

## A Short History of Machine Knitting

### Significant dates:

1589 - invention of Knitting Frame by William Lee

1759 - addition of ribber by Jedediah Strutt and others

1955 - last frame with bearded needles produced in Nottingham

1806 - invention of latch needle by Jeandeau in France

1816 - early type of circular machine invented by Marc Brunel

1849 - latch needle patented by Matthew Townsend in UK and James Hibbert in USA

1878 - addition of ribber to circular machines by Henry Griswold

### The Early Days of Knitting Frames

It has been estimated that at the end of the 16<sup>th</sup> century there was an annual **need** in England (not including Scotland or Wales) of 10 million pairs of stockings, allowing around two pairs per person per year, the population being around 4.4 million. Richard Rutt, in a *History of Hand Knitting*, states that at that time hand knitters could turn out six pairs of stockings a week. England exported hand knit stockings for many years - one particular destination was Rouen in France. In 1589 **William Lee** must have seen hand knitters all around him. Exhaustive research by Negley Harte (see ref 1) has dispelled many of the myths we have grown up with surrounding Lee, and those myths are not going to be perpetuated here. A Partnership Agreement of 1600 is described as "*Betweene George Brooke of London Esquier and William Lee of London Gentleman...*". Gentleman at that time usually denoted a man of independent means. All contemporary evidence points to Lee's motivation in inventing a machine as being profit.



We don't know exactly what this initial frame looked like – no diagrams exist. That it was designed to produce more than stockings is evident from the wording of the partnership agreement, "all manner of works usually wrought by knitting needles such as stocking, wastcootes and such like" and was described as "a certain Invention or Artificialitie being a very speedie manner of working and makings in a loome or frame" (see ref 2). Lee's invention of the frame

[The oldest Frame in the Framework Knitters Museum ca. 1750](#) ↑ depended on the use of a spring, bearded or barbed needle. These are held in a strong iron bed, surrounded by a huge wooden frame not unlike a weaver's loom.

The needle bed is held rigidly horizontal, and parts of the rest of the machine work around this. The yarn was initially placed across the needles by hand – this did not change for some 200 years.

The frame shown is possibly the oldest *working* frame in the UK; some parts may even have been rescued from older frames. It was a “one-at-once” frame and eventually used for knitting surgical hose.



Lee’s efforts to meet with royal patronage came to naught in England, where an ageing Elizabeth, with no national police force, could envisage riots if hand knitters were put out of work. The presentation of a pair of Italian silk stockings would also have knocked the spots off a pair of coarse woollen ones, however well made. Lee would have had to have set up another machine in Spitalfields, as silk workers were restricted to that area by the London Guilds. Following the queen’s death in 1603, James I was similarly not interested. Making his way to Rouen, where there was still a demand for stockings, Lee also came a cropper there, as the French king Henri IV was assassinated in 1610. This probably made him give up, but he signed another two documents in Rouen in 1612 and 1615 and his work was carried on, supposedly by his brother and his apprentice. Stockings were shaped on the frame and needed a back seam and under-foot seams sewing.

The use of frames initially only slowly spread throughout England, Europe and America. Jedediah Strutt of Belper Mills fame, along with his brother in law and an employee developed a ribber attachment, known as the Derby Ribber, patented in 1759. Initially formulated to make ribbed stockings (which became very popular), this ribber bed could also produce garter stitch.



With this, hand knit Shetland and Orenburg shawls could be mimicked. Frame knitting was conducted in both domestic and grouped (early factory) settings. By the end of the century, the yarn no longer needed to be laid in by hand, but could be fed by operating one of two treadles with the right foot. As men’s fashions changed and trousers or pantaloons got shorter, there was a call for longer stockings, and stripes were very much in favour. The only way to make these vertical stripes was to knit them sideways on the frames. It is the same

today for modern flatbed knitters. The frames got wider, as wide as a man’s arms could reach. Inevitably, fashion changed, and by the end of the eighteenth century more thought had to go into production. The fixed needle bed had its limitations due to the type of needle used. Some knitters reverted to making single, shaped stockings on a wide frame, others saw that it would be quicker to make full use of

↓ [1850's frame from Saxony](#)

the width to make an unshaped piece and cut and sew afterwards. They could thus undercut the prices of the shaped pieces. This put many traditional knitters out of work. However, cut stockingette and hand-sewn seams come apart very quickly. Rumbings led to riots, and Luddism. Around 1811-1812 groups of traditional workers were smashing the machines of those they perceived to be mass-manufacturing shoddy goods (not, as it generally believed, hand knitters smashing all machines – do visit the only Luddite Gallery in the country, complete with “sound shower”



at the Framework Knitters Museum near Nottingham). Some of the wide machines were adapted to make three or even five shaped stockings at once. The industry was very slow to recover from this in England, although there were signs of growth in Europe, notably Germany, and America. Fewer than 1,000 Victorian frames now exist, the vast majority unworked, and in museums. Martin Green, in Leicestershire, does make his living by knitting on them and you can see a film of him working a five-in-one frame machine here:

[https://www.youtube.com/watch?v=j1H\\_T6VtE5c](https://www.youtube.com/watch?v=j1H_T6VtE5c)

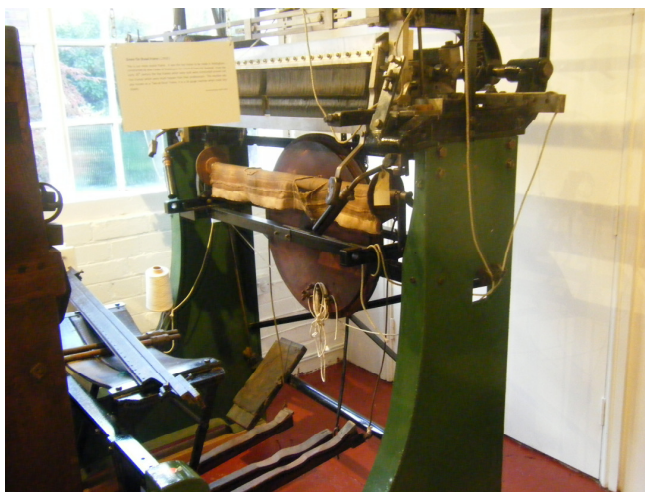


The Framework Knitters Museum regularly works their machines for visitors and the serious scholar can take a course of lessons there.

← Late Victorian machine mainly used for Museum demonstrations, with Andy Bone of FWKM

The last frame with spring needles was made around 1955 in Nottingham by Alan Cook of Ruddington for J Buck & Sons, Hucknall, with green painted cast iron surround rather than

oak, and can be seen still working at the Framework Knitters Museum. It was a “two at once” frame, and used for making lace shawls. Flatbed knitting is also known as weft knitting when only one thread is used to create rows horizontally. Improvements using pattern cards, Jacquard cards similar to those used in weaving from 1801, the forerunner of punchcards for computers, led the way to lace and warp knitting, where several threads are in operation at once. Massive industrial machines were constructed, in particular for the world famous Nottingham Lace, and some of these can be seen at Woollaton Park Museum in Nottingham.



1950's frame →

### The Circular Knitting Machine

The sticking point of further development on the frames was always the bearded needle. Pierre Jeandeau is said to have invented the first latch needle in France, with dates varying from 1802 to 1803 to 1806. (See [https://textInfo.files.wordpress.com/2011/10/image\\_thumb27.png?w=501&h=471](https://textInfo.files.wordpress.com/2011/10/image_thumb27.png?w=501&h=471) for needle diagram).

William Lee's frame had required a sequence of horizontal and vertical moves to be made by the knitter in order to produce the goods. The automation of these movements was difficult, particularly when steam engines provided only rotary motion. However, **Marc Brunel**, a French engineer, inventor and father of Isambard Kingdom Brunel, built a machine in the UK in 1816 that arranged the needles in a circular form rather than a flat bed. The machine produced a tube of fabric suitable for cut-ups, but it could not create fully-fashioned work and had many problems.

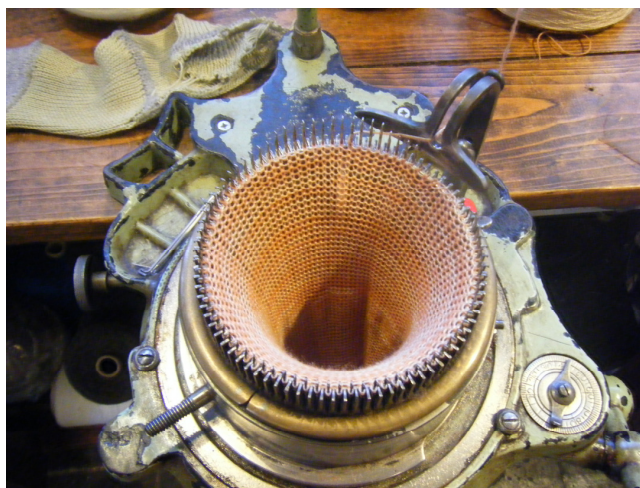
**Matthew Leo Townsend** was born in Cropston, Leicester, UK, in 1817, the son of a framework knitter. His father died in 1827 and it is believed that Townsend learned his skills at a very early age from necessity. By 1851, aged 34, he was described as a hosiery manufacturer in Leicester. The latch needle is much more versatile than the spring needles, and does not need to be placed horizontally, as the latch itself does much of the work. Thus, it can be mounted vertically in a machine. The most modern machines being built in Leicester today, and exported to the Chinese knitting industry, still use latch needles. (See WholeGarment Technology® <http://www.shimaseiki.com/wholegarment/>)

The latch needle was particularly valuable for circular machines, and it was taken up with more enthusiasm in the USA than in Britain, particularly after Townsend migrated to New England. Townsend registered five inventions with the Patents Office for improvements in knitting. The one for the Latch Needle was registered on 13 February 1849, Patent No. 12474. The precise date is significant, remember it for later!

Townsend's latch needle was being made in 1854 in America by Theodor Groz. Townsend set up in partnership with a Charles Draper in 1863, but the company failed in 1866. The main reason for this failure seems to be a lawsuit brought about by Walter Aiken, owner of a latch needle patent invented by James Hibbert dated 9 January 1849, i.e. a matter of days before Townsend's own. Townsend's defence in court was that the original needle had been invented by Jeandeau in France in 1806, but he could not produce written evidence, so he lost the court case by default, and had to stop manufacturing. Aiken's went on to become known for their circular sock machines. Townsend filed three more patents up to his death in 1879.

The circular machine had a great boost during the time of the American Civil War (1861-1865), when the quartermaster general of the Northern army decided the quality of its socks and stockings was far better than the frame knits with necessary seams he had been offered. Before then, only plain tubes were being made. In English workhouses, children from the age of 4 often worked these machines, lengths being cut off by their supervisors for hand knitting the heels and toes. Adaptations led to the machine being operated back and forth as well as circularly, for shaping of the toes and heels. The machines, being quite compact, and taking up only half the space of the domestic treadle sewing machine, were used at home as well as in factory environments where they could be linked to a band drive, and heavily advertised and promoted.

**Henry Josiah Griswold** was born in Madison, New Haven, Connecticut, USA on 4 Jul 1837. He attended Yale University, and during the Civil War drafted guns for the Union government (one wonders whether the diameter of a circular sock machine owes something to the diameter of a large gun or cannon barrel!). He was an inventor in many disciplines. In 1866 Henry visited both London and Paris. The year he patented a knitting machine in Britain, recorded in the London Gazette was the item 'To Henry Josiah Griswold, of the Hop and Malt Exchange, Southwark-street, in the county of Surrey, Merchant and Manufacturer, for the invention of



↑ A bench mounted Griswold machine knitting a plain tube

"improvements in knitting machinery." In his patent Griswold claimed possession of an invention for *"Improvements in Knitting Machinery"* and made *"Solemn Declaration that I am the true and first Inventor thereof"*. In the next year he patented several improvements to his invention commonly known as the *"little rapid family knitting machine"*.

The most important improvement is that in 1878 Griswold added a second set of needles set in a disc horizontally to the top of circular knitting machine enabling rib knitting and the cuff or welt for socks. US patent 255,971 can be found online, simply called "knitting-machine", dated April 1882. It was filed in 1879, after being patented in England in 1873 and in France 1874. This related to improvements "so that the needles may be adjusted or thrown out of action without removing the loops from the same" and includes brief instructions on the making of a ribbed sock. Little further development appears to have been carried out, and indeed there are many of these machines still working over 100 years later.



← A Harrison table mounted machine with top ribber in position

In America, the circular sock knitting machine gained in popularity during World War I. In 1917, a special commission of the Red Cross cabled National Headquarters from the war zone in France, requesting hospital supplies and knitted goods. They begged for a million and a half each of knitted mufflers, sweaters, socks, and wristlets. The Red Cross responded by providing the necessary coordination for the purchase and distribution of wool and military patterns to knitters. When America entered the war, Mabel Boardman, the only woman member of the Red Cross Central Commission, realized that hand knitters were facing an enormous task. Novice knitters were encouraged to master the machines, at Red Cross headquarters, and knit a perfect pair of socks in 40 minutes.

In the UK, popularity waned between the wars, and indeed many machines were melted down for the re-cycling metal war effort for WWII, and production of new machines ceased. In the last decade, thanks to self-patterning sock yarns and websites such as eBay and Ravelry, the CSMs have gained another set of followers, machines in good working condition changing hands for up to £800 in late 2013. Although using the same latch needle as the flatbed machines, it is a much steeper learning curve. The machines are capable of making many other items than socks, flat web as well as tubes. Several people in the UK offer tuition, as does the Framework Knitters Museum. Modern, lighter weight machines may be obtained from The New Zealand Auto Knitter (at up to £2,000 imported) and in America from Erhlbacher Gearhart, as well as their own second-hand machines.

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Post war, there was surge of interest in the domestic flatbed machine – for the history of this, download the separate file.

*Author's note: This article represents the author's personal view based on ongoing research. There are inevitably some facts missed out for the sake of brevity. I am very much indebted to the descendants of Matthew Townsend for placing their family genealogy on line, including a portrait See <http://search.ancestry.com>.*

*I am also grateful to Richard Candee, author of *The Hand-Cranked Knitter and Sock Machine – A Social History and Catalogue of 19<sup>th</sup> and 20<sup>th</sup> Century Home Knitters of American Inventions* for his help and suggestions.*

*Ref (1) Personal correspondence and meetings between the author and Negley Harte, plus his chapter in *Four Centuries of Machine Knitting*, publ 1989. Copies of this book can still be obtained from the Framework Knitters Museum, Ruddington, Nottingham. The museum has over 20 knitting frames on display, and some very able demonstrators. There are also more than a dozen circular (sock) knitting machines set up for visitors, including children, to try out. [www.frameworkknittersmuseum.org.uk](http://www.frameworkknittersmuseum.org.uk)*

*Ref (2). The Partnership Agreement original document is in the De Lisle and Dudley MS no 1234 (Foulis collection)/ Historical Manuscript Commission, transcribed by Charles Cruikshank on behalf of the Pasold Research Fund. The full transcript appears in the journal *Textile History*, 1975.*

*Further reference was made to <http://www.german-hosiery-museum.de/technik/02erfindunghandwirkstuhl/handwirkstuhl.htm>*

*An otherwise difficult website to get into, this should give you the English page. Lots of facts on there should be taken with a pinch of salt, but there are some very interesting diagrams and photographs, and it goes into the European development in much greater depth.*

*All photos taken by Mary Hawkins at the Framework Knitters Museum in November 2014, whose kind permission is gratefully acknowledged.*