THE TEXTILE MACHINERY COLLECTION AT THE AMERICAN TEXTILE HISTORY MUSEUM

A HISTORIC MECHANICAL ENGINEERING HERITAGE COLLECTION

ASME

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Introduction

The Osborne Library holds an extensive collection of trade literature, including manufacturers' catalogues and advertising sheets.

Textiles are an important part of our everyday lives. They clothe and comfort us, protect our first-responders, filter the air in our automobiles, and form the core of the fuselage in our newest aircraft. We enjoy their bright colors, wrap up in their warmth, and seldom give a second thought to how they make bicycles stronger and lighter or how they might be used to repair our vital organs. As textiles have changed from the first simple twisted fibers to high-tech smart fabrics, the tools and machinery used to make them have evolved as well. Drop spindles and spinning wheels have given way to long lines of spinning frames. And looms now use puffs of air instead of the human hand to insert the weft thread in a growing length of fabric.

During the eighteenth and nineteenth centuries, textile manufacture was the catalyst for the Industrial Revolution in America. It was the leading edge in the transformation from an agricultural to a manufacturing economy and started the move of significant numbers of people from rural areas to urban centers. With industrialization came a change in the way people worked. No longer controlled by natural rhythms, the workday demanded a life governed by the factory bell. On the consumer side, industrialization transformed textiles from one of a person's most valuable possessions to a product widely available at incredibly low prices.

For more than a century, textile mills in Great Britain and the United States dominated textile production and led the industrial revolution in both Europe and North America. At the same time, cotton production in the United States became an important factor motivating the extension of slavery and leading to the Civil War. Since that conflict, people have felt the economic impacts of textile manufacturers' incessant search for low-cost labor. With textile and clothing production moving offshore, American manufacturers have looked increasingly to niche markets and specialty products.

The collections of the American Textile History Museum (ATHM) record the interactions of textile machinery and materials with inventors, managers, workers, and consumers. The wealth of pre-industrial tools and industrial machinery within the Museum provide a comprehensive account of the changes in textile production in America, from small home and workshop equipment to large factory production machinery, as well as specialty tools, testing equipment, and workplace artifacts. Exhibits focus on a variety of textile production methods and uses, showing how both natural and man-made fibers are transformed into fabrics that furnish our homes, walk down fashion's runways, and help doctors save lives. ATHM preserves the legacy of both the art and science of textiles even as it looks to the next generation.

The Museum –

Presents one of the most diverse collections of textile machinery and associated artifacts in the world. ATHM holds more than 250 spinning wheels and more than 300 examples of industrial-era textile machinery. Among the artifacts in the collection are roving frames and spinning jacks; carding machines and twisters; hand and powered looms for weaving woolen, cotton, horsehair, and other fibers, and many other tools and machines necessary to the textile-making process.

Has artifacts that represent and preserve the names of many innovative individuals and companies. Companies that once were well known in the industry, including Draper, M.A. Furbush and Son, Daniel Pratt Gin Company, Whitin Machine Works, and Crompton and Knowles.

Places the machines in their proper perspective within the story of textile industry development. In addition to the machine artifacts themselves, ATHM interprets this story in the United States through its exhibitions and other collections. ATHM's Osborne Library contains operator manuals, business records, advertisements, photographs, and other artifacts of the textile industry.

Thus, the textile machinery and tools, along with important library and textile collections, provide a historical record of the textile industry. They document its impact on mechanical engineering, and the industry's interactions with society.

History of the Textile Industry

Before the Industrial Revolution

Textile production in the United States began well before the country was established, with long-established textile traditions among some Native American groups. A different set of practices arrived with European settlers. During this pre-industrial period, textiles in America came from a variety of sources. Some were imported, others were made by professional handweavers who sold their goods, and others were made by individuals at home or on the farm. While some individuals started with shearing the sheep and ended with a blanket or suit of clothes, most people accomplished one or more parts of the process and relied on others to provide the rest. Pre-industrial textile production required a lot of time and hard work, as each of the common natural fibers required many steps in the transformation from fiber to fabric. Each had to be grown and harvested, then cleaned, combed or carded to straighten out the fibers, spun into yarn or thread, wound on bobbins and, finally, woven or knitted into fabric.

Spinning wheel, c. 1880. Patented spinning wheels and accessories helped speed up hand-spinning, but they could not compete against powered machinery.

Industrialization Begins

During the colonial period when the thirteen American colonies were still part of the British empire, England discouraged the Americans from developing textile manufactures, preferring that the colonists acquire their textiles from the mother country. England had a fast-growing industry of its own, spurred by inventions that transformed production methods. In the 1760s, Richard Arkwright developed the water frame, so named because it operated on waterpower. The frame spun cotton yarns strong enough to be used as warp threads in weaving. Arkwright also made improvements in carding machinery that help speed this preparatory process. By the end of the next decade, Samuel Crompton had invented a "mule," a further improvement in spinning technology to make a machine that could produce both fine and coarse yarns. The next decade saw Edmund Cartwright's invention of the power loom, which sped up the weaving process, allowing weaving to catch up with the large quantities of yarn being produced by mechanized spinning.

As the textile industry developed, the British government jealously guarded manufacturing secrets and hoped to maintain the advantage they'd gained through powered machinery. They prohibited people with technical know-how from leaving the country. In spite of the restrictions, knowledgeable individuals, including Samuel Slater, slipped out of England and migrated to America seeking better opportunities. Settling in Rhode Island, Slater helped textile entrepreneurs Almy and Brown by rebuilding their faulty spinning frame to make it workable. His success spurred American industrialization and led to the many textile mills, large and small, that transformed the American landscape and economy.

The Early Textile Industry in America

In America, two different business models characterized the textile industry's first phase of growth. Typified by the spinning mills Slater and his partners built in southern New England, the "Rhode Island System" focused on relatively small single-process factories. These mills employed whole families and became the centerpieces of villages with houses, a store, a machine shop, and adjacent farms.

The other model, the "Waltham-Lowell System" was established in Massachusetts by a group of New England merchants who saw an opportunity to organize textile production in a more comprehensive way and on a much larger scale. One important actor in the transfer of technology and ideas from Great Britain to America was Francis Cabot Lowell. During a two-year-long trip to Great Britain, like many "tourists," Lowell visited factories to see the wonders of the age. However, he had more than a passing interest in the workings of British textile factories. On his return to America, he worked with fellow businessmen to establish in 1813 the Boston Manufacturing Company (BMC) at Waltham, Massachusetts. He also returned with technical information that helped the BMC's talented mechanic, Paul Moody, build a workable power loom. In the BMC, the United States had its first vertically integrated factory—a mill that took raw cotton fiber and transformed it into finished fabric, all in a single factory.

The factory quickly became successful. Production, however, was limited by the power that could be derived from the Charles River. Lowell and a group of investors, known today as the Boston Associates, found a better source of waterpower on the Merrimack River. There, they modified the existing Pawtucket Canal and built a massive network of canals, mills, and boarding houses for young female factory operatives. This new city, named Lowell, Massachusetts, after the visionary who did not live to see his dream realized, became an enormously successful venture.

In their Lowell mills, the Boston Associates laid foundations for the broad development of industrial capitalism in America. Seeking to build large-scale factories, the Associates needed to raise huge sums of capital. To obtain it, they turned to an organizational device rarely used in that era, the private corporation, empowered by the state to issue stock and bonds. To equip their factories with carding machines, power looms, and other equipment, they created a centralized machine shop, one of the first in the nation. The Lowell Machine Shop then innovated continuously in textile machinery while also building first-generation machine tools and locomotives for other rising industries.

Another critical element in Lowell's success was the labor force that worked in the mills. Rather than hiring families, Lowell mills built boarding houses that operated under strict rules of propriety and paid relatively good wages to attract young, single women from New England farms. While the workdays were as much as twelve and fourteen hours long, the life provided workers with a rare source of cash income and a rewarding interlude of independence. Almost from the beginning, tensions between owners and workers posed challenges to the textile industry. When owners increased the speed and number of machines each laborer was responsible for, the workers protested and began the process of agitation, bargaining, and change that took place over the next one hundred years. As social norms changed, so did laws, limiting the workday first to 10 hours and then to 8, prohibiting children from working in factories instead of attending school, and improving conditions for health and safety.

Manufacturing Evolution

The United States' textile industry continued growing throughout the nineteenth century. While many of the biggest operations continued to be located in New England, other areas of the country also developed textile manufactures, often with a focus on a particular type of production. Silk manufacturing was particularly important in the Mid-Atlantic states, and the Philadelphia area produced specialty fabrics such as brocades, damasks and figured fabrics. New York State and the Midwest focused on knitting. In the South, textile mills were established as early as the 1830s, but they didn't start to grow significantly until the end of the century.

In the drive for continued growth, mills made further improvements to machines and manufacturing methods. The scarcity of skilled labor in America spurred innovation and led to inventions that reversed the usual direction of technology transfer between Great Britain and the United States. John Goulding's carding machine condenser and James Northrop's filling-changing batteries are two such American inventions.

James B. Francis adapted a water turbine, designed by Uriah Boyden, to powering the mills. Paul Moody developed a system using belts and drive shafts to transfer power from the water turbine to power looms on different floors. But water-driven turbines and wheels eventually encountered environmental constraints. Streams froze in winter or slowed in summer droughts, floods could wash away expensive mill equipment, and the dams could not be extended indefinitely to provide pools of falling water. Increasingly after 1850, steam engines provided the power needed for expansion.

Other innovations required workers with new sets of skills, leading to the emergence of the professional efficiency engineer. Called an industrial or manufacturing engineer today, these people were in charge of getting ever more output from the process. In Lowell, one of the several schools established around the country to support manufacturing and train textile workers and efficiency engineers, was founded as the Lowell Textile Institute, now the University of Massachusetts, Lowell.

By the end of the nineteenth century, manufacturing and business conditions had changed in ways that made building mills in the South much more attractive. The invention and spread of electricity eliminated the need to build mills along streams having waterpower potential, and the cost of labor was much lower in the South than elsewhere in the country. Together, these factors induced many companies to relocate their operations in the twentieth century, moving the center of the American textile industry from the Northeast to the Southeast.

Textiles Today

Today, American textile manufacturing companies are hard-pressed by overseas competition. The same drive for lower costs that impelled the industry to move from north to south has led to the rapid development of textile production in other countries around the world. As factories and businesses have closed, the same dislocations and hardships that plagued "rust belt" states have troubled the South. The textile companies that have survived are now more likely to focus on niche markets and specialty fabrics not made elsewhere or research and development of technically complex textiles. Highly innovative, they use new manufacturing techniques and modifications in the machinery to produce valuable products for today's market.

Textiles tell a sweeping story of invention and innovation. Fabrics continue to be a basic commodity serving both practical and aesthetic needs of people around the world. An expanding roster of materials used to make textiles now includes hundreds of man-made and synthetic compositions such as nylon, polyester, Kevlar, Tencel and so many more. Their uses are more varied than ever before. No longer are textiles appropriate only for clothes and home furnishings. They're also critical elements in road construction, internet cables, and vehicles. The importance of textile manufacturing in the United States' economy may have declined, but the legacy of the industry, and its relevance to all our lives, remains an important story that reaches from our past through the present and into our future.

About the American Textile History Museum

ATHM's clothing collection spans nearly 300 years in American clothing.

Overview

This national treasure, affiliated with the Smithsonian Institution, houses one of the largest collections of its kind in the world. With thousands of books, manuscripts, and images, as well as millions of textile samples and hundreds of textile-making machines, the Museum is an unparalleled resource for the study of the American textile history.

Historians and textiles designers, architects and preservationists, engineers, novelists, and industrial archeologists are all drawn to ATHM's collections. There they find a wealth of information about textile art, factory design, textile production, technological invention, labor, and industrial organizations.

Collections

Tools, Machinery, and Workplace Artifacts

The Museum's collection of tools, machinery, and workplace artifacts includes a broad range of objects from eighteenth-century hand powered tools and equipment to present-day factory machines. In addition to tools and machinery, the collection includes thousands of items used in the workplace in categories ranging from communication devices to advertising displays, lighting, fire suppression equipment, and fixers' tools. The collection provides construction details not recorded in drawings or patents, as well as evidence of use and adaptation.

Clothing, Textiles, and Decorative Arts

The clothing, textile, and decorative arts collection includes clothing, textile samples and flat, finished textiles, and textile-related decorative art objects from the eighteenth century to the present. The Clothing Collection includes men's highly ornamented waistcoats and women's pockets from the eighteenth century, nineteenth-century girls' printed cotton everyday dresses and men's workshirts, as well as 1970s double-knit bell-bottom pantsuits. Textile samples number in the millions and include woolen, worsted, cotton, silk, and synthetic textiles produced by hundreds of American manufacturers. Textile-related decorative arts objects form a small and unusual part of the Museum's collections. These include objects such as a nineteenth-century bowl showing a sheep-shearing scene, a goblet presented to a mill overseer by his weavers, and a set of cuff links commemorating the Textile Workers Union of America.

Osborne Library

The Osborne Library houses the Museum's collection of books, images, and manuscripts. The book collection also includes pamphlets, trade catalogues, periodicals, newspapers, government documents, broadsides and advertising material. Researchers will find Rosetti's Plico dell'Arte del Ingere Tutte, printed in 1611, probably the first technical manual on dyeing textiles; manuscripts from manufacturers and other textile-related businesses, as well as the personal papers of researchers, inventors, educators, workers, and managers associated with the industry. The image collection includes paintings, prints, photographs, insurance maps, architectural and engineering drawings, and pictorial ephemera such as postcards, stereocards, and cloth labels. Prints, paintings, and photographs of textile mills, workers, and machinery constitute an unparalleled collection of textile-related images found nowhere else.

Other Activities

Education

The Museum supports many efforts to educate children, families, and adults about textiles. This includes the curriculum-based programs for school-age children, the Textile Learning Center, Boy Scout and Girl Scout textile badge programs, and summer vacation programs. ATHM works with the Museum Institute for Teaching Science (MITS) and actively develops engineering-based programs. Lectures and workshops provide lifelong learning opportunities for adult audiences.

Publications

The Museum's quarterly publication, called Textile Times, provides news of Museum activities and articles related to the history of textiles. ATHM also communicates with its online audience through social media:

Website	www.athm.org
Facebook	www.facebook.com/athmlowell
Twitter	www.twitter.com/athmlowell
Blog	blog.athm.org

Highlights of the ATHM's Textile Machinery Collection

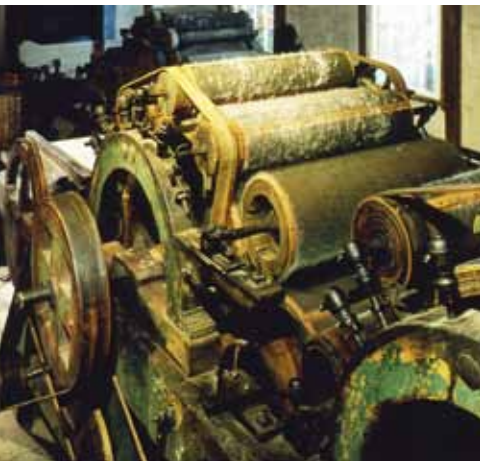
The machines featured here are some of the more important examples in the ATHM's collection of more than 300 industrial period textile machines. The Museum's collection also includes many spinning wheels, cloth swatch books, and an extensive library and archive which are not included in these highlights.

Cotton Gin

Pratt Gin Company, Prattville, Alabama, between 1873 and 1899; patented July 15, 1873
1968.48.1

As upland cotton culture developed in Africa, India and other parts of the world in ancient times, many roller devices were created to force the sticky cottonseed from its protective fiber boll. Beginning with inventor Eli Whitney in 1794, American mechanics and engineers sought to mechanize the ginning process. The sawtooth gin, a great advancement from the simple Whitney design, efficiently removed the seed, but damaged the fibers in the process. This gin featured 50 circular sawtooth blades that pulled the cotton through openings too narrow for the seeds; the cotton was taken from the blades by a series of brushes and deposited in baskets from which it was taken to the "picker" for cleaning.

The Pratt Gin Company was the leading manufacturer of sawtooth gins after the Civil War. The paint and decoration on the gin, including the pictorial scene of the Pratt factory and Prattville, Alabama, suggests that this example may have been prepared for exhibition at an agricultural fair or exposition.



Carding machine, made by Artemus Dryden, Jr., ca. 1825.

Woolen Card

Artemus Dryden, Jr., Holden Massachusetts, circa 1825
1960.3

This water-powered two-cylinder, 24" x 25" roll-drum woolen carding machine dates circa 1825. Beginning with cleaned raw wool, the card used a series of rollers covered with steel-toothed card clothing to straighten and align the wool fibers. The process delivered a loosely twisted wool rolag ready for the next step in the spinning process—that is spinning it into roving. Machines such as this replaced hand cards, which could process only a very small amount of wool at any one time, making it easier and faster to produce larger quantities of wool ready for spinning. The amount of wood used in its construction testifies to the early date of this card. It was last used in a South Waterford, Maine, carding mill.

Four-Part Wool Card Line

Bridesburg Manufacturing Company of Bridesburg, Pennsylvania, circa 1870.
1968.38.4, 1968.38.5, 1968.38.6, 1968.38.9

This card line consists of a breaker section and lap delivery, a second breaker section, the finisher section and the spool stand. The cards feature cast iron frames and parts, wooden rollers, leather card clothing and rawhide laced belts. This high-speed machine represents many generations of improvement over the Dryden machine described above. Using more rollers and a longer carding process plus a Goulding condenser, the Bridesburg card line took raw wool, and in one pass down the line, turned it into spooled roving ready for the spinning jack. Goulding's condenser, patented in 1826, was an especially notable addition to the carding operation because it eliminated the necessity of piecing together individual lengths of carded fibers and produced a more uniform, higher quality roving.

Spinning jack, c. 1864. Men who operated spinning jacks were highly skilled, and often the highest-paid employee in a mill.

Spinning Jack

Bickford & Lombard of Worcester, Massachusetts circa 1864
1968.38.11

The scarcity of highly skilled labor in the United States during the early nineteenth century meant that Americans were constantly searching for ways both to make a better product and save labor. This spinning jack took 100 ends of wool roving from the card line and spun them into tight yarns ready for the loom. A spinning jack required a skilled operator, usually a man with a great deal of experience. As the belt-driven jack came forward it simultaneously lengthened and twisted the 100 ends of spooled roving fixed on the unmoving stand. The operator then manually pushed the jack back, simultaneously turning the wheel to wind the yarn onto the spindles on the front of the jack. Youngsters, often the operator's own children, were employed to doff or exchange the filled spindles with empty ones. This jack was of a size used in small country mills. This one is from the Antioch Woolen Mill, Antioch, West Virginia.

Throstle frame, c. 1835. The Lowell Machine Shop made this and many other first-generation American mill machines.

Throstle Frame

Lowell Machine Shop (probably), Lowell, Massachusetts, c. 1835
1983.32.1

Throstle spinning is different from jack or mule spinning in that it is a continuous process. Roving on the bobbins at the top is drawn through rollers, twisted in the flyer, and wound on bobbins below. This machine was made about 1835, probably in the Lowell Machine Shop, where many of the best mechanical minds worked to supply America's first industrial city with powered textile machinery. The term "throstle" comes from the noise the machine makes as it spins yarn. It is said to sound like the singing of a throstle or thrush.

Warping System

Davis & Furber Machine Co., North Andover, Massachusetts, and the Warp Compressing Machine Co., Worcester, Massachusetts, circa 1945
1100.245

A critical part of the weaving process is preparation of the warp (lengthwise yarns on a loom) before it is placed on the loom. This system builds a warp in segments, with one cone for each yarn in a section of the warp. Each yarn is carefully aligned so that it does not cross any other threads and is drawn on to the warp beam with an even tension across the full width of the beam. The complete system includes a creel, condensing reed, warping reel, and drive.

Power Loom

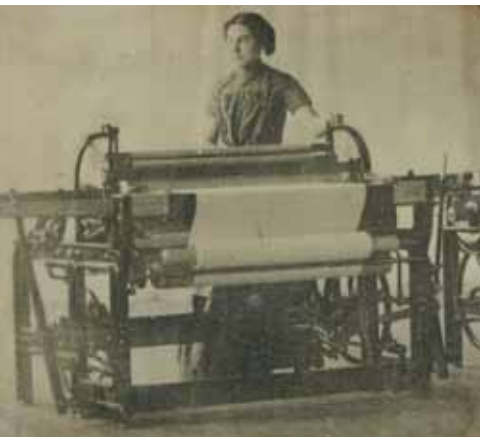
M. A. Furbush & Son, Philadelphia, Pennsylvania, circa 1870; head motion patented, November 24, 1863; box motion patented September 16, 1868
1974.35

Woolen power loom weaving lagged behind cotton power loom weaving because it was difficult to produce yarns strong enough to be used as warps. Once that hurdle was overcome, all-wool fabrics were produced in greater quantities and at lower cost on powered looms. One of the oldest powered looms in existence in the United States, this 11-harness loom uses three shuttles to weave fancy woolen fabrics. The shuttles, propelled by the motion of the picker sticks, travel sixty times a minute across the loom. Female operatives typically supervised several of these fast looms.

Horse Hair Loom

Manufactured under the patent to Isaac Lindsley, November 15, 1864.
1979.31

The manufacture of horsehair fabric, a standard upholstery material in the Victoria era, posed special challenges in power loom weaving. Unlike ordinary weaving in which a shuttle carried a continuous yarn back and forth across the weft (crosswise threads in a loom), horsehair weaving made use of individual hairs from the tail of a horse. In other words, each weft was a separate length. The horse hairs sat in a tray at one side of the loom, and a rapier or nipper moved across the loom, picked up a single hair and carried it back across the weft, inserting it in the web of horsehair cloth. The end of rapier was like two fingers that opened and closed to grasp the hair. This loom is a precursor to other types of shuttleless looms that came to dominate the textile industry by the end of the twentieth century.



Daguerreotype, ca. 1848-1852. This image is the earliest known photograph of a power loom in America.

Power Loom

Model W-3, Crompton & Knowles of Worcester, Massachusetts, c. 1966.

Crompton & Knowles' W-3 loom was the workhorse of the woolen industry in the United States and made C&K one of the leading manufacturers of loom technology in the world. This 64-inch loom can hold up to 24 harnesses and use as many as four shuttles that travel 114 times per minute across the loom making fabrics with complex patterns and multiple colors. This loom features a warp stop motion, which stops the loom automatically if a warp yarn breaks, allowing the operator to fix the broken thread immediately rather than waiting until the problem became obvious as a flaw in the cloth.

Tape Loom

Crompton & Knowles, Worcester, Massachusetts, circa 1920
1973.11

Narrow fabrics such as tapes, webbing, and ribbons have many uses both utilitarian and decorative. Looms like this can weave as many as six individual strips of fabric from 0.25 inches to 3.25 inches in width at one time using up to 16 harnesses activated by cams to create patterning. Shuttles on this narrow fabric loom run back and forth in a short track rather than being thrown across the warp from one shuttle box to another, allowing the loom to weave multiple fabrics at once. There is a bobbin winding system attached to this loom so that the weavers could wind their own bobbins while operating the loom.

19th century power looms show advances in weaving technology.

Power Loom

Model E, Draper Corporation, Hopedale, Massachusetts, 1964.
1968.24.3

Draper Corporation of Hopedale, Massachusetts, manufactured looms widely used in the cotton industry in the United States and around the world. With the development of the revolutionary Northrop battery which automatically replaced shuttle bobbins as they ran out of yarn, the loom became fully automatic and could run continuously. Since the weaver no longer had to replace the shuttle bobbins by hand, s/he could tend more looms.

Teasel Gig

I. S. Churchill, Rutland, Vermont, mid-19th century
1977.31

Teasel is a weed whose head has sharp prongs that catch on fabrics and pull the fibers. Used first by hand, teasels were later set into frames on machines such as this to raise a nap on woolen fabrics. This machine is constructed of wood and hand-forged iron parts. The maker, whose name is stamped in the wooden frame, is as yet unidentified.

Large, heavy shears (on the wall) used to cut the nap on woolen fabrics were replaced by machines with a helical blade in the 19th century.

Shearing Machine

Manufacturer unknown, mid-19th century
1966.46.1

The process of shearing cut the nap on a woolen fabric to an even height, making a smooth, finished surface. While at one time, highly skilled men used very large, heavy shears to do the work, this machine with its helical shear accomplished the same task as a continuous process. A machine this size was probably used in a small mill.

Stocking Frame Knitter

Manufacturer unknown, 19th century
1972.54

Mechanization of the hand process of knitting predated many other textile inventions in Great Britain when, in 1589, William Lee created the first "knitting frame" or "stocking loom." His invention was refused a patent by Queen Elizabeth I because she was concerned it would put hand knitters out of work. However, the stocking frame eventually gained an important place in the knitting industry and continued in use until well into the twentieth century. The frame makes a flat fabric that can be shaped but requires sewing to make it into a three-dimensional garment such as a stocking.

Dual Circular Knitting Frame

Tompkins Brothers, Troy, New York, circa 1898
1992.161

The motion of the parts and gears of this frame intermeshed loops of yarn to produce very serviceable tubular knitted fabric. The cloth was then cut and sewn into socks and undershirts used by people across the nation.

Roller Printer

Rice, Barton & Fales Machine & Iron Co., Worcester, Massachusetts, late 19th century
1100.172

The fast and efficient roller printer, often called the calico printer, changed little from that first patented by Scotsman Thomas Bell in 1783. This model is from the height of the technology just before screen-printing began to replace the use of engraved rollers. Dye was poured into a trough where a roller picked it up and deposited it on the rotating metal roller on which a portion of the calico pattern had been engraved. The engraved roller then transferred the dye to the cloth as the fabric passed around the large drum; each color or part of the pattern had a separate engraved roller. The success of this technology was dependent first on the skill of the engraver, then on the ability of the operators who mixed dyes and adjusted the roller settings to ensure accurate registration of the pattern. In the end, operating this machine was as much art as science.

Glossary

Throstle frame, c. 1835. The Lowell Machine Shop made this and many other first-generation American mill machines.

Bobbin – A small cylindrical or slightly tapered core made of wood, metal, or other materials on which yarns are wound. It has a hole drilled through the center so it will fit on a spindle, skewer, or other holding device.

Breaker Section – The first section of a carding machine, which breaks up impurities such as burrs and chaff in the fiber and removes them before the fiber passes into finer sections of the carding machine

Card Clothing – Sheets or strips of leather or other foundation material set with closely spaced, bent steel wires. The sheets or strips of card clothing cover the drums and rollers of the carding machine.

Card or Carding machine – A machine that prepares fibers for subsequent operations preparatory to spinning. Variously sized cylinders or flats are covered with card clothing. The cylinders run at various speeds and in different directions, passing the fibers from one cylinder to another to clean and align them.

Condensing reed – Comb-like device in a long, narrow frame with regularly spaced, vertical canes or wires that spread the warp evenly across a defined width

Creel – Frame or rack holding bobbins or spools.

End – A single yarn.

Goulding Condenser – Patented in the US in 1826 by John Goulding, his condenser delivered a continuous "rope" of fibers from the end of a finisher carding machine.

Harness – A frame that holds heddles in position in a loom during weaving.

Heddle – A cord, wire, or flat metal strip with a loop or eye near the center, held in a harness on a loom. Each warp yarn passes through the eye of a heddle and is raised or lowered by the heddles and harnesses during the process of weaving.

Jack spinning – A process of intermittent spinning in which fibers in roving form are drawn out, twisted, and wound on a spindle.

Lap Delivery – A mechanism to produce a continuous, soft sheet of fibers from the end of a carding machine section

Loom – A machine used for weaving or, in its simplest terms, interlacing two sets of yarns or threads at right angles.

Mule spinning – A process of intermittent spinning, made "self-acting" within fifty years after its invention so that all segments of the spinning action were powered and regulated. Mules could spin all sizes and twists of yarn very well.

Ply – A process of twisting together two or more yarns to create a single, plied

Rapier – A rigid or flexible rod with a finger-like mechanism at the end that grasps a weft element and carries it across the loom

Rolag – A long, narrow roll of carded fibers.

Roving – A continuous, soft, slightly twisted strand of fibers.

Throstle – A machine for spinning roving into yarn in a continuous process. Roving is fed through drawing rollers, twisted by the flyer, and then wound onto a bobbin.

Warp – Yarns that run lengthwise in a piece of fabric parallel to the selvedges, also lengthwise in a loom. Warp yarns interlace with weft yarns.

Warp beam – Long spool-like device on which are wound long lengths of parallel and evenly tensioned yarns. Each yarn is drawn off the beam and "threaded" into the loom in preparation for weaving.

Warping reel – Large cylindrical frame used in the warping process to align yarns parallel to one another and with even tension before winding them on the warp beam.

Weft – Yarns that run from selvedge to selvedge in a fabric and perpendicular to the warp. Also called filling.

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All photos courtesy the American Textile History Museum.

Nominator and Author

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Since the invention of the wheel, mechanical innovation has critically influenced the development of civilization and industry as well as public welfare, safety and comfort. Through its History and Heritage program, the American Society of Mechanical Engineers (ASME) encourages public understanding of mechanical engineering, fosters the preservation of this heritage and helps engineers become more involved in all aspects of history. In 1971 ASME formed a History and Heritage Committee composed of mechanical engineers and historians of technology. This Committee is charged with examining, recording and acknowledging mechanical engineering achievements of particular significance.
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There are many aspects of ASME's History and Heritage activities, one of which is the landmarks program. Since the History and Heritage Program began, 250 artifacts have been designated throughout the world as historic mechanical engineering landmarks, heritage collections or heritage sites. Each represents a progressive step in the evolution of mechanical engineering and its significance to society in general.

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MECHANICAL ENGINEERING HERITAGE COLLECTION
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AMONG THE MORE IMPORTANT MACHINES IN THIS COLLECTION ARE AN ARTEMUS DRYDEN CARD (CA. 1825), A THROSTLE SPINNING FRAME (CA. 1835), A BICKFORD & LOMBARD SPINNING JACK (CA. 1864), AN M. A. FURBISH & SON POWER LOOM (CA. 1870), AND A RICE, BARTON & FALES ROLLER PRINTER (CA. 1880). THE COLLECTION ALSO INCLUDES AUXILIARY MACHINES, SUCH AS CREELS AND WARPING MACHINES, AND NUMEROUS TOOLS DEVELOPED BY MILL OPERATIVES.

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About the American Textile History Museum

An affiliate of the Smithsonian Institution, the American Textile History Museum in Lowell, MA, tells America's story through the art, history, and science of textiles. In addition to its core exhibition, "Textile Revolution: An Exploration through Space and Time" and rotating special exhibitions, ATHM holds the world's largest and most important publicly held collections of tools, spinning wheels, hand looms, and early production machines, as well as more than five million pieces of textile prints, fabric samples, rolled textiles coverlets, and costumes. The Osborne Library contains books, pamphlets, government documents, trade catalogs, advertising material, prints, photographs and business records that record the history of textile production in the United States.

The American Textile History Museum is a non-profit organization that thrives due to the generous support of our friends. Join this dynamic institution today with a gift or membership. Please call 978-441-0400 for more information.

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