

THE DIN OF MACHINES: THE TECHNOLOGY OF TEXTILE PRODUCTION

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Sometime around 1880, William E. Barrows, the President and General Manager of the giant Willimantic Linen Company in Willimantic, Connecticut (which despite its name manufactured mostly cotton thread, not linen) published a booklet entitled *How We Make Our Thread*, intended for “the private use of the [Company’s] work-people.” “If each person engaged in the business of thread making understands what has been done to the cotton before it reaches him, and what will be done after it leaves his hands,” Barrows wrote in the introduction, “the work will be much more intelligently performed.” Although no longer in print, Barrows’s booklet remains a useful primer on the technology of industrial textile production.

Cotton was **picked, ginned** (a process for removing the seeds from the bolls), and packed into **bales** or bags in the South, then shipped by rail to Windham’s factory city of Willimantic, where the Willimantic Linen Company’s mills were located. Arriving at the “Thread City,” the trains pulled onto sidings owned adjacent to the WLC’s gigantic Mill #4, where workers quickly unloaded it. Other workers opened the bales with machines called **breakers**, then pushed the loose cotton into other machines called **pickers**, which picked out stones, sticks, seeds, and other foreign objects.



A worker at the American Thread Company in Willimantic, Connecticut, stuffs cotton into a picker, a machine designed to pick out sticks, stones, leaves, and other detritus. This photo is c. 1950. From the collections of the Windham Textile and History Museum.

The cotton came out of the pickers in flat sheets known as **lap**. Workers rolled the lap and carried it to the carding rooms. Rolls of lap were heavy – they weighed several hundred pounds – and workers usually transported them in large, wheeled carts. The carts had three sets of wheels – smaller wheels in the front and back, and larger ones in the center, to make it easier to push the carts over door sills. Enclosed wooden **bridges** joined many of the different wings of the mills, making it easier to roll the carts from room to room.

Carding machines had powerful metal brushes. Workers fed the lap into the cards, whose fine metal teeth brushed it so that all the fibers faced the same direction. The cotton came out of the cards in the form of long, thick strands of cotton known as **sliver**. Carding machines were dangerous: unwary workers sometimes lost fingers or arms in their crushing grip. Until the 1940s, picker and card operators were almost entirely men, as the work generally was considered too strenuous and dangerous for women.



Carding machines brushed the cotton so that all the fibers faced the same direction. Cards were the most dangerous machines in thread mills. Until the 1940s, they were operated almost exclusively by men, but during World War II women like Alice LaFerriere of the American Thread Company in Willimantic, Connecticut, shown in this c. 1950 photo, also began to operate cards. From the collections of the Windham Textile and History Museum.

After the cotton was carded, workers ran the sliver through a series of machines – **drawing heads, slubbers, roving frames**, and **jacks** – that prepared it for spinning by twisting and folding it. The end result of the twisting and folding was a substance known as **roving**, which looked a lot like thick yarn, but – because it had yet to be spun – was not nearly as strong and could be pulled apart fairly easily by hand. Workers wound the roving onto large **bobbins** – in Barrows’s time made of a hard wood known as ironwood, but today made of plastic – and took it to the spinning room. There, a mostly female workforce used machines called **spinning frames** to **draw** (stretch) and **spin** (twist) the cotton until it emerged as thin strands of strong thread. Spinning frames were noisy, like most mill machinery, and workers frequently suffered from hearing loss. Spinning frames also produced copious amounts of cotton dust and lint that, when inhaled, often led to lung diseases.

From the spinning room, the thread usually went to another room to be **twisted** (combined with several other strands to make a stronger, thicker product; sewing machine thread, for example, was usually “six-cord”) and prepared for **dyeing**. In the nineteenth century, thread was dyed in loose skeins in open vats, but in the twentieth century, large, new, efficient sealed pressure vats made it possible to dye thread while it was wound onto special metal spools. Once twisted and dyed, the thread was taken to another location to be **mercerized**, a finishing process that kept it from fraying, and rewound onto wooden (later plastic, Styrofoam, or cardboard) spools, tubes, cones, or pre-wound sewing machine bobbins for distribution.

In order to maximize profits, textile mills often sought to control as many steps of the manufacturing process as possible, a strategy known as **vertical integration**. The Willimantic Linen Company owned a township in northern Maine – also named Willimantic – where it harvested white birch for spools. Later, when most of the white birch in Willimantic, Maine, had been harvested, the American Thread Company (which purchased the Willimantic Linen Company in 1898) moved its sawmills to Milo and Lakeview, Maine. The WLC also had its own print shop, where it printed its labels and boxes. And it had a machine shop, where skilled machinists crafted replacement parts for the various machines.

How We Make Our Thread ends with the finished thread being boxed and sent to market. But other textile mills in Willimantic and elsewhere in Connecticut took the process further, weaving thread into cloth on large, industrial **looms**. Like pickers, carding machines, and spinning frames, power looms were both noisy and dangerous. Their metal-tipped **flying shuttles** traveled back and forth at around 60 miles per hour. Sometimes they came loose and flew out of the machines, seriously injuring workers.

Once it was woven, the cloth was shipped to urban factories called **sweatshops** – usually located in metropolises like New York, Boston, Hartford, and Providence – where other workers, most of them women hunched over heavy, noisy industrial-sized sewing machines, cut and stitched it into garments.



This staged 1943 photo was probably taken to accompany a safety brochure. It shows an American Thread Company employee pretending to put his hand into a carding machine. If this scene had been real, the worker would probably have lost his hand. From the collections of the Windham Textile and History Museum.



Carding machines produced a rope-like material called sliver. Roving machines refined the sliver, shown in this c. 1950 photo taken at the American Thread Company's Willimantic plant, into roving, a more regular product that could fit into a spinning frame. From the collections of the Windham Textile and History Museum.



A worker tends a spinning frame, which stretched and twisted roving into thread. From the collections of the Windham Textile and History Museum.



Mill worker Irene Monroe demonstrates a winder in this c. 1950 photograph taken at the American Thread Company's Willimantic mills. From the collections of the Windham Textile and History Museum.



Pressure dye vats like this replaced inefficient open dye vats in the 20th century. Using a pressure dye vat, a worker could dye thread right on the spool. This photo was taken c. 1950 at the American Thread Company's Willimantic mills. From the collections of the Windham Textile and History Museum.

While textile mills purchased their machines from companies like the Whitin company in Whitin, MA, and the Saco-Lowell company in Saco, ME, and Lowell, MA, most mills did their own repairs when the machines broke down or parts wore out. Carpenters constructed wooden “patterns” of machine parts, which machinists then used to make the parts from cast iron or brass, using casts, lathes, and grinders. Fixers installed the new parts. This photo shows the machine shop at the American Thread Company, c. 1950. From the collections of the Windham Textile and History Museum.



In the nineteenth and early twentieth centuries, mill machines were belt-driven. Until the 1870s, the chief source of power was waterpower. Beginning in the 1870s, it was a combination of waterpower and steam produced by coal-fueled steam boilers. Waterpower was generated in the mills' wheelhouses, normally located either beneath the mills or in ells jutting towards the rivers. Steam was produced in boiler rooms, also usually located near the rivers. From the

wheelhouses and boiler rooms, the power was transferred to vertical drive shafts the connected to horizontal drive shafts on the ceilings of each production room. Large leather belts transferred power from the drive shafts to the machines. This photo shows ceiling mounted drive shafts at the Cheney Silk Mills in Manchester, CT in c. 1915. From the collections of the Windham Textile and History Museum.