

(No Model.)

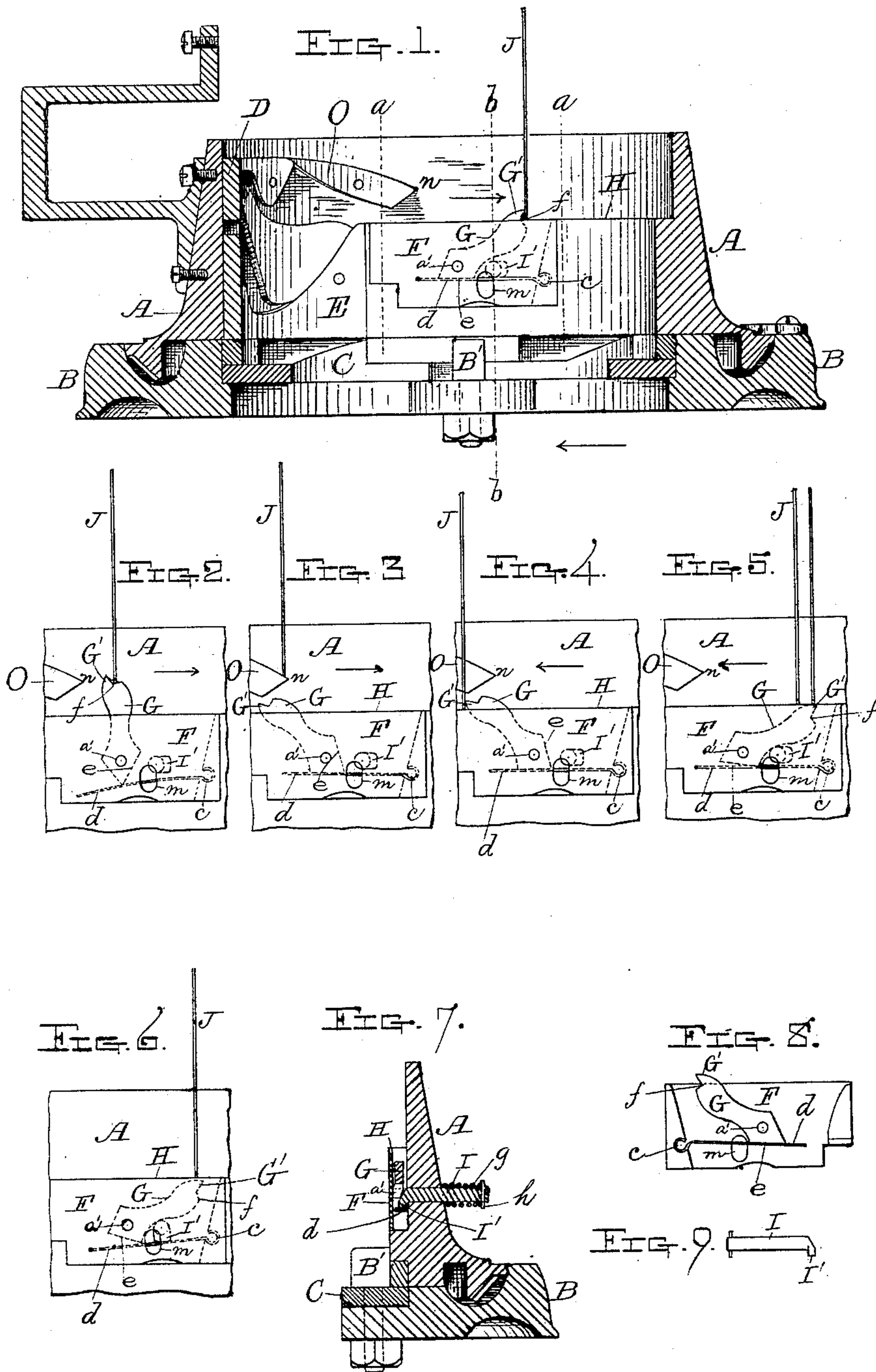
2 Sheets—Sheet 1.

G. C. CONVERSE.

CIRCULAR KNITTING MACHINE.

No. 339,046.

Patented Mar. 30, 1886.



Witnesses;

Thos. H. Dodge.
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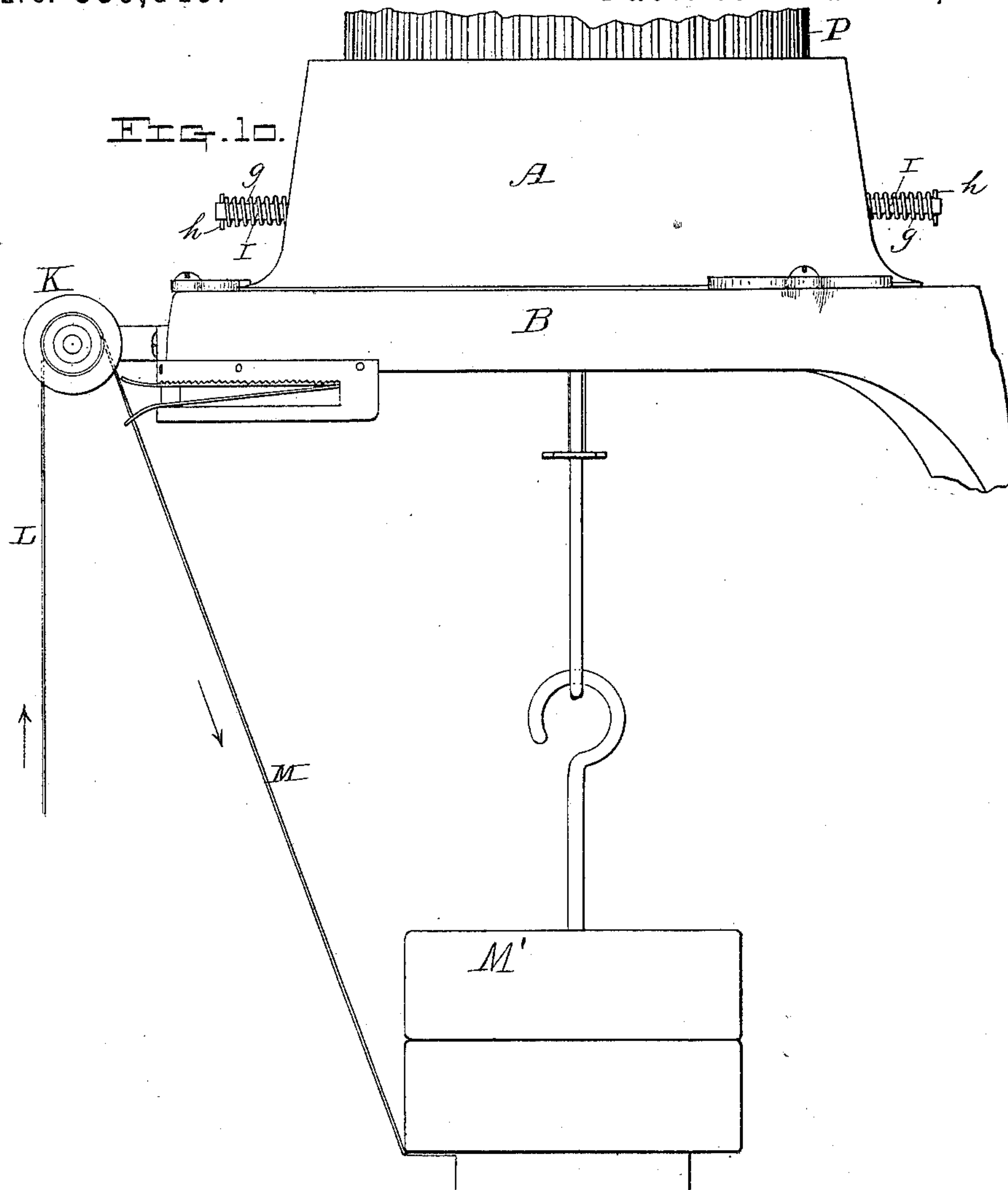
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UNITED STATES PATENT OFFICE.

GEORGE C. CONVERSE, OF BROOKFIELD, MASSACHUSETTS, ASSIGNOR, BY
MESNE ASSIGNMENTS, TO LUCY CONVERSE, OF SAME PLACE.

CIRCULAR-KNITTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 339,046, dated March 30, 1886.

Application filed May 29, 1885. Serial No. 167,112. (No model.)

To all whom it may concern:

Be it known that I, GEORGE C. CONVERSE, of Brookfield, in the county of Worcester and Commonwealth of Massachusetts, have invented certain new and useful Improvements in Circular-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 the letters of reference marked thereon, forming a part of this specification, and in which—

Figure 1 represents a vertical central section through the rotating cylinder of a circular-knitting machine and a portion of the stationary base. Fig. 2 represents a section of part shown in Fig. 1 between the lines *a a*, when the shell or cam-cylinder has moved forward from the position shown in Fig. 1 in the direction of the arrow, same figure, as will be hereinafter more fully described. Fig. 3 represents the parts shown in Fig. 2, when the cylinder has moved a little farther in the direction of the arrow. Figs. 4 and 5 represent the same parts shown in Figs. 2 and 3, when the cylinder has been reversed and moved in the opposite direction, as will be hereinafter described. Fig. 6 represents a portion of the parts shown in Fig. 5, to illustrate more fully my improvements, as will be hereinafter more fully described. Fig. 7 represents a vertical section on line *b b*, Fig. 1, when the spring-depressing cam *I'* is turned down, as will be hereinafter described. Figs. 8 and 9 represent side views of detached parts, as will be hereinafter more fully described. Fig. 10 represents a side view of the movable outer cylinder and a portion of the stationary needle-cylinder, together with a portion of the stationary base, work-tension devices, &c., as will be hereinafter more fully described.

My invention consists in certain special improvements in circular-knitting machines, as will be hereinafter fully described, and as pointed out in the claims.

It may be stated briefly, before entering upon a detailed description, that my present invention relates to automatic needle-lifting devices or mechanisms designed especially for narrowing in knitting heel and toe work.

As my improvements apply to only a cer-

tain part of a knitting-machine, and as the same are shown applied to a circular-knitting machine patented to James L. Branson, June 18, 1872, March 31, 1874, May 22, 1877, and May 17, 1881, it will not be necessary to enter into a description of the knitting-machine, further than to show the application and mode of operation of my particular improvements.

In the drawings, A represents the rotating cylinder which carries the needle-operating cams, and B the base upon which it rests and turns in the usual manner.

C is the ledge or regulating-ring upon which the cylinder containing the needles rests, a strong stationary dog, *B'*, entering a slot in the bottom of the needle-cylinder when placed in rotating cylinder A.

D and E represent a part of the needle-operating cams, which operate as described in the said Branson patents.

G is a needle-lifter, pivoted at *a'* to the outer side of a curved plate, F, and to which curved plate F is fastened at *c* a spring, *d*, the free end of which spring presses up against the flat bottom *e* of lifting-piece G, as fully indicated in the drawings.

The upper part of lifter G is made with a notch, *f*, and a finger, *G'*, the latter being always above the lower needle way or path, H, when the spring *d* is in the position shown in Figs. 1, 3, 4, and 8.

A cam-piece, O, is attached upon the inside of rotating cylinder A, in such a manner that as the cylinder is rotated the point *n* of cam-piece O passes under the heel of a needle, after it has been raised by needle-lifter G, and just after it leaves the finger *G'*, and the continued rotation of the cylinder A causes the needle to traverse the upper inclined surface of cam-piece O, thereby gradually raising the needle as cylinder A revolves, until it reaches the upper needle-path, where it is retained out of work until the narrowing is completed, by any suitable friction device—in this (the Branson) machine a spiral spring arranged in a circular groove extending entirely around the needle-cylinder, performing in a satisfactory manner that function. The point *n* of cam O extends out far enough beyond the lower part of the cam O to allow the finger *G'* of

needle-lifter G to fall down into the position shown in Fig. 3 without coming in contact with said cam after it has raised the base of the needle high enough to allow point *n* to pass under the same.

In the moving cylinder A is fitted in suitable bearings a spindle, I, having a cam, I', upon its inner end to work over spring *d*, while upon its outer end is arranged a spiral spring, *g*, one end of which presses against a pin, *h*, and the other end against the outer side of cylinder A. (See Figs. 7 and 10 of the drawings.)

When cam I' is turned down, as shown in Figs. 6 and 7, spring *d* is depressed, thereby allowing the finger end G' of needle-lifter G to drop below the needle-path H, so that the base or heels of the needles J will not be acted upon as the needle-lifter is carried around with the cylinder A.

Plate F is so fitted in a recess in the inner curved side of cylinder A that it can be slipped up and taken out at pleasure, spindle I and cam I' being first drawn out through the oblong hole *m* in piece or plate F, which is but the work of an instant, pin *h* and spring *d* being removed.

The ends of plate F are made beveling or wedge-shaped on their inner sides to fit corresponding grooves formed in the sides of the metal of the outer cylinder, by which construction plate F is held securely in position while the cylinder rotates, and yet, as above described, said plate can be raised up and removed, when desired, for repairing and replacing the spring or the needle-lifting finger G.

Parts F, G, and I are represented in Figs. 8 and 9 detached from cylinder A for the purpose of illustrating their construction more fully. The parts are shown in Fig. 8 from an opposite point of view from what they are seen in Fig. 1.

In Fig. 10 the needle-cylinder P is shown broken off at the top, and the needle-cylinder is left out in all the other figures, for the purpose of exposing to view more fully the parts relating to my particular improvements.

Operation: When it is desired to knit the leg of a stocking, spindles I are turned so as to depress cams I' and springs *d*, thereby allowing the needle-lifting pieces on each side to fall by gravity below the path or way H of the needles, as indicated in Fig. 6 of the drawings. After the leg has been knit and it is desired to knit the heel, the usual number of needles are raised out of work, spindles I and attached cams I' are turned so as to allow springs *d* to act on the bottoms of lifters G, one being arranged on each side of the machine, as before stated, thereby raising the fingers G' of lifters G above the path of the needles when not held down by needles, the two lifters G being made right and left, so that when both are turned upon their pivots into positions to operate alternately in lifting the

needles one points to the right, as shown in Fig. 1 of the drawings, and one to the left.

Referring now to Fig. 1, the parts are there shown in the positions they will occupy in relation to each other after the cylinder has been revolved to the left, so as to bring all the needles which are in operation to the right of the lifter G, (shown in that figure,) and the motion reversed, as indicated by the arrow, thereby bringing the needle J, (shown therein,) which is supposed to be the first needle on the left-hand end of the row of needles which are in operation, into position to be caught by finger G' of lifter G, and lifted automatically to a point higher than the point *m* of cam O, which operation is effected by means of the rotation of the cylinder to the right, such rotation bringing the lifter G and the needle which has been caught thereby successively into the positions shown in Figs. 2 and 3. As soon as the lifter is turned beyond the center of gravity it falls, partly by gravity and partly by the action of the spring *d*, into the position shown in Fig. 3, and is carried by the rotation of the cylinder under and beyond all the needles, spring *d* yielding to allow the end of the lifter to fall below the path H of the needles. The cylinder is rotated in this direction until all of the needles in operation have passed over the lifter on the opposite side of the machine, which points toward the left, when the motion is reversed and the first needle on the right-hand end of the row of needles in operation is lifted by such lifter in like manner as the first needle on the left-hand end was lifted, as before described, the cylinder being moved in the direction indicated by the arrow, Fig. 4.

The needle indicated in Fig. 4 is the first needle on the right-hand end of the row of needles in operation against which the finger G' of lifter G strikes, thereby throwing the lifter over upon its pivot, and pressing it down below the path of the needles, as shown in Fig. 5, in which position it is retained by the needles passing over it until the last needle on the left-hand end of the row (indicated by needle J, Fig. 5) has passed over, when it springs up, as shown in Fig. 1, into position to act upon the next left-hand needle of the series, and the operation is repeated until the desired number of needles on each side have been raised out of work and the narrowing completed, after which, for widening the fabric, the needles are pushed down into work by the operator in the usual manner.

It will be observed that the backs of fingers G' project out and are rounded off in such form that two needles will always be in such relative position, when the lifters are passing under the needles with their finger-backs up, as indicated in Figs. 5, 6, and 8, as to keep the points of the fingers always depressed below the lower needle-path, H. It will also be observed that the outer under edges of the lifters also project out and are rounded off in

a similar manner, so that two needles will also be in position to press the ends of fingers G' below the lower needle-path, H, when the lifters are being moved under the needles when their backs are turned down, as indicated in Fig. 3. This being the case, there is no liability of the lifter-fingers catching against the shanks of the needles prematurely, thus rendering it impossible for either of the lifters to lift a needle until such lifter has been moved out from under the needles, and then it will only lift the right needle. By my invention, too, all the needles except the one raised remain resting on the lower needle-path, H, each time the lifters are carried under the needles, either to the right or left, and there is therefore no necessity of changing the positions of the needles to bring their shanks upon the lower needle-path, H, after the lifters pass under the same before the reverse movement takes place.

It will be understood that at each extreme motion of the cam-cylinder, either to right or left, one of the lifters is turned over in the operation of raising a needle with its finger-back down, and the other, which had been previously turned over in the same manner, is struck and turned back into its normal position, and the fingers of both are immediately depressed below needle-path H, and pass under the needles without raising them, as herein explained.

When only about one-half the needles are raised out of work in knitting the heel and toe, it is necessary, first, or until five or six additional needles have been raised, to move the lifter after it has raised a needle and been turned over around a little more than an entire circle, consequently it passes back under a few of the needles, following the one that it raised before the reverse movement takes place, since there is not room enough in the space left by raising one-half the needles to permit both lifters to work therein until, as before indicated, five or six additional needles have been raised by the narrowing operation; but the lifter in this case cannot catch and raise a needle in this operation, and which fact renders my invention of still greater practical importance and value.

In all attempts prior to my invention, so far as I am aware, the lifters have not been so

constructed and arranged as to leave the needles all resting on the lower needle-path, as hereinbefore explained, but, on the contrary, the points of the lifters during the narrowing operation project at some distance above the lower needle-path, thereby raising all the needles some distance above said path, thus rendering it necessary to push the needles down after the lifters have passed under the same.

Having described one good practical way of applying my invention to practical use, I do not wish to limit myself to the particular mechanism described, since the invention may be carried out by different equivalent mechanisms and applied to the different knitting-machines in use without departing from the principle of my invention.

Those skilled in the art to which my invention relates will readily appreciate the great practical value of my said improvements, and especially in the saving of time in knitting and the greater accuracy of the work.

Having described my improvements in knitting-machines, what I claim therein as new and of my invention, and desire to secure by Letters Patent, is—

1. The combination, with a needle-cylinder for supporting and guiding the needles, a series of knitting-needles, a cam-cylinder equipped with needle-operating cams, and cam O, of an automatic needle-lifting mechanism consisting of spring *d* and hinged needle-lifter, G, provided with finger G', substantially as described.

2. The combination, with cam-cylinder A, needles and needle-cylinder of a circular knitting-machine, provided with needle-lifters G G, of springs *d d*, spindles I I, and cams I' I', substantially as and for the purposes set forth.

3. The combination, with the cam-cylinder, needle-cylinder, and needles in a circular-knitting machine, of springs *d d* and lifters G G, having their outer under edges projecting out and rounded off, and also provided with fingers G' G', the backs of which project out and are rounded off, all for operation with the needles, substantially as and for the purposes described.

GEORGE C. CONVERSE.

Witnesses:

THOS. H. DODGE,
CHAS. D. GAY.