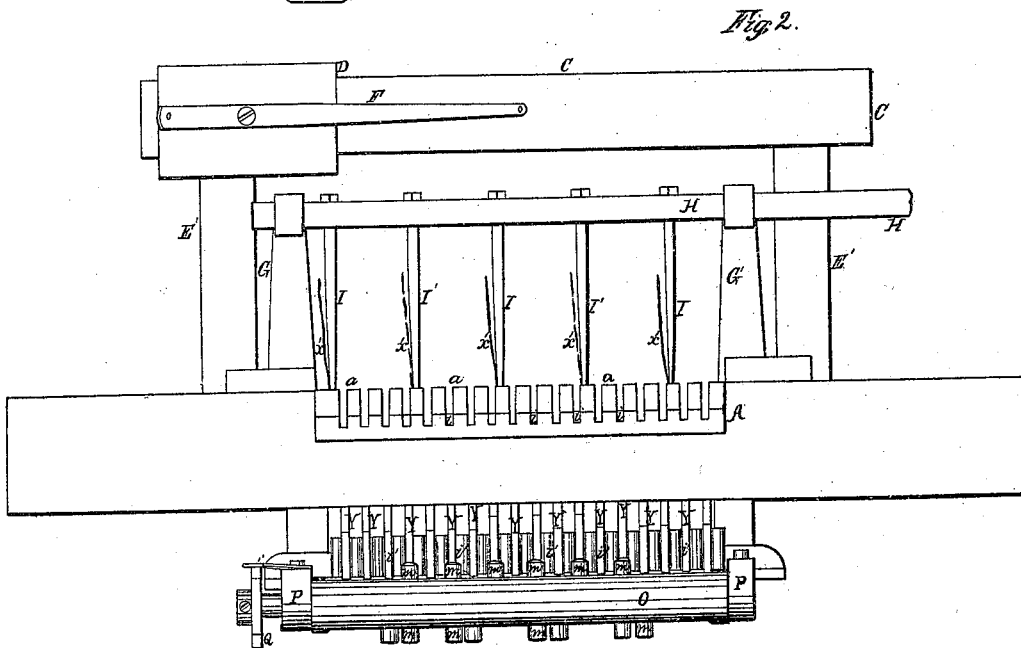
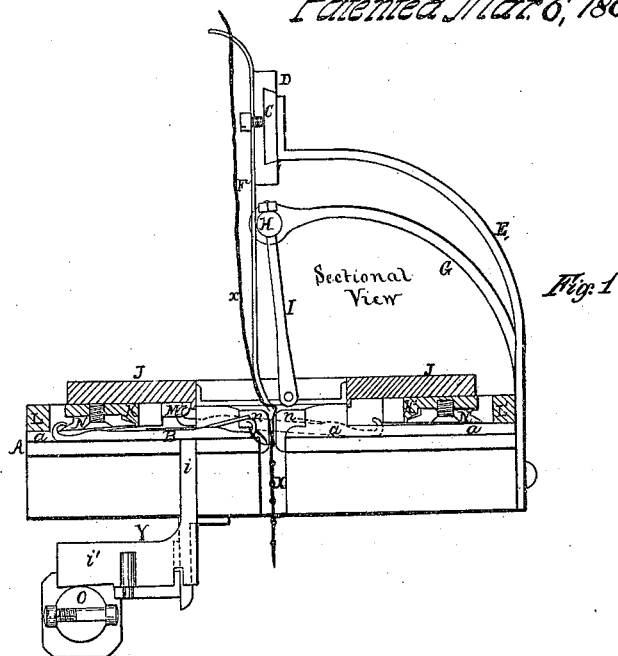


*I. Langham.*  
*Straight Knitting Machine.*

*No 53,013.*

*Patented Mar 6, 1866.*



*Witnesses*  
*Am. Agent Luce.*  
*John Parker*

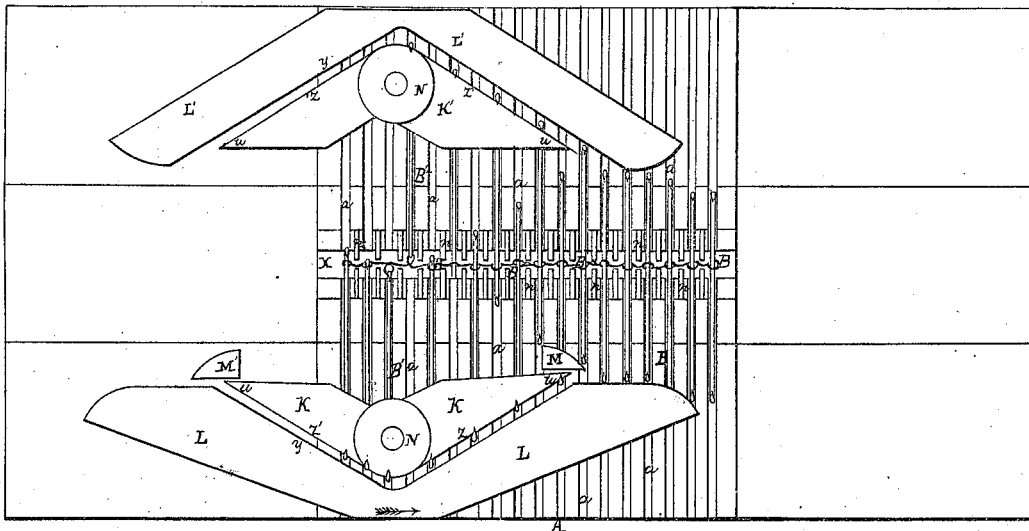
*Inventor.*  
*I. Langham*

*T. Langham.*  
*Straight Knitting Mach.*

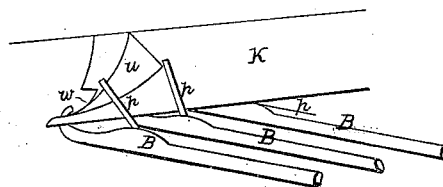
*N<sup>o</sup> 53,013.*

*Patented Mar. 6, 1866.*

*Fig. 3.*

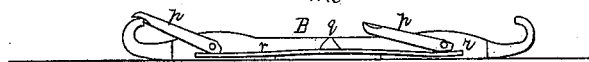


*Fig. 4.*



*Fig. 5.*

*Section.*



*Witnesses.*  
*Wm. H. Smith & Son*  
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*Inventor.*  
*T. Langham.*

# UNITED STATES PATENT OFFICE.

THOMAS LANGHAM, OF PHILADELPHIA, PENNSYLVANIA.

## IMPROVEMENT IN KNITTING-MACHINES.

Specification forming part of Letters Patent No. 53,013, dated March 6, 1866.

*To all whom it may concern:*

Be it known that I, THOMAS LANGHAM, of Philadelphia, Pennsylvania, have invented certain Improvements in Knitting-Machines; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

My invention consists of certain devices, constructed and operating as fully described hereinafter, so that a knitted fabric having almost any desired pattern and combination of colors may be produced.

In order to enable others skilled in the art to make and use my invention, I will now proceed to describe its construction and operation.

On reference to the accompanying drawings, which form a part of this specification, Figure 1, Drawing No. 1, is a sectional elevation of my improved knitting-machine; Fig. 2, a side view of part of the machine; Fig. 3, Drawing No. 2, a plan view, representing the bed-plate of the machine with the needles and the cams for operating the latter; Fig. 4, a perspective view of part of the machine drawn to an enlarged scale; and Fig. 5, a sectional view of one of the needles drawn to an enlarged scale.

Similar letters refer to similar parts throughout the several views.

In a metal bed-plate, A, secured to the frame of the machine, is a series of parallel grooves or channels, *a*, in each of which slides a double-ended self-acting needle, B. In the center of the plate A, at right angles to the grooves *a*, is a narrow opening, X, and to brackets E E', attached to the frame of the machine, is secured a bar, C, on which is a slide, D, the said bar being directly above the opening X.

To the slide D is secured an adjustable thread-guide, F, through openings in which is passed a thread, *x*, of yarn, the lower end of the guide extending nearly into the opening X.

In brackets G G', attached to the frame of the machine, slides a shaft, H, to which are secured, at equal distances from each other, guides I I', and through an eye in the lower

end of each guide is passed a thread, *a'*, of yarn.

Into the opening X project a number of plates, *n n*, which are secured to each edge of the plate A, between the grooves *a a*, for a purpose described hereinafter.

Above the plate A slides a frame, J, to the lower side of which are secured cams K L M, and K', L', and M', the faces of the cams M M' being farther from the plate A than those of the other cams, for a purpose described hereinafter.

In the center of each cam K K' revolves a disk, N, the face of which is flush with that of the cam, the disk being so arranged that a part of the edge of the same shall form a continuation of the outer edges, *z z'*, of the cam.

In suitable guides below one side of the plate A are arranged a number of L-shaped plates Y, one arm, *i*, of each plate extending upward through an opening in the plate A, which communicates with one of the grooves *a*, and the other arm, *i'*, extending over an ordinary pattern-cylinder, O, which is provided with the usual detachable lugs or pins *m*, and which turns in brackets P P', secured to the frame of the machine.

The opposite ends, *w w*, of each cam K K' are pointed, as shown in the drawings, the side of the cam, at *u*, near each point, being inclined, as shown in Fig. 4, for a purpose described hereinafter.

To each needle B are hung two latches, *p p*, the central portion of the needle being cut away to admit a spring-rod, *r*, which is secured, by soldering or otherwise, at the point *q*.

Each end of the spring *r* projects beneath the inner end of one of the latches *p*, and tends to maintain the latter in position, either when closed or turned back toward the center of the needle, as shown in Fig. 5.

Operation: The shaft H is turned so that the guides I I' will be brought to the position shown in Fig. 1, and the needles B are moved to the side of the plate A adjacent to the cams K L. A reciprocating motion is then imparted to the frame J, so as to carry the cams attached to the same back and forth across the face of

the plate A, a similar motion being by any well known means imparted to the slide D and its guide F, but so that the point of the latter shall always, when moving in either direction, be a short distance behind the leading-point *w* of the cam K or K'. As the frame J is moved in the direction of the arrow, Fig. 3, the edge *z* of the cam K will be brought into contact with the hooked ends of the needles B, and the latter will be carried back toward the position occupied by the needle B', Fig. 3, the needle being moved inward toward its first position as the edge *y* of the cam L is brought into contact with the same. As the needles are moved in and out and the guide F is moved back and forth the yarn *a* is introduced by the guide into the inner hooked end of each needle, and the old loop slips off the needle and forms a new loop in a manner too well known to those skilled in this class of machines to need particular description.

When it is desired to transfer one or more of the needles to the opposite side of the opening X, in order to form a rib in the fabric, the cylinder O is turned so that each of its pins *m* shall be brought beneath and elevate one of the plates Y, the arm *y'* of the plate bearing against the needle B above the same and raising one end of the latter. On the next movement of the frame J the cam M or M' will be brought against the elevated ends of the needles, and will move each of the same away from the cam K and toward the cam K', the edge *z'* of the latter being brought against the adjacent hooked end of the needle, and drawing it back toward the position occupied by the needle B<sup>2</sup>, the needles thus transferred operating on the opposite side of the opening X and producing the rib or ribs desired.

It will be apparent that the number and width of the ribs in the fabric may be varied by altering the positions of the pins *m*, and that plates Y, or equivalent devices, may be arranged beneath the opposite side of the plate A, so that if necessary the needles can be transferred across the opening X at every movement of the cams.

By the alternate use of different-colored threads carried by the guide F transverse stripes of various colors may be made in the fabric. When, however, it is desired to form longitudinal colored stripes in the fabric the guide F is moved to the position shown in Fig. 2, and the shaft H is turned so that the ends of the guides I I' shall be over the opening X.

Threads *x'*, of different colors, are then passed through the eyes of the guides I I', and the shaft H is moved laterally until each guide I is brought to the position previously occupied by the adjacent guide I', each thread being thus carried over a number of the needles and formed into loops on the same. The shaft H, on the next movement of the cams, is moved back, so that the guides are carried to their

first positions, and these operations are continued until a striped fabric of the length desired is formed.

It will be apparent that the guide F may be used in connection, but alternately, with the guides I I', so as to form a fabric with colored stripes running alternately longitudinally and transversely.

Should the latch of a needle be closed when the cam K is brought into contact with the same the point *w* of the cam will be introduced below the said latch, the latter will be raised onto the inclined side *u* of the cam, Fig. 4, and will then be turned down toward the center of the needle as the same is drawn under the cam, the breaking of the latches and consequent tearing of the work being thus prevented.

In double-ended needles it has heretofore been customary to use two springs, secured at their inner ends by soldering in a slit in the needle, the outer end of each spring bearing against the inner end of one of the latches. This arrangement is objectionable, as the pressure on the outer ends of the springs forces the inner ends of the latter from the solder and elevates the same above the needles, so that they very frequently catch in and tear the fabric. This difficulty is obviated in the above-described needle by using a single spring-rod, *r*, as described, it being apparent that as the rod cannot be broken in the center no such accident as that referred to can take place.

Another difficulty in ordinary knitting-machines arises from the excessive friction on the needles when the hooked ends of the latter are brought against the projecting edge of a cam, these ends of the needles being so worn away or roughened as to cut the yarn when the latter is introduced into the same.

By the use of a rotating disk, N, at points where there is the greatest friction, as described, the wearing of the needles is prevented, and the amount of power required to drive the machine is much reduced.

By the use of the plates *n n* the knitted fabric is held in a central position in the opening X, so that the loops drawn back to either side by the needles will be of an equal size, and so that the movement of one needle will not tend to disturb the thread on the needles adjacent.

I claim as my invention and desire to secure by Letters Patent—

1. The combination, with the double-ended self-acting needles B, of two or more thread-guides, I I', each of which operates over a portion only of the needles, substantially as and for the purpose described.

2. The combination, with a knitting-machine in which double-ended needles are used, of a cam so constructed as to turn back the latches of the needles when brought into contact with the same, for the purpose specified.

3. A pattern-cylinder, O, and plate Y, or

their equivalents, combined with the needles B and their operating-cams, substantially as and for the purpose set forth. to this specification in the presence of two subscribing witnesses.

4. The plates *n n*, secured to the edges of the plate A between the grooves *a*, substantially as and for the purpose specified.

In testimony whereof I have signed my name

THOMAS LANGHAM.

Witnesses:

CHARLES E. FOSTER,  
JOHN WHITE.