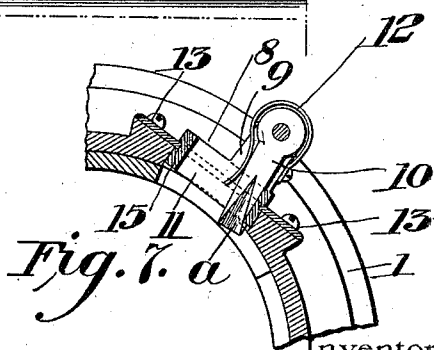
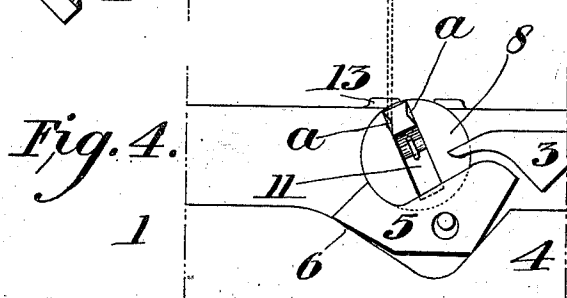
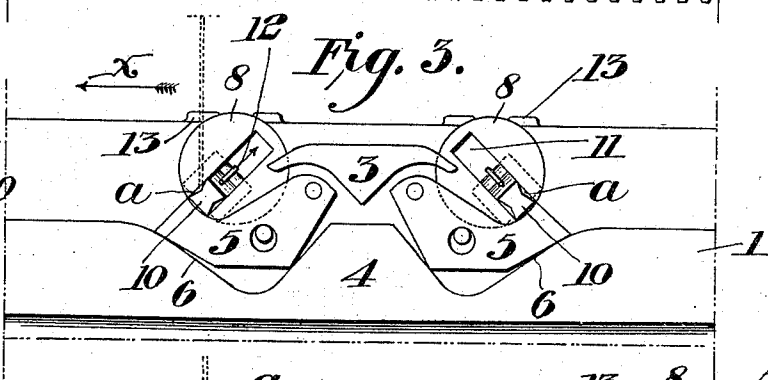
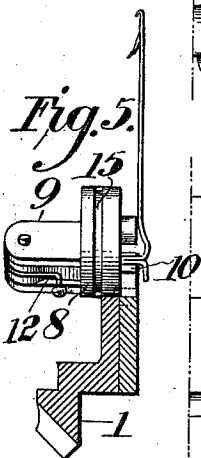
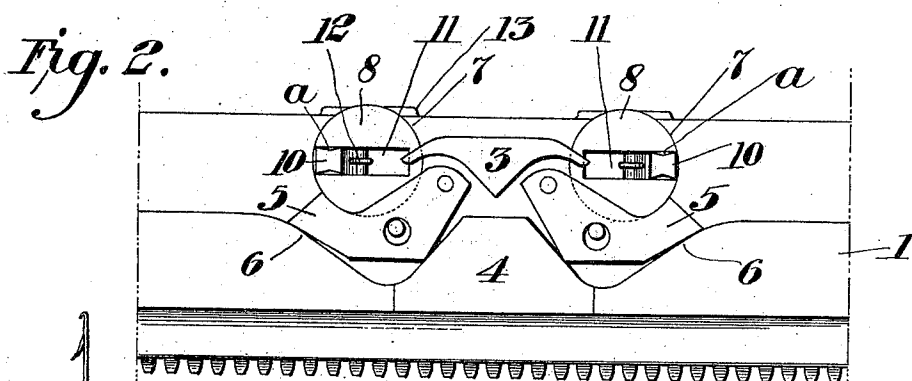
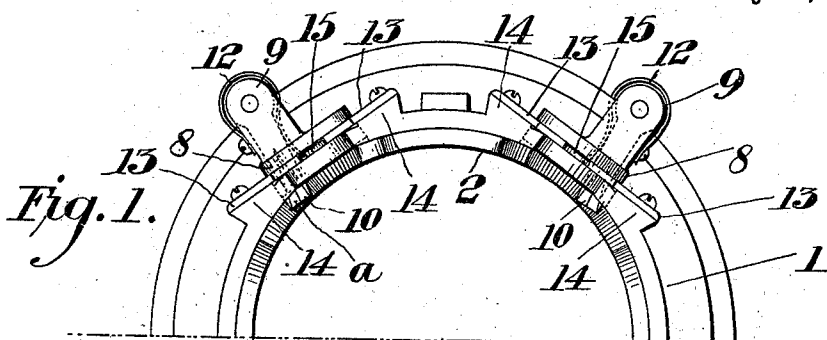


(No Model.)

J. L. BRANSON & S. S. COOK.
CIRCULAR KNITTING MACHINE.

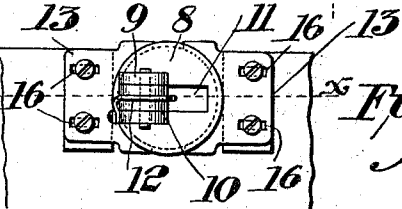
No. 519,170.

Patented May 1, 1894.



Witnesses:

Jesse B. Heller
Geo. S. Heller



Inventors:

James L. Branson,
Stephen S. Cook,
per John T. Molau
Attorney.

UNITED STATES PATENT OFFICE.

JAMES L. BRANSON AND STEPHEN S. COOK, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNORS TO THE BRANSON MACHINE COMPANY, OF SAME PLACE.

CIRCULAR-KNITTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 519,170, dated May 1, 1894.

Application filed October 7, 1893. Serial No. 487,418. (No model.)

To all whom it may concern:

Be it known that we, JAMES L. BRANSON and STEPHEN S. COOK, citizens of the United States, residing in the city and county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Circular-Knitting Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

This invention relates to knitting machines, particularly to the circular type used in the manufacture of stockings and other hosiery. The novel features embody devices, of simple and efficient construction, for directing certain needles into and out of operative position, relative to the knitting cams, during the fashioning operation, as, for example, in the knitting of the heel and toe parts of stockings.

Our object, primarily, is to provide a needle-controlling device which shall be adjustable in respect to the knitting cams, so as to perform the function of a needle-elevating cam to effect the narrowing operation, and, subsequently, that of a needle-depressing cam, to effect the widening operation. Preparatory to the knitting of tubular work, the device is or may be adjusted to an intermediate position wherein it lies above the normal path of the needles, so as not to interfere therewith; yet should a needle or needles be thrown into the track of the upper knitting cam, the device will tend to deflect such needle or needles above or below the nose of said cam, and thus incidentally perform the function of a guard-cam. As hereinafter set forth there are two needle-controlling devices—one disposed relatively to each end of the knitting cams—which devices are brought alternately into play during the reciprocation of the cam carrier.

The construction and operation of the said devices in that form that we consider to be most efficient and desirable, are illustrated in the annexed drawings, to which reference will now be had, as follows:

Figure 1 is a partial plan of the cam cylinder of a circular knitting machine in which our improvement is embodied. Fig. 2 is an

elevation of Fig. 1, developed, showing the needle-controlling devices in the intermediate positions which they occupy during tubular knitting. Fig. 3 is a similar view, showing said devices in the down or "narrowing" positions. Fig. 4 is a similar view showing one of said devices in the up or "widening" position. Fig. 5 is an end view of Fig. 3. Fig. 6 is a detail of the cam cylinder showing one of said devices and its adjuncts. Fig. 7 is a transverse section, as on the line $x-x$ of Fig. 6.

The numeral 1 designates the cam cylinder and 2 the knitting cams supported thereon, these cams comprising the upper and lower central cams, 3 and 4, respectively; the lateral wing cams 5, and the raising end cams 6. As these parts are of well-known construction and operation they require no special description herein. Circular openings 7 are cut in the wall of the cam-cylinder or carrier, at or adjacent to the respective ends of the knitting cams. Fitted to each of these openings, so as to be rotatable therein, is a diametrically-slotted head 8, provided, preferably, with exteriorly-projecting lugs 9, to which is pivoted one end of an arm, 10, the other or free end thereof projecting normally through and beyond the slot, 11, in the head. For a purpose hereinafter appearing the projecting end of the arm is notched or recessed on its upper and lower faces, as at a . The pivotal point of this arm is on one side of the axial line of the head, so that the free end projects through the adjacent end of the slot, but is moved into the latter when it is swung toward the opposite end thereof. A suitably-disposed spring, 12, maintains the arm yieldingly toward the near end of the slot, which spring in the present instance, comprises a piece of wire having one end secured to the outer edge of a lug 9, while its other or free end is curved around the pivoted end of the arm in a manner to press against the inner edge of the latter, as clearly seen in Fig. 7. In this case the head is illustrated as held rotatably in place by means of a couple of plates, 13, fastened to lugs 14 on the exterior of the cam cylinder, the inner edges of the plates being appropriately recessed to engage a circumferential

groove 15 in the head. The holes 16 through which pass the fastening screws are preferably elongated, so that the plates may be adjusted inwardly from time to time to compensate for wear, if desired; and so that said plates may be moved outwardly from engagement with the groove to permit the ready removal of the head from the cylinder, should occasion require it.

By the above described construction, it will be obvious that the head may be rotated, wholly or partially, to bring the projecting end of the arm to any position relative to the knitting cams, the parts being snugly fitted to insure sufficient friction to maintain the head in its positions of adjustment.

During the knitting of tubular work, the arms at the respective ends of the knitting cams, are disposed in the intermediate positions indicated in Fig. 2, so that during the revolution of the cam cylinder, said arms are quiescent, or out of action with the needles. The arms, when in this position, are in line with the ends of the upper cam, 3, and hence if a needle be accidentally thrown upward in the path of said cam, the projecting arm will abut yieldingly against the needle heel and tend to deflect it above or below the opposed end of the cam. The arms thus perform the functions of guard cams for the needles during tubular knitting.

Preparatory to proceeding with the narrowing operation in the formation of the heel or toe part of the stocking,—after the requisite number of needles (usually one-half) has been raised out of action—the heads are moved so as to adjust the notched ends of the arms into the positions indicated in Fig. 3, that is, to bear upon the adjacent outer ends of the wing cams, respectively. This done, the cam cylinder is reciprocated in the usual manner. During the initial stroke of the cylinder—assuming the movement to be in the direction indicated by the arrow x ,—the notched end of the leading arm abuts against the first needle-heel in its path, which end, with the needle engaged therewith, is thrust upward against the action of the spring 12. As the said end reaches the upper portion of the slot it swings into the latter, thereby releasing the needle heel above the nose of the upper knitting cam, or out of action. Immediately upon the escape of the needle therefrom, the arm is depressed by the action of its spring, which arm thereupon rides upon the heels of the succeeding needles until the knitting cams reach the open space at the end of the stroke, whereupon the arm, escaping the needle-heels, resumes its original or active position. In this stroke of the cams, the active needle-heels upon being actuated by the knitting cams, are discharged therefrom in the usual manner, the yielding action of the rearward arm upon the proximate wing cam permitting the needles to raise the latter sufficiently to escape therefrom. During the reverse stroke of the knitting cams, the said rearward arm,

becoming the leading one, acts similarly to the other arm upon the first needle-heel in its path, likewise raising that needle out of action and returning for a succeeding operation at the proper time. Hence, during the reciprocations of the cam cylinder, the notched ends of the arms are brought alternately into play, thereby elevating a predetermined number of needles to effect the requisite narrowing. Following this operation, the heads are moved to adjust the notched ends of the arms in the position indicated in Fig. 4, that is, to intersect the horizontal path or plane of the previously up-thrown needle-heels, whereupon the cam cylinder is reciprocated. In the first stroke, the notched end of the leading arm impinges against the first needle-heel in its path, which end, with the engaged needle is swung diagonally downward until the arm reaches the bottom of the slot into which it swings, thereby discharging the needle-heel into the path of the knitting cams. Upon the escape of the needle therefrom, the arm is raised by the action of the spring, which arm thereupon impinges against the under portions of the up-thrown needle-heels, remaining thereunder until it clears the series of needles, at the end of the stroke. At this stage said arm resumes its normal position. In the next or reverse stroke of the cam cylinder, the notched end of the other arm impinges against the first needle-heel in its path, depresses the same, and operates in all respects similarly to the arm described in the last preceding operation. In this way, during the succeeding reciprocations of the cam cylinder, the arms will act alternately upon the inactive needles, and move them individually into active position until the requisite widening has been accomplished. There will thus be formed a fashioned toe or heel pouch of a stocking.

To proceed with the knitting of the tubular foot or leg, the series of needles first up-thrown is pushed down into active position in the usual manner, and the heads turned to adjust the arms to the intermediate position above described.

We claim as our invention—

1. The combination with the cam carrier and its knitting cams, of an adjustable support mounted on said carrier beyond the nose of the upper knitting cam, and an independently movable needle-controlling device mounted on said support, the former having provisions whereby the needle-engaging portion of said device may be adjusted above or below the nose of said upper knitting cam to perform the function of a needle-raising or needle-depressing cam, as desired, substantially as described.

2. The combination with the cam carrier and its knitting cams, of a rotatable support on said carrier, and an independently-movable needle-controlling device operatively mounted on said support, the former having provisions whereby the said device may be ad-

justed to perform the functions of a needle-raising and needle-depressing cam, substantially as described.

3. The combination with the cam carrier and its knitting cams, of an adjustable support on said carrier, a vibratory needle-depressing and needle-elevating arm pivoted on said support, and means for maintaining said arm yieldingly in a normal position, substantially as described.

4. The combination with the cam carrier and its knitting cams, of a rotatable support on said carrier, a vibratory needle-depressing and needle-elevating arm pivoted on said support, and means for maintaining said arm yieldingly in a normal position, substantially as described.

5. The combination with the cam carrier and its cams, said carrier being provided with an opening in its wall, of a circular head rotatably fitted to said opening, and an independently-movable needle-controlling device mounted on said head, substantially as described.

6. The combination with the cam carrier and its cams, said carrier being provided with an opening in its wall, of a slotted head fitted to said opening, an arm pivoted to said head so as to project through said opening, and a spring acting upon the said arm, substantially as described.

7. The combination with the cam carrier and its cams, of the circumferentially grooved head, the plates fastened to the carrier and fitted to the groove in said head, and a needle-controlling cam mounted on said head, substantially as described.

8. The combination with the cam-carrier and its knitting cams, of rotatable supports at or adjacent to the respective ends of said

cams, and independently-movable needle-controlling arms mounted on said supports, the former having provisions whereby the said devices may be adjusted to perform the functions of needle-raising and needle-depressing cams, substantially as described.

9. The combination with the cam carrier and its knitting cams, of a needle-controlling cam mounted in advance of the end of the upper knitting cam, and provisions whereby said needle-controlling cam may be adjusted to perform the respective functions of a needle-raising, needle-depressing and needle-guard cam, substantially as described.

10. The combination, with the cam carrier and its cams, of a needle-controlling cam mounted in advance of the leading end of the upper knitting cam, and provisions whereby said needle-controlling cam may be adjusted to perform the respective functions of a needle-raising and needle-depressing cam, substantially as described.

11. The combination, with the cam carrier and its knitting cams, of a vibratory needle-controlling arm mounted in advance of the leading end of the upper knitting cam, and provisions whereby the free or needle-engaging portion of said arm may be adjusted either below or above the end of said upper cam, to perform the function of a needle-raising or a needle-depressing cam, as desired, substantially as described.

In testimony whereof we have hereunto affixed our signatures in the presence of two subscribing witnesses.

JAMES L. BRANSON.
STEPHEN S. COOK.

Witnesses:

JOHN R. NOLAN,
JESSE B. HELLER.