1782; and on Jan. 8, 1783, Samuel was apprenticed to Jedediah Strutt, whose name is associated with those of Arkwright, Hargreaves and Crompton, in the improvement of cotton manufacturing machinery. In 1771 he entered into partnership with Arkwright, who, by different inventions, the last patented in 1775, completed his system of machinery; and about this time Mr. Strutt, on his own account, erected a cotton-factory at Milford, near Belper. Before the elder Slater's death, Mr. Strutt had applied to him for one of his sons, to learn the business of cotton manufacturing; and the father suggested Samuel, who "wrote well, was good at figures, and possessed mechanical genius," among other things having early devised for his mother a polished steel spindle. Samuel accordingly entered Mr. Strutt's service, who received him as a member of his own family, instructed him personally in mechanical matters, and consulted with him as to improvements in machinery. During the latter years of his apprenticeship, young Slater was intrusted with important responsibilities, that showed his employer's high estimate of his ability. His attention was now directed to America, as his future field of labor. He believed that here would be a field for enterprise, in which his experience would be of value. As there was, at that time, a great jealousy in England regarding the emigration of skilled machinists, and legal penalties had been made against taking or sending out of the country, models, patterns or drawings of machinery, young Slater determined to make himself familiar with the machinery, and to depend on his memory and skill for constructing the different machines of the Arkwright system. He left home, in the garb of a farm-laborer; and on the 1st of September, 1789, he sailed from

England, landing in New York early in November. Within four days he obtained employment from the New York Manufacturing Company, then recently organized, and engaged in attempts at manufacture with very crude machinery. After remaining here three weeks, he became satisfied that the concern had little prospect of success. Learning from the captain of a sloop trading between Providence and New York, of the attempts at Pawtucket to manufacture cotton-yarns by water-power, he wrote to Moses Brown, and, in response to the invitation of that gentleman, went to Providence about the first of January, 1790. On examining the machinery of Almy and Brown, he saw that it could be of little if any service. He at once entered into a contract with Moses Brown and Almy and Brown, and began altering the old machinery and constructing new so successfully that he was invited to enter into partnership with them. On April 5, 1790, articles of copartnership were signed between Almy and Brown on the one part, and Samuel Slater on the other, under the style of Almy, Brown and Slater. The other members of the firm engaged to furnish material and capital for the construction of two carding-machines, a drawing and roving-frame, and spinning-frame to the capacity of 100 spindles; and for the conduct of the enterprise, Mr. Slater was to receive one-half of the profits, and be owner of one-half of the machinery, the others receiving a commission of two and one-half per cent for purchasing stock, and four per cent for the sale of yarns. Mr. Slater was also to be charged with one-half of the expense incurred in the construction and purchase of machinery, old and new, as also for amounts advanced by Almy and Brown for his support while starting the business. After much delay, he was able, on the 21st of December, 1790, to start the machinery successfully, including carding, drawing and roving-machines, and two spinning-frames, of 24 and 48 spindles respectively.

To obtain the card-clothing, he applied to Pliny Earle, at Worcester, a maker of hand-cards. The first attempt to card by the machinery was a failure. On closely examining the reeds, however, he found that the teeth were loose, because the holes in the leather were too large, so that they fell back, and the inclination was not sufficient to carry the fiber forward on the cylinder. Pliny Earle went to Pawtucket, and bending forward the teeth, finally secured such a pitch that the difficulty was remedied, and the carding by power-machinery became an accomplished fact.\* From that time the enterprise was so successful that, fourteen months afterward, Moses Brown wrote to the Secretary of the Treasury of the United States, that "machinery and mills could be erected within one year to supply the whole United States with

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\*The discovery of the cause of the serious difficulty encountered, and the application of the remedy, is claimed for Pliny Earle, and also for Sylvester Brown, who was employed to make the machinery.

yarn, and render its importation unnecessary." The machinery was at first set up and operated by a water-wheel, in an old fulling-mill connected with a clothier's shop at the west end of the Pawtucket Bridge, and with such success that, very soon, yarn as good as that spun in England was produced. A mill was completed and occupied in 1793, which still stands, with some additions since made to it, and is known as "The Old Mill."

In the same year the idea of cotton thread, as a substitute for linen or flax thread, for sewing purposes, was first suggested. Mr. Slater had spun some very smooth and even yarn from Surinam cotton, which, in length of staple and quality of fiber, was very similar to the Sea Island cotton of later date. His wife suggested that it would make a good sewing thread; and, with the aid of her sister, twisted some of it on an ordinary spinning-wheel, making a two-ply No. 20 thread. On testing this with linen thread, by sewing a seam of cloth with each, the cotton thread was found to be the stronger. This was probably the first manufacture of cotton sewing thread, which, in Great Britain and in this country, has become an immense industry.

In 1798 Mr. Slater formed a copartnership with his father-in-law, Oziel Wilkinson, Timothy Green and William Wilkinson, each of whom had married a sister of his wife. The style of the firm was Samuel Slater & Co. They erected a mill on the other side of the Pawtucket River, on territory then within the limits of Massachusetts, but, in 1861, ceded to Rhode Island. Mr. Slater's relation to the firm of Almy, Brown and Slater also continued. The business of the two firms so increased, and Mr. Slater's prospects of prosperity became such that, in 1803, he invited his younger brother, John,—after acquainting himself with the improvements in cotton-machinery introduced there since he had left England,—to come to this country. The most important of these improvements was the mule invented in 1772 by Samuel Crompton, of Bolton, England. Soon after John Slater's arrival, late in 1803, the spinning of yarns was begun at Smithfield, R. I.; and the village which grew up around this factory is called Slatersville. The establishment is now the property of William S., son of John Slater.

Samuel Slater's increase of capital was now such as to afford him the means for investment in another direction; and in 1811 his attention was called to a locality thirty miles north-west of Providence, where there was a large pond, called Chaubunagungamaug. The neighboring land was rocky, and covered with a forest. This place was known as "Oxford South Gore." Through this tract, and by the borders of the pond, was a road leading to Providence, already the center of large manufacturing interests. Among those who visited Providence in this business was James Tiffany, of South Brimfield, now Wales, Mass. Mr. Tiffany secured situations in Mr. Slater's office, successively, for two of his sons, Lyman and Bela. The

young men, while in Mr. Slater's office, had been impressed with the abundant supply of water-power at the pond, and spoke of it to Mr. Slater. Bela Tiffany then made a somewhat more careful survey of the region, and reported that there were, at the outlet of the lake, a small grist and saw-mill, a blacksmith's shop, with trip-hammer, an unfinished two-story dwelling-house, and only four or five families anywhere in the vicinity. Mr. Slater soon visited the locality, and purchased land near the outlet of the lake sufficient to control the water-power. The reasons for this action were, undoubtedly, the extent of this natural reservoir, and the necessity growing out of the character of the business, as then pursued. The power-loom had not yet been invented; and, for more than twenty years after Mr. Slater's arrival in this country, the cotton manufacture by machinery run by water-power was limited to the production of cotton yarns. These, either in skeins or made up into warps, were sold to farmers and others, to be taken to their homes and woven for themselves in hand-loom; or were given out to be woven on account of the manufacturers, and returned to them in the shape of cloth. By 1811 cotton manufactories had made such progress in Rhode Island and south-eastern Massachusetts, that it was difficult to find an outlet for all the yarns made. Mr. Slater, therefore, resolved to enter a new territory. Having made the purchase at "Oxford South Gore," he received into partnership Bela Tiffany, under the style of Slater and Tiffany, and erected a cotton-mill, which was the beginning of the large manufacturing operations at what is now East Webster. This partnership continued until 1815, when Mr. Tiffany retired, Mr. Slater becoming sole owner.

This enterprise encouraged others to occupy privileges on French River, in that vicinity. In 1812 Larned Corbin, Jephtha Bacon, Aaron Tufts, Phineas Bemis and William Larned, traders and farmers in Dudley, having been incorporated as the Merino Wool Factory Company, built a woolen-mill on the site of the present Stevens Linen Factory. In 1815 Braman, Benedict and Waters built a small cotton-mill, at the privilege afterward owned and occupied by Samuel Slater and Sons, at North Village, Webster. About the same time, Edward Howard, an Englishman who had been in the employ of the Merino Wool Factory Company, obtaining capital from Mr. Slater, and hiring from him a small building and power at the East Village, began the woolen manufacture on his own account, continuing until 1820, when his factory was burned. He then, also, with capital furnished by Mr. Slater, built a factory on the site of the present Slater Woolen Factory. Mr. Howard, in improving the privilege, by raising the dam in 1822, flowed the water back on the privilege of Braman, Benedict and Waters. The result was a suit for damages on their part, which was settled by the purchase of the whole property, at the North Village, by Samuel Slater. At the same time he entered into partnership with Mr. Howard,

under the style of Slater and Howard, for carrying on the woolen-mill, which connection continued until 1829, when Mr. Slater purchased Mr. Howard's interest. In 1832, mainly through Mr. Slater's influence, the three villages which had grown up from his enterprise, together with some territory taken from Dudley and Oxford, were incorporated as the town of Webster, named after Daniel Webster.

During the rapid development of business and of population at this point, from 1811 to 1829, Mr. Slater's interest at Pawtucket and at Slatersville were also prosperous, and claimed much of his care ; but, with his great capacity for business, he was ready to enter other openings for profitable investment. In 1813 an association of farmers and traders in Griswold, Conn., built a cotton-mill in that part of the town now known as Jewett City. After ten years, when under the management of different persons the enterprise was found to be a failure, the property was purchased at auction, July 10, 1823, by Samuel and John Slater, who made the business a success. Samuel Slater sold his interest in this property July 10, 1831, to his brother John ; and it is now owned by the latter's son, John F. Slater, of Norwich.

In 1817 Mr. Slater, with Washington Jenks and Benjamin Jenks, of Providence, Arnold Jenks, of Pawtucket, and Joseph Bucklin, of Smithfield, R. I., formed a corporation, and bought the property known as the Springfield Manufacturing Company, at Ludlow, Mass. Mr. Slater held this property, though it was not as profitable as the enterprises directly under his own control and management, until his death ; and his interest in it was retained by his heirs until 1840.

On a certain evening about the year 1822, Mr. Slater received a large package, which proved to contain a magnificent salmon. The next day he received a letter from a Mr. Olney Robinson, of Goffstown, N. H., who stated that he owned a small cotton-mill at the Amoskeag Falls, on the Merrimac River, and that he wished to negotiate a loan of three thousand dollars from Mr. Slater, and added that the fish was a sample of the productions of the river. Mr. Slater thereupon repaired, with his wife and his son, Horatio N., then fourteen years of age, to Amoskeag Falls, passing through Chelmsford, where laborers in the employ of Francis C. Lowell, Patrick T. Jackson, Kirk Boott, Nathan Appleton and other Boston capitalists were blasting rocks, and otherwise laying the foundations of the future town and city of Lowell. Mr. Slater found that the property of which he was in search consisted of a small red wooden-mill, of two stories, and two or three tenements of one story each. He was so impressed with the possibilities of manufacture at this point, and with its fine water-power, that he purchased the property, and, with Willard Sayles and Lyman Tiffany, of Boston, Oliver Dean, of Franklin, and Pitcher and Gay, of Pawtucket, formed a company, the property to be held by the parties named and Mr. Slater, in five equal shares, Pitcher and Gay, as a firm, holding one share. This was the foun-

dation of the great manufacturing industries at Manchester, N. H. About the same time, in addition to the agencies for the sale of his goods in Boston and New York, Mr. Slater established commission houses in Philadelphia and Baltimore, inducing capable young men to take his goods on commission, aiding them by leaving with them for long periods, and without interest, large balances due him; thus establishing in those cities the commission business in domestic dry-goods.

In the year 1829 a severe financial revulsion occurred; and at no time in their history have the cotton-manufacturing interests of New England been at so low an ebb as they were that year. In Boston, the business-paper of manufacturers was regarded with great distrust. Mr. Slater's position, at the head of this interest, and the fact that he was known to be a large indorser of the paper of several concerns, caused great anxiety, notwithstanding his reputation for sagacity and for ability as a financier. By the sale of his mill property at Pawtucket and Slatersville, however, and the negotiation of a large loan from the Providence banks, he passed through the crisis without injury to his credit. But his wealth was impaired to the amount of nearly a quarter of a million of dollars. He afterward repurchased his interest in the Slatersville property; and, in 1833, with his brother John, he bought out the interest of Almy and Brown. From that time until his death the business there was conducted under the firm-name of S. and J. Slater.

Mr. Slater now became the owner of the Providence Steam Mill, which had been erected in 1827-8, largely by the aid of his capital and credit, and of the mills at Wilkinsonville, in Sutton, Mass. The owner of the latter and a large owner in the former was David Wilkinson, Mr. Slater's brother-in-law, a very skillful mechanic, and an enterprising manufacturer. Mr. Slater had loaned him capital, and had indorsed his paper to a large amount. In the settlement of his affairs, there being no one who would purchase the mills except at an enormous sacrifice, Mr. Slater, to protect his own interests and those of others, was compelled to assume a heavy addition to his previous burdens.

From that time until his death, Mr. Slater continued in the superintendence of his large manufacturing interests, and of business connected with his other investments. He was fifteen years president of the Manufacturers Bank, at Pawtucket, having been one of its original corporators. He retained his citizenship at Pawtucket, but spent most of the time, in his last years, at his home at Webster, Mass., near the cotton-mills first erected by him at the East Village. He died there April 21, 1835.

Mr. Slater married, on Oct. 2, 1791, Hannah, daughter of Oziel Wilkinson, of Pawtucket, whose family were Quakers. Mrs. Slater was the mother of ten children, six of whom, all sons, survived her. These were: Samuel, who died at

the age of seventeen; George B., born Feb. 12, 1804; John, born May 23, 1805; Horatio Nelson, born March 5, 1808; William, born Oct. 15, 1809; and Thomas G., born Sept. 19, 1812. William and Thomas G. also died in early manhood. George B. resided for many years at North Webster, and died there in 1843. He exerted much influence in the affairs of the town, was justice of the peace, and held other civil trusts. As a member of the firm of Samuel Slater and Sons, his relation to the business was wholly mercantile, and chiefly concerned with the landed interests of the firm. In this relation he was succeeded by his son, William S., who is now a citizen of Webster. John Slater resided at Providence, and, after the death of his father, became, by inheritance, the owner of the Providence Steam Mill. He died in the West Indies, whither he had gone for his health, in 1840. He had attained an excellent reputation as a merchant and business-man. Horatio N., who is still living, inherited much of his father's mechanical taste. He entered the mill at the age of fourteen, to acquire a practical knowledge of manufacturing, and, before attaining his majority, was intrusted by his father with important duties. Since his father's death, he has been the head of the firm of Samuel Slater and Sons. As the executive manager of its large business, he has acquired a high reputation as a merchant, and, especially, as a manufacturer in the two branches of textile fabrics.

In person, Samuel Slater was tall, fully six feet, erect and well proportioned, and his usual weight was about two hundred and sixty pounds. He was of light complexion and of a ruddy countenance; his features were regular; his forehead was broad and high; his expression intellectual; and his presence and bearing were commanding. His relations with his *employés* were always most pleasant; in their welfare he took a kindly, and, often, paternal interest; and to his care, through more than forty years, is largely due the amelioration effected, within that period, in the condition of manufacturing villages. His interest in the welfare of the young was indicated by his establishing, in 1793, a Sunday School in his own house for the instruction of the children brought together by his business, and otherwise destitute of instruction. At first he taught them himself, and then employed students from Brown University in this task; thus, also, affording aid to worthy young men.

In the sphere of his personal experience and work, Mr. Slater was wise and skillful; while on other topics of general interest and importance his views were always broad. His handwriting was elegant, he was systematic and economical in business, and his habits of life were simple. He had large sympathy for the poor; and in the relief of immediate and pressing want, he was prompt and liberal. Mr. Slater deserved the place which he holds in the annals of New England and the country, as the one who gave direction to the movement which has made New England the workshop of the western continent, as Old England is of the eastern.

A decorative banner with a central rectangular box containing the name "AMOS D. SMITH." in a serif font. The banner has ornate, symmetrical flourishes at both ends and small decorative elements within the central box.

AMOS DENISON SMITH was born in Groton, Conn., April 13, 1805, on a farm which had been owned by his ancestors since the settlement of the town in 1650. His father was a sea-captain; and his mother, whose maiden name was Priscilla Mitchel, was a lineal descendant of the Pilgrim maiden, Priscilla, the heroine of "Miles Standish's Courtship." Amos, after attending school until the age of eleven, left home and went to Springfield, Mass., where, with a relative, he commenced his business training. He remained at Springfield until he was eighteen, during the latter two years of the time having the entire charge of the business of his employer, who removed to a neighboring town.

In 1823 young Smith went to Providence, R. I., and served with James Aborn, then engaged in the lumber trade, on Washington Street. Two years later, before he had attained his majority, Mr. Aborn received him into partnership, and his brother, James Y., became a clerk in the office. In 1828 Mr. Smith retired from the firm, and opened a store on South Water Street, as a wholesale grocer. About the same time, in connection with Charles H. Franklin, whose sister he had married, he hired what was known as the Button-mold privilege, in Johnston, and started the small cotton-mill which had been built there some years before. They began with only a few hundred spindles, and sent the yarn into the rural districts, to be woven into cloth on hand-loom.

Mr. Smith, while still engaged in his store, also took an interest in various outside mercantile affairs, purchasing shares in several vessels sailing from Providence, and becoming the agent, and, in part, owner, of a line of steamboats running between Providence and New York. Meanwhile he gradually increased his property in the cotton manufacture. He became interested in the Union Mill started by his father-in-law, Henry P. Franklin; and in 1848, in company with his

brother-in-law, he purchased an interest in the Merino Mill, immediately adjoining their mill at Johnston. The Merino Mill had been erected by Henry P. Franklin, in 1810, and had been run until the enterprise was interrupted by a fire, which destroyed the mill. The property lay idle about twelve years, until 1848, when the mill was rebuilt, Amos D. Smith and Charles H. Franklin having an interest at this time of two-thirds. In 1850 this interest, including the Union Mill and the mill on the Button-mold privilege, was organized as a corporation, by Amos D. Smith, Charles H. Franklin and the heirs of Henry P. Franklin. The capital was fixed at \$200,000. The mills have been since continuously employed, and now run 34,500 spindles.

Mr. Smith received his younger brother, James Y., into partnership in 1843. The latter had been engaged, since 1830, in the lumber trade. The new firm, under the firm-style of A. D. and J. Y. Smith, also represented, as agent, the manufacturing interests in which each of the brothers had invested capital.

In 1845 they purchased from Thomas J. Hill, of Providence, a mill at Willimantic, Conn., which had been thoroughly repaired by him, a new dam having also been built. Mr. Hill had used it in the manufacture of cotton-machinery and of spool-cotton thread. On its purchase by the Messrs. Smith, the machinists' tools were removed, and they introduced new machinery. The establishment took the firm-name of the Smithville Manufacturing Company. In the same year they purchased the rights of others in the cotton-mill at Woonsocket, since known as the Groton Mill. This mill had been erected, in 1831, on land leased, by John W. Buffum, of Samuel G. Arnold. He had purchased it, in 1814, from James Arnold, who then owned nearly all the land occupied by the main business portion of Woonsocket. Mr. Buffum erected a mill known as Buffum's Mill. In August, 1835, it was sold by him to Peter J. Cook and Samuel Shove, under the firm-style of Samuel Shove & Co. The mill afterward received the name of Law's Mill, from George Law, its managing agent for several years. In October, 1850, A. D. and J. Y. Smith obtained a charter, under the firm-name of the Groton Manufacturing Company, the authorized capital of which was \$200,000.

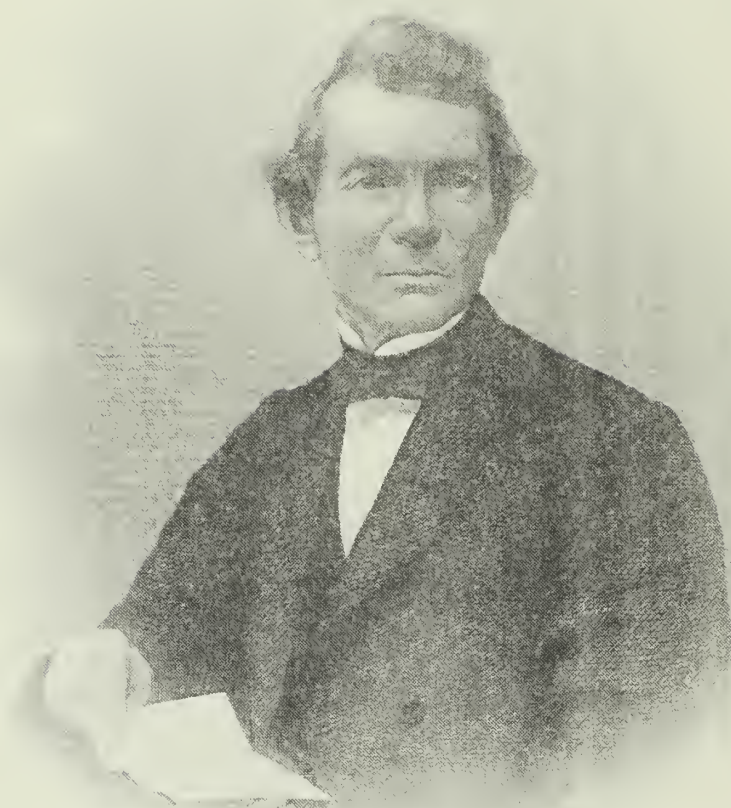
The two sons of Mr. Smith, Henry J. and Francis M., and Benjamin B. Adams, who had been for several years a clerk with the firm, were admitted to partnership in 1856, the style being changed to A. D. and J. Y. Smith & Co. In 1857 they became the proprietors of the Providence Steam Mill, which had been started in 1827 by Samuel Slater, David Wilkinson, Benjamin Dyer and Charles Dyer, and afterward owned successively by Samuel Slater, his son John, and a firm in New York, in whose interest it had been run from 1838 until the time of their purchase, which was at a sale by auction.

Since the organization of the firm, in 1843, the resources and energies of both its members had been directed more and more to manufacturing. In September, 1862, James Y. Smith retired from the firm, which now took the firm-style of A. D. Smith & Co.; and Amos D. Smith, Jr., the third son of the senior partner, was admitted to it. In 1865 a mill on Dexter Street, Providence, which had formerly been the State Arsenal, and was more recently known as the Durfee Mill, was purchased by the Groton Manufacturing Company. The mill was rebuilt and remodeled, and received the name of the Groton Mill No. 2, its business being conducted in connection with that of the mill at Woonsocket. It has 14,000 spindles, while Groton Mill No. 1 has 16,000. This interest, in 1867, was put in charge of C. M. and W. S. Smith, as agents, that firm having been organized by Charles Morris and William S., sons of Amos D. Smith.

Since the death of Mr. Smith, which occurred Jan. 21, 1877, the business has continued under the same style, the present members of the firm being Francis M. Smith, Amos D. Smith and Benjamin B. Adams. They have the management of the Franklin Mill, having 34,500 spindles, and the Providence Steam Mill, with 22,500 spindles.

Mr. Smith, from his first residence in Providence, evinced much public spirit. He was for many years a member of the city council, and also served on the school committee. He commanded one of the fire-companies, and was for several years major-general of the State militia. He was, moreover, an active promoter of railroad interests, and for many years was president of one of the roads leading from Providence. One of the original corporators of the Providence Gas Company, he was its president from its organization until his death. He took an active part in the formation of the Board of Trade, and was for three years its president. He was, at different times, a director in eleven banks and insurance companies, of three of which he was president. Mr. Smith was also one of the founders of the Butler Insane Asylum, and trustee and president of its board, and treasurer and then president of the Rhode Island Hospital.





Wm. H. Wood & Co. Boston.

*James Y. Smith*

GOVERNOR OF THE STATE OF RHODE ISLAND.



PROMINENT place was long held among the cotton manufacturers of Rhode Island and of New England by the late James Y. Smith, of Providence, R. I. He was born at Groton, Conn., Sept. 15, 1809. After attending school until he was fourteen years of age, he was placed in a store in Salem, Conn., for the next three years, and was intrusted much of the time with nearly the entire charge of the business. In 1826 he went to Providence, and entered the counting-room of Aborn and Smith, a firm engaged in the lumber trade, of which his elder brother, Amos D., was the junior partner. The latter retired in 1828; and the business was continued by the senior partner, under the style of James Aborn, with whom James Y. Smith remained until 1830. He then, with John W. Aborn, a nephew of his previous employer, formed a new copartnership, also under the style of Aborn and Smith, succeeding to the business, and occupying the premises of the old concern, Nos. 1 to 10 Washington Street. This firm acquired a remunerative trade; and, having at the death of Mr. Aborn, in 1837, accumulated a good capital, Mr. Smith became sole proprietor.

He first became interested in the cotton manufacture in 1837. His father-in-law, Thomas Brown, had been a stockholder in the Scituate Manufacturing Company, at North Scituate, R. I., since its organization, in 1826. In this company Mr. Smith had invested capital on his own account, and at once took an active interest in the management. A charter was granted in January, 1834, the capital being fixed at \$200,000.

At a later period Mr. Smith bought an interest in the Ashland Company, its mill being in South Scituate, R. I. This company was incorporated June, 1847. He continued his lumber business, under the old firm-style, until 1843, when he sold his interest in it, and entered into partnership with his elder brother, Amos D. Smith, who had been, since 1838, engaged in the wholesale grocery trade, and since

1828 interested in manufacturing at Olneyville. The new firm, under the style of A. D. and J. Y. Smith, engaged in a general wholesale merchandise business, representing, also, the mills in which the brothers were interested. Their business was profitable, and in 1845 they purchased, from Thomas J. Hill, a mill at Willimantic, Conn., formerly known as the Lee Cotton Mill, but which had been used by Mr. Hill, since its purchase by him in 1837, for the manufacture of cotton-machinery and of spool-cotton thread. The Messrs. Smith filled it with new and improved machinery, and conducted the enterprise under the name of the Smithville Manufacturing Company. In 1845 they also bought the Groton Cotton Mill, at Woonsocket, R. I., the business of which they organized, in 1850, as a corporation.

From this time until 1857 the firm was engaged in establishing the business, both mercantile and manufacturing, without entering into new large enterprises. Then the Providence Steam Mill, owned by a firm in New York, was put up at auction, and bought by A. D. and J. Y. Smith & Co.—which had become the style of the firm in 1856, on the admission to the firm of Francis M. and Henry J., sons of Amos D. Smith, and of Benjamin B. Adams.

During their association in business, Amos D. was the merchant of the concern; while James Y. assumed the special charge of the manufacturing department. He gave his attention to mastering its details, and in a few years became thoroughly skilled in the industry. He kept constantly under his own eye the details of the manufactures at his mills, no less than those of his counting-room or store, or the state of the markets. Before the opening of the railroad to Willimantic, he made regular journeys for the inspection of his mills.

In September, 1862, the firm of A. D. and J. Y. Smith & Co. was dissolved, and James Y. Smith began business in his own name.

At the close of the war Mr. Smith erected, in that part of Cranston called "Elmwood" (now included in Providence), a cotton-mill, and organized its business as the "J. Y. Smith Manufacturing Company." The mill is operated by steam, and has gained a good reputation for its product, the "Elmwood shirting."

Mr. Smith was president of the Union Bank and of two savings banks, and a director in eight insurance companies, in some of which he was president. He was for three years president of the Providence Board of Trade, a director of the Providence and Worcester Railroad Company and of the New York and New England Railroad Company, and was at the time of his death a member of five commissions under the city government.

He was always deeply interested in political affairs, and for some years represented Providence in the general assembly. In 1855 and 1856 he was mayor of the city, and in 1861 he was the Republican candidate for governor; but that party being in a minority, he failed of election.

In 1863, however, the Republican party in Rhode Island had been greatly augmented by its uniform support of measures for the suppression of the Rebellion, and the Democratic party had been proportionally weakened by the vacillating course and questionable loyalty of its leaders. Mr. Smith's active fidelity to the cause of the Union, and his eminent fitness for the office of Governor of the State in that most trying period, again made him in that year the nominee of the Republican party, and he was elected. His able administration of the affairs of the State, and the unqualified support he had enabled her to give to the National Government during this term, resulted in his being returned as her executive officer, by the election of 1864; and again, in 1865, by a remarkable vote, every town and ward in the State giving him a majority—a case never paralleled in the history of the State, or, it is believed, of any other State in the Union.

During the entire period of his administration, covering the most eventful time in the history of the war, when the greatest demands of the National Government were made upon the different States for troops, Governor Smith, by his ability to cope with the extraordinary exigencies which occurred, averted the necessity of a draft during his administration, filling all the quotas assigned to the State by voluntary enlistments, not excepting the memorable requisition of Dec. 19, 1864. This call was supposed to have been met; but an official dispatch from the War Department, announcing a change in the system of assigning quotas, on account of the excess furnished by some of the States, and that Rhode Island was largely in arrears, came like a thunderbolt, creating the utmost consternation throughout the State. Even then, by his personal exertions and power to inspire activity in enlistments, a resort to a compulsory draft was averted; and Rhode Island took her place, side by side, with the most loyal and patriotic of her sister States.

Governor Smith's most efficient service to the State and the country in these turbulent years, when the wisdom resulting from a long and successful experience in various departments of business and a strong arm at the helm were needed, elicited the gratitude of the people, and placed his name in the imperishable record of those whose patriotism and earnest labors for the public weal transcended all other considerations.

At the close of his official career, he resumed the immediate personal control of his manufacturing and other business relations, and continued to identify himself, as formerly, with the interests of the city. He was stricken with paralysis in March, 1876; and, after lingering ten days, died on the 26th of that month. His wife, Emily, daughter of the late Thomas Brown, to whom he was married Aug. 13, 1835, and two daughters, survived him.

When Mr. Smith came to Providence, in 1826, it had a population of less than

sixteen thousand; at his death it numbered more than one hundred thousand. It was then in its infancy as a manufacturing city, but now is counted among the largest and most important in New England. Mr. Smith was among the most active in developing its manufacturing interests; gave his best talents in securing wise legislation in municipal affairs, in instigating and accomplishing many important improvements, in aiding in the establishment and maintenance of public institutions and organizations; and, by the conscientious exercise of his duties as a citizen, he sought the material prosperity and general welfare both of the city and State.

In 1866 Charles A. Nichols, husband of his elder daughter, was received into partnership, the firm-style becoming James Y. Smith and Nichols. In 1873 the firm-style was changed to James Y. Smith, Nichols and Rogers, on the admission of Horatio Rogers, who had married the younger daughter. After Mr. Smith's death, the business was conducted by the surviving partners until the death of Mr. Nichols, in 1877. Since that time General Rogers has had the sole charge of the business, which represents more than 40,000 spindles, and is conducted under the same style—James Y. Smith, Nichols and Rogers.





Van Slyck & Co. Boston.

*Horace Smith*



HORACE SMITH—DANIEL B. WESSON.



NO department of industry has made more rapid progress during the past half a century, by invention and improvement than that of fire-arms. The demand created by the exigencies of warfare has been met by a multitude of devices; and, since 1835, the United States has granted fifteen hundred patents for these inventions. The earliest, since Eli Whitney, to enter this field was Samuel Colt, though Elisha Collier patented, in 1818, a gun with a revolving breech and five chambers, turned by hand. Colonel Colt's first and most successful competitors were Smith and Wesson, of Springfield, Mass.

Of this firm the senior member was Horace Smith, who was born in Cheshire, Mass., Oct. 28, 1808. His father was a house-carpenter, but found at Cheshire a limited demand for his work. He removed to Springfield in 1812, and obtained employment in the United States Armory, where he was engaged in building machinery and making tools, and in various other capacities. Horace, in his youth, attended the schools of Springfield, and, in the intervals of school-terms, aided his father by doing miscellaneous jobs. At sixteen he entered the armory, as an apprentice, and was employed there for eighteen years, in different capacities, becoming a master of the trade of gun-making.

In 1842 he left the armory, and went to Norwich, Conn., and in December, 1842, to New Haven. There he was employed for some months in the Whitney Armory, making tools for the manufacture of rifles, a contract for which Mr. Whitney had made with the Government. He then returned to Norwich, and was employed for three years in the pistol factory of Allen and Thurber, afterward successful manufacturers in Worcester, Mass. They then made what was called the "pepper-box pistol," designed to compete with Colt's revolver. The body of the pistol consisted of five or six chambers, virtually a group of so many barrels around a common axis, on which they revolved.

Mr. Smith, in 1846, established himself as a gunsmith, in a shop of his own, making shot-guns and fowling-pieces, and continued in business until 1849, when he was employed by Oliver Allen, of Norwich, to assist in the manufacture of whaling guns, which projected harpoons by the force of gunpowder.

He closed his own shop the next year, and continued with Tracy and Bland, the successors of Oliver Allen, until the autumn of 1851. He then took a position in the establishment of Allen, Brown and Luther, manufacturers of rifle-barrels, who occupied a part of the junction-shop, at Worcester. He remained in the employ of Allen, Brown and Luther about a year, there becoming acquainted with Daniel B. Wesson, afterward co-inventor and copartner with him. During the year Mr. Smith and Mr. Wesson united in devising and making a new fire-arm, on the repeating, or magazine, principle. Though they did not then obtain a patent, or attempt to introduce it, they completed a single rifle, which is still in existence, and is as effective a weapon as the best now manufactured. It was essentially the same as the well-known Winchester repeating rifle, the main difference being in a change in the arrangement for filling the magazine. An improvement in this rifle was patented by B. Tyler Henry, of New Haven, Oct. 16, 1860, and the rifle was for a time called by his name.

The cartridge used by Messrs. Smith and Wesson was made by altering the French cartridge of Frobert, which was really a large percussion cap, with a ball affixed to it. This cap was filled with fulminating powder, and from this the whole projectile force was derived. Messrs. Smith and Wesson taking these caps, and supplying the place of most of the fulminating powder with common gunpowder and replacing the ball, made essentially the first metallic cartridge like the metallic cartridge now in general use. At the end with which the hammer of the trigger would come in contact was a small quantity of fulminating powder, then a sufficient amount of gunpowder for a charge, and, lastly, the ball.

In 1852 Mr. Smith turned his attention to the project of engaging in the manufacture of a pistol embodying the idea of the arm made by them at Worcester. During the year he visited Taunton, to advise with Mr. Wesson, who was employed there; and the next year, 1853, they entered into partnership, and removed to Norwich. They applied for a patent, which was granted Feb. 14, 1854. There was a substitute for the metallic cartridge at first thought of by them, invented by Walter Hunt, of New York. This would foul a gun so badly that very soon the lead ball, in being fired from it, would be elongated or distorted, and accuracy of aim would be wholly destroyed. Messrs. Smith and Wesson obviated this difficulty by a patent granted Aug. 8, 1854. Meanwhile, they had disposed of their first patent to a company organized at New Haven as the Volcanic Repeating Arms Company.

They also assigned to this company the patent of Aug. 8, and a subsequent patent granted Jan. 22, 1856.

In the summer of 1854 Mr. Smith removed to Springfield, and again gave up active employment for a time ; and about the same period Mr. Wesson removed to New Haven. Both now turned their thoughts to devising a pistol on a new principle, and one which, resembling Colt's revolver in the adjustment of a revolving group of chambers, with a single barrel, should surpass that weapon in the convenience and rapidity of loading. Their main idea was to perforate the revolving breech completely through, so as to load from the rear end, instead of the front. Before they had fully matured this, they learned that a patent had been issued, April 3, 1855, to Rollin White, of Hartford, Conn., for a perforated breech. The pistol, however, as constructed by Mr. White, was adapted to use the paper cartridge ; and the effect was that the charge would blow out backwards. Messrs. Smith and Wesson entered into an arrangement with Mr. White, by which they obtained the entire control of this feature ; and in May, 1856, Mr. Wesson joined Mr. Smith in Springfield, and they together engaged in the manufacture of pistols with a metallic cartridge, beginning their sales in November, 1857.

Late in 1860 a patent was issued to them for a metallic cartridge in which the fulminate was inclosed in the hollow, annular, projecting base. This patent was adopted by the manufacturers of metallic cartridges for most of the breech-loading arms, but recently, in some degree, has been superseded by the cartridge with the fulminate in the center of the base.

The pistol of Smith and Wesson soon acquired popularity, and there were numerous attempts at infringement. One of these was a pistol manufactured by a Mr. Pond, under a patent issued to A. J. Gibson, of Worcester. This pistol contained a device patented June 10, 1860, which was a valuable improvement on Smith and Wesson's. In the latter, as originally made, the chambered breech was lifted out, or detached, to be loaded, and then replaced. In Gibson's improvement the barrel, with the breech, was hinged to the stock ; so that, by a simple movement, the barrel being turned down, the breech would be thrown up, so as to present the rear end conveniently for the insertion of the cartridges. This improvement was deemed by Messrs. Smith and Wesson so valuable that they compromised with Mr. Gibson, and purchased his patent ; and since that time their pistols have included his device.

William C. Dodge, of Washington, D. C., in 1865 obtained a patent for an extractor, the object of which was to throw out the empty shells, which it effects by a single motion, when all the chambers have been discharged. This valuable device was at once purchased by Smith and Wesson, and incorporated into their pistol.

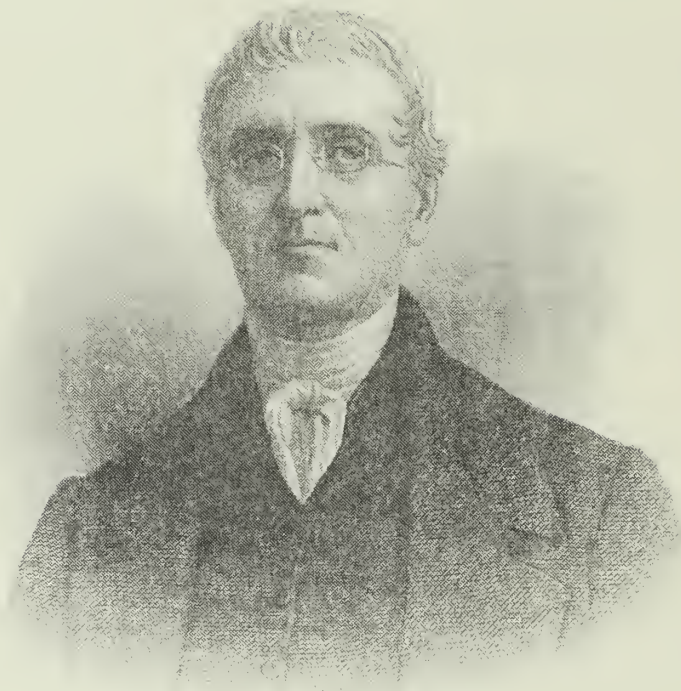
Other improvements have been made from time to time, and several valuable patents have been issued to the firm or to Mr. Wesson himself. In comparison with other revolvers, it has the important advantage of greatly increased rapidity of loading.

In addition to the excellence of their pistol, it has always been the policy of Smith and Wesson to use the best material, finish, and workmanship; and their works have been constantly employed, and additions have been made at different times. Beginning in May, 1856, in a small hired building on Market Street, Springfield, they purchased, in 1859, the present premises on Stockbridge Street, beginning work there on the first day of January, 1860. Their factory at first occupied about two-thirds of the present front building, without the tower. Besides extending the front building to its present length of two hundred and ten feet, building the tower, and adding the ell, one hundred and thirty feet in length, other large buildings have been also erected. The whole group of buildings is conveniently arranged, is well supplied with machinery and appointments of every kind, and has a large corps of skilled workmen.

On July 1, 1873, Mr. Smith sold his interest to Mr. Wesson. During their connection, for twenty years, their relations were harmonious, and their co-operations successful. Mr. Smith has been, from early manhood, an active member of the First Methodist Episcopal Church, a member of the city government, and has represented the city in the State legislature.

Mr. Wesson has been, since July 1, 1873, the sole proprietor of the business, which is conducted under the same style as from the beginning. With a large domestic trade, a yet larger part of the demand has been from foreign governments, both in Europe and South America; and the competition by inferior workmanship, and cheapened prices because of cheapened quality, cannot be successful.





Van Slyck & Co. Boston

*Cyrus Alger*

## SOUTH BOSTON IRON COMPANY.

CYRUS ALGER—WM. H. HOWARD.

**A**MONG the great industries of New England, the manufacture of iron was the first to receive attention. Iron ore in considerable quantities was known to exist within the territory of the Massachusetts Bay Colony; and, as early as 1629, some steps toward its manufacture appear to have been taken by the Court of Assistants in London, under whose patronage the colony was founded. But the first decided attempt at iron manufacture in this country was made in Lynn, Mass., in 1643. Within less than ten years after, deposits of bog-ore were found in numerous ponds in the Plymouth Colony; and, in 1652, the iron manufacture was begun at Raynham. The "Old Colony" has now become a main seat of this industry in New England. Several representative manufacturers of New England were born there, some of whom have remained in the vicinity, and have built up large establishments in the iron manufacture. Others have removed, among them the gentlemen who were associated in organizing, and who held successively the office of president of, the South Boston Iron Company.

Its founder, and, during the remainder of his life, its executive manager, was Cyrus Alger, who was born at Bridgewater, Mass., Nov. 11, 1781. He was descended, in the sixth generation, from Thomas Alger, who came to this country about 1665, and settled first in Taunton, but removed to Bridgewater, where he died. His son Israel, grandson Israel and great-grandson James were all substantial farmers. His son Abiezer learned the trade of an iron-founder, and, during the active years of his manhood, was largely engaged in the business on his own account. He had three furnaces—one in West Bridgewater, another at Easton, and a third at Titicut, a village of Middleboro. He is said to have been a man of much sagacity and enterprise, for many years a selectman and for three successive terms a member of the State legislature. Cyrus Alger was the son of Abiezer. After attending the

academy at Taunton, he learned his father's business, and, entering the foundry, became expert in it. He was for some years in charge of the foundry at Easton; and in 1809, in his twenty-eighth year, went to Boston, to engage with General Winslow in the same business. Their works were established near the junction of the present Second Street and Dorchester Street. The partnership was dissolved four years after, and Mr. Alger engaged in business on his own account in the foundry near the junction of Fourth and Foundry Streets. The well-known merchant, Thomas H. Perkins, was for some years associated with him as a special partner. His business at first was that of a general jobbing-foundry. He soon, however, began to devise valuable inventions applicable to his trade. A patent was granted to him March 30, 1811, for an improved method of casting chilled-iron rolls, by which the part subject to wear was of increased hardness. During the War of 1812 he cast large quantities of cannon-balls for the Government.

In 1816 he purchased from the South Boston Association all the land on the west side of the Dorchester Turnpike, from the channel where the Federal Street Bridge was afterward built, nearly to the present line of Swan Street, excepting a narrow strip on the Turnpike, south of Fourth Street. The purchase included all the flats extending to the channel as it then was. The filling of the flats, and the location of numerous factories, shops, dwelling-houses and other buildings, with the sale of a large area to the Old Colony Railroad, ultimately made the investment a profitable one.

Mr. Alger introduced the use of anthracite coal for melting iron in this vicinity, and adapted his furnaces to its use. To provide for its domestic use, he devised, in 1822, the cylinder stove. He also, early in his career as an iron-founder, made a change in the reverberatory furnace for melting iron. The hearths of these furnaces had previously been made to incline outward. This he reversed, so as to cause the molten metal to flow toward the flame, where the heat would be most intense.

The business steadily increased, and Alger's Foundries gained such a reputation that, for many years after the business had received a corporate form and name, the shops were known by that name. In 1827 an act of incorporation was granted to Cyrus Alger, William H. Howard, George C. Thacher and others, for a company, under the firm-style of the South Boston Iron Company. Mr. Alger was elected President, and Caleb Reed, Treasurer.

Mr. Thacher had been associated in business with Mr. Alger since 1822, having been engaged in trade, and continued in the Company until 1833. In 1835 he established the Fulton Iron Foundry, which has since carried on business as a jobbing-foundry, on premises nearer to the city proper than the works of the South Boston Iron Company.

Caleb Reed, the treasurer, was the son of Rev. John Reed, D. D., for many years pastor of the Congregational Church of West Bridgewater, where Caleb was born, April 22, 1797. He graduated at Harvard College in 1817, and studied law in the office of his brother, Hon. John Reed, at Yarmouth, Mass., where he afterward entered into practice. In 1827 he removed to Boston, and taking stock in the South Boston Iron Company, was elected its treasurer; and from that time, until a few months before his death, was actively engaged in the management of the finances of the Company. While pursuing his studies at college he embraced the religious views of Emanuel Swedenborg, and in 1832 became the editor of the *New Jerusalem Magazine*, for which position his taste and liberal culture fitted him, and in which, during the remainder of his life, he rendered valuable service without pecuniary compensation. He died Oct. 14, 1854. As a man of business, Mr. Reed was characterized by marked industry, integrity and ability.

In 1829 Mr. Alger, on his own account, in connection with some capitalists of Halifax, N. S., erected at Clements, in the Annapolis Basin, Nova Scotia, a smelting furnace for iron, the first of the kind in the British Provinces. The machinery for it was made by the South Boston Iron Company. But the expected capital was not furnished, and the enterprise proved an unprofitable investment.

The South Boston Iron Company began in 1828 the manufacture of iron ordnance. Mr. Alger had devised a method of purifying cast-iron, which gave to it a strength nearly threefold that of ordinary iron castings. This process gave to the Company a great advantage in making iron guns, especially those of large caliber; and those of its manufacture have sustained severe tests when subjected to extreme proof. In 1834 the first rifled cast-iron gun ever made in the United States was cast and finished at these works. It commenced the manufacture of malleable-iron guns in 1835, at Mr. Alger's suggestion, a patent having been issued to him May 30, 1837. Mr. Alger also received a patent for the use of malleable iron in the manufacture of plows, Aug. 3, 1838. In 1836 the Company began to make bronze cannon, which from that time has been among its important specialties. The mortar gun "Columbiad," the largest gun which had, at that time, been cast in this country, being of twelve-inch caliber, and having a range of more than three miles, was cast in 1842.

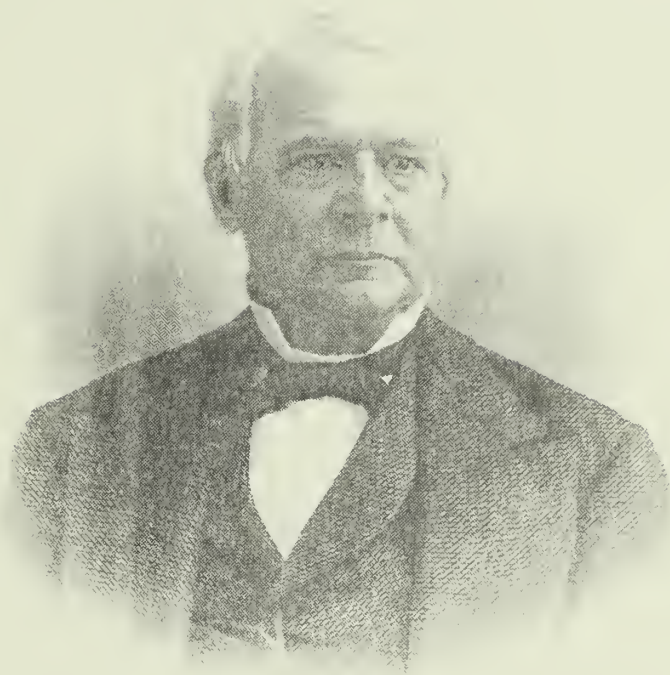
From the organization of the Company until his death, a period of twenty-nine years, Mr. Alger was its president, and was actively engaged in the general supervision of its business. After it became largely employed in ordnance-work, his attention was directed to the subject of shells and fuses; and, as early as 1840, he was engaged in experimenting on an improvement in the form of shells and the mode of casting them, and in the endeavor to prepare a safety-fuse for mortar-shells and grenades.

Naval and fortress-gunnery was then in a comparatively crude state. In connection with the modification in the forms of the guns themselves, the inventive ability of engineers and mechanics has been directed to shells and fuses; and Mr. Alger was among the first to make improvements in them. He had so far completed his inventions in 1843, that some of his improved shells and fuses had been furnished for the frigate *Cumberland*; and before 1846, their merits had become known in the army and navy. Mr. Alger freely divulged his methods and plans to the Bureau of Ordnance, on a contract which should secure the making of all the shells to his Company, or, in case a portion of the contract was given to others, that he should be paid for the information which he would give. The Government did not agree to this; and he prepared, in July, 1846, applications for patents for a safety-cap for the fuse of mortar-shells or grenades, for a new method of constructing a safety-fuse for mortar-shells, and for an improvement in the manner of casting mortar-shells, or grenades; but, at the suggestion of the bureau, he finally decided not to make the application. In December, 1855, Mr. Alger had a stroke of paralysis, partly the effect of the death of his youngest son, Cyrus, Jr., which occurred on the seventeenth of the previous month; and he died Feb. 4, 1856.

Mr. Alger not only possessed mechanical and business ability, but had much public spirit; and, to his enterprise and investments, South Boston is indebted for much of its prosperity. He was, at different times, a member of both branches of the city government. He was the first to introduce the ten-hour system of labor at South Boston.

He was succeeded in the office of president of the South Boston Iron Company by William H. Howard, who was born in Bridgewater, June 30, 1799. Mr. Howard was descended, in the sixth generation, from John Haward, who came from England to Duxbury, became a member of the family of Capt. Miles Standish, and was enrolled as "able to bear arms" in 1643. His name was originally Hayward, then Haward, and finally changed to Howard. He was one of the original proprietors and settlers of Bridgewater, removing, in 1651, from Duxbury to that town. His eldest son, John, married Sarah Latham, granddaughter of Mary Chilton, said to be the first woman who stepped on Plymouth Rock. The mother of William H. Howard was a sister of Cyrus Alger's wife; and, when he was seven or eight years old, he became a member of Mr. Alger's family, and removed with them to Boston, in 1809. He entered the foundry, and, after serving a long apprenticeship, became master of all the details of that branch of the iron manufacture.

In the early part of young Howard's apprenticeship, Mr. Alger himself, with his assistance, made the molds, and on Saturdays prepared and run the furnace, the blast of which was driven by horse-power, and poured the metal, thus completing



Van Slyck & Co. Boston.

*Wm H Howard*



a week's work. Having attained his majority, Mr. Howard continued in the employ of Mr. Alger, and was for some years superintendent, or foreman, of the foundry. On the incorporation of the South Boston Iron Company, he was named as one of the three incorporators, and was elected a director. He continued in the superintendence of the foundry until 1856; when, on the death of Mr. Alger, he was elected president, retaining his previous personal relation to the mechanical department.

Mr. Howard, while not strictly an inventor, made some valuable improvements; and his practical skill contributed greatly to the Company's success. Mr. Howard died Jan. 17, 1875, at the age of seventy-five years and six months.

The office of treasurer, made vacant by the resignation of Caleb Reed, in 1854, was filled by the election of Francis, eldest son of Cyrus Alger, who was born at Easton, Mass., March 8, 1807. He became a stockholder in 1829, and was a director for several years before his election as treasurer, which office he held until his death, in 1863. The last two and a half years of his life were the first years of the Civil War, in which the Company's resources were severely taxed, to meet the demands of the Government. During this period, his attention and study were directed to improvements in shells and fuses. A patent was issued to him, September 30, 1862, for an improved fuse, combining a time-fuse and a percussion-fuse, its object being to secure, by the action of the percussion-fuse, the explosion of the shell in case it should strike the object aimed at before the time-fuse had been consumed. Another patent was issued to him July 21, 1863, which was for a water-proof pouch, to contain the powder constituting the charge to be used in shrapnel. The pouch was a cartridge with the fuse inserted, which could be readily placed in the shell, the charging of the shell being rendered more rapid and less dangerous than in the old method of filling the shell with loose powder, and then inserting the fuse. The pouch, being of water-proof material, would also protect the powder from dampness. Mr. Alger was often called to Washington, in the interest of the Company, and while engaged there, on one occasion, in testing shells, he was attacked by pneumonia, and died Nov. 27, 1863.

Mr. Alger's active relation to the business occupied only the last nine years of his life. He had been from youth devoted to scientific pursuits, and gained a high reputation in mineralogy and geology. In recognition of his researches, he was elected a member of the American Academy of Arts and Sciences, and received the honorary degree of M. A., from Harvard University. He was also a member of the Boston Society of Natural History, and for several years its curator of minerals. He was succeeded as treasurer, by William P. Hunt.

The vacancy in the office of president, caused by the death of Mr. Howard, in 1875, was filled by the election of Edward Reed. He was born at Yarmouth, Mass.,

Dec. 9, 1820, and was the son of Hon. John Reed, of Yarmouth, his mother, Olive, being a younger sister of Cyrus Alger. He was, therefore, the nephew of the first president and the first treasurer of the Company, and, by his marriage to Miss Catharine Howard, became the son-in-law of William H. Howard, whom he succeeded in office. His father, Hon. John Reed, was for twenty-eight consecutive years a member of Congress. He was also Lieutenant-Governor of Massachusetts in 1844. Edward Reed graduated at Dartmouth College in 1841, and studied law; but in 1858 he became connected with the South Boston Iron Company. In 1864 he was elected a director, in the place of Francis Alger, and on the death of his father-in-law, Mr. Howard, in 1875, he was elected president. He had previously been associated with Mr. Howard in the general supervision of business at the works, to the full management of which he succeeded. In this position he exhibited ability and good judgment. In July, 1876, to the regret of his associates, ill-health necessitated his resignation, and retirement from active participation in the business.

The vacancy in the office of president of the Company was filled by the election of the present incumbent, William P. Hunt, who was born in Bath, N. H., Jan. 14, 1827. His father was for many years a manufacturer of woolen goods. William received a good common-school and academic education, and was prepared to enter Dartmouth College, but decided on a business career. In 1847 he came to Boston, and entered the office of Caleb Reed, treasurer of the South Boston Iron Company, as a clerk. On the resignation of Mr. Reed, and the succession of Francis Alger to the treasurership, in 1854, Mr. Hunt became the latter's assistant, and was intrusted with the details of the financial business. As before stated, on the death of Mr. Alger, in 1863, he was elected treasurer, and on the resignation of Mr. Reed, in 1876, president, of the Company. He is now the largest stockholder, and, in his double capacity as president and treasurer, is the executive head and general manager of the business. Besides Mr. Hunt, Francis Alger, son of the late Francis Alger, and Joseph W. Howard, son of the late William H. Howard, are the directors.

The works of the South Boston Iron Company cover an area of six acres. Having been constructed from time to time to meet the exigencies of business, they are conveniently located as to each other. Originally engaged only in foundry work, the Company added large and well-equipped shops for the finishing of ordnance, and of a variety of heavy machines, either of regular or special manufacture.

Before the Civil War, the ordnance work of the Government had been distributed among four foundries: the South Boston, the West Point, the Fort Pitt, at Pittsburg, Penn., and the Tredegar, at Richmond, Va. During the war, the West Point Foundry was devoted to the manufacture of the Parrott gun. Several other foundries were employed, to some extent, for the war only, and almost exclusively

on guns of small caliber. The reliance of the Government for its heavy ordnance, was almost wholly on the South Boston and the Fort Pitt Works. The South Boston Company, during the war, also manufactured for the Government a very large amount of projectiles, especially of shot and shells for rifled guns, and the Schenki projectile, then much in use. To meet these special demands, an additional foundry, 125 feet long and 114 wide, and a new machine-shop especially adapted to finish guns of large caliber were erected. This new ordnance foundry was put into operation in March, 1863, the work being the casting of a ten-inch Rodman gun. Other guns of the same size and style were cast; and in June, 1863, work was commenced on fifteen-inch guns of the same system, which were cast and finished with success.

The liberal policy of giving good wages in times of full activity, and of retaining them on half pay at other times, has secured to the Company an excellent force of skilled operatives. Since the war, the special requirements for the ordnance work has ceased; but the regular demand has continued. The Company's rival for several years, the Fort Pitt Foundry, closed its operations several years ago, and the West Point Foundry has only facilities for making guns of small caliber; so that the South Boston Iron Company is the only concern which can make iron ordnance of the largest caliber.

In the manufacture of bronze cannon, an important improvement was made by Samuel B. Dean, and a patent was issued to him May 4, 1869. Mr. Dean had been for some years the master mechanic of the Company—a position of great responsibility, which he filled with mechanical skill and diligence. He was for some time a stockholder and one of the directors. By his improvement, the interior metal of the cannon is made more dense, and its strength and wear is increased. After it has been bored and rifled, a mandrel, slightly larger than the bore, is forced into it by a hydraulic press, and is succeeded by other mandrels, increasing in size, and forced in by the same method. This renders the metal surrounding the bore much more compact, and less liable to wear or abrasion in firing. Bronze cannon made by the usual method, if rifled, very soon become ineffective, on account of the rapid wear. By this patented method, they are made as durable as steel guns. This improvement has been adopted by the Austrian Government, without remuneration to Mr. Dean, or to the Company which now owns the patent.

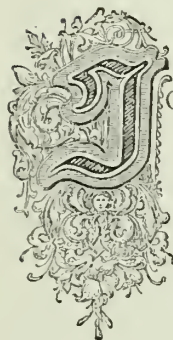
In 1875 the Company cast a twelve-inch, breech-loading, steel-lined rifled gun, under the patent of Nathan Thompson, of Brooklyn, N. Y. This gun, when cast, weighed eighty tons, and, when finished, forty-five tons. During 1877 a still larger gun was made. It was a rifled cast-iron gun, lined with wrought-iron, a muzzle-loader, of twelve-inch caliber, and firing a six-hundred-pound shot. It is the largest rifled gun ever cast, and is for the United States Government. Its weight,

when cast, was one hundred and seventy-seven thousand pounds. The weight of the gun, finished, is seventy-seven thousand pounds ; that of the wrought-iron tube, thirteen thousand pounds ; and the total weight is ninety thousand pounds.

According to the ordnance office, the Company has, within the last fifteen years, delivered to the Government two hundred and seventy-two Rodman guns, of which one hundred of them were fifteen inch, weighing about fifty thousand pounds each.

While the distinctive features of the Company's business, almost since its incorporation, has been the manufacture of ordnance and projectiles, it has also produced a large amount of other work, including, besides, chilled rolls, hydraulic-presses, beds for marine and stationary steam-engines, heavy gear-wheels, castings for rolling-mills, stills and gas-holders.



A decorative banner with a central rectangular frame containing the name "JOHN SOUTHER." in a serif font. The banner is adorned with ornate scrollwork and floral patterns at its ends and corners.A large, ornate initial letter "J" in a decorative font, featuring intricate scrollwork and floral patterns.

JOHN SOUTHER, who has been prominently identified with various branches of the iron industry in New England, was born in South Boston, March 1, 1818. His father was a ship-carpenter, and John, was engaged in the same trade until the age of twenty, when he was employed by Cyrus Alger, as a pattern-maker; and he made patterns for the cannon cast at the South Boston Foundry. Very soon, however, he went to Cuba, where he remained two years, and became familiar with the mechanical wants of the sugar-planters, which served him in after years, in opening a market for his sugar machinery, which he largely manufactured.

On Mr. Souther's return from Cuba, he entered the employ of Hinkley and Drury, as pattern-maker; this firm having changed their manufacture from stationary to locomotive engines. Here he prepared the first drawings and patterns for their locomotive engines; and in this capacity he continued for seven years. When he retired from it, the firm were constructing fifty-two locomotives a year. In 1846 Mr. Souther engaged in business under the style of Lyman and Souther; but the firm was soon dissolved, and Mr. Souther continued alone. The construction of stationary and sugar-mill engines now chiefly engaged his attention.

In 1852 he went to Richmond, Va., with one hundred and fifty men, and founded the Tredegar Locomotive Works, in which enterprise he had a half interest with Joseph R. Anderson. After two years of successful management of these works, he left them in other hands, and returned to the construction of sugar-mill and sugar-refining machinery at home. In addition to fulfilling the demands of the Southern plantation mills, large amounts of machinery were shipped to Cuba, San Domingo, the Sandwich Islands and Mexico. Twenty-five hundred estates in Cuba alone have been supplied with machinery.

Early in his South Boston enterprise, Mr. Souther engaged also in the construc-

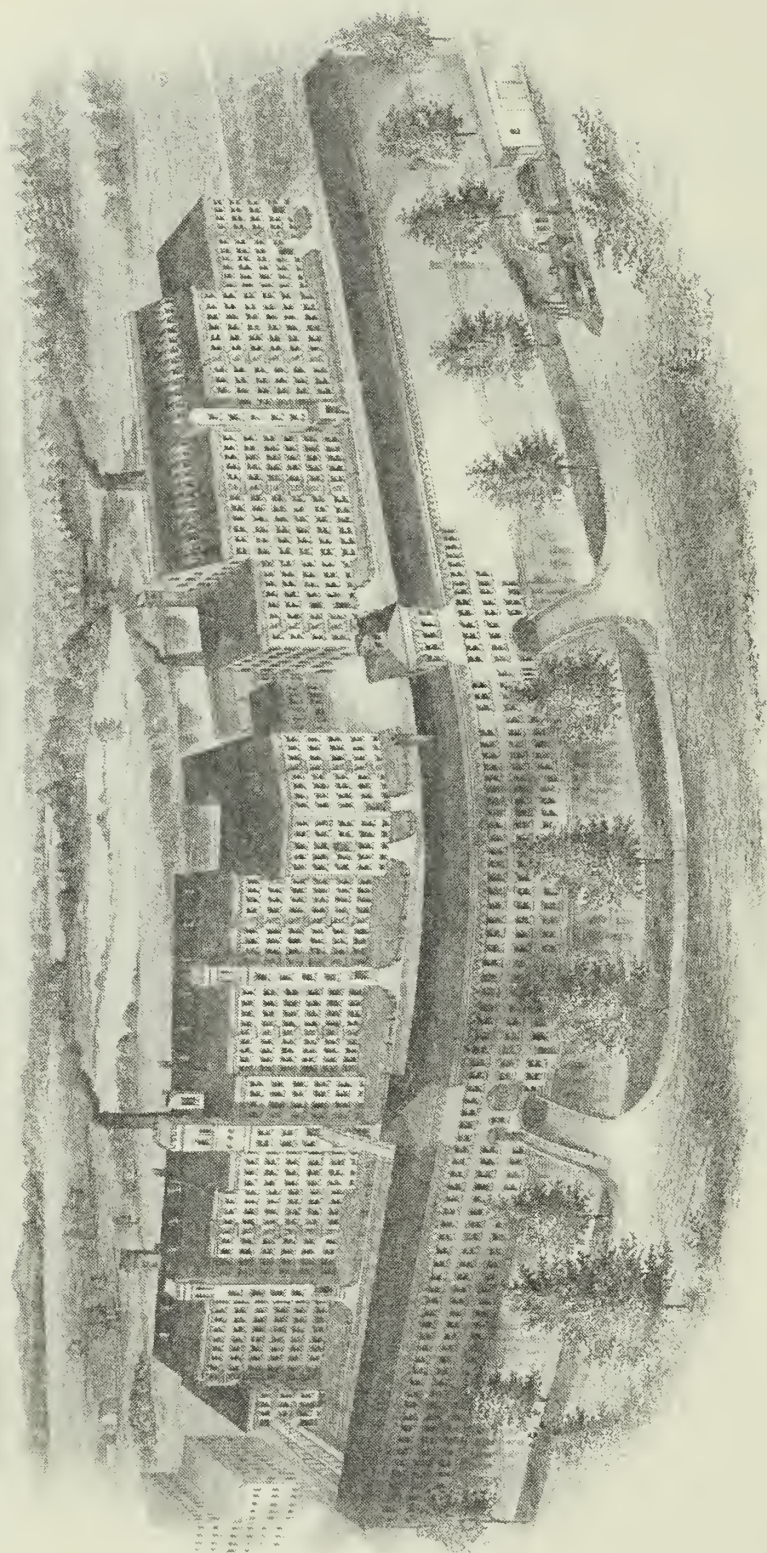
tion of locomotives; and he furnished, in 1847, the first locomotive used on the Pacific coast, to James Cunningham, with a steam excavator for grading, digging and filling in. He also made the first engines for several Eastern, Western and Southern railroads.

In 1854 the Globe Locomotive Works, of which Mr. Souther was the principal owner, were incorporated; and these works produced, under Mr. Souther's supervision, the engine that took the first train from the Pacific to Ogden. At the outbreak of the Civil War, the Globe Works were largely devoted to Government work. The firm built the machinery for the Housatonic, afterward sunk in Charleston Harbor, by a torpedo; and hulls and machinery for several monitors, steam-machinery for frigates, sloops of war and side-wheel steamers, as well as the engines for two revenue cutters. The amount of contracts filled for the Government was nearly \$2,000,000. At the close of the war, the name of the Globe Works was dropped, and the firm resumed the business title of John Souther & Co.

The Company, besides continuing its former manufactures, entered upon the building of steam excavators, contractors' machinery and dredging-boats, and machinery for the Egyptian, Russian and Japanese Governments. They recently sent to Hull, England, the first steam excavator ever employed there for dry land, and have shipped a similar machine to the Chincha Islands, for digging guano. They have also been, for eighteen years, the builders of the Otis Patent Steam Excavators, with O. S. Chapman's improvements.

Mr. Souther has been a resident of Boston for more than half a century. He served as a member of the convention for revising the Constitution in 1852, and as representative in the succeeding State legislature.





Van Slyck & Co. Boston

# THE STARK MILLS.

MANCHESTER N H



### PHINEHAS ADAMS.

**A**MONG the manufactories at Manchester, N. H., the Stark Mills rank second in age and third in magnitude. This Company was organized in 1838, but did not begin operations until the following year. The original proprietors were Nathan Appleton, George W. Lyman, Willard Sayles, Francis C. Lowell, William Appleton, William Amory and Samuel Henshaw. On the organization of the Company, these seven gentlemen were chosen directors, and William Appleton president. Mr. Appleton held this office until June 26, 1871, when he was succeeded by Israel Whitney, who, on Oct. 2, 1872, was followed by Charles Amory. The latter's successor was T. Jefferson Coolidge, who was elected Oct. 9, 1873.

William Amory, the first treasurer of the Company, was chosen Oct. 24, 1839, and held the position until Jan. 1, 1848, when he was succeeded by Charles Amory, but was re-elected to the treasurership June 29, 1852, and remained in the office until the present incumbent was chosen.

The corporation has had but two resident agents: John A. Burnham, who was chosen at the time of its organization, and Phinehas Adams, who succeeded Mr. Burnham, Nov. 6, 1847, and still holds the position.

Phinehas Adams was born at Medway, Mass., June 20, 1814. His father was not only a farmer, but a mechanic. He constructed a number of hand-loom, and employed girls to operate them. Mr. Adams was afterward a manufacturer, and, when Phinehas was a child, resided at different times in Waltham, and then Cambridge, and Nashua, N. H., where he became a proprietor of a hotel.

Phinehas attended a private school at Newton, Mass., where he remained until 1827. It was during this year that his father became the agent of the Neponset Manufacturing Company, at Walpole, Mass., and removed his residence thither. Phinehas was employed for a year, as bobbin-boy, in the mill of the Company; then

entered Wrentham Academy, remaining in it a year and a half. He then went to Lowell, where he became a bobbin-boy in the Merrimac Mills. He was soon promoted to be second overseer in the weaving department, which position he retained until 1831, when he took a similar position in the Methuen Company's Mill, of which his uncle was then agent.

In 1833 he removed to Hooksett, N. H., where he entered the service of the Hooksett Manufacturing Company, his father being then its agent. Here he became the first overseer of the weaving and dressing departments, at the same time performing the usual duties of office clerk, and having a general oversight of affairs within the mills. After remaining at Hooksett about a year, the failure of the company threw him out of employment; but he was soon after called to the position of overseer in the mills at Pittsfield, N. H. After staying in Pittsfield a few months, he again entered the service of the Merrimac Company, at Lowell, as an overseer, in March, 1835.

In December, 1841, the agent of the Company, John Clark, proposed that Mr. Adams should enter the office as clerk. The proposal was reluctantly accepted, and for five years Mr. Adams devoted himself to the duties of the position. He then left the Merrimac Mills, and assumed the agency of the old mills of the Amoskeag Company, on the west side of the Merrimac River, at Amoskeag, N. H. Here he remained until November, 1847, when he became agent of the Stark Mills, as has been stated.

Mr. Adams introduced a new system of management, and secured improvements in machinery and new methods of manufacture, which brought the goods up to their present high standard.

Mr. Adams has held responsible relations to some of the moneyed institutions of Manchester, having been a director in the Merrimac River Bank from 1857 to 1860, a director in the Manchester National Bank from 1865 to the present time, and a trustee in the Manchester Savings Bank since 1846. He was also elected, in 1865, one of the original directors of the N. E. Cotton Manufacturers Association—an office which he still holds.

For the first twenty-five years after the Stark Company began operations, the products of the mills were sold by the firm of J. W. Page & Co., commission merchants in Boston. In 1864 they were followed by Gardner Brewer & Co., who acted in the capacity of selling agents until January, 1876, when they were succeeded by J. L. Bremer, Brother & Co.

The original capital of the corporation was \$500,000. To this amount an addition of \$250,000 was made in January, 1845. In June of the next year the capital was raised to \$1,000,000; and in June, 1847, it was increased to the present sum of \$1,250,000.



Van Slyke & Co. Boston.

*John Adams*



The lands of the Company comprise about fourteen acres. Of these, one-third are included in the mill-yard; and the rest is largely occupied by overseers' blocks and tenement houses.

The mill-yard, which is situated on the upper canal, has a frontage on Canal Street of one thousand and twenty-two feet, extending from Stark to Bridge Street. On the eastern side of the yard, and facing Canal Street, is a building three stories high, extending the entire length of the yard. The southern portion of this building is the linen-mill, 170 feet long by 30 wide. The next section contains a shearing-room, belt-room and card-room, in the first, second and third stories respectively. Next in order is the counting-room; then come the cloth-rooms, over one hundred feet long, and occupying the three stories. Beyond these are the repair-shops, extending about two hundred feet. The extreme northern portion of the building is used for storage. On the western side of the mill-yard, and separated from the building just described by an open space of about fifty feet, stand the principal Mills, No. 1 and No. 2, — the former built in 1838 and the latter in 1839, — and the first cotton-mills put in operation on the east side of the Merrimac River, in Manchester. They are of the same size and style, 150 feet in length by 50 in width, and six stories high. Attached to each is a picker-house, one extending northward from Mill No. 1, a hundred and twelve feet, the other southward from Mill No. 2, thirty feet.

In 1844 these two mills were united, by an addition 80 feet long and 58 wide; so that they now form a continuous line of buildings, 520 feet long. Mill No. 3 is also placed upon the western side of the yard, on a line with Mills No. 1 and No. 2. It is seven stories high, with a picker-house at either extremity.

In the rear of the northern picker-house of Mill No. 2 is a three-story building, 45 feet long and 35 wide, the first story of which is used for drying yarns, and the other stories for card-rooms. Near this is another building, 68 feet long and 20 wide, two stories in height, one-half of which is a bleachery for yarns, the other half being used for sizing. In the north-west corner of the mill-yard is the bleachery for linen, 75 feet long, 45 wide and three stories high. The mills are heated throughout by steam supplied from two boiler-houses.

The combined productive capacity of the Stark Mills is 47,000 spindles and 1300 looms. Of these spindles, two thousand, and of the looms, one hundred, are for linen goods. The machinery is driven by nine turbine-wheels, whose aggregate capacity is two thousand horse-powers.

The product of the mills comprises sheetings, drillings, cotton duck, seamless bags and linen fabrics; before 1850, sheetings and drillings only were made. In that year the production of seamless cotton bags was commenced, and was continued

until the outbreak of the Civil War; when, owing to the enhanced price of the raw cotton, flax replaced cotton in the production of bags—the necessary flax-machinery having been imported from England. After this, until the close of the war, bags were made of linen; and since that period cotton has, in its turn, replaced flax in the manufacture of bags, of which about six thousand are now made in a day. The linen-machinery has since been used in the production of crash, in making which, about one ton a day is used.

The total consumption of raw cotton in these mills is about 15,000 bales a year. No coal is consumed, but about thirty-six hundred cords of wood are annually required. The mills give employment to thirteen hundred operatives, with an annual pay-roll of \$480,000.

The present officers of the Company are: Phinchas Adams, Clerk, and Edmund Dwight, Treasurer; Directors, William Amory, J. Ingersoll Bowditch, Lewis Downing, T. Jefferson Coolidge, John L. Bremer, J. Lewis Stackpole and Roger Wolcott.





W. H. B. & Co. N. Y.

*Nathl. Stearns*

## NATHANIEL STEVENS.

**N**ATHANIEL STEVENS, in the early part of the present century, was distinguished for his enterprise and prominent connection with the woolen manufacture. He was the son of Jonathan Stevens, a currier of leather and a farmer, and was born at North Andover, Mass., Oct. 18, 1786. At the age of sixteen he went to live with John Carlton, a neighboring farmer, with whom he remained four years. He then shipped before the mast, and spent the next two years upon the sea. On his return to Andover he entered a grocery store, where he continued five years.

In the latter portion of this time the demand for woolen fabrics, excited by the War of 1812, attracted his attention; and in 1813 he purchased the Andover Mill property, originally owned by Governor Bradstreet, on which he built a two-story wooden building, with an area 36 feet wide and 40 feet long. Here he engaged in the woolen manufacture. In 1818 he began the manufacture of flannels; and the products of his mill soon became widely known. He found it necessary to enlarge his facilities, and added to his wooden mill a more spacious brick structure, which itself was enlarged, as the growth of business demanded.

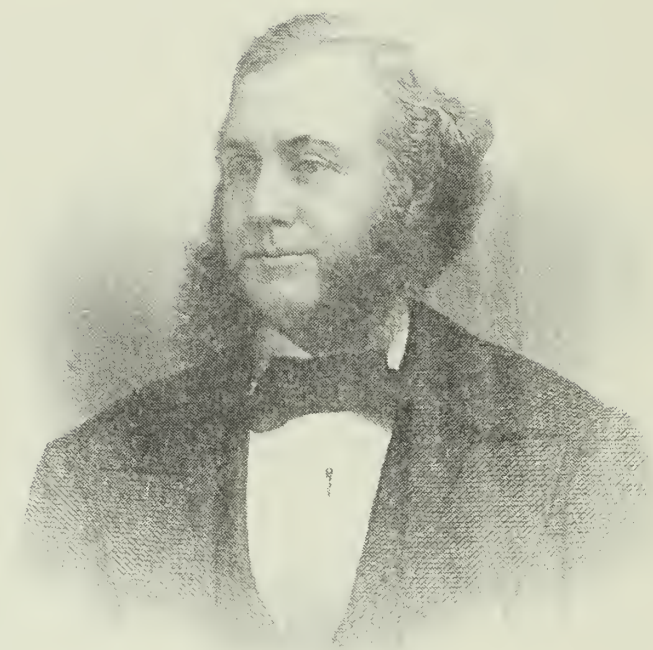
In 1854 still more extended facilities were found necessary; and Mr. Stevens purchased, and put in operation, another mill in Haverhill. He continued in the active management of his business enterprises nearly to the time of his death, which occurred suddenly, in 1865, in the seventy-ninth year of his age. He married, in 1815, Harriet Hale, a daughter of Moses Hale, a well-known Lowell manufacturer. He was elected a member of the State legislature in 1835, and for a time was a captain of the State militia. The enterprises which he founded, and with energy and sagacity developed, have, since his death, been conducted by his sons, Moses T., George and Horace N. Stevens.

Moses T. Stevens, the senior partner in the present firm of Nathaniel Stevens and Sons, was born in North Andover, Oct. 10, 1825. His early education was obtained in the public schools, and at Phillips Academy, Andover; and in 1842 he entered Dartmouth College, where, however, he did not complete the course. On leaving college he entered his father's office as clerk, and also performed, to a large extent, the duties of superintendent. In 1850 he became a partner, and in 1860 assumed the entire charge of the business. Aside from his able management of its large interests, Mr. Stevens was the projector and principal contributor in building the Town Hall at North Andover; and he has originated, or been actively interested in, other public enterprises. In 1861 he was elected a member of the house of representatives, and in 1868, a member of the State senate.

George Stevens, the second son, was born in North Andover, in 1831. He attended the Franklin Academy until 1848 when he left school and entered the mill. After an experience of six years in the conduct of woolen manufacture, at Andover, he became, in 1854, a partner in the concern, and removed to Haverhill, to superintend the mill established there. George Stevens died in 1871, at Newport, R. I.

Horace N. Stevens, the youngest son, was born in North Andover on Dec. 14, 1837. He attended Franklin Academy and Phillips Academy, Exeter, N. H., and entered Harvard University; but after remaining at Cambridge six months, he left college, and became connected with his father's mill, becoming a partner in 1860. The business of the firm made rapid progress; and, in 1870, another factory was established at Franklin, N. H., of which Horace N. Stevens had the principal charge until his death, which occurred at North Andover, May 1, 1876.



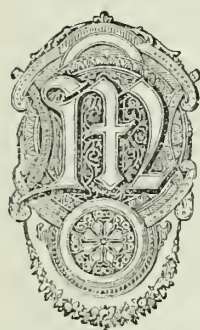


Van Slyke & Co Boston

*Norman C. Stiles*



NORMAN C. STILES.



MACHINISTS' tools, or machines intended to aid in the manufacture of other machines as substitutes for manual labor in forging, filing, and so on, have become, within recent years, a considerable industry. Especially important, in this branch of manufacture are planes, milling-machines, and presses of various kinds. The latter have effected great changes in making many small articles complete in themselves ; or parts of articles, such as distinct pieces in guns and sewing-machines, and table and pocket cutlery. The use of dies and presses has not only made the manufacture of interchangeable parts practical, but has, to a large extent, done away with old modes of shaping pieces of metal.

Norman C. Stiles, of Middletown, Conn., prominently identified with this industry, is the son of Henry and Sally Stiles, and was born, June 18, 1834, at Feeding Hills, a village of Agawam, Mass. His father owned and carried on a farm, and was also engaged in selling whip-lashes and tobacco, both of which were then specialties of production in that part of Massachusetts. The grandfather of Norman, Dorus Stiles, had been the principal trader in the village. When Norman was five years of age his father lost all his property, and from that time earned his livelihood by taking land on shares. Norman early evinced an aptitude for mechanics. When he was about ten years of age his elder brother gave him a wooden clock, which he took apart and put together again, having repaired it so well that it afterward kept good time. When about twelve years of age he built an ell to his brother's house, doing alone all the work, including carpentering, joinery and painting. About the same time he made a small fire-engine and a miniature steam-engine, which ran very well. Being of a musical, as well as of a mechanical taste, he made a very good violin.

At sixteen years of age he went to Meriden, Conn., to assist his brother, who

was engaged in the manufacture of tin-ware. He was soon able to earn, at piece work, two dollars a day,—more than was usually earned by the best of workmen. His taste was, however, for a higher branch of manufacture; and at eighteen he entered, as an apprentice, the American Machine Works, at Springfield, at that time a large establishment. At the end of six months he was able to do, and was put on, the best work. He remained there until he was twenty-one years old, when he went to Holyoke, and entered the employ of Mr. Osgood, who worked by contract for the Holyoke Machine Company, and employed men to work under him. His wages were one dollar and twenty-five cents a day of eleven hours. In a fortnight, however, he returned to Springfield, and engaged, at two dollars per day of ten hours, with Mr. Stearns, a manufacturer of inkstands. Having remained there about three months, he repaired to Meriden, Conn., and entered the employment of Snow, Brooks & Co.; a concern which, after several changes, has become the well-known establishment of Parker Brothers & Co. Here Mr. Stiles worked on dies and other small work requiring ingenuity and skill. While in this establishment he made his first invention, a sash-fastener for car windows. This was an effective device, and was applied to a car on the Boston and Albany Railroad. Mr. Stiles disposed of this invention, however, to a person who soon afterward failed, and it was not introduced into general use. After working for Snow, Brooks & Co. a year, at one dollar and seventy-five cents a day, he engaged his services to Edward Miller & Co., at two dollars and twenty-five cents a day, employed on the same kind of work. He remained with this firm until 1857, when their factory was burned.

Being now ambitious to engage in business on his own account, he hired bench-room from B. S. Stedman, who was running a small manufactory at West Meriden. He soon after bought out the whole stock and tools of Mr. Stedman, and continued with success the manufacture of dies and small tools. In 1860 he invented his simple but effective toe-stretcher and instep-stretcher. These have come into general use, and more than \$50,000 worth have been sold. He has more recently invented the combination toe and instep-stretcher, performing at once the work of both the others. In 1862, his shop being burned, Mr. Lyman Clark built for him a new factory, the brother of Mr. Clark, Alden Clark, furnishing him the requisite capital, and engaging with him as a special partner. He, however, soon retired, his place being taken by George S., son of Lyman Clark. This partnership continued until 1867, when the business had so much increased that larger facilities were needed. Mr. Stiles accordingly leased the water-privilege, shop and machinery of William Strom, in Middletown, and removed his own machinery and tools thither.

In 1863 Mr. Stiles invented the peculiar feature of his press, the eccentric adjustment, which obviated the objections pertaining to the Fowler and other

presses then in use; and in January, 1864, he patented this device, and commenced the manufacture of power-presses. Parker Brothers, of Meriden, were manufacturing the Fowler press, and adopted Mr. Stiles' eccentric adjustment. A suit was entered by the latter, in 1868, and litigation under it continued until 1871, when a compromise was effected, and the two interests were united. A company was organized, under the firm-style of the Stiles and Parker Press Company, with a capital of \$90,000, of which Mr. Stiles holds \$50,000, a controlling interest. In 1873 Mr. Stiles exhibited his presses at the Vienna Exhibition, where he received a medal. He sold all the presses which he had on exhibition, and took numerous orders for others. These presses have since been introduced into the armories and navy-yards of the United States, and into those of Germany, Austria, Sweden, Turkey, and Egypt. Among the manufactures in which his presses are used, are: fire-arms, agricultural implements, builders' hardware and locks, sewing-machines and their attachments, tin-ware, brass goods, silver, plated and Britannia ware, table and pocket cutlery, clocks, watches, spectacles, saws, skates, and an almost endless variety of other articles. One of the nicest of its adaptations is the stamping and embossing of silver or plated ware, affording instantaneously, and at a greatly reduced expense, results formerly attained only by the tedious handiwork of artists. The business of the Company has been a success, profits having accrued each year.

Mr. Stiles married, March 23, 1864, Sarah M. Smith, born at Rocky Hill, but, since she was seven years of age, resident at Meriden. Mr. Stiles is an accomplished mechanic, both by natural bent and acquired skill. He was nominated as one of the Advisory Committee of the Commissioner of the United States at the Vienna Exposition, and failed of the appointment only on account of the adoption of the rule excluding exhibitors from this office. He represented Connecticut on the Advisory Committee of the Centennial Exposition, at Philadelphia. He is also one of the seven directors of the United States Patent Association, including examiners of the Patent Office, solicitors of patents and inventors. He has served the city of Middletown two years as a member of its common council.



## EZEKIEL ALBERT STRAW.



EZEKIEL ALBERT STRAW was born at Warner, N. H., Dec. 30, 1819, and is the eldest of the seven children of James B. and Mehitable Straw. In 1828 the family removed to Lowell, Mass. Ezekiel went to the public schools, and afterward attended Phillips Academy, at Andover. In the early part of 1838, he entered the service of the Nashua and Lowell Railway Company, as an assistant civil engineer. In July, of the same year, he was invited by the consulting engineer of the Amoskeag Manufacturing Company, which had been organized five years previous, to go to Manchester, and act temporarily as engineer. Mr. Straw repaired to Manchester; and, from that time to the present, he has been uninterruptedly in the service of the Amoskeag Company.

Mr. Straw at once entered upon his engineering duties, one of the first of which was that of assisting in the construction of the stone wing-dam at Amoskeag Falls, and the upper canal. He continued as civil engineer for the Amoskeag Company until 1844. He was then sent abroad by some of the leading manufacturers of Manchester. In 1839 the Manchester Mills Company, composed largely of Stockholders in the Amoskeag, had been organized for the manufacture of delaines, which the Amoskeag Company had already woven, to some extent, in their Hooksett mills. But the business of manufacturing these goods was then almost unknown in this country; and the Manchester manufacturers had neither the knowledge nor the machinery necessary for printing the fabric after it was woven. The proprietors of the Manchester Mills, however, who were virtually one with the Amoskeag Company in this matter, having now resolved to undertake the manufacture and printing of delaines, sent Mr. Straw to England and Scotland, to acquaint himself with the machinery and processes there employed in the production of these goods. He spent several months abroad, visiting the principal manufactories in



Wm. Lloyd Garrison

*E. C. Stearns*



Great Britain. He thus fitted himself to superintend, for the Manchester Mills Company, the erection of the first American manufactory in which the entire process of making and printing delaines was carried on.

When the Amoskeag Company began its operations on the east side of the Merrimac, in 1836, it was deemed expedient to create a land and water-power department of its business; and in July, 1851, Mr. Straw was placed in charge of it. His management of it was so successful that, five years after, the Company united this department with that of the mills, and appointed Mr. Straw the agent of the combined departments. In 1858 the business of the Company's machine-shop was also put in Mr. Straw's charge, and he thus became the sole resident manager of the Company's business. During the twenty years that have since elapsed, the entire control of the Company's affairs at Manchester has been committed to him. This Company has a capital of \$3,000,000, eleven mills, containing 150,000 spindles and 5,000 looms, producing every week seven hundred thousand yards of cotton-goods, and employing a total force of nearly four thousand operatives.

Mr. Straw has also been prominently connected with other large manufacturing enterprises. In 1856 the Amoskeag Duck and Bag Mills, afterward named the Namaske Mills, were organized for the manufacture of bags and duck-cloth, and Mr. Straw was chosen treasurer of the company. The property passed wholly into his hands in 1864, and he became both president and treasurer. He continued to be the sole proprietor of these mills until 1875, when they were sold to the Amoskeag Company, who now own and run them. In 1874 he was elected to succeed Gardner Brewer, as a director of the Langdon Mills—a company originally chartered in 1846, but not organized until 1860, and now having a capital of \$500,000. He is still a director in this Company. In 1855, at the organization of the Blodget Edge Tool Manufacturing Company, now known as the Amoskeag Axe Company, Mr. Straw was made its president. This office he held until 1862, and has since been one of the directors.

On the organization of the New England Cotton Manufacturers Association, in 1866, Mr. Straw was chosen president, an office which he resigned in 1878. He has also been the president of the New Hampshire Fire Insurance Company since its organization, in 1869. In 1850, on the organization of the Manchester Gas Light Company, he became a director, and, in 1856, was made its president.

Mr. Straw has been, from early manhood, an active and public-spirited citizen of Manchester, and of the State. He was intrusted with the surveying and laying-out of the boundaries of the growing town, and was a member of the committees for rebuilding the town-house, and introducing water-works. He was the first chairman of the water board,—which office he held until 1877,—and is a trustee of the

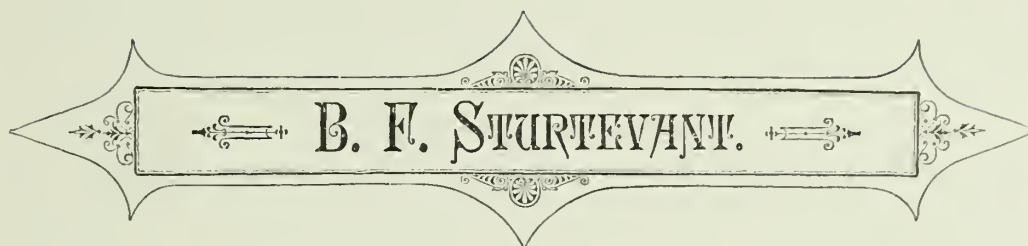
Manchester Public Library. For five successive years he was elected a member of the legislature, his first election occurring in 1859. From 1861 to 1863 he was a member of the committee on finance. In 1864 he was elected a State senator ; and, on his return to the senate the following year, he was chosen its president. During his term of service in the senate he was one of the commissioners to superintend the rebuilding of the State capitol. In 1869 he was appointed by Governor Stearns as one of his staff officers ; and he was governor of New Hampshire in 1872 and 1873. Two years before his first election as Governor, he was appointed on the national commission to make arrangements for the Centennial Exhibition at Philadelphia, in 1876, and he was one of the executive board of that body. In 1865 Dartmouth College conferred upon him the honorary degree of Master of Arts.





Van Slyke & Co. Boston.

*B. F. Sturtevant*



**B**ENJAMIN FRANKLIN STURTEVANT, of Jamaica Plain, Mass., was born Jan. 18, 1833, at Martin's Stream, Norridgewock, Me., whither his family came from Massachusetts in the early part of the century. He is a lineal descendant, in the seventh generation, of Samuel Sturtevant, who emigrated to Plymouth, in 1642, from Rochester County, Kent, England, and whose progeny spread over, and are found in every part of, the old colony. Lot Sturtevant, his grandfather, was in the Revolutionary army, and lived through the hardships of Valley Forge. His father, Seth Sturtevant, served in the War of 1812; but, being far from robust, the chief care of his family rested upon his wife. The mother of Mr. Sturtevant was one of those remarkable pioneer women to whose force of character is due so much of New England's prosperity. The daughter of a Revolutionary sailor, she had those sturdy traits which best fitted her to endure living in a new country. Her absorbing idea was to own a home; and to accomplish this she exerted every faculty. She had a strong will and bodily vigor, and was fertile in resource.

She spun the fleece into yarn, and wove it into cloth sufficient not only to pay for the little farm of wild land and clothe her family, but to barter at the store for the yearly gallon of molasses, a little salt, thread and a few other needful articles. She assisted her husband in his severer out-door labors, rigidly saved, guarded the deed of her humble home with jealous care, and herself paid every household debt. She had a deep religious nature, the simple confident faith of which led her into the field on Sunday to pray, among the hills of corn, that the crops, her sole dependence, might not fail.

Under the care of this mother, young Sturtevant passed the first fifteen years of his life. When but six years old he cut out peg-wood, by hand, for the cat-whipper, or cobbler, which was the beginning of that made later by him, for the first

time, by the aid of machinery ; and, a few years later, having had described to him a rude blower made in England to furnish a draft for a coal fire, he built two wooden blowers that worked effectively, and were prototypes of his present perfected blower. Meanwhile, he worked upon the farm in summer, and attended the district school in winter.

In the latter part of 1848 young Sturtevant found his way to Northbridge, Mass., and thence back to Skowhegan, Me. ; in both of which towns he worked, until 1856, at shoe-making, and became, without having served any apprenticeship, a skillful shoe-maker. He had married, in 1852, and had injured his health by the confining work of the bench ; and now, casting about to better his condition, the idea of pegging boots and shoes by the use of power entered his mind. With no knowledge of mechanics or experience in building machinery, he knew what went to make up a good boot or shoe, and how many pegs he must be able to drive, and how rapidly, to make a paying machine. After a month's labor he succeeded in making a model of a pegging-machine, which, though rude and imperfect, embodied all the main principles of the modern pegger. In 1856, at the age of twenty-three, he left Skowhegan with his model and went to Boston, with twenty cents left in his pocket—just enough to pay the carriage of the model to a boarding-house.

Mr. Sturtevant, in order to induce a capitalist to guarantee him a small sum each week, while developing his pegger, assigned to him one-half of the patent absolutely, and the entire control of the remaining half ; an arrangement which resulted in the inventor's never receiving any return from his device. Mr. Sturtevant employed the years 1857 and 1858 in building five experimental machines, the first type of the pegger, upon which three patents were taken out ; and the ensuing two years, 1858-9, were occupied in perfecting his first attempts. In 1859 the owner of a worthless patent, granted in 1854 for a pegger, having examined the Sturtevant pegger, claimed an infringement, and artfully convinced the capitalist who had aided Mr. Sturtevant of the validity of his claim, so that the latter, in 1860, stopped Mr. Sturtevant's weekly stipend, thus closing their joint account, just on the eve of success, and left the inventor penniless, but not without resource.

Up to 1860, at which time the Sturtevant pegger and its comrade, the sole sewing-machine, were introduced, not more than half a dozen power shoe-factories were in existence. The trade was carried on in many New England villages, where shoes were parceled out among persons who worked on them at their homes. These two inventions gave birth to the New England shoe-factory system, now grown to be the largest industry in the country save that in iron ; and have given rise to over two hundred other patented shoe-machines for the equipment of a complete establishment. From 1860 to the present time, an average of thirty million pair of boots

and shoes have each year been pegged upon the Sturtevant pegger, with an annual saving to the public of over \$1,000,000; and in general, by its employment and that of similar machines, the cost of boots and shoes has been lessened to the consumer, although the price of raw material has advanced, the wages of operatives increased, and their hours of labor reduced.

Mr. Sturtevant soon saw that the success of his pegger depended upon its having a suitable supply of pegging material; and that an exhaustless series of pegs contained in a narrow strip of wood veneer could alone meet this want. No machine for cutting such veneers with a knife was in existence, and to do this successfully, without shattering the wood, was thought to be impossible. He then invented the wood-veneer lathe, by which not only the peg strip is cut and turned, but also veneers of a thousand shapes and forms, from the bulky barrel-stave down to the delicate slices of ornamental woods, which, when pasted upon paper, are employed in the external finish of all fine wood-work, and for interior decoration. To gain the required length of peg strip, Mr. Sturtevant conceived the plan, in 1859, of cutting a spiral ribbon from around a log across the grain; and after a week's labor with a common lathe and a rude spring, to control the log, he succeeded in obtaining a fair specimen. It was not until some time after, however, that he was successful in building a lathe that would turn out, unvaryingly, a perfect peg veneer, and then only by having developed the rude spring of his first attempt into the well-known presser-bar. He was granted patents both for the veneer-cutter and for its product, the veneer. The peg-wood lathe takes a peeled log of white birch, eighteen inches long, and with great rapidity turns out a spiral veneer, which is at the same instant divided into ribbons as wide as the length of a peg, and from fifty to one hundred feet long. These ribbons are then dried, beveled on one edge, uniformly compressed and toughened by machines also invented by Mr. Sturtevant, and are fed from rolls, into which they are wound into the pegger like thread into the sewing-machine. The annual production of the peg-wood machine equals fifteen thousand miles of peg strips, enough to peg the fifty-five million pair of boots and shoes that passed through the pegger in 1877.

From 1860, when his capitalist abandoned him, until 1862, Mr. Sturtevant resorted to many make-shifts to gain a support, and to rescue some portion of his past labor from passing beyond his control. To pay the necessary expenses of his patent on the veneer-cutter, he parted, for a loan of only seven hundred dollars, with the right to all profits arising from the sale of all peg-wood in a single large shoe town and county; a transaction which, after having netted the lenders over \$64,000 in actual cash paid them by Mr. Sturtevant as such profits, cost him enough more in law-suits, begun by them, for still larger returns, to swell the amount to \$100,000.

He next sold, for four hundred dollars, the right to make the wooden toothpick, which is cut from none other than a widened peg-strip beveled on both edges. Finally, he was forced to dispose of the right to cut veneers of every kind, except the peg-ribbon alone, for long notes of the face value of six thousand dollars, which yielded, when discounted at two and one-half per cent a month, a much smaller amount; so that in 1862, when prosperity first visited him, Mr. Sturtevant retained, of all his inventions and their many uses, the control only of his peg-wood patent, and so much of the veneer-cutter patent as applied to the production of pegs.

In 1864, Mr. Sturtevant turned his attention to the building of blowers. Before that time all appliances in use for the production of a blast, chiefly for blowing furnaces and forges, were crude; while the exhausting-fan did not exist. He began work upon entirely new designs for supplying a local trade, and by a uniform reduction in prices and good workmanship, has created a new business. His blower is used where it is desired to set air in motion, in whatever quantity, direction or velocity, from making a blast amid the rare atmosphere at the summit of the Andes, to exhausting the foul air from the lowest levels of the Bonanza Mines of the Sierra Nevadas. All the national buildings, most of the public buildings of the different States, many asylums, hospitals and similar institutions, and the vessels of the navy, are thus ventilated. They include pressure-blowers, for producing a blast in the arts; exhaust-fans, for the removal of clogging dust and all impure gases; pneumatic dispatch-blowers, for conveying packages; hot-blast blowers and steam-heaters, for drying; cold-blast blowers, for cooling and preserving perishable food; and condensers. The largest are one thousand times as large as the smallest; and they vary in capacity from propelling five hundred to five hundred thousand cubic feet of air a minute. An average month's sales will make a sufficient blast to drive a column of wind twelve feet in diameter from Boston to Chicago in twelve hours, or to blow a train of cars in a pneumatic tube of that size and length from one city to the other at the same rate.

A minor invention, made by Mr. Sturtevant during the Civil War, was an improved metallic sabot for a shell-casing; which was the projectile used on the "Swamp Angel," before Charleston, S. C., and was an active instrument in the reduction of that city.

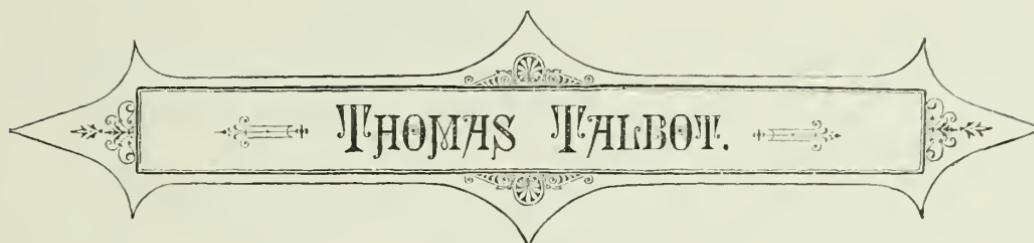

He received the medal of progress, at the Vienna Exposition, for peg-wood, and at the Centennial, the first prize for blowers. At the latter exhibition, prizes were received for both peg-wood and peggers; and at various State fairs and sectional exhibitions he has been awarded medals and prizes upon each of his inventions.





Van Slyck & Co Boston.

*Thomas Talbot.*

A decorative banner with a central rectangular frame containing the name "THOMAS TALBOT." in a serif font. The banner has ornate, symmetrical flourishes at both ends and along the top and bottom edges.A large, ornate, decorative initial letter 'T' in a gothic or similar style, featuring intricate scrollwork and floral patterns.

HARLES and Phœbe Talbot, the parents of Thomas Talbot, were natives of Ireland, and came to America soon after their marriage, settling in Cambridge, New York, where their son Thomas was born, Sept. 7, 1818, being the seventh of eight children. The elder Talbot became interested in a woolen-mill, and a year after the birth of Thomas, removed with his family to Danby, Vt., where he worked as superintendent of a woolen-mill until his death, in 1824. His widow was left with the care of her eight children, whom she managed to support, and to give a good common-school education. Learning that her children might find employment in the mills at Northampton, Mass., she removed to that place two years after her husband's death; and here Thomas, when about thirteen years old, obtained a place in the carding-room of the Northampton Woolen Mill. While some of Mrs. Talbot's sons were at work in the mills, others attended school; and then they exchanged places with each other. Thomas Talbot remained alternately in school and in the Northampton Woolen Mill—working from five o'clock in the morning until eight at night—until he was seventeen years old.

His elder brothers, Charles P. and Edward H. Talbot, had now established, in the neighboring town of Williamsburg, a mill for the manufacture of broadcloth; and the family removed thither. Thomas entered the mill as carder, but was soon promoted to the finishing-room, and after three years was appointed overseer of that department. In 1837 his brother Edward died; and the next year Charles P. Talbot sold the mill to David Mason, and removed to Lowell; in June, 1839, engaging in the manufacture of dye-stuffs, in North Billerica. Thomas Talbot remained in the employ of Mr. Mason until the fall of 1838, when he went for six months to the academy in Cummington. In the spring of 1839 he entered the mills of the Pontoon Manufacturing Company, in Pittsfield, and was employed as a gigger of broadcloths.

His brother Charles hired, in the spring of 1839, an old mill, in which to grind his dye-stuffs. He sent for Thomas, and they two formed a copartnership, under the firm-name of C. P. Talbot & Co. In 1851 they bought the water-power of the Middlesex Canal Company, in North Billerica, and, in 1857, established a woolen-mill with eight sets of machinery, for the manufacture of flannels. In 1870 an addition was built, giving room for twenty sets.

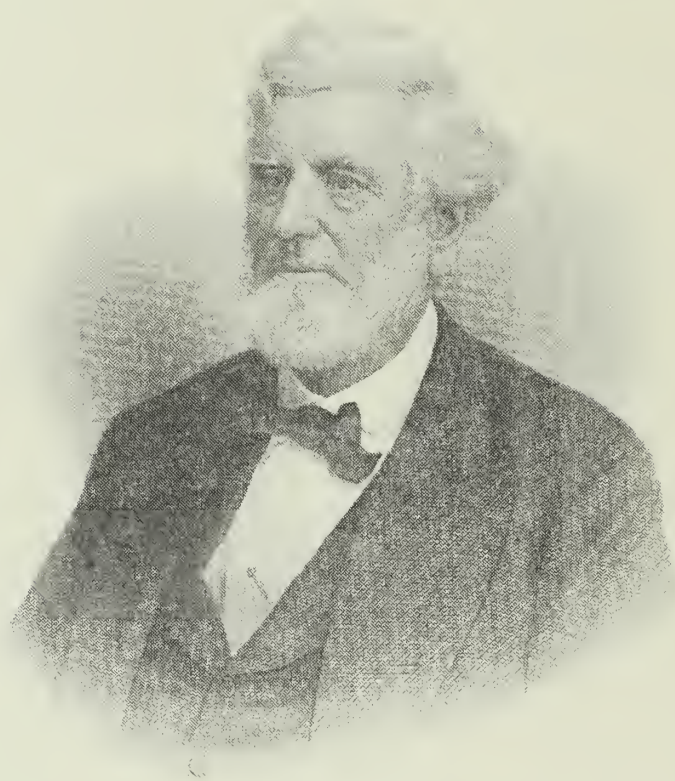
In the woolen-mills, dye-wood and chemical works of C. P. Talbot & Co., between two and three hundred hands are employed; and the establishments have been kept steadily running throughout the business depression of recent years. The rate of wages, from the breaking out of the Civil War, was maintained until April, 1878; when the decline in values rendered an average reduction of about twelve per cent necessary. Much attention is given to the condition of the operatives, care being taken to secure them comfortable homes.

Mr. Talbot has been married twice. His first wife, whom he married in 1848, was Mary H. Rogers, daughter of Mr. Calvin Rogers, of Billerica. She died childless, in 1851. In 1855 he married Isabella W. Hayden, daughter of the late Hon. Joel Hayden, of Williamsburg. Mr. Hayden was one of Mr. Talbot's predecessors in the lieutenant-governorship of Massachusetts, and was the senior member of the manufacturing firm of Hayden, Gere & Co. Of Mr. Talbot's seven children, but four are now living, two daughters and two sons.

Three of Mr. Talbot's brothers moved to Texas in 1852, two of whom were elected to the convention for the revision of the Constitution of Texas. Mr. Talbot's mother died in 1841, in Centreville, Michigan, where she was living with her eldest son, John N. Talbot. In 1851 Thomas Talbot was chosen to represent Billerica in the legislature; and in the following year he was elected a member of the convention to revise the State Constitution. In 1864 he became a member of the executive council; and for five successive years he held his seat in that body, under the administration of Governors Andrew, Bullock and Claflin.

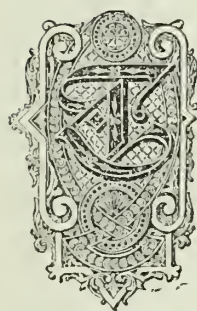
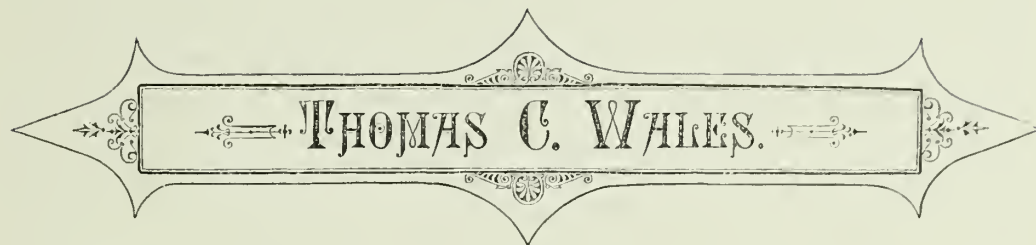
He was chosen lieutenant-governor in 1872 and 1873. In the spring of 1874 Governor Washburn was elected United States Senator, in place of Charles Sumner, leaving Mr. Talbot to assume the duties of governor. He took charge of the office on the first of May. Many important matters were acted upon by the legislature of that year, and Mr. Talbot favored an economical administration of State affairs. He refused to approve the plans for the new Concord State prison, and he promptly signed the ten-hour bill. He vetoed the bills abolishing the State police and substituting a license for a prohibitory law. In 1874 he was a candidate for governor, but was defeated; in 1878 he became again a candidate for this office, and was elected by a plurality of twenty-four thousand votes.





Van Slyke & Co Boston

*T. C. Wales*



THE nineteenth century has been marked, more than any preceding one, by marvelous improvements in the means and appliances of luxury and elegance to the wealthy, and of comfort and health to all classes of society in the civilized world. Among the important industries which have been developed is the manufacture of goods from India-rubber, a leading branch of which is that of boots and shoes. Preparatory to the establishment of this industry, which now employs thousands of operatives and many millions of capital annually, was the importation from Brazil of the rude shoes made from the pure gum, by the native Indians of that country. The gum itself was known long before its peculiar and valuable properties were appreciated. The first recorded notice of it was in a communication made in 1736, to the French Academy of Sciences, by La Condamine, one of the corps of scientific men who, during the previous two or three years, had visited the valley of the Amazon, for the purpose of astronomical observations. During that century, some experiments with it were made by French chemists, and it was used, to a very limited extent, in making small tubes to cover the juncture of glass tubes in chemical apparatus. In 1770 Dr. Joseph Priestley, the English philosopher and chemist, in the preface to his work on Perspective, published that year, spoke of India-rubber as a substance which had been just brought to his notice, as being admirably adapted for rubbing out the marks of a lead-pencil, and as being sold at three shillings for a piece a cubical half-inch in size. This use of the article was its principal one for more than a half-century from the date of this notice of it by Dr. Priestley, and gave rise to the name "Rubber," by which it has been universally known in England and the United States, receiving the prefix given to it because it came wholly from those equatorial regions which, in either hemisphere, have been known since their discovery by the common name—*India*.

The first suggestion of its use in manufacture, so far as is known, was in 1797, when a patent was granted in England to one Johnson, for rendering cloth water-proof, by covering one side of it with a varnish made by dissolving India-rubber in oil of turpentine and spirits of wine; and then, to obviate the stickiness, sifting over the surface fibers of silk, wool or flock. In 1813 a patent was issued by the United States Government to Joseph Hummel, of Philadelphia, for a varnish of India-rubber. Neither of these patents, it is believed, were developed to practical results. In 1823 Charles Mackintosh, then of Glasgow, obtained a patent for water-proof fabrics, made by uniting together two layers of cloth with a cement made by dissolving India-rubber in coal-tar naphtha. He afterwards engaged extensively at Manchester, England, in the manufacture of these water-proof fabrics, giving them his own name, "Mackintoshes," under which they were sold. In 1825 the first India-rubber shoe ever sold in the United States, and, so far as is known, in the civilized world, was sold by Thomas C. Wales, a young shoe-dealer in Boston. His subsequent relation to the development of the India-rubber manufacture, in what has been one of its most important branches, that of boots and shoes, has been such as to render it especially suitable that a sketch of his career should be included in our record of New England industries.

Thomas Crane Wales was born in Stoughton, Mass., Nov. 10, 1805. He was descended in the seventh generation from Nathaniel Wales, who came, in 1635, in the ship *James*, of Bristol, with Rev. Cotton Mather, to Boston, and lived in that town till his death, in 1661. He was a shipwright by trade, a deacon in the church, and had an excellent record as a master mechanic and a good citizen. His descendants, many of whom have sustained an excellent reputation as men of business, have lived in Dorchester, Braintree, Bridgewater, and other towns of that vicinity. The father of Thomas C. Wales, Samuel, a native of Braintree, married Mary Cranc, of Milton, and removed to Stoughton, Mass., where he had purchased and carried on a farm. On this farm the subject of this sketch was trained in the industrious and virtuous habits of rural life, enjoying only the limited opportunities for education afforded at that time in the smaller towns of Massachusetts. In his fourteenth year he went to Boston, and entered the employment of Amos Fitch, who then carried on a retail business in shoes, on the north-eastern corner of Scollay's building, then occupying a part of the open space now known as Scollay's Square. At the end of a year he entered the retail shoe-store of Joseph Thayer, on Washington Street, opposite Franklin, where he remained about two years. The next year he was with Benjamin C. Harris, in the same business, on the corner of Washington and West Streets.

In the fall of 1823 he was hired by his previous employer, Mr. Thayer, to go to New York, to assist in the establishment of a similar store. This store was located

on the corner of Division Street, Bowery and Chatham Square, then, as now, a locality characterized by an extensive trade in clothing, shoes and other commodities, mostly of the cheaper grades, and having as customers the lower classes of that city. The locality and the business were very distasteful to young Wales, and he gladly availed himself of the offer made to him the next year by his former employer, Mr. Harris, to furnish capital sufficient to enable him to engage in business on his own account in Boston. He rented the store in which, five years before, he commenced his apprenticeship. He was then in the nineteenth year of his age. The next year, 1825, he purchased the first pair of rubber-shoes he had ever seen, from a sailor, who had brought them, as a curiosity, from Pará, Brazil. He placed them in the windows of his store, where they remained for a considerable time, attracting much attention. Shortly afterwards a small lot of the shoes were brought to Salem, Mass., in one of the vessels belonging to Robert Upton, a shipowner of that town, who was engaged in trade with Brazil. These shoes Mr. Wales bought, and worked them over, putting them on lasts, and otherwise preparing them for sale. In this manner began a trade which was developed, in a few years, by himself and others so that there was a large demand in every part of the country. Meeting with success in his first venture, he requested Mr. Upton to inform him when another lot should arrive, hoping thereby to anticipate other dealers in the trade. The next year he received notice from Mr. Upton that another lot had arrived; and with the same purpose and hope of securing them before others should hear of them, he hastened to take the first stage for Salem. To his surprise he found in the stage eight other shoe-dealers, bound on the same errand to Salem, having also received intelligence from Mr. Upton of the arrival of the shoes. Consulting together, they finally agreed to go in a body to the merchant, purchase the shoes, and make an equal division of them. Calling on him, they were disconcerted at what seemed to be the very high price which he had fixed on them, which was \$1.33 per pair, and most of them were disposed to return home without making the purchase. Eventually, however, five of them combined and took the whole lot, some three thousand pairs, at Mr. Upton's price, and found a ready market for them.

To meet the increasing demands of his business, Mr. Wales enlarged his store in Scollay's Building, and remained there until the close of the year 1830. He then entered into partnership with Benjamin C. Harris, under the firm of Harris and Wales, and engaged in the wholesale business of boots, shoes and rubbers, at No. 6 Broad Street, in the immediate vicinity of Central Street, which at that time was the headquarters of the boot and shoe trade of New England. Their business was largely in rubber shoes, and was profitable. It was, however, attended by a serious drawback: the rubbers were made in clay molds, and the clay, on account of its weight, was

replaced by straw and chaff before shipment, and on the voyage they were frequently pressed into such forms that it was very difficult to restore them to a salable shape. On one occasion Mr. Upton, the importer, came to them to sell a cargo which had not yet arrived, but which he believed to be in good condition; and the firm agreed to take them at a certain price. On their arrival they were found to be so pressed out of shape, that Messrs. Harris and Wales believed they might in equity repudiate the contract. They decided, however, to take the shoes and do what they could with them. The result was that after expending a great amount of labor on them, they were compelled to dispose of them at a loss of some nine thousand dollars; which was a large sum to lose in those days of limited business operations, and especially for a firm so recently established. This misfortune so disheartened Mr. Harris, that he was disposed to close up the concern. This was done; and early in 1833, Mr. Wales again started a retail business on Washington Street, near the Old South Church, combining with it a jobbing trade. The trade in rubber shoes was still a very important feature of his business. He prospered, and his capital increased from year to year. But in 1837, in the great financial crisis which carried down so many of the strong mercantile houses of the country, a friend for whom he had indorsed to a considerable amount failed, and Mr. Wales was compelled to suspend payment. With the approval of most of his creditors, he made an assignment to himself for their benefit, proposing to pay borrowed money and indorsed paper in full, and fifty per cent of other claims. This proposition was accepted by the creditors, with the exception of a few representing about six thousand dollars. Within that and the following year he paid the borrowed money and indorsed paper in full, and the fifty per cent of all other claims, as agreed upon. The remaining fifty per cent, from which he had long before been released by the compromise and by the statute of limitation, he paid in 1859. In 1866 he also paid the interest on that fifty per cent for the twenty-two years which had elapsed, amounting to one-third more than the principal. He has recently said "that to him this was one of the most satisfactory transactions in his whole business career." It was certainly a most creditable instance of the old-time mercantile honor and integrity, only too rare at the present day.

After making the assignment and closing up the business on his own account, he established an agency at No. 15 Central Street, for the sale of boots, shoes and rubbers on commission. The importation of rubber shoes had, during the twelve years since Mr. Wales exhibited the first pair in his shop window on Court Street, greatly increased. Prominent among the merchants engaged in it was Thomas P. Pingree, of Salem, who had several vessels employed in importing various products from Brazil; and among them were large quantities of India-rubbers, from Pará,

for the sale of which Mr. Wales had the agency. At about the same time Capt. John Bertram, a successful shipowner of Salem, put two vessels into the trade, on the condition that Mr. Wales, who had become the largest dealer in rubber shoes in the country, would act as his agent. This was the beginning of a life-long connection in business, and of the warmest personal friendship and mutual regard. Capt. Bertram authorized Mr. Wales to have well-shaped lasts made, which he sent out to Pará, and had the shoes made on them by the natives. This proved a great success. The shoes made in this manner were called *fabricas*, and sold at about ten per cent more than those of the old style imported by other merchants. The "*fabricas*" became so popular, that in a single year half a million of them were sold in the United States and Europe.

In 1839 Mr. Wales removed to a more eligible store, on the corner of Broad and Central Streets. Experiments had been in progress for several years to combine India-rubber with other articles, so as to adapt it more perfectly to the uses to which it had been applied, and also to other purposes. The promising but futile attempts to make clothing and shoes of cloth coated with rubber dissolved in spirits of turpentine, and the experiments of Nathaniel Hayward, resulting in his discovery of the agency of sulphur in producing an important change in rubber, rendered valuable and useful by the subsequent discovery of the vulcanizing process of Charles Goodyear, are narrated in the biographical sketches of these men.

During a brief period, Mr. Wales was agent for the sale of rubber shoes, made by Dr. Isaac Hartshorn, of Providence, R. I., by what was known as the "acid process." These shoes were considered an improvement on the native rubber shoes, but, on the introduction of the vulcanized shoes, were quickly superseded by them.

Mr. Wales' long connection with the trade in Pará shoes, and his position as the largest dealer in them, led him to watch with great interest the progress made toward the manufacture of rubber shoes by the process of vulcanization. Some shoes were made by this process, before any patent was issued, by L. Candee & Co., at New Haven, Conn.; but the Goodyear Metallic Rubber Shoe Company, at Naugatuck, Conn., was the first company organized for the special manufacture of boots and shoes under the Goodyear patent. Mr. Wales was appointed agent for the sale of this Company's goods; and in 1851, with his friend Capt. John Bertram, he purchased a majority of its stock, and was elected one of the directors. The capital was at that time \$60,000, but was at once increased to \$100,000. Nov. 3, 1853, it was again increased—then to \$300,000. Mr. Wales has continued in the board of directors till the present time, and has increased his interest, till he is, at the present time, the largest stockholder. Capt. Bertram was elected a director in 1859, but in 1866 retired from the board, retaining, however,

his interest in the Company. He has been well known in the India-rubber trade, and has been universally respected as one of the most upright and honorable men connected with it. He was for many years one of the largest importers of rubber shoes, and then of the native gum for manufacturing purposes. He was also largely interested, by the investment of his capital, in several manufactories; and is still living, esteemed and venerated, at his old home in Salem, Mass., at the advanced age of eighty-two years.

In 1852 Mr. Wales received into partnership, in the sale of rubber boots and shoes, Henry S. Downs, who had previously been the agent of the L. Candee Rubber Shoe Company, of New Haven, and the style of the firm became Wales, Downs & Co. He had three years previously received into partnership in his wholesale and commission business in boots, shoes and leather, his oldest son, George C. Wales, and William B. Robinson, under the style of Thomas C. Wales & Co. This firm continued at the old location on Broad and Central Streets till 1854, when the business was removed to No. 29 Pearl Street. In 1856 the firm of Wales, Downs & Co. was dissolved, Mr. Wales continuing, in his own name, at No. 66 Pearl Street, the agency of the Goodyear Metallic Rubber Shoe Company and of the L. Candee Rubber Shoe Company. At the same time he retired wholly from the business in leather boots and shoes, the firm of Thomas C. Wales & Co. being succeeded by George C. Wales, who continued the business until 1865, in which year he died, greatly lamented by his kindred and a large circle of friends in business and social relations; by none so much as his father, who had looked to him to take his own place at the head of his extensive business.

Mr. Wales invented and patented, Feb. 2, 1858, the justly celebrated waterproof and cold-proof over-shoe, made of cloth and rubber, styled by him the "Wales Patent Arctic Gaiter," more commonly known as the "Arctic." It is made with a rubber sole and foxing and cloth upper, lined throughout with a thick, warm, fleecy wool fabric, having a thin sheet of rubber between the outside and the lining. This shoe was regarded at the outset unfavorably by the rubber shoe companies and agents, and was refused a place on the price-lists of the Association as "Wales Patent;" a place, however, was allowed it under the name "Arctic." Even the superintendent of the Goodyear Metallic Rubber Shoe Company, in which Mr. Wales had so large an interest, was indisposed to make them, and prejudiced the other directors against them; and it was only by the personal effort of Mr. Wales, and his determination that the merit of his invention should be fairly tested, that the company continued to make them that year. The next year the superintendent, who was of dissipated habits, and otherwise unreliable, was removed, and the place filled by the appointment of the present efficient superintendent, Charles A. Ensign. Under his management all the products of the factory were very much improved in their

character, and the *Arctic* was made so precisely according to the idea of its inventor, and with such excellence of material and workmanship, that it at once attained the position which it has since held, as the most desirable winter over-shoe ever produced. It became so popular, and so large a demand for it was developed, that for several years during the continuance of the patent, the whole force of the Goodyear Company was employed in its manufacture, realizing from it large profits. Other companies endeavored to imitate it, even to the extent of infringing on the patent. The original patent has now expired, and all the companies make a similar article, and place it in their lists as an "Arctic." At first they styled it a "Polar Gaiter"—a name which is now among the obsolete things of rubber manufacture.

In January, 1863, Mr. Wales patented a valuable improvement in his "Arctic," obviating the liability which existed in his earlier style, of tearing asunder on the upper edge or down at the side. The patent for this improvement is still in force. This invention of Mr. Wales' has been one of the most important in the history of the business, "Arctics" to the value of millions of dollars being annually made.

The agencies for Boston of all the rubber shoe companies working under the Goodyear patent, associated themselves together under the firm-name of Wales, Emmons & Co., for the period of the extension of that patent, beginning June 9, 1858, and ending June 9, 1865. The partners were Thomas C. Wales, previously agent of the Goodyear, L. Candee and the Newark Companies; Henry Emmons, of the Hayward Company, and Henry L. Daggett, of the New Brunswick Company. On the expiration of this term of copartnership Mr. Daggett retired, taking with him the agency of the New Brunswick Company. The remaining members of the firm continued their copartnership under the style of Wales, Emmons & Co. In 1869 Nathaniel Wales, the youngest son of Mr. Wales, was admitted as a partner. In 1873 Mr. Emmons retired, taking with him the agency of the Hayward Company. The firm of T. C. Wales & Co., consisting of Thomas C. Wales and Nathaniel Wales, continued till April 1, 1877. The elder Mr. Wales had then been connected with the boot and shoe trade, in some form, nearly sixty years, and on his own account more than fifty years, and he transferred the active responsibility to his sons. He is still the largest owner in the old Goodyear Metallic Rubber Shoe Company, which, to distinguish its goods from those of a much younger concern, which has sought by similarity of name to secure the advantage of its prestige, and from respect for the earliest dealer in rubber goods of any kind in the country, has adopted as its *trade mark*, "Wales Goodyear Shoe Company."

Mr. Wales, in his retirement from active business, has the highest respect of the trade, and of the whole business community, in which he has but few seniors—the well-earned reward of a long career of honorable dealings and unimpeachable integrity.

A decorative banner with a central rectangular box containing the name "ROBERT WALLACE." in a serif font. The banner has ornate, symmetrical flourishes at both ends and small circular motifs above and below the central box.

NUMEROUS and valuable improvements in the manipulation of metals have been made during the past half century; among them, the plating of cheaper metals, with silver or gold, by the galvanic process. Of plated goods, those of the best quality have, for their basis, the alloy of copper, nickel and zinc, known as German, or nickel-silver. As this native alloy often contained iron and other metals injurious to its purpose, and as it was desirable to vary the proportions of the copper, nickel and zinc, so as to adapt the alloy to special purposes, the practice was soon adopted of making the alloy from the three pure metals. The manufacture of articles from it was commenced in England, at Sheffield, in 1830, by Dickson and Son, whose goods soon obtained a high reputation.

Its first use in this country was in the manufacture of German-silver spoons, and was due to Robert Wallace, now of Wallingford, Conn. He was born in Prospect, Conn., Nov. 13, 1815. His father, James Wallace, was of Scotch, and his mother, Urania Williams, of English, descent. His grandfather, James Wallace, moved from Scotland to Dublin, and thence to America, settling in Blandford, Mass., where he died. He was a silk-weaver, and brought with him two looms for weaving silk stockings. His son, James, moved to Prospect, Conn., where he carried on a small farm, and lived in modest circumstances. The subject of this sketch, from his ninth to his sixteenth year, worked with neighboring farmers for small wages, living at home during the winters, and occasionally attending school. At sixteen years of age he engaged with Captain William Mix, of Prospect, to learn to make britannia spoons.

Two years later he went to Cheshire, hired an old grist-mill, and began, on his own account, to make spoons by water-power. He had been thus employed for about a year, when Mr. Sherman, of Smith and Sherman, of New Haven (to whom



Wm. H. & Co. Boston

*Robert Wallace*



he had sold goods), showed him a spoon made of a metal new to both of them, and what is now known as German-silver. The spoon was heavier than those now made of the same material, and was evidently cast, or molded, and then polished. It was made by Dickson and Sons, of Sheffield, England, and cost as much as a spoon of solid silver. Mr. Sherman referred Mr. Wallace to Dr. Louis Feuchtwanger, a well-known analytical chemist, in New York, who had recently brought with him from Germany a bar of German-silver. Mr. Wallace at once went to New York and purchased this bar. Having carried it to Waterbury, and had it rolled, he made from it about four dozen spoons, and showed them to Deacon Almer Hall, afterward the head of the firm of Hall, Elton & Co., of Wallingford. Mr. Hall had been engaged in the manufacture of wood-screws, and had failed. He now proposed to Mr. Wallace to move to Wallingford, and engage with him in the manufacture of spoons; which Mr. Wallace accordingly did. He set up his machinery and melted the metal, which had been left in scraps from the previous manufacture, and had it rolled and made it into spoons. Finding in Waterbury a man named Stanley who had recently brought from England the recipe for the composition of German-silver, Mr. Wallace purchased it for twenty-five dollars. At the same time he bought from another man in New York sixty pounds of refined nickel, and made arrangements to import this metal from Germany. He went to work casting the metal, which was then taken to Waterbury and rolled. In about a year some persons in Waterbury, having become acquainted with the process, began to compound the metal and to roll it into sheets suitable for Mr. Wallace's purposes; and he has since obtained from them his supplies of German-silver. From 1834 to 1854 he continued to make spoons from this material for Deacon Hall, and for Hall, Elton & Co., Deacon Hall having, in 1837, entered into partnership with William Elton, and continuing under that firm-style, until 1854. Having then accumulated a few thousand dollars, Mr. Wallace went West, with the intention of engaging in farming; but returned home without fulfilling it. He again entered into the manufacture of German-silver forks, spoons and similar articles, with Samuel Simpson, of Wallingford, a partnership for ten years being formed May 1, 1855, under the firm-style of R. Wallace & Co. The capital of the firm was \$12,000, each partner contributing one-half that amount. On May 15, the partners of Mr. Simpson in the Meriden Britannia Company were admitted to the copartnership, the firm-style not being changed, but the capital being increased to \$14,000.

The business, under this contract, progressed favorably, and, at its termination, in 1865, a new contract was made, the capital being now made \$100,000; of which Mr. Wallace owned one-third, Mr. Simpson one-third, and the Meriden Britannia Company one-third. The name of the concern was then changed to Wallace,

Simpson & Co. A brick factory was erected, 160 by 35 feet, and three stories high, forty rods below Mr. Simpson's factory, and a canal and tail-race were built, thus securing additional head, and consequent increase of power. Work was continued in this factory until 1860, when Mr. Wallace purchased two-thirds of Mr. Simpson's interest in the business; and in 1871 he bought the remainder of it. With his sons, Robert B. and William J., he organized the R. Wallace and Sons Manufacturing Company, one-third of the stock being held in the interest of the Meriden Britannia Company, which took all the nickel-silver goods. The Messrs. Wallace reserved the right to make, on their own account, forks, spoons, and other flat-ware, of any other metals except nickel-silver. They commenced the manufacture of iron spoons; and, in 1875, that of forks and spoons of sterling-silver. In July, 1877, Mr. Wallace formed a partnership with his sons, Robert B., William J., Henry L., George M. and Franklin A., and with W. J. Leavenworth and D. E. Morris, under the firm-style of Wallace Brothers, for the manufacture of a new line of silver-plated flat-ware, having, as its basis, cast-steel. The process was perfected, after long-continued study and experiment, by Mr. Wallace. By this new process articles lighter in weight, yet of greater strength and elasticity, are produced.

Mr. Wallace married, on March 16, 1840, Harriet L. Moulthrop, of North Haven, Conn. Of their ten children, nine survive. Five of their sons, Robert B., William J., Henry L., George M. and Franklin A., are engaged with their father in various relations to his business. Mr. Wallace has devoted himself especially to the manufacture of his goods, leaving the details of their disposal to other members of the firm. He has established his enterprise on a firm basis, and has built up a most useful industry.



### ICHABOD WASHBURN.

**I**CHABOD WASHBURN was born in Kingston, Mass., Aug. 11, 1798, and was descended, on his father's side, from a family many of whom have been prominent as mechanics, merchants or in public life. His mother's maiden name was Sylvia Bradford, whose father, Peabody Bradford, was a lineal descendant, in the fifth generation, from William Bradford, one of the pilgrims who landed at Plymouth in 1620, and was the second governor of the colony. Her mother's name before marriage was Wealthy de Lano, of French extraction, and a Protestant. The father of Ichabod Washburn was a sea-captain, and died at the age of twenty-eight, of yellow fever, when Ichabod and his twin brother, Charles, were only two months old, and their sister four years old. Then the mother was obliged to work at the spinning-wheel and loom, to support her young family. Ichabod's mechanical labor was to wind quills for this loom. He attended school at intervals, however, until nearly nine years old. At that age he went to live with a harness-maker, in Duxbury, where he "did chores," including the care of a horse and two cows, making the fires, chopping the wood, running the errands; and he also worked in the shop, stitching harnesses. Meanwhile he attended the district school during the winter terms. He remained at this place until he was fourteen, and became so expert in harness-making that, on his return to Kingston, he made a complete harness, which did good service for many years.

Toward the end of 1813, when he was fifteen, he went to work in a small cotton-factory in Kingston. This was during the war with Great Britain, when the British men-of-war were on the coast; and it was feared that the enemy might come on shore, and burn the factory. Young Washburn, with his brother Charles and another boy employed in the factory, undertook to watch the factory. Besides his daily work, each took his turn in watching three hours every night. During that

winter he assisted a man in running a hand-loom. Its working interested him in machinery, and he became anxious to learn the trade of a machinist. An opportunity to do this was offered at Samuel Slater's factory, at Pawtucket, but young Washburn was dissuaded from entering it; and he obtained employment of Messrs. Trask, blacksmiths, at Leicester, in 1814. Here he worked the bellows, and wielded the sledge-hammer, attending the academy six weeks in each year. On his own account he hired a seat in the Congregational church, paying for it fifty cents a year; which amount he paid in pot-hooks, made by him in time gained from over-work. After serving with Messrs. Trask two years, at which time they dissolved partnership, he engaged with Nathan Muzzy for two years, on condition that he should be paid fifty dollars, and be allowed twelve weeks' schooling, with board and clothing. At the end of the first year Mr. Muzzy left Leicester, and moved to Auburn.

In that town young Washburn closed his apprenticeship when he was twenty, and obtained employment as a journeyman in Millbury. After working in this capacity for two months, Mr. Warren, who had married Mr. Washburn's mother, offered him a place in his grocery store, at Portland, Me. He settled his affairs at Millbury, and went to Portland; but, on reaching there, he made up his mind that, after all, mechanical pursuits were better suited to him than mercantile ones; and he suddenly returned to Millbury, where he began the manufacture of plows on his own account. This not being altogether to his taste, he entered and worked for a while in Col. Asa Waters' armory. In 1820 he was engaged by William Hovey, of Worcester, to forge machinery. During the year of his engagement he worked both at forging and at finishing, and acquired a knowledge of the different kinds of work on machinery. He then entered into partnership with William H. Howard, to manufacture woolen-machinery and lead pipe; but, after a short time, he purchased his partner's interest. He had employment then only for himself and one man. The demand for woolen-machinery soon greatly increased; and in 1822 he took, as partner, Benjamin Goddard, under the style of Washburn and Goddard. It was not long before they employed thirty men, and enlarged their building on School Street. They sold their business eight years after to Messrs. March, Goulding, Smith and Hobart.

Mr. Washburn next turned his attention to another branch of business. During his apprenticeship at Leicester, he had become familiar with the manufacture of cards for cotton and woolen-machinery; and while engaged in the manufacture of lead pipe, which was drawn out by machinery, it occurred to him that wire might be drawn out in a similar manner from iron rods. His first experiment was a failure; but he persevered in his efforts, and so far succeeded that, in 1830, Washburn

and Goddard purchased a water-power in Northville, and put up the necessary works for the manufacture of iron wire and wood screws. The first wire-drawing machine, the main device in which was a pair of self-acting pinchers, drawing out about a foot of wire in length at a time, was a crude one, and not more than fifty pounds could be drawn out with it in a day. It was soon improved, however, so that the product was increased tenfold. Mr. Washburn then invented "the drawing-block," by which twenty-five hundred pounds of wire can be drawn out in a day. This was at once put into operation, and has not been since materially improved.

In 1833 the business had so far outgrown the water-power that it seemed necessary to remove where they could obtain more power. Mr. Goddard, however, would not consent to this; and the partnership of eleven years was dissolved, a division being made of the machinery and tools.

Mr. Washburn now removed to the Grove Mill, built by Stephen Salisbury, under Mr. Washburn's direction, to adapt it to his business. Here the manufacture of iron wire increased; and, in 1842, Mr. Washburn took his twin brother, Charles, into partnership, under the style of I. and C. Washburn. In 1841 they commenced the manufacture of wire in a new mill, erected for the purpose near Lake Quinsigamond, the village which grew up in the vicinity of the mill taking the name of the lake. The partnership was dissolved in 1849, Ichabod Washburn taking the Grove Mill, and his brother that at Quinsigamond.

In 1850 Mr. Washburn received into partnership his son-in-law, Philip L. Moen, under the style of I. Washburn and Moen. Under their management the establishment progressed rapidly, both in its financial resources and in its capacity for the manufacture of goods. In 1833 the number of men employed was about twenty, which, by 1868, had increased to nine hundred. Soon after Mr. Moen's entrance into the partnership, Mr. Washburn undertook a series of experiments in the manufacture of steel wire for piano-strings, a business which, for some eighty years, had been almost monopolized by the Messrs. Webster, of Birmingham, England. The successful result of these experiments he regarded as the greatest success of his mechanical career.

About the same time the demand for steel wire for needles and other purposes connected with sewing-machines, then being rapidly introduced, and for crinoline-wire, became so great, that a new and large field of manufacture was opened to the firm; and their wire secured a decided advantage in the trade. In 1864 the style of the business was changed to the I. Washburn and Moen Wire Works. The enlargement of this business resulted in the building of the South Worcester Works, the purchase of the Quinsigamond property, and the consolidation of the whole business into the present Washburn and Moen Manufacturing Company, which

occurred in 1868. In February, 1868, Mr. Washburn had a stroke of paralysis; and on the 20th of December, of the same year, he was suddenly attacked with congestion of the lungs, and died on the thirtieth of that month.

Mr. Washburn united with the Old South Church in Worcester, in 1832; and, four years later, he assisted in the organization of the Union Congregational Church, of which he was one of the first deacons, holding that office until his death.

He did much to help the poor, and, among other philanthropic works, made large donations to the Bangor Theological Seminary, Maine, to Wheaton College, Illinois, Berea College, Kentucky, the Colored Orphan Asylum, at Atlanta, Ga., and to Lincoln College, Kansas, the name of which has, since his death, in respect to his memory, been changed to Washburn College. By his will he devised seven hundred and fifty shares of the stock of the Washburn and Moen Manufacturing Company for the foundation of a hospital in memory of his two deceased daughters, with the provision that the amounts received from dividends should be added to the fund; and that \$100,000 should be devoted to the hospital, and the rest to a free dispensary for the poor of Worcester. He also gave \$20,000 for the support of the minister at the Mission Chapel, and \$5,000 to its industrial school. These were only a few among his charitable legacies.

Mr. Washburn served in the senate of Massachusetts in 1860 and 1861. He was for many years a director in the Mechanics Bank, and, from its organization, in the First National Bank. He was an active promoter of the erection of the Bay State House, and was a large stockholder in the company which built and owned it. He first suggested the idea of the Mechanics Hall, and gave \$25,000 dollars toward its erection; and he applied \$80,000 to the erection and fitting up of the machine-shop in the Worcester School of Industrial Science.

The Washburn and Moen Manufacturing Company was organized, as has been stated, in 1868; its act of incorporation was granted Feb. 24 of that year. The capital stock authorized was \$1,000,000, which was increased by act of the legislature, May 26, 1869, to \$1,500,000. The original officers were: Ichabod Washburn, President; Philip S. Moen, Vice-President; William E. Rice, Treasurer; and Charles F. Washburn, Secretary. Hon. Charles Washburn was a director — an office which he retained until his death. He received a liberal education, and graduated at Brown University in 1820; began the practice of law in 1824, and soon obtained a high position at the bar; in 1833 was a member of the Maine legislature; removed to Worcester in 1836; was employed by his brother until 1842, when the firm of I. and C. Washburn was formed; and in 1851 was elected a member of the Massachusetts legislature. Mr. Washburn remained actively engaged in business until the organization of the Washburn and Moen Manufacturing Company in 1868, when he

retired from personal participation in it. He died on the 27th of October, 1875, at the age of seventy-seven years.

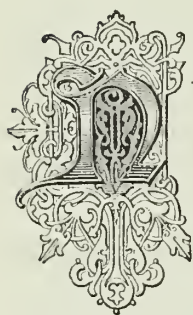
On the death of Ichabod Washburn, the first president of the Company, within less than a year after its organization, Hon. Philip L. Moen was elected to that office. When Mr. Moen was admitted to partnership with Mr. Washburn, in 1850, he brought to the business the mercantile qualifications necessary for the successful prosecution of the business. When Mr. Washburn's health failed, the chief responsibility devolved on Mr. Moen. In his office of president of the company, with the exception of a brief period, he has been throughout its executive head; and, within a few years, there have been added to these duties those of the treasurership.

Charles L. Washburn, the eldest son of Hon. Charles Washburn, attended the Leicester Academy, purposing to enter college; but, ill health preventing, he made a voyage to Europe. He returned home to enter his father's establishment at Quinsigamond. Here he acquired a thorough mercantile training. He became interested in the details and operations of the manufacture, and was elected, at the organization of the company, its secretary, and, later, its vice-president.

Associated with Messrs. Moen and Washburn in the board of directors are John F. Slater, of Norwich, Conn., for many years a leading cotton manufacturer in his own State, and connected by the investment of his capital with several of the representative manufacturing interests of New England; Hon. Francis H. Dewey, of Worcester, Judge of the Superior Court of Massachusetts; and Charles F. Morgan, who was associated, in the mechanical department, with Mr. Washburn, for several years before his death, and is now superintendent of the works. Messrs. Slater and Dewey have, as directors, only an advisory relation; the other three directors manage the business in its general supervision and in the details of its operations.

In the ten years which have elapsed since the company was organized, its facilities have been much extended, the number of its operatives has largely increased, and the amount of product has nearly doubled. Among the specialties of machinery used by the Company may be mentioned the continuous rolling-mill, patented in England, and introduced into the establishment in 1867. This enables them to make, for their own use and for sale, iron rods rolled from bars, heated to a needed degree. From these rods wire of various sizes is drawn, cold. Barbed wire for fencing is also now made; and another patent owned by the Company is that for bale-ties of iron wire, which affords a good substitute for the rope or wood bands formerly used.

## NATHAN WASHBURN.



NATHAN WASHBURN, the projector of several large mills for rolling iron, and patentee and manufacturer of locomotive-tires and car-wheels, was born at Stafford, Conn., on the 22d of April, 1818. His father was a farmer, and at one period had charge of a smelting furnace in South Carolina. Young Nathan alternately worked on the farm and attended school. After his twentieth year he followed carpentering for two years, and then went to work in W. A. Wheeler's iron-foundry, at Worcester. After twelve months' service here he bought out L. C. Armsby, and associated himself with a cousin, Augustus Washburn, who had recently started an iron-foundry at Fitchburg, Mass. He soon evinced his mechanical skill by making, unassisted, a set of gears, both straight and beveled, from his own designs, for a grist and saw-mill at Ashburnham. His partner becoming ill, Mr. Washburn sold out, and, in 1844, returned to Stafford, Conn., where he connected himself with John L. Young, in establishing a foundry. He continued in this enterprise until 1846, in which year he went to Rochester, N. Y., where he made castings for cotton and woolen-machinery, and did a large business with the railroads.

The car-wheels then in use were very defective ; and, after making some experiments, with a view to relieving the wheels from strain, Mr. Washburn invented what is called " Washburn's chilled car-wheel," which he patented in 1849. He claimed for this invention the combination of the arch with the curved plate and arms, connecting the hub and rim, and a new way of disposing the metal so as to produce great strength, and avoid many of the defects to which ordinary wheels are liable when cast whole. The usual methods of cooling the iron, so as to produce the hardness desired, left it liable to crack ; and it was not until after experimenting with charcoal and white sand, that Mr. Washburn discovered a way by which this defect



Van Slyke & Co. Boston.

*A. Washburn*



could be overcome. His patent displaced every other pattern of a car-wheel. Mr. Washburn sold out his business at Rochester, N. Y., prior to the granting of the patent. E. A. Converse, of Stafford, Conn., became interested in the chilled wheel, and it resulted in a partnership, under the style of Converse and Washburn, and their removal to Worcester. Large undertakings were entered into by this new firm besides the manufacture of the Washburn wheel. In 1852 they built the Hope Mills, at Staffordville, Conn., for the manufacture of satinets, and organized a company, in which they were large owners. The same firm built another mill at Stafford Springs, Conn., in 1865, and organized the Converseville Manufacturing Company, in which they were half owners: this mill was also employed in the manufacture of satinets. Besides their works at Worcester, Converse and Washburn built a foundry at Troy, N. Y., for the casting of wheels, and continued to operate it for two or three years, when they sold out. The firm dissolved in 1854, and Mr. Washburn became the sole proprietor of the business.

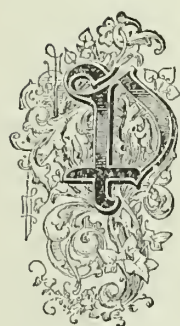
The Schenectady Locomotive Works, of New York, leased their property to Mr. Washburn in 1856; and these he converted into a manufactory for his wheels, doing a large business here for three years. In the same year that he leased the works at Schenectady the increase of his operations demanded more room; and he made arrangements at Brandon, Vt., for the casting of wheels.

In 1857 Mr. Washburn also turned his attention to other wants of railroads in iron equipments; and, to meet them, he built at Worcester, the Washburn Iron Works. They consisted of two rolling-mills, 400 by 125 feet, with a foundry attached, 150 by 60 feet, and other buildings convenient for the work, covering in all about four acres. The works produced about four hundred and fifty tons of iron rails per week. Early in the prosecution of this branch of his business, Mr. Washburn invented a machine for rolling locomotive-tires without boring them out, and received a patent for it in 1858. In 1859 he built other large iron works, intended for similar work, at Toronto, C. W., and designed the machinery for them himself; organized the Toronto Rolling Mills, and received one-quarter of the stock. During the war, the Washburn Iron Works, at Worcester, were for some time devoted to the manufacture of gun-barrels. The English method of rolling the barrels was introduced into the establishment, by which the iron, heated to a white heat in the furnace, is passed through rolls, or constantly decreasing grooves, until it is of proper size, diminishing the cost of their production two-thirds. Gun-iron had been imported from England; but Mr. Washburn discovered a new process of puddling steel, whereby he could produce a gun-iron which was a semi-steel, equal to anything imported. But he was obliged to desist from its manufacture, in consequence of being unable to secure from American mines the necessary quality of pig-iron.

In 1865 Mr. Washburn sold the Washburn Iron Works, at Worcester, and built a foundry for casting his chilled wheels in the vicinity. This building is 200 by 60 feet one way, and 90 by 60 feet the other, and has a capacity of producing one hundred wheels a day. At the same time he entered into partnership with William C. Barnum and other capitalists, for the mining and preparation of iron suitable for commerce and for the manufacture of chilled steel and locomotive tires, holding one-quarter interest. They established blast-furnaces at Canaan, Conn., in 1865, and at Salisbury, Litchfield County, Conn., in 1866, where pig-iron was made. This firm, in 1865, also purchased some iron-works at Spuyten Duyfel, near Yonkers, N. Y., where they manufactured railway iron for two or three years.

In the new works at Worcester, Mr. Washburn put mills of his own design, for the production of his wheels. In 1867 he began to make steel locomotive tires at Worcester; overcame the difficulties in their construction, and was the first to produce a satisfactory steel tire. These have constituted a large part of his manufactures ever since. His experiments in steel for locomotive tires suggested a combination of iron and steel for car-wheels, which he brought to a successful result. The plan was a steel tire with a cast-iron filling. Steel and iron actually unite under the Washburn process, and constitute the best wheel for railroad cars. The chilled wheel never came from the cooling process perfectly round, and this interfered with the speed. The combination wheel is always finished a perfect circle. The chilled wheel is still used; but it will only travel, on an average, thirty thousand miles, while the combination wheel has run four hundred thousand miles. The tires for these wheels have thus far been cast in solid ingot in cheese form, and then have been reheated, punched, and drawn to proper size and shape. But to accomplish the task requires heavy machinery, and large expense in heating. Mr. Washburn is altering his furnaces, doing away with the Seaman Master's furnace for making steel on the open hearth, and substituting a crucible furnace. He has erected at Hartford, Conn., a building 175 by 60 feet, and a machine-shop 50 by 80 feet, where these tires are taken and filled with cast-iron, the two making a perfect union under his process.

## THE WASHINGTON MILLS.



PROMINENT among the establishments in Lawrence devoted chiefly to the fabrication of wool are the Washington Mills, which were originally known as the Bay State Mills, having been established, and long managed, by a company bearing that name.

The Bay State Mills was the second of the manufacturing companies organized in Lawrence. It was incorporated Feb. 2, 1846, with an authorized capital of \$1,800,000. The Company began the erection of their mills in April, 1846, the construction being carried on under the superintendence of Samuel Lawrence, who, during the whole period of its existence, was the treasurer of the corporation. The Company purchased of the Essex Company—the owners of the water-power and canal at Lawrence—eight mill-powers; and additional purchases of water-power were afterward made, as the productive facilities of the mills were enlarged. Manufacturing was begun early in 1848, under the supervision of M. D. Ross, the first agent, with five sets of woolen-machinery; and, during that year, these were increased to thirty.

The original purpose of the Bay State Mills was to manufacture, principally, plain cassimeres and broadcloths; but, on the eve of starting (late in 1847), Mr. Lawrence found the market overstocked with these goods, and that shawls were in great demand. The Company then devoted itself to making shawls, their selling agents, Lawrence, Stone & Co., having sent them a black-and-white Scotch plaid shawl for imitation. The effort to copy this proved entirely successful, and the Bay State shawls soon acquired a reputation. Looms were started, so as to produce several hundred a day; and, as it was found very costly to twist the fringes by hand, Milton Whipple, at Mr. Lawrence's suggestion, and in co-operation with Albert Marshall (a skillful machinist in charge of the repair-shop), invented a machine to do this work. Improved shearing machines in the finishing-room, hydro-extractors

in the dye-house, and important improvements in the carding and spinning-rooms were soon introduced; and the operations of the mill, during 1848 and 1849, rapidly increased. In 1849 a clear profit of \$200,000, mainly in shawls, was made; and during the succeeding years the mills introduced a large variety of novel and popular goods. Among these was the "opera flannel" which gained so wide a distinction, and received its name abroad from the purposes to which it was originally applied. It is a light flannel, highly gigged and finished, and piece-dyed, uniformly, in many fancy colors.

For eight years manufacturing was carried on continuously in these mills; but the crisis of 1857 brought ruin upon the Company. Its property passed into the hands of the creditors, who decided to form a new Company, under the name of the Washington Mills, and continue operations. The gentlemen chiefly concerned in the formation of the new Company, were E. R. Mudge, Ezra A. Bourne and Joseph S. Fay. Mr. Mudge, senior member of the commission firm of E. R. Mudge, Sawyer & Co., and selling agent of these mills, has been a director of the Company, and otherwise prominently connected with it from the beginning. Mr. Bourne was elected its first president; and Mr. Fay was chosen its first treasurer. The charter of incorporation was granted March 27, 1858, and the Company was duly organized on the 30th of December following. The first resident agent was G. V. Fox, who held the position for two years; he was then appointed assistant secretary of the navy, and is now a member of the Boston firm above mentioned.

Operations were commenced in 1859. The productive power of the mills now consisted of a large quantity of machinery for the manufacture of cotton bags, one mill having previously been devoted to the production of this class of goods, and of ninety-six sets of woolen-cards. In this year they brought out a blue flannel coating, indigo and wool dyed, having a three-leaved twill which has a large domestic consumption, and has become an article of export to South America. This fabric is sheared and finished like cloth, but retains the lightness and flexibility of the flannel texture. While acting as a commissioner of the United States at the Exposition of Paris in 1867, the attention of Mr. Mudge was drawn to the fabric on exhibition, created in France, known as worsted coatings. They were made of combed merino wool; and, becoming satisfied that suitable wools from American fleeces could be furnished for these fabrics, he purchased the requisite machinery for combing and spinning the wools, and their manufacture was largely and successfully entered into by the Washington Mills.

Under the management of the present proprietors, important changes in the productive power have been made, and the establishment has been both enlarged and improved. Soon after the organization, the machinery for the manufacture

of bags was removed from the cotton-mill, and improved cotton-machinery was substituted, at a cost of about \$120,000. In 1868 the dye-house, originally a wooden building, was removed, and a brick structure was erected, at an expense of \$60,000. More recently, two steam-engines, one of four hundred and fifty, the other of six hundred horse-power, have been purchased and set up. These engines are of sufficient capacity to drive almost the entire machinery of the mills, and render the Company, in large measure, independent of the water-power.

The boiler capacity has been doubled, the entire number of boilers now in use being twenty-six, of which twenty-two are horizontal tubular, and four upright boilers, of the Corliss pattern. Two hundred fancy woolen-looms have been added to the number before in use; a block of tenements for the overseers has been erected, at an expense of \$60,000; and a fifth block has been added to the three built by the Bay State Mills for the operatives. The worsted-mill, built in 1868, involved, by its erection and supply of machinery, an expenditure of more than \$500,000. In these and other enlargements and improvements, more than \$1,000,000 has been spent.

Excepting the worsted-mill and the dye-house, the mills themselves remain substantially as they were built by Mr. Lawrence. The ground upon which they stand is in the form of a parallelogram, 1000 feet long and 400 wide, lying between the canal and the Merrimac River. Extending the entire length of this parallelogram, on the river side, is a mill 40 feet in width and three stories high, excepting the central portion, which is five stories, with a wing at each end, 240 feet in length and three stories high. Bordering on the canal is a line of buildings 800 by 38 feet, two stories high, used for counting-rooms, wool-sorting and storage. In the central space, between the canal and the river-building, are the three principal mills, each 200 by 48 feet, and eight stories in height, with a basement and attic. In the rear of these mills, and parallel with them, stands the worsted-mill, 200 by 80 feet, and three stories high, containing ten combers and sixty spinning-frames; the dye-house, 233 by 63 feet, and two stories high; and a third building, occupied in part by felting-machinery, and also used for the storage of waste. The mills are provided throughout with an efficient fire apparatus, and are heated by steam. They are lighted by gas, which the Company manufactures from the crude petroleum.

Before its failure, in 1857, the Bay State Mills corporation had purchased of the Essex Company eleven mill-powers. The present proprietors have bought six additional powers, making the present number seventeen. The motive-power is furnished by seven breast-wheels of twenty-six feet diameter. Two of these are placed in each of the principal mills, and one in the river-mill. There are now in the mills seventy sets of cards, four hundred looms for the manufacture of woolen fabrics, and eight hundred and fifty looms for the production of cotton goods.

The variety of fabrics produced in the Washington Mills is very large. The products of the woolen-mills comprise shawls, flannel coatings, beavers, chevots, and many other styles of woollens. In the worsted-mill, coatings of various kinds, for men's use, and ladies' dress-goods in great variety, are produced. In the cotton-mill, which has a capacity of 20,000 spindles, such goods are made as expediency may dictate.

The total value of the product of the mills for 1860, was \$2,000,000. The value of the annual production during more recent years has ranged from \$3,000,000 to \$3,500,000. The yearly consumption of wool exceeds 3,000,000 pounds, while that of cotton is from 1,500 to 2,000 bales; and from 10,000 to 12,000 tons of coal are annually used. About twenty-five hundred operatives are employed. The value of the indigo and other dyes used each year is from \$150,000 to \$200,000; and the aggregate wages of the operatives exceed \$900,000 annually.

In 1862 Mr. Bourne resigned the office of president, and Mr. Fay became his successor. After holding the office two years, the latter resigned, and was succeeded by John A. Blanchard, and he, in 1866, by George R. Minot, who, in 1872, was followed by the present president, Peter S. Homer. The treasurership vacated by Mr. Fay, in 1862, was conferred upon Mr. Joshua Stetson, who held the office until 1868, when he resigned. After an interval of a year, during which Mr. Mudge was the managing director, the present treasurer, Henry F. Coe, was elected. The present board of directors comprises E. R. Mudge, Peter S. Homer, Henry Saltonstall, Charles H. Cotting, Charles W. Freeman, Robert Couch and John A. Blanchard, Jr.





W.P. & W. Co. Railway Car Building,  
Springfield, Mass.



THOMAS W. WASON.



RAILWAYS have been introduced into this country within less than half a century; and their introduction and progress have given rise to many new and thriving industries. Of these, one of the most important is that of the manufacture of passenger and freight-cars; and these are the products of the Wason Manufacturing Company, of Springfield, Mass.

Its founder, Thomas W. Wason, was born in Hancock, N. H., Dec. 28, 1811. He was trained as a carpenter, and worked at this trade until he was thirty years of age. He was then appointed foreman of the repair-shop of the Cabot Manufacturing Company, at Cabotville (now Chicopee), Mass. In 1845 he resolved to engage in business on his own account. He removed to Springfield, Mass., and formed a copartnership for the manufacture of railway-cars, with his brother Charles, who had been employed with him at Cabotville, under the style of T. and C. Wason. They hired a shop near the bank of the Connecticut River, just south of the railroad-bridge, on land now occupied by buildings of the Boston and Albany Railroad. This shop was so small that a single car, when set up, would stand partly in the open air. Their first year's work was the building, for the Connecticut River Railroad, of six single and two double-box freight-cars, and several platform-cars, the amount paid to them being \$4,700. In 1846 they leased land on Liberty Street, and built a brick shop. They remained there two years. In 1848 they hired a part of the large building which had been erected for the Springfield Car and Engine Company. The firm of T. and C. Wason was dissolved in 1851, Charles Wason removing to Cleveland, O., where he established, and still carries on, a large business in railway materials, as well as being concerned in a manufactory of railroad-cars at Chattanooga, Ga.

Mr. T. W. Wason remained alone in business for two years. In 1853 he

received into partnership George C. Fisk, L. O. Hanson and Josiah Bumstead, former *employés*, when the firm became T. W. Wason & Co. In the new concern, Mr. Wason held an interest of one-half. The firm purchased in 1859 the land and buildings occupied by them, and, afterward, adjoining property, until the premises included 155,000 square feet — nearly four acres. Mr. Wason also formed a partnership with Samuel W. Ladd, who had learned iron-founding in the old foundry of Eliphalet Trask, and established a foundry as Wason, Ladd & Co., mainly for casting car-wheels and other work of cast-iron needed in the business of T. W. Wason & Co. In 1863 the business was organized as the Wason Manufacturing Company, Thomas W. Wason being President; George C. Fisk, Treasurer; Henry S. Hyde, Secretary; Levi O. Hanson, Superintendent; and Josiah Bumstead, Assistant Superintendent. The business of Wason, Ladd & Co., was united with that of the Wason Manufacturing Company in 1868. Messrs. Hanson and Bumstead retired the same year, the former taking an interest in the firm of Gilbert, Bush & Co., car-builders at Troy. Other *employés* have since been admitted as members of the corporation, one of whom, Wm. H. Paige, took the place of superintendent, vacated by Mr. Hanson.

On the 21st of August, 1870, Mr. Wason died. The business, since its establishment in 1845, had been steadily progressing. Beginning with \$4,700, it had, in eight years, reached \$100,000; in 1863, \$250,000; and, in ten years more, \$1,470,000. The premises occupied by the Company proving too narrow, it purchased, in 1871, a tract of sixteen acres on the broad meadows near the Connecticut River, on the line of the Connecticut River Railroad, two miles north of the center of the city. The new shops, designed and arranged by Mr. Fisk, the president, are well adapted, both in plan and equipment, for the uses to which they are put. Between the two ranges of buildings runs a transfer-track, terminating in the lumber-yard of the works.

On this track, which consists of three rails, runs a transfer-table, operated by a steam-engine attached to it. This transfer-table takes freight-cars, loaded with material, from the side-track of the Connecticut River Railroad, and moves them to any part of the works; there being at intervals numerous side-tracks at right angles to the main transfer-track, and running into different parts of the shops and yard. This transfer-table is an ingenious device, and saves much labor and expense in handling and moving materials, and in transferring the furnished cars from the shops to the adjoining railroad. It was constructed at an expense of \$10,000, from a plan devised by superintendent Paige.

The foundry is 170 feet long by 62 wide, and 35 feet high. Its capacity of daily work is one hundred car-wheels, and ten tons of other castings. North of the foundry is a shed for foundry supplies, 83 by 33 feet, and one for coal, 80 feet by 40.

The machine-shop is 96 feet by 45, and two stories high, the lower story being devoted to heavy machine-work, and the upper to that of a lighter character. North of the machine-shop is the smithery, 150 feet long, 45 feet wide, and 35 high. It contains a drop-hammer, weighing twelve hundred pounds, and a full equipment of forges and trip-hammers. The passenger-car shop is 117 feet by 75, and is devoted wholly to the construction of the car-bodies, the trucks being set up in an adjoining building 60 feet by 45. Next is a building 200 feet by 62, of two stories, the lower story being filled with wood-working machinery, and the upper devoted to cabinet-work. Adjoining this building is the engine and boiler-house; the capacity of the engine is one hundred and fifty horse-power. The lumber-shed is of two stories, 420 feet by 40. On the south side of the grounds is the paint-shop, 500 feet long, 75 feet wide, and 35 high. In this building thirty-two of the largest passenger-cars can be undergoing decorative work at once. Two other buildings, one of two stories, the other of one, each of them 180 by 42 feet, are devoted to the construction and painting of freight-cars.

A good-sized village has grown up in the vicinity of the works, and has received the name of Brightwood. It has already become the seat of other manufactories besides that of the Wason Company.

On Mr. Wason's death, in 1870, Mr. Fisk became president. George C. Fisk was born March 4, 1831, in Hinsdale, N. H. In 1850 he went West, where he remained several months, and then returned to New England. Going to Springfield in 1852, he entered the employment of Mr. Wason, as book-keeper and cashier. He was soon afterward received into partnership, and took charge of the accounts and finances. On the organization of the Company, in 1863, he was elected treasurer, and in 1869 became vice-president. As president, since 1870, he has had the general charge of the business at the home office.

Henry S. Hyde, the secretary and treasurer of the Company, was born in Mount Hope, N. Y., Aug. 18, 1837. He went, at an early age, to Detroit, Mich., to which place his father removed in 1840, and afterward became prominent in that city, being elected its mayor three terms. Mr. Hyde was educated for the bar, but married Jennie S., daughter of Thomas W. Wason, and became connected with Mr. Wason's business. On the organization of the Company he was elected its secretary, and in 1869 succeeded Mr. Fisk as treasurer. Besides being the financial manager of the Wason Manufacturing Company, he is prominently connected with the general business interests of Springfield, being the president of the Agawam National Bank and of the Springfield Clearing House, and vice-president of the Hampden Savings Bank.

The working staff of the Company, outside of its general officers, are (in 1878) as

follows: William H. Paige, general superintendent of manufacturing; A. C. Reed, foreman of passenger and freight car-body building; A. Nutting, foreman of the cabinet-room; Charles H. Wheeler, foreman of the paint-shops; S. D. Wilson, foreman of the blacksmith's shop; William T. Parker, foreman of the machine-shops; P. O'Connell, foreman of the foundry; T. Goodwin, foreman of the yard; E. C. Pierce and Elisha Childs, decorative painters; Louis C. Hyde, book-keeper; and Charles A. Fisk, purchaser and cashier.

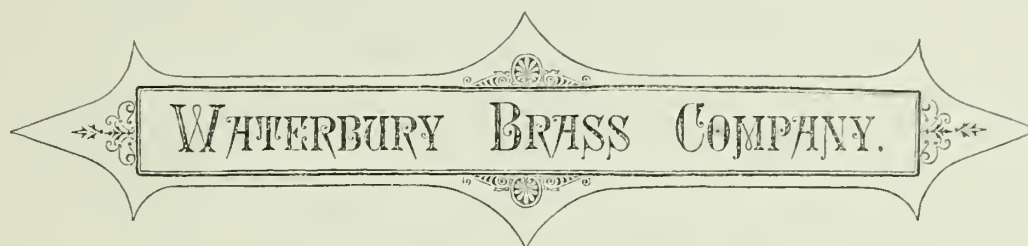
The Wason Manufacturing Company find a demand for their cars from every part of the country and from foreign lands. They recently executed a large contract with Egypt for sixty passenger-cars and one hundred freight-cars, and for the royal car of the Khedive. Notwithstanding the general depression of business, the Company is able to keep its works in full operation. It has now, in active employment, over four hundred skilled workmen, and is building eight passenger-cars per week.



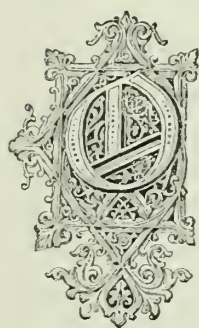


Van Dyck & Co. Boston

*John P. Elton*



### JOHN P. ELTON.



ONE of the most active and prominent manufacturers of Waterbury was John P. Elton. To him was due, in no small measure, the progress of the town as a manufacturing center, and he was one of the most efficient promoters, for many years, of its industrial interests.

Mr. Elton was born in Watertown, Conn., April 24, 1809, and was the son of Dr. Samuel Elton, who was of the third generation of physicians resident in Watertown, his grandfather, Dr. James Elton, and his father, Dr. John Elton, having preceded him in successful practice. The latter died at the age of forty-five years, and was succeeded by his son Samuel, who, at the age of eighteen, began a long and prosperous career of sixty years, as a physician. He was a man of more than ordinary ability, judgment and integrity. Dr. Elton acquired what was considered, in his time, a large property, and died in 1858, at the age of seventy-eight.

Of his eight children, six died in childhood or early youth. His daughter, Lucy, married Frederick Parker, of New Haven, Conn., and died at the age of thirty. His son, the subject of this sketch, attended the district school of his native town, and when about fifteen years of age went to the Academy at Farmington, Conn. He afterwards worked for some years on his father's farm; and in March, 1832, repaired to Waterbury, and became an active partner in the firm of Holmes and Hotchkiss, which had begun, the previous year, the rolling of sheet brass for the market.

The active partners of the firm at the beginning were Israel Holmes, Horace Hotchkiss, Philo Brown, and James P. Sommers; and the special partners were James Brown, Edward Field, Solomon B. Miner and Preserved W. Carter, each of these partners having contributed to the capital stock \$1000, making it in all \$8000.

Mr. Elton, on entering the firm, also contributed \$1000. Additional subscriptions in cash were made at different times prior to 1838, to the amount of \$3000, of which Mr. Elton contributed \$500, the whole capital at that time being \$12,000. Mr. Elton had been inured to hard work by his experience of several years on a farm, and at once entered the mill; and, although without previous mechanical experience or training, he engaged in personal labor, resolved to become a master of the details of the brass manufacture. He applied himself with energy to his work; and, although he was one of the firm, and resided in the center of the town, it was his practice for some years, to walk to and from the mills, which were two miles distant, arriving in the morning with or before the operatives, and remaining at work at least through the full hours of labor.

In January, 1833, the firm began the manufacture of brass wire, being the pioneers in this country of that important branch of the brass industry. In the same month Mr. Sommers sold his stock, in equal shares, to Philo Brown and Mr. Elton, and retired from the concern. Messrs. Brown and Elton had been until this time special partners, receiving wages for their labor; but on the 30th of January, 1833, they became general or active partners, and the style of the firm was changed to Holmes, Hotchkiss, Brown and Elton. On the 30th of January, 1834, Israel Holmes also retired from active connection with the firm, selling his stock to the same parties in the proportion of three-fourths to Mr. Elton and one-fourth to Mr. Brown. Mr. Holmes removed to Wolcottville, Conn., where, with John Hungerford and Israel Coe, previously of the firm of Benedict and Coe, of Waterbury, he engaged in starting the mill of the Wolcottville Brass Company, which was succeeded in 1863 by the Coe Brass Manufacturing Company.

In 1836 the company began to make brass and copper tubing, which, though attended at first with much difficulty, soon became an important and profitable branch of the business.

The style of the firm remained unchanged, the name of Mr. Holmes having been retained after his retirement from it till the 1st of January, 1837. It then became Hotchkiss, Brown and Elton. On the 1st of January, 1838, Horace Hotchkiss sold his interest in the firm, the style of which was again changed to Brown and Elton. The capital of the firm was at this time \$40,000, all of which had been earned, except the \$12,000 which had been subscribed and paid in as cash. Brown and Elton in April, 1842, purchased an interest of one-third in the firm of Slocum, Jillson & Co., manufacturers of pins, at Poughkeepsie, N. Y. As will appear in the sketch of the American Pin Company, in our record of Philo Brown, Mr. Slocum was the pioneer in the manufacture of solid-headed pins in this country, having himself devised the machinery for this purpose, and commenced their manufacture at Bristol, R. I.

Mr. Slocum removed, about July 1, 1838, to Poughkeepsie, N. Y., and established the manufacture there. John I. Howe had, two years previously, commenced in New York City the manufacture, by machinery of his own invention, of the old style of coil-headed pins, and introduced the successful manufacture, by machinery, of pins of that style; but he was anticipated by Mr. Slocum in making solid-headed pins, which, very soon after their introduction into the market, entirely superseded the coil-headed pins. Mr. Howe's first patent for a machine to make solid-headed pins was issued March 24, 1841. He had visited Mr. Slocum's factory at Poughkeepsie, soon after the production of the solid-headed pins. The machine by which they were made had not been protected by a patent, and Mr. Slocum freely showed its operation and results to his competitor. While much credit, however, is due to Mr. Howe for his ingenuity and perseverance, through years of difficulty, in developing what has become an important branch of industry, at least an equal tribute should be given to Mr. Slocum, as the pioneer in the present style of manufacture.

In this establishment, as we have said, Messrs. Brown and Elton purchased an interest in 1842. In September, 1843, they purchased the pin-making business of M. Fowler and Sons, at Northford, Conn., and transferred the machinery to their own mill at Waterbury. Three years later, the American Pin Company was organized by members of the firm of Brown and Elton and gentlemen interested in the Benedict and Burnham Manufacturing Company, one-half of the stock being owned by men interested in each concern. The capital stock was fixed at \$50,000. At the annual meeting in January ensuing, Nelson Hall was elected secretary and treasurer, with the executive management of the business. These offices he held till Dec. 24, 1866, when he was succeeded by Theodore J. Driggs, the present incumbent.

At the time of the organization of the Company, the erection of new buildings was at once begun; and on their completion, the pin machinery at Brown and Elton's mill and that of Slocum, Jillson & Co., at Poughkeepsie, the property and business of which firm had been purchased by the Company, were removed to the new factory. At the annual meeting of 1850, the capital stock was increased to \$100,000. In February, 1848, the American Pin Company and the Howe Manufacturing Company, at Birmingham, which had been the leading concerns in this enterprise, and between which there had been a sharp competition, entered into an arrangement for combining their sales. The American Company had, at first, sixty per cent, and the Howe Company forty per cent, of the profits. These proportions have since been changed respectively to fifty-five and forty-five per cent.

In 1845 the brass industry had made such progress, and the companies engaged

in it had reaped such large profits, that it was decided to start a new enterprise; and Timothy Porter, who owned an unoccupied mill privilege on Mad River, a quarter of a mile above the mills of Brown and Elton, tried to interest several gentlemen to take stock in a new company for the brass manufacture. One of these gentlemen was Hobart V. Welton, who refused to engage in the enterprise unless he was permitted to state the proposed scheme to Mr. Elton, and secure his aid. The latter not only approved, but at once took a leading part in promoting it. He laid the matter before his partner, Philo Brown, and they resolved to head the subscription to the capital stock, and to issue the call for a meeting of the subscribers to organize the Company.

Their action gave solidity and assurance to the movement; and on April 1, 1845, the meeting for organization was held, and the new company took the name of the Waterbury Brass Company. Israel Holmes, Philo Brown, John P. Elton, Julius Perry, Hobart V. Welton and Timothy Porter were chosen Directors. Israel Holmes was elected President, Solomon B. Miner, Secretary, and Timothy Porter, Treasurer. The capital stock was \$40,000. The erection of the mill was commenced without delay, and was completed so that brass was first rolled in it on Feb. 9, 1846. At the time of its completion, this was the largest brass-mill in the country. At the annual meeting, held early in the same year, the capital stock was increased to \$50,000, and Lyman W. Coe was elected secretary and treasurer. The capital stock was still further increased, at the annual meeting in 1848, to \$78,000; in 1850, to \$104,000; in 1852, to \$208,000; and in 1853, to \$250,000. In 1852, the manufacturing capacity of the company was increased by the erection of new factory buildings, now known as the West Mills, at which the office of the company has, since that time, been located. At the annual meeting in February, 1853, Mr. Holmes resigned the office of president, and was succeeded by Lyman W. Coe, who was at the same time succeeded in his offices of secretary and treasurer by his brother, Russell A. Coe. Both of these gentlemen resigned their respective offices on the 31st of October, 1855, and John P. Elton was elected president, and Lyman W. Coe secretary and treasurer. The capital stock was increased in 1857 to \$300,000. Mr. Coe resigned the office of secretary on April 28, 1862, and was succeeded by Phineas F. Parsons; and on the first of May, 1863, he also resigned the office of treasurer, in which he was succeeded by Calvin H. Carter. James S. Elton was elected secretary, in place of Mr. Parsons, in May, 1864, and on the 25th of January, 1865, Calvin H. Carter was elected president, to fill the vacancy caused by the death of John P. Elton, in the previous November.

At the annual meeting in 1865, the capital stock was increased to its present sum of \$400,000; and on the 20th of March of the same year, the American Flask and Cap Company was consolidated with the Waterbury Brass Company.



Van Hook & Co. Boston.

# WATERBURY BRASS COMPANY.

WATERBURY CONN.



The American Flask and Cap Company was formed in 1857, by the union of the American Flask Company of Meriden, Conn., and the Walter Hicks Percussion Cap Company, of Haverstraw, N. Y. Its capital stock was \$125,000; and on its formation, by the union of the two companies named, it purchased the property of the Manhan Manufacturing Company, consisting of a large stone factory and other buildings contiguous to the West Mills of the Waterbury Brass Company; at the same time the machinery was removed from Meriden and Haverstraw. The Manhan Company had been engaged, but not successfully, in the manufacture of woolen goods. When the two companies were consolidated, most of the stockholders of the American Flask and Cap Company were also owners in the Waterbury Brass Company. Abram Ives, the president of the former, and a director in the latter concern, was elected president of the consolidated company; Calvin H. Carter remaining its treasurer.

In 1867, Mr. Ives sold his stock, and Mr. Carter was elected president, and James S. Elton, treasurer. At the next annual meeting, in 1868, Mr. Elton resigned the office of secretary, and Edward D. Steele was elected. Two years after, Joseph C. Welton was elected president in place of C. H. Carter, who declined a re-election, and on the death of Mr. Welton, James S. Elton was elected.

Besides holding this responsible position as the head and executive manager of the Waterbury Brass Company, Mr. Elton is president of the Blake and Johnson Company, of Waterbury, a director in the Waterbury Bank, and in the Wheeler and Wilson Manufacturing Company, and, though yet a young man, is noted for his prudence and energy.

His associates in the management of the company are also young men. Mr. Steele entered the East Mill when a lad, and continued there till he became its foreman. He was then book-keeper in the office of the company, and for several years was a traveling salesman. He was appointed secretary in 1868, and treasurer in 1870. The latter office he still holds. Mr. Hill entered the employ of the American Flask and Cap Company when eighteen years of age, and was afterwards appointed its secretary, which office he held at the time of the consolidation of that company with the Waterbury Brass Company. On the election of Mr. Steele as treasurer, he was elected secretary, and now holds the office.

The history of the Waterbury Brass Company has been one of marked success. Its capital stock of \$400,000, with a large surplus, has been earned, with the exception of the \$40,000 of the original capital, and \$10,000 of additional capital, subscribed ten months after the organization of the company. Large dividends have also been made, and the company has acquired a substantial reputation in the Naugatuck valley.

Mr. Elton's active connection with the firm of Brown and Elton was terminated

early in 1850. Other business interests and his impaired health were the reasons for his wish to be relieved from the immediate personal responsibility which his previous relation to the firm devolved upon him. Its business was continued under the charge of its senior partner, Philo Brown, until 1856, under the same firm style, and on the same premises, Mr. Elton still retaining his pecuniary interest. It was then removed to the mills which Mr. Brown with his brothers had established in 1851, under the style of Brown and Brothers. Mr. Elton was not afterwards actively engaged in manufacturing, but gave much time to the various corporations, manufacturing and financial, in which he had invested capital, and held the position of director or president. In December, 1850, on the death of Judge Bennet Bronson, who had been president of the Waterbury Bank from its organization, Mr. Elton, a director during the same period, was elected to that office, and held it to the time of his decease.

The firm of Brown and Elton was dissolved in 1856; and on the 1st of September of that year, Mr. Elton and Abram Ives, who had been associated with him in the old firm, purchased an interest of four hundred shares each, in Holmes, Booth and Haydens. Messrs. Elton and Ives owned, together, one-fourth of the stock which had been held in the interest of Brown and Elton. This one-fourth interest has since been held in the interest of Holmes, Booth and Haydens, giving to that company the right to furnish one-fourth of the wire needed as supply for the American Pin Company. On the organization of the Wheeler and Wilson Manufacturing Company, at Watertown, Mr. Elton's native town, in 1854, he subscribed for some of the stock, but disposed of it on the removal of the manufactory to Bridgeport, his desire being to invest his capital so as to aid in developing the industry of the city with the interests of which he had identified himself in his early years.

Mr. Elton, in 1858, opened an office, and engaged in private banking, under the style of the Elton Loan and Trust Office. This business was organized after his death as a joint-stock company, with a capital of \$100,000, under the style of the Elton Banking Company. His son, James S. Elton, was president, and his son-in-law, Chandler N. Wayland, cashier. These, with Augustus S. Chase, were the directors.

The business was the receiving of deposits, on which interest was allowed. The funds were invested only in substantial securities, mainly in manufacturing stocks in the immediate vicinity, and in United States Bonds. That the management was judicious and successful was shown by the fact that when it was decided, early in 1877, to close up the concern, after having paid reasonable dividends from year to year, its managers were able, within sixty days, to pay off all the depositors, and to distribute the capital with a surplus of fifty per cent to the stockholders.

Mr. Elton was married, in 1835, to Olive M., daughter of Capt. Moses Hall, of

Waterbury. Of their children, two sons, Charles P. and John M., died, the former at five years of age, and the latter at seventeen. The surviving children are Lucy E., born April 16, 1837, and married to Chandler N. Wayland, of Waterbury, and James S., born Nov. 7, 1838. The latter has succeeded his father in many of the business interests in which he was concerned.

In early manhood Mr. Elton was blessed with a vigorous constitution, and was capable of, and for many years performed, a large amount of physical and mental labor in connection with the rapid progress of the enterprises in which he was engaged. He was, however, twice prostrated by severe attacks of rheumatism, the effect of which partially incapacitated him from continuous labor. His last illness lasted but ten days, and he died in the prime of life, on the tenth day of November, 1864, aged fifty-five years.

He was deeply interested in public affairs. A whig in his party connections, he was elected to the General Assembly of Connecticut, in 1840, 1849 and 1851. On the formation of the Republican party he became one of its active adherents, and as such was again elected to the General Assembly in 1863. At the general election of 1864, he was a presidential elector, and in this capacity voted for Abraham Lincoln's re-election two days before his death. He was characterized by large public spirit, and heartily co-operated in any enterprise of interest or benefit to the city. He was a member of the St. John's Church, and during his life contributed liberally to all its expenses and charities. On his death a public meeting of citizens was called, to pay a tribute of respect to his memory. On the day of his funeral, which occurred at the time of the regular Sunday service, by a common impulse all the Protestant churches of the city were closed, to give the members of their congregations the opportunity to attend it.

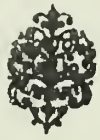
## JOHN WATERMAN — JOHN O. WATERMAN.



EW of those who were connected with the cotton industry at the period when machinery, operated by water-power, for the manufacture of cotton, was introduced into this country, are now living. Among the few survivors of whom this may be said is John Waterman, now residing at Johnston, R. I., who was operating a cotton-factory, on his own account, in the first ten years of this century. His grandfather was John Waterman, who, early in the last century, resided at Olneyville, about two miles from Providence. Richard Waterman, the first of the name in this country, came hither with Higginson, in 1629, and settled at first in Salem. Sympathizing with Roger Williams, he went with him to Providence, and settled on the east side of Narragansett Bay, on land now included in Warwick. He had three sons, Nathaniel, Joseph and Resolved. The latter married Mercy, daughter of Roger Williams. They had five children, Richard, John, Resolved, Mary and Waite. The second son, John, married Anne Olney, daughter of Thomas Olney. Their children were three sons—John, Benoni and Resolved—and six daughters. The eldest of these three was probably the grandfather of John Waterman, of Johnston, and great-grandfather of John O. Waterman, of Warren. The date of the elder John Waterman's birth was about 1700. He was, in early manhood, a seaman and master of a vessel; but having a taste for mechanical pursuits, he soon engaged in manufacturing. He operated a mill for fulling and finishing woolen cloth, and a chocolate mill, and erected a paper-mill, probably the first in Rhode Island, and one of the earliest in New England. In 1769 he purchased a press and types, and also engaged in printing and publishing. He died in 1787, leaving one son and three daughters. His son, John Olney, born in 1760, owned and occupied the homestead estate, and succeeded to his father's business. He married Sally Franklin, daughter of Asa Franklin, of Providence, by whom he had four sons and two daughters. He died in 1796.



The Curtis & Co. Boston



*Jos Waterman*



His eldest son, John Waterman, the subject of this memoir, was born in 1786, and was, at the death of his father, but ten years of age. Having served the full term of apprenticeship with a house-carpenter, named Williams, of Providence, and working a few months at that trade, he entered the employment of his uncle, Henry P. Franklin, the agent of the Union Mills, intending to fit himself for the business of cotton manufacturing. He went into the machine-shop, in which, besides the ordinary repairs of machinery, the building of new machines was carried on. Having acquired skill in this department, he was employed in the regular routine of manufacturing. During these years, which were really those of additional apprenticeship, he worked for very low wages. Having become an expert, both as a worker in wood and iron and in building and running machinery, he contracted, in 1808, to run a cotton-mill at Canton, Mass., for its owner, Richard Wheatley, a wholesale merchant in Boston, who agreed to furnish the material and take the goods, paying a certain price per yard for manufacturing. Mr. Waterman's partner was Daniel Wilde, who had worked with him at the Union Mill. Connected with the factory was a machine-shop, in which they not only did their repairs, but built machinery for their own use, and for others. The chief responsibility of the business rested on Mr. Waterman, and it was managed with economy and efficiency. The partnership was dissolved at the end of three years, and they divided profits. Mr. Waterman then hired a room and power, and engaged in the manufacture of cotton-machinery, continuing in the business about six months.

Early in 1812 his uncle, Mr. Franklin, proposed that they should engage together in a new manufacturing enterprise, at Olneyville. Mr. Franklin then owned one half of a mill-privilege, the other half of which, with the land adjacent, belonged to Stephen Williams. Mr. Waterman had married Sally, daughter of Mr. Williams, who was a lineal descendant of Roger Williams. Mr. Waterman now purchased from his father-in-law his interest in the privilege, with land sufficient for the purposes of the factory. The vicinity was but sparsely settled, and the proposed site of the factory was covered with woods, which were now cut away; and the foundations of the factory were laid. The mill, 100 feet long by 40 feet wide, was finished and put in operation the same year, having a capacity of 1500 spindles. Mr. Franklin became the financial manager, and Mr. Waterman the manufacturing agent. The factory, to which the name of Merino Mill was given, by Mr. Franklin, was run about seven years by Messrs. Franklin and Waterman; at the end of which time the accounts showed that the capital invested by the latter had been sunk. He was now forced to look elsewhere for business. The Union Mills, in which he had learned his trade as a practical manufacturer, was then owned mainly by Brown and Ives, and had for some time been run at a loss; and Mr. Waterman hired it on a

lease for three years, with the privilege of a fourth year. Having obtained a credit of \$20,000 from Pitcher and Gay, of Pawtucket, he fitted the mill with new machinery. He ran the mill for the whole term of four years, and so profitably, that, at the end of that time, he had much more than paid off all his indebtedness.

His lease having expired, Mr. Waterman became the resident agent of the mills of the Blackstone Manufacturing Company,—of which Brown and Ives were the largest stockholders,—and he moved to Blackstone. His agency of three years was successful, and the business of the mills was made profitable. He was then compelled, by ill health, to go South. He went to New Orleans, the Blackstone Company continuing his salary, while he did what business he could for them in the sale of goods and the purchase of cotton. Regaining his health, he returned for awhile to Providence. The Company desired him to resume his agency at Blackstone; but he had made arrangements for a permanent business at New Orleans; and this he carried on for ten years, selling goods, and purchasing cotton on commission for the Blackstone Company and for other Northern manufacturers. In this business he had as a partner, for some years, Hon. Thomas M. Burgess, afterward, from 1840 to 1852, mayor of Providence.

In 1829 Mr. Waterman, with others, began the erection of the Eagle Mills, at Olneyville, which were completed in 1837, and were operated by the firm of John Waterman & Co. Meeting, in one of his voyages from New Orleans, with Captain George Wheaton, of Warren, R. I., he proposed to him to start a cotton-factory at Warren; and this purpose was carried out, establishing the Warren Manufacturing Company. Since that period, the elder Waterman has had no connection with manufacturing, but has resided on his farm, in Johnston; where, at the date of this publication, he is still living, at the advanced age of ninety-three years.

John O. Waterman, the eldest son of John and Sally Waterman, was born in Canton, Mass., Nov. 4, 1810. When about twelve years of age, he commenced work in the Union Mill, Johnston, R. I., and was afterward employed at Blackstone, Mass., thus early acquiring skill as a practical manufacturer. He continued through youth and early manhood to be engaged in various branches of the industry, until he was appointed agent of the Eagle Mills, at Olneyville. In 1848 he became agent and treasurer of the Warren Manufacturing Company, which had been incorporated in 1847. During his administration of nearly thirty years as agent and treasurer, he has increased the capacity of the three mills to about 58,000 spindles. Mr. Waterman has been from the first a large stockholder, and has acquired a substantial property. He moved to Warren when a young man, and, in 1847, was elected a member of the common council of that city.



Van, Rye & Co. Boston

*L. W. Atkinson*





JAMES S. ATWOOD.



COMPARED with the machinery now used in the cotton manufacture, that of the first half-century of this industry was very crude. At that time, also, the managers and superintendents of mills were far from being as skilled in the mechanic arts and in the details of business as it is necessary for them to be now. The management of cotton, as of other factories, has been reduced to a science; and the successful managers and agents of the present day are trained men, experienced in details as well as principles, and possessing business tact as well as technical knowledge.

Among those who have attained prominence in the capacity of management is James S. Atwood, resident agent of the Wauregan and Ponemah Mills. His father, John Atwood, was born in Scituate, R. I., Feb. 16, 1805. The son of a farmer, he worked on his father's farm through childhood and youth; and just before attaining his majority he went to Fall River, then Troy, Mass., to learn the trade of a machinist. Having become expert, he went to work in a cotton-mill, in North Scituate, R. I., repairing machinery. He was afterward employed in the same capacity in a cotton-factory at East Haddam, Conn. Here he was soon transferred to the weaving-room, of which he was appointed overseer. He removed thence to Killingly, Conn., where Caleb Williams, of Providence, had erected a factory, giving his name to the village, which is still known as Williamsville. In this factory, also, Mr. Atwood was overseer of the weaving. In 1836 he went to Rhodesville, in the town of Pomfret, now included in the town of Putnam, and took charge, as superintendent, of a factory there. In this position he succeeded Gen. Charles T. James, afterward of Providence, and United States Senator from 1851 to 1857. Remaining at Rhodesville a year, he then returned to Williamsville. During his absence Caleb Williams had died, and the property had passed into the hands of Edward S. Williams, his son. A partnership was soon formed by Mr. Williams and Mr. Atwood,

under the style of E. S. Williams and Co., Mr. Atwood being the manufacturing agent. He gave up the agency, on account of ill-health, in 1846, and returned to Scituate. Two years later he returned to Williamsville, and resumed the agency. The number of spindles had now been increased to 6,000. In the next year, 1849, the Williamsville Manufacturing Company was organized, the parties forming it being E. S. Williams, Stephen W. Foster, of Providence, and Mr. Atwood. The latter became the resident agent, continuing in the office until his death, which occurred on July 31, 1865. A marked feature of his management was his close attention to the details of the work in every part of the mill. He was succeeded as resident agent by his second son, William A. Atwood, who was born in 1833. William had been brought up under his father's instruction, and had been for several years his assistant. He has managed the business with ability. The mill has been considerably enlarged, and has now a capacity of 28,000 spindles.

James S. Atwood, the eldest son of John Atwood, was born at Scituate, R. I., March 17, 1832. His father soon removing to Williamsville, Conn., James remained there until he was eleven years of age, when he was sent to the academy at South Woodstock, Conn., and afterward to the Smithville Seminary, at Scituate, R. I. In 1847 he went into the factory store, at Williamsville, as a clerk. The next year he returned to Scituate, and again attended the Smithville Seminary. On the organization of the Williamsville Manufacturing Company, in 1849, he again entered the factory store. At this time the mill was thoroughly remodeled, and new machinery was placed in it, under the supervision of David Whitman. Mr. Whitman, while thus engaged at Williamsville, prepared his well-known tables for the use of cotton manufacturers. These tables, consisting in part of long rows of figures, involved much labor and calculation. This work was efficiently performed, under Mr. Whitman, by James Atwood. In 1849, that he might become familiar with every department of the manufacture, Mr. Atwood entered the mill as an operative, working in turn at every process. He was then employed for about five years to take the place of any absent or otherwise-engaged person, whether operative or overseer, in any part of the mill. He thus became expert in every stage of the manufacture.

In 1853 the Wauregan Company was chartered, and Moses B. Lockwood, Calvin Spencer and Orray Taft were the incorporators. The next year the mill was started, with a capacity of 10,000 spindles. Moses B. Lockwood was chosen treasurer, and Amos D. Lockwood, agent, of the Quinebaug Mill, and, living at Danielsonville, was also chosen agent of the Wauregan Mill. Mr. Atwood, then twenty-two years of age, was appointed superintendent, and took charge of putting in the machinery and starting the mill. The building then erected was the northern

half of the front mill, and is now known as Mill No. 1. The Quinebaug River at this point has a fall of sixteen feet, and furnishes power to the capacity of 60,000 spindles. In 1858 Messrs. M. B. and A. D. Lockwood sold their interest in the stock; Orray Taft & Co. purchased stock additional to that previously owned by them, and became the financial agents; and Mr. Atwood was appointed resident agent. The business became so prosperous that the next year the remainder of the front structure, now Mill No. 2, was built, and machinery to the capacity of 12,000 spindles was added. In 1866-7 the rear building, comprising Mills Nos. 3 and 4, was erected, as was also the structure connecting the front and rear buildings; at the same time the number of spindles was increased to 56,000. The new mills were started on Jan. 1, 1868.

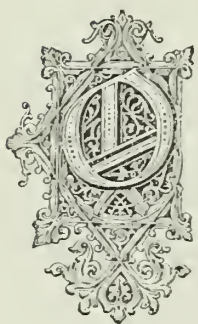
Before the death of Orray Taft, which occurred in 1865, his son, Edward P. Taft, who had been a member of the firm of Orray Taft & Co. since 1858, had assumed the active financial management of the Wauregan Mills, which he still retains. The Wauregan Company has been very successful; the capacity of its mills has been increased, while under its present management, nearly sixfold; and the stock, which, in the spring of 1858, was at fifty per cent discount, has been brought up to one hundred per cent above its par value.

The only incident of disaster occurred April 1, 1876, when, in the great freshet which swept away so many dams in central Massachusetts and eastern Connecticut, its dam was carried away. It was at once repaired, at an expense of thirty thousand dollars; the rolling-way, which had been two hundred feet in width, was increased to three hundred and fifty feet; and every other provision which engineering skill and the ample means of the Company could secure was made, to prevent a recurrence of the accident. The power is furnished by four turbine wheels, having an aggregate of eight hundred and fifty horse-power, and by an auxiliary steam-engine of two hundred and fifty horse-power.

Mr. Atwood's practical skill and devotion to the interests under his charge have proved him to be a thorough mechanic and a competent practical manufacturer.

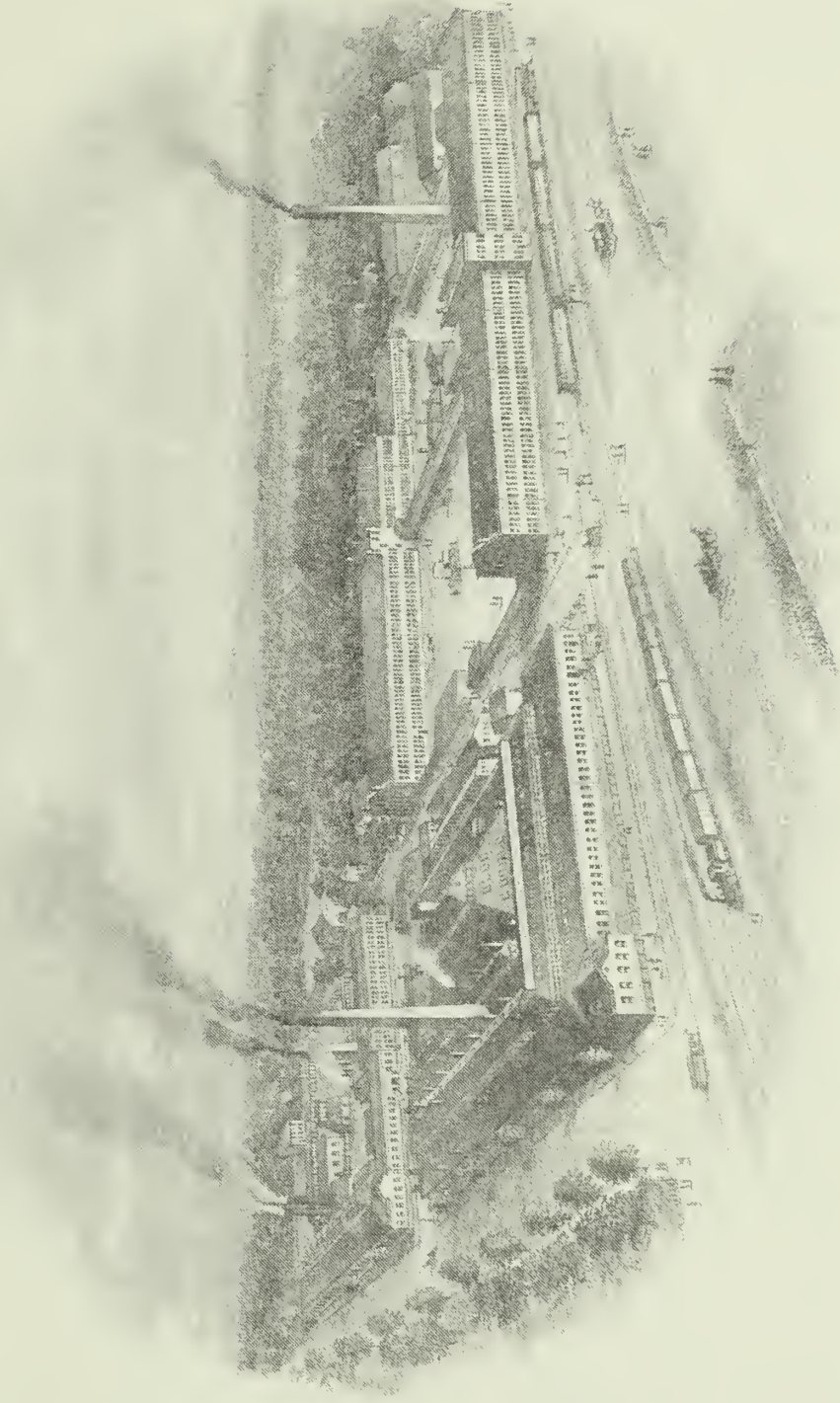


NATHANIEL WHEELER — ALLEN B. WILSON.



IF the numerous inventions which have benefited mankind, a few stand out in especial prominence. Such was the invention of movable types and the printing-press; of the steam-engine, and its application to machinery, and to transportation by water or on land; of the magnetic telegraph; of the machinery which supplanted the hand-card, the spinning-wheel and the hand-loom, and so greatly diminished the drudgery of domestic labor. With the latter may be classed the invention of a practical sewing-machine, adapted alike to family and to manufacturing purposes. The need and the possibility of such a machine presented themselves early in this century to many mechanics; and, between 1830 and 1850, several patents for sewing-machines were granted in England and in the United States. No one of these patents, however, fully covered a practical and useful sewing-machine. The first patent for such a machine was granted Nov. 12, 1850, to Allen B. Wilson, of Pittsfield, Mass.

Allen B. Wilson was born in the obscure town of Willett, Cortlandt Co., N. Y., Oct. 18, 1824. His father was a mill-wright, and was killed by an accident which occurred while he was putting in a water-wheel. He left a wife and three young children, two of them being girls. Mrs. Wilson, a self-reliant woman, managed to keep her little family together until they were able to do something toward earning their own livelihood. Allen was indentured, at eleven years of age, as an apprentice to a neighboring farmer, who was also a carpenter, with whom he remained about a year. From that time until he was sixteen years of age, he worked on farms; using his leisure time, however, in taking advantage of the opportunity offered him in a neighboring blacksmith's shop, to study mechanics. In this shop he forged various tools for his own use. When fifteen years of age he built a small work-shop, in which he made and put up a lathe for turning wood, and constructed water-wheels



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and saw-mills, which he set in operation at the little water-falls of a neighboring mountain stream. He also made apple-parers, and other useful or amusing contrivances. At sixteen he was apprenticed to a distant relative, a cabinet-maker, residing at Cincinnatus, in the same county. His industry and mechanical aptitude soon made him a superior workman. He was sent with a team, on one occasion, to a neighboring town. A delay of several hours enabled him to drive to Aurora, eighteen miles away, where he wished to examine a steam-engine, the first he had ever seen. It was in a small steamboat, which plied on Cayuga Lake. His employer found fault with this action; and so young Wilson, packing up his worldly effects, started to seek a new field of labor. He obtained work at his trade, and continued at it until early in 1847, at which time he was at Adrian, Mich., in the capacity of a journeyman. He then conceived the idea of a sewing-machine, never having heard of one, and settled in his own mind the devices and adjustments to accomplish the various processes, and the arrangement of the several parts. But he did not then do anything toward the completion of his design.

As has been said, attempts had already been made to devise such a machine. The earliest sewing-machine of which there is record is that of Thomas Saint, patented in England, in 1790. It had an overhanging arm, on the end of which was a vertically reciprocating straight needle. Instead of the eye there was a notch near the point, by which the thread, drawn, as in modern machines, continuously from a spool, was pushed down through the cloth, forming a loop. Through this the needle, in its next descent, carried down another loop, forming a chain-stitch, essentially the same as in a large class of modern machines. The feed device was a box, on which the cloth was laid, the box being propelled between slides by a screw until a seam equal to the length of the box was sewed. The box was then drawn back, and another length of cloth laid upon it. Saint's machine was not introduced into practical use. In 1830 Bartholemy Thimonnier patented, in France, a machine in which a chain-stitch was formed on the surface of the cloth, the needle being barbed near the point. Passing down through the cloth, it engaged with the thread fed from a spool on the under side of the cloth, and drew it up, laying a loop on the surface; then, passing down again, it drew up another length of thread through the previous loop, to form a second loop. The feed was by hand. Thimonnier had, in 1841, eighty of these machines at work in Paris, on army clothing. Like the loom of Jacquard and the spinning-jenny of Hargreaves, they were destroyed by a mob; but, in 1848, Thimonnier had another set of machines at work in Paris, sewing and embroidering any material, from fine muslin to leather; but these also were destroyed, and their enterprising inventor gave up in despair. This machine of Thimonnier, was, so far as is known, the only sewing-machine before that of Wheeler

and Wilson introduced into practical and continuous use; but it did not meet the demand, either for domestic or manufacturing purposes, because of two fatal defects: first, it made only the chain-stitch; and, secondly, the cloth being moved along by hand, it required great steadiness of hand and closeness of attention to make a stitch that would be at all uniform.

In 1841 Newton and Archbold secured a patent, in England, for a sewing-machine, the main point of difference from Saint's, of 1790, being that, in place of the notch, the needle had an eye near the point, and was essentially identical with the needle now in universal use. About 1832 Walter Hunt, of New York made a sewing-machine which embraced as its features a curved, eye-pointed needle at the end of a vibrating arm, and a shuttle making the lock-stitch. Mr. Hunt was an ingenious man, but he did not perfect his sewing-machine. In 1854, after the sewing-machine with his own device, in the hands of Singer and others, had become a success, he applied for a patent, with abundant proofs of his claim that he had used both the eye-pointed needle and the shuttle some ten years before.

Elias Howe, Jr., began his experiments in 1843. In May, 1845, he had a machine at work which was patented Sept. 10, 1846. The features of his invention, which have since been used in sewing-machines, were the curved eye-pointed needle at the end of a vibrating arm, and the shuttle making a lock-stitch. They were, it is presumed, original with him; yet, as has been shown, they were not novel. The only really new feature of Howe's machine was his feed-motion. It consisted of a horizontal baster-plate about a foot long, with holes, engaged by the teeth of a small pinion having an intermittent motion. On its edge was a row of pins, on which the two layers of cloth to be seamed together were hung, the edges of which were just enough above the plate to be pierced by the needle. The needle had a horizontal motion, which was not an improvement on that of Saint, in 1790, and has not been adopted in any of the later successful machines. When a seam, equal in length to that of the baster-plate, has been sewed, the plate must be run back, and a new length of cloth attached to it. This was, in itself, a clumsy and awkward device; and, in addition to the liability of injury to the cloth from the holes made by the needle-points, and the delay in affixing the successive lengths of the cloth to the plate, there was the fatal objection that only straight seams could be sewed. John Bachelder, of Boston, Mass., patented, May 8, 1849, an improvement on this baster-plate, consisting of a wheel, or endless belt, with points along its edge. This was liable, however, to the same objection as the plate; namely, that it would admit only of a straight seam. Bachelder's machine made the chain-stitch, and was applicable to certain varieties of coarse sewing in which straight seams only were required, and when the cloth was of such texture as not to be injured by the needle points—as in coarse

bags, for the manufacture of which the machines were for some time in actual operation. Mr. Bacheider devised the first automatic continuous feed; and, as involving this principle, the patent was renewed on its expiration in 1863, and again in 1870, by special act of Congress. This was the last of the early sewing-machine patents to expire, which it did May 8, 1877.

Mr. Howe constructed four machines, but did not succeed in introducing them into actual use. The machine now bearing his name was not patented until 1857, some six years after Wheeler and Wilson had made the business a success.

Mr. Wilson devised his first machine, as has been said, in 1847. He became ill, and was not able to work at his trade until August, 1848, when he obtained employment at Pittsfield, Mass. He now resolved to develop the idea of a sewing-machine. By November he had made full drawings of all the parts of the machine, according to his previous conceptions. He was then at work with Barnes and Goodrich. This firm was dissolved on the 1st of February, 1849; and Mr. Wilson remained with Amos Barnes, who continued the business, with the privilege of working evenings for himself in the shop. On the evening of the 3d of February, the first day of his engagement with Mr. Barnes, he began the construction of his first machine, which he completed about the first of April. He was compelled, by want of means, to construct every part of the work—that in iron and steel as well as in wood—himself; and, as he was not a practical machinist, and had not suitable tools, his first machine was rude and imperfect. With it, however, were made dress-waists and other articles requiring fine sewing, with straight or curved seams; and it was exhibited to several persons, who were pleased with its work.

The first problem for Mr. Wilson was, what kind of a stitch to make; and the next, how to make it. The stitch needed the use of the least possible quantity of thread, and a non-liability of the seam to rip. He arrived at the same conclusion as Walter Hunt and Elias Howe—that both these conditions could best be met by a lock-stitch, made by two threads crossing each other within the two layers of cloth, and presenting the same appearance on both sides of it. The chain-stitch would take one-half more thread; and, should the thread break at any point, the whole seam might ravel out. Mr. Wilson believed that such a lock-stitch could be made if a loop could be formed by one thread on one side of the cloth, and another thread could be passed singly through it. Then, by some proper device for tension, the two threads could be drawn tight, so as to present the same appearance on both sides of the cloth. For this, enough of the looping thread must be pushed through the cloth to form the loop. It did not require much mechanical ingenuity to conceive of the needle, with an eye in the point at the end of some reciprocating mechanism, to push the needle nearly through the cloth, carrying the thread with it, and then to

withdraw the needle, leaving enough of the thread behind to form the loop. Mr. Wilson's idea of the shuttle was an improvement on that of Hunt or Howe, in that, as it was pointed at both ends, it would make a stitch in its motion both ways, so that to make the same number of stitches, his shuttle would need to travel only half as fast. The next point was to devise a feed-motion so far automatic as to secure a uniform length of stitch, which could not be effected by a mere guidance with the hand. It must also provide for crooked, or curved, as well as straight, seams, and such seams that a sharp angle could be made, if necessary. Mr. Wilson's first device was that known as the "two-motion feed," to distinguish it from his subsequent, more effective device, the "four-motion feed." The two-motion feed consisted of a horizontally reciprocating, toothed surface, the inclination of the teeth being forward, always in contact with the material, and, while the needle was in the material, moving backward to take a new stroke. This feed proved usually effective, and thousands of machines having this device were sold. In this feed device Mr. Wilson solved the problem, not of making a machine which would sew after a certain fashion, but the first one which was fully adapted to the necessities of every household, and a saver of time and labor in many kinds of manufacturing.

In May, 1849, having removed to North Adams, Mass., he built a second machine on the same principle, but of better workmanship. He finally induced Joseph N. Chapin, of North Adams, to purchase one-half of the invention for two hundred dollars, and with this money he secured a patent, Nov. 12, 1850. While his application was pending, he got notice from parties owning an interest in a machine patented by John A. Bradshaw, of Lowell, Mass., Nov. 28, 1848, that Bradshaw's patent covered the double-pointed shuttle which he claimed in his application, and that they should oppose an issue of a patent to him. Two of these parties were A. P. Kline and Edward Lee, of New York. A compromise was made, by which Mr. Wilson conveyed them one-half of the patent. Mr. Wilson was associated with Kline and Lee for about two months before the issue of the patent, arranging to go into the manufacture and sale of the machines; but, becoming dissatisfied with this arrangement, on the 25th of November he sold to Kline and Lee all his interest in the patent, except the right for New Jersey, and that to sew leather in Massachusetts, for \$2,000. This sum, however, was never paid to him. Before the end of the year he was introduced to Nathaniel Wheeler, with whose name his own has been associated for a quarter of a century, as identified with one of the most extensive industrial interests of New England.

Nathaniel Wheeler was born in Watertown, Conn., Sept. 7, 1820. His father was a carriage manufacturer, and the son learned the trade. He was at first employed chiefly in the ornamental parts of the work, and afterward had the entire



Van Slyck & Co. Boston

*A. Wheeler*



charge of the business, his father owning and carrying on a farm. On attaining his majority Nathaniel took the business on his own account, and carried it on about five years. At that time the manufacture of buttons and other articles of metallic small-ware had become an important industry in the adjoining town of Waterbury, and he decided to engage in it. Beginning with implements and tools involving only hand labor, he soon introduced machinery of various kinds. Among other articles, he made polished steel slides, for ladies. These had before been imported from Europe, and Mr. Wheeler was among the first in this country to engage in making them. The price was at first eight dollars per gross, and was finally reduced to twenty-five cents per gross, at which low price, by his improvements in machinery and methods, he was able to make a profit. Other articles of his manufacture were buckles, and slides for hat-bands. These were also made in the same town, by Messrs. Warren and Woodruff. This firm was interested in the Warren and Newton Manufacturing Company, engaged in the neighboring village of Oakville, in the manufacture of suspenders. Warren and Woodruff joined both their interests with that of Mr. Wheeler in 1848, and a partnership was formed, under the name of Warren, Wheeler and Woodruff. A new factory building was erected, and Mr. Wheeler, taking the whole charge of the business, soon placed it on a footing of substantial success.

On one of his business visits to New York, he heard of the Wilson Sewing Machine, which was then in a room in the old *Sun* building, 128 Fulton Street. He examined it, saw its possibilities, and at once contracted with E. Lee & Co. to make five hundred of the machines. He also engaged Mr. Wilson to go with him to Watertown, to perfect the machine and to superintend its manufacture.

Their relations with Lee & Co. soon ceased; and, within a short time, Mr. Wilson substituted for the shuttle the rotary hook and bobbin now so well known. He had made in New York a model of a machine with this new device, and had carried it with him to Watertown, and now showed it to Mr. Wheeler, who highly approved it. Mr. Wilson now went to work to perfect the new machine, with the substitution referred to, and secured the patent for it Aug. 12, 1851. On the same date Isaac M. Singer received his first patent on the machine which has since been so formidable a competitor of the Wheeler and Wilson machine. The main features of Mr. Singer's machine were, that the needle was straight, moving vertically at the end of a stationary arm, and that the feed was by means of a roughened wheel, which, it was claimed, was an improvement on Wilson's two-motion feed, since it had no backward movement while in contact with the cloth. It had, however, the defect of touching the cloth only at a very small portion of its periphery. It was inferior to the later four-motion feed of Mr. Wilson. This wheel-feed of Singer was, moreover, an infringement on Wilson's patent of 1850. The principle of the automatic

feed, covered by that patent, was the including of the cloth between a roughened surface on the under side, and a smooth surface on the upper side, so that the cloth would be held in place while the needle was carrying the thread through it, and, on the withdrawing of the needle, would be pushed forward the length of a stitch, at the same time permitting the cloth to be turned in either direction, to form a curve or angle in the seam.

Messrs. Warren, Wheeler, Woodruff and Wilson now formed a new copartnership, under the style of Wheeler, Wilson & Co., and began the manufacture of the machines under the new patent. This patent was for the combination of a rotary hook, which extended or opened more widely the loop of the needle-thread, with a reciprocating bobbin, which carried another thread through the loop so extended. To avoid litigation, Mr. Wilson contrived the stationary bobbin, which has since been the permanent feature of the Wheeler and Wilson Sewing Machine. This not only entirely removed the appearance of infringement, but was free from the objectionable features of the shuttle. The stationary bobbin was a feature of the first machine introduced into the market by Mr. Wheeler, though the patent for it was not granted until June 15, 1852. This rotary hook was an entirely novel device.

Having begun the manufacture of the machine, the next step was to introduce it to the public. Mr. Wheeler took one of the machines to O. F. Winchester, now at the head of the Winchester Repeating Arms Company, then largely engaged in the manufacture of shirts at New Haven, Conn. Mr. Winchester refused even to try it; but Mr. Wheeler had a shirt made wholly on the machine, Mr. Wilson's wife being the operator; whereupon Mr. Winchester, struck by the beauty of the work, at once purchased the right in the machine for the county of New Haven. Mr. Wheeler then carried two of the machines to Troy, N. Y., and left them with J. Gardner, a leading shirt manufacturer there. After a trial of them for three weeks, Mr. Gardner came to Watertown, and purchased the one-half right to sell the machines in Rensselaer County, N. Y., for \$3,000. Mr. Wheeler now devoted himself to the introduction of the machine, especially in New York, Boston and Philadelphia. Several hundred machines had been sold, when, in October, 1853, the Wheeler and Wilson Manufacturing Company was organized. The business at this time had become so well established that outside parties desired to obtain an interest in it; and a proposition was made to Messrs. Wheeler, Wilson & Co., that a joint-stock company should be organized, with a capital of \$160,000, of which \$100,000 was to be allowed for the patent, and \$60,000 for the factory, machinery, and so on. The firm, meanwhile, engaged to sell to the outside parties stock to the amount of \$70,000 at par. The parties who subscribed for the stock gave their notes, which, however, they were not called on to pay, the dividends from the earnings of the company liquidating them as they became due.

Mr. Wilson at this time retired from active participation in the business. In consideration of the value of his inventions, however, he received a regular salary, without personal service, and considerable sums of money on the renewals of his patents. He has resided at Waterbury since 1863, where he owns an estate of some twenty-five acres, with a commodious residence. Among his out-buildings is a shop well furnished with tools and machinery for working in wood and metals, affording him ample facilities for the gratification of his mechanical taste. Here he has perfected several inventions. On the 19th of December, 1854, he patented his four-motion feed, whereby the flat, toothed surface, being in contact with the cloth, is moved forward, carrying the cloth with it; then drops a little, so as not to touch the cloth; then moves backward; then rises up against the cloth, and is again ready for the first motion. This feed is at once simple and effective.

In 1865 Mr. Wilson erected a fine hotel, with a large public hall, at North Adams, Mass.

The manufactory was continued at Watertown until 1856, when, owing to the increase of the business, the property of the Jerome Clock Company, at Bridgeport, Conn., was purchased. Additions to the old brick factory, already on the premises, were made from time to time. A portion of these buildings, including the old clock factory, was burned Dec. 12, 1875, but was at once rebuilt.

In the work-shops of the Company are made the needles and other minor attachments needed for the great variety of work to which the machine is adapted. Extensive shops are also devoted to the cabinet work. The new finish of the latter, by the use of the wood-filling, was invented and patented Jan. 18, 1876, by Mr. Wheeler. This invention is of value not only to manufacturers of sewing-machines, but in every line of cabinet-work in which it is aimed to give a high polish to hard woods. The process occupies less than one-half the time, and the materials cost much less than in any of the processes previously in use. Care is taken to secure the best qualities of machine thread and silk or twist. Distributing points, not only of machines, but of the various parts, attachments, needles and supplies, have been established in all parts of the country and the world.

The original idea of Messrs. Wheeler and Wilson was to produce a light-running machine adapted to the lighter kinds of manufacturing, such as that of shirts and of cotton goods generally. Mr. Wheeler soon concluded that there would be a very large demand for family use, and directed his efforts to secure this demand. His success was such that his competitors, whose machines had been constructed more heavily, and only with reference to manufacturers' use, began to build lighter machines for a similar purpose.

A demand also arose for machines for heavy manufacturing purposes, such as

stitching leather and the manufacture of woolen clothing, in which, often, several thicknesses of cloth must be stitched through. It was found that some of the shuttle machines, constructed on a larger scale, and running so heavily as to be beyond the strength of female operatives for the regular number of hours of a day's labor, and usually run by steam, gave better satisfaction; and Mr. Wheeler resolved to meet these demands for leather and heavy cloth work. The result of his experiments and of the expenditure of nearly \$500,000, has been the "Improved Wheeler and Wilson Machine, Nos. 6 and 7." To this machine awards were made at Vienna in 1873, and at Philadelphia in 1876; corresponding to the awards to the old machine at London, in 1862, and at Paris in 1867.

The first suggestion of change was in the form and movement of the needle, from one curved and moving in the arc of a circle, to one straight and moving vertically, the latter having more piercing power. This change was easy to make, and in its device is superior to that of any other vertically-working, straight needle, in its diminished liability to the dropping of oil on the work. The next point was to make some provision for a take-up of the upper thread. In the original machine this is done by the action of the rotary hook, which, in opening a new loop, draws tight the thread of the previous loop. To effect this, the latter thread must be drawn both up and down through the two layers of cloth, which is done with perfect facility by the hook, in ordinary family sewing and light manufacturing; but, in leather and woolen goods, it was found that the hold-back on the thread was so great as to frequently break it. In shuttle-machines, as the shuttle, in passing through the loop, did not enlarge it, there was no take-up action to the shuttle; and a take-up above, drawing the thread up through the cloth, was needed. In the improved Wheeler and Wilson Machine, an independent take-up was provided; and, in arranging its movement, an advantage over any take-up previously in use in shuttle-machines was secured. In the latter, the take-up begins to draw on the thread before the needle has been withdrawn from the material, requiring a larger hole than when, as in the Wheeler and Wilson machine, the take-up draws in the thread only while it alone occupies the hole, the needle having been withdrawn. In leather especially, the Wheeler and Wilson Improved makes finer perforations, perfectly filled by the thread, and much greater beauty of workmanship is attained; and in water-proof articles, a water-proof seam can be secured, which is impossible with any shuttle-machine, with the take-ups heretofore in use on them. To give more time for the action of this independent take-up, a simple yet ingenious adjustment has been devised, whereby the hook, instead of the regular revolutions of the original Wilson hook, moves with less rapidity through a portion of its revolutions—that is, while the needle is out of the work—than during the remainder of the revolution.



Van Slyck & Co Boston

*A. B. Wilson*



This required also a modification of the form of the hook, which was still further altered to conform to the shape of the bobbin, which was increased in thickness so as to hold twice the amount of thread. The last new device is that designed to secure tension on the lower thread. Here, also, a manifest improvement over the shuttle-machines has been made. In the latter, the tension is secured by passing the thread through one or more holes in the shuttle, or by some other device in the shuttle itself; and, if the tension is wrong, the operator must take out the shuttle, change the adjustment of the thread, replace the shuttle and try it, with the liability of having to repeat the experiment, and with much loss of time. In the Wheeler and Wilson Improved, the simple pressure of a lever, which can be made while the machine is in motion, will effect the object.

The machines numbered respectively six and seven are essentially the same, the former being used for leather, and the latter arranged so that the operator may sit on the opposite side of the machine. The power of this machine is illustrated in the fact that it has sewed through a fabric composed of seven layers of tin-plate, with two layers of woolen cloth between each layer of tin-plate, making fourteen thicknesses of cloth and seven of tin, and the whole fabric being more than three-eighths of an inch thick; and has then passed directly and without change of adjustment, except dropping the presser-plate, to the stitching together of two thicknesses of fine muslin. The same general features have been introduced into a new machine for family purposes — No. 8.

Mr. Wheeler took a leading part in forming the combination, in 1856, of the principal sewing-machine companies. The three companies which were parties in it, the Wheeler and Wilson, the Singer, and the Grover and Baker, had begun business about the same time; and the patents under which they were working were granted between Nov. 12, 1850, and Aug. 12, 1851. They had been engaged in mutual litigation, and Mr. Howe, was also seeking to enforce his claim on the Singer Company. Of the four parties thus in legal conflict, all except the Wheeler and Wilson, in addition to the suits against each other as manufacturers, had threatened purchasers or users of rival machines with suits for damages. It was contracted by the three companies and Mr. Howe, that they would stop their litigation, and, with a fair payment to each other and to Mr. Howe for special rights, would carry on the business with only honorable competition. They finally agreed to license any responsible persons who should propose to engage in the manufacture of a good machine, on the payment of a royalty, which, for several years, was only three dollars on a machine.

The officers of the company at its organization, were: Alanson Warren, President; George P. Woodruff, Secretary and Treasurer; and Nathaniel Wheeler, General Manager. Mr. Warren resigned his office in 1855, and Mr. Wheeler was

elected president, retaining the office of general manager. Mr. Woodruff resigned his offices in 1855, being succeeded by William H. Perry, who was born in Woodstock, Conn., in 1820. When a young man Mr. Perry taught school in Newington, Conn., six terms. He was afterward employed by his brother, who was a contractor in the armory of Samuel Colt, at Hartford, Conn. Having acquired in this employment practical skill as a machinist, he engaged with his brother to execute a portion of his contract. In 1855 he went to Watertown, Conn., and became book-keeper in the office of the Wheeler and Wilson Manufacturing Company, and was appointed the next year superintendent of the factory. In July, 1856, he was elected secretary and treasurer, which offices, with that of superintendent, he still holds. Mr. Wheeler has represented Bridgeport in the State legislature, and his political party in its national conventions. He was also one of the commissioners of the State capitol at Hartford, the greatest public enterprise ever undertaken in the State. He is in the prime of life, in vigorous health, and with the prospect of many years of honorable and useful activity.

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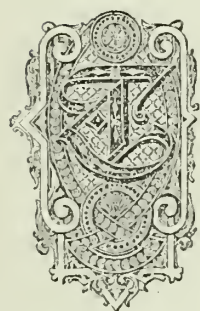
THE WHITIN MACHINE WORKS.

WHITINSVILLE, MASS.



# WHITIN MACHINE WORKS.

JOHN C. WHITIN.



HE cotton manufacture in New England, beginning late in the last century, created a demand for, and hastened the introduction of, machinery operated by power, instead of the crude hand or foot machinery of previous generations. These power-machines were at first either imported from England, or modeled after English machines. This was the case with the machines constructed at Pawtucket, by Samuel Slater. But the skill of our mechanics was early turned to inventing and constructing machines for the various processes; and many establishments devoted to this specialty of manufacture have since been created. Among these establishments is the Whitin Machine Works, at Whitinsville, Mass.

Its founder and principal proprietor, John C. Whitin, was descended, in the sixth generation, from Nathaniel Whiting, who came from England about 1636, to Lynn, Mass. He was probably a brother or cousin of Rev. Samuel Whiting, the settled minister of Lynn, the original Indian name of which was Saugus, and which was changed to Lynn in November, 1637, in honor of its minister, Mr. Whiting, who had been a curate at Lynn Regis, in Norfolk, England. Nathaniel Whiting removed, about ten years later, to Dedham, where he married Hannah, only daughter of John Dwight, of that place. The descendants of Nathaniel Whiting are numerous in that and the neighboring towns. His great-grandson, Nathaniel, lived near the boundary-line between Dedham and Roxbury, where his son Paul was born, Dec. 3, 1767. He died in early manhood, Paul being then only a year old. His widow afterward married James Prentice, a farmer of Sutton. Here Paul was reared, laboring on the farm and attending the rural school in his childhood. At fourteen years of age he was apprenticed to a blacksmith, in Northbridge, and served nearly seven years. He then worked about four years as a journeyman. In

1794 he married Betsey, daughter of Col. James Fletcher, a farmer residing in that part of Northbridge now called Whitinsville, his farm being on the south side of the Mumford River. Colonel Fletcher served in the army of the Revolution, and was a man of large landed estate, and prominent in the town. In addition to his farming he ran a saw and grist-mill, of which he was, in part, owner, and in which Paul Whiting worked for a year. Paul then obtained employment at his trade, and at the end of a year hired the shop, and commenced business on his own account.

His father-in-law, Colonel Fletcher, owned a small forge, on the south side of Mumford River. Its drop-hammer was operated by power obtained from the lower privilege, now occupied by the stone cotton-mill of Charles P. Whitin. There had been an iron-forge there as early as 1733, and this was partly supplied by iron-ore obtained in the vicinity. The business of Mr. Whiting was at first that of an ordinary country blacksmith; but he soon determined to engage in the speciality of scythes and hoes. He changed his name about this period by dropping the final g. Hiring a man who understood the art of tempering and other special processes in the manufacture, he soon became himself expert in them; and, in a few years, his business became profitable. During the suspension of trade with England, caused by the Embargo, a large demand arose for certain agricultural tools, which had previously been imported from England. One of these articles, in the manufacture of which Mr. Whitin was among the first to engage, was the large hoe used by the slaves at the South. His shop was on the north side of the Mumford River, taking the power which operated the trip-hammer and grind-stones from the same privilege which supplied the forge and grist-mill of Colonel Fletcher, but from the other end of the dam. Mr. Whitin continued in the active pursuit of his business until his death in 1831, in the sixty-fourth year of his age. In addition to this enterprise, which he always personally superintended, he began, more than twenty years before his death to invest in the cotton manufacture. In 1809 he built a mill on the privilege which now supplies power to the Whitin Machine Works, and organized a company, himself being the principal stockholder, for the manufacture of cotton goods, styled the Northbridge Manufacturing Company. This was the third cotton-mill erected in the valley of the Blackstone River, above Pawtucket, the mill of Almy, Brown and Slaters, at Slatersville, R. I., preceding it by about two years, and the original mill of the present Blackstone Company, at Blackstone, then South Mendon, Mass., by one year. The original Northbridge Mill was of wood, and had a capacity of 1500 spindles. It was operated by the company in which Mr. Whitin was interested for fourteen years, and was sold in 1824.

In 1815 he entered into partnership with Colonel Fletcher and his two sons, under the firm-style of Whitin and Fletchers, and erected a small mill of 300





John C. Whittier

spindles, for the manufacture of yarns, on the site of the old forge. The business of this mill was continued until 1826, when Mr. Whitin, who owned an interest of one-half, purchased the other half from the Fletchers, and formed a new partnership with his sons, Paul, Jr., and John C., under the style of P. Whitin and Sons. They erected a new mill of 1500 spindles in place of the small mill just named. Mr. Whitin only invested capital, and had no personal care or responsibility in the management of either of these enterprises.

His second son, John C. Whitin, was born March 1, 1807. In his childhood, and until he was about fifteen years of age, he attended the school of the district during the usual summer and winter terms. During the rest of each year, after he was nine years old, he was employed in the mill of the Northbridge Manufacturing Company, working at first in the picker-room. When about twelve years of age he was placed in the machine-room, and for the next three years worked on the repairs, thereby serving, in some measure, an apprenticeship at the business in which he in later years achieved such success. Early in 1822 he went to New York, and was employed there in a store until the latter part of 1825, when he returned home again, and engaged in manufacturing. A partnership was formed by his father, elder brother and himself, to start a new enterprise in the manufacture of cotton goods. The firm-name was P. Whitin and Sons; and they at once began the erection of a new mill on the site of the old Whitin and Fletchers mill. Paul Whitin, Jr., was at this time twenty-six years of age, having been born Feb. 5, 1800. His previous training had been wholly mercantile, and, in the business of the new concern, he took charge of the financial and mercantile department; John C. Whitin managed the mechanical and manufacturing department.

Attached to the main building of the mill was an ell, in which the Whitin Machine Works had their origin. A portion of this ell, consisting of a single room about 20 by 30 feet in area, was used for a machine-shop, in which John C. Whitin, in addition to his general superintendence, made the necessary repairs on the machinery, with the aid of one assistant. He had been early impressed with the imperfection of the machines then in use, and especially of that used for picking; and in 1830 he directed his efforts especially to its improvement. His first machine, indeed, had relation to this process with which his earliest experience, at nine years of age, had been identified. Cotton, after having been submitted to a great pressure, and then kept confined, often for a long time, in bales, becomes matted together; and picking is the process by which it is lightened up, freed from leaf, seed and dust, and made fleecy. Its fibers are then lapped and pressed between rollers, to hold them together, while they are wound, in the form of a loose sheet, an inch or more in thickness, around a smooth roll, to be then transferred to the carding-machine.

This process is called in England "scutching," and the machine a "scutcher." In 1831 Paul Whitin, Sr., having died, the firm was re-organized; Mrs. Paul Whitin and her three sons, Paul, John C., and Charles P. being the partners, each owning an interest of one-fourth, the previous style, P. Whitin and Sons, being retained. Charles P. Whitin had attained his majority the previous year, having been born Aug. 6, 1800. He had been employed in the office of the firm. The old North-bridge mill was re-purchased and put into operation.

In the same year, 1831, John C. Whitin so far perfected his picking-machine, that he decided to apply for a patent, which was granted in 1832. It soon attracted the attention of other manufacturers, and the firm began to make the machine for sale to other parties. A small shop, about 20 by 40 feet, was erected within the present premises of the Whitin Machine Works; and some machinery and tools were set up in it, and put into operation. These were comparatively crude, and incapable of producing the accurate and finished workmanship rendered possible by the greatly improved machinery and tools of the present day; yet the improved devices of Mr. Whitin produced, at the outset, pickers, or lappers, so superior to those previously in use that, from 1834, when the first machine was sold, the demand steadily increased, and within a year an addition to the shop became necessary. For many years most of the pickers in use throughout the country were made at these works. Mr. Whitin was encouraged to engage in building machines for other processes in the same line of manufacture; and the list of machines have been increased from time to time so as to include cards, card-grinders, doublers, railway-heads, drawing-frames, ring-frames, spoolers, warpers, dressers and looms, so that at the present time all the machinery, except fly-frames and mules, used by cotton-mills are built in these works. To meet the demands of this increased and varied business, the original machine-shop was enlarged from time to time; and, in 1845, the stone cotton-mill having been erected, the machinery was transferred from the cotton-mill of 1826, and that factory was devoted also to the building of cotton-machinery. In 1847 the large brick machine-shop was built, being 102 by 306 feet.

John C. Whitin purchased the Holyoke Machine Works, on his own account, in 1860. This was an extensive establishment at Holyoke, Mass., engaged in the manufacture of the Boyden turbine-wheels, and of cotton and miscellaneous machinery. In Mr. Whitin's hands it became profitable; but, on account of its extent, and its distance from his home, he decided, in 1864, to dispose of it. Removing a part of the machinery to his own works at Whitinsville, and selling the remainder, he disposed of the buildings and other real estate to the Hadley Company, which was organized in that year for the manufacture of cotton thread and yarn.

In the same year the joint business of P. Whitin and Sons, as manufacturers

of cotton goods and of cotton machinery, was divided. The former branch had increased, in forty years, from a capacity of 1500 spindles to that of 50,000. In addition to the erection of the large stone mill at Whitinsville, in 1845, the firm had purchased, in 1840, the old Uxbridge cotton-mill, which had been erected by Robert Rogerson, a merchant and capitalist of Boston; and they afterward built the Rockdale cotton-mill, in Northbridge. James F. Whitin, the youngest son of Paul Whitin, born Dec. 21, 1814, who had been for some years the book-keeper of the firm, was soon after admitted a partner. This event was followed in a few years by the death of Mrs. Paul Whitin, Sr., who had been a member of the firm since its re-organization in 1831. She was a woman of very superior ability, and her counsels were always of weight in the affairs of the firm. In the division of the business and property, the other three brothers took the cotton-mills, and John C. Whitin received the machine-works as his share. On coming into this separate proprietorship he erected the large brick building, with ell, nearest the road. The next year, 1865, a new foundry was built, 100 by 120 feet, on the site of the old Northbridge factory, which had been removed a little to the northward; it is now used as a workshop for the repairs of the tenements and other outside property of the Company. The increasing demand for cotton-machinery has been met by a continued enlargement or increase, not only in the number and size of the buildings, but in the extent and character of the equipment of tools and machinery. The little repair-shop of 1830, in the ell of the factory, has been succeeded by substantial brick structures, with more than five acres of floor-room, for making and setting up machines, beside 12,000 square feet for foundry purposes, and about 50,000 square feet covered by store-houses and sheds for lumber, molding-sand and other materials. In place of two men, the working force comprises over seven hundred men; while the improved machine-tools render the labor of each man equal to that of three men using the old-time tools and appliances. The only motive-power is water.

In 1826 the Mumford River, on which the works are situated, furnished, at that point, ten horse-power; but, by a system of reservoirs, the flowage has been increased from a few acres to more than fourteen hundred acres, and the ten horse-power to three hundred and seventy-five. This actual increase of power has been supplemented by the replacing of the breast-wheels by turbine-wheels. In 1870 the business, which had been during the previous six years under the sole proprietorship of John C. Whitin, was organized as a joint-stock corporation, under the style of the Whitin Machine Works, with a capital of \$600,000; John C. Whitin was made President, Josiah Lasell, Treasurer, and Gustavus E. Taft, Superintendent. Mr. Lasell is the son-in-law of Mr. Whitin, and was, from 1860, in his employ. The business is now mainly under his executive management.

Mr. Whitin, at over seventy, still retains the full use of his faculties, and continues to take a lively interest in the business so long under his personal direction. He married, on May 30, 1831, Catharine H. Leland, of Sutton, Mass. She, as well as Mr. Whitin, was a lineal descendant of John Dwight, of Dedham, Mass., her grandmother, Silence Dwight, having been John Dwight's great-great-granddaughter. He was the common ancestor of all of that name in New England, and among his descendants, of his own and other names, were Jonathan Edwards and Timothy Dwight. Mr. Whitin's only son, who attained manhood, was John Maltby, born June 10, 1838. He was employed for several years in connection with his father's works at Whitinsville, and died Oct. 22, 1872. Mr. Whitin's only daughter, Jane, born Jan. 27, 1834, married, on June 16, 1855, Josiah Lasell, now treasurer of the corporation. He was born in Schoharie, N. Y., Aug. 6, 1825, and graduated at Williams College, in 1844. In 1852 he established the Lasell Seminary, at Auburndale, Mass. In 1860 Mr. Lasell went to Holyoke, to superintend the machine-works, and remained there until the sale of the property, in 1864. He then removed to Whitinsville, and became connected with the business of Mr. Whitin in that place. In 1870, on the organization of the Whitin Machine Works, he became, as stated, its treasurer and general manager.



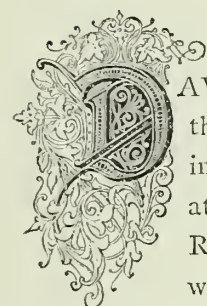


Van Slyke & Co. Boston.

*David Whitman*



## DAVID WHITMAN.



DAVID WHITMAN, late of Cranston, R. I., held a high rank among the practical mechanics and mill-engineers who have been concerned in the erection of mills, and in the construction, putting-up and operating of machinery. He was born at Anthony Village, in Coventry, R. I., Jan. 2, 1799, and was the son of Gen. Reuben Whitman, a millwright, who, early in this century, built the old Roger Williams Mill, at Warwick, R. I., on the site of the present Phoenix Factory. David entered this mill, as a mill-boy, at the age of seven, and became in time an expert in all the operations of a cotton-mill. Before he was twenty-one, he was overseer in the Roger Williams Mill.

In the autumn of 1820 he started, at Pomfret, Conn., a cotton-mill for Smith Wilkinson, of Providence, R. I., whose sister was the wife of Samuel Slater; and he remained there four years. The Roger Williams Mill was burned in May, 1821. In 1823 a new company was formed, and a mill was built by Gen. Reuben Whitman on the site of the Roger Williams, which, being erected in place of one previously burned, received the name of the Phoenix Mill, giving, also, the name of Phoenix to the village which has grown up in its vicinity.

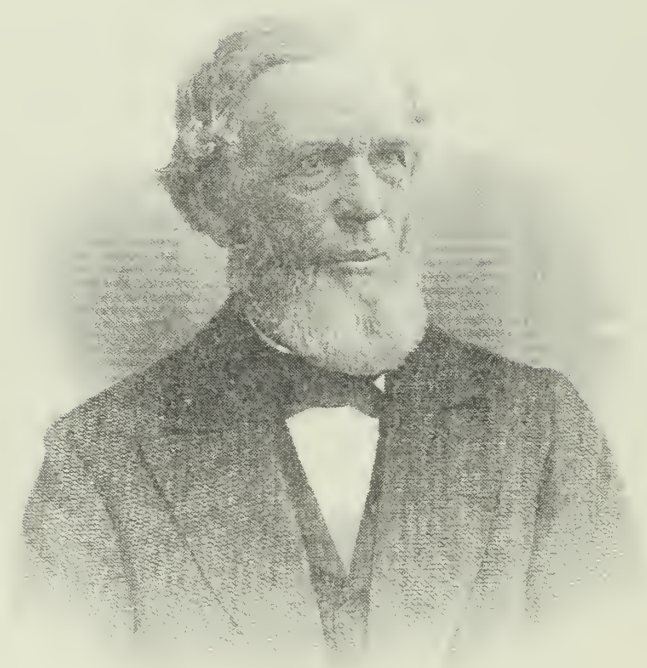
Early in 1825 David Whitman returned to Phoenix, and was appointed superintendent, which position he held two years. In 1827 he went to Providence, to superintend the erection of the Providence Steam Mill; and, on its completion, he was appointed superintendent, or manufacturing agent, in which post he remained four years. He was then employed by Watson and Tingley, of Providence, to start and superintend a factory for them at Willimantic, Conn. After continuing there four years he returned to Phoenix, and entered into partnership with Zachariah Allen, of Providence, who had become a proprietor of the Phoenix Mills. In this partnership he remained ten years.

In 1840 Mr. Allen imported a complete set of improved cotton-machinery, such as was then used in England, from which Mr. Whitman took some valuable ideas, which he afterward brought into practical use. In 1842 they purchased a mill which had previously been run on woolen goods, and changed it to a cotton-factory.

During this engagement at Phoenix, he purchased a residence and farm in Cranston, about three miles from Phoenix. In 1847 he went to Lewiston, Me., in behalf of the Lewiston Water-Power Company, to lay the foundations of the extensive manufacturing operations at that place. From that time to his death, he was employed constantly in that part of New England by eastern capitalists, and superintended the construction of the mills of the Bates Manufacturing Company, at Lewiston, of the Pepperell and Laconia Companies, at Biddeford, Me., and of the Naumkeag Company, at Salem, Mass. He died at Lewiston, Aug. 30, 1858.

Mr. Whitman had intuitive mechanical perceptions; and besides the important labors that have been mentioned, he prepared several manuals on mechanical subjects. He was an authority and expert in his profession, and freely lent his aid to its younger members.

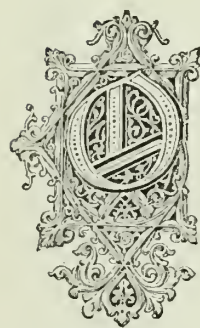




Van Slyke & Co Boston

*Baxter L Whitney*

## BAXTER D. WHITNEY.



ONE of the "fathers" of the village of Winchendon, Mass., was Amasa Whitney, a farmer, and the owner of a valuable water-privilege, now occupied by Goodspeed and Wyman. On this water-privilege the first grist-mill was built in 1756; and Mr. Whitney had upon it, at first, a saw and grist-mill, and then a flax-seed oil-mill. In 1816 he began to run a small woolen-mill, in which only the carding of the wool and the dressing of the cloth was done. The wool, having been carded, was spun and woven by hand in the farm-houses, and the home-spun cloth was returned to the mill, to be dressed. This mill was burned in 1820, but was at once rebuilt.

Baxter D., son of Amasa Whitney, was born at Winchendon, June 28, 1817. At the age of six he began to work in his father's mill, in piecing rolls. The mill was again burned, and rebuilt in 1824; and the elder Whitney now put in power-looms, and manufactured satinets and cassimeres. From his eighth to his eleventh year Baxter was employed in piecing rolls, except during eight weeks in the summer, and a similar period in the winter, when he went to school. At eleven he began to work at carding, and the year after he was set to work on the repairs. In 1830 his father contracted with White and Boyde, of Worcester, to build some looms for him, and Baxter was sent to aid the firm in this task. On his return home he built a "gig," for napping cloth, making, himself, the patterns of wood for the iron frame and other castings, and afterward finishing all parts of the machine. When he was fifteen years of age his father, having learned that, in a factory at Plympton, in Plymouth County, a satinet was being made in which the cotton threads on the back were covered by the woolen filling much better than he was able to do, sent Baxter to examine the looms; and, on his return, he made a change in his father's looms which secured the desired result. Soon afterward, having seen a warping and

dressing-machine at Fitchburg, he built one on the same model for his father. When he was seventeen he entered the academy at Fitchburg, where he remained one term. He then returned home, and went into the employment of the Winchendon Manufacturing Company, which had, in 1835, succeeded to his father's business. Here he took charge of the machinery and repairs, having several men employed under him. He put up new shafting, repaired the old machinery, and built, with the aid of several operatives, sixteen new looms, and warping and dressing-machines similar to those he had constructed.

In the autumn of 1839, the Winchendon Manufacturing Company having suspended operations, he hired a small building, 75 feet by 30, in the rear of the saw-mill, and there commenced the manufacture of wood-working machinery. While employed by the Winchendon Manufacturing Company, he had devised a machine for stretching cloth, its object being to take out the wrinkles produced in the process of pulling. It was patented in his own name and that of Geo. W. Lawton, the superintendent of the Company, who had rendered him some aid, March 25, 1840. Machines made under this patent are still in use. From this time he manufactured machinery for making clothes-pins, and pail and tub-making machinery, including a machine for cutting the pail-cars, which he devised and made for Webster Whitney and Calvin R. Whitman, manufacturers of wooden-ware. His shop was burned Jan. 10, 1842, and he removed to the shop of Col. William Murdock, remaining there until 1845, during which period he built machinery of various kinds used in the manufacture of wooden-ware and of chairs.

In 1845 he built his first dam, and machine-shop and foundry, on the premises now occupied by his larger works. In April, 1852, a freshet swept away his dam and a mill owned by himself and Ephraim Murdock, Jr. He at once obtained a stationary steam-engine at Fitchburg; and his machine-shop was again in operation within a few days. Six months after, the dam was also reconstructed, a change of its position being made so that the foundation of the stone-work now rests on a solid ledge. The same year he erected the wooden mill since occupied by Murdock & Co., in the manufacture of wooden-ware; and, in 1854, the brick mill, still rented and used as a cotton-factory by N. D. White. Before 1869 he erected other buildings for his own use, including a brick foundry, in place of the wooden one burned in 1863. His first patent in wood-working machinery was issued Aug. 11, 1857, and was for a smoothing-machine, by which any hard-wood lumber, previously planed by any suitable machine, can be surfaced and finished better and more rapidly than by hand. This patent was extended Aug. 11, 1871. A patent for a gauge-lathe, which turns and finishes ornamental rails of any desired contour at one operation, was issued Aug. 7, 1860, and was extended Aug. 7, 1874. His cylinder planer was

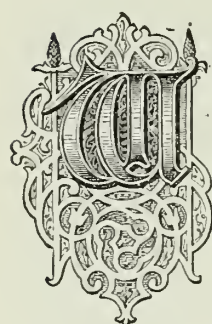
patented Jan. 1, 1867; and, on April 9 of the same year, he received a patent for a machine for grinding the surface of cylinder or barrel-saws, whereby he is able to secure a uniform thickness of the plate of cylinder-saws of any size, so as to obtain a perfect balance, and freedom from tremor to the saw, when run at the highest rate of speed. With this machine, and his process of tempering, by which a high and uniform temper is secured, he is able to make the best cylinder or barrel-saws of any size required, the largest yet made being seventy-eight inches in length and thirty-six inches in diameter.

In 1869 Mr. Whitney built a new canal for the supply of power to his shops, and the mills rented by him to other persons. The foundation and sides of this canal are of granite. It supplies two Swain turbine-wheels of one hundred and thirty horse-powers each, and there is a provision in the structure, as well as an ample supply of water, for a third wheel of the same size. Mr. Whitney has also laid granite foundations for a new machine-shop. In May, 1872, he received a patent for a stave-sawing machine; and on the same date, and on May 14, 1872, April 8, 1873, and July 13, 1875, patents covering various improvements in band-saws were issued to him. A patent was issued to him Feb. 17, 1874, for a machine for grinding the peculiarly shaped knife of his wood-smoothing machine, adapting the latter for more general use by means of which an inexperienced workman can keep the knife in condition for good work. In 1867 Mr. Whitney exhibited at the Paris Exposition four machines—a cylinder planing-machine, a saw-bench for the use of pattern-makers, a gauge-lathe and a wood-smoothing machine. For these he received a silver medal. In 1873 he exhibited at the Vienna Exposition, besides the four machines previously exhibited at the Paris, a band-sawing machine, and a complete set of machinery for making pails.

Mr. Whitney is still in the prime of life and of business activity. He married Sarah J. Whitney, of Winchendon. He is one of the trustees of the Winchendon Savings Bank, and a director of the Monadnock National Bank, of Jaffrey, N. H. He represented his district in the Massachusetts Senate for 1871 and 1872.

# WHITNEY ARMS COMPANY.

ELI WHITNEY.



WITH the achievements of Watt, Fulton and Arkwright is worthily ranked the invention of the cotton-gin. It was, indeed, an epoch in industrial progress; and it was, moreover, one of the few inventions of which the originator obtained not only the reputation, but, in a measure, the substantial fruits.

Eli Whitney was born in Westboro, Mass., Dec. 8, 1765.

His father was a well-to-do and intelligent farmer. His paternal ancestors were from England, and among the early settlers of Massachusetts; and their descendants are numerous in Worcester County. A maternal ancestor, by the name of Fay, was also an English emigrant. He landed in Boston, and purchased near that town a large tract of land. His son, John Fay, removed to Westboro, and was the ancestor of the numerous Fays in that part of Worcester County.

From early childhood until he was sixteen years of age, Eli worked on the farm; but, when quite young, he evinced the genius for invention which afterward achieved such important results. His father had a workshop, in which, in winter, he made chairs and wheels of different kinds. He had a variety of tools and a turning-lathe. These afforded his son the means of gratifying his mechanical tastes; and, as soon as he could handle tools, he seized every interval in farm labor to make something in the shop. When about twelve years old he had finished, throughout, a very tolerable violin. Eli was soon afterward employed to repair violins, and executed many jobs to the satisfaction of his patrons. His father's watch was the greatest piece of mechanism he had ever seen, and he was anxious to examine its interior construction. One day, gaining possession of it, he took it all to pieces, and, to his delight, succeeded in putting the parts accurately together again. When he was thirteen his father married a second time, and among the articles which his step-mother brought into the family was a set of table-knives. One of these knives



Van Dyke & D. B. Jones

WESTERN AIRLINE COMPANY

130 WEST 11TH ST.

NEW HAVEN, CONN.



being accidentally broken, he made one so precisely like the others that it could be distinguished from them only by the absence of the maker's stamp on the blade.

When about fifteen, his father gave him some tools with which to make nails, which were then made chiefly by hand; and, after making such special tools as he could not obtain, he engaged in that work. He pursued his nail-making alone, performing also many other little jobs, such as putting in knife-blades. He thus worked profitably for two winters, laboring on the farm during the summers. He soon resolved, however, to enlarge his business; and he set out on horseback in quest of a workman to assist him. He went from town to town, calling at every work-shop on his way, gleaning all the desired information that he could, and at last found a workman who pleased him. At the close of the Revolution, the importation of nails being resumed, his manufacture became unprofitable, and he turned his attention to the making of the long pins with which ladies fastened their bonnets; and he made these so skillfully that he soon monopolized the business.

At nineteen he resolved to obtain a college education; and, after having been delayed in this purpose for a year, by severe illness, he entered Yale College in May, 1789, and graduated in 1792.

While a student, he devoted more attention to mathematics and mechanics than to the classics. On one occasion a tutor referred to an interesting experiment, but said that he could not exhibit it because the apparatus was out of order, and needed repairs which could not be made without sending it to Europe. Mr. Whitney undertook to repair it; and, borrowing some tools from a house-carpenter, he completely succeeded in setting the apparatus right.

Soon after taking his degree, Mr. Whitney went to Georgia, to take a position as a private tutor; but on reaching his destination, found that the place had been filled. He had become acquainted, on the journey, with the widow of General Greene; and, being destitute, Mrs. Greene invited him to make her house his home.

Shortly after, Mrs. Greene, being engaged on a piece of embroidery in which she used a tambour-frame, complained that the frame was badly constructed, and that it tore the delicate threads of her work. Mr. Whitney set himself at once to work, and soon presented her with an entirely novel tambour-frame, which remedied the difficulty.

At that time the great demand for cotton and the high prices offered excited the attention and desire of the planters to increase their product; and the obstacle to preparing the raw cotton for market became a general subject of discussion. From the lips of the daughter of General Greene, the venerable Zachariah Allen of Providence, R. I., obtained the following narration of the circumstances that originally led Mr. Whitney to the invention of the cotton-gin, which, it is believed, has not

heretofore been published. She related that one day at the dinner-table some neighboring planters discussed the pressing necessity of some device, for separating the seed from the cotton-fiber, to take the place of hand-labor. After dinner, while strolling with them through the garden, Mr. Whitney reverted to the subject, and said he had just thought how it might be done. Stooping over he pulled up a tuft of grass, with the fiber adhering to the central root; and, taking from his pocket a comb and a tooth-pick, he laid the tuft of grass on the comb, and, with his tooth-pick, drew the slender fibers through the spaces between the teeth, the bulbous part, too large to pass through, being left above on the comb. It occurred to him that the fiber of cotton might, in the same way, be separated from the seeds by hooked wires, made to revolve between stationary wires, above which the seeds would be left by themselves. Thus, as by a flash of inventive genius, the idea of the cotton-gin was conceived.

Mr. Whitney next went to Savannah, and procured a small parcel of cotton in the seed. A room was fitted up in the basement of Mrs. Greene's house, where he commenced with only the materials and rude tools then to be found on a Georgia plantation. With these he made tools better adapted to his purpose, and even drew the wire of which the teeth of his first machines were made. Only Mrs. Greene and Mr. Miller, a tutor in the family, were admitted to his work-room. Early in 1793 the machine was so nearly completed that its success was assured.

Mrs. Greene eagerly invited gentlemen from different parts of the State to her house, and showed them the machine, by which they saw that more cotton could be freed from the seed by the labor of one hand in a day, than could be done in the old method by one hand in months. The problem of the development of the Southern territory, adapted to the growth of cotton, had thus been solved; and the only machine which has superseded hand-labor in the preparation of the cotton staple for the market is the cotton-gin of Mr. Whitney; nor has it been essentially changed since.

At the urgent advice of Mr. Miller, the tutor, who was an enthusiastic and intelligent man, and who, having some capital, proposed to join him, Mr. Whitney resolved to obtain a patent for his machine, and to undertake its manufacture for the Southern market. They formed a partnership in May, 1793; and Mr. Whitney established a factory in New Haven, Conn., for the construction of the machines. For the next eight years they struggled against formidable difficulties, every effort being made to defraud them of their just claims. A patent had been granted, March 14, 1794, and lawsuits were begun against persons infringing on it; but no trial could be obtained until May, 1797, when they were decided in favor of the defendants. The encroachments on the patent right greatly multiplied in consequence, and the business of the firm was almost destroyed.

At the beginning of 1798 Mr. Whitney, discouraged in his attempts to pursue the enterprise, resolved to manufacture arms for the United States. He obtained a contract for supplying ten thousand stands of muskets, amounting to \$134,000—a bold undertaking, considering the obstacles in his way. Ten New Haven gentlemen became his security for a loan at the bank of \$10,000; and \$5,000 more was advanced by Mr. Wolcott, Secretary of the Treasury, in behalf of the United States, with the promise of \$5,000 more when his arrangements for the manufacture were completed. The site which he purchased for his works was at the foot of East Rock, two miles from New Haven. A moderate waterfall afforded the necessary power. He zealously began operations, but soon encountered many obstacles. The result was that it was eight years before the whole ten thousand muskets were completed; and the final balance due Mr. Whitney was only \$2,450.

Meanwhile, he devoted much time and labor to obtain some recognition of his rights as the inventor of the cotton-gin. In this he so far succeeded that, in December, 1801, South Carolina purchased his right in it for the State for \$50,000; of which \$20,000 was paid at once, and the rest in three annual installments. In December, 1802, he sold the right to North Carolina, the consideration being two shillings and sixpence a year on every saw employed in ginning cotton in the State, some of the gins having forty saws. A similar contract with Tennessee was made in 1803, the tax being thirty-seven and one-half cents a year on every saw operated in the State. The only other State at that time engaged in raising cotton was Georgia. Then Mr. Whitney was engaged in constant and expensive litigation, to obtain his due; and it was not until 1807 that he obtained a decision, when the case was brought before the United States Circuit Court, and decided in his favor. He reaped little advantage from this decision, thirteen years of the life of the patent having expired.

In 1812 he made application for an extension of the patent. He stated that, even then, with the limited area of cotton-growing territory, there was an annual gain to the Southern States of \$3,000,000; while all that he had received, from the beginning, was not equal to the value of the labor saved in one hour by his machine, then in use, reckoning the labor of a man at only twenty cents a day; and that, after deducting his expenses, his whole income from the invention had not exceeded half the sum made by a single individual in the use of the machines for one year. Notwithstanding these facts, his application for a renewal of the patent was refused.

He now turned his whole energies to his business at the armory. He had already constructed machinery for making every part of the musket with perfect uniformity and precision. He had devised and adopted the system of making the various pieces so exactly alike as to be interchangeable. In 1812 he entered into a

new contract with the Government to make fifteen thousand muskets; and, at about the same time he made a similar contract with the State of New York. His system was brought into successful operation; and, the utility of his machinery being shown, both were introduced into every large establishment for the manufacture of arms in the United States. The Secretary of War declared that the Government saved \$25,000 a year by the use of his improvements in its two armories. For the next ten years he was occupied mainly in the concerns of his armory, inventing new machinery, improving the old, and reaping, in affluence, the reward of his labors.

Mr. Whitney was married in January, 1817, to Henrietta F., youngest daughter of Hon. Pierpont Edwards, Judge of the United States District Court for Connecticut. A son and three daughters, were the fruit of this union. After a long illness, this great inventor died, on Jan. 8, 1825, in the sixty-first year of his age.

The armory was managed, after Mr. Whitney's death, by his nephews, Philo and Eli W. Blake, until 1835. From that date to 1841, it was under the general charge of Gov. H. W. Edwards, as trustee of Mr. Whitney's estate during the minority of Eli Whitney, Jr., who, on attaining his majority, assumed control of the business, and has managed it with ability and success down to the present time.

Eli Whitney, Jr., was born in New Haven, Nov. 24, 1820. He graduated at Princeton College in 1841. Inheriting, in a large measure, his father's mechanical ingenuity, he soon made himself competent to manage the establishment in all its departments. An enlargement of the works was soon needed, and improved machinery was introduced. In the war with Mexico, Mr. Whitney made rifles for the Government. The famous regiment of Mississippi Riflemen was armed with these Whitney rifles, which did effective execution. During the late Civil War, the resources of the Whitney Armory were again called into requisition by the Government, in the manufacture of Springfield muskets. The State of Connecticut also ordered 14,000 of the same style of arms. Mr. Whitney has taken out a number of patents for breech-loading arms, and for magazine rifles. Of the latter class, weapons are made at the armory of four different systems, all of them invented by Mr. Whitney, or by men in his employ. The Whitney armory has a capacity for producing one hundred and fifty rifles and one hundred and fifty revolvers a day. Its situation, and that of the village of Whitneyville, which has grown up around it, is at the base of East Rock. Lake Whitney, a fine sheet of water which supplies the armory with power, also furnishes New Haven with its water. This lake was formed in 1861, by the erection of a dam four hundred feet long, originated and built by Mr. Whitney. Under his superintendence, a bridge, having a span of one hundred feet,—rendered necessary by the raising of the lake,—was removed a quarter of a mile, and raised on abutments thirty feet high.

A decorative banner with a central rectangular frame containing the name "DAVID WILKINSON." in a serif font. The banner has ornate, symmetrical flourishes at both ends and along the top and bottom edges.

UMBERLAND and Smithfield, R. I., in the last century, were the homes of the Wilkinsons, notably a race of iron-workers. Jeremiah Wilkinson, in the early part of the century, wrought in iron, steel, gold and silver, drew wire by horse-power, made hand-cards, and is said to have been the first person who made and used cut-nails. Israel Wilkinson, about the middle of the century, invented a machine for making the heavy screws of wood or iron used in oil, paper, cider and clothiers' presses. John Wilkinson was a blacksmith, in Smithfield, R. I., where his son, Oziel, was born, Jan. 30, 1744. The latter learned his father's trade, and worked at it in Smithfield until 1783, his reputation bringing him trade from Providence and Attleboro, already the seat of mechanical industries, as well as from more distant places. During the Revolution, he made many articles for the Government, to be used in the war. In 1783 he removed to Pawtucket, both for the better water-power, and in order to be nearer his customers in Providence. The next year he put in operation his anchor-shop, and made many large anchors for Providence and Boston. He also purchased the Israel Wilkinson Screw Machinery, and engaged in that manufacture. In 1791 he began to make blistered-steel and nails, cutting the latter from sheets of iron which had been forged under his trip-hammers, and constructed a small machine, or pinch-press, to form the heads. He received Samuel Slater as a member of his family on his arrival at Pawtucket, and in due time gave him his daughter, Hannah, as his wife. He and his five sons, all of whom were, like him, at first iron-workers, were afterward identified with the cotton manufacture, either by investment of capital or actual personal labor.

His son, David Wilkinson, was born Jan. 5, 1771. When six years of age he helped his father in heading nails, by being placed astride a log, with his foot in a stirrup, to operate the pinch-press devised by his father for that purpose. At fifteen

he was taken by his father to Hope Furnace, in Scituate, established by Israel Wilkinson, on the site of the present Hope Factory, to mold a paper-mill screw. These screws were first cast, and then finished. The molding was a difficult task, and Israel Wilkinson, when he wanted a casting made, went to different furnaces, and made the mold himself. David molded three or four of them, weighing five hundred pounds each, and, taking them to Pawtucket, finished them. His success at so early an age indicated his mechanical capacity. He afterward made screws for similar purposes of wrought-iron; but they were defective, and suggested the necessity of more perfect methods of finishing them. It occurred to him to make a machine to cut screws on centers, which would remedy the defect. His father, by whom he was then employed, gave him permission to commence one, and, in 1794, he put his new machine in operation. It contained the principle from which he afterward worked out a most useful invention, namely the sliding-lathe, for turning wood or brass. This he patented Dec. 14, 1798. Fifty years after, Congress voted to him \$10,000 for his invention of "the gauge and sliding-lathe."

It is also claimed that the credit for constructing the first steamboat in America belongs to him. In 1793, returning home from the Hope Furnace, he stopped to see the ore-bed at Cranston. Here he examined the engine which was used to raise water from the ore-pits. "The engine," he afterward wrote, "was made with the main cylinder open at the top, and the piston raised with a large balance-lever, as the news of the cap on the cylinder, by Boulton and Watt, had not come to this country when that engine was built." Mr. Ormsbee, a Providence mechanic, who was repairing the engine, had heard that a boat had been run by steam in Philadelphia; and he and Mr. Wilkinson agreed to try the experiment. Ormsbee proposed to build or obtain a boat, and Wilkinson was to build the engine. Mr. Wilkinson made his patterns, cast and bored the cylinder, and otherwise finished the engine, and Ormsbee hired a large boat of about twelve tons, belonging to one of the East India ships, of John Brown. The boiler was a large copper still, of from one to two hundred gallons capacity. Mr. Wilkinson had two plans for the paddles, one of which he called a "flutter-wheel," and the other the "goose-foot paddle." The latter was adopted. It opened and shut with hinges. The boat was taken to a place a few miles from Providence, called Winsor's Cove. They succeeded in getting the machinery at work; and one evening they left Winsor's Cove, and arrived in safety at the lower wharf in Providence. The next day they went up in the boat to Pawtucket, and then returned to Providence. The propelling power was by upright paddles, which did not lift out of the water, as those of Fitch's did; but, when moved forward, they closed, and when moved aft, they expanded, their whole width being twenty-four inches. The speed attained was about four miles an hour.

Mr. Wilkinson made the first machinery for the cotton manufacture of Samuel Slater, forging the iron work, and turning the rollers and spindles; and, soon afterward, he engaged in the manufacture of cotton-machinery, continuing in it at Pawtucket, and afterward at Providence, in the machine-shop connected with the Providence Steam Mill, until 1829. He had also invested largely in the cotton manufacture, purchasing, in 1823, a privilege, and erecting a mill in Sutton, around which gradually grew up the village now known as Wilkinsonville.

In 1827, in connection with Samuel Slater and Benjamin and Charles Dyer, Mr. Wilkinson built the Providence Steam Cotton Mill; but in 1829, in the financial crisis which affected so disastrously many cotton manufacturers, he failed; and both the Providence Steam Mill and the mill at Wilkinsonville passed into the hands of Samuel Slater. The latter mill was afterward owned and operated by the Sutton Manufacturing Company, and is now managed by H. N. Slater, Jr., a grandson of Samuel Slater. It has 11,500 spindles.

Mr. Wilkinson, with Hezekiah Howe, who had married his youngest sister, Lydia, and had been his partner at Pawtucket, and in the enterprise at Wilkinsonville, removed, in March, 1831, to Cohoes, N. Y. Mr. Wilkinson had, five years before, become interested in the project of establishing manufactures at Cohoes Falls, on the Mohawk River. The projector of that enterprise was Canvass White, one of the engineers of the Erie Canal. While engaged in the construction of the canal at Cohoes, his attention was attracted by the eligibility of the locality as the site of a great manufacturing town; and, in 1825, he devoted himself to the formation of a company for the purpose of establishing it, with the aid of De Witt Clinton. Mr. White succeeded in interesting a number of capitalists, and the Company was incorporated March 28, 1826. Among the directors, besides himself, were Stephen Van Rensselaer, of Albany, Peter Remsen, of New York City, and David Wilkinson, of Pawtucket, R. I.

Little progress was made during the next five years; and, early in 1831, the Company induced Mr. Wilkinson to take up his residence there in April of that year. He was soon followed by Mr. Howe and eight others, from Rhode Island. The "History of Cotton Manufactures," published in Philadelphia, in 1836, refers to this removal of Mr. Wilkinson, in the following words: "The capitalists of Rhode Island ought not to have allowed David Wilkinson to leave the State. But he is now placed at Cohoes Falls, and that place has already felt the benefit of his business talents."

Mr. Wilkinson began operations at once, and his machine-shop, for the construction of cotton-machinery, was erected, and in full operation, before the end of 1831. In a year or two afterward, the Cohoes Iron Foundry was erected under his

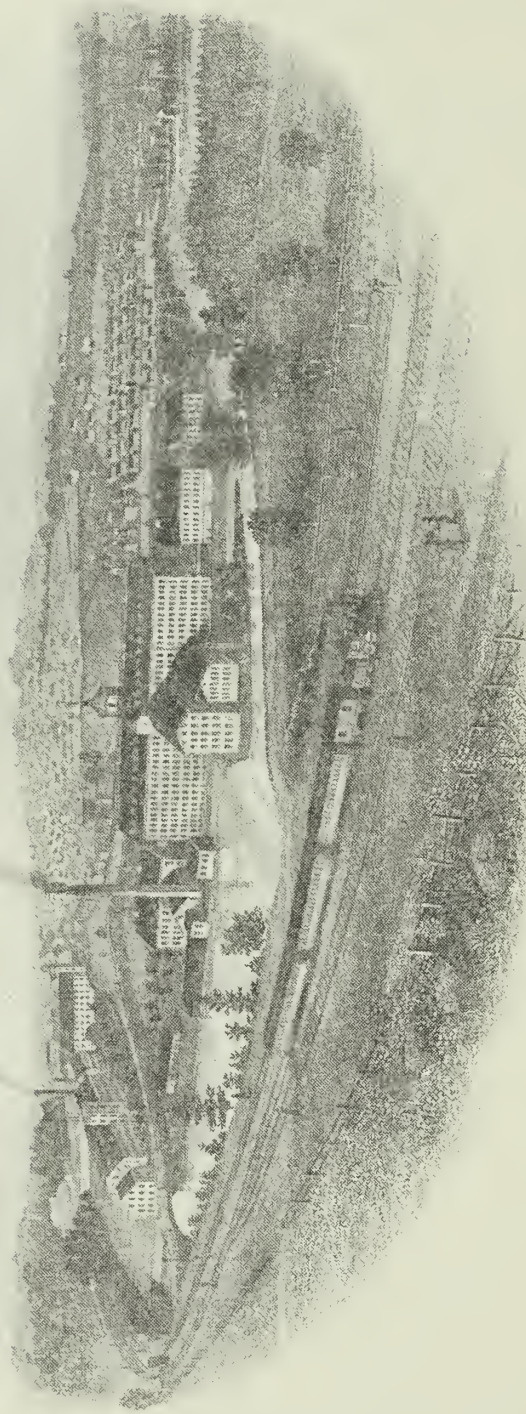
supervision. The business of both of these establishments was soon put in the charge of his son, John L. Wilkinson.

Mr. Wilkinson was engaged until his death, in various enterprises connected with internal improvements, both in the United States and Canada. Such was his reputation throughout the country for mechanical skill that there was a demand in various places for his services.

Among the enterprises with which he was connected was the construction of the Delaware and Raritan Canal in New Jersey, the Sandy and Beaver Canal in Ohio, the St. Lawrence improvements, and the wire bridge on the Ottawa River at Bytown, Canada. He was also engaged in some public enterprises in Virginia. He died at Caledonia Springs, Canada, Feb. 3, 1852, aged eighty-one years.

Mr. Wilkinson was born and bred as a Quaker, but in manhood connected himself with the Episcopal Church, of which he became a very active and useful member. He was one of the principal founders and largest supporters of St. Paul's Church, at Pawtucket. At Wilkinsonville he built a church, and supported its minister, at his own expense; and, on coming to Cöhoes, he took the lead in establishing St. John's Church.





Van Slyke & Co Boston

**WILLIMANTIC LINEN CO'S WORKS.**

WILLIMANTIC, CONN



AUSTIN DUNHAM.



THE history of American manufactures presents a series of long-continued conflicts with foreign capital and labor. The latter have had the advantage of long experience and the possession of the markets of the world. To this were added, in many branches of industry, domestic prejudice in favor of the foreign product, and, what was still more formidable, the relatively high price of labor in this country. Against these advantages held by the foreigner, which might easily have been regarded as decisive of the contest, have been combined the ingenuity of American mechanics, and the enterprise and organizing and executive ability of American owners and managing agents.

There are few manufactured articles supplying the ordinary demands, whether of necessity or comfort, or of the most cultivated taste and artistic culture, in which home manufacturers have not entered into successful competition, not only in their own markets, but in those of the world.

Among the articles for which our people depended, less than a quarter of a century ago, on foreign manufacturers, was spool cotton thread. The idea, indeed, of twisting cotton yarns into thread, as a substitute for the linen, or flax thread, which had been in universal use for sewing, was first suggested by an American lady, the wife of Samuel Slater, who, in 1793, having received from her husband some single No. 20 yarns spun from Surinam cotton, and which, in the length of its staple and the quality of its fiber, was quite similar to the Sea Island cotton of the present day, twisted it on an ordinary spinning-wheel, and made a two-ply thread, which was found to be stronger than the common flax thread then in use. Still, the manufacture was not successfully pursued in this country for more than half a century afterwards, especially in the fine numbers; and the English and Scotch manufacturers claimed that, owing to certain atmospheric influences, the best quality of fine cotton thread

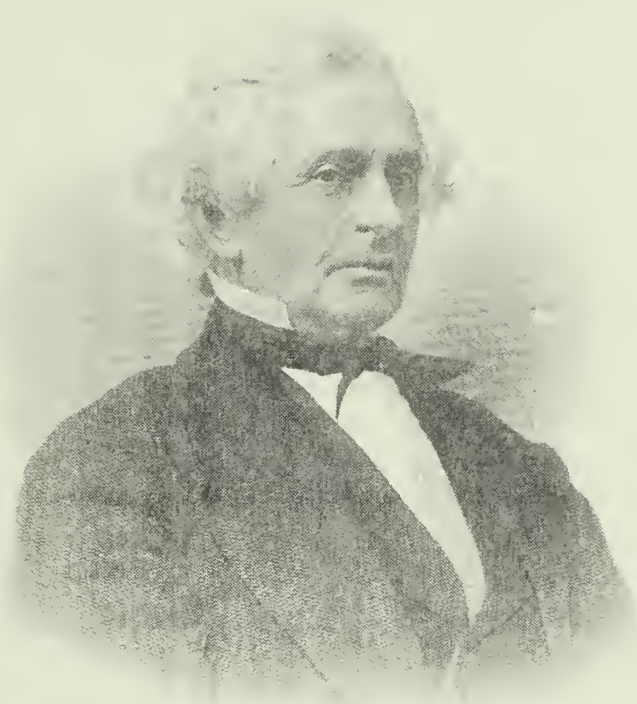
could not be made in the United States. It has, however, been shown, that when submitted to the severest test—its use in sewing-machines of different styles and device—American thread is superior to the English.

This triumph, which may be justly regarded as among the most signal achieved in any contest between the manufacturers of the New and those of the Old World, has secured to the Willimantic Linen Company both large pecuniary returns for its invested capital, and established prestige among the industrial establishments of New England, and of the country. The relation of its late president and treasurer, Austin Dunham, to its inception, development and success, as well as his large share and active interest in other manufactories, has placed him among the representative manufacturers of New England.

Austin Dunham was born in Mansfield, Conn., on the 7th of November, 1805. His ancestor, John Dunham, came to this country in 1633, on the seventh voyage made to New England by the Pilgrim ship, the "Mayflower," and settled at Plymouth. His descendants are numerous in the Old Colony, and on Cape Cod. When the branch of the family now resident at Mansfield, Conn., moved to that town, is not known. The father of Austin combined, as was not seldom the case in those days, the occupation of a farmer with those of a trader and manufacturer. He was the owner of a woolen-mill, and of a small cotton-factory of the class then very common in Rhode Island, south-eastern Massachusetts and eastern Connecticut, that supplied the yarns for the warp and filling of the hand-woven cloth. This hand-woven cloth was then made in most farmers' homes, the power-loom not having yet superseded the hand-loom, as they began to do about 1817.

Like many New England boys, who, in their manhood, have achieved wealth and reputation as manufacturers or merchants, Austin only went to the district school a portion of his time, and was employed during the greater part of each year in farm labor. Thus he developed a vigorous constitution, and habits of industry and self-reliance, which were large elements of his future success. At the age of fourteen he entered his father's store, at Mansfield, where he remained five years.

His diligence, capacity and trustworthiness were so marked, that about the beginning of 1825, when he was but little more than nineteen years old, he was appointed the agent of the Coventry Manufacturing Company, at Coventry, Conn. He remained in this position nine years. In 1834 he removed to Hartford, and became a member of the firm of Peck, White & Co., wholesale dealers in general merchandise. A few years after, the place of Elisha Peck as the head of the firm was taken by Daniel P. Crosby, for many years an influential citizen and wealthy capitalist of Hartford, and the style of the firm was changed to Crosby, White & Co. This firm was dissolved in 1845, and Mr. Dunham continued the business in his own name, and devoted his attention to trade in cotton.



Van Dyke & Co. Boston.

*Austin Dunham*



Having been trained from boyhood as a practical manufacturer, and having begun early to make investments in cotton-mills, he had now added the experience of eleven years as an active partner in a large and successful mercantile firm. He was thus thoroughly adapted to business in the specialty to which, for some twenty-five years he devoted himself. In 1851 the firm-style was changed to Austin Dunham & Co., and in 1859 his son, Austin C. Dunham, was admitted as a partner. The style of the firm remained the same till 1871, when it was changed to Austin Dunham and Son. In that year the business in wool, which had been transacted in the same store by Mr. Dunham, in partnership with Ebenezer N. Kellogg, under the firm-name of E. N. Kellogg & Co., was united with Mr. Dunham's cotton business, the firm just named being dissolved. In 1876 Samuel G. Dunham was admitted a partner, and the firm-style was changed to Austin Dunham and Sons.

During these more than forty years of active, engrossing mercantile life, Mr. Dunham was also interested in manufacturing operations, both in cotton and in woolen goods. He was, at different times, owner in whole, or in part, of several mills, mostly in northern and central Connecticut. Earnestly believing in manufacturing interests as a sound, and, in a succession of years, paying investment, he was always ready to purchase. He believed as fully, however, that only by the best machinery and methods success could be attained; and as soon as he came into possession of manufacturing property, however run down, he would at once renovate it. He introduced improvements whenever possible, and thus soon placed a concern which in other hands had been unsuccessful, on a basis of prosperity. He retained till his death, his interest in the Tunxis and Poquonnock Mills, in Windsor, Conn.; the Ellington Mill, at Windsor Locks; the Florence Mills, at Rockville, Conn.; and the Dunham Hosiery Company, at Naugatuck, Conn. Of these mills he, with his sons, constituting the firm of Austin Dunham and Sons, were the sole owners. He was also a stockholder in the Rock Manufacturing Company, at Rockville, Conn., and in the Wheeler and Wilson Manufacturing Company, at Bridgeport, Conn. Of the former company he was the president, and of the latter a director.

The most important enterprise of Mr. Dunham's life was the Willimantic Linen Company, organized in 1854. During the period of the progress and success of its special brand of manufacture, he was its controlling spirit.

The original partners in this enterprise were Lawson C. Ives, Austin Dunham, Elisha Johnson and Lucius Barbour. Mr. Ives was the senior partner of the long-established wool-house of Ives, Hooker & Co. Mr. Johnson had been warden of the State Prison at Wethersfield, and had thus had executive experience. He held the office of superintendent of the mill until 1860, when he disposed of his interest in the company. He was afterwards connected, up to the time of his death, with

the thread manufacture at Holyoke, Mass. Mr. Barbour had been a merchant in St. Louis, and only invested capital. He was a stockholder and director as long as he lived.

The original object of this company, as its name indicated, was the manufacture of linen goods, such as crash, toweling and shoe-thread. The business was soon interrupted by the failure of the supply of flax from Southern Russia, in consequence of the Crimean War, in 1854-5; and the attention and efforts of the company were then turned to the manufacture of spool cotton. Mr. Ives, as president and treasurer, was the official head of the company; but his experience had been wholly mercantile, and the personal supervision of details mainly devolved on Mr. Dunham, who added to the practical experience of his youth and early manhood in charge of a cotton-mill, to his acquaintance with all grades of the staple, as a dealer in it for twenty years, and to his mechanical taste and skill, other qualifications.

The first products of the company in spool thread were of the qualities known as three-cord finish and *glacé* thread of No. 60 and below. A profitable business soon sprang up, and the capital stock, which at the outset was \$75,000, was increased, in 1855, to \$125,000; in 1856, to \$225,000; and in 1865, to \$1,000,000.

About 1865, the attention of the company was called to the production of thread of the higher numbers. At that time single yarns higher than about No. 60 had not been spun in this country. It had become desirable, not only for making spool cotton thread of higher numbers, but for the purposes of certain other manufactures, to be able to make the finer yarns. For example: in the warps of fine elastic-web, for shoe-gusseting, the manufacture of which was commenced about that date in this country, two-ply yarn of about No. 100 was needed. It was at first imported; but under the operation of the tariff of July 1, 1865, two-ply yarn, No. 100, would cost, when imported, about eight dollars per pound; which, as the tariff did not proportionally affect the price of imported elastic-web, put a stop, for the time, to the manufacture of that kind of elastic-web in this country.

The attention of the Willimantic Linen Company was then turned to the manufacture of fine yarns. It had been asserted that the peculiar moisture of the atmosphere of Great Britain was essential to the spinning of fine yarns, and that this physical difficulty was insuperable. Mr. Dunham believed otherwise; and the Willimantic Company, obtaining, through the ingenuity and skill of American mechanics, machines which worked with peculiar exactness and nicety, have not only reached the limit which had then been attained by the best manufacturers of Great Britain, but have gone far beyond it, making, in the regular line of their business, yarns of No. 200, and much higher numbers as a matter of curiosity and experiment.

The attention of the company was early directed to making thread for sewing-machine purposes. The requisites for this thread were uniformity of size, evenness

of twist, and entire freedom from any knot or other irregularity on its surface. Imperfection in either of these respects would render the thread wholly unfit for the sewing-machine. That the Willimantic Company have succeeded in their aim,—to make the best thread for this purpose, and thus to compete successfully for a trade which has now become immense, but which originated in the same decade with the Company,—is shown by the testimony of the operators of fourteen of the sixteen American companies which exhibited sewing-machines at the Centennial Exposition, together with that of Newton, Wilson & Co., of London.

Mr. Ives retired about 1868, and Mr. Dunham was elected president and treasurer of the Company. Though not officially responsible for either the financial or the mechanical departments during the earlier years of the Company, his knowledge of both departments gave weight to his advice; but from 1868 he was not only virtually, but actually, the manager, and his name was thenceforth inseparably connected with the Company. It became evident, early in 1876, that the days of his activity were drawing to a close; and during the summer of that year he suffered acutely from heart disease. On the 15th of March, 1877, he passed away, as serene in his exit from life as he had been in all its affairs.

As a business man, he was a high type of the manufacturer and the merchant. His experience in the former vocation had extended over more than fifty years, and in the latter, over nearly the same period. His judgment, sagacity, caution and enterprise were the qualities that assured his success. Among the local corporations in which he had a pecuniary interest or official relation were the *Ætna Life Insurance Company*, of which he was, from 1863, the vice-president; the *Ætna Fire Insurance Company*, the *Hartford Steam Boiler Insurance Company*, the *Phoenix National Bank*, the *United States Trust Company*, and the *Security Company*, in each of which companies he was a director; and the *Hartford Eyelet Company*, of which he was president.

As a citizen, he took an active interest in political affairs. He was one of the founders of the Republican party of the State, but was not an office-seeker. His appointment by the Governor as one of the Commissioners for the erection of the new Capitol at Hartford—the most important public work ever undertaken by the State—was a just recognition of his public spirit, and of his sound judgment and executive ability.

Mr. Dunham made a profession of religion in early life, and was a member of the North Congregational Church, under the pastoral charge of Dr. Horace Bushnell. When the new edifice on Asylum Street, now known as the Park Congregational Church, was built, he was one of the most prominent and liberal promoters of the enterprise.

He married Miss Martha Root. Of their six surviving children, Austin C. Dunham graduated at Yale College, in 1854, and received a practical training in both branches of his father's business. In 1855 he entered the store of the mill in Hartford, becoming a partner in the firm of A. Dunham & Co., and also in that of E. N. Kellogg & Co., in 1859. For several years past the main responsibility, both of the mercantile business at Hartford and of the woolen mills, owned exclusively by the firm, has devolved upon him; and he is now at the head of the firm of Austin Dunham and Sons, the style being unchanged. Edward, the second son, was for some years a clerk in the store of A. Dunham & Co., but he has at the present time no active relation to the business. Samuel G., the youngest son, early in life entered the store as a clerk. On the 1st of January, 1876, he was admitted as a partner, and the firm-name was changed to that of Austin Dunham and Sons.

The office of president of the Willimantic Linen Company, made vacant by the death of Mr. Dunham, was filled by the election of Thomas Smith, of Hartford. He had been a stockholder in the Company from its organization, and, in 1860, had been elected a director, in place of Elisha Johnson. Mr. Dunham's place as director has been filled by the election of his son, Austin C. Dunham. The office of treasurer, also made vacant by the death of Mr. Dunham, was filled by the election of William E. Barrows, who had been, previously, assistant treasurer. Mr. Barrows has also been elected a director, and the vice-president of the company. In the latter capacity he is the executive manager of the company—a position which he held during the prolonged illness of Mr. Dunham. His experience during this period, as well as that previously acquired by him at the works of the Lowell Machine Shop Company, amply fitted him for the post to which he was promoted.





Van Slyke & Co. Boston.

*Samuel Williston*

# SAMUEL WILLISTON.



SAMUEL WILLISTON was born in Easthampton, Mass., June 17, 1795, and was the son of Rev. Payson Williston, for more than fifty years pastor of the First Congregational Church in that town. His grandfather was Rev. Noah Williston, of West Haven, Conn. The mother of Samuel Williston was the daughter of Rev. Nathan Birdseye, of Stratford, Conn. He attended the district school until he was sixteen years of age. During the summers of the latter part of his school life, he worked on several farms, the last of these engagements being in the adjoining town of Westhampton, where his wages were seven dollars a month.

On leaving school he studied privately with his father for a few months, and then entered into the employment of his brother-in-law, a clothier, at Rochester, Vt. He worked there the greater part of two years; and afterward attended Westfield Academy, and Phillips Academy, at Andover, Mass. But his eyesight failed him; and, for the next two years, he vibrated between labor on a farm and a clerkship in a store, the latter employment being partly at West Springfield, and, for about a year, in the wholesale establishment of Francis Child, in New York.

In the spring of 1817 he returned home, and engaged as a farmer, his father furnishing him with a farm, which he purchased for five hundred dollars. Samuel soon added to farming the business of sheep-raising, and of growing fine wool, teaching school in the winter; having, in 1820-21, for fourteen months, charge of the grammar school in Springfield. In the spring of 1822 he was married to Emily Graves; and the succeeding year he taught the school in the central district of Easthampton. His occupation as a farmer continued with fair success, though he was burdened with debt.

Mr. Williston struggled on about three years, when his wife, in order to earn something on her own account, determined to make covered buttons for sale. She

made up a gross with her own hands, a portion of which was purchased by President Humphrey, of Amherst College. The second gross made by her was sent to Arthur Tappan, of New York, who at once returned an order for twenty-five gross, at two dollars per gross. She next employed others to work for her in her own house, and then began to give them out to neighboring families. In 1826 her business had so increased that her husband resolved to devote himself to this new field of labor. The next year he went to New York, Boston, Philadelphia and Baltimore, and other large cities, obtaining customers and establishing agencies. The business grew so rapidly that more than a thousand families were soon at work for Mr. Williston. As auxiliary to this business, he opened a store for the sale of dry-goods, his first clerk being Horatio G. Knight, and his book-keeper, Mrs. Williston. The manufacture was continued by hand for some ten years with good profits.

Toward the end of this period Mr. Williston saw, in New York, some buttons of English manufacture, which had evidently been made by machinery. He took some of these buttons to Messrs. Joel and Josiah Hayden, ingenious mechanics of Williamsburg, Mass., and proposed to furnish the capital, sell the goods and divide with them the profits equally, if they would discover the process, get up the machinery and manufacture the buttons. They entered into the plan, and worked patiently a year or more, when success crowned their efforts. The machinery was then set up, and the manufacture was begun at Haydenville, by the Messrs. Hayden, for Williston. The control of the business and the sale and distribution of the goods were committed to Mr. Williston, who remained in his store at Easthampton, under his own name, until 1842. In that year he received into partnership, under the firm-style of S. Williston & Co., Horatio G. Knight, recently Lieutenant-Governor of Massachusetts.

Mr. Knight had entered Mr. Williston's store when fourteen years old; and, in the intervening period, had exhibited qualities which secured to him, at twenty-five, a valuable business connection. In 1847 the manufacturing contract with the Messrs. Hayden was closed, by the consent of the parties on both sides. The firm-style was then changed to Williston, Knight & Co. The machinery and manufacture were removed to Easthampton; and Mr. Williston, desiring to give his attention largely to other interests, the executive management, both of manufacture and sales, was assumed by Mr. Knight. This has continued in his hands until the present time. In 1865 a joint-stock company was formed, under the name of the National Button Company.

Soon after the transfer of the business to Easthampton, Mr. Williston turned his attention to other enterprises. In 1848-9 he erected a brick building, by the side of the button-factory, for the manufacture of suspender-webbing and suspenders,

and continued the enterprise on his own account until 1852, when a charter was obtained, and a joint-stock company organized, under the name of the Nashawannuck Manufacturing Company, of which Mr. Williston was President, and Edmund H. Sawyer, Treasurer and Agent. The Company purchased the right to use Charles Goodyear's vulcanized rubber in all kinds of woven goods. The manufacture of similar goods, with threads of native rubber, had been carried on for years in Europe and in this country; and an unsuccessful attempt had been made to use threads of vulcanized rubber. Under Mr. Sawyer's superintendence the difficulties were overcome, and excellent goods were soon produced. Mr. Sawyer still retains the position occupied by him from the beginning, of executive manager.

In 1862 another branch of elastic manufacture was undertaken, and the Glendale Elastic Fabric Company, mainly comprising the same persons, was formed. It manufactures narrow plain webs, frills and boot gusseting. Unsuccessful efforts in making this line of goods had already been made in this country; but the Glendale Company soon established a profitable business. In 1865 a new company was organized, for the manufacture of vulcanized rubber thread, as subsidiary to the business of the Nashawannuck and Glendale Companies; and sales were also made to other parties. In 1866, when past seventy years of age, Mr. Williston engaged in the last and largest enterprise of his life, the erection of the Williston Mills, for the manufacture of cotton sewing-thread; but this did not prove a success.

Mr. Williston used liberally the ample fortune amassed during his business career. He made many endowments to Williston Seminary, at Easthampton, which was named in his honor; and gave large sums to Amherst College, of which he was a trustee, to Payson Church, at Easthampton, the freedmen's societies, and to home and foreign missions. In all, his various gifts exceeded \$1,500,000. He was a member of the Massachusetts House of Representatives in 1841, and of the Senate in 1842, and 1843; was a trustee of the State Reform School and Holyoke Seminary; and a corporate member of the American Board of Commissioners of Foreign Missions. He was also connected with many manufacturing companies, banks and railroads, as director or president.

Having lost four children at early ages, he adopted and reared as his own the children of others. His three adopted daughters are respectively the wives of President William S. Clark, of the State Agricultural College, at Amherst; M. F. Dickinson, a well-known lawyer of Boston; and Rev. Joseph Lauman, a Congregational clergyman; and his adopted son is Lyman R. Williston, principal of the High School at Cambridge, Mass.

# WINCHESTER REPEATING ARMS CO.

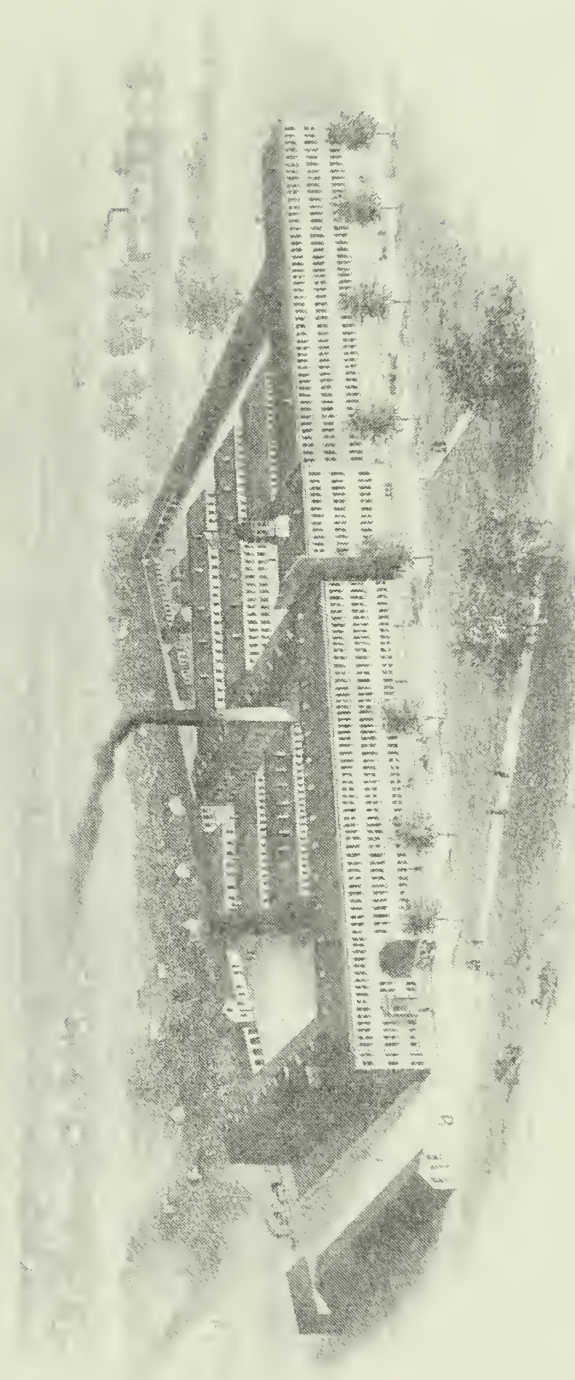


ANY armories have sprung up in the United States since 1850, to supply the demand created by the advancing art of war for improved weapons; and one of these is that of the Winchester Repeating Arms Company, of New Haven, Conn.

Oliver F. Winchester, the founder of this Company, was born in Boston, Mass., in 1810. At seven years of age he went to live on a farm near Boston, where he lived four years, attending school in winter. When he was fourteen, he was apprenticed to a house-carpenter and joiner, in Boston, and continued with him six years. He then bought the remaining year of his apprenticeship, and engaged on his own account in business, as a master-builder, in Baltimore, Md. He secured, the first year, a contract to build a church, and thus laid a good foundation for future operations. He continued as a builder until 1837, when he opened a store in Baltimore for the sale of men's furnishing goods. In this new enterprise, begun in a year of financial disaster, he had but moderate success; but he continued to pursue it for eleven years. During this period he invented a perfectly-fitting dress shirt, a patent for which was issued to him Feb. 1, 1848.

In the same year he sought a wider field of operation, and, selling his establishment in Baltimore, he formed a copartnership, under the firm-name of Winchester and Davies, with J. M. Davies, Jones & Co., then leading importers and jobbers in men's furnishing goods in New York. Mr. Winchester devoted himself exclusively to the manufacture of shirts, establishing a factory at New Haven, in which city he fixed his residence. This enterprise was successful from the outset, and received a new impetus in 1852, when the sewing-machine replaced hand-labor.

In 1857 Mr. Winchester became one of the principal stockholders in the Volcanic Arms Company, which was incorporated in that year. The weapon made by



WINCHESTER REPEATING ARMS CO

*Win. & H. W. Spencer.*



this Company was one of the earliest of the class known as repeating, or magazine, guns. Its main peculiarity, retained in the manufacture of the Winchester Repeating Fire-arms, is the tube, nearly the length of the barrel, for holding the cartridges, through and from which they are successively propelled by a spiral spring. The mechanism for receiving the cartridge from the tube, and feeding it into the breech of the barrel, was invented and patented, Feb. 14, 1854, by Horace Smith and Daniel B. Wesson, then of Norwich, Conn., of whom a sketch is given in these pages. The Volcanic Arms Company was not successful; and Mr. Winchester, having purchased its entire stock, formed a new organization in 1860, under the firm-name of the New Haven Arms Company, of which, as its president, he assumed the general executive management. In October of this same year, a patent was issued to Benjamin T. Henry, the superintendent, for an improvement on the patent, which received the name of the Henry Rifle. During the next six years a large quantity of these fire-arms were manufactured, and they were partially adopted by the Government in the Civil War. Many officers gave testimony to their effective service.

In 1865 a special charter was obtained, and the Company was re-organized as the Winchester Repeating Arms Company, with a capital of \$500,000. Mr. Winchester now sold out his interest in the firm of Winchester and Davies, and devoted himself to the business of the Company with which his name had now become identified. During that year and the next, experiments for further improving the Henry rifle were made by Mr. Winchester and others, which resulted in changes in the details of the magazine and of the mechanism at the breech of the gun, which were covered by patents issued to Nelson King, of Bridgeport, Conn., May 22, and Aug. 28, 1866, and to O. F. Winchester, Sept. 4, 1866. The name of the weapon was changed to the Winchester Repeating Arm. The main improvement was one designed to facilitate the transfer of the cartridge from the magazine to the barrel, and to enable a person to supply a single cartridge at a time, through a side opening; so that the arm might be used like a single breech-loader as long as desired, and the cartridges in the magazine be held in reserve for an emergency.

A new model was adopted in 1873, with several improvements, the most important of which was the adapting of the arm to a longer cartridge, having a charge of forty grains of powder, instead of twenty-five; retaining the same caliber (No. 44) and the same weight of ball, two hundred grains; increasing the initial velocity, the power and the accuracy of the arm; and giving it a power of penetration of about four inches in pine wood, at a distance of one thousand yards. The arm was also adapted to center-fire cartridges. The metallic cartridges were what are known as rim-fire, the fulminate being inclosed in the rim of the base of the cartridge, and being exploded by a blow on the rim. The improvement produced

by placing the fulminate in the center of the barrel had been generally adopted, one of its advantages being that the brass shell of the cartridge can be used a second time, and more if necessary; whereas, the shell of rim-fire cartridges is rendered useless by a single explosion. This is not only a saving of expense, but of special convenience to persons who live at a distance from dealers in ammunition. Having the powder and ball, they can, with the tools made by the Company, reload the shells. Another important improvement was in a device which prevents accidental, or premature, explosions. Several other improvements, to adapt the arm to sporting purposes or to target practice, were made.

The theory on which the Winchester repeating rifle had been constructed was to produce an arm which should be effective at all practicable ranges, up to five or six hundred yards, with the least weight of ammunition, and allowing great rapidity of firing. This theory was opposed by that which aimed at making as light a gun as possible, and using a very heavy charge to obtain accuracy at extreme ranges, of one thousand yards or more. Thus the Springfield, Remington and Sharpe's rifles of the United States, the Berdan of Russia, the Chassepot of France, and the Mauser of Prussia, use cartridges ranging from seventy to eighty grains of powder, and four hundred to four hundred and eighty grains of ball—twice the amount of powder, and more than twice the weight of ball, used by the Winchester arms of 1873. The Martini-Henry, of England, and the Snider, of Turkey, with about the same weight of ball, use even a greater weight of powder—eighty-five grains. The Winchester Repeating Arms Company claim that, making all allowance for improvement in modern arms of precision, five hundred yards will probably more than cover the distance at which decisive conflicts will be fought; and that the advantage will, in that case, be with soldiers who can, at that range, do most effective service. Besides, the greater recoil of the guns, heavily loaded, would tend to disable the soldiers using them. In the case of target practice, much of which is at long ranges, cartridges of greater weight may be used to advantage.

Notwithstanding their theory as to arms designed for military or sporting purposes, the Company resolved in 1876 to meet the demand for some arms of a longer range, and prepared the model known as that of 1876, or "The Centennial." This uses a cartridge conforming precisely, in caliber, weight of powder and weight of ball, to those of the United States Springfield rifle. As to the successive models of 1866, 1873 and 1876, in neither of the latter two cases has the later model supplanted a former one, the demand for each of the former two continuing equal to that which existed for it before the adoption of its successor.

Besides the Winchester repeater, the Company is now engaged in the manufacture of the Hotchkiss magazine gun, having purchased the exclusive right, under

the patents of the original inventor, B. B. Hotchkiss. This arm, as altered and improved by the Winchester Repeating Arms Company, has lately been adopted by the Ordnance Department of the United States, for the use of the army. It is an arm of simplicity and strength, and its system permits the use of the heaviest charges. The magazine is placed in the stock, below and behind the breech-piece; so that when the latter is withdrawn, in opening the arm, a cartridge slides into the chamber. The return of the breech-piece, to close the gun, cocks the hammer, and it remains only to pull the trigger. It is a peculiar feature of this arm that it has no carrier-block, and that cartridges of as many different lengths as the same shell will permit can be used in the magazine at the same time. No tool is required to dismount it, the fingers being aided by the parts of the gun itself.

In 1872 the Company engaged in the manufacture of metallic cartridges—a branch of the business which has already reached an amount of production equal to that of fire-arms, and to make which they have introduced a large amount of machinery. Besides having introduced effective machinery, the Company exercises constant and minute inspection of the work. The bullets, from the smallest to the largest sizes, are swaged by patented machinery, giving uniformity of size, also of density and weight. Every bullet is also inserted in its shell in such a manner that its axis coincides with that of the shell, and, therefore, with that of the barrel of the gun. The capacity of the Company is equal to the production of one and a half million of cartridges, of every variety, in a day.

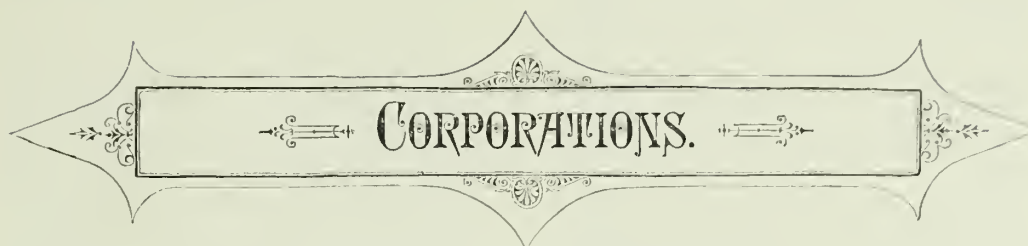
The buildings have been erected from time to time, as the business demanded. They are situated in the northerly part of New Haven, and nearly cover a quadrangular area of about four acres. The main building, fronting on Winchester Avenue, is six hundred and ninety-three feet long; and the aggregate length of all the brick-buildings is over sixteen hundred feet, with an average width of forty feet. There is nearly an equal length of wooden structures, four hundred feet being workshops, the rest for sheds and other small buildings. The buildings are heated by steam; and, to avoid fire, four watchmen are kept on duty, and an apparatus consisting of eight double hydrants, six stand pipes, with hose constantly attached in each story, nine fire-extinguishers and thirty-eight casks of water, has been established in the factory.

Mr. Winchester still retains his full physical and mental vigor. While devoting himself assiduously to business, he has always taken an active interest in public affairs; and was elected, in 1866, Lieutenant-Governor of Connecticut. He has been a generous patron of learning and the arts, and of benevolent and religious institutions.



CORPORATIONS.





## COTTON — IRON — WOOLEN.

**American Linen Company.**—This Company, whose mills are in Fall River, Mass., was incorporated in 1852. In the same year a mill 301 feet long, 63 feet wide and four stories high, was built for the manufacture of linen goods. In 1858 the production was changed to cotton print-cloths, and a fifth story was added to the mill. In 1866 a second mill, 393 by 72 feet and five stories high, was built. Both these mills were constructed of granite, and contain 82,512 spindles, and 1,956 looms. 8,500 bales of cotton are annually used, producing 21,000,000 yards of print-cloths, and employing 1000 operatives.

**Ames Plow Company.**—This Company was incorporated in 1864, but was established as a business prior to 1840, under the firm-name of Ruggles, Nourse and Mason. Although they manufactured every variety of agricultural implements and machines, their specialty has always been the plow. Previous to 1841 the manufacturing was done, and the sales were made, in Worcester; but in that year a warehouse was established in Boston, the Company occupying the entire upper floor of the Quiney Hall Market.

In 1856 the firm-name became, through a change of partners, Nourse, Mason & Co.; and in 1861 all the interests of the

partnership passed to Oliver Ames and Sons, the prominent shovel-makers of Easton, Mass. This firm continued the business in their own name until 1864, when the Ames Plow Company was incorporated.

The number of establishments in the United States for the manufacture of agricultural implements is between four and five hundred. One of the oldest of these is the Ames Plow Company.

This Company has extensive manufactories at Worcester and Ayer, Mass., and warehouses in Boston and New York. The manufactory at Worcester is a large establishment, the length of one wing of the main building being 200 feet, and that of the other 175 feet, each having a width of 50 feet. These wings are four stories in height, including basement. Besides the main buildings there are blacksmith shops, grinding and polishing-shops, a foundry, a three-story pattern-shop, steel-rooms, store-houses, sheds, coal-houses and boiler and engine-house.

A special track gives the shops direct communication with the various railroads converging at Worcester. The factory of the Ames Plow Company at Ayer is almost equal in extent to that at Worcester. The two groups probably constitute one of the largest establishments of the kind in the world.

**Androscoggin Mills.**—These mills are located in Lewiston, Me. They were organized in 1860, and operations were begun in the following year, with a capital of \$1,000,000. There are now three mills, all of them being situated upon the Androscoggin River, which furnishes abundant water-power. Mill No. 1 is of brick, 600 feet long, 75 feet wide and four stories high, and is devoted to the manufacture of sheetings, shirtings, prints and jeans. 7,900 yards of these goods are being produced annually. Mill No. 2 is 184 feet long, 74 feet wide and three stories high; No. 3 is 166 feet long, and of the same width and height as No. 2. In these two mills seamless bags are manufactured, used principally by the Western farmers, for the transportation of grain to the railroads. These two mills turn out 42,000 bags, each a pound in weight, every week. Mill No. 1 contains 52,450 spindles.

These mills consume 5,400,000 pounds of cotton, 1,200 tons of coal and seven tons of starch, annually. The monthly pay-roll averages \$45,000. Besides seven turbine-wheels, with a total of 1,200 horse-powers, there is a Corliss engine of 150 horse-powers. The mills are lighted by gas, manufactured on the premises in works constructed in 1876.

The treasurer (*pro tem*) of the corporation is Lyman Nichols, of Boston, who succeeded the late Benjamin E. Bates; the resident agent is William F. Goulding; and the selling agents are Wright, Bliss and Fabyan, of Boston and New York.

**Appleton Company.**—The Appleton Company, of Lowell, was organized in 1828. It has a capital of \$600,000, and owns three mills, in which are employed 470 females and 230 males. There are 1,202 looms and 42,500 spindles. 100,000 pounds of cotton are consumed each week. The specialties of the Company are sheetings, drillings and shirtings. James A. Dupee, of Boston, is the treasurer; J. H. Sawyer, the resident

agent; and Upham, Tucker & Co., of Boston and New York are the selling agents.

**Arlington Mills.**—The mills of this Company are located on the Spicket River, in Lawrence, Mass. The business was begun by a company known as the Arlington Woolen Mills, incorporated in 1865, with a capital of \$200,000. The original proprietors were: Robert M. Bailey, Charles A. Lambard, Joseph Nickerson and George C. Bosson; and Mr. Bailey was the first president. The proprietors purchased the Berkeley Mills, and began operations on fancy shirtings, flannels and woolen-felted goods.

Manufacturing had been carried on about two years, when, in October, 1866, the mill, with its machinery, was burned. Another mill was, however, completed early in 1867. About the same time, the capital stock was increased to \$240,000. Under the stimulus given, by the tariff of 1866, to the worsted manufacture, the Company directed their operations to the production of women's worsted and cotton goods. The new mill was equipped with 175 looms and other worsted-machinery. But unexpected difficulties were met with, against which the Company struggled for three years. A reorganization was then effected, in 1870, and Joseph Nickerson was elected president, and William Whitman treasurer and general agent; at the same time, the stockholders paid in the whole amount of the authorized capital.

The next year the mill was remodeled, largely increasing its productive capacity; and, more recently, further additions of buildings and machinery have been made; so that their productive power now consists of more than 500 looms, which produce annually 5,000,000 yards of cloth. About 600 persons are employed in the mills. In 1872 the Company began the manufacture of alpacas and brilliantines; and in 1875 the present corporate name was

adopted. The following year the capital was raised to \$320,000; and, in 1877, it was further increased to \$400,000.

**Atlantic Mills.** — Lawrence, Mass., in which the Atlantic Mills are situated, lies on both sides of the Merrimac River, twenty-six miles from Boston, and was made up of parts of the towns of Andover and Methuen. In 1845 an association was formed as the Essex Company, for building a dam and other purposes connected with manufacturing. The principal stockholders were members of the Lawrence family, of Boston; and when the town was incorporated, in 1847, it received their name. Its growth has been remarkable, its population being now more than 30,000. The Company built a dam, chiefly of granite, across the Merrimac River, which, with its abutments, is 1,629 feet in length. It is 30 feet wide at the base, 40 feet high, and gives a water-flow of 900 feet. A distributing canal about a mile long was also constructed.

One of the first two manufacturing companies incorporated to do business within its limits was the Atlantic Cotton Mills, which was chartered Feb. 3, 1846, with a capital of \$2,000,000. The buildings of the Atlantic Company, devoted to the manufacture of goods, are of brick, and are grouped together between the Merrimac River and the canal which conducts water to them. The main building, having a frontage on the Merrimac River, consists of a central portion, 140 by 106 feet, seven stories high, with wings, each 220 by 60 feet, and six stories high. There are other buildings connected with this main structure; one of these is 180 by 65 feet, two stories high; and two are each 140 by 50 feet, five stories high.

The number of operatives is about 1,200, most of them being women and girls. The machinery comprises 1,800 looms, and a capacity for 80,000 spindles. The water-

power is estimated at 1,500 horse-powers, with an auxiliary steam-engine of 500 horse-powers, to be used when the supply of water is insufficient. The mills have no apparatus for dyeing or bleaching, but the machinery for all the processes of manufacturing unbleached goods is ample. The product of the mills was at first about 3,500,000 pounds of goods annually; it is now about 7,000,000 pounds. The amount of cotton consumed is about 16,500 bales a year.

**Boott Cotton Mills.** — The Boott Cotton Mills Company, whose mills are in Lowell, Mass., was organized in 1835. It has a capital of \$1,200,000, and owns six mills, which are devoted to the manufacture of fine sheetings, shirtings, drills and print-cloths. About 24,000,000 yards of goods are annually manufactured, consuming 6,760,000 pounds of cotton, employing 2,552 looms, 112,752 spindles, and nearly 2,000 operatives.

**Bridgewater Iron Manufacturing Company,** incorporated June 18, 1825, succeeded the firm of Lazell, Perkins & Co., which, in 1816, on the death of Mr. Carey, had succeeded Lazell, Carey & Co., who had been the proprietors from 1810. These works are at Bridgewater, Mass., and are the oldest established in America. There is a record of iron-works at this place as early as 1785; and the first locomotive crank-axle made in this country was forged here, for the Locks and Canals Company, of Lowell. The Company's works comprise in all twenty-eight buildings, occupying an area of about ten acres of the tract of seventy acres of land belonging with the works. The iron-foundry has two cupola furnaces, capable of melting thirty tons of iron; one air furnace, that will melt twelve tons; and they have all the requisite facilities for producing the largest class of castings and the

heaviest forgings. The forge department is a special feature of the works. They have one hammer which weighs over eleven tons, a full stroke of which is said to be equal to the fall of one hundred and thirty-five tons. The anchors of the old "Constitution," and shafts and other wrought-iron work for the new "Constitution"; the large forgings for all the steamers of the fleet of the Pacific Mail Steamship Company running on both the Atlantic and Pacific Oceans; the truss-work for the iron-clad frigates built by the Government in 1868; the forgings for the original "Monitor," and the greater part of all those for the Iron-clad Navy of the United States, were furnished from these works. The capital of the Bridgewater Iron Company is \$480,000; and, in usually prosperous times, they employ, in the various departments of their works, about 600 men.

**Burlington Woolen Company.** — The mills of this Company are established at Winooski Falls, Vt., and were erected from 1836 to 1838. For the first twelve years the business of the Company was unprofitable; but in 1852 it passed into new hands, and its affairs were placed on a more prosperous basis. In the fall of 1862 the concern passed into the hands of Hon. E. R. Mudge and others of the present corporation, under whose management the capacity of the mills has been nearly doubled. The fabrics produced at these mills are fine and medium broadcloths, doeskins and Moscow beavers, and, more recently, fine figured and fancy cassimeres and suitings. The Company introduced into this country the manufacture of Moscow beavers. The value of its whole annual product is about \$1,000,000, and the wool consumed nearly 1,500,000 pounds.

**Cocheco Manufacturing Company.** — This Company was the successor of the Dover Manufacturing Company, which suc-

ceeded the Dover Cotton Factory. The Company bearing the name of the Dover Cotton Factory was incorporated Dec. 15, 1812, with a capital of \$50,000; which, on June 21, 1821, was increased to \$500,000; and on June 17, 1825, to \$1,000,000; when a re-organization was effected, and the name changed to the Dover Manufacturing Company.

The Cocheco Manufacturing Company was incorporated June 27, 1827, and purchased, Dec. 1, 1829, all the works and personal property belonging to the Dover Manufacturing Company.

The first officers of the Company were chosen July 17, 1827, and were: President, Ebenezer Francis; Directors, William Payne, George Bond, Eben T. Andrews, Francis Coffin and John Wheeler; Treasurer, William Appleton; Clerk, Matthew Bridge.

The Dover Cotton Factory Company built its first mill on what are called the upper-factory falls of the Cocheco River, about two miles above its lower falls. This mill was called No. 1, or the upper factory. It was built in 1815, of wood, in the form of an L; the main building was 80 by 33 feet; the projection 55 by 30 feet, four stories high, including the attic. It contained, in 1837, 2,500 spindles and 100 looms. Some time after 1837 it was pulled down.

The Cocheco Manufacturing Company has four mills on the lower falls of the Cocheco River. Mill No. 2, built of brick, in 1822, is 154 by 43 feet, and is four stories high; No. 3, built of brick, in 1823, is of the same dimensions as No. 2, and five stories high; No. 4, built of brick, in 1825, is six stories high; and No. 5, also brick, and erected in 1825, is covered by an unbroken continuation of the roof of No. 4. The whole length of the two mills is 422 feet; and they are so placed that they nearly form a square, which makes a mill-yard 265 feet by 362 feet. The number of operatives now employed in the mills and print-works is 1,300. The mills

contain 1,329 looms, and 56,000 spindles ; and manufacture yearly over 16,200,000 yards of print-cloth.

**Continental Mill.**—This mill is situated on the Androscoggin River, at Lewiston, Me. It was first organized in 1853 by the Franklin Company, as the Porter Mill. In 1864 the Continental Company was organized and incorporated for the manufacture of cotton ; and, in November of the following year, they purchased the Porter Mill, changed its name to the Continental, and, early in 1866, began running it. When purchased by the Company the mill was about one-third its present size, and contained 27,000 spindles. In 1872 the east wing was added. Three extensions have since been made, which occupy the interior area ; and the whole so enlarged as to permit the putting in of 43,000 more spindles. The mill now has a frontage of 787 feet, and an average depth of 75 feet, with six floors, giving a superficial area of over eight acres, and a capacity at present for 70,000 spindles. The premises also contain fire-proof houses, for storing large amounts of cotton, and for shops.

The mill has a motor equal to 1200 horse-powers ; six turbine-wheels, distributed at different angles of the building, and working in the wheel-pits, with a fall of water, from one of the canals of the Franklin Company, of twenty-three feet. Steam is never here employed as power, but simply for heating purposes.

The product of this mill is a brown cotton cloth, never bleached, of even texture and pure material, thirty-six and forty inches wide, intended for sheetings and shirtings ; about 1,300 operatives are employed, of whom two-thirds are women and girls. The pay-roll amounts to upward of \$30,000 a month. The value of the annual product reaches \$1,500,000. Since the organization of the Continental Company, Messrs. R. A. Budlong, S. E. Abbott

and E. S. Davis have filled the position of agent ; and Mr. Davis is the present incumbent.

The directors are L. Nichols, Benjamin E. Bates, George F. Fabyan, Eben D. Jordan, James H. McMullan and Nathan Cushing. William B. Wood is treasurer of the Company.

**Dwight Manufacturing Company.**—

The cotton mills of the Dwight Company are situated in Chicopee, Mass., on the southern bank of the Chicopee River, and about three miles from Springfield. Attention was called, many years ago, to the water-power furnished by the Chicopee River at this point ; and measures were adopted to make use of it for manufacturing.

The Springfield Canal Company was organized for this purpose on the 9th of June, 1831. This Company bought the entire water privilege at Chicopee, erected a dam, and constructed a canal.

The formation of the Dwight Manufacturing Company was the result of the consolidation of the Cabot Manufacturing Company organized March 20, 1832, and named for Samuel Cabot, a merchant of Boston ; the Perkins Mills, organized March 10, 1836, and named for Thomas H. Perkins, also a Boston merchant ; and the Dwight Manufacturing Company, organized Feb. 6, 1841, and named for Edmund Dwight, a merchant of Springfield. The Cabot Company and the Perkins Mills were united in 1851, the new company thus formed retaining the name of the Perkins Mills. A union of the Perkins Mills and the Dwight Company was effected Feb. 28, 1856, the name of the latter becoming the corporate title of the new concern. Samuel Cabot was chosen the first president ; F. H. Story, treasurer ; and George W. Lyman, Samuel Hooper, Ignatius Sargent and William Sturgis were elected directors. Before their consolidation, the three Companies owned seven mills, in which

70,000 spindles were used, and about one thousand operatives were employed. All these mills were built under the superintendence of John Chase. During the first twenty years after the organization of the Cabot Company, James K. Mills, a man of large experience, was the treasurer of the three corporations. Sylvanus Adams was, for a time, the resident agent of the Perkins Mills; then of both the Perkins and the Cabot Companies; and still later, of the Dwight, after the consolidation—serving in all these capacities for twenty-seven years.

The final union of these Companies was, to a large extent, due to Franklin H. Story, who was elected to the treasurership both of the Perkins Mills and the Dwight Company in 1852, and retained that position for thirteen years. He was succeeded by Daniel N. Spooner, whose term of service extended from 1865 to 1869. The next treasurer was Charles W. Freeland, who held the office until the election, in 1876, of the present treasurer, J. Howard Nichols.

Associated with him in the management are T. Jefferson Coolidge, a prominent Boston merchant, who was chosen to the presidency of the Company in 1877; and William S. Bullard, Williams G. Means, F. M. Weld, Charles W. Freeland, S. W. Marston and John L. Gardner, Jr., who compose the present board of directors.

Since the organization of the Dwight Manufacturing Company, in 1856, repairs and renewals have been made, at different times, upon the property of the corporation. In the years 1872 and 1873, during the treasurership of Mr. Freeland, two of the mills were entirely rebuilt, and filled with new machinery. During the period from 1862 to 1875, over \$2,000,000 were spent in repairing the dam, enlarging the buildings and in general improvements. The enlargement of the mills demanded an increase also of power; and two Corliss engines, of four hundred horse-powers each, were put in operation in 1877.

The number of mills remain the same as before the consolidation; but their productive capacity has been increased, until they now contain 110,944 spindles. The fabrics woven are sheetings and shirtings, and the annual production is 6,000,000 pounds, or 22,000,000 yards, ranging from No. 14 to No. 50 yarn. The finer grades of goods produced at these mills are well known for their good qualities, and received an award at the Centennial; while the coarser fabrics made in them are extensively exported abroad. The present capital of the corporation is \$1,200,000; and about fourteen hundred persons, one-fourth of whom are males, are employed by it.

**Fall River Manufactory.**—This Company, organized for the manufacture of cotton goods, in Fall River, Mass., was incorporated in 1820, with a capital of \$150,000. It succeeded the enterprise of David Anthony, Dexter Wheeler, Abraham Bowen and others, who built and started the mill with a capital of \$50,000, in 1813; and it was one of the first two cotton-goods manufactories established and maintained in Fall River. The mill was built for 1,500 spindles; and its dimensions were 60 by 40 feet, and three stories high. The first story was constructed of stone, and the second and third of wood. Mr. Anthony was the first treasurer and agent of the Company.

The factory was enlarged in 1827, and again in 1839. In 1868 the mill was wholly burned, and the following year the present stone factory was erected. It is 275 by 73 feet, and five stories in height, and has two turbine wheels of 140 horse-powers each, supplemented by a Corliss engine of 300 horse-powers. It contains 25,992 spindles and 600 looms, which annually produce 7,000,000 yards of print-cloth.

The present list of stockholders of this Company numbers forty-seven. Dr. Nathan Durfee was president of the Company up to the time of his death.



1892



**GREAT FALLS MANUFACTURING CO.**

GREAT FALLS, N. H.

*Incorporated 1823*

**Great Falls Manufacturing Company.**—The Great Falls Manufacturing Company, of Somersworth, Strafford County, N. H., was incorporated June 11, 1823, with a chartered capital of \$500,000. The first meeting of the corporation was held at Dover, July 10, 1823. A board of directors was elected, Abraham Wendell being chosen president, and Jacob Wendell treasurer.

Isaac Wendell, of Dover, during the years from 1821 to 1823, purchased the privileges at Great Falls, with large tracts of the land adjoining on both sides of the Salmon Falls River, with the view of establishing cotton-factories on the stream; and, at the time when the organization of the Company was completed, he had erected a store, boarding-houses, work-shops suitable for building cotton-machinery, and a wooden building for a cotton-factory near the present site of the flouring-mill. For the property which Mr. Wendell had purchased, and improved, under a contract to complete, by the following January, 1,280 cotton-spindles, at twenty-five dollars per spindle, with all other necessary machinery for manufacturing cotton goods, the Company voted, July 22, to pay him \$76,224.18, and appointed him resident agent of the corporation.

George Trott was chosen treasurer in 1824, when a second cotton-factory, of 4,000 spindles, was built, which is the upper section of the present No. 1 Mill. The following year a woolen-mill was built, capable of producing two hundred yards daily of fine broadcloths. This mill was built easterly from, and at right angles with, the present repair-shop. In the upper portion of the latter carpetings were woven, the lower story being used for a woolen-picker and dyeing-house. Christopher C. Walcott was chosen superintendent of the woolen department.

The works were enlarged from the original plan; and the carpet-mill produced two hundred yards daily, and the woolen-mill

four hundred yards of broadcloths. Large sums of money were expended in experiments; and, although it does not appear that this branch of the Company's manufactures was profitable, its fabrics were very fine, and compared favorably in texture, color and finish with the best importations of that time. In 1826 the charter was amended, authorizing a capital of \$1,000,000.

The two lower sections of what is now the No. 2 Mill were erected, and machinery was put into the lower section the following year. The upper section was not filled with machinery until two years later, it being used in the meantime as a place of worship by the Congregational Society. The Company's charter was further amended in 1827, authorizing a capital of \$1,500,000, which is the present nominal capital.

In 1831 Lloyd W. Wells succeeded Mr. Wendell as agent. The manufacture of carpets was discontinued in 1833; and in January, 1834, the business continuing unprofitable, the directors were authorized to stop the manufacture of all woolen goods. In the same year George H. Kuhn was appointed treasurer, and Robert W. Israel agent. The woolen business was entirely closed up; the goods on hand and the machinery were sold prior to July, 1835; and the mill was equipped with cotton-machinery. The machinery from the old Wendell Mill was transferred to it (the mill itself sold and removed in 1838); also, owing to a lack of power on the upper level, some of the machinery from the other mills was transferred to this mill; and the balance of the mill was supplied with new spindles to the number of 5,700.

Prior to this time all the mills had been operated by the power on the first level, and the lower fall had not been utilized; but, to run the new mill, in 1835 a dam was built, nearly opposite the present cloth-room, and the water conducted through a long wooden pen-stock to three breast-wheels about two hundred and fifty feet easterly of the woolen-

mill, or No. 4, as it was then called, and the power was transmitted by a system of belting. When this mill was completed, there were 39,840 spindles and 1,132 looms.

In 1835 the dam at Mast Point was built and the dam at Milton was raised four feet. The first created a new reservoir within two miles of the mills, capable of storing a day's water; and the latter increased the area of the Milton Ponds about five hundred acres.

In 1838 John A. Burleigh was appointed agent, and in 1840 Patrick T. Jackson succeeded to the office of treasurer. Under their administration the condition of the Company improved rapidly.

The reservoirs were increased in 1841 by the purchase of Cook's and Lovell's ponds. The plan to fully and economically use the water on the second level was carried into effect by building a dam on the present site, in 1842; and the system of long belts, by which a large percentage of power was lost, was discontinued. In this year, also, the lower or southerly section of the present No. 3 Mill was built; and, in the following year, the woolen-mill was taken down and rebuilt, and is now the upper or northerly section of No. 3.

The new No. 1 Mill was commenced in October, 1845, and completed in 1847. In the meantime the dam on the third level was built, it being the privilege now leased to the Great Falls Woolen Company.

Mr. Jackson died in September, 1847. During his administration the product of the looms had more than doubled; 25,000 spindles had been added; and, of the five mills, two had been built new and one rebuilt, and the two others put in the best order and condition. John Clark succeeded to the office.

In 1849-50 the old No. 1 Mill was filled with new machinery, the best then obtainable adapted for the spinning of No. 50 yarns. A turbine-wheel displaced the old breast-wheels, and a one hundred and eighty horse-power engine was added. In 1851

Robert Hooper became treasurer. The bleachery was built the following year, the gas-works erected, and the reservoirs increased by the purchase of Horne's and Wilson's ponds.

In 1855 the middle section of the present Mill No. 3 was built, and equipped with 7,427 spindles and 200 looms, which were put in operation January, 1856.

In 1859 Mr. Hooper resigned, and Daniel N. Spooner was appointed in his place, at which time the Company had seven mills, 83,120 spindles, and 2,120 looms.

In 1861 J. A. Burleigh died, after twenty-three years of faithful and efficient service, and his son, George W., was appointed to fill the vacancy. The mills were closed the greater portion of the time from 1862 to 1864, during which years the reservoir for fire purposes and daily use at the mills was constructed, at a cost of \$100,000. It has a capacity of 1,700,000 gallons, and is located on the summit of Prospect Hill, one hundred and forty feet above the first level. By a liberal policy the Company has allowed water-pipes to be laid through all the principal streets of the village, and gratuitously furnishes water for fire purposes to the town.

For more than a decade prior to 1866, little or nothing had been done to keep the mills in good repair, beyond the absolutely necessary repairs to keep the machinery in motion; but during the years from 1866 to 1869 an addition of 163 feet by 100 feet was made to the present Mill No. 2, the two old mills consolidated, and the whole partially furnished with new machinery (turbines being substituted for the old breast-wheels), at a cost of nearly \$700,000. Upon the decease of Mr. Spooner, September, 1869, Charles W. Freeland became treasurer.

In 1871 was commenced the renovation of the lower-level mills, under the immediate supervision of Wm. A. Burke, of Lowell, who had previously been appointed assistant treasurer. The three mills were consolidated, and covered under one flat

roof; and a complete set of new machinery—including turbines where breast-wheels had been used—was put in, the whole, when complete, comparing favorably with the best mills in the country.

In 1872 a fine new stone dam was built in place of the old wooden dam on the upper level; and an addition of two feet was made to the height of the Milton Three Ponds dam. During this year a 450 horse-power Corliss engine was put into Mill No. 1, for reserve power. In 1874-5 the last of the old breast-wheels was taken out of Mill No. 1, and a fifty-four inch turbine and gearing substituted. From 1870 to 1874 improvement in the works was the order of the day; and there was expended, in the various constructions, reconstructions and special repairs, upward of \$900,000.

In July, 1874, John Cunmnock, the present agent, succeeded Mr. Burleigh; and in December, 1875, Charles H. Dalton became treasurer upon the resignation of Mr. Frec-land.

At this time, owing to the large expenditures which had been made upon the works, the Company was not only without an active capital, but the plant was impaired to the extent of a quarter of a million of dollars; but, by a rigid economy at the mills, and a corresponding reduction in the cost of the manufactured goods, together with the tact, energy and financial skill of the treasurer, the Company, at the close of his administration, in December, 1877, was relieved of its debt on the plant, and had accumulated an active capital of \$45,000.

Mr. Dalton having resigned, to assume the management of the Merrimac Company, Daniel Hussey succeeded to the office, and resigned December, 1878. Mr. Dalton is at present managing the affairs of the Company as its treasurer *pro tempore*.

The Company now has three mills, containing 112,000 spindles and 2,756 looms,—operated by about 1,800 hands,—which consume upward of 13,000 bales of cot-

ton, and produce over 23,000 yards of cloth annually. It has one of the finest water-privileges in the State, having the unrestricted control of the Salmon Falls River to the third level at Great Falls, including the following-named tributaries and reservoirs: The Great East, Horne's and Wilson's ponds on the East Branch; Cook's, Lovell's and Cate's on the West Branch; and the Three Ponds at Milton—a flowage exceeding 5,000 acres in all. There are about 4,000 horse-powers on the three levels at Great Falls, of which not more than 2,500 are employed, from which it appears that the water-power is sufficient, when improved, to enlarge the present capacity of the works about fifty per cent.

With the present able general management of the Company's affairs, and the skillful, practical management of the present resident agent at the mills, the future prosperity of the Company is not a matter of doubt.

#### **Hamilton Manufacturing Company.**

—This Company was the second of the large corporations of Lowell, and the first to purchase power of the Locks and Canals Company. It was chartered, in 1825, with a capital of \$600,000. The first mills of the Company were built and put into operation under the superintendence of Mr. Batchelder; and under his skillful management the power-loom was first applied to the weaving of twilled and fancy goods. The cotton-drills, which became so important a commodity both in domestic and foreign trade, were first made by him in these mills. The Company established print-works in 1828, under Mr. William Spencer, who remained superintendent for many years. The capital was soon afterward increased to its present amount of \$1,200,000. This Company operates 57,208 spindles and 1,544 looms. The goods manufactured are flannels, ticks, stripes and

prints; and 84,500 pounds of cotton are consumed each week. There are 650 female and 475 male operatives at present employed in these mills. The treasurer of the Company is James A. Dupee, of Boston, and its resident agent, Oliver H. Moulton.

**Lawrence Manufacturing Company.**—This Company was incorporated in 1831, and has a capital of \$1,500,000. Five mills in Lowell, Mass., are owned by this Company, in which are manufactured sheetings, shirtings, print-cloths, cotton flannels and cotton and merino hosiery. There are 100,000 spindles, 2,360 looms and 550 knitting-machines. The amount of raw material consumed weekly comprises 175,000 pounds of cotton and 1,000 pounds of wool. The mills give employment to 1,440 female and 690 male operatives.

**Lowell Machine Shop.**—The oldest shops belonging to this Company were built by the corporation known as the Proprietors of Locks and Canals, on Merrimac River, which also carried on the business, in connection with the water-power for the mills, from 1825 to 1845. At the latter date, the property passed into the hands of the present Company, then incorporated as the Lowell Machine Shop, with a capital of \$600,000. William A. Burke, who had been agent of the Manchester Machine Shop, was the first agent of this Company, and is now its treasurer. In 1862 Mr. Burke was succeeded in the agency by Mertoun C. Bryant. On Mr. Bryant's death, soon after, Andrew Moody was appointed agent, and was succeeded by George C. Richardson, the present incumbent of the office. The Company has six shops, a smithy and a foundry, and, when running in full capacity, employs 1,000 men. The products of these shops are principally cotton, woolen and paper-machinery, complete for mills.

**Lowell Manufacturing Company.**—

This Company was organized Feb. 8, 1828, by Frederick and Richard C. Cabot, William Whitney and others, for the manufacture of carpets. Its authorized capital was \$300,000, which was increased, in 1832, to \$700,000; in 1846, to \$1,500,000; and, in 1850, to \$2,000,000, its present amount.

The Company wove its goods on hand-loom until 1843. Experiments had been made in England to produce a power carpet-loom, and several patents had been granted; but the looms were defective in their operation. At the suggestion of the Company, E. B. Bigelow, then acting as a general supervisor of the corporations at Lowell, invented a loom for weaving ingrain carpets by power. The patents for this were assigned to the Lowell Manufacturing Company; and, by contract, it has enjoyed its monopoly. The result has been a revolution in the processes of making this class of goods, the fabric produced being superior in texture and finish, and the cost being much lessened. In addition to the power-loom, this Company has long had in use other machinery of superior construction; and to ingrain carpeting, it added, some years ago, the manufacture of Brussels and Wilton carpetings, as well as serges and shoe-lastings.

The Company has four mills, operates 19,700 worsted and woolen-spindles, 2,816 cotton-spindles, 297 power carpet-loom and 75 lasting-loom. About 37,000 yards of carpetings are made each week, and 1,450 operators are employed.

**Lyman Mills.**—This Company, whose mills are located at Holyoke, Mass., was incorporated in 1854, with a capital of \$1,470,000. The corporation was named for George W. Lyman, of Boston, who was actively concerned in its formation, and for some years was one of its principal stockholders. It was organized by the election of Samuel A. Eliot, of Boston, as President, and George W. Lyman, as Treasurer. Mr.

Lyman retained this office until 1868, when Samuel L. Bush, the present incumbent, was chosen. By an agreement with the Hadley Falls Company, two mills, with their machinery and the land on which they stood, together with four blocks of tenements, were transferred to the stockholders of the Lyman Mills, for about \$1,000,000. These two mills, known as No. 1 and No. 2, were built by the Hadley Falls Company, between 1848 and 1857, under the superintendence of John Chase, a well-known builder. With these mills the new Company carried on operations until 1872, when a third mill was erected. The combined productive power of the three now comprises 75,000 spindles and 1,600 looms. Of the spindles, 52,000 are used in the production of lawns and cambrics, and the rest in coarser fabrics.

The Company purchased of the proprietors of the water-power at Holyoke, twenty-one and a half mill-powers, equivalent to 1,433 horse-powers; and the machinery in the mills is run by eight turbine-wheels.

The establishment is devoted to the production of sheetings, shirtings, flannels, drillings, cambrics and lawns. Of the latter fabric, the Lyman Mills make from 4,000,000 to 5,000,000 yards annually.

The quantity of cotton annually consumed by the Lyman Mills is about 9,500 bales.

**Merrimack Manufacturing Company.**—Upon the 5th of February, 1822, Nathan Appleton, Patrick Jackson, Warren Dutton, Kirk Boott and others, were incorporated as the Merrimack Manufacturing Company. The capital stock was at first fixed at \$600,000. Warren Dutton, a Boston lawyer, was elected president; and Kirk Boott treasurer and agent. The Company succeeded to the property and rights of the Proprietors of the Locks and Canals on Merrimack River, and immediately constructed the dam above the falls, widened and deepened Pawtucket Canal,

renewed the locks, and opened from the main canal to the river a lateral canal, on the margin of which the mills were to be erected. The first mill was completed, and went into operation Sept. 1, 1823; and the first return of cloth was made the following November. In June, 1823, the capital stock was increased to \$1,200,000; and in the same year a machine-shop was established, which, modeled on the plan of that at Waltham, and superintended by Paul Moody, not only supplied the needs of the Merrimack Company, but various other mills successively established in Lowell and vicinity.

The first superintendent of the Merrimack Mills was Ezra Worthen, who, dying June 18, 1824, was succeeded by Warren Colburn, who held the office until his death, Sept. 13, 1833. The superintendents since Mr. Colburn, have been, successively: John Clark, until 1848; then, for one year, Emory Washburn—afterward Governor of the State; then Edmund Le Breton, until 1850; from 1850 to 1866, Isaac Hinckley; from 1866 to 1874, John C. Palfrey; from that date to the present time, Joseph S. Ludlam. The superintendent of the printery from 1826 to 1855 was John D. Prince; when he was succeeded by Henry W. Burrows, who still holds the position. These gentlemen were assisted by Dr. Samuel L. Dana, as chemist.

The stock of the Company, raised in 1825 to \$1,200,000, was again increased, in 1828, to \$1,500,000; in 1837, to \$2,000,000; and in 1849, to \$2,500,000. The Company own five mills and a print-works, 158,000 spindles, 3,900 looms; and 2,500 operatives are employed, producing 725,000 yards of prints a week. The stock of the Company has paid an average dividend of more than ten per cent per annum.

**Middlesex Company.**—This Company was chartered Jan. 5, 1830, with a capital of \$500,000, Samuel Lawrence, William W. Stone and others being the incorporators. Messrs. Lawrence and Stone

had been, for some years, importers of woolen goods, under the firm-name of Lawrence and Stone, and were conversant with the wants of the trade. The Middlesex Company soon acquired a reputation for their broadcloths.

An obstacle to their early operations was the existence, in New York, of importers who were natives of the cloth districts of England, and who evaded the full duties by under-valuations; but, in 1837, a large amount of the goods thus fraudulently imported was seized, and the importers fled, leaving a free field to native manufacturers.

Another difficulty to contend with was a defect in dyeing. The Company early discovered that it was caused by the imperfect cleansing of the wool, and remedied it. Until 1840, the fabrics made in this country wholly of wool were of a plain, lustrous surface; but, in 1839, the Middlesex Company introduced the manufacture of fancy cassimeres. In 1847 the Company commenced the manufacture of shawls; and in 1858-9 that of a blue flannel coating, wool-dyed, and having a three-band twill.

The capital stock was increased, in 1839, to \$750,000, and, in 1848, to \$1,000,000. In 1857, owing to the financial crisis, it was compelled to ask an extension, and to call in additional capital. The par value of the shares was at the same time reduced, so that the capital was made \$750,000. It operates forty-nine sets of cards, and employs 800 operatives.

**Nashua Iron and Steel Company.**—For some time after the establishment, by Lemuel W. Blake, Francis Winch and Ziba Gay, of the Nashua Iron and Steel Company, in 1829, with a capital of \$30,000, under the title of the "Manufacturers and Mechanics Association," it was a little more than a machine-shop. The works comprised but a single wooden building, with a force of thirty or forty men; and the

total annual production did not exceed \$100,000.

In 1847 a change of proprietorship occurred. Nearly all of the original stockholders sold their interests; and the property passed into the hands of others, among whom were John A. Burnham, then of Manchester, now of Boston; William P. Newell and Oliver W. Bayley, of Manchester; and Thomas W. Gillis, Seth Williams, Jr., and Bernard Stearns, of Nashua. Mr. Gillis was then chosen president, and Mr. Stearns treasurer.

The concern then ceased to be merely a machine-shop, and assumed the character of an iron manufactory. The works were enlarged and equipped, and the business increased in extent and variety. The following year the corporate name was changed to that of the Nashua Iron Company, and the authorized capital raised to \$100,000. From this time the manufacture was carried on, without material change, until 1864; when the capital was again increased to \$125,000. The additions to the works, undertaken in 1847, had been completed and equipped, and they had been fully paid for. The number of workmen employed had also been increased to 180, and the annual production raised to \$500,000.

During the Civil War, the Company aided the Government by the production of iron-work for gun-boats, monitors and other war vessels. At their works was constructed the forged work, including the shafts, of the steam frigate "Franklin."

Since 1864 the operations of the Company have steadily increased; the present capital is \$500,000; the number of persons employed is about 250; and the value of the annual production is about \$1,000,000.

Before 1871 steel had only been made to a limited extent at these works; since then the production of this metal has entered largely into their operations. During that year the Company adopted its present corporate name. The Company

now manufacture almost every description of forged iron and steel; of iron forgings, all shapes and weights are produced, as well as various qualities of bar-iron and general machine work; while in steel work, locomotive, truck, tender and car-wheel tires and axles, homogeneous boiler and fire-box plates, crank-pins and lathe-spindles, piston-rods and slide-bars, shafts, some of twelve thousand pounds weight, Purvé's car-replacers and many other articles, are manufactured. In their production, the Company use metals which have been made on their own premises, and by their own methods, taking the crude iron in the form of charcoal blooms, and carrying it through the process of refining and working. The Company also possess facilities for heavy forging, which constitute an important feature of their enterprise.

Soon after the re-organization of the Company, in 1847, a machine for rolling iron tires for wheels of locomotives was introduced into these works; and they have also put in successful operation a Siemen's gas-furnace, for reheating iron and steel. They began to roll tires made of steel, in 1867.

The Company has recently undertaken the manufacture of an improved car and engine-wheel, patented by James A. Woodbury, of Boston. The body of this wheel is constructed of gun-iron, and the tire of steel is hardened by a new process; and these two parts are separated by rubber packing.

The works of the Nashua Iron and Steel Company comprise a rolling-mill; two forging-shops, one with four steam trip-hammers, the other with five; a steel-melting shop; a steel-tire shop; and a machine shop. They are centrally situated in Nashua, N. H., and cover an area of from ten to twelve acres of ground.

The present president, John A. Burnham, was elected in 1853; and the present treasurer, M. A. Herrick, in 1856. Mr. Herrick was also chosen agent, in 1862. Associated

with them in the management, are: Aretus Blood, of Manchester; Edward Spalding, of Nashua; Daniel Hussey, of Lowell; and John A. Burnham, Jr., of Boston; who, with the president, constitute the board of directors.

**Pacific Mills.**—For over a quarter of a century, the Pacific Mills have been engaged in textile manufacture. They were started by the Essex Company, and were incorporated March 29, 1850, under the present name, with a capital of \$2,000,000, for making ladies' dress-goods, from wool, from cotton, and from cotton and wool combined. The construction of the works exceeded the capital paid in, and the Company, at its outset, found itself embarrassed. But Hon. Abbott Lawrence advanced several hundred thousand dollars, and secured the services, as treasurer and managing agent, of J. Wiley Edmands, who accepted the office in June, 1855.

J. Wiley Edmands was born in Boston, Mass., March 1, 1809. He was the son of Thomas Edmands, one of the firm of Lincoln and Edmands, booksellers and publishers. In his early years he attended a grammar school, and entered the English High School when it was founded, in 1821; where, on graduating in 1823, he received one of the Franklin Medals. In 1824 Mr. Edmands went into the counting-room of A. and A. Lawrence; and in 1833 was admitted a partner to that firm, and soon became the active manager of the business. He retired from the firm in 1843, and was for some years connected with the Maverick Woolen Mills, in Dedham, Mass., where he became familiar with cloth manufacture. In 1852 he was elected a member of the United States Congress, serving for one term. In June, 1855, he assumed the management of the Pacific Mills, at Lawrence, as treasurer and agent.

Mr. Edmands was active in the organization of the National Association of Wool

Manufacturers, in 1866, and was one of its first vice-presidents. In October, 1870, he became its president, and held the office until his death, on Jan. 31, 1877.

During two or three years after 1855, the mills, though making money, were only sustained by borrowing to a large amount. In 1857 the Company received an extension of credit for six months; and in 1858 the stockholders were called on to subscribe additional capital of \$500,000, all but seventy-five shares, of \$1,000 each, being taken. A year later the Company had attained such success that these seventy-five shares were sold at auction, at prices from \$1,320 to \$1,342 per share, although but two years before many shares had been sold at prices ranging from \$75 to \$200.

The number of the Company's mills is twelve; of its spindles for cotton, 135,000; for worsted, 25,000; of looms, 4,500; of cotton, 6,000,000 pounds are used each year; of wool, 3,500,000 pounds; of starch, 500 tons; of dye-stuffs, in cost, \$400,000. About 65,000,000 yards of cloth are yearly sold, about sixty per cent being worsted goods. They have twenty-four printing-machines and eleven turbine-wheels, aggregating 2,000 horse-powers; thirty-seven steam-engines, aggregating 1,200 horse-powers; and 5,300 operatives, two-thirds of whom are women and girls.

The Company early founded for its operatives a reading-room and library, with about 7,000 volumes; and established a relief-society, to which the Company and the operatives alike contribute.

**Pocasset Manufacturing Company.** — The principal organizer of this Company was Samuel Rodman, of New Bedford, who, in 1821, acquired mill-privileges in Fall River, and formed this Company, with eight original stockholders, which was incorporated in 1822, with a paid-in capital of \$100,000. The first mill erected was for 1,000 spindles, and was called the Bridge Mill,

where the first print-cloths were made in Fall River, and which were bought and printed by Andrew Robeson. For several years this Company engaged in erecting factory buildings, and leasing them to others.

The Quequechan Mill, owned by this Company, was put in operation in 1826. It is built of stone, 319 by 48 feet, and five stories high. It contains 16,392 spindles and 492 looms employed in the manufacture of print-cloths. The Pocasset Mill was started in 1847, and is also of stone, 208 by 75 feet, and five stories high. In this mill 20,352 spindles and 422 looms are operated in the production of sheetings and shirtings. The authorized capital of this Company was originally \$400,000, but, in 1849, was increased to \$800,000. It employs 550 operatives.

**Proprietors of Locks and Canals on Merrimac River.** — In 1792 a company bearing this name was incorporated for the purpose of opening and maintaining a canal around the Pawtucket Falls, in Chelmsford, Mass. This canal was a mile and a half long, and was completed in five years at a cost of \$50,000, and connected the Merrimac with the Concord River. The descent of thirty-two feet was accomplished by four locks. The object of the canal was to provide for the passage of boats, rafts of timber, and so on. In 1793 the Middlesex Canal Company was incorporated; and in 1804 the canal was completed, at an expense of \$700,000. It began at the Merrimac River, about a mile above the Pawtucket Falls, and terminated at or near Long Wharf, in Boston, its length being about thirty-one miles. Its object was to connect the lumber regions of New Hampshire with Boston; and it came into competition with the previously named canal — Boston being a more important market for lumber and other productions than Newburyport. This reduced the value of the stock of the Proprietors of Locks and Canals, so that,

in 1821, most of it, together with the lands, was sold to the Merrimack Manufacturing Company, at a low price. But, in 1825, this Company found itself in possession of a large amount both of water-power and of surplus land; and it was deemed best to limit the operations of the Company to a regular business as a cotton-manufactory and print-works, and to organize the property not needed for these purposes as a separate interest. With this view a new company was organized, under the old title of the Proprietors of Locks and Canals on Merrimack River, with 1,200 shares, which were allotted, share for share, to the holders of stock in the Merrimack Company. The corporation was established under the old charter of 1792, with an amendment allowing them to purchase, hold, sell and lease water-power. The Merrimack Company conveyed all their water-power and lands to the new company, which re-conveyed to the Merrimack Company so much as it needed.

The affairs of the Proprietors of Locks and Canals were then placed under the executive charge of Kirk Boott. At his death, in 1837, Joseph Tilden was the agent for one year, when Patrick T. Jackson succeeded him, with a salary of \$10,000.

Mr. Jackson, in seven years, increased the value of the stock, which, after Mr. Boott's death, was depreciated to thirty per cent below par, to sixty per cent above par. After his retirement from the office, it was held for a short time by William Boott, who, in 1845, was succeeded by James B. Francis, the present agent. Mr. Francis had been, for eleven years before, the surveyor and engineer of the Merrimack Company; having been at first associated as an assistant with George W. Whistler, then engineer of the corporation, and afterward superintendent of the Boston and Worcester Railroad.

For twenty years, in addition to furnishing land and water-power, and building

mills for new corporations, the Company also owned and operated the machine-shops started in 1823, under the superintendence of Paul Moody. It constructed all the mill-canals, to supply water-power to the various companies organized after 1825, erected most of the mills and boarding-houses attached to them and built a greater part of the machinery. The last corporation dependent on their canals was the Prescott, chartered in 1844, which in a few years was consolidated with the Massachusetts Manufacturing Company.

In 1845, after all the mill-powers had been disposed of (a mill-power being about sixty horse-powers), a second re-organization took place. The business of the two machine-shops, foundry and saw-mill before operated by the Company, was then organized as the Lowell Machine Shop. Since then the Proprietors of the Locks and Canals have only had the management of the water-power, leasing it to the companies, and the keeping of the canals in repair. This water-power has been increased by the addition of reservoirs, which supply the upper waters of the Merrimack, and cover an area of one hundred and fifteen square miles.

The Company now lease to the manufacturing corporations, water-power amounting, in the aggregate, to nearly 10,000 horse-powers. The Merrimack Company alone use the whole fall of thirty-three feet. To the other companies the water is furnished from two levels. The Hamilton, Appleton, Lowell, Tremont and Suffolk, and the Lowell Machine Shop draw from the upper level, under a fall of nearly fourteen feet; while the Middlesex, Lawrence, Boott and Massachusetts, including the Prescott, draw from the lower level, under a fall of rather more than seventeen feet.

The stock in the Locks and Canals Company is owned by the manufacturing companies in the same proportion in which they hold the water-power.

**Tremont and Suffolk Mills.** — The cotton-manufacturing company of this name, whose mills are in Lowell, was incorporated in 1830. It has a capital of \$1,200,000, and makes a specialty of sheetings, shirtings, jeans, drills, flannels and print-cloths. There are four mills, having 2,300 looms and 94,000 spindles. The amount of cotton consumed each week is 140,000 pounds, and the number of operatives employed about 1,400.

**Troy Cotton and Woolen Manufactory.** — This enterprise was contemporary with that of the Fall River Manufactory, and was inaugurated in Troy, now Fall River, March 8, 1813, by Oliver Chace, Nathaniel Wheeler, Eber Slade and eight others subscribing to the articles of association, under the name of the Troy Manufacturing Company, with a capital of \$50,000. The charter of incorporation was issued Feb. 22, 1814; and on the 25th of July following, the name was changed to the Troy Cotton and Woolen Manufactory. Mr. Chace was made agent, and Mr. Slade treasurer. The mill was built of stone obtained from the fields, and was 108 by 37 feet, and four stories high, intended for 2,000 spindles. The old mill has since given place to a new one, and other buildings added. The number of spindles now operated is 38,928, and of looms, 932, — annually producing about 10,250,000 yards of print-cloth. The present capital of the Company is \$300,000. Jefferson Borden is president, and Richard B. Borden clerk and treasurer.

**Wamsutta Mills.** — The mills of this Company are situated in New Bedford, Bristol County, Mass. The Company was organized in 1847, and commenced manufacturing in a mill of 15,000 spindles. In 1854 it erected Mill No. 2, and in 1865 No. 3 Mill. In 1868 No. 4 Mill was built, and in 1875 No. 5 Mill; containing, in all,

152,000 spindles, 634 cards and 3,053 looms. The principal productions of the Company are the Wamsutta fine shirting and a superior sheeting, in plain, twilled and double warp, ranging from 32 to 108 inches in width; but fine cambric, muslin, percales, umbrella-cloths, a medium grade of Victoria lawns and a variety of other goods are included in their manufacture. The annual consumption of cotton at the Wamsutta Mills is about 19,000 bales, producing 20,000,000 square yards of cloth.

**York Manufacturing Company.** — This Company was chartered March 16, 1831, with a capital of \$300,000; and in the April following it became the successor of the Saco Manufacturing Company, of Saco, York County, Me. An enlargement of the mills was immediately commenced; and the Company have since constructed new works, and rebuilt and extended the mills, until they now contain 33,000 spindles and 900 looms.

Samuel Batchelder, of Cambridge, Mass., was one of the originators of the Company, and was its agent from 1831 to 1846, and Pliny Cutler its treasurer until 1853. Mr. Batchelder became its treasurer in 1856, and remained in that position until 1867. Under his management the Company was very prosperous. In August, 1833, the capital was raised to \$540,000; in May, 1835, to \$600,000; in August, 1835, to \$750,000; in November, 1836, to \$1,000,000; and in March, 1849, by a stock dividend, to \$1,200,000, its present amount. At first, the productions of these mills were coarse, plain, twilled and colored goods, but now consist, principally, of cottonades, ticks, denims and dress-goods in great variety.

James Ellison has been president of the Company since 1863; and, since April, 1874, William G. Saltonstall has been treasurer. In 1867 Ira H. Foss succeeded to, and still occupies, the position of resident agent.

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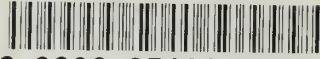


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