

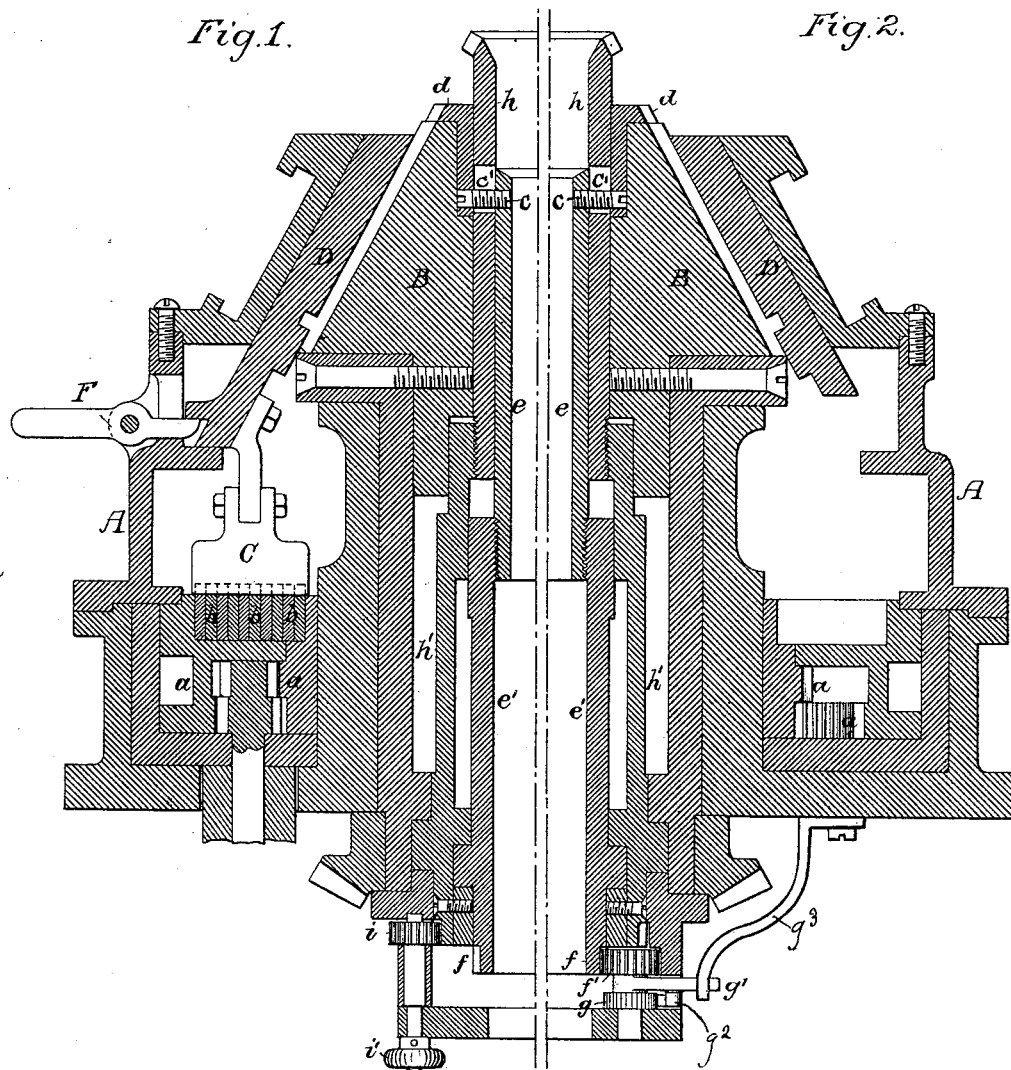
(No Model.)

3 Sheets—Sheet 1.

S. HENSHALL.
CIRCULAR KNITTING MACHINE.

No. 386,820.

Patented July 31, 1888.



Witnesses:
William D. Bonner.
John E. Parker

Inventor:
Samuel Henshall
by his Attorneys
Howson & Sons

(No Model.)

3 Sheets—Sheet 2.

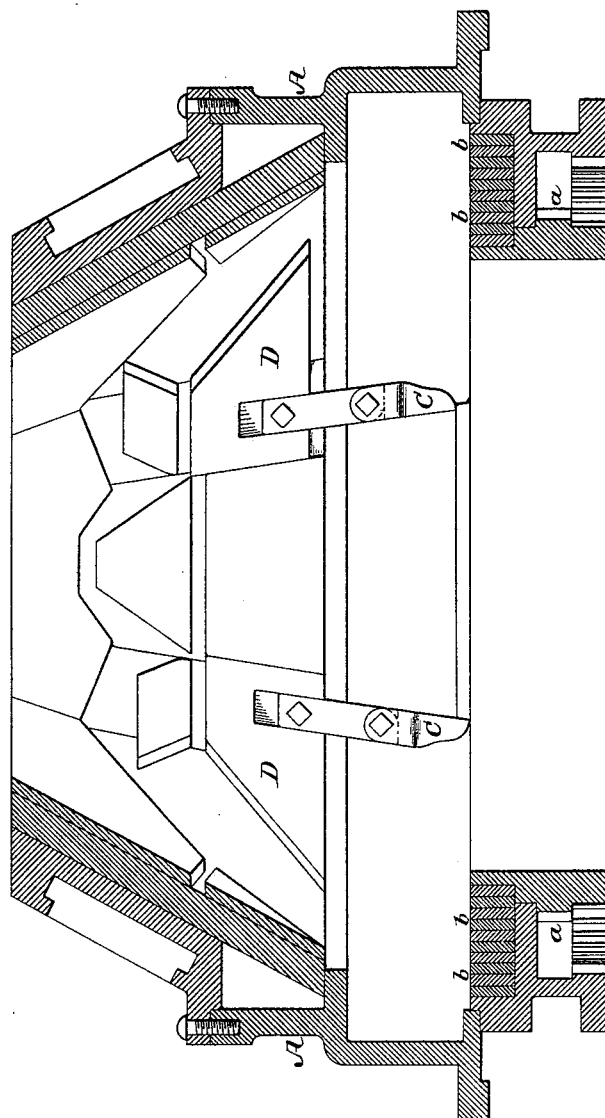
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FIG. 3.



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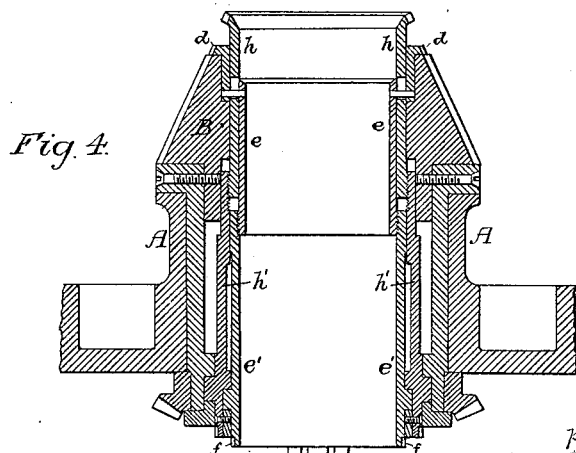


Fig 5.

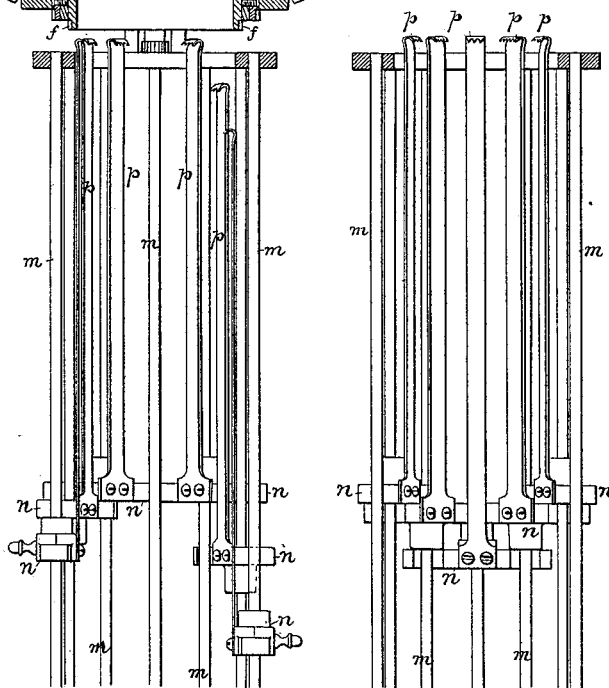
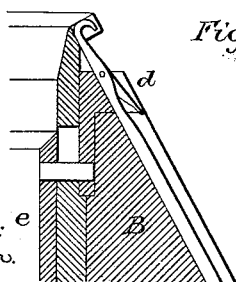
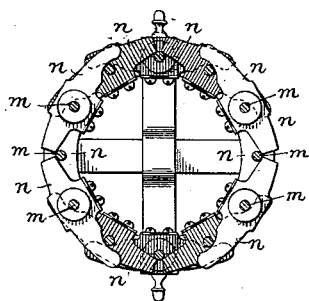
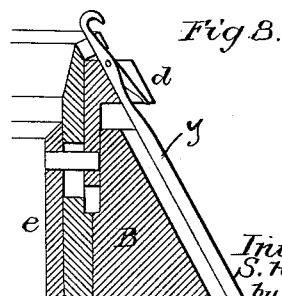


Fig. 6.



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UNITED STATES PATENT OFFICE.

SAMUEL HENSHALL, OF PHILADELPHIA, PENNSYLVANIA.

CIRCULAR-KNITTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 386,820, dated July 31, 1888.

Application filed June 3, 1887. Serial No. 240,162. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL HENSHALL, a citizen of the United States, and a resident of Philadelphia, Pennsylvania, have invented certain Improvements in Circular-Knitting Machines, of which the following is a specification.

My invention consists of certain improvements in the knitting-machine for which I filed application for patent on the 7th day of October, 1884, Serial No. 144,957, and on the 21st day of November, 1885, Serial No. 183,526, the objects of my present improvements being to provide for the ready expansion and contraction of the gage of the machine, to insure the proper take-up of the fabric at all times and at all points, and to simplify the mechanism for throwing the needles out of action in narrowing and widening to form the toe or heel pocket on the tube.

In the accompanying drawings, Figures 1, 2, and 3 are sectional views of sufficient of the machine to illustrate the novel construction of the head of the same; Fig. 4, a view, on a smaller scale, illustrating the take-up; Fig. 5, a transverse section of the latter; Fig. 6, a sectional plan view of the same; and Figs. 7 and 8, views, on a larger scale, illustrating the expanding head.

So far as the general construction of the machine is concerned, it is similar to those shown in my former applications, A being the cam-ring, B the tapered needle-cylinder, and *y* the needles. To a recess in the ring A are adapted annular racks *a a*, with rings *b*, carrying the sections of an expansion-rib, these racks being operated by gearing similar to that of the former machines, so as to automatically expand and contract the rib to determine the operation of the cams D, which actuate the needles, the rib being expanded or contracted to the extent of one needle on each reciprocation of the machine, as will be readily understood. Instead, however, of using, as in the former machine, devices for automatically lifting the cams by means of the rib, I now permit the latter to act as a stop for a pivoted toe, C, on the cam when the latter has reached the position at which it must be raised, and I effect the elevation of the cam by means of levers F—one for each cam—these levers being hung

to the ring A and projecting therefrom, so as to be readily operated by the attendant. This operation can be readily performed by one hand while the machine is being reciprocated by the other hand, so that the operation of widening and narrowing to form a heel or toe pocket can be effected as rapidly as is practicable without the use of the automatic cam-lifting devices formerly employed.

There are two movable cams, D, arranged one on each side of a central fixed cam, as shown in Fig. 3, one cam D acting upon the bits of the needles when the machine is moved to the right, and the other cam acting when the machine is moved to the left. The toe C of one cam swings in one direction and that of the other cam in the opposite direction, so that in moving to the right one cam will be stopped by the expansion-rib, the toe of the other cam yielding and passing freely over the rib, while in moving in the opposite direction the other cam will be stopped, the toe of the first cam yielding to pass over the rib. (See Fig. 3.)

In order that the diameter of the knitted tube which is being produced may be expanded or contracted to form the calf and ankle portion of a stocking, I provide the cylinder with an expansion-ring, *d*, located some distance below the top of the cylinder, this ring being adjustable vertically, so that it acts as a wedge to expand radially the cylindrical series of needles, and thus increase the effective diameter of the head at the point where the stitch is formed, as shown in Figs. 7 and 8. As will be seen, however, this movement is effected without changing the vertical position of the upper end of the cylinder in respect to the needles, so that the set of needles, however expanded radially, will still continue to draw the stitches to the same extent below the top of the cylinder.

Various means may be employed for adjusting the ring *d*. In the present instance said ring is connected to an internal ring, *e*, which is threaded at the lower end for adaptation to the threaded upper end of a second ring, *e'*, confined vertically to but free to turn in the needle-cylinder, so that by turning said ring *e'* the ring *e*, and with it the ring *d*, will be raised or lowered, the ring *e* being prevented from turning by means of pins or screws *c*, which

connect the rings *e* and *d* and pass through vertical slots *c'* in the inner portion, *h*, of the cylinder.

In order that the raising and lowering of the ring *d* may be effected automatically, the ring *e'* has around its lower end a rack, *f*, with which engages a pinion, *f'*, on a shaft having a ratchet-wheel, *g*, the latter being operated by a pawl, *g'*, hung to a lever, *g''*, which is actuated on each rotation of the cylinder by contact with any suitable stop, *g'''*, on the frame. (See Fig. 2.) The inner portion, *h*, of the cylinder *B* is also adjustable vertically, so as to regulate the length of stitch, the adjustment being effected by a threaded ring, *h'*, which ring has a rack engaging with a pinion, *i*, on a shaft provided with a milled head, *i'*, by which it may be readily manipulated.

In making heel or toe pockets on knitted tubes for the manufacture of stockings slack is necessarily formed on that side of the tube in which said pocket is made; hence the necessity for a differential take-up in order that this slack may be properly drawn down into the cylinder and prevented from riding up on the needles *y*. I therefore provide the machine with a depending frame having a series of rods, *m*, which serve as guides for weights *n*, each of which has an upwardly-projecting take-up hook, *p*.

There are in the present instance ten weights arranged in three tiers—four on each of the upper tiers and two in the lowest tier—each weight in the lowest tier being overlapped by two weights in the tier above, and each of the latter weights being overlapped by a weight in the top tier, whereby the elevation of either of the lowest weights will lift two weights in each of the tiers above the same, so that all the weights can be lifted to take a fresh hold by simply lifting the two lowest weights. The lowest weights, however, can descend independently of those above, and the weights in the second tier can descend independently of those in the upper tier, so that by applying the hooks to the fabric, so that the hook of one of the lowest weights is at or about the center of the toe or heel pocket which is being formed, the slack formed by said pocket will be taken up as fast as made and uniform tension upon the fabric at the top of the head will be preserved.

I claim as my invention—

1. The combination of the needles and needle-operating cam of a knitting-machine, and the needle and cam cylinders, with an expansion-rib serving as a stop for the cam, and a

hand-lever for moving the cam into operative position, all substantially as specified.

2. The combination of the needles and needle-operating cam of a knitting-machine, and the needle and cam cylinders, with a toe pivoted to the cam and free to swing thereon, an expansion-rib serving as a stop for said toe, and a hand-lever for moving the cam into operative position, all substantially as specified.

3. The combination of the needles of a knitting-machine, two needle-operating cams, and the needle and cam cylinders, with an expansion-rib serving as a stop for said cams, and a hand-lever for moving each cam into operative position, all substantially as specified.

4. The combination, in a knitting-machine, of a conical needle-cylinder and its needles with an expansion ring acting upon the needles and free to move vertically on the cylinder below the upper end of the same, whereby the expansion of the needles may be effected without changing their draft, and means for vertically adjusting the position of the said ring, all substantially as specified.

5. The combination of the conical needle-cylinder and its needles, the conical expansion-ring, a carrier therefor, a threaded ring engaging with said carrier, and pawl-and-ratchet mechanism, whereby said threaded ring is moved on each rotation of the cylinder, all substantially as specified.

6. The combination of a series of take up hooks with weights carried by said hooks, said weights being arranged in tiers, and the weights of one tier overlapping those of the tier below and resting thereupon when their hooks are free from the fabric, all substantially as specified.

7. The combination of the take-up frame having depending rods with weights guided on said rods and arranged in tiers one above another, so as to overlap, each weight having a take-up hook, all substantially as specified.

8. The combination of the cylinder having an adjustable top section for regulating the stitch, the threaded ring for operating said top section, and rack-and-pinion mechanism for operating said ring, all substantially as specified.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

SAMUEL HENSHALL.

Witnesses:

WILLIAM D. CONNER,
HARRY SMITH.