

O. TWOMBLY.  
Knitting Machine.

No. 229,288.

Patented June 29, 1880.

Fig:1.

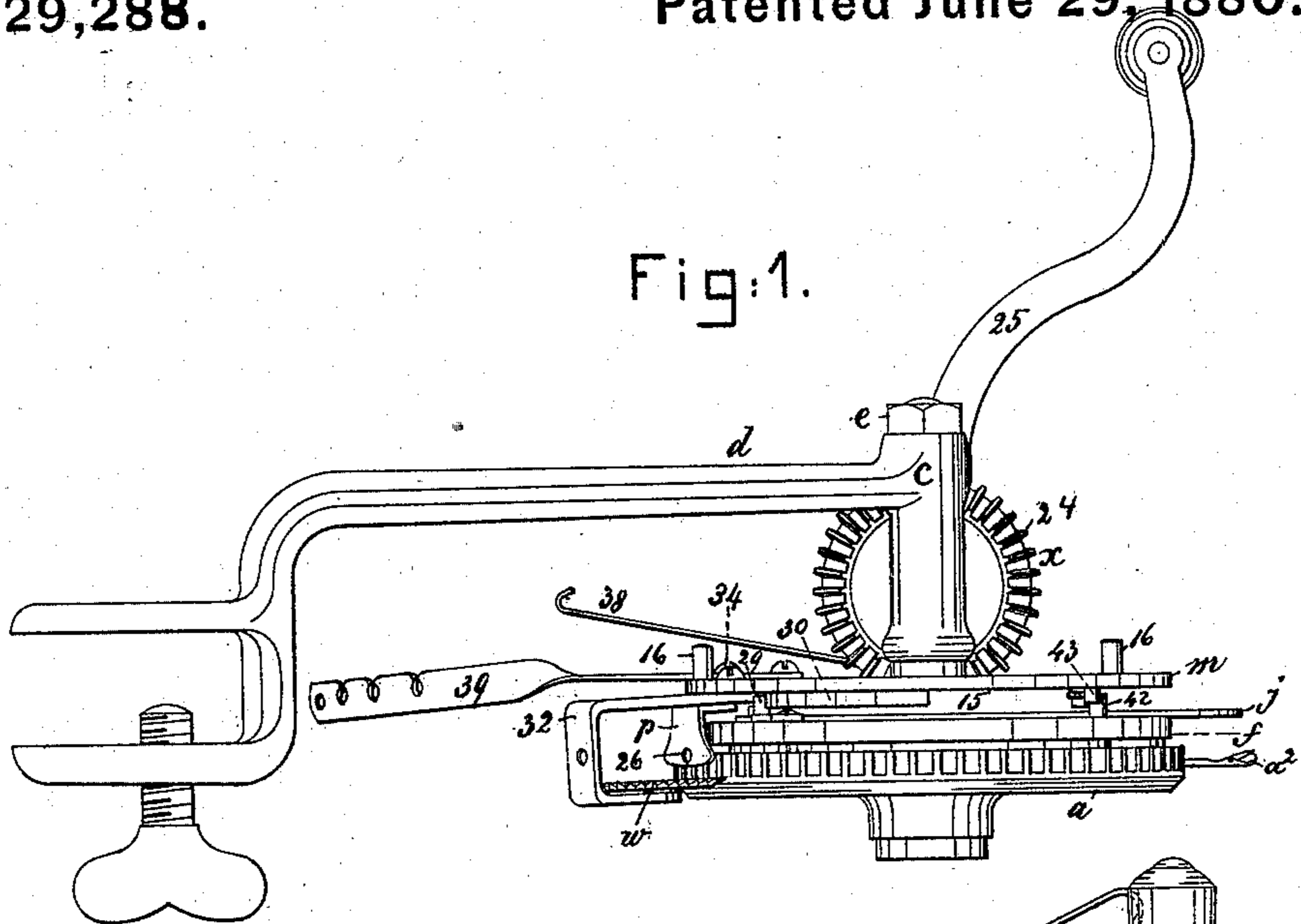


Fig:2.

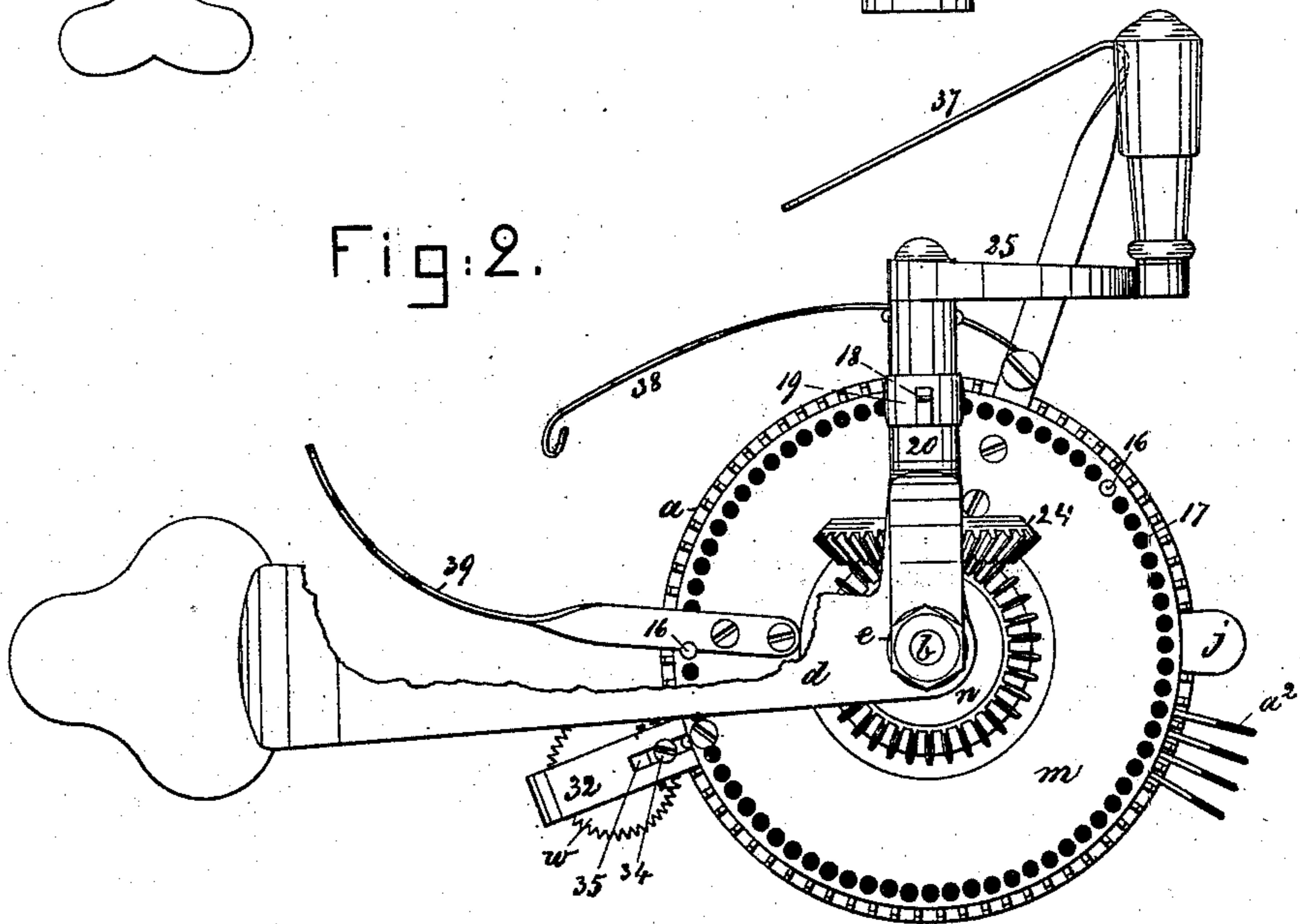


Fig:3.

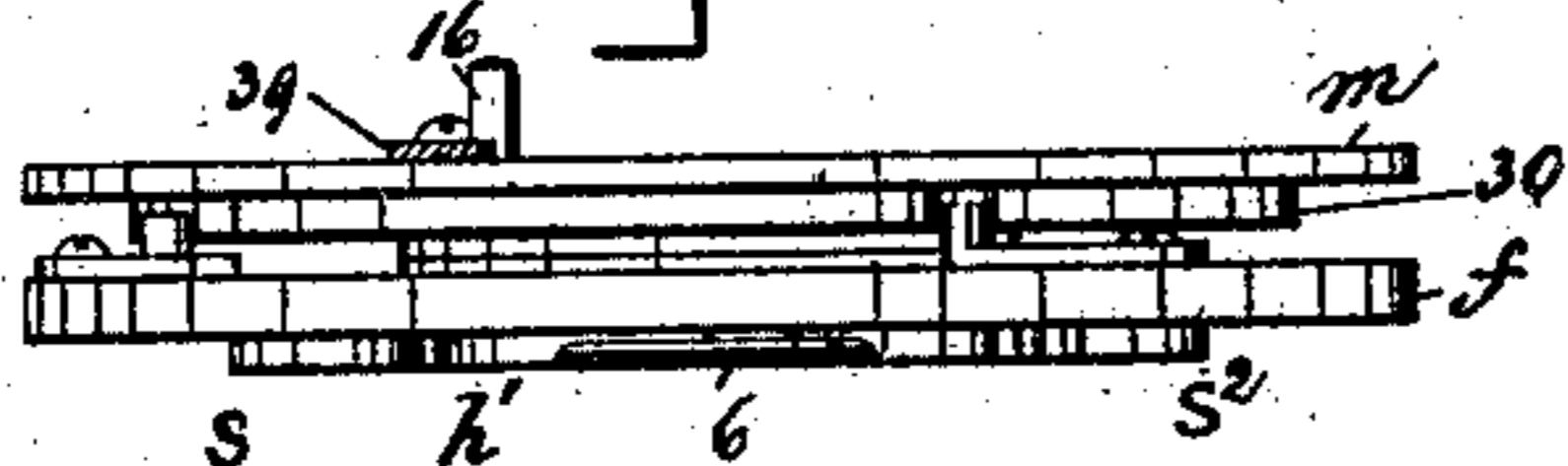
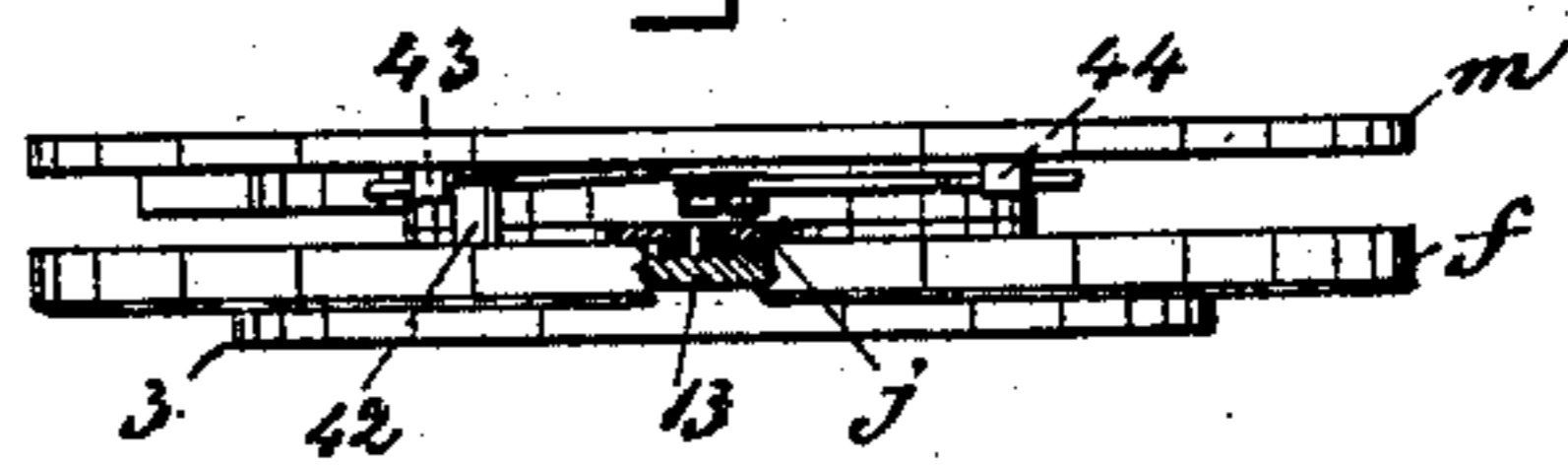


Fig:4.



Witnesses.  
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Fig. 5.

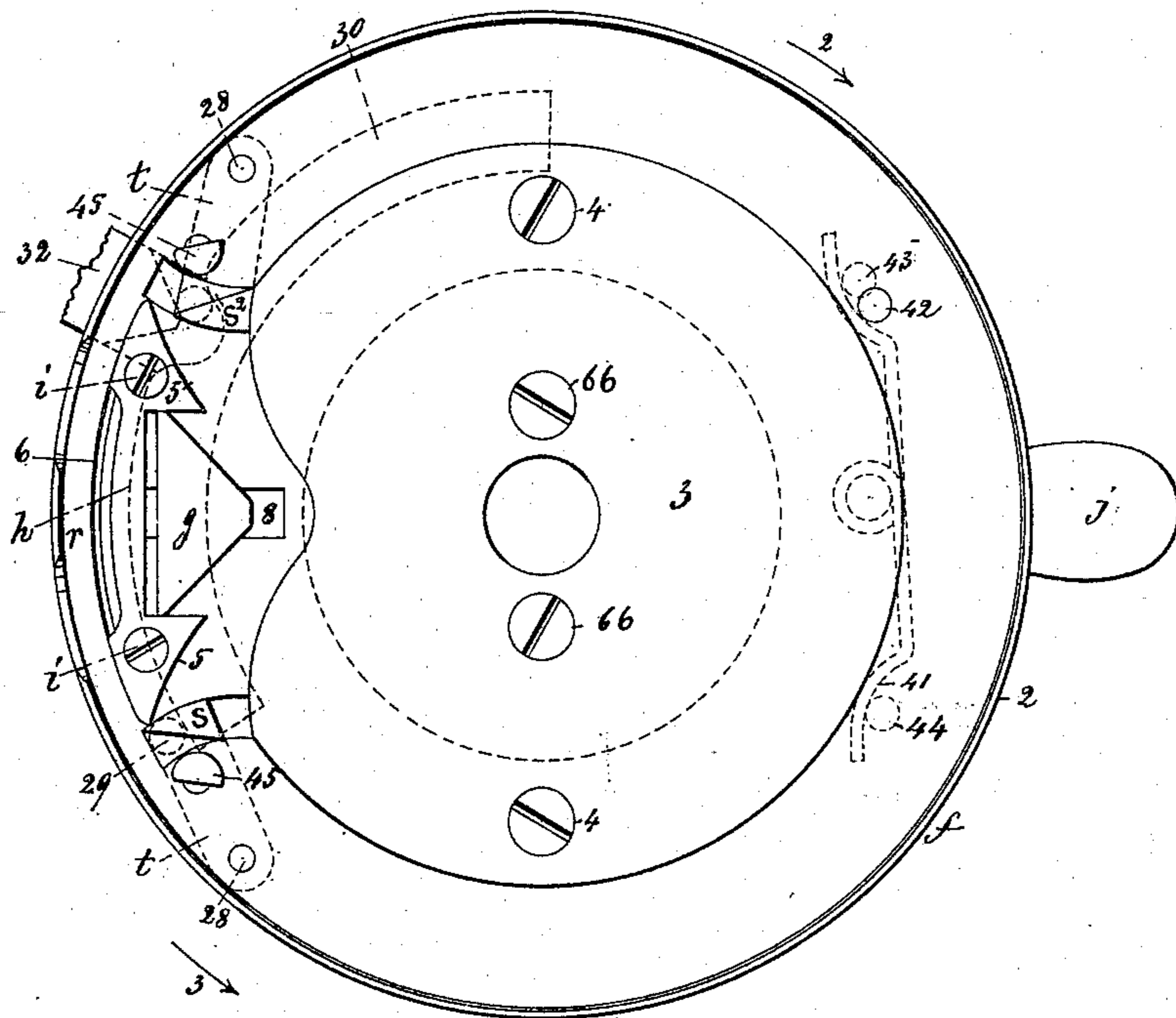
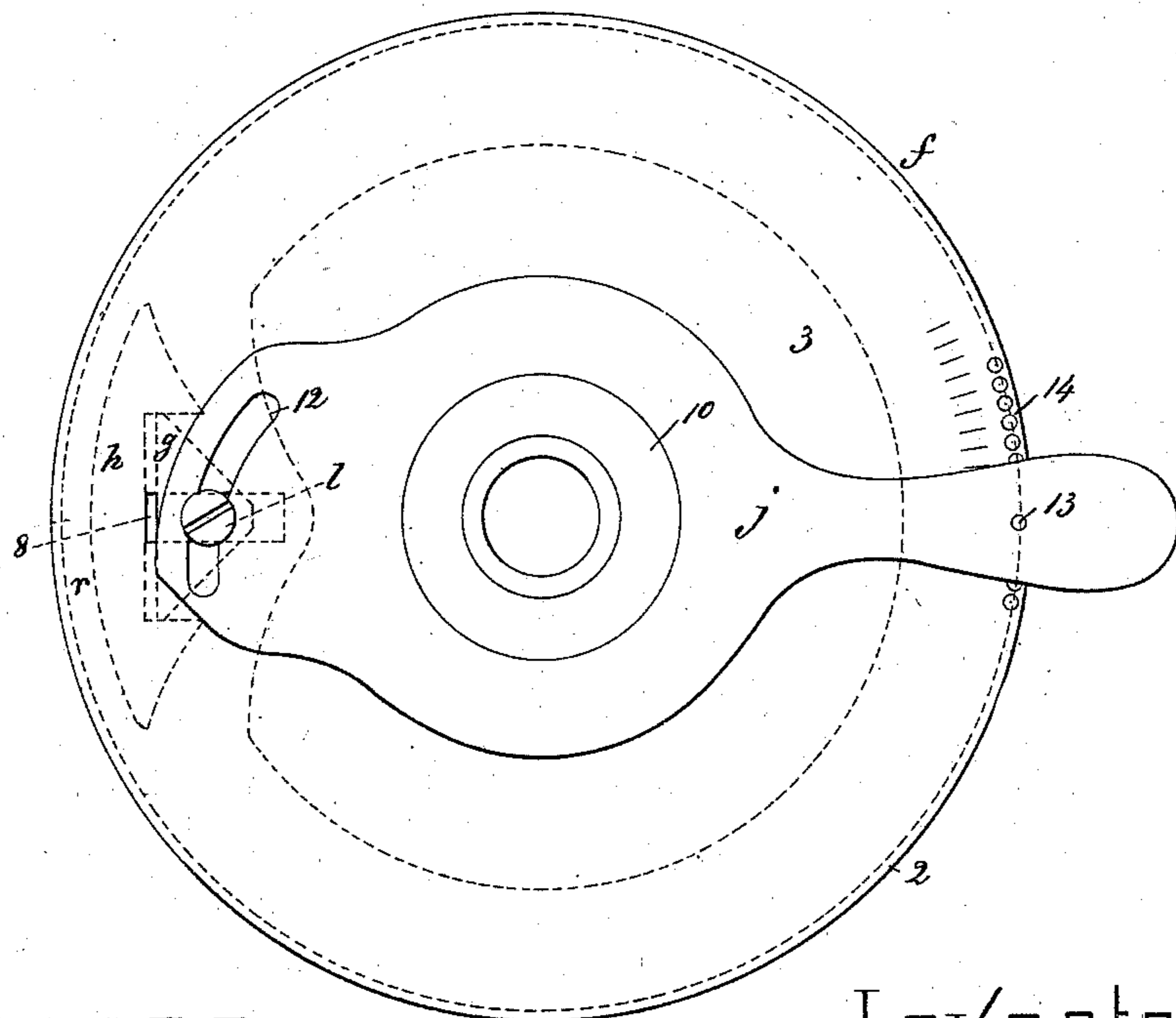


Fig. 6.



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Fig:7.

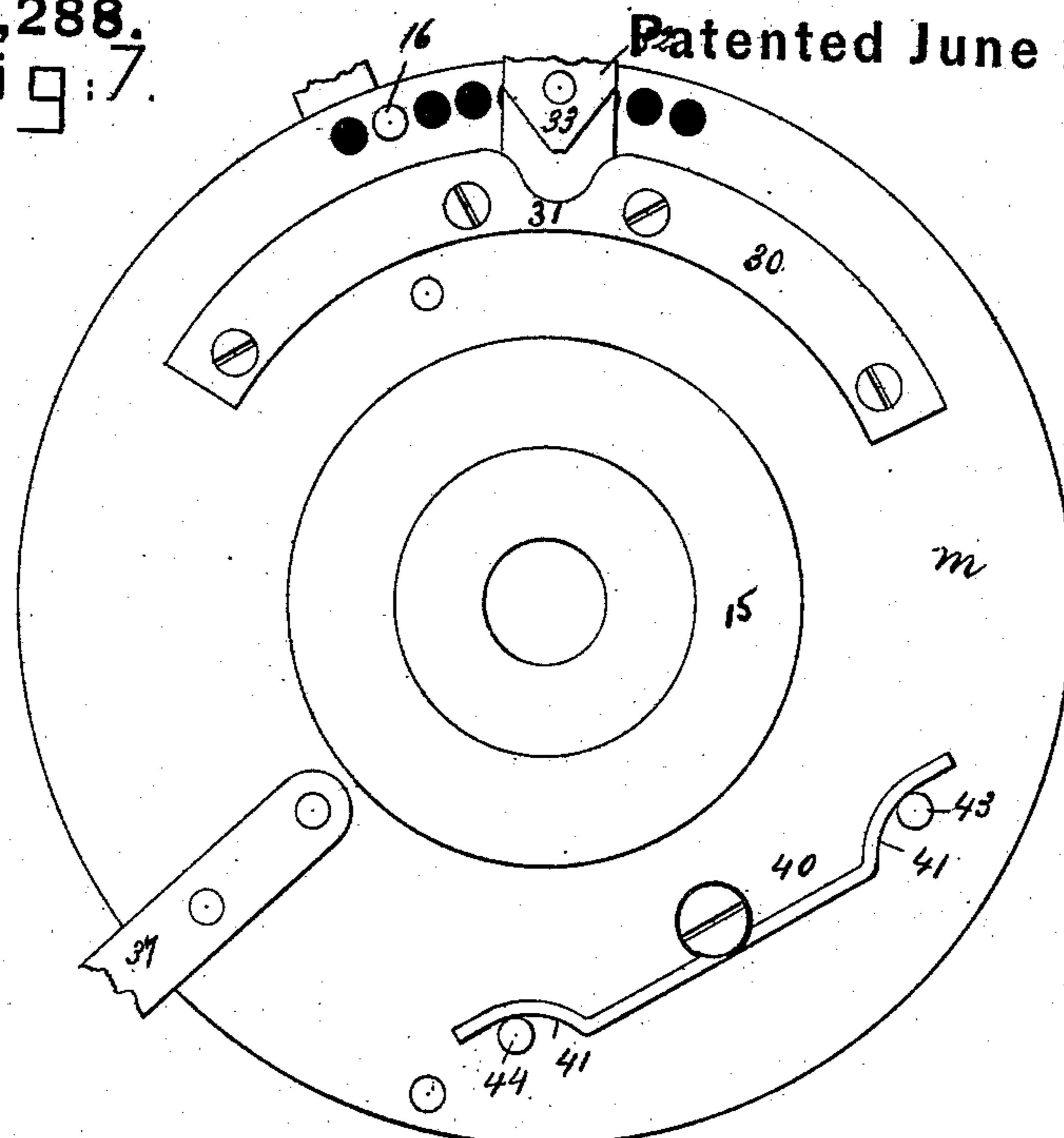


Fig:8.

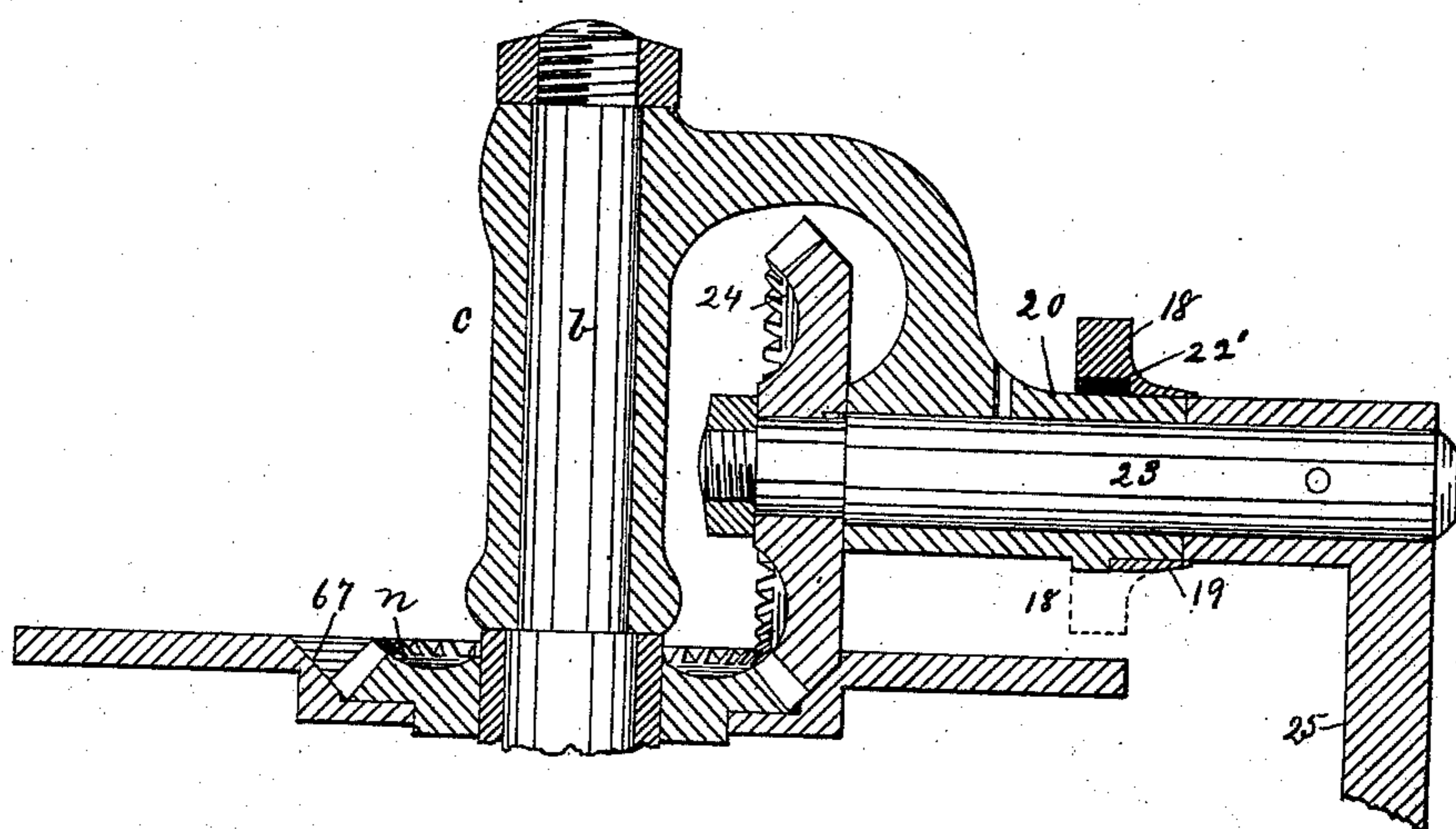


Fig:9

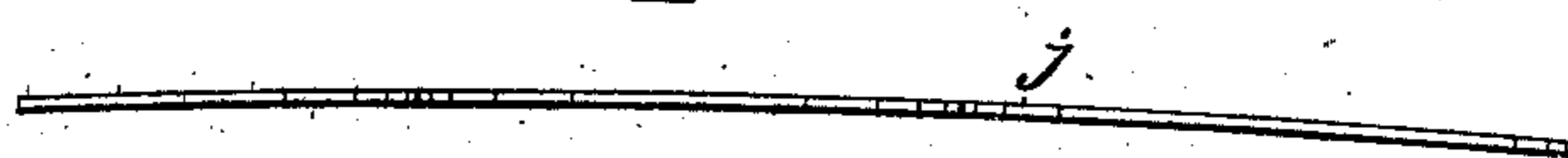
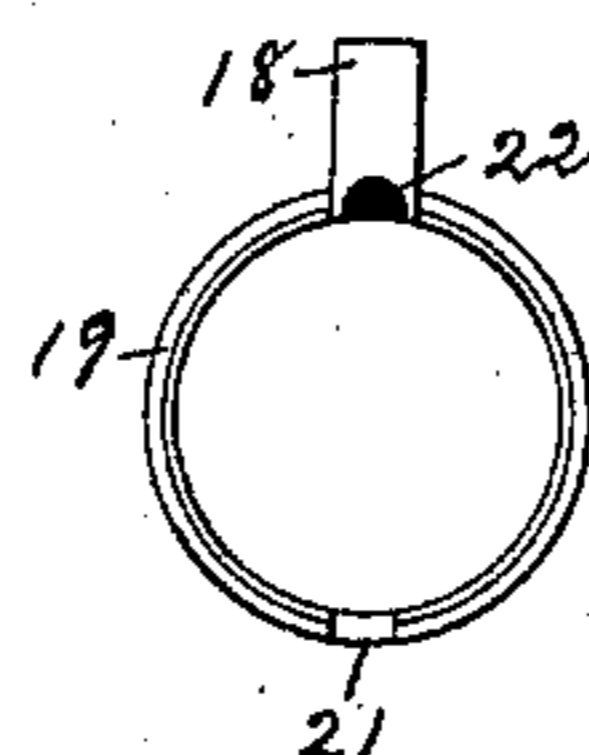


Fig:10.

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# UNITED STATES PATENT OFFICE.

ORISON TWOMBLY, OF LAKE VILLAGE, NEW HAMPSHIRE.

## KNITTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 229,288, dated June 29, 1880.

Application filed January 12, 1880.

*To all whom it may concern:*

Be it known that I, ORISON TWOMBLY, of Lake Village, county of Belknap, State of New Hampshire, have invented an Improvement in Knitting-Machines, of which the following description, in connection with the accompanying drawings, is a specification.

This invention relates to improvements in knitting-machines employing a radially-reciprocable set of latched needles held in a stationary radially-grooved disk-bed, and operated by a cam-disk which is capable of being rotated continuously in one direction, for the production of a tubular knitted web, or of being reciprocated over a greater or less number of needles to knit a selvage-edged web, or a portion thereof, of same or varying width, as may be desired, in the fashioning of the heels and toes of stockings, or for other work.

This present invention is an improvement on United States Letters Patent Nos. 141,836 and 173,086, heretofore granted to me, and to which reference may be had. In the said Patent No. 173,086 the operator, when doing reciprocating knitting, had to depend upon judgment to govern the extent of each reciprocation, which demanded constant care and attention and rendered it impracticable to run the machine rapidly.

In this my present machine I have combined with the usual needle-operating cam-disks an independent pattern-disk frictionally held or connected with the cam-disk. The said pattern-disk is provided at or near its edge with a series of holes to receive pins, which at the proper time come in contact with a reversing-stop, to thereby change the position of the pattern-disk and the thread-deliverer mounted thereon with relation to the apex of the knitting-cam, as is necessary for reciprocating knitting.

It will be noticed that this pattern-disk also carries the bobbin-holder, tension devices, and web-holding toothed wheel.

In this present machine the knitting-cam is composed of two parts, one of which is fixed to the cam-disk and gives to the needles a start, while the other part of the cam is made radially adjustable with relation to the ends of the needle-starting parts, to insure any desired length of loop, and at each end of the needle-starting parts I have added certain wedge-

blocks, which, by change of their positions with relation to the ends of the needle-starting parts, determine when such ends shall or shall not operate the needles to knit. These wedge-blocks, as the pattern-disk is shifted upon the cam-disk, are moved outward by means of a cam connected with the pattern-disk, and inward, in this instance, by a cam-projection attached to the arm which supports the thread-deliverer.

The pattern-disk has also connected with it at its under side a regulating device, which co-operates with a stop on the cam-disk to regulate the distance that the thread-deliverer shall travel beyond the selvage-needle when doing reciprocating knitting.

Figure 1 represents, in side elevation, a knitting-machine provided with my present improvements; Fig. 2, a top view thereof, the supporting-arm being partially broken away; Fig. 3, an edge view of the cam and pattern disks, looking at that part of the cam-disk with which the needle-starting cam and wedge-blocks are connected. Fig. 4 is a view of the same disks from their opposite edges. Fig. 5 is an enlarged view of the under side of the cam-disk, showing its cams, the dotted lines showing the position of the cam for operating the wedge-blocks and the regulating device, to be referred to; Fig. 6, a top view of the cam-disk, showing the friction-lever for moving the knitting-cam; Fig. 7, an under-side view of the pattern-disk; Fig. 8, a section thereof, showing the bevel-gear above it and actuating parts; Fig. 9, an edge view of the lever for moving the knitting-cam, and Fig. 10 details of the stop for the pattern-disk.

The radially-grooved needle-bed and the pin or stud *b* with which it is connected, and the sleeve-bearing *c* at the end of the arm *d*, and the nut *e* are substantially the same as shown in my Patent No. 173,086.

The cam-disk *f* is composed essentially of an annular plate having an outer flange, 2, entirely around it, and a plate, 3, attached to its center by screws 4, the plate 3 being cut away, as shown in Fig. 5, opposite the apex of the knitting-cam *g*, the said space left between the periphery of the plate 3 and the flange 2 serving as a wide groove for the reception of the butts of the knitting-needles *a*<sup>2</sup>, which, in practice, will be of the latched sort. It is obvious,

however, that the parts *f* 2 3 may be made as one piece.

The needle-starting cam *h*, having inclined ends 5, is affixed to the cam-disk by screws *i*. Its outer edge, at 6, is beveled or rounded, so as to obviate the latches striking the same, and at its inner side is provided with a notch to receive the knitting-cam *g*. This knitting-cam, at its upper side, has a projection to enter the slot 8 in the cam-disk, to insure right-line movement of the said cam in radial direction when it is desired to lengthen or shorten the stitch made by the needles, the said movement of the said cam being produced by the lever *j*, herein shown as composed of a thin but stiff piece of sheet-steel curved in the direction of its length, as shown in Fig. 9, having its central part cut away at 10 to embrace the stud *b*, and slotted, as at 12, to engage the screw *l*, connected with the knitting-cam. The free end of this lever is extended beyond the edge of the cam-disk, and the said lever is provided with a holding device, shown as a small projection, 13, which is adapted to enter any one of the depressions 14 made at the upper side of the cam-disk, as shown in Fig. 6, to thereby hold the said lever in adjusted position.

The pattern-disk *m* (see Fig. 7) has at its center a hub, 15, which, when the pattern and cam disks are in operative position, as in Fig. 1, rests directly upon the sheet-steel lever *j*, about its opening 10. As the cam-disk is attached to the bevel-gear *n* by the screws 66, the pattern-disk, by the action of the said gear upon the beveled upper portion, 67, thereof, (see Fig. 8,) is so forced against the curved sheet-steel lever *j* lying between it and the cam-disk as to temporarily straighten it. Straightening this lever causes it to act with sufficient friction between the said two disks to cause the pattern-disk to follow the direction of motion of the cam-disk attached to the said bevel-gear *n*, except when the friction so produced is positively overcome by one of the pins 16 (placed in one of the pin-holes 17, a series of which are made about the pattern-disk, as in Fig. 2) striking against the stop 18, (shown in Fig. 2.) The stop 18 is turned down at the proper time, as shown in Fig. 8, dotted lines, to rest in the path of the pins 16, which project upward from the moving pattern-plate. This stop 18 is shown as connected with a sleeve, 19, fitted about the bearing 20, and is adapted to be so moved and held as to project upward, as in Fig. 2, when circular knitting is being done, and of being turned downward, as just described, when reciprocating knitting is being done. The detail of this stop and its connection with the bearing is shown in Fig. 10, where it will be noticed that the sleeve has within it grooves 21 and 22 to fit a key, 22', on the bearing 20, and by moving the collar or sleeve of the stop laterally it may be engaged with or disengaged from the said key.

The shaft 23, moving the bevel-gear 24, which

engages and drives the bevel-gear *n*, has connected with it the handle 25; or it might be a pulley of usual construction.

The lever *j*, clamped, as described, at its central part, when moved by grasping its free end, will cause its slotted end to move in the arc of a circle or laterally about its central clamped portion, and acting upon the screw *l* will draw the knitting-cam more or less out from the notch in the needle-starting cam, as before described, as it is desired to increase or decrease the length of loop to be formed.

The edges 5 of the needle-starter *h* give to the needles their start inward to form loops from the yarn delivered into the hooks of the needles from the eye of the thread-deliverer *p*, (see Fig. 1,) and the butts of the needles, after passing from one of the said edges 5, are acted upon by one of the inclined edges of the knitting-cam, it, by its position, determining the length of the loops to be formed.

The long edge 6 of the needle-starter *h* always occupies the same fixed position, so as to act in the same manner upon the butts of those needles which are thrown outward into the groove or space *r* between it and the flange 2 by either of the wedge-shaped blocks *s* *s*<sup>2</sup>, for, when reciprocating knitting is being done, the needles, the butts of which rest in said space *r*, are projected outward, and during that time they hold their loops, but do not knit.

If the parts *h* and *g* were in one piece and should be adjusted, the width of space *r* would be varied at times, and the ends of *h* would close the spaces between the edges 5 and the wedge-blocks. The wedge-blocks *s* *s*<sup>2</sup> form part of carrying-arms *t*, shown in dotted lines, Fig. 5, pivoted at 28. These arms *t* each have a stud, 29, which is acted upon by the outer edge of a cam, 30, on the pattern-disk, (see Fig. 7 and dotted lines Fig. 5,) which moves the arms so as to place the wedge-blocks into either of their two positions shown in Fig. 5. With the block *s* *s*<sup>2</sup>, as shown in Fig. 5, the cam-disk being moved in the direction of the arrow 2, the butts of the needles will pass along the outer edge of *s*<sup>2</sup>, strike edge 5, and pass from it to the edge of the knitting-cam, thence along the groove and in contact with the edge of plate 3, when tubular or circular knitting will be done, the stop 18 then being turned up, as in Fig. 2.

To perform reciprocating knitting, a certain quantity of the needles which it is not desirable to employ at the commencement of the flat web, are drawn out so as to pass the loops held by them back of the latches of the said needles. In such position the butt of each of the said needles will pass in the space *r* between the flange 2 and cam as the cam-disk is reciprocated, and the said needles will not be moved by the cam.

Now, the stop 18 is turned down, and the cam-disk is turned in one or the other direction until the pins 16 strike the said stop, when the motion of the pattern-disk is arrested,

while the cam-disk continues to move, the pins 29 of the arms *t* moving along the face of the cam 30, which is then stationary, such cam acting to throw outward one or the other of the said arms and its wedge-block *s* or *s*<sup>2</sup>, according to the direction of movement of the cam-disk, the said blocks, when the cam-disk is moved in the direction of arrow 3, being in exactly the reverse position to that shown in Fig. 5.

In practice, I prefer, when about to commence to knit a heel, to draw out and throw out of operation about one-half the series of needles. The cam-disk will now be reciprocated, and at the end of each reciprocation one additional needle will be drawn out until all the needles have been drawn out except those used to knit the narrowest course, and thereafter at each reciprocation of the cam-disk a needle is returned until all the needles employed for reciprocating knitting have been returned. This operation will result in the production of a pocket-like web or a bulge suitable for the formation of a heel, after which all the needles will be returned into working position and the stop 18 will be turned up, which will leave the parts in condition to resume circular knitting for the foot of the stocking.

To knit a toe it is only necessary to form a bulge, as before described, and press it off. The toe is completed by joining the loops so pressed off by a short seam across the bottom of the foot just back of the toe end.

To throw an arm, *t*, in and cause its pin 29 to enter the space 31 in the cam 30, (the wedge-block then assuming the position shown by block *s*<sup>2</sup>), I have so shaped the inner end of the arm 32 as to form a cam, 33, the inclined edges of which operate at the proper times, according to the direction of movement of the cam-disk, to strike the pins of said carrying-arms *t* and push them and their wedge-blocks inward. This arm 32 has adjustably attached to it, by adjusting-screw 34 in slot 35, the yarn-deliverer *p*, it being made adjustable independently of the said arm in order to place it in the proper position with relation to the length of the needles beyond the needle-disk.

When the machine is knitting properly the arm 32, which carries the deliver *p*, stands opposite that end of the needle-starter between which and the adjacent wedge-block the butts of the needles are to pass; but if the arm 32 be turned by hand and left opposite, or nearly so, to the apex of the knitting-cam it will so move the wedge-blocks as to close the passage between them and the starter, so that should the cam-disk be turned in either direction it will not cause the needles to cast off their stitches. This is a very convenient provision, for it frequently happens that a person using a machine will leave it and some one else will turn it carelessly and run off the work.

The teeth of the toothed wheel *w*, supported by the arm 32 and free to rotate about its supporting-stud, act upon and partially enter the

outer face of the web being knitted, and operate to hold it back as the needles are moved outward to take the yarn.

The bobbin to supply the yarn for knitting is held on a projecting arm, 37, attached to the pattern-disk, the said disk having also attached to it the take-up 38 and the guide 39.

Connected with the pattern-disk is the regulator 40, herein shown as a spring, having holding-cavities 41, into one of which, at the end of each reciprocation of the cam-disk, enters the pin 42, connected with the cam-disk *f*.

The pattern-disk, near the ends of the regulator, has two pins, 43 44, which become, as it were, fixtures when the motion of the pattern-disk is arrested, as before described; and when the pin 42 on the cam-disk, which continues to move after the pattern-disk is stopped, reaches either of the said pins 43 or 44, according to the direction of the knitting, the said pins act to positively stop the movement of the cam-disk, and, as will be obvious, the distance which the cam-disk can move beyond the pattern-disk is determined by the distance between the pins 43 44. The pin 42, having been stopped by one of the said pins 43 or 44, enters the recess 41 and causes the pattern and cam disks to thereafter move as one until one of the pins 16 again strikes the stop 18, when the said pin 42 is moved over the regulator to its opposite notch, 41.

At the rear of each wedge-block is placed a stud, 45, having an inclined face, as shown in Fig. 5, the purpose of which is to strike the butts of any of the needles which are drawn out, as described, and throw them fully out, so as to properly enter the groove *r*, should the pressure and weight of the knitted web held upon the said needles draw them so far inward as to be struck by the end of the needle-starter or one of the wedge-blocks as the cam-disk is reciprocated.

The teeth in the wheels *n* and 24 (the latter being on the rotatable shaft 23) are of equal number, so as to insure that the handle 25, when traveling through the lower part of its course, shall not strike any of the parts projecting from the pattern-disk.

I am aware that a fixed knitting-cam, with movable cams at each end of it, has been used in knitting-machines; and I am also aware that it is not new to move a thread-deliverer farther than the knitting-cam at each reciprocation.

I claim—

1. In a knitting-machine, a radially-grooved needle-disk, a cam-disk, and cams thereon to reciprocate the needles, a series of needles, and a stop, combined with a pattern-disk frictionally connected with the cam-disk, a thread-deliverer, a wheel to act upon the outer side of the knitted web, mechanism to turn the cam-disk, and pins to alternately engage the said stop and change the position of the cam and pattern disks, substantially as described.

2. In a knitting-machine, the rotatable cam-

disk, its attached needle-starter, knitting-cam *g*, movable wedge-blocks, and their carrying-arms, combined with the pattern-disk frictionally held to the cam-disk, and cams 30 and 33, to operate the said arms and wedge-blocks, substantially as described.

3. In a knitting-machine, a cam-disk and a beveled pinion, *n*, connected therewith, combined with the pattern-disk, and spring-metal lever to unite the cam-disk and pattern-disk frictionally, substantially as described.

4. The combination, with the bearing 20, of the reversible sleeve-like stop and key adapted to engage with grooves in said stop to hold it in adjusted position, substantially as described.

5. In a knitting-machine, a rotatable pat-

tern-disk, combined with and carrying the yarn-deliverer, the arm, and toothed wheel *w*, the bobbin-holder, and a take-up and tension device, all substantially as described.

6. The gear *n*, the cam-disk, the pattern-disk frictionally connected therewith, and the arm 37, the take-up, and the yarn-guide 39 carried thereby, combined with the gear 24, having the same number of teeth as the gear *n*, and the handle 25, all substantially as described.

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

ORISON TWOMBLY.

Witnesses:

G. W. GREGORY,  
N. E. C. WHITNEY.