

H. J. GRISWOLD.
KNITTING MACHINE.

No. 255,971.

Patented Apr. 4, 1882.

Fig. 3.

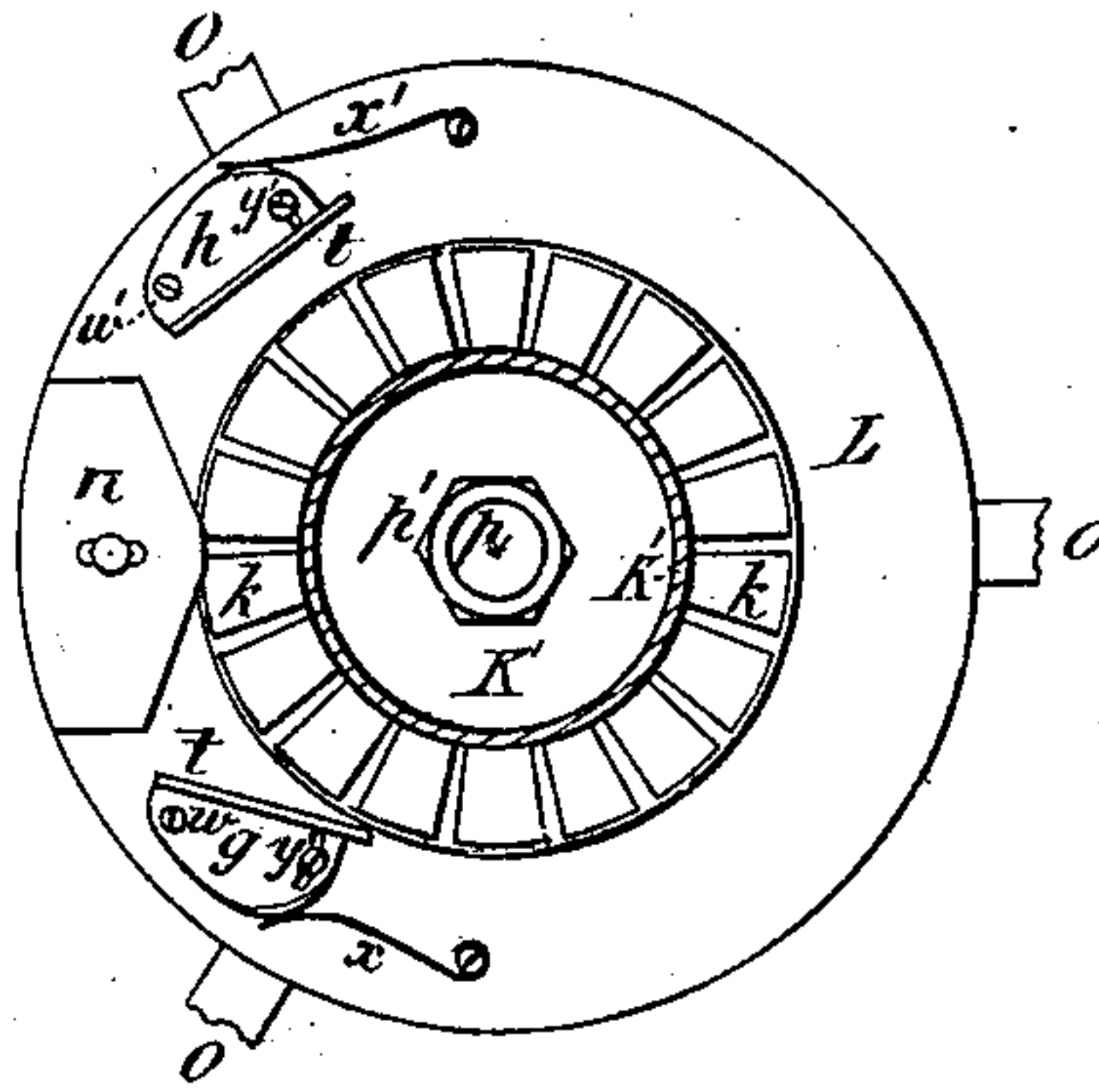
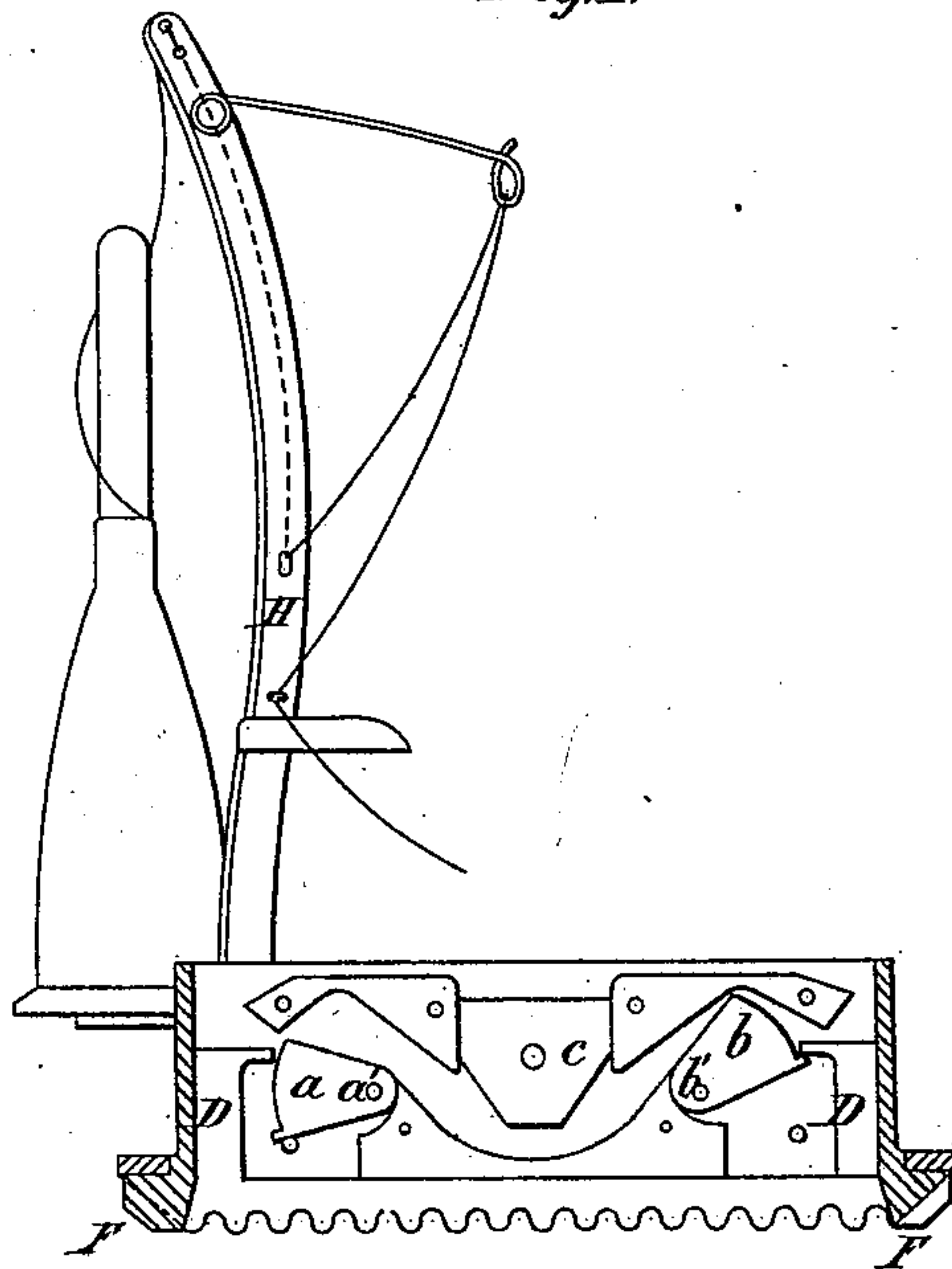


Fig. 1.



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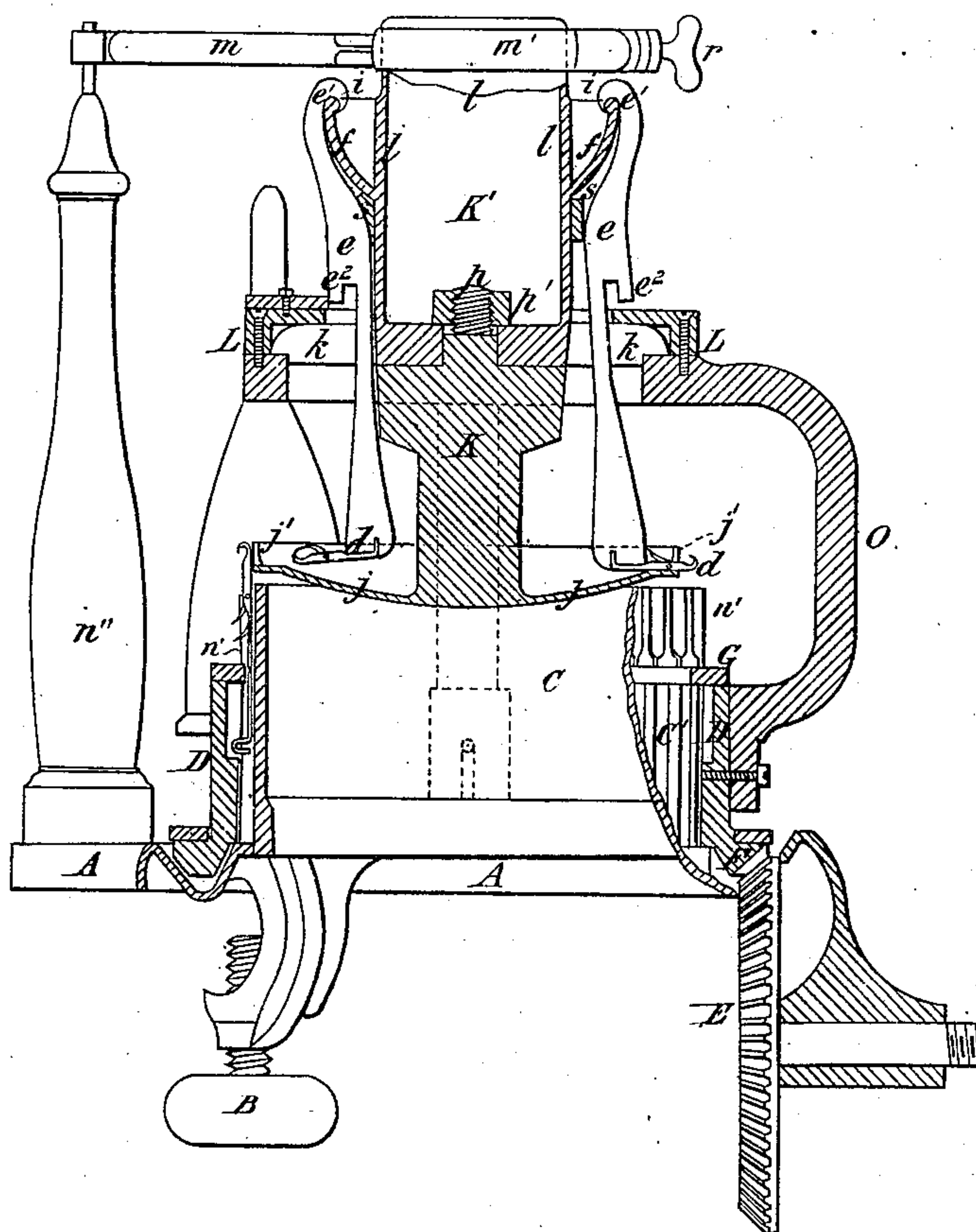
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Fig. 2.



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UNITED STATES PATENT OFFICE.

HENRY J. GRISWOLD, OF LONDON, COUNTY OF MIDDLESEX, ENGLAND.

KNITTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 255,971, dated April 4, 1882.

Application filed July 15, 1879. Patented in England October 8, 1873, and in France April 9, 1874.

To all whom it may concern:

Be it known that I, HENRY J. GRISWOLD, formerly of Madison, Connecticut, now residing in London, Middlesex county, England, have invented certain Improvements in Knitting-Machines, of which the following is a specification.

My invention relates to improvements in circular-knitting machines constructed, as fully described hereinafter, so as to be capable of knitting either a flat or tubular web, or so that the needles may be adjusted or thrown out of action without removing the loops from the same.

In the drawings, Figure 1 is a vertical section of the revolving cam-ring of a circular-knitting machine with cams so constructed as to permit of the needles being lifted out of action and of knitting a flat as well as a tubular web. Fig. 2 is a vertical section of the said machine combined with my ribbing attachment. Fig. 3 is a plan, partly in horizontal section, of the said ribbing attachment.

Like letters indicate the same parts throughout the drawings.

A represents the bed of the machine, and has a clamp-screw, B, whereby it is secured to the edge of a table or other support.

C is the fixed needle-cylinder, grooved vertically for the purpose of guiding the needles in the usual manner.

D is the revolving or reciprocating cam-ring, (shown detached in Fig. 1,) the cams *a b* being so constructed as to give the same vertical movement to the needles in whichever direction the said cam-ring is revolved; and whenever one or more of the needles are lifted up, so that the butts pass above the cams, they are no longer in action, but the stitch remains upon the said needles until they are pressed down, so as to again engage the cam.

E is a bevel-gear wheel, and F bevel-gearing upon the cam-ring D, by which motion is communicated to the said cam-ring.

H is the yarn-carrier which is made to slide backward and forward in respect to the cam-ring D in such a manner as to present the yarn to the needles at the proper time in whichever direction the said cam may be revolved or reciprocated.

With circular-knitting machines, varied somewhat by different inventors, but constructed as above set forth, I combine a ribbing attachment consisting essentially of a stationary needle-holder, K K', and a revolving ring, L, carrying cams *g h* for actuating a series of dial-

needles, which are arranged radially. The needles are preferably actuated by jacks or levers *e*, to one end of which they are secured at right angles, or nearly so, while the other ends of the said jacks are provided with hooks *i*, so as to hang and vibrate freely upon the cup-shaped part *f f'* of the fixed holder K K'. Near the middle longitudinally of each of the said jacks is a lip, *e'*, which overhangs the ribs *t t* on the cams *g* and *h*, Fig. 3, so that the said cams may catch behind the said lips and actuate the said jacks and their respective needles as the cams are carried past the jacks. By this construction all the cams of the ribbing attachment may be placed on the revolving cam-ring L and in front of the said jacks, and the jacks may be readily removed from the machine by simply lifting them off their bearings and replaced again for the purpose of fashioning properly the stocking. The fixed holder K of the said ribbing attachment has a circular disk or web, *j*, turned to nearly the same size as the diameter of the needle-cylinder of the knitting-machine, but thickened somewhat at its circumference, in which thickened part are cut grooves *j'* equal in number to the needles *d* required. The office of these grooves is to guide the said needles as they are actuated, and also to discharge or knock off the loops from the said needles. The holder K' also has a slotted circular disk, *k*, which serves to guide the aforesaid jacks as they are being actuated. The said holder is also provided with the aforesaid cup-shaped piece *j* and is concentric with the axis of the attachment, to which the said jacks are pivoted at their upper ends, as described above. From the cup-shaped piece there projects upward the support *l*, preferably tubular, which surmounts the attachment and serves, in combination with the clip-lever *m* and the pedestal *n''*, to hold the frame from revolving or reciprocating with the cam-ring L. The contractile ring or clip *m'* of this clip lever or arm *m* is clamped to the tubular part *l* by means of the thumb-screw *r*. By this combination I am able to adjust the radial needles accurately, so that they may be held at will either directly above the grooves of the needle-cylinder C of the machine, or turned to one side or the other so as to be above the ribs and between such grooves. By thus changing the position of the

radial needles of the ribbing attachment I am able to decrease the size of the leg of a stocking to form the ankle by as many stitches as there are ribs in the stocking being knit, and have accomplished the result of properly fashioning the leg of a stocking knitted on a circular machine without resorting to sewing up the back of the stocking.

The fixed needle-holder K with its four parts mentioned above may all be cast in one piece, but is preferably made in two parts divided as shown in Fig. 2. In this case the parts K K' are fastened together by means of the screw *p* and the nut *p'*. While the needle-holder K is held adjustably from revolving or oscillating, as above described, the cam-ring L of the ribbing attachment is attached rigidly by three or more brackets, O, to the main cam-ring D of the machine, with which it is revolved or reciprocated simultaneously.

The cam *n* of the cam-ring L actuates the jacks *e* and their needles to discharge the loop and form the ribbed stitch, while the other two cams, *g* and *h*, which may be designated "wing-cams," push the said needles at the proper moment to disengage their latches from the loops last formed.

The wing-cams *g* and *h* are preferably pivoted at *w w'*, so as to be moved backward and forward, are held in position by the springs *x x'*, and may be secured by set-screws *y y'*.

It will be seen that the ribbing attachment as well as the main machine will knit equally well in whichever direction it is revolved, and together they will knit a flat-ribbed web as well as a tubular one. When, as when forming the heel of a stocking, it is required temporarily to suspend the knitting of the ribbing attachment, the wing-cams *g* and *h* are drawn out into the position shown by the cam *h* in the drawings and held there by the set-screw *y y'*. When a ribbed fabric is not required the ribbing attachment is readily disconnected and the main machine may be used to knit a plain web in the usual manner.

The operation of the machine is as follows: Having commenced at the top of a stocking in the usual way, and having knit once around, I adjust the ribbing attachment to the machine, the cams of the attachment being arranged in respect to the corresponding cams of the machine to effect the desired operations. I then insert in the ribbing attachment, equidistant from each other, jacks equal in number to, say, one-fourth as many needles as are in the machine, and adjust the clips so that the radial needles of the attachment shall fall directly over the ribs *n'* of the machine and between every fourth and fifth needle thereof. I then revolve the machine and knit a straight tubular web, say, six or eight inches long. I then narrow the leg off gradually by taking out from the machine a needle, say, every fourth time around, and putting the stitch over the adjoining ribbing-needles. I continue this until as many needles have been removed as there are ribs—say one-fifth of the whole number of

stitches. I then adjust the frame K of the attachment by means of the clip-lever, so that the radial needles shall be held directly over the grooves of the needle-cylinder C which have become vacant by the removal of the needles for narrowing. I then knit, say, three inches more of tubular work for the ankle.

For the heel and bottom of the foot I remove one-half of the jacks and insert in the needle-frame C needles in their places, transferring to these needles the stitches which were on the jack-needles. This makes the heel and bottom half of the stocking-foot plain, while the top is ribbed. While the heel is being knitted the ribbing-jacks are thrown out of action by drawing back the wing-cams and holding them by set-screws, as described above, and the ribbing attachment is detached before knitting the toe. The heel and toe are knitted in the well-known manner practiced on reversible circular-knitting machines the needles of which may be thrown out of action.

A machine suitable for knitting seamless stockings should have a needle-cylinder not exceeding four and a half inches in diameter; but in machines of larger diameter I may employ the same needles as are used in the main machine and actuate them in radial grooves by cams similar to those used in the main machine.

The essential parts of my invention remain the same in either case.

I claim—

1. The combination, with the suspended jacks carrying needles and having lips *e²*, of the revolving ring L, adjustable flanged cams *g h*, and plain cam *n*, carried by said ring, as set forth.

2. The combination, in a knitting-machine, of the cylinder provided with needles, a ribbing attachment carrying radial needles, cams for operating both sets of needles, all constructed to permit the knitting to be effected by revolving the cylinder in either direction, and appliances whereby the attachment may be adjusted and secured relatively to the cylinder with its needles, either opposite or between those of the cylinder, substantially as set forth.

3. The within-described improvement in the art of manufacturing stockings, the same consisting in first forming the ribs with the ribbing-needles opposite the posts between the cylinder-needles, successively removing cylinder-needles adjacent to the ribbing-needles, putting the stitches over the adjoining needles, and, when a number of needles equal to the ribbing-needles are removed, then adjusting the ribbing device to bring the needles opposite the grooves of the needles removed, substantially as specified.

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

H. J. GRISWOLD.

Witnesses:

CHARLES E. FOSTER,
WILLIAM PAXTON.