

THE DUGAN MILL FACTORY FLOOR EXHIBIT ROOM

Located in the Jonathan Dugan Building, the Dugan Mill Factory Floor Exhibit mimics a textile factory floor, with machines from the 1830s through the 1960s. It features an 1890s carding machine; a 1950s spinning frame; a mill machine shop with wooden patterns, metal patterns, a machinist's bench, two lathes, a grinder, and a machinist's or fixer's toolbox; a winding department with three working winders; a testing department with three tensile testers; an overseer's office; a weaving department with three looms and a creel (including an early-19th-century Jacquard loom; a print shop; and a variety of mill tools and implements.

The Dugan Building was built in 1877 by the Willimantic Linen Company as a one-and-a-half-story warehouse. After 1898, the Linen Company's successor, the American Thread Company, raised the roof and converted the upper story into a headquarters for its American Fire Brigade, while continuing to use the first floor as a warehouse. Later, in the 1920s after the City of Willimantic had modernized its own municipal fire department, ATCO discontinued its own Fire Brigade and converted the second story into a meeting room. Later still, both stories were turned into office space, most notably for ATCO's Engineering Department.

Jonathan Dugan purchased the entire American Thread Company's Willimantic Mills complex shortly after ATCO closed down in 1985. Two years later, he donated both the Mill Museum's main building and the smaller, brick Jonathan Dugan building to the Mill Museum. Today, the Museum uses the first floor as an exhibit room to teach about the process of producing cotton thread and about working conditions in old-time mills.

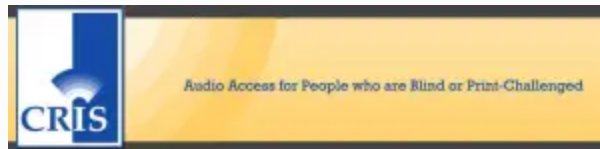
Connecting to the Mill Museum's Archives

Actual factory building were much larger than the Dugan Mill Factory Floor Exhibit room. The Museum has floor plans, photos, and fire insurance maps of many of Connecticut's old, 19th-century textile mills. To see a floor plan of the American Thread Company's Mill No. 1 in Willimantic, [click here](#). To see an early 20th-century fire insurance map of the American Thread Company's Mill No. 2 complex, [click here](#). To see an early 20th-century fire insurance map of ATCO's massive Mill No. 4, [click here](#). To see a 1905 stereograph of a spinning room in a woolen mill in Philadelphia, [click here](#). To see the interior of a drawing room in a silk mill in Paterson, NJ in 1905, [click here](#). To see an early 20th-century postcard of the giant Ponemah Cotton Mill in Taftville (Norwich), CT, [click here](#). To see an early 20th-century postcard showing the "bridge" connecting the American Thread Company's Mill No. 1 to Mill No. 5 in Willimantic, [click here](#). (Connecting to the Mill Museum's Archives made possible in part by a grant from Connecticut Humanities.)

Audio Exhibits

Partnering with CRIS Access Radio, the Museum has created a series of audio exhibits that describe the Dugan Mill Factory Floor Exhibit in detail. Designed for people who are sight or reading impaired and accessible through QR codes, the audio exhibits were funded by Connecticut Humanities, the Willimantic Lions Club, the Rose and Leo Pageau Trust, and CRIS Access. To listen to the Dugan Mill Audible Exhibits, [click here](#).

CThumanities



Video Tour

For a video tour of the Dugan Mill Factory Floor Exhibit for elementary schools, [click here](#). (The video tour is made available in part thanks to grant by the Last Green Valley.)

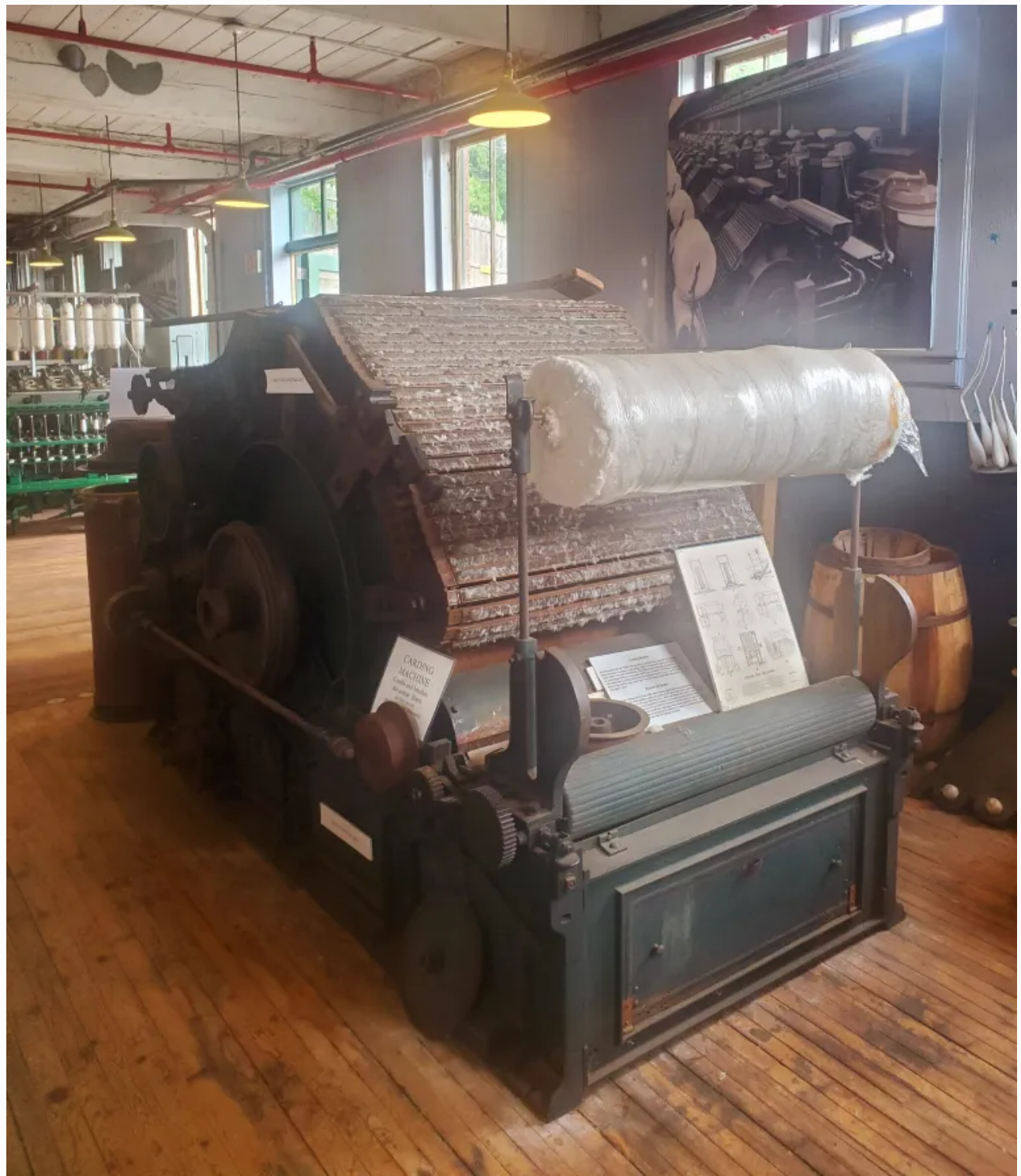


Video of Spool Tumbler

Spool Tumbler (below) — Finished thread can be wound onto large tubes or cones for sale, but most commonly we see it wound onto spools. Today, spools are usually made of plastic, but until the 1980s, most spools were wood. The preferred wood for making spools was white birch, which is both harder than pine or spruce and lighter than the oak, maple, or ironwood used to make bobbins. A northern tree, white birch was never plentiful in Connecticut — and it did not take long before the burgeoning 19th-century Connecticut textile industry exhausted local supplies. So in 1870, the Willimantic Linen Company bought a birch forest in Howard, Maine, renaming it Willimantic. The Company built a sawmill there, and installed the first electric generator in Maine. (Thomas Edison only developed his incandescent light bulb in 1879.) From these trees they produced the many spools and shipping crates the Company needed. By the end of the 19th century, the Company had exhausted most of the white birch in Willimantic, Maine. The Willimantic Linen Company's successor, the American Thread Company, moved its sawmill operations to Lakeview and Milo, Maine. This tumbler was used to smooth the rough-cut spools that came off the sawmills' lathes. The spools were tumbled inside, along with a mixture of sand and sawdust, until they were smooth. This tumbler was used in the Milo sawmill. The Museum operates this machine for visitors.



Other Things to See in This Exhibit



Carding Machine (above) — This 19th-century carding machine combed (brushed) raw cotton or wool to align the fibers, in preparation for spinning. Before the invention of the first, hand-crank barrel carding machines in the 18th century, women carded or combed the wool or cotton with hand held brushes, a laborious and time-consuming chore. Carding machines like this water-powered card did the job much faster, but they were also very dangerous. Carders — who were mostly men until World War II — could and did lose fingers, hands, and arms to the giant steel rollers and big grinding gears. Raw cotton or wool, called lap, was fed into the far end of the machine. A finished strand or rope of fiber, called sliver, came out of the near end. Other machines would transform the sliver into roving, which would then be spun into thread or yarn.



Spinning Frame (above) — Spinning machines turned cotton roving into yarn or thread. Until the 11th century, when spinning wheels were invented in the Middle East, spinning was done solely by hand, using drop spindles or whorls. Spinning wheels did not reach England until the 16th century, during the reign of Henry VIII. In the 17th century, English colonists brought spinning wheels to Connecticut. But even with a wheel, spinning was still a laborious, time-consuming process. Historians estimate that, before the Industrial Revolution, a typical woman spent 75% of her working life producing textiles (yarn, thread, cloth, etc.). Spinning machines were invented in England in the 18th century, and were brought to Connecticut in the early 19th century. While the earliest spinning machines were driven by

waterpower, this machine — built around 1952 — is powered by an electric motor. Machines like this were found in the American Thread Company's Mill No. 2. Spinning machines and other industrial textile machinery changed women's lives forever. A spinning machine can spin in one day what it would take a woman perhaps 30 years to spin by hand. This machine is a one-quarter-size spinning machine that would have been used in a testing department. A full-sized spinning machine would have been four times this size, and a single worker (almost always female) would tend four of them. Spinners spent their work hours on their feet and on the move, checking each of their machines' many feeds, tying up broken threads, and replacing empty roving bobbins and full thread bobbins. A spinning machine performs three tasks — it stretches the thick roving into thinner yarn or thread (this is called drawing), twists the yarn or thread to give it strength (this part is called spinning), and then winds the finished product on a large bobbin. The bobbins were hollow, and slid over the upright silver metal posts shown in the photo, called spindles. Originally, bobbins were made of hard wood, but today are usually aluminum. As the spinning machines drew or stretched the roving before spinning it, countless small fibers — too small to spin — would pop loose, forming a cloud of wool or cotton fibers in the air around the machine. Spinners breathed in those fibers, which severely damaged their lungs, often resulting in brown lung disease, which could be debilitating and even fatal. This machine has a safety feature that had only recently been developed. Suction tubes connected to a motor "vacuumed" most (about 90%) of the loose fibers out of the air and deposited them in a large "lint trap," visible as a big box on the right side of the machine, above the electric motor. Today, few people in Connecticut have the knowledge to maintain and repair old textile machines like this, and replacement parts are no longer manufactured. For those reasons, the Museum rarely runs this machine.

Winding Machine (above) – Winding machines like this tube winder / cone winder (it winds finished thread or yarn onto tubes or cones for sale) date back to the 19th century, and continued to be used until the mill closed in 1985. Today, the tubes and cones are made of cardboard, but originally they were made of hard wood. At their peak of production, the American Thread Company in Willimantic produced 90,000 miles of thread each day, all of which had to be wound. About half of the women who worked at ATCO were winders. Winding was among the lowest paid positions at the mill.





Industrial Sewing Machine (above) — The Dugan Mill exhibit features several industrial sewing machines, the kind used in factories and sweat shops to mass produce garments. This machine was manufactured by the Merrow Company, which started in the village of Merrow in the town of Mansfield, Connecticut in the 19th century. The Company grew, and eventually relocated, first to Hartford and then to Wethersfield, Connecticut. Today, it is Massachusetts. Industrial sewing machines are heavier and more rugged than home sewing machines, and are usually found attached to sturdy tables that are bolted to the floor. Most sweat shop workers were women. Sweated labor paid even more poorly than spinning or weaving in a mill.



Mill Fire Bucket (above). Their rounded bottoms (a) were designed to push the water in the bucket forward in a concentrated stream when thrown, and (b) ensured that workers hung their full fire buckets on the designated hooks, rather than try to set them on the floor.



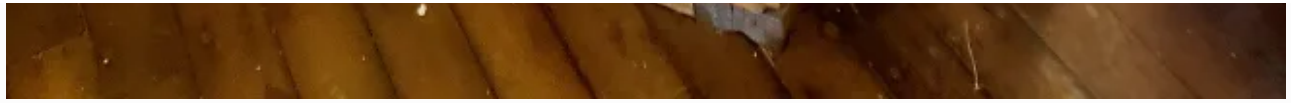
Jacquard Loom Punch Cards (above).

Jacquard Loom (below) — This was one of the earliest industrial looms. It is a jacquard loom, invented in 1804 by the Frenchman Joseph Marie Jacquard. Although powered by hand workers turning cranks and not by water, steam, or electricity, it is considered an industrial machine because it vastly sped up the production of rugs, tapestries, damasks, brocades, and other cloth where different colored threads or yarns were woven together into complex patterns. The threads move independently through a dense array of heddles, each governed by a series of holes punched in cards, which are stitched together and fed into the machine's head. Some historians of technology deem jacquard looms to be the first computers, because they were the first machines to use binary — the holes and not-holes in the cards substituting for ones and zeroes. Indeed, early computer technology would be influenced by jacquard looms. This loom is made almost entirely of wood (only the heddles and a few bolts are made of iron), and does not have interchangeable parts. Joiners marks on the wooden pieces, in the form of Roman numerals, indicate where the individual beams are to be joined by wooden pegs. This jacquard loom was likely manufactured in Europe sometime in the early 1800s. It eventually made its way to Japan; in addition to the Roman numeral joiner's marks, there is also Japanese writing on some of the parts. Most of the wooden pieces are original, although some have been replaced.









Keighley Loom (above) – This 19th-century industrial loom used flying shuttles that traveled over 60 mph. It was very dangerous, as the shuttles could come loose and shoot away from the machines. Most weavers were women or girls, each operating several looms at one time. The rack behind the loom is a creel. This creel comes from the last textile factory to operate in Willimantic, Connecticut — the Roselin Manufacturing Company, which made cotton, silk, and rayon ribbon. The Roselin Company relocated to Willimantic from New York in 1935, and operated until 1995. This creel is designed for a larger, more modern loom than the Keighley loom. (The Keighley loom was, despite its mostly steel construction and the fact that it was designed so that it could be attached to some sort of power source, intended by its British manufacturer to be used in cottage industry!) The creel fed the individual threads into the loom, where each thread was warped through an eye in a heddle. This Keighley loom is fairly small, a simple four harness loom. Looms like this still had to be warped by hand. A flying shuttle — seen balanced on the front of the loom — was batted mechanically back and forth, left to right and then right to left, to add the weft. The finished cloth was pulled through by the large, rotating, steel roller in the front.





Atwood Loom (above) — Even older than the Knightly loom, this Atwood loom was manufactured in Stonington, Connecticut in 1875 by the Atwood Machine Company. The Company originated in Mansfield, Connecticut, relocated to Willimantic, Connecticut, and eventually moved again to Stonington.