

J. NELSON.
Knitting-Machine.

2 Sheets—Sheet 1.

No. 214.309.

Patented April 15, 1879.

Fig 1.

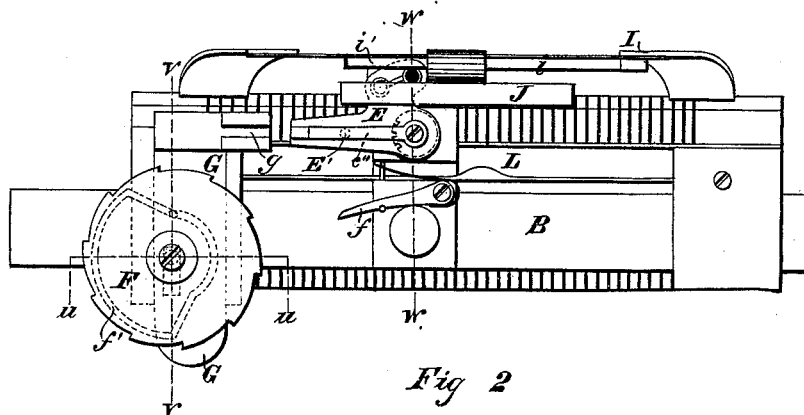


Fig 2

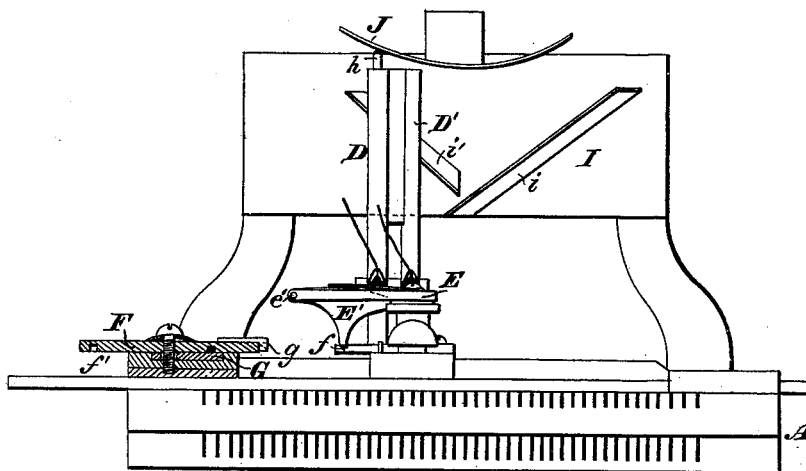
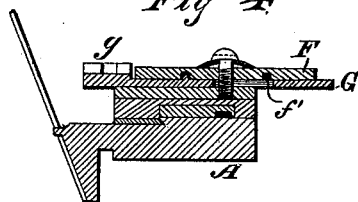


Fig A



WITNESSES

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By his Attorney,

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Fig 5

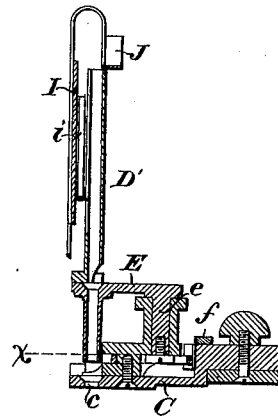


Fig 6.

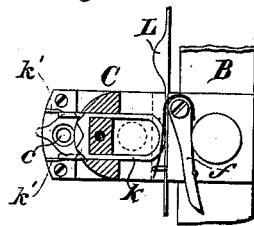


Fig 7

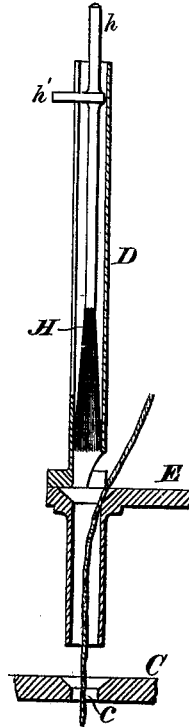


Fig 8

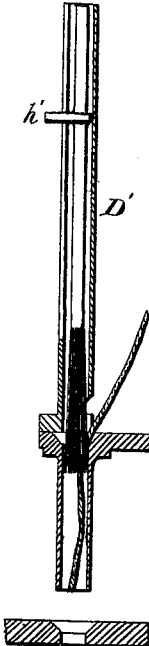


Fig 9.

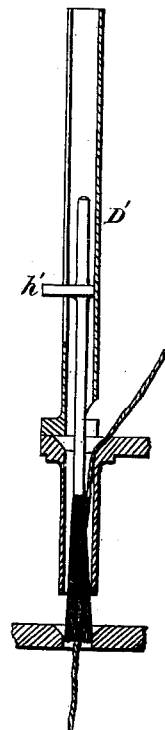
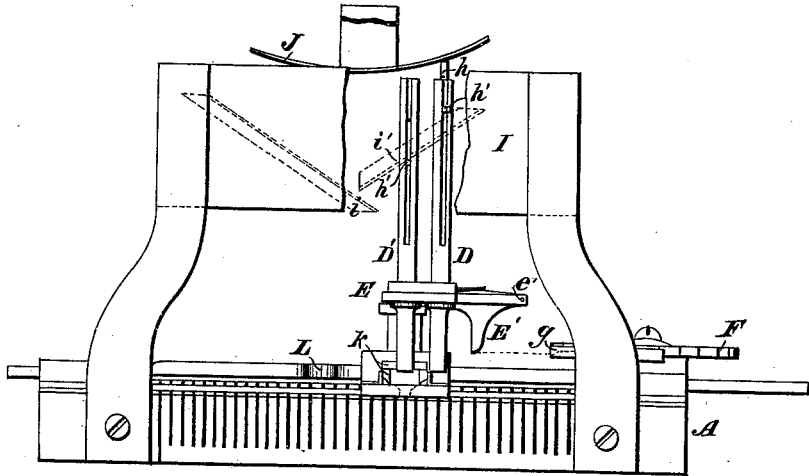


Fig 3



WITNESSES

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UNITED STATES PATENT OFFICE.

JOHN NELSON, OF ROCKFORD, ILL., ASSIGNOR OF ONE-THIRD OF HIS RIGHT
TO RALPH EMERSON AND WILLIAM A. TALCOTT, OF SAME PLACE.

IMPROVEMENT IN KNITTING-MACHINES.

Specification forming part of Letters Patent No. **214,309**, dated April 15, 1879; application filed
December 18, 1875.

To all whom it may concern:

Be it known that I, JOHN NELSON, of Rockford, in the county of Winnebago and State of Illinois, have invented certain new and useful Improvements in Knitting-Machines, of which the following is a specification.

The object of my invention is automatically to change at pleasure from a yarn of given size or color to a different one, which end I attain by combining with knitting mechanism a series of yarn-carriers, each carrying a yarn of different size or color, and automatically operated so as to supply the desired size or color to the needles at the proper time.

The subject-matter claimed hereinafter will be designated.

In the accompanying drawings, which show so much of a knitting-machine embodying all my improvements in the best way now known to me as is necessary to illustrate the subject-matter herein claimed, Figure 1 represents a plan view; Fig. 2, a back view, partly in section, on the line *u u* of Fig. 1; Fig. 3, a front view, with a portion of the framing broken away. Fig. 4 represents a vertical transverse section through the apparatus on the line *v v* of Fig. 1; Fig. 5, a vertical transverse section on the line *w w* of Fig. 1; Fig. 6, a plan view, partly in section, on the line *x* of Fig. 5. Figs. 7, 8, and 9 represent vertical sections through the yarn-carrier tubes and distributing-eyes, showing the respective positions of the parts when the yarn is passing freely through the carrier, when it is held fast therein, and when it is being fed through to the needles.

The mechanism is to be mounted on a stout frame, and driven by gearing of usual and well-known construction.

The needles reciprocate in suitable guides in a needle-bed, A, being actuated successively by a cam on a reciprocating cam-bar, B, as usual. A bracket, C, projecting from the cam-bar B, is provided with the usual distributing-eye *c*.

A series of yarn-carriers or carrier-tubes, D D', are mounted upon a swinging frame, E, oscillating intermittently on a pivot, *e*, on the bracket above mentioned. Two carrier-tubes only are shown in the drawings, but a greater number may be employed, if desired. I have,

in practice, found four a convenient number to be used.

The carrier-frame reciprocates with the cam-bar B, and carries a spring-pawl, *f*, which moves a ratchet-wheel, F, provided with a cam-groove, *f'*, on its under side. (Shown in dotted lines in Fig. 1.) A pin traversing said cam groove actuates a slide-bar, G, reciprocating transversely to the path of the cam-bar, and carrying a guide-slot, *g*, in which a pendent oscillating lever, E', on the oscillating carrier-frame E works to shift the carrier as required. The frequency of these changes will of course be varied to suit the requirements of the work. The pendent lever E' oscillates vertically on its pivot *e'* in the bracket-frame E, being ordinarily pressed down by a spring, *e''*, into one of the notches in the post of the bracket-frame E, thus positively locking the yarn-carriers to prevent their accidental shifting while at work until the required moment, and they are always thus positively locked, while the pendent lever is free from the slot or guideway *g*; but the bottom of this guideway is inclined, so that every time the pendent lever enters it it is unlocked from one of the notches in the post of the bracket-frame, but positively held by the guide-groove, and only moves laterally when the slide G is reciprocated by its cam.

The drawings show the ratchet-wheel and other mechanism so organized as to shift the yarn-carrier at every fifth reciprocation of the cam-bar.

I have shown and described a yarn-carrier as mounted on an oscillating frame, which form I prefer as the cheapest and best, as compared with other forms known to me.

The carrier-tubes D D' are preferably made of a tubular form, with an opening at the back just above the supporting-frame, through which they project.

A brush, H, secured on a handle, *h*, slides freely in the tube, and is actuated at proper intervals by a stud, *h'*, on the brush-handle, working against the cams *i i'*. (Shown in dotted lines in Fig. 3 on a gallows-frame, I, when the yarn is being fed to the tubes.) The brush of each tube, as it swings out of position, is restored to its normal atti-

tude of holding the yarn, as shown in Fig. 8, by passing under a cam, J, which, as will be seen in Fig. 3, is in a different but parallel vertical plane from that of the cams *i* *i'*.

A double-bladed knife or shear, K, movable on the bracket transversely to the line of motion of the cam-bar, works on each side of the distributing-eye, being thrown forward by a cam, L, and pushed back by the carrier-tubes as they change position, so as to shear past two stationary cutter-blades, K', and cut the arm.

The operation of the machine is as follows: We will suppose the machine to be knitting with yarn from the carrier-tube D, its brush being in the position shown in Fig. 7, to permit the yarn to pass freely through the tube to the distributing-eye in the plate or bracket C, over which it lies. When the pawl on the carrier-frame moves the wheel F and causes the slide G to move the tube D is swung away from the distributing-eye, and the tube D' is put in its place. The brush and yarn in this tube D' at the moment of swinging into position over the distributing-eye are in the attitude shown in Fig. 8. As the tubes change position they force back the shears, and lay the yarn of the tube moving out of position across the face of one shear-blade, and as the cam L is passed the shears are forced forward and the yarn is cut. As the tube D' swings into position over the distributing-eye its stud *h'* comes under the cam *i'*, which shoves it down from the position shown in Fig. 8 to that shown in Fig. 9, thus forcing the yarn down through the distributing-eye a moment before the shears cut the yarn of the tube D, so as to insure the engagement of one thread before the other is cut, and the knitting proceeds as before.

By the time the stud *h'* strikes the upper side of the cam *i* the yarn is well engaged. The brush is then withdrawn to the position shown in Fig. 7, and the yarn passes freely through the tube. As the tube D swings out of position its brush, being then in the position shown in Fig. 7, is pressed down by the cam J into the position shown in Fig. 8, in which position the yarn can be drawn through the tube as the knitting progresses, but is prevented from drawing out backward. These movements precede the cutting of the yarn, above described.

The brushes, by preference, are made of fine wire, though bristles or other equivalent material might be substituted. Experience has demonstrated this device to be of great practical importance, owing to the certainty with which it holds and feeds the yarn, notwithstanding variations in its size or material; and the want of such a device has heretofore been a great obstacle in the way of this method of manipulation.

The operations above described are repeated as often as it is desired to change the size or color of the yarn, and as by this method of operation I am enabled to substitute a heavier mate-

rial for a lighter one in working the heel of the stocking—for instance, instead of throwing in an extra yarn—the advantages of my improvements are obvious.

I am also enabled to knit stockings with stripes of uniform width, notwithstanding variations in the width of the stocking, as it is widened or narrowed to conform to the shape of the limb; and this I am enabled to do without carrying the yarn which ceases to be knit across one or more stripes outside of the fabric, but, on the contrary, give a smooth even finish to the goods.

The mechanism described is adapted to knit a flat fabric, the edges of which can afterward be united by stitching, but is adaptable to a rotary or circular machine for knitting a tubular fabric.

It is also obvious that some of my improvements may be used without the others in machines differing in construction from the one herein described.

I claim as my invention—

1. The combination of a series of alternating tubular yarn-carriers provided with reciprocating brushes and mechanism for operating the carriers and brushes, substantially as described, whereby one yarn may be substituted for another during the operation of knitting automatically and without interruption to the work.

2. The combination, substantially as hereinbefore set forth, with a reciprocating cam-bar, of a plate or bracket provided with a distributing-eye, through which the yarn passes to the needles, shifting yarn-carriers, which successively supply yarn to the needles, and a swinging intermittently-oscillating frame, all reciprocating with the cam-bar, as and for the purposes described.

3. The combination, substantially as hereinbefore set forth, of a plate provided with a distributing-eye, through which yarn passes to the needles, shifting-carriers adapted to successively supply yarn to the needles, and a cutter to sever the yarn as its carrier moves out of working position.

4. The combination, substantially as hereinbefore set forth, of shifting yarn-carriers adapted to successively supply the yarn to the needles, a cutter adapted to be opened by the carrier as it moves out of working position, and a cam adapted to close the cutter to sever the yarn.

5. The combination, substantially as hereinbefore set forth, of a needle-bed, a reciprocating cam-bar, shifting yarn-carriers reciprocating with the cam-bar, and shifting mechanism operated by the cam-bar.

6. The combination, substantially as hereinbefore set forth, of a reciprocating cam-bar, yarn-carriers mounted in a frame pivoted thereon and reciprocating therewith, and mechanism which positively and automatically locks the yarn-carrier frame in position.

7. The combination, substantially as hereinbefore set forth, of a traversing shifting yarn-

carrier frame, a positive automatic locking-latch, and mechanism which automatically releases the latch, holds the frame in position until the proper moment, shifts the yarn-carriers, and then allows the latch to escape and relock the yarn-carriers in their new positions.

8. A yarn clamp and feeder consisting of the combination of a carrier, and a brush reciprocating endwise in the carrier, and brush reciprocating mechanism, substantially as set forth.

9. The combination, substantially as hereinafore set forth, of a plate provided with the distributing-eye, the tubular yarn-carrier having an opening therein for the passage of the yarn, and a brush reciprocating from a point above the opening of the yarn-tube into the distributing-eye and brush reciprocating mechanism, whereby the end of the yarn always protrudes in advance of the brush.

10. The combination, substantially as hereinafore set forth, of a yarn-carrier, a reciprocating brush, and a cam, whereby the yarn is protruded from the carrier to be seized by the needles, and the brush then withdrawn to allow the yarn to pass freely through the carrier.

11. The combination, substantially as hereinafore set forth, of a yarn-carrier, a reciprocating brush, and a cam which forces down the brush to clamp the severed yarn and prevent its retraction.

12. The combination, substantially as hereinafore set forth, of shifting yarn-carriers, brushes reciprocating therein, a cutter, and two sets of cams arranged in different vertical planes, whereby the yarn is protruded and released by one cam as its carrier moves into action, and clamped by another cam as the carrier goes out of action and the yarn is severed.

13. The combination, substantially as set forth, of a cam-bar, the cam-wheel actuated thereby, the shifting-slide actuated by the cam-wheel, and the yarn-carrier shifting mechanism carried by the cam-bar, but controlled by the shifter-slide, for the purposes specified.

14. The combination, substantially as hereinafore set forth, of the needles, a cam-bar acting successively thereon, a plate having a distributing-eye mounted on the cam-bar, shifting yarn-carriers also mounted on said bar, mechanism actuated by the cam-bar for shifting the yarn-carrier, and cams acting upon the feed mechanism of the yarn-carrier, whereby the yarn automatically may be changed without interruption to the knitting, and a smooth fabric is produced.

In testimony whereof I have hereunto subscribed my name.

JOHN NELSON.

Witnesses:

WM. J. PEYTON,
WM. D. BALDWIN.