

(No Model.)

3 Sheets—Sheet 1.

E. C. BREAITHWAITE & J. W. HEPWORTH.
SELF ACTING FASHIONING DEVICE FOR CIRCULAR KNITTING MACHINES.

No. 521,098.

Patented June 5, 1894.

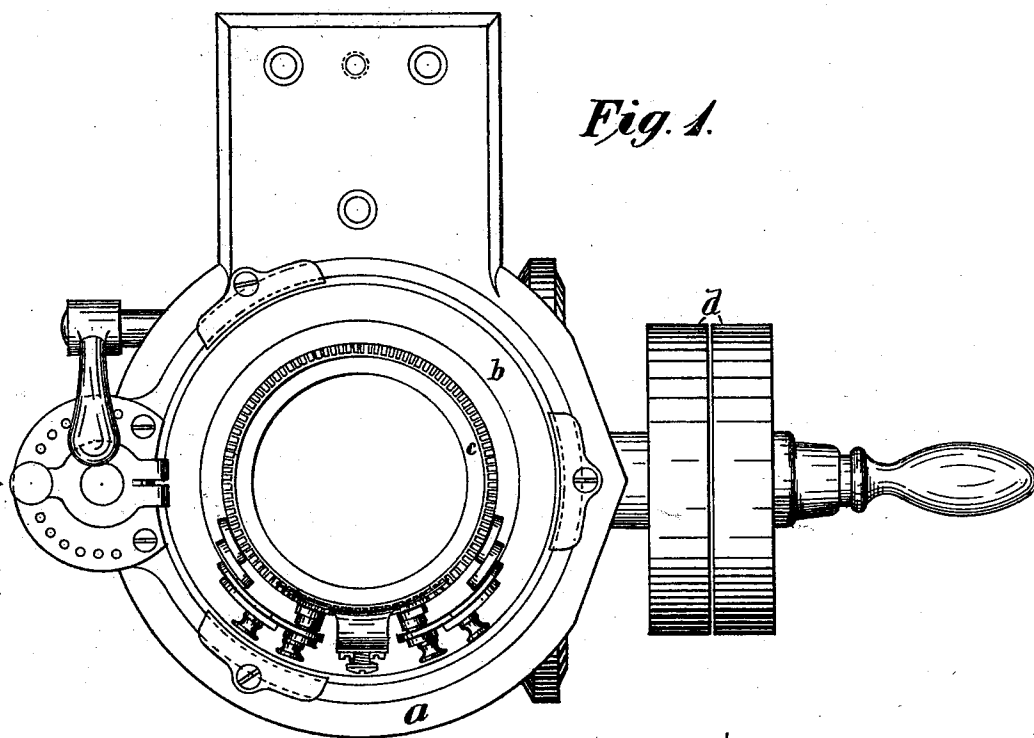


Fig. 1.

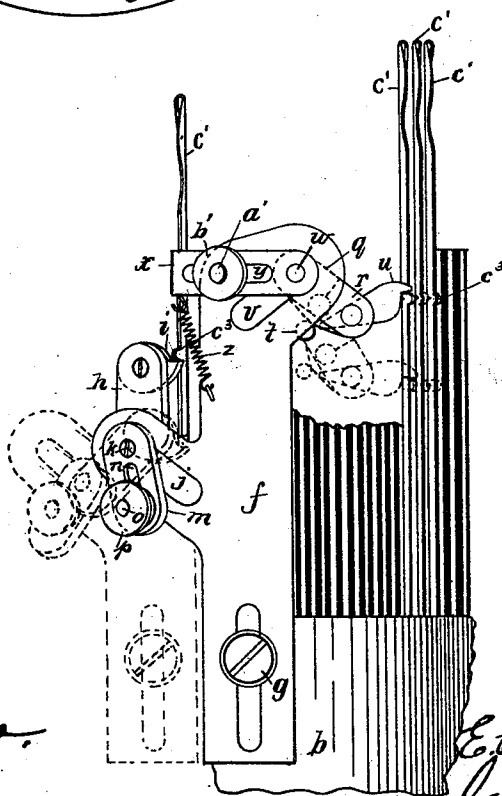


Fig. 3.

WITNESSES
J. E. Shaw.
William Pearson

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(No Model.)

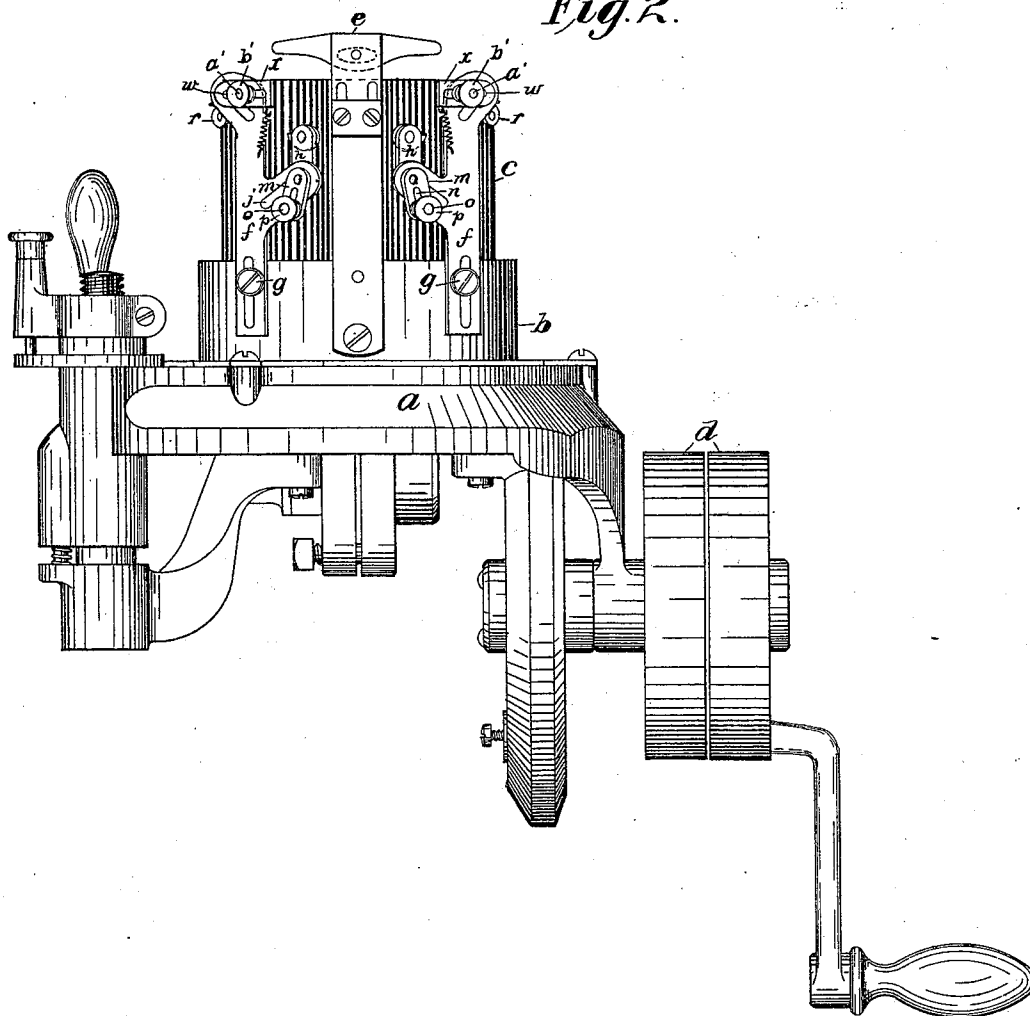
3 Sheets—Sheet 2.

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Fig. 2.



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(No Model.)

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Fig. 6.

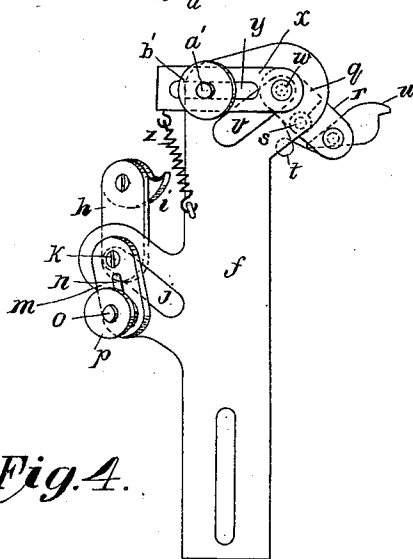
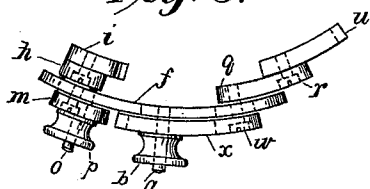


Fig. 4.

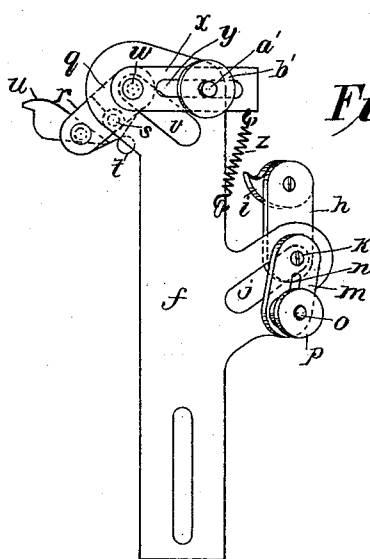
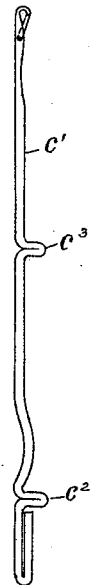


Fig. 5.

Fig. 7.



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UNITED STATES PATENT OFFICE.

ERNEST C. BREAITHWAITE AND JOHN W. HEPWORTH, OF PHILADELPHIA,
PENNSYLVANIA.

SELF-ACTING FASHIONING DEVICE FOR CIRCULAR-KNITTING MACHINES.

SPECIFICATION forming part of Letters Patent No. 521,098, dated June 5, 1894.

Application filed October 15, 1892. Serial No. 449,029. (No model.)

To all whom it may concern:

Be it known that we, ERNEST C. BREAITHWAITE and JOHN W. HEPWORTH, both citizens of the United States, residing in the city of Philadelphia, State of Pennsylvania, have invented a new and useful Improvement in Self-Acting Fashioning Devices for Circular-Knitting Machines, of which invention the following is a specification.

Our invention relates to the well known class of knitting machines described in Patents Nos. 333,102 and 435,378.

The said invention consists of self-acting devices for raising the needles into inoperative position, as required for the purpose of narrowing the knitted fabric, in knitting the heel or toe of a stocking and for lowering the needles into operative position for widening the same preparatory to knitting the cylindrical portions of a stocking.

In the annexed drawings, Figure 1 represents a plan and Fig. 2 a front elevation of a circular knitting machine embodying our invention. Fig. 3 is an elevation of a portion of the cam and needle cylinders with needles, showing our self-acting raising and lowering devices in two positions by full and dotted lines, for the purpose of illustrating the action of the same in raising and in lowering the needles. Figs. 4 and 5 are front face elevations of our self-acting raising and lowering devices, respectively right and left hand, and Fig. 6 is a plan of the right hand devices. Fig. 7 is an elevation of a needle provided with a lower and an upper butt.

Similar letters of reference denote similar parts in the several figures.

a represents the bed plate of the knitting machine; *b* the cam cylinder; *c* the needle cylinder; *d* fast and loose pulleys by which power is thrown on and off; and *e* the yarn guide; all these parts are in the usual form.

f, Figs. 4 and 5, is a plate or bracket forming the foundation for the several working parts of our self-acting raising and lowering devices. The bracket *f* is rigidly and adjustably attached by means of a thumb-screw *g*, Fig. 2, or its equivalent, to the cam-cylinder *b*.

h, Figs. 4 and 5 is a lever provided with a

finger *i*, the latter being adjustably fastened to, or made integral with lever *h*.

j is a slot in bracket *f*.

k is a pin projecting from lever *h* through slot *j* to lever *m* which is provided with a slot *n*.

o is a pin projecting from bracket *f* through slot *n*, said pin *o* forming a bearing for the lever *m*.

p is a thumb-screw working on pin *o* whereby the levers *h* and *m* are adjustably held back out of operative position, as desired.

The parts so far described constitute our device for raising *seriatim* the needles at one end of the series of operative needles, up into inoperative position; it being intended to be understood that two such devices, one adapted to the right hand and the other to the left hand side of the knitting machine, are used for said purpose as shown in Fig. 1.

Our self-acting device for lowering the inoperative needles into operative position consists of a lever (see Figs. 4 and 5) made in two parts *q* and *r*, united by a hinge joint *s* and flexibly held in line by a spring *t*. This lever is provided with a finger *u* which is rigidly and adjustably attached to or made in one piece with said part *r*. *v* is a slot in bracket *f*. *w* is a pin projecting from said part *q* through slot *v* to lever *x*, which is provided with a slot *y*. *z* is a spring one end of which is attached directly to bracket *f* and the other end to the slotted lever *x*. *a'* is a pin projecting from bracket *f* through slot *y*. *b'* is a thumb-screw for securing the levers *q*, *r* and *x* when put into inoperative position. These parts constitute our lowering device; it being intended to be understood that two such devices, one adapted to the right hand and the other to the left hand side of the knitting machine, as shown in Fig. 1, are used.

In action, both the raising and the lowering devices have a compound turning and sliding movement controlled by their respective pins and slots, as shown by the full and dotted lines in Fig. 3.

c', Fig. 7 represents a needle which we provide with a lower butt *c²* for traversing the cams of the cam-cylinder as usual and an upper butt *c³* for our special purposes.

The needle c' is made a little longer in the shank than the ordinary needle, in order that the upper butt may be located above the top of the cam-cylinder without interfering with the ordinary or lower butt c^2 and the needle cylinder is correspondingly lengthened.

Referring to Fig. 2, the yarn guide e occupies what is herein regarded as the front of the machine; the operator being supposed to hold a position facing this front; the cams of the cam-cylinder hold positions respectively at and to the right and left of the yarn guide e ; the word "right" as herein used means in a direction to the right of the operator, and "left," to the left of the operator.

Upon the completion of the stocking leg, and in order to prepare the knitting machine for knitting the heel, the circular or rotary movement of the cam-cylinder is stopped in the position shown in Fig. 2 and the needles on the rear side of the cylinder c , to wit:—one-half of the whole number of needles, are then raised up clear of the needle cams, or, in other words into inoperative position. The other half of the needles are left down in operative position. The cam-cylinder is then turned half way round and then given a reciprocating motion and our right and left hand lifting devices are brought into operation for gradually narrowing the knitted fabric; the finger i of the right hand lifting device of Fig. 2 on the forward movement of the cylinder, that is to say, on the movement of the front of the cylinder or side facing the operator from left to right, raising into inoperative position the needle at the left hand extremity of the series of operative needles and the finger i of the left hand lifting device on the reverse movement of the cylinder raising into inoperative position the needle at the right hand extremity of the series of operative needles. The dotted lines to the left in Fig. 3 show the finger of the right hand lifting device ready to engage a needle butt c^3 ; as the bracket f advances along with the cylinder to which it is attached, the finger i in consequence of the friction or force exerted upon it by its contact with the needle butt, gradually rises until it occupies the position shown by full lines to the left in Fig. 3, the needle being carried up with it; and (the bracket still advancing) said finger raises the needles high enough to let the finger pass under the butt of the needle; after which said finger drops by gravity until its rounded under side rests on the upper side of butt c^3 of the needle next in the series of operative needles and (bracket f still advancing) then travels along on the several butts c^3 until it has passed the last needle in the series of operative needles, when it drops into the position shown by the dotted lines to the left in Fig. 3. When the motion of the cam-cylinder is reversed the finger i again rises high enough to pass over the tops of the needle butts c^3 , and when it has passed the last of these to the left, it again drops into the position shown

by the dotted lines to the left in Fig. 3, and is then ready to pick up, on the forward movement, the next needle.

It is to be understood that the right and left hand lifting devices act alternately, the right hand device on the forward movement raising the needle occupying the extreme left, and the left hand device, on the reverse movement, raising the needle occupying the extreme right in the series of operative needles; also, that the actions of the left hand lifting device are similar to the above described actions of the right hand lifting device; and also, that these lifting actions are continued until enough of the operative needles have been raised up into inoperative position to effect the required narrowing of the knitted fabric.

The operation of our lowering devices is as follows:—On the forward movement of the cam-cylinder, the finger u of the right hand lowering device strikes the upper side of the upper butt c^3 of the needle occupying the extreme right of the inoperative needles, as indicated by the full lines at the right in Fig. 3, and lowers this needle to the extent indicated by the dotted lines at the right in Fig. 3, or, in other words, the last needle raised by the raising device in moving from left to right is usually the first needle lowered by the lowering device moving from left to right, in order that the widening may begin where the narrowing left off. As the bracket f advances along with the cam-cylinder, the rounded lower portion of finger u comes in contact with the upper side of the last named butt, the spring controlled hinge-joint s , together with the self-adjusting connections of the slotted levers q , r and x giving enough flexibility to said finger to enable it to ride up easily on top of said butt and thus release itself; whereupon spring z draws said finger upward and (the bracket still advancing) causes it to strike the under side of the upper butt c^3 of the next needle; finger u then moves along in contact with the lower side of the butts c^3 of the remaining inoperative needles, the spring t bringing finger u up into its normal position as soon as it has passed the last of the inoperative needles. When the movement of the cam-cylinder is reversed, the rounded lower portion of the left hand finger u comes in contact with the upper butt c^3 of the needle occupying the extreme left of the series of inoperative needles and raises it as just described, the hinge-joint s enabling finger u to easily pass back again under the butts of the group of inoperative needles on that side and (the bracket f still moving) pass under the upper butts c^3 of all the inoperative needles and upon passing the last of them assume, through the action of spring t , its normal position. It is then ready to lower the next needle as it again advances on the forward movement, when the above described operations are repeated.

It is to be understood that the right and

left hand lowering devices act alternately, the right hand device in the forward movement acting on the needle occupying the extreme right and the left hand device in the reverse movement acting on the needle occupying the extreme left in the series of inoperative needles; also, that the actions of the left hand lowering device are similar to the above described actions of the right hand lowering device, and also, that these lowering actions are continued until all or any required less number of the inoperative needles have been lowered into operative position.

It will be seen (first) that our raising and lowering devices are not hidden by the cam-cylinder as in previously existing machines, but are raised up into view so that in case any portion of them work improperly, it can be readily seen and adjusted without taking the machine apart; (second) that in cases where the raising and lowering levers are arranged to turn on fixed centers, the needles are raised or lowered by them to a certain extent and the work then finished by fixed auxiliary cams; whereas our raising and lowering devices being provided with variable self-adjusting bearings are of themselves capable of raising and lowering the needles; (third) that when the raising and lowering devices work on fixed centers a little wear on their free ends spoils their adjustment and necessitates their removal, but when these devices have self-adjusting bearings like ours, wear on the levers does not affect their working.

Instead of employing a single bracket for the raising and the lowering devices, the rais-

ing device may be attached to one bracket and the lowering device to a separate bracket if desired.

We claim—

1. The self-acting needle raising device consisting of a bracket *f* provided with a slot *j* in combination with the lever *h* provided with the finger *i*, the pin *k*, the lever *m* provided with a slot *n* and the pin *o*, substantially as set forth.

2. The self-acting needle-raising device consisting of a bracket *f* provided with a slot *j* in combination with the lever *h* provided with the finger *i*, the pin *k*, the lever *m* provided with the slot *n*, the pin *o* and thumb-screw *p*, substantially as set forth.

3. The self-acting needle lowering device consisting of a bracket *f*, provided with a slot *v* in combination with a lever made in two parts *q* and *r* united by a spring controlled hinge-joint *s*, pin *w*, lever *x* provided with a slot *y*, a spring *z* and a pin *a'*, substantially as set forth.

4. The self-acting needle lowering device, consisting of a bracket *f* provided with a slot *v* in combination with a lever made in two parts *q* and *r* united by a spring controlled hinge-joint *s*, pin *w*, lever *x* provided with a slot *y*, spring *z*, pin *a'* and a thumb-screw *b'*, substantially as set forth.

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Witnesses:

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