

(No Model.)

3 Sheets—Sheet 1.

H. HEINE.

CIRCULAR KNITTING MACHINE.

No. 390,965.

Patented Oct. 9, 1888.

Fig. 1.

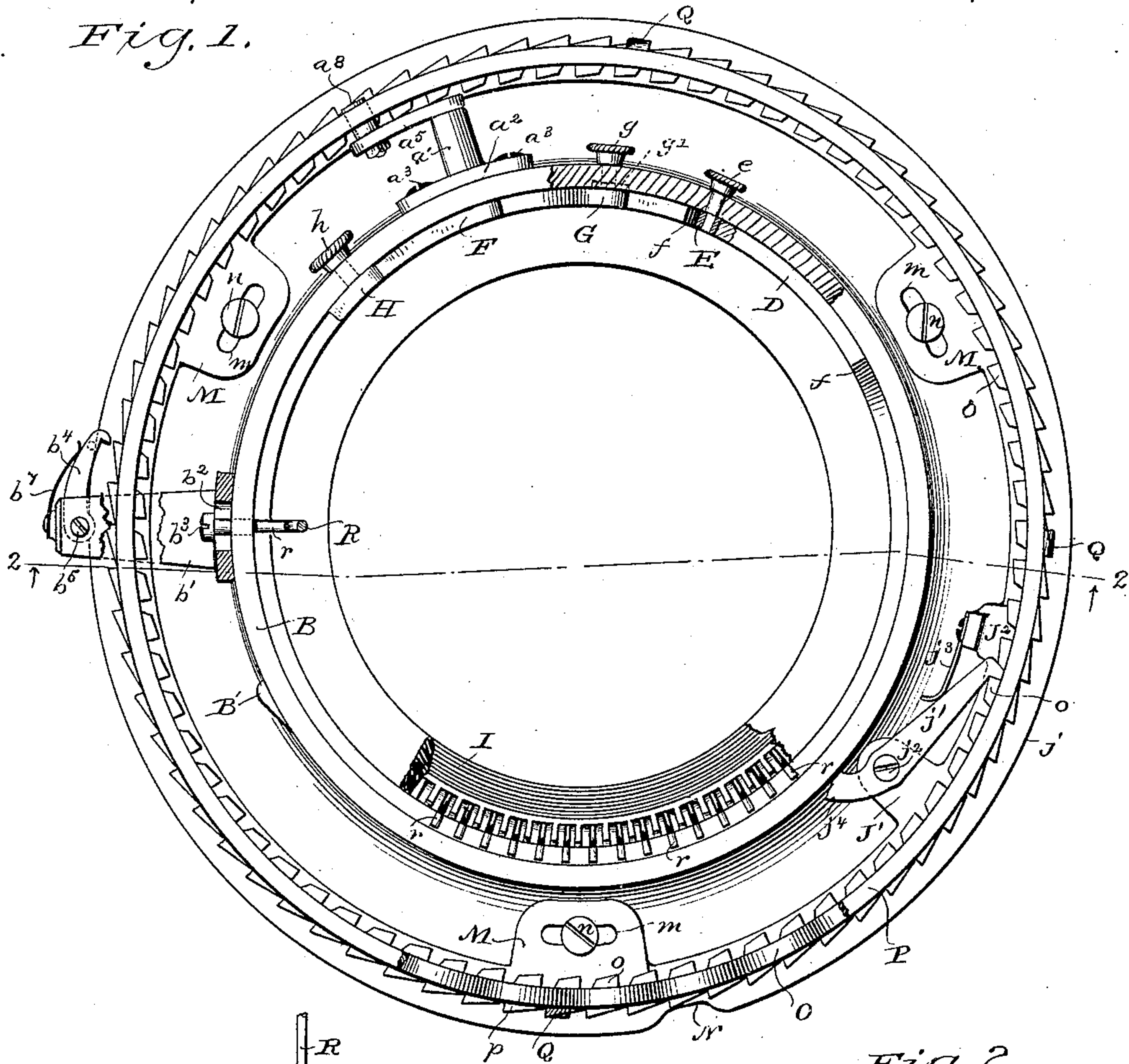
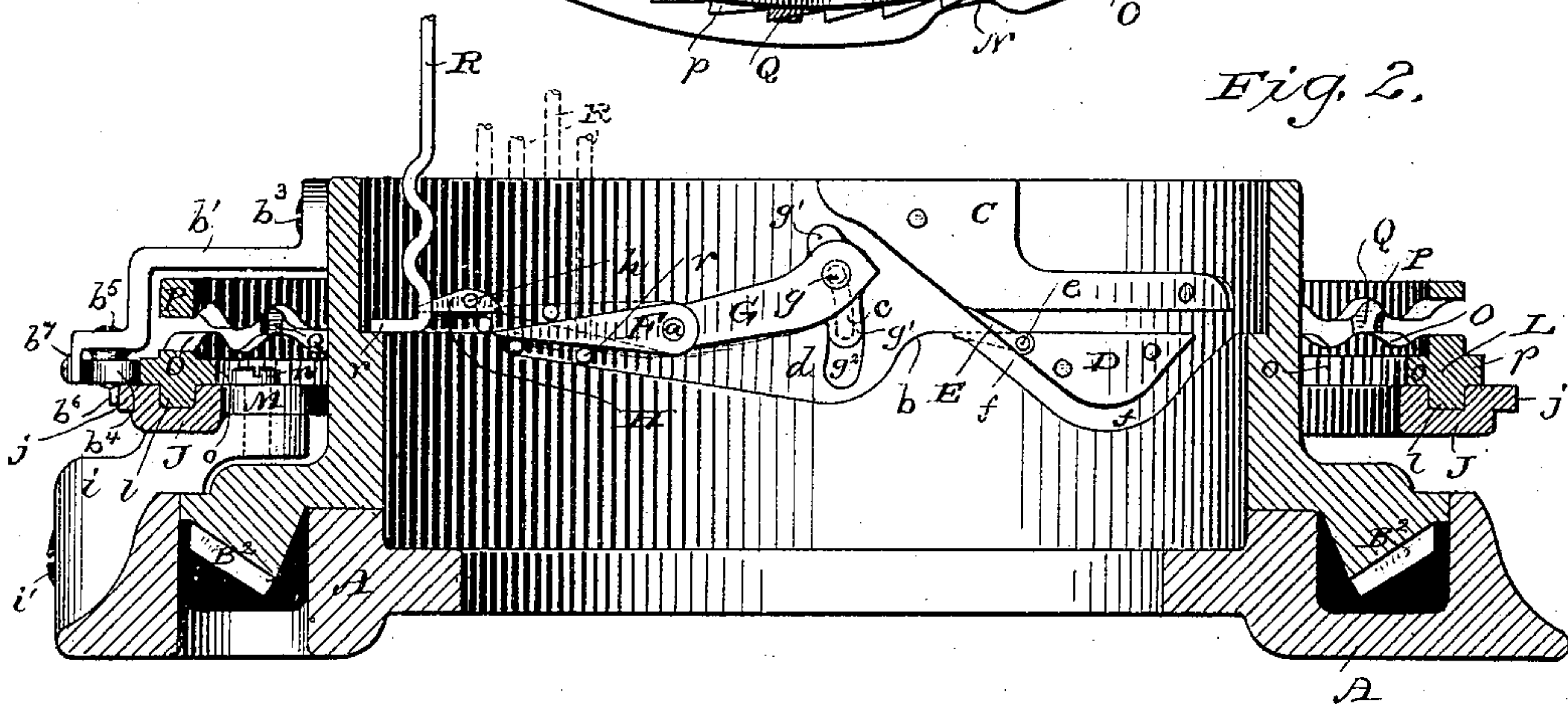


Fig. 2.



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Fig. 3.

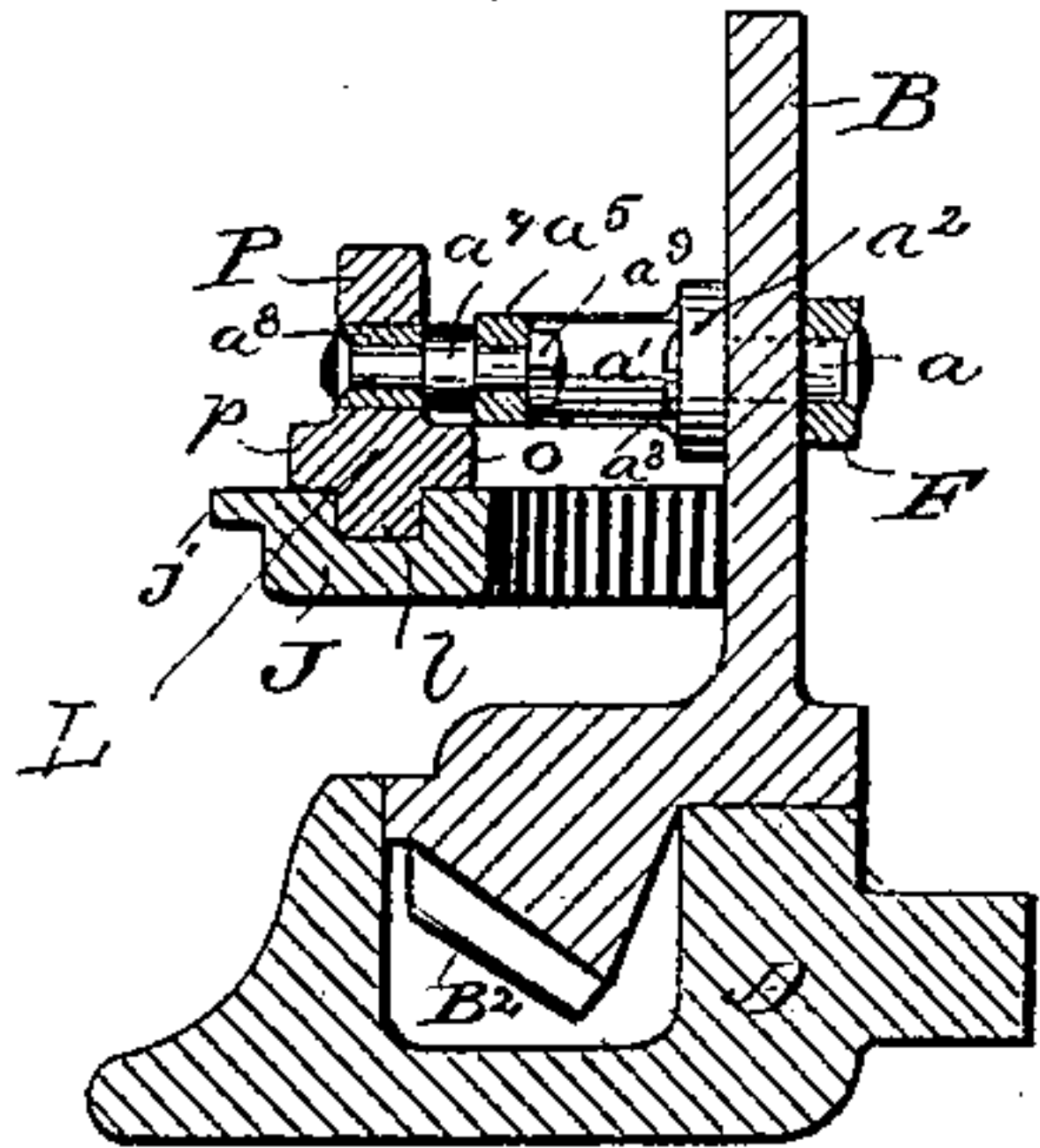


Fig. 4.

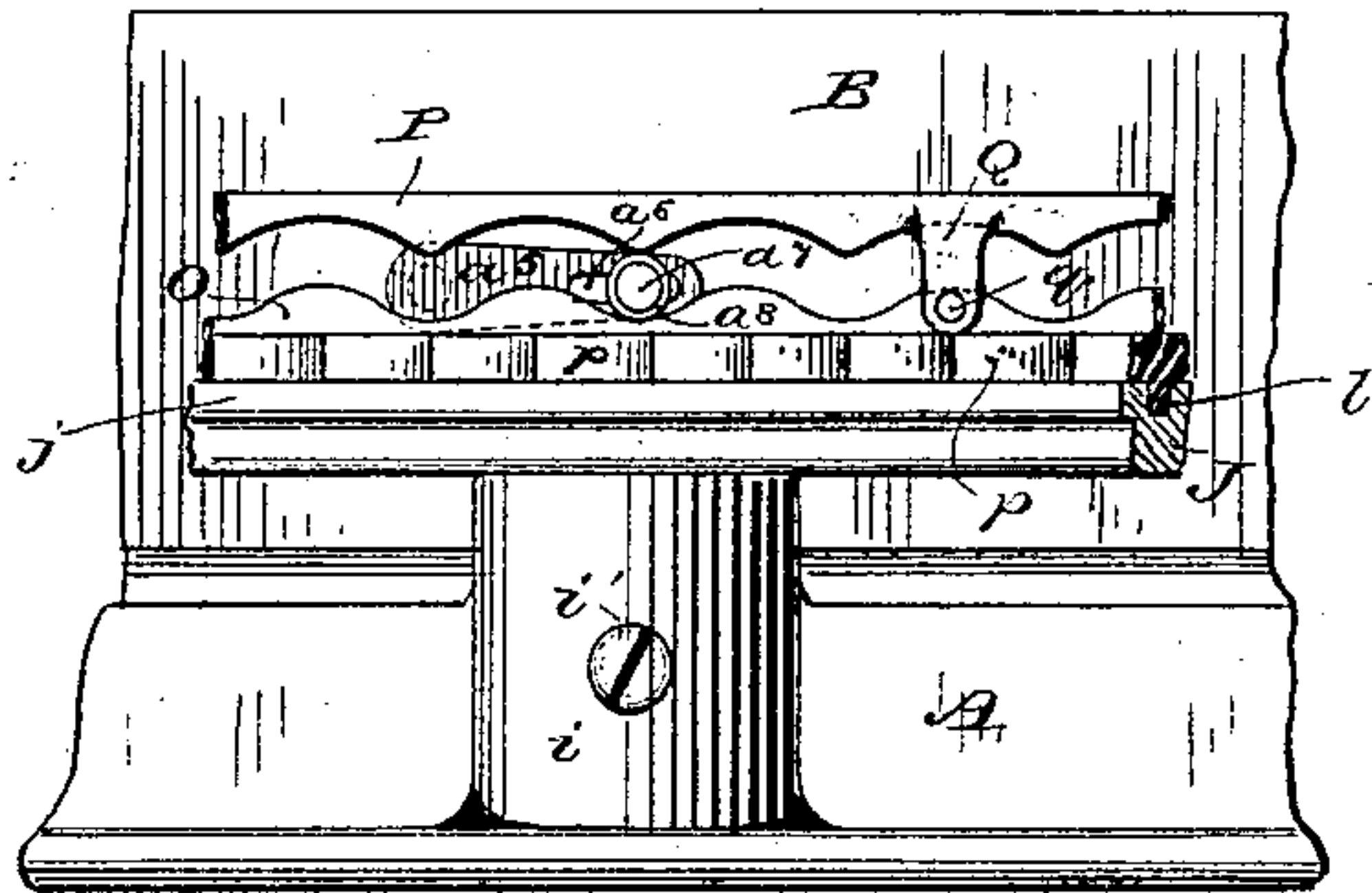


Fig. 5.

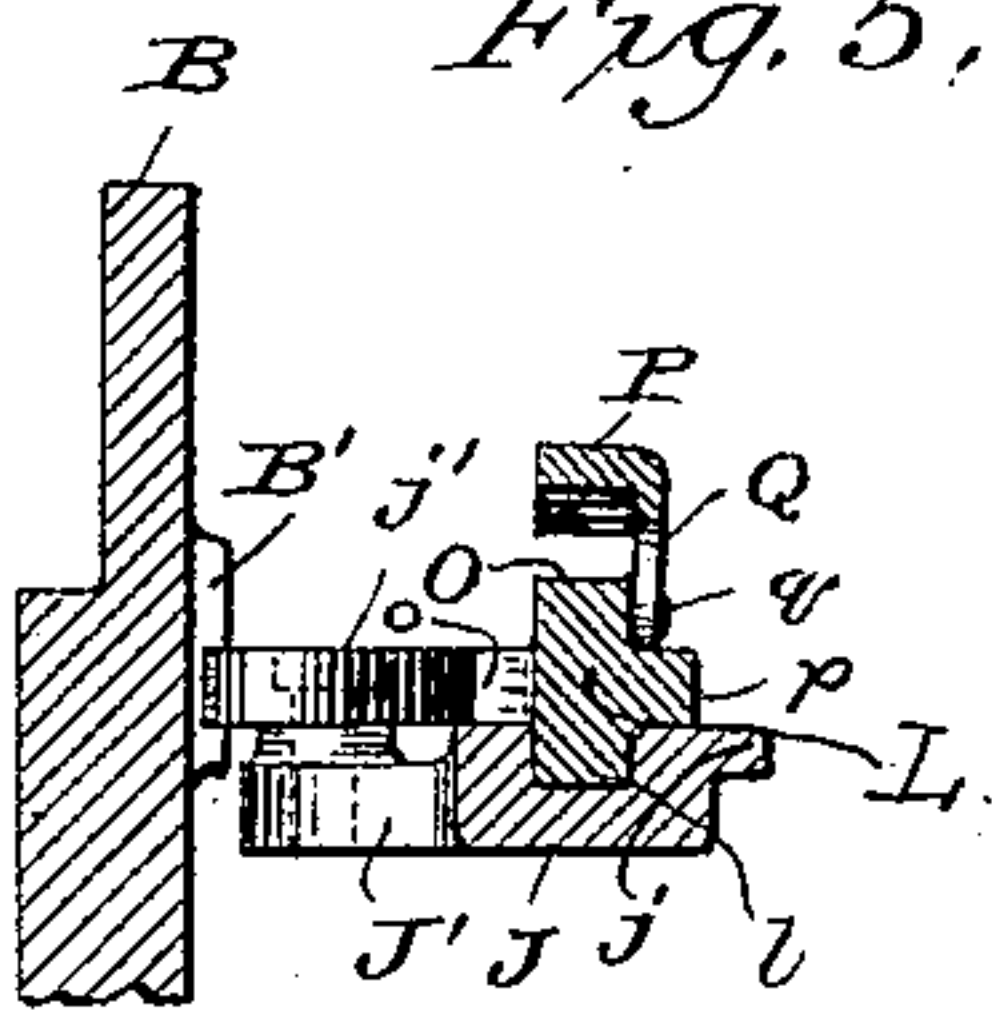


Fig. 6.

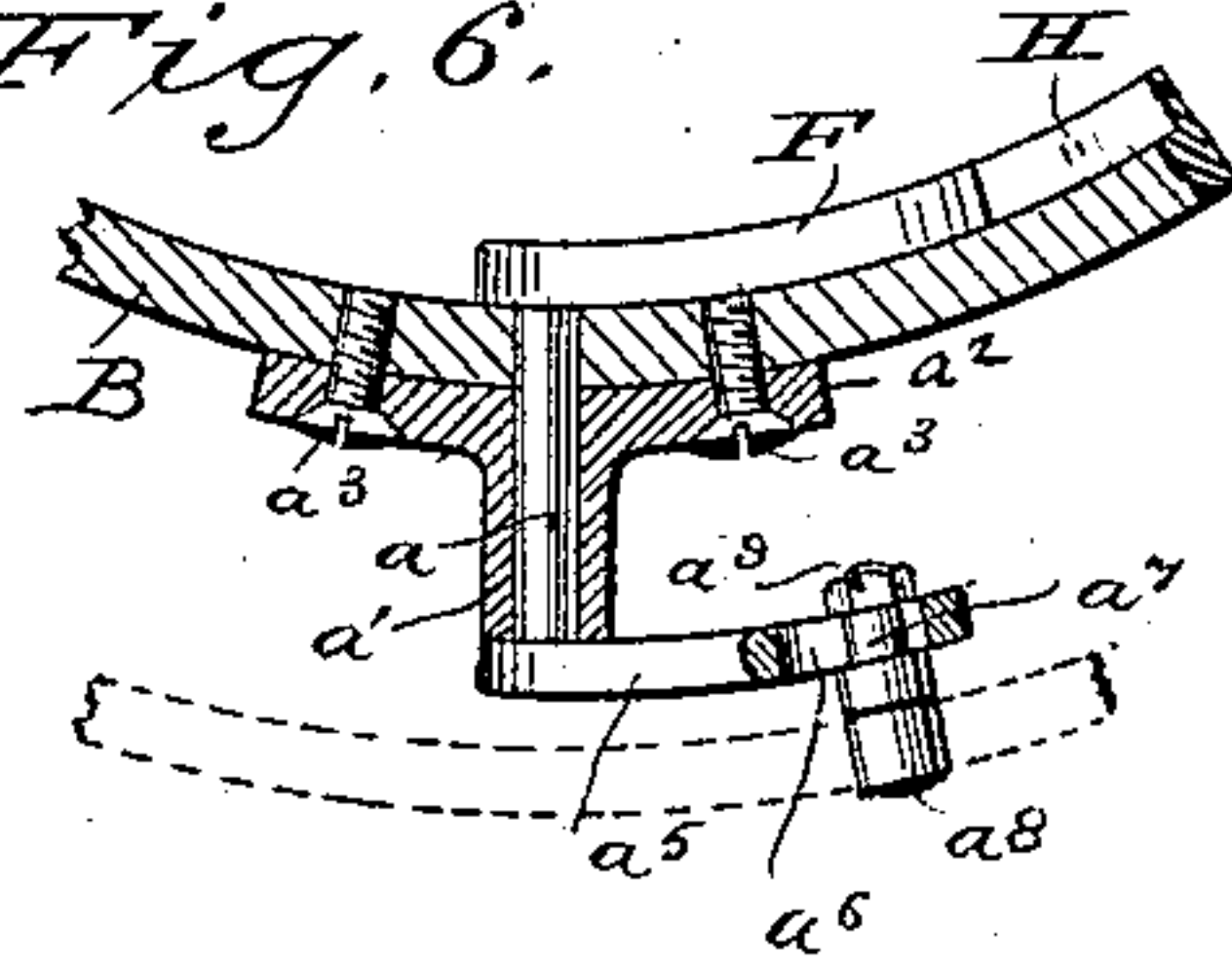
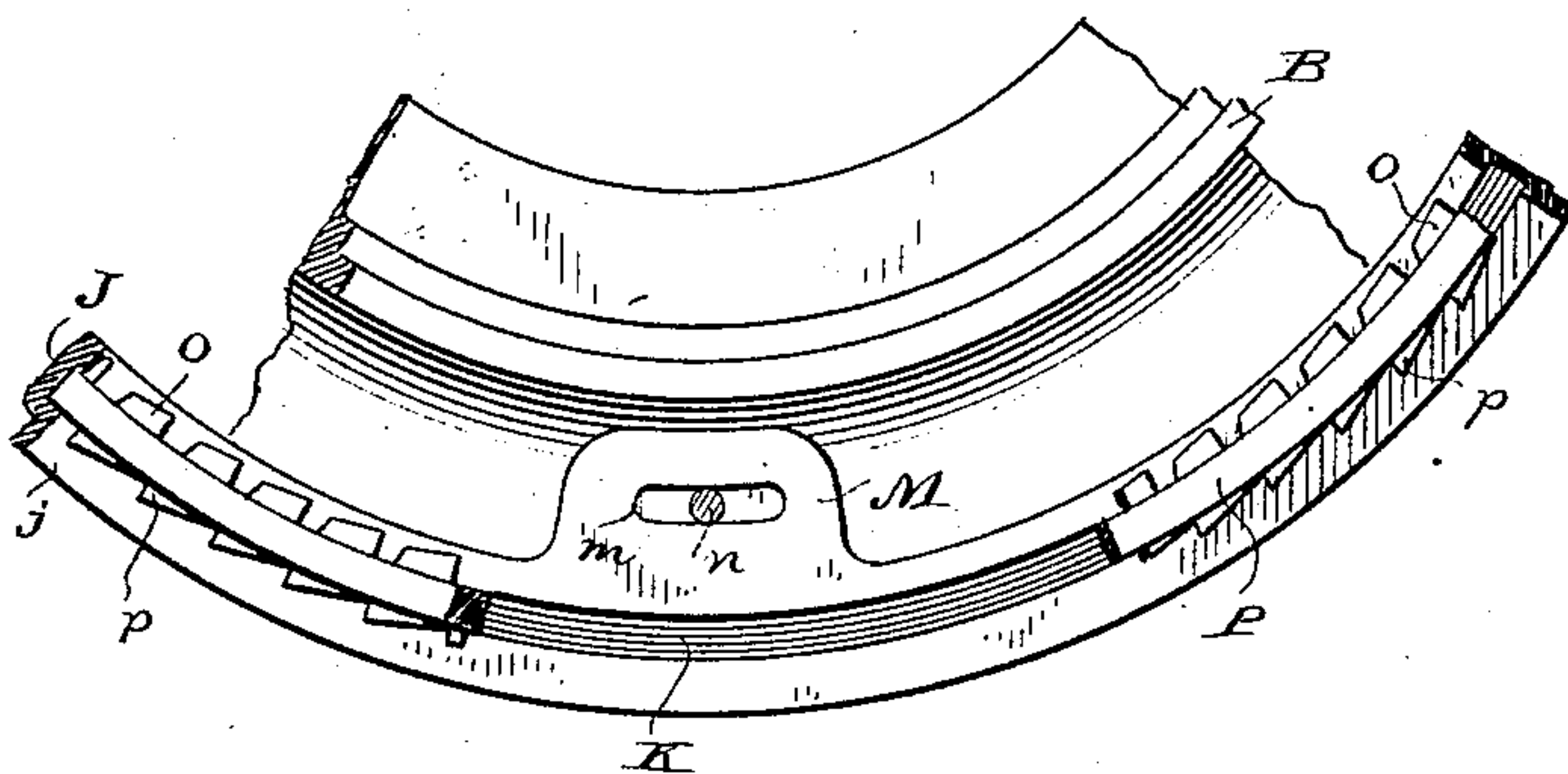


Fig. 7.



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Fig. 8.

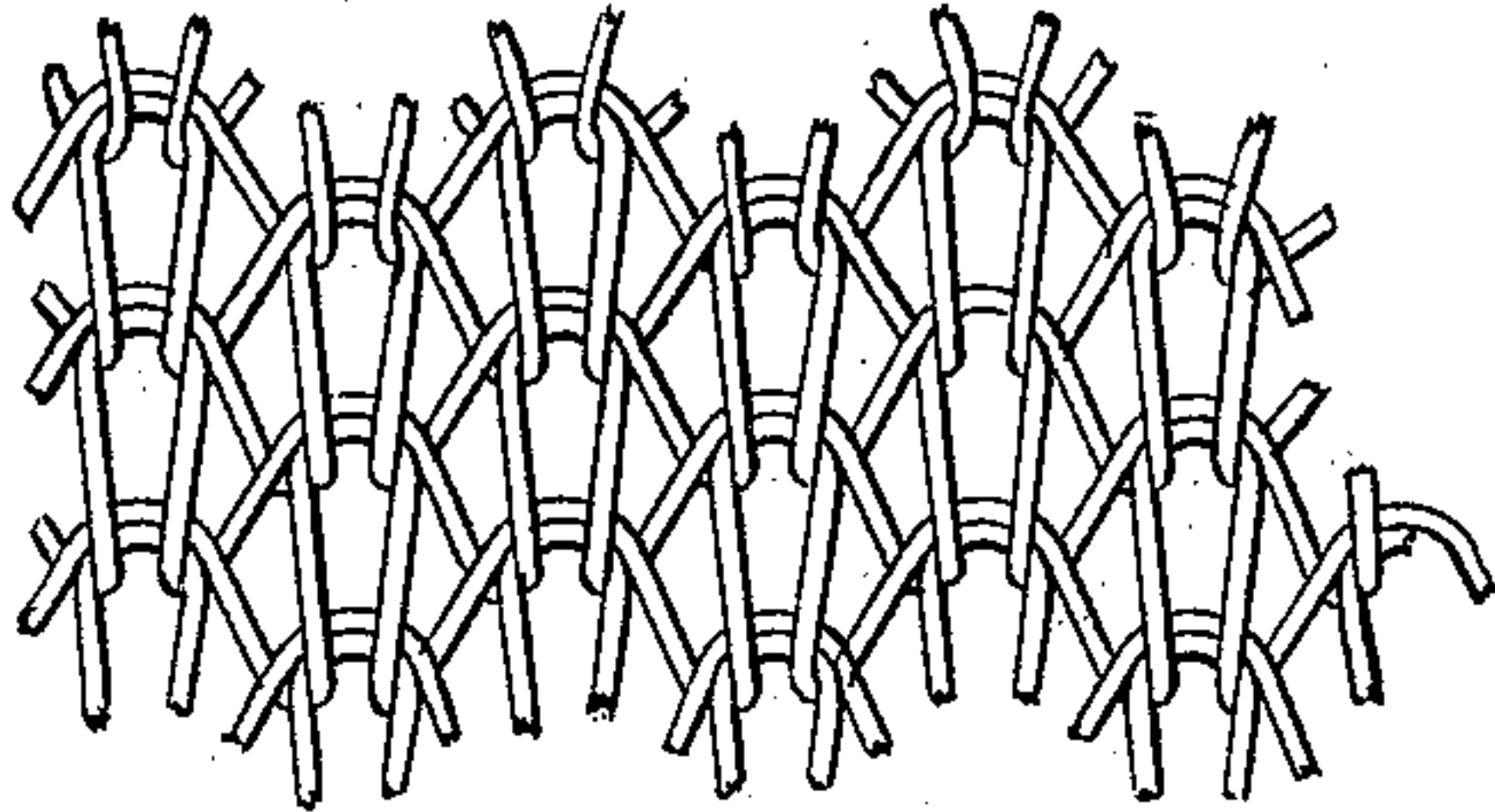


Fig. 10.

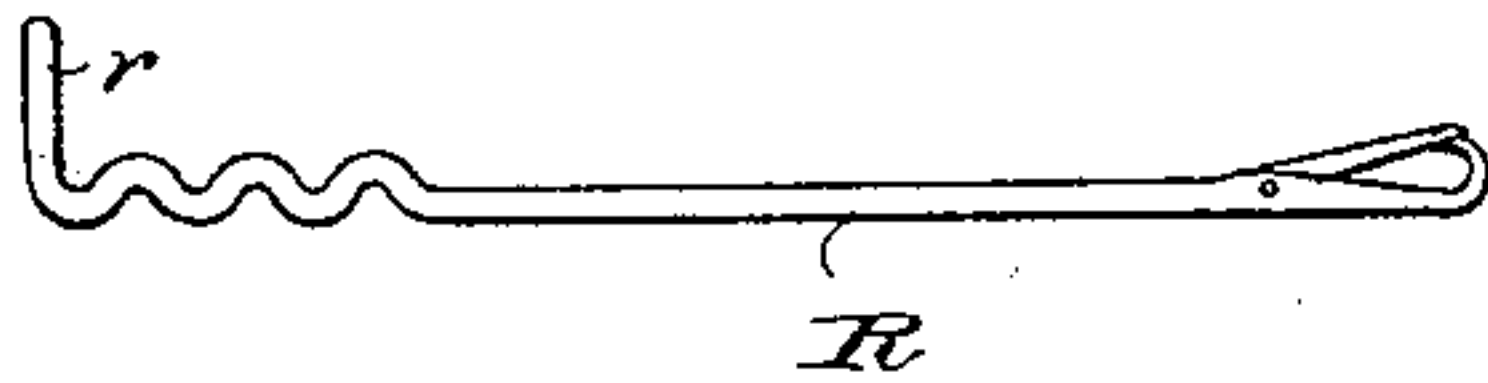
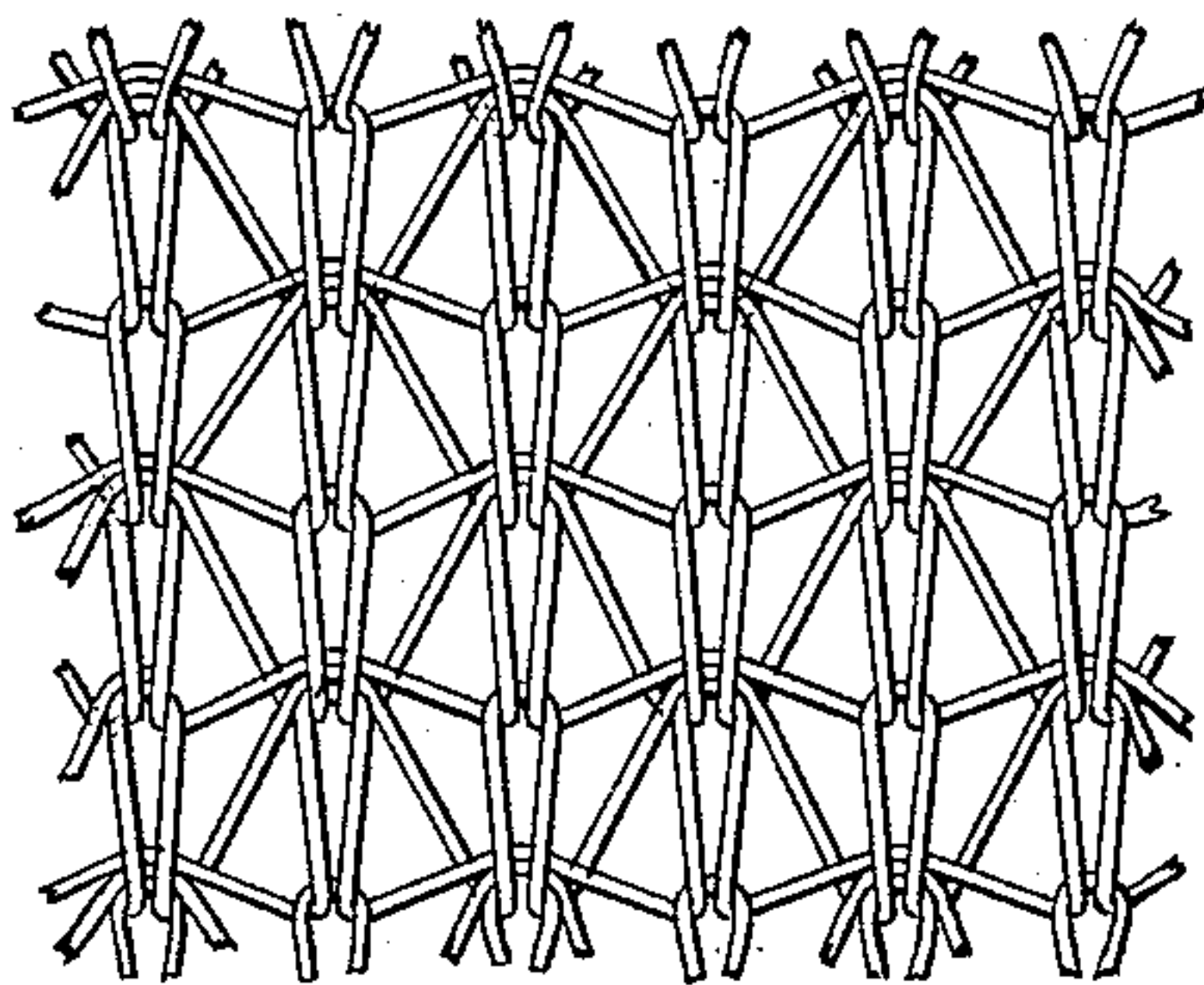


Fig. 9.



Witnesses.

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UNITED STATES PATENT OFFICE.

HERMAN HEINE, OF MILWAUKEE, WISCONSIN.

CIRCULAR-KNITTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 390,965, dated October 9, 1888.

Application filed October 18, 1887. Serial No. 252,679. (No model.)

To all whom it may concern:

Be it known that I, HERMAN HEINE, of Milwaukee, in the county of Milwaukee, and in the State of Wisconsin, have invented certain
5 new and useful Improvements in Circular-Knitting Machines; and I do hereby declare that the following is a full, clear, and exact description thereof.

My invention relates to knitting machinery,
10 and will be fully described hereinafter, and pointed out in the claims.

In the drawings, Figure 1 is a plan view of the machine with the needle-cylinder and some other parts partly broken away. Fig. 2 is a
15 central vertical section through the same on the line 2 2, Fig. 1. Figs. 3 to 7, inclusive, are detail views illustrating the construction of the machine. Figs. 8 and 9 are detail views of single and double fabrics formed on my said
20 machine, and Fig. 10 is a view of the preferred form of needle.

A represents the lower frame of a circular-knitting machine, and which is different in the different machines, my attachments being
25 adapted to be used with any circular-knitting machine that has a stationary needle-cylinder.

B is the cam-cylinder, having the stationary cams C and D, which are ordinarily united by the switch-lever E, as shown in Fig. 2, so as
30 to make practically a single cam of the parts C E D, said switch-lever being tightened to place by screw *e*.

F is a movable cam whose rear end is fast to a pivot-bolt, *a*, projecting through the cyl-
35 inder B, and this rear end is rounded and abuts against the correspondingly rounded or concave end of the stationary cam G, whose other end is secured by the screw *g* to the cylinder B and normally at the upper end of a slot, *c*,
40 (shown in dotted lines,) and has thin ears *g' g'*, which cover said slot, and which are received within correspondingly-shallow countersinks *g²* in the cylinder B, all as plainly shown in Fig. 2. Below the cams F G is the cam-groove
45 *d*, and below the cam D is the cam-groove *f*, connected by the cam-groove *b*.

H is an adjustable cam which is tightened to place by the screw *h*.

I is the needle-cylinder, of which a portion
50 only is shown in Fig. 1, and this may be of any ordinary construction, according to the particular machine to which my improvements

are applied, so long as said needle cylinder is stationary. At convenient intervals a number of brackets, *i*, three or more, are secured,
55 as by screws *i'*, to the lower frame, A, of the machine, and to these brackets are secured a flanged ring, J, whose upper surface is provided with a circular groove, K, to receive the lower flange, *l*, of another ring, L, herein-
60 after described. The ring J has a series of inwardly-extending flanges, M, corresponding in number to the brackets *i*, and provided with slots *m*, by means of which and screws *n* they are adjustably secured thereto; and the
65 said ring J has also an outwardly-extending horizontal flange, *j*, recessed at one point, as shown at N in Fig. 1.

The ring L is provided with an interior row of horizontal ratchet-teeth, *o*, and also an ex-
70 terior row of horizontal ratchet-teeth, *p*, while its upper surface is provided with a central upwardly-extending flange with a rounded cam-surface, O, and above this is supported another
75 ring, P, whose lower surface is correspondingly shaped, and which is preferably provided at conveniently intervals with downwardly-extending strips or lugs Q, cast therewith and secured,
80 as by screws *q*, to the outside of the cam-flange O of the ring L; or, if preferred, the rings L and P may be cast in one piece.

The pivot-bolt *a*, which projects through the cam-cylinder B, and whose inner end carries the cam F, fast thereon, as already stated, ex-
85 tends on the outer side of said cylinder through a sleeve, *a'*, having a hub or flange, *a²*, secured by screws *a³* to the outside of the said cylinder B, and the outer end of this pivot-bolt *a* is made fast to a lever-arm, *a⁵*, whose free end is
90 slotted, as at *a⁶*, and this slot receives the reduced journal *a⁷* of a roller, *a⁸*, said journal, outside of said slot, being of same diameter as the roller, and adjustable within the slot to vary the stroke of the cam, being tightened to the desired place by the screw *a⁹*, all as shown
95 in the detail views, Figs. 3, 4, and 6.

Secured to the upper part of the outside of the cam-cylinder B is a hanger, *b'*, preferably shaped in a succession of right angles, as shown
100 in Fig. 2, the upper vertical flange of which is provided with a transverse slot, *b²*, by means of which and screw *b³* it is adjustably secured to said cylinder B, and to the under side of the lowest horizontal flange is secured a pawl, *b⁴*,

by pivot-screw b^5 , from the under side of the other end of which pawl there depends a pin, b^6 , which bears against the outer horizontal flange, j , of the ring J, and keeps the operative end of said pawl free from engagement with the teeth p on the ring L, supported on said ring J until the recess N is reached, a spring, b^7 , being secured to the lowest vertical flange of the hanger b' and bearing against the said pawl b^4 . Adjacent to this hanger b' , but lower down on the outside of the cylinder B, is a tripping-lug, B' .

The ring J has an inwardly-projecting lug or flange, J' , which supports another pawl, j' , secured thereto by means of a pivot-screw, j^2 , and this pawl is held in engagement with the inner row of teeth, o , on the ring L by means of a spring, j^3 , secured to an inwardly-extending lug, J^2 , on the said ring J, while the heel j^4 of this pawl j' is in the path of the described tripping-lug B' , by contact with which said pawl is free from engagement with a tooth, o , on the ring L in the revolution of the cylinder B.

While my attachment is adapted to be employed, as stated, with any ordinary circular-knitting machine having a stationary needle-cylinder, I find it of great advantage to employ a needle having a single foot, as shown at r in Fig. 10, the shank R and latch of the needle being of any ordinary construction similar to the needles in common use, which, however, have a doubled foot. The advantage of the single foot is principally an added ease of the cam motion, occasioned by the fact that that there is less rise in operation.

In Fig. 8 I show a single fabric and in Fig. 9 a double fabric made with my attachment.

The operation of the device is as follows:
The needles in the cylinder I are all supplied with yarn in the usual manner, and the cam-cylinder B is rotated by means of the ordinary gearing meshing with the ordinary cogs or teeth, B^2 , on the under side of said cylinder, (the needle-cylinder I being stationary, as stated,) and said cylinder B carries around with it the sleeve a' , pivot a , lever-arm a^5 , and roller a^8 , the latter moving in the wavy cam-groove between the parts O and P of the outside rings, the said parts O P being held stationary by the engagement of the pawl j' with one of the inner row of teeth, o , on the ring L, of which the part O is an integral portion. In the illustration given there are seventy-two teeth o and seventy-two teeth p on the ring L, and a like number of needles are understood to be in the cylinder I, and just half as many high or convex points and an equal number of low or concave points alternated therewith on the cam-surface O and P. Therefore, as the cylinder B is revolved the roller a^8 is raised and lowered alternately, and as the cam F and roller a^8 move together the result is (when the cams are adjusted as shown in Fig. 2, which is their normal position) that every other needle is raised by said cam F, which passes under the feet r of said needles, while the alter-

nate needles are lowered, and said cam F passes over their feet which are in the groove d , until the point b of the cam-groove reaches these needles, where all of the needles receive fresh yarn, and then the feet of all the needles are received in cam-groove f (under cam D) in the continued revolution of the cylinder B, the result of which is that the lowered needles (whose feet were under the cam F) retain their original stitches, while all the raised needles whose feet were over said cam F slip their original stitches over the newly-received yarn as the needles are pulled down to the lowest point of cam-groove f , and all the needles continue in these respective conditions until one revolution of the cylinder B is completed, when the tripping-lug B' meets the heel j^4 of the pawl j' and frees said pawl from the tooth o , which it held during said revolution, while at the same time the pin b^6 , depending from the free end of the pawl b^4 , is pressed by the action of the spring b^7 into the recess N of the flange j of ring J, which causes said pawl b^4 to engage with one of the outer teeth, p , on the ring L and to advance said ring the distance of one tooth, (while the pawl j' is held away from the teeth o by the lug B'), when the pin b^6 emerges from the recess N, and the tripping-lug B' at the same moment passes beyond the heel of the pawl j' , and hence the spring j^3 causes the said pawl j' to instantly engage with the tooth o next to the one which it formerly held, while the pawl b^4 is freed from all contact with the teeth p until another revolution is completed. In consequence of this change (the teeth corresponding in number to the needles) the roller a^8 and cam F remain stationary for one needle until said change is made, and then the roller continues its wavy path and the cam F continues to move up and down in obedience to the movement of the roller a^8 , as before, with this necessary difference that those particular needles which were before lowered and held their stitches are now raised and slip their last stitches just after taking on fresh yarn, while those needles that were raised in the last revolution are now lowered and hold their last stitches, the result being the production of the fabric shown in Fig. 8. To produce the fabric shown in Fig. 9, it is only necessary to duplicate the several cams and operate the machine as before. In order to knit a plain stitch on a machine provided with my attachment, the screw h of cam H is loosened and the long arm of this cam lowered until it touches the bottom of the path beneath, and then the screw h is tightened again, and the cam H will move under the feet of the needles, and thus keep them out of the groove d and prevent them from being lowered by the cam F.

In case I construct my device with duplicate cams, as above described, and desire at any time to knit a section of plain stitches with a single cam, I adjust both cams H in the manner just described, and next loosen screw g of one of the cams G and drop the rear end of this cam as far down as the slot c will permit,

and then tighten the screw *g* again, and next loosen the adjacent screw *e* and drop the switch-lever *E* to the position shown in dotted lines in Fig. 2, and again tighten screw *e*, there being no change made in the arrangement of the duplicate set of cams, except the dropping the long arm of the cam *H*, already named, in which case a straight path for the needles will be left above one set of the cams (it being immaterial which set of cams is thus treated) and only the other set will operate. If I should wish to knit plain stitches with both sets of cams with a separate yarn fed for each set, or what I call "double plain knitting," then I would simply adjust both of the cams *H*, as stated, and leave the cam *G* and switch-lever *E* as shown in Fig. 2. As the two sets of cams are exactly alike, and as it is immaterial where they are located on the cylinder *B* with relation to each other, I have shown only one set in the drawings.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. The combination of a revolving cam-cylinder, a revolving double cam-ring surrounding the same and supported outside thereof, a pivot-bolt passing through said cylinder, a movable cam made fast to said pivot-bolt inside said cylinder, and a lever-arm made fast to the other or exterior end of said pivot-bolt and bearing at its free end a roller adapted to move in the cam-path of the double cam-ring, substantially as set forth.

2. The combination of a revolving cam-cyl-

inder, a revolving double cam-ring surrounding the same and supported outside thereof, a pivot-bolt passing through said cylinder and bearing a movable cam at its inner end and a lever-arm at its outer end, said lever-arm provided with a roller adapted for engagement with the cam-ring, a series of inner and outer ratchet-teeth on the cam-ring, a grooved supporting-ring for receiving and guiding the cam-ring, provided with an exterior horizontal flange notched or recessed at one point, a tripping-lug on the exterior surface of the revolving cam-cylinder, and spring-controlled pawls, one located upon the cam-cylinder and the other secured to the grooved supporting-ring, said pawls being adapted for engagement with the said inner and outer series of ratchet-teeth, the outer pawl being provided with a pin for engagement with the recess in the flange of the supporting-ring, substantially as set forth.

3. The combination of the revolving cam-cylinder *B*, having cam-path *d b f*, and slot *c*, with the adjustable cam *H*, movable cam *F*, adjustable cam *G*, stationary cams *C* and *D*, switch-lever *E*, and set-screws *h g e*, substantially as set forth.

In testimony that I claim the foregoing I have hereunto set my hand, at Milwaukee, in the county of Milwaukee and State of Wisconsin, in the presence of two witnesses.

HERMAN HEINE.

Witnesses:

H. G. UNDERWOOD,
GEO. W. YOUNG.