

No. 670,892.

Patented Mar. 26, 1901.

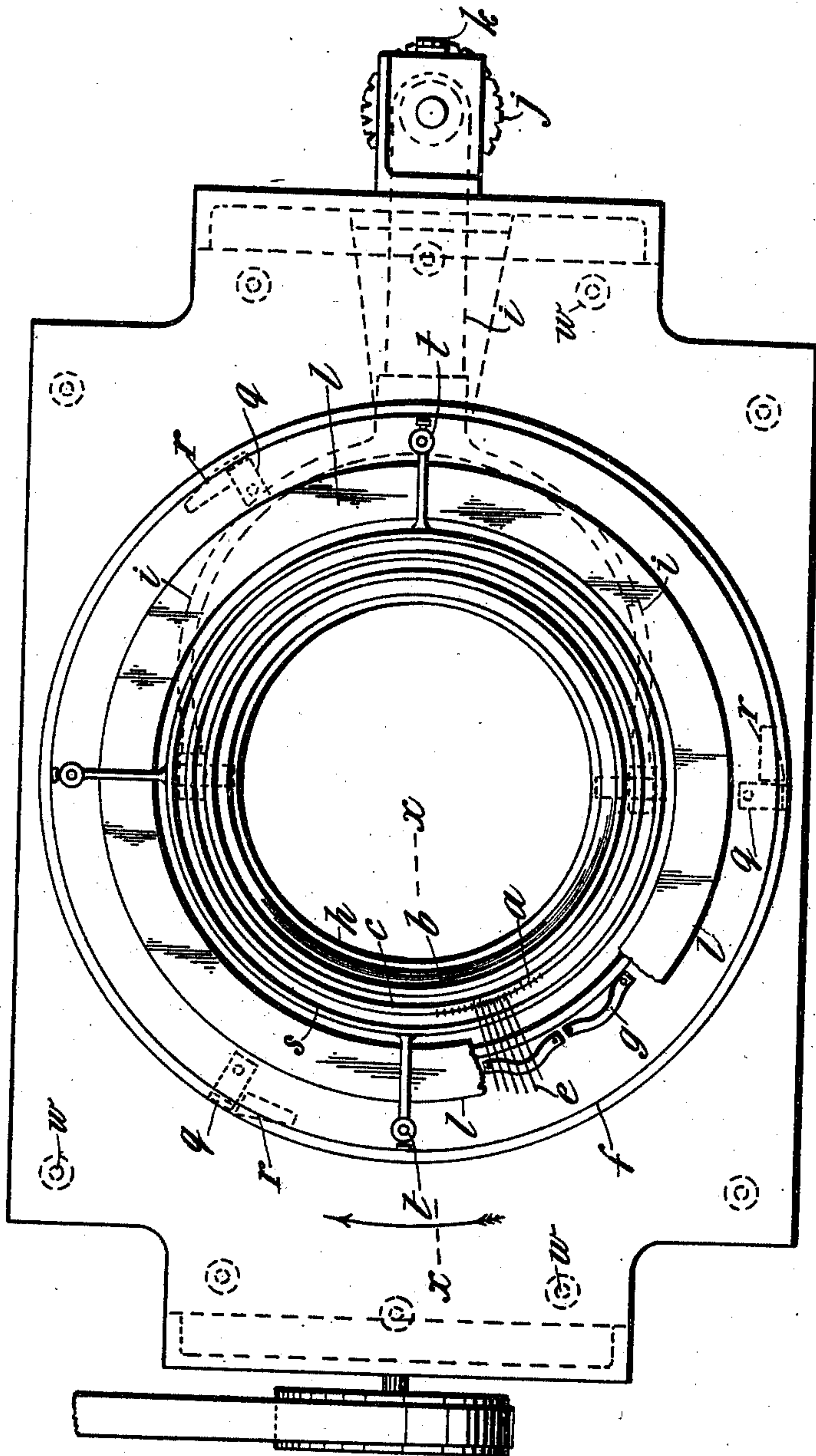
H. CLARKE.  
CIRCULAR KNITTING MACHINE.

(No Model.)

(Application filed July 7, 1900.)

4 Sheets—Sheet 1.

Fig. 1.



Witnesses  
*W. B. Steadman*  
*H. Lee Helms*

Inventor  
*Harry Clarke*  
by *James L. Norris*

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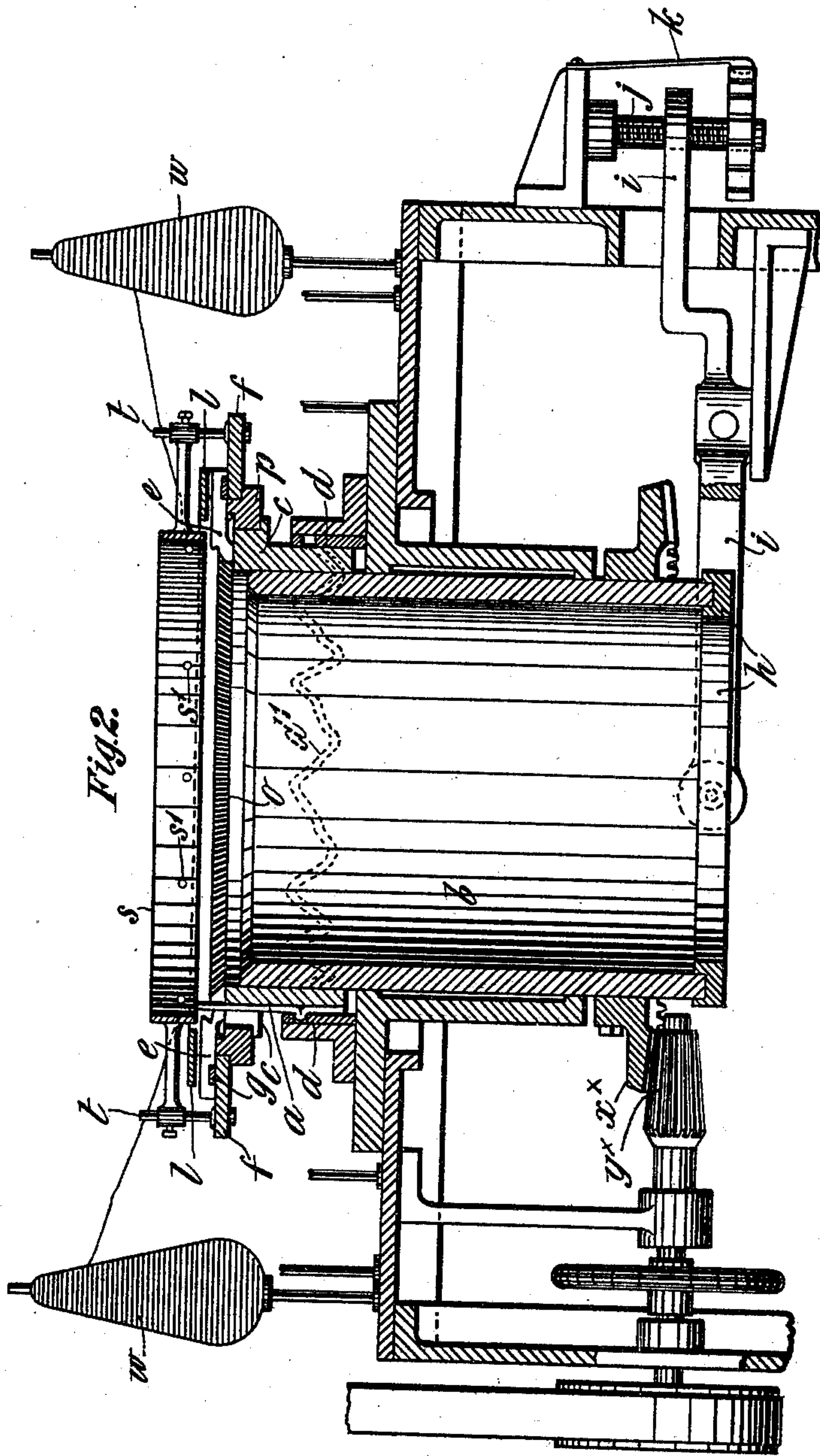
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Witnesses

*J. B. Keefe*  
*H. Lee Helms*

Inventor

*Harry Clarke*  
By *James L. Norris*  
att'y



No. 670,892.

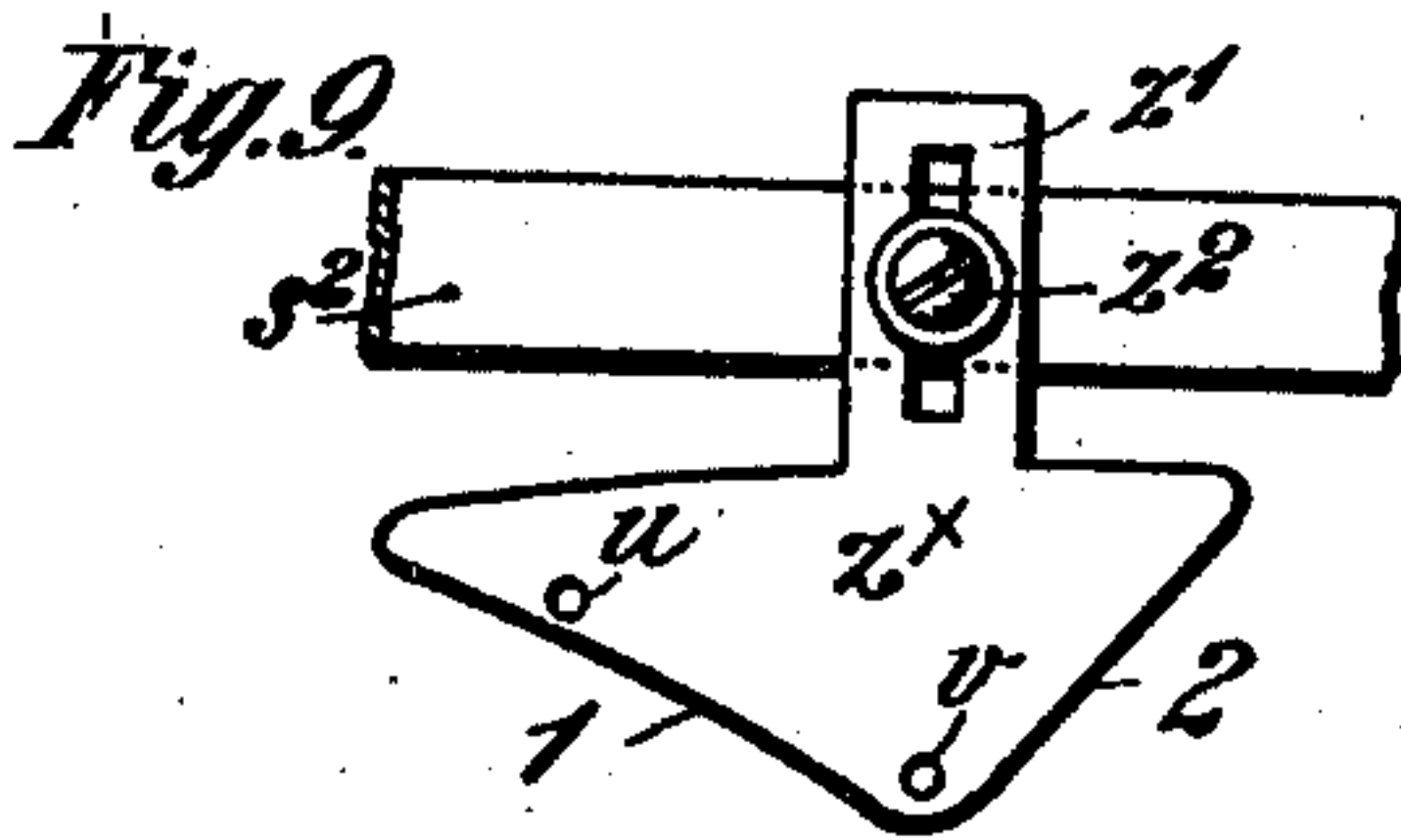
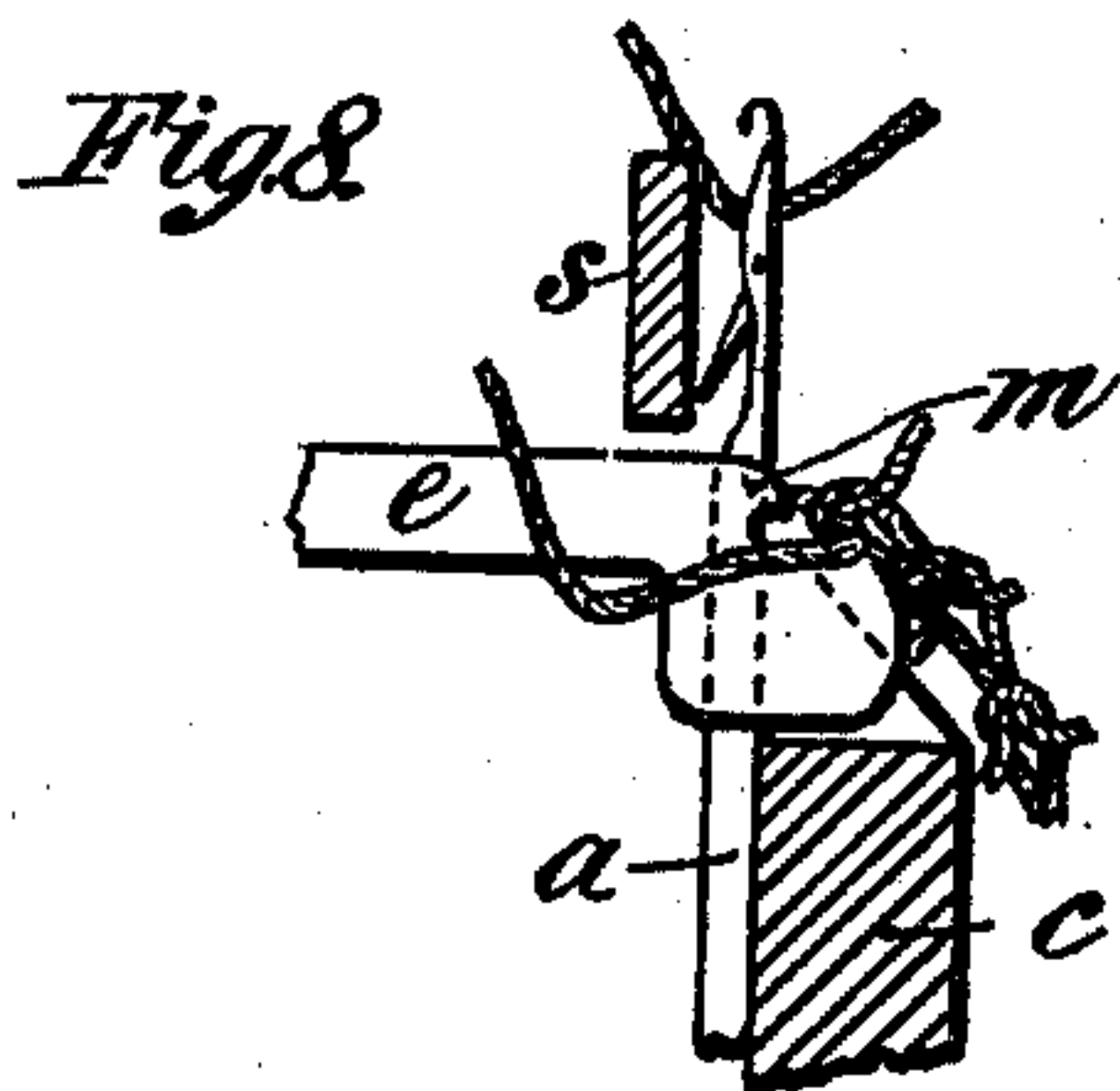
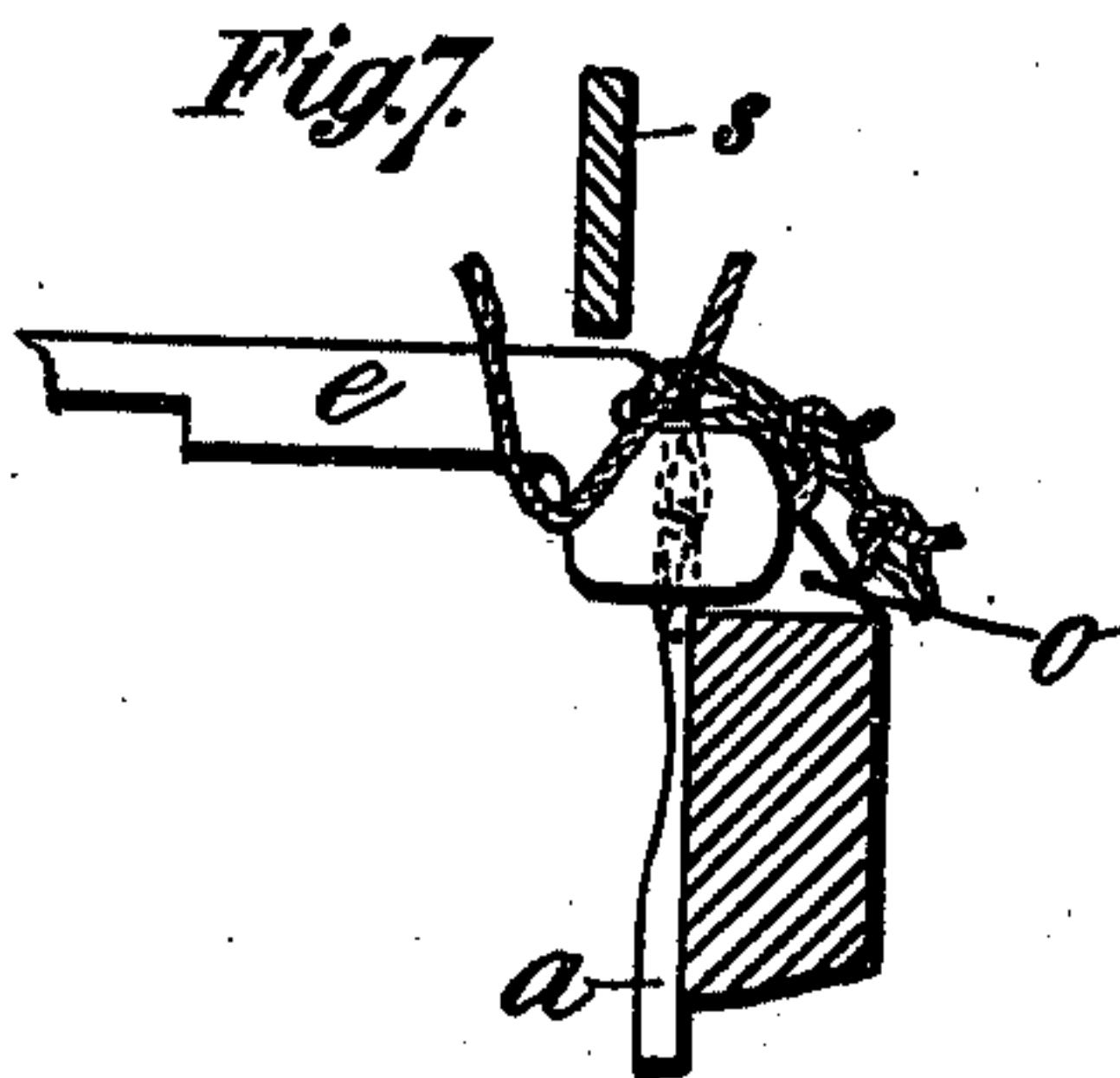
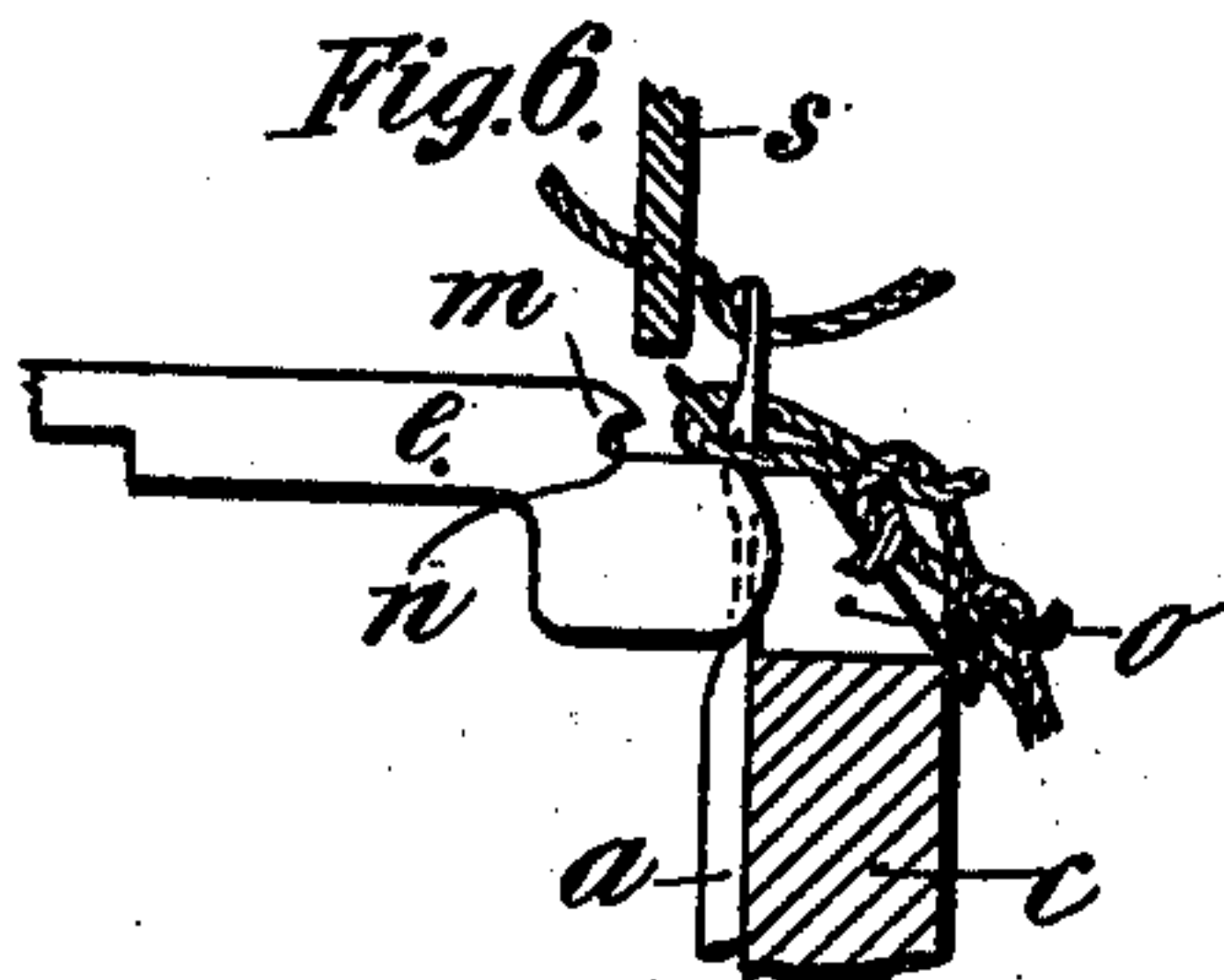
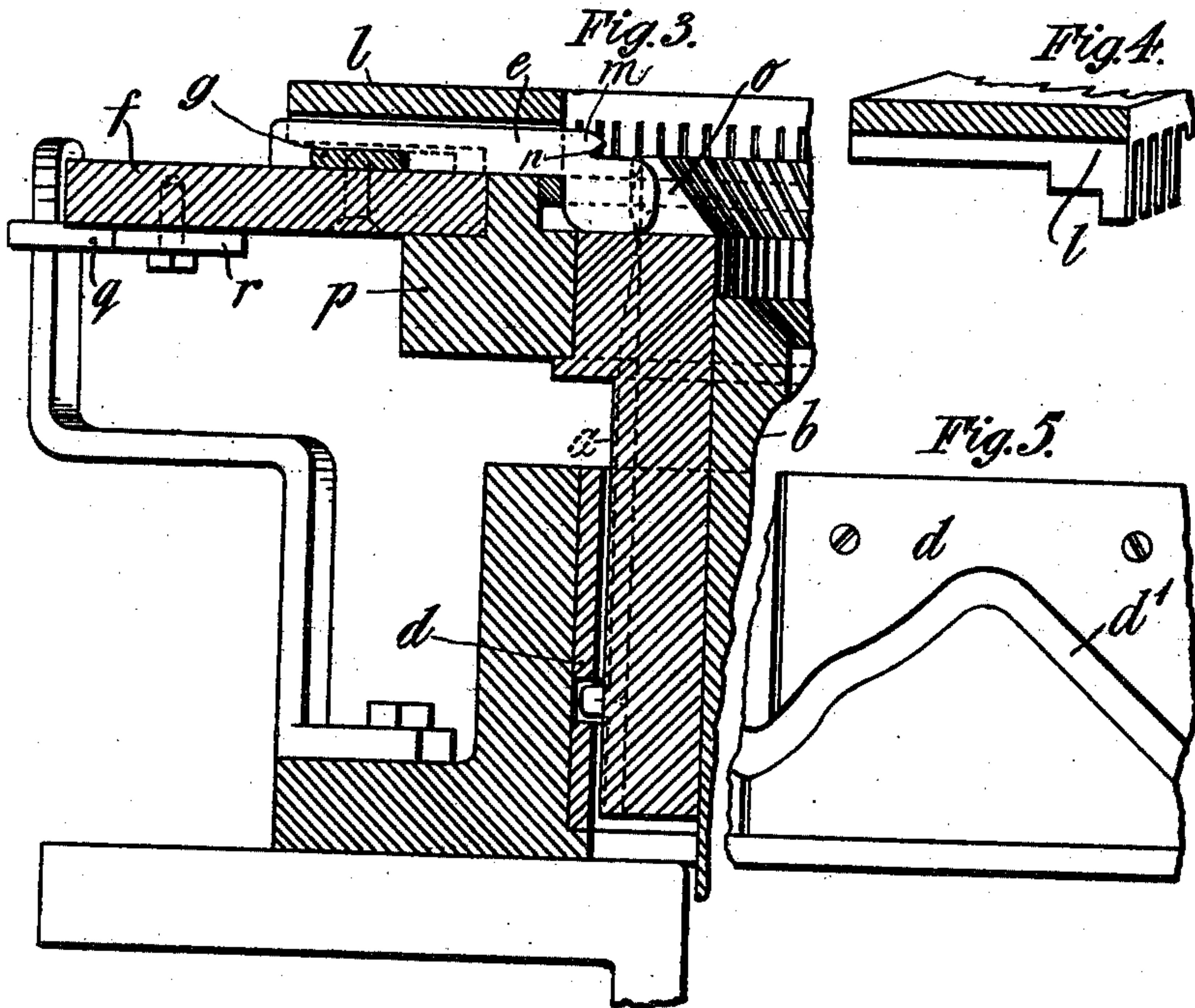
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(No Model.)

(Application filed July 7, 1900.)

4 Sheets—Sheet 3.



Witnesses

*W. B. Keeler*  
*W. A. Nelson*

Inventor

*Harry Clarke*  
by *James L. Norris*  
att'y

**No. 670,892.**

**H. CLARKE.**

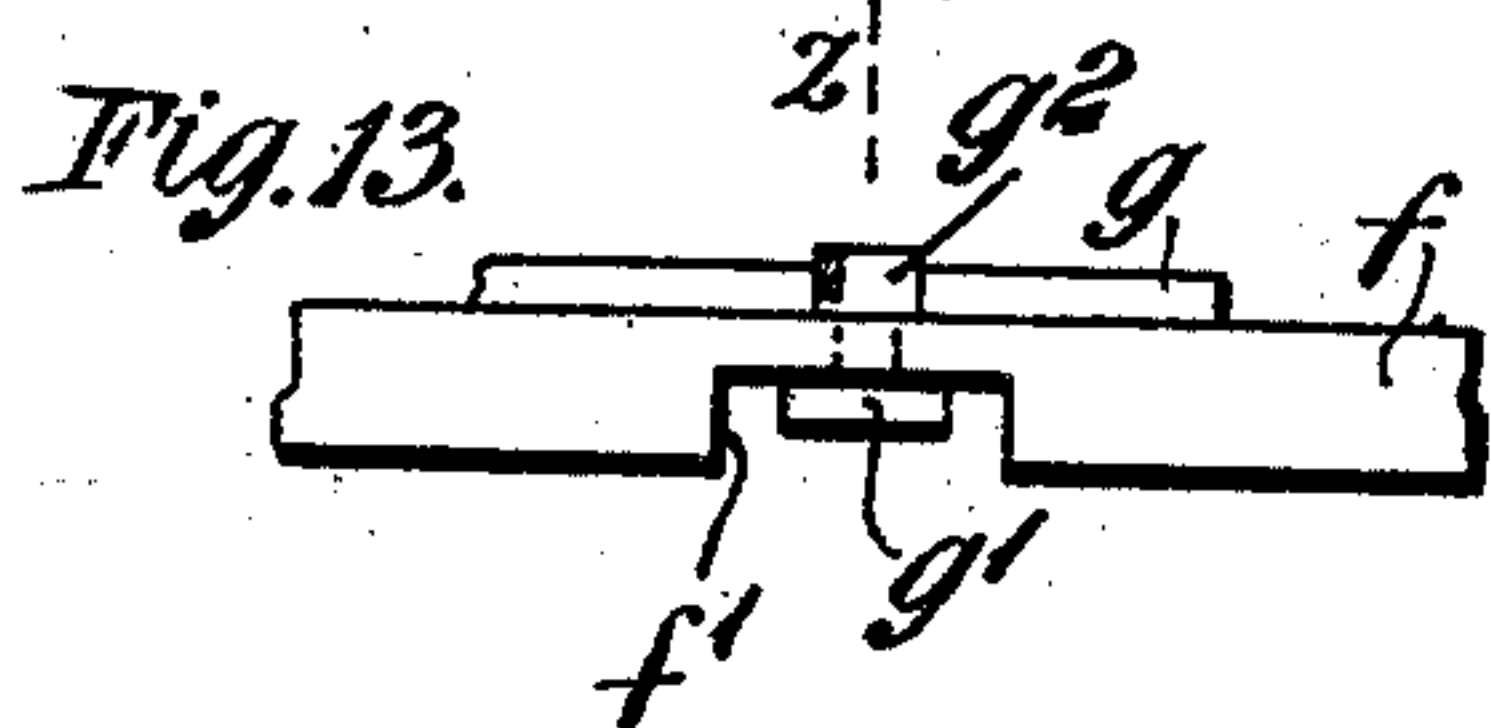
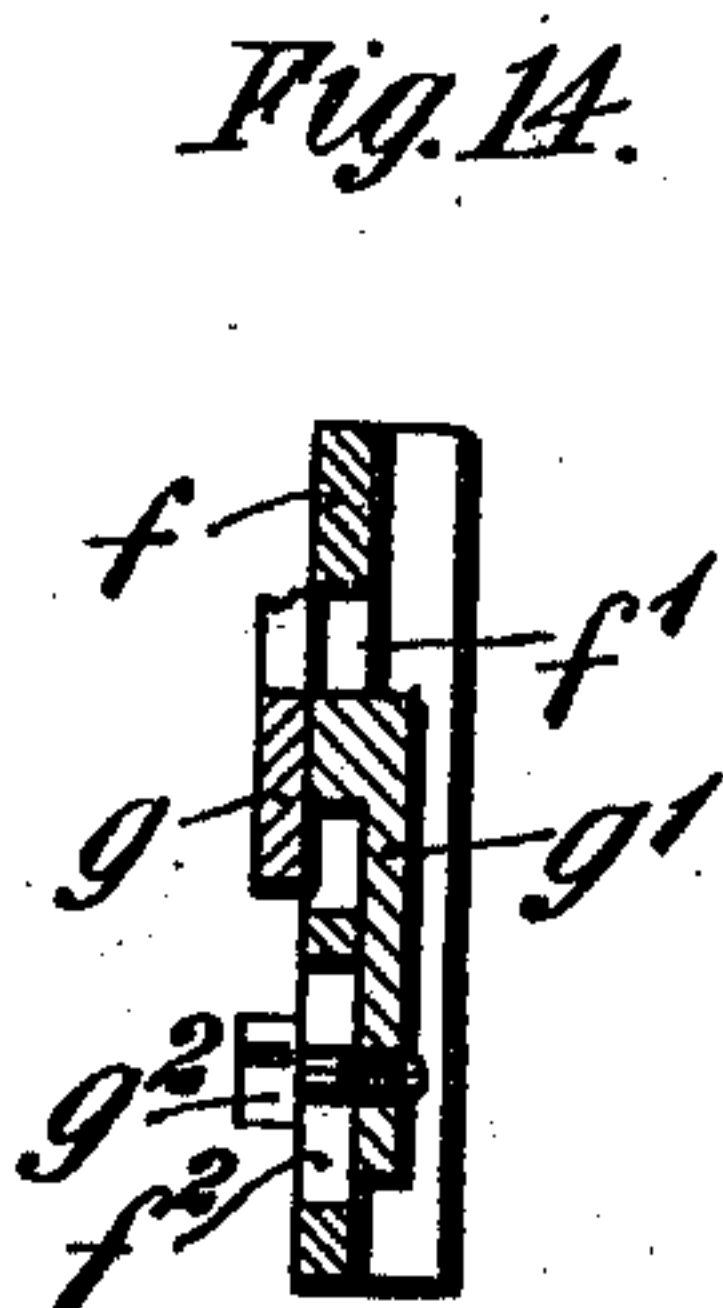
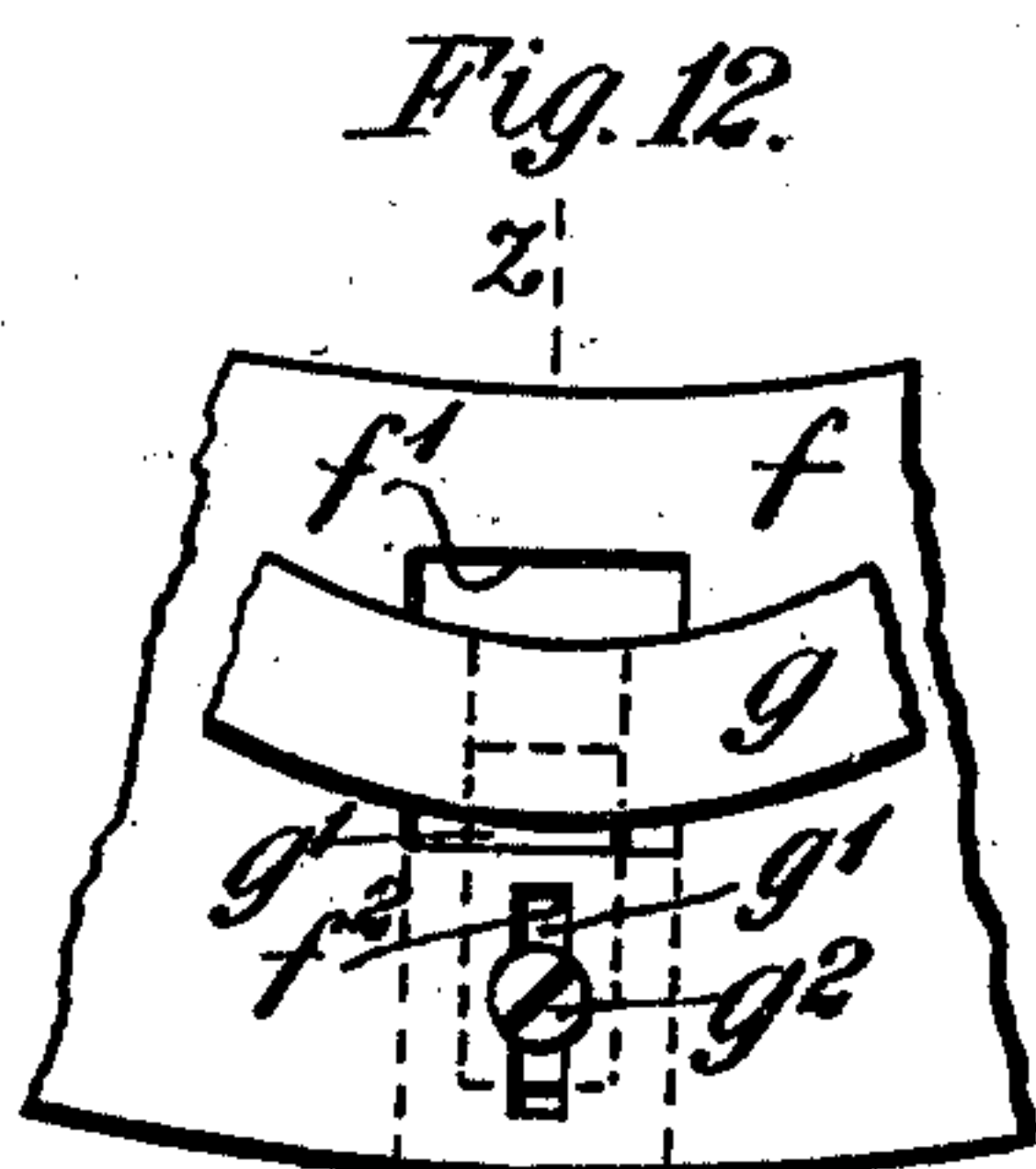
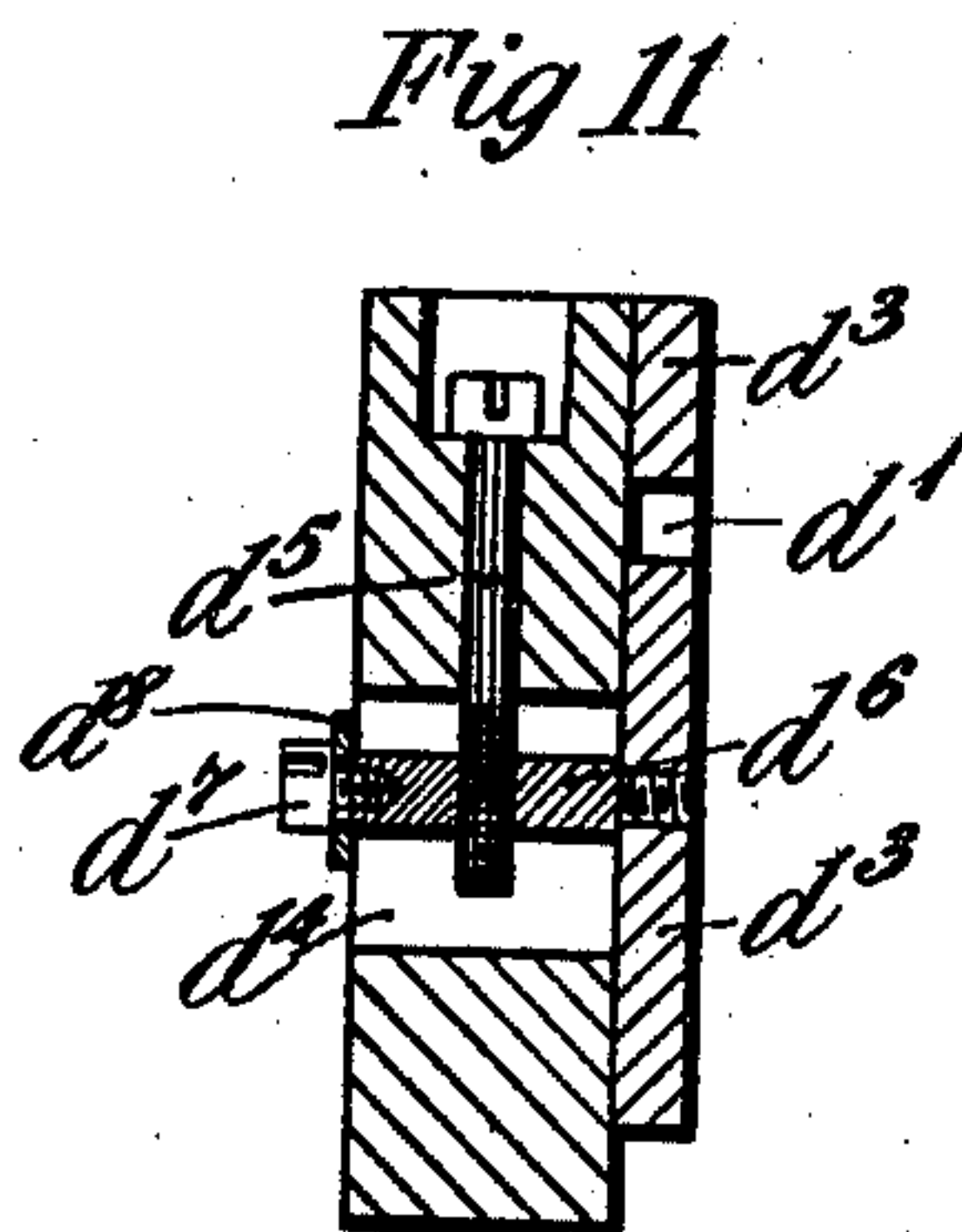
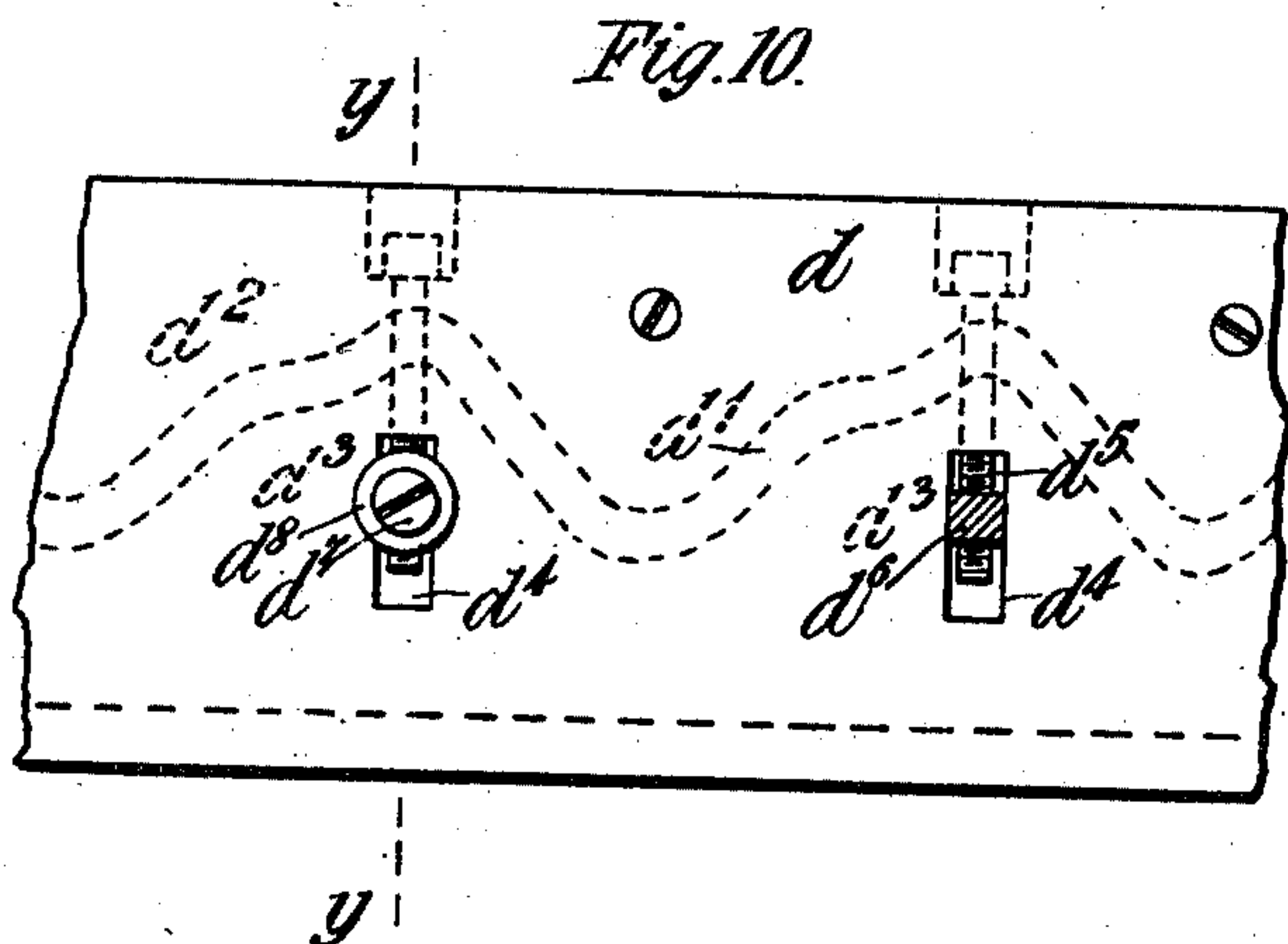
**Patented Mar. 26, 1901.**

**CIRCULAR KNITTING MACHINE.**

(No Model.)

(Application filed July 7, 1900.)

**4 Sheets—Sheet 4.**



Witnesses

W. Lee Helms

Inventor

Harry Clarke  
By James L. Norris.  
att'y



# UNITED STATES PATENT OFFICE.

HARRY CLARKE, OF NOTTINGHAM, ENGLAND.

## CIRCULAR-KNITTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 670,892, dated March 26, 1901.

Application filed July 7, 1900. Serial No. 22,846. (No model.)

*To all whom it may concern:*

Be it known that I, HARRY CLARKE, a subject of the Queen of Great Britain and Ireland, residing at Nottingham, England, have invented new and useful Improvements in Circular-Knitting Machines, of which the following is a specification.

This invention relates to circular-knitting machines for manufacturing at a much greater speed and less cost than heretofore a wide unfashioned tubular fabric intended for cutting up and sewing together to form garments.

The improved machine is provided with latch-needles and with radially-reciprocating sinkers and is so constructed that there are several knitting positions—i. e., yarn-feeders—at regular distances around it. The needles are formed in one with their stems, which latter are guided positively on their inner and outer edges to enable high speeds to be obtained. The radially-reciprocating sinkers or loop-holders serve both to keep the loops down while the needles are rising to form the next set of loops and also to force the fabric downward inside the needle-cylinder as it is produced, the work being received in a basket or upon a winding-up rack, as desired. To further simplify the construction and facilitate superintendence, the needle-cylinder and the sinkers are arranged to revolve, while the operating-cams remain stationary. The yarns, of which there may be several to each yarn-feeder, are supplied continuously at all the feeders, thus permitting a large output, while the yarn-bobbins are stationary, and hence can be very easily looked after.

The above arrangements enable the machine to work at a higher speed than others for producing the same class of work, four hundred thousand to five hundred thousand loops per minute being possible.

The invention further relates to other features of construction, as will be hereinafter fully set forth in the specification and pointed out in the claims.

Referring to the accompanying drawings, Figure 1 is a plan of a machine constructed according to this invention. Fig. 2 is a vertical central section thereof. Fig. 3 is a detail sectional view, to a larger scale, showing the arrangement of the needles, radial sink-

ers, and cams. Fig. 4 is a fragmentary view of the ring in which the sinkers are arranged, the section being on the same line as Fig. 3. Fig. 5 shows one of the needle-cams. Figs. 6, 7, and 8 are diagrams showing the formation of the loop. Fig. 9 shows an arrangement of yarn-guide suitable for a machine intended to produce either plated or plain work. Fig. 10 is an outside elevation of a portion of the needle-cam cylinder, showing the means for adjusting said cams. Fig. 11 is a section thereof on the line *yy* of Fig. 10. Fig. 12 is a plan of a portion of the cam-ring for actuating the sinkers. Fig. 13 is an edge view of the same, and Fig. 14 is a section on the line *zz* of Fig. 12.

*a* represents the needles, which are formed without jacks—that is to say, all in one piece—as shown, and have their stems made to fit in and completely fill the tricks in which they work.

*b* is the needle-cylinder, which has a ring *c* at its upper part provided with vertical and parallel tricks for the needles to work in.

*d* is the stationary cam-ring for raising and lowering the needles as they revolve, this ring having a cam-groove *d'*, the lifts or rises in which form the needle-actuating cams and which for simplicity of construction is unprovided with switches. This cam-groove *d'* is formed between fixed upper cam-pieces *d<sup>2</sup>* and adjustable lower cam pieces or rises *d<sup>3</sup>*.

*d<sup>4</sup>* represents slots in the cam-ring, and *d<sup>5</sup>* represents adjusting-screws let into recesses in the top edge of the ring and engaging in projections *d<sup>6</sup>* or “squares” working in the slots *d<sup>4</sup>*.

*d<sup>7</sup>* is a set-screw engaging in the end of the square *d<sup>6</sup>*, and *d<sup>8</sup>* is a washer overlapping the edges of the slot *d<sup>4</sup>*.

*e* represents the sinkers, which are arranged at right angles to the needles and travel around continuously with them, said needles and sinkers alternating with each other, and *f* is a flat stationary cam-ring provided with cam-pieces *g* for moving said sinkers to and fro radially, there being as many of these cams and also of the needle-cams as there are “yarn-feeders,” or, in other words, as there are courses made in each revolution of the machine, the number being conveniently about sixteen.

*g'* is a bent piece or heel secured to each



cam-piece  $g$ , extending through a slot  $f'$  in the ring  $f$ .  $g^2$  is an adjustable set-screw passing through a corresponding slot  $f^2$  in the said ring and engaging in said heel. This arrangement enables of proper adjustment of the sinker-cams in a radial direction.

$h$  is a grooved ring which supports the cylinder  $b$  and is designed to receive lubricating-oil. It is carried by a forked lever  $i$ , whose extremity can be raised or lowered by a screw  $j$ , which is prevented from turning accidentally by a spring-catch  $k$ . This arrangement enables the cylinder  $b$  to be raised or lowered, according to the gage of yarn employed and the size of the loop required.

$l$  is another trick-ring revolving with the needle-cylinder and having tricks (see Fig. 4) on its under side in which the sinkers fit.

$m$  is a nib, and  $n$  is a throat or recess at the upper side of each sinker to engage the yarn.

$o$  represents tricks in the top edge of the trick-ring  $c$  of the needle-cylinder to receive the inner ends of the sinkers. The beds of the tricks  $o$  are exactly perpendicular to those of the needle-tricks.

$p$  is a collar or ring clipped or fixed on the trick-ring  $c$  (or is a ledge formed thereon) for the sinker cam-ring  $f$  to rest upon, and  $q$  represents adjustable stops engaging blocks  $r$  on the under side of said ring to prevent it being drawn around by friction. This arrangement, however, enables the cam-ring to be turned around slightly for timing the movements which the cams impart to the sinkers, such circular adjustment being effected by correspondingly moving the stops  $q$ . The arrangement also enables the cam-ring to move up or down when the needle-cylinder is raised or lowered.

$s$  is the latch-ring, which is made to serve as a yarn-guiding ring and is secured adjustably on supports  $t$  on the stationary ring  $f$ , the yarn being fed through eyes  $s'$  from the bobbins  $w$ , which are stationary and are arranged on the frame of the machine, as shown.

$x^x$  is a bevel-gear whereby the needle-cylinder is rotated and carries with it the trick-rings  $c$  and  $l$  and the sinkers, as well as the needles, thus enabling a single driving-pinion to operate the whole machine.

It will be seen that the trick-rings  $c$  and  $l$ , in which the needles and sinkers fit, are both mounted on the needle-cylinder and revolve therewith, thus securing simplicity of construction and permitting all the parts to be driven from the single gearing  $y^x$ . Moreover, all parts of the machine are open to inspection by the operator, no "loop-wheels" or other devices that obstruct the view being employed.

The above construction of machine is particularly adapted for producing plain knit fabric at a high rate of speed. When, however, it is desired to produce plated as well as plain work, an adjustable stationary yarn-guide, such as shown in Fig. 9, is provided at each yarn-feeder. This yarn-guide con-

sists of a triangular piece  $z^x$ , in which are two sets of guide-eyes  $u$  and  $v$ , one set for the ordinary yarns and the other for the plating-yarns—that is, the second yarn used, say, for putting a silk face on a cotton back. If more than one plating or other yarn be fed in at a time, more eyes may be provided. Each guide has a slotted arm  $z'$ , by which it is secured to the guide-supporting ring  $s^2$  by a screw  $z^2$  and can be adjusted independently of any other guide. In this case the inclined faces 1 and 2 of the guides act on the needle-latches and serve the purpose of a latch-ring, the ring  $s^2$  being too high to act in such a way.

The operation of the machine is very simple, the needles being raised and lowered and the sinkers being moved in and out between them by means of their respective cams, which are adjusted before commencing to work by means of the adjusting-screws  $d^5$  and  $g^2$ . The attainment of a high speed is also assisted by the fact that the needles are formed all in one piece and work vertically and parallel with each other, being firmly guided on their inner and outer edges, as shown, while the nibs  $m$  and the recesses or throats  $n$  of the sinkers serve to keep the yarns and loops in position.

The formation of the loops is shown in Figs. 6 to 8. In the first of these figures the sinker is at its extreme backward position while the needle is descending, its latch being open and its hook about to catch the yarn. As the needle descends into the position shown in Fig. 7 the sinker comes forward and the yarn being caught in the throat  $n$  is pulled into a loop by the needle, which loop is at the same time drawn through the loop previously formed. The needle now rises, while the sinker still continues its forward movement and the nib  $m$  of such sinker knocks the last-formed loop over the tricks  $o$ . When the needle is at its highest position, the sinker is at its forward position and just beginning to retire, as shown in Fig. 8, where it is holding down the newly-formed loop under the nib  $m$ , allowing the needle to move without moving this loop and leaving the said loop around the needle, after which both needle and sinker return to the position shown in Fig. 6.

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

1. In a circular-knitting machine provided with latch-needles, a series of adjustable stationary yarn-feeders having inclined edges acting on the needle-latch, an adjustable channeled ring, a needle-cylinder operating thereon and adjusted thereby, a sinker-ring carried by said cylinder, sinkers supported thereby, means for reciprocating said sinkers, and a latch-ring supported by said means and carrying the adjustable yarn-feeders.

2. In a circular-knitting machine, the combination of a plurality of yarn-feeders, a revolving needle-cylinder, means for adjusting the height of the same, a sinker-ring carried by said needle-cylinder, cam-rings for said



cylinder and sinker-ring, means for adjusting said sinker cam-ring in a circular direction, and means for revolving said needle-cylinder, substantially as described.

5 3. In a circular-knitting machine, a series of adjustable stationary yarn-feeders, a revolving needle-cylinder, a sinker-ring revolving therewith, a sinker cam-ring arranged below said sinker-ring, means for adjusting  
10 said sinker cam-ring in a circular direction, a latch-ring for supporting the adjustable yarn-feeders and mounted upon the sinker cam-ring, and means for vertically adjusting said needle-cylinder.

15 4. In a circular-knitting machine, the combination of a number of adjustable stationary yarn-feeders each having guiding-eyes for ordinary and plating yarns, a revolving needle-cylinder, a sinker-ring carried thereby,  
20 stationary cam-rings for said needle-cylinder and sinker-ring, a grooved ring capable of containing lubricant and supporting said needle-cylinder, a forked lever carrying said ring, a screw engaging one end of said lever and  
25 serving to move it to raise and lower the needle-cylinder, and a spring-catch for preventing said screw turning accidentally, substantially as described.

30 5. In a circular-knitting machine, the combination of a plurality of adjustable stationary yarn-feeders, a revolving needle-cylinder, latch-needles therein, a sinker-ring carried by said needle-cylinder, sinkers in said ring working at right angles to said needles, cam-  
35 rings for actuating said needles and sinkers,

and means for revolving the needle-cylinder and with it the sinker-ring, substantially as described.

6. In a circular-knitting machine the combination of a plurality of adjustable station- 40 ary yarn-feeders, a revolving needle-cylinder having vertical tricks therein, latch-needles carried by said cylinder and having jacks which fill said tricks, a sinker-ring carried by said needle-cylinder, horizontal tricks in 45 the under side of such sinker-ring, sinkers arranged in said tricks, a flat cam-ring beneath said sinkers, a cylindrical cam-ring around the needle-cylinder, and means for revolving the latter and with it the sinker-ring, 50 substantially as described.

7. In a circular-knitting machine, the combination of a plurality of adjustable yarn-feeders having inclined edges to act on the needle-jacks, a revolving needle-cylinder, 55 latch-needles carried in said cylinder, a sinker-ring revolving with said needle-cylinder, sinkers in said ring each having a rib and throat at its upper side, stationary cams for operating said needles and sinkers, means for ad- 60 justing the needle-cylinder and sinker-cams, and means for driving said needle-cylinder, substantially as described.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

HARRY CLARKE.

Witnesses:

EDWARD D. HEARN, Jr.,  
THOS. H. COOK.