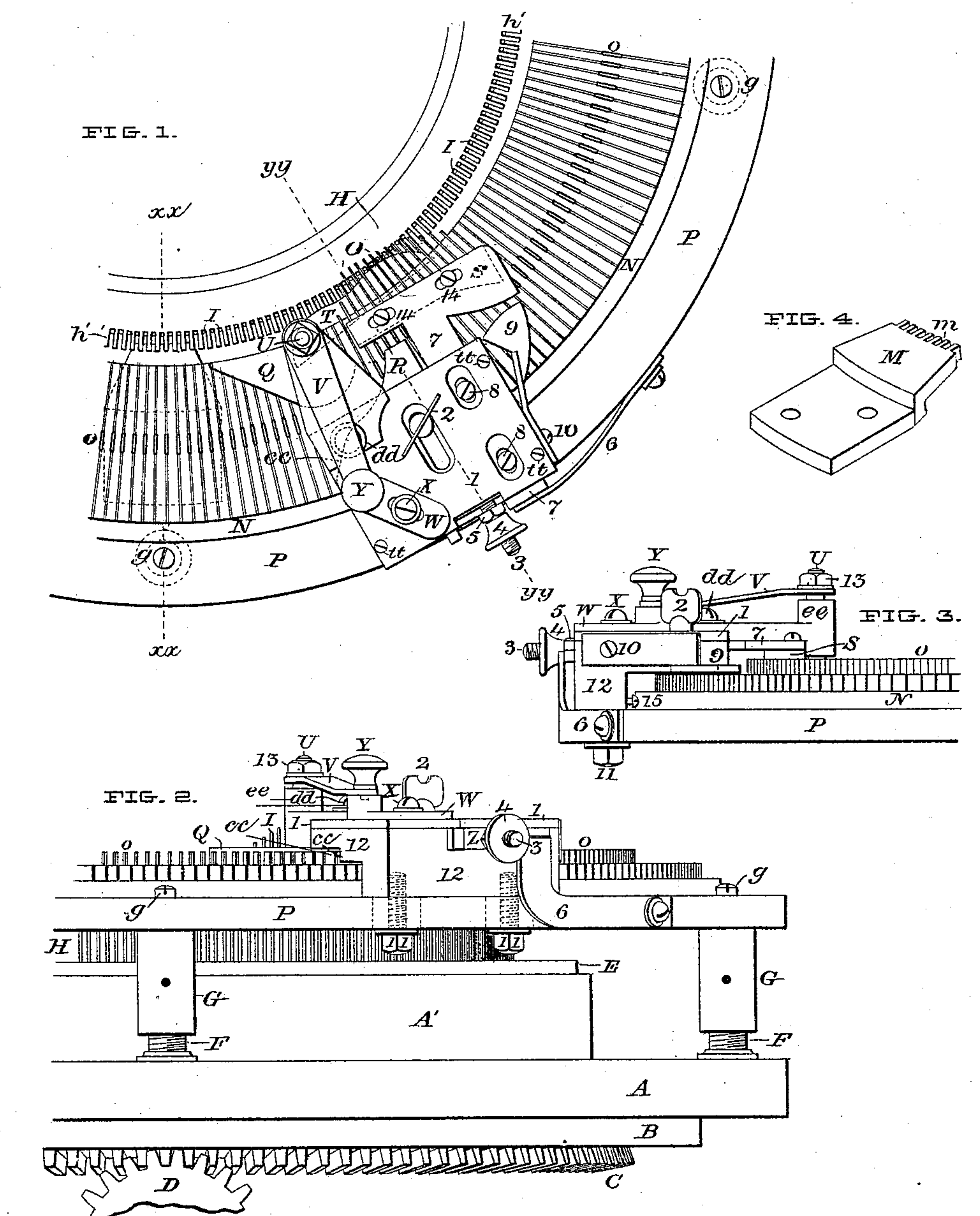


3 Sheets—Sheet 1.

No. 536,743.

Patented Apr. 2, 1895.



WITNESSES:

J. O. Bangs
C. J. Bangs

INVENTOR:

ELI TIFFANY,
BY *Franklin Scott,* ATTORNEY

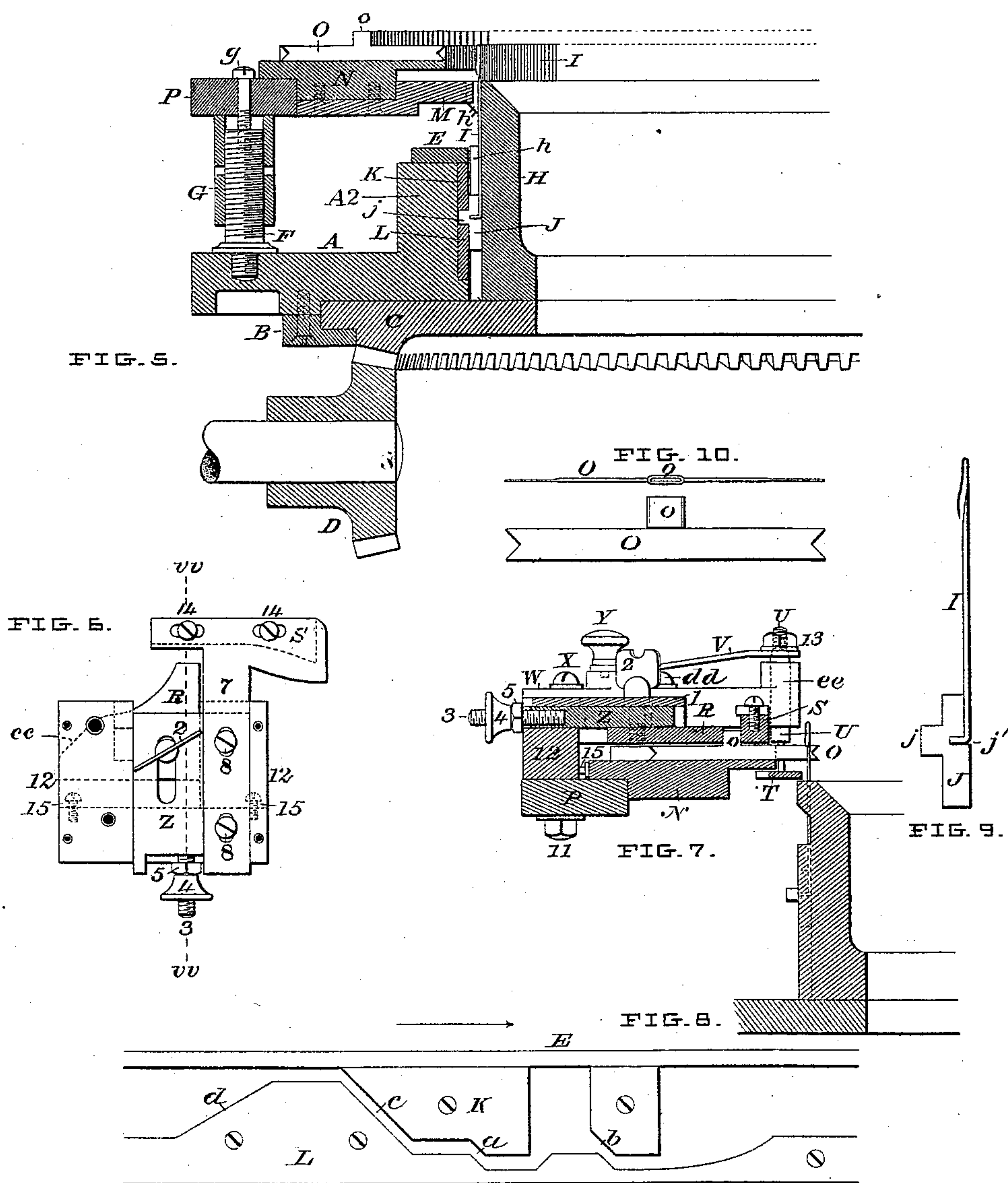
(No Model.)

3 Sheets—Sheet 2.

E. TIFFANY.
CIRCULAR RIB KNITTING MACHINE.

No. 536,743.

Patented Apr. 2, 1895.



WITNESSES:

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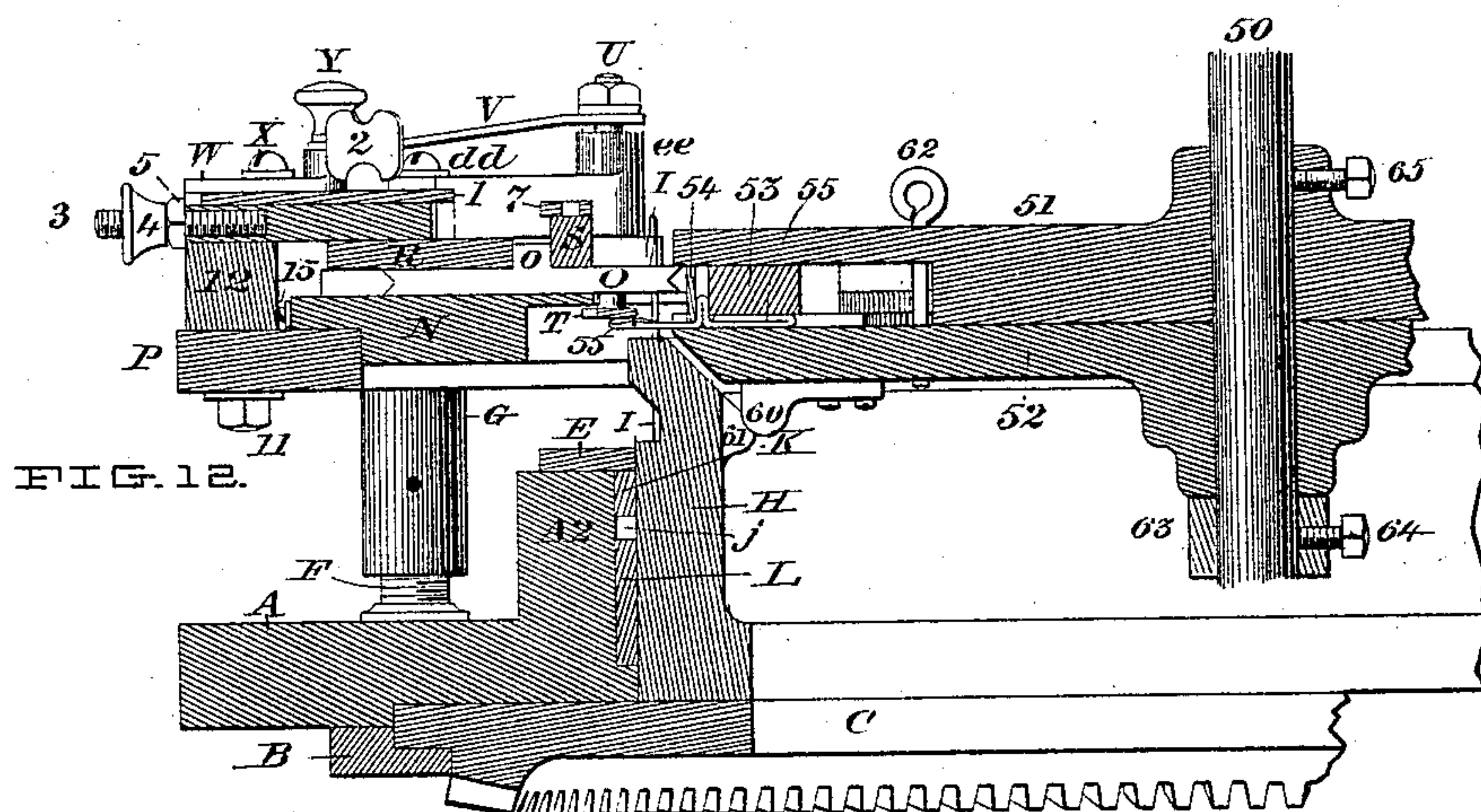
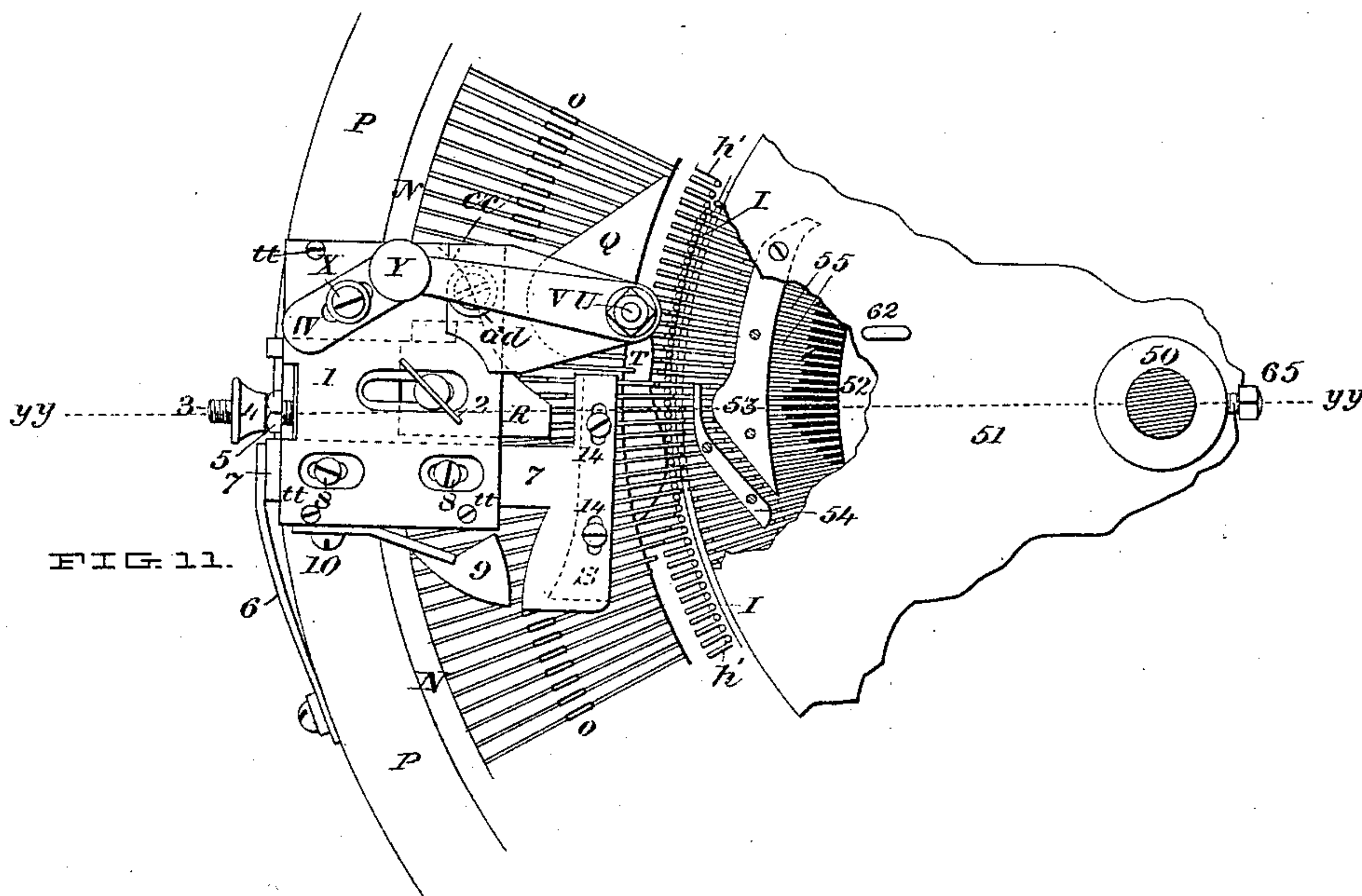
(No Model.)

3 Sheets—Sheet 3.

E. TIFFANY.
CIRCULAR RIB KNITTING MACHINE.

No. 536,743.

Patented Apr. 2, 1895.



WITNESSES:

William Wilcox.

R. E. Reed.

INVENTOR:

ELI TIFFANY,

BY *Franklin Scott*, ATTORNEY.

UNITED STATES PATENT OFFICE.

ELI TIFFANY, OF BENNINGTON, VERMONT.

CIRCULAR-RIB-KNITTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 536,743, dated April 2, 1895.

Application filed August 26, 1892. Serial No. 444,157. (No model.)

To all whom it may concern:

Be it known that I, ELI TIFFANY, of the village of Bennington, in the county of Bennington and State of Vermont, have invented certain Improvements in Circular-Rib-Knitting Machines; and I hereby declare that the subjoined description, in connection with the accompanying three sheets of drawings, illustrative thereof, together constitute a specification of the same and of the best method of carrying said invention into practical operation.

This invention covers improvements in machines for knitting both plain and ribbed tubular fabrics by the use of two sets of needles. Some parts of the invention are also adapted to machines employing latch needles. One set of needles is carried in a horizontal dial plate, and the other in a vertical needle cylinder and the two sets of needles work at right angles with each other in the usual way in knitting ribs.

The leading features of the invention embrace a rotating annular sinker bed adapted to couple with and be driven by the rotating needle cylinder, a series of sinkers carried in vertically open grooves in said sinker bed, novel means for controlling the action of the sinkers and the presser, and novel means for effecting clutch engagement between the needle cylinder and the rotating sinker bed.

The invention is fully elaborated in the drawings, wherein—

Figure 1 shows a quarter plan of the top of the needle cylinder and of the sinker bed with the slurcock, presser, sinker cams and stitch adjusting devices. Fig. 2 is a front elevation of the same. Fig. 3 is a side elevation of the same. Fig. 4 is a perspective view of one of the clutch blocks attached to the sinker bed which connects with the needle cylinder and by which the sinker bed is rotated in unison with the needle cylinder. Fig. 5 is a vertical radial section of parts taken on the line $xx-xx$ of Fig. 1. Fig. 6 is a plan of the slurcock and sinker drawback cam as connected with the stand in which they work. Fig. 7 is a vertical radial section through various parts taken on the line $yy-yy$ of Fig. 1. Fig. 8 is an elevation of the needle jack shank race. Fig. 9 is a side elevation of a needle and needle jack connected.

Fig. 10 shows respectively an edge and side view of one of the sinkers detached and shows the reinforcement of the driving shank. Fig. 11 shows in plan, a portion of a horizontal dial plate carrying a set of radial needles in connection with a portion of the needle cylinder and sinker bed. Fig. 12 is a vertical section through the slurcock needle cylinder and dial plate taken on the line $yy-yy$, of Fig. 11.

The main structural parts of the machine are seen in combination in Figs. 5, 11, and 12, and consist of a fixed annular table A within which the concentric needle cylinder H runs. This cylinder is mounted on an annular gear C which is seated and rotates in a rabbeted way cut in the under side of the table—and is held up in place and guided by the cleats B which are attached by screws to the under side of the table A as shown in Fig. 5. The gear C, is driven by a bevel pinion D, to which motion is imparted from any source of power.

On the inner edge of the circular table A, is an upturned flange A^2 , to the inner side of which the cams K and L, which control the action of the needle actuating jacks J, are attached. The cylinder is grooved in the usual way for the reception of the needles and the jacks used in connection with them, as will be seen, Figs. 2, 5 and 7. The grooves are, however, cut somewhat deeper than is usual for two purposes. One is to take in the whole width of the needle jack, thereby protecting and concealing the coupling between the shank of the needle and the needle jack, and the other is, to afford sufficient projection of the wings or "tricks" as they are often designated, (being the material of the cylinder between the needle grooves,) beyond the needles at their upper ends, to receive the teeth of the driving clutch blocks M between them, without interfering with the needles, as will be seen in Fig. 5 at h' .

The needles employed in this machine are of the style in common use but are fitted to be loosely connected with and driven by jacks as shown in Fig. 9.

The sinker bed which carries the sinkers that co-operate with the needles in sinking the stitches, consists of an annular plate N (seen in cross section in Fig. 5), rabbeted at its under outer edge so as to fit the guide

ring P in which it revolves. This guide is mounted on studs F which are seated on the top of the table A of the machine and are provided with screw collars for effecting vertical adjustment of the sinker bed. When the height of the ring P has been regulated by the collars G it is fastened in such position by the set screws *g* which pass through the ring, and screw into the tops of the studs F, as seen in Fig. 5. To the under side of the ring P are fastened a number, three or as many as may be required, of the driving clutch blocks M, shown in detail in Fig. 4 and in position in dotted lines in Fig. 1. This clutch is dentated with teeth *m* which fit the needle grooves of the needle cylinder. They do not enter deep enough, however, to interfere with the working of the needles. The upper side of the bed is radially grooved for the reception of the sinkers O which are shown in Fig. 10. These sinkers are preferably made double ended so as to be reversible in the grooves, and have a driving shank in the middle which is reinforced with a wrapping of metal to resist wear and by which they are actuated by the slur cock and the draw back cam. In practice they lie loosely in the grooves in the bed so that any one of them can be lifted out of its position at any time for any purpose.

The action of the sinkers and the presser are controlled by the apparatus mounted on or connected with a small stand 12 which is fastened to the ring P by two bolts 11 11 which pass through the ring from its under side. Connected with this stand are the following parts:—Two sinker guiding cams, Q and *c c*, are arranged as follows: The former is carried at the lower end of a sleeve *e e* at the outer end of an overhanging arm which is attached to the stand by screw *d d*. The latter is shaped in the material of the inner under side of the stand itself. The function of these guiding cams is to bring the sinkers into proper position to coact with the slur cock when they reach it. Next in order of movement comes the slur cock R, which is fastened to the under side of the slide Z which is fitted to work in a way provided for it in the upper part of the stand 12. The cam S which is provided to draw back the sinkers after they have performed their duty in sinking the stitch between the needles, is fastened to a long stem 7 which projects to the rear and is attached to the slide Z by the screws 8 8 which pass through elongated slots in the stem so as to provide for adjustment toward and from the needles. When this adjustment is determined the screws are set firmly. The slur cock is attached to the slide by a similar provision, viz:—the thumb screw 2 which passes through an elongated slot in the slide and is screwed into the body of the slur cock, thus binding them together. This slide and its attachments are held in place by a cap 1 which is screwed at *t t* onto the top of the stand as shown.

The drawback cam S may be circumferen-

tially adjusted by the screws 14 14, which pass through elongated slots in the stem and engage the cam below. The drawback cam S also performs another duty. It commences at a point in front of where the sinker shanks leave the cam face of the slur cock, and extends around on a practically concentric curve to the point where its contour bends outwardly to form the drawback cam proper. This is to prevent too deep insertion of the sinkers between the needles as well as to preserve uniformity of sinkage.

A guard 9 is provided which is attached to the side of the stand 12 which prevents the sinker from being thrown out too far by the drawback cam S or by any other force. As the sinkers pass out from between the cams S and 9 they are in proper position to enter the throatway between the cams Q and *c c* as they approach the slurcock in the succeeding revolution. The plate which carries the cam Q has a hollow stud or socket *e e* in which the rock shaft or pivot U is fitted to turn. The lever V and knob Y by which it is turned are attached to the upper end of this rock shaft and an arm T projects from its lower end, the edge of which toward the needles is rounded to the proper shape to act on the barbs of the needle as a presser. By the swinging of the arm V the presser T can be thrown against or away from the needles.

The arm V is pivoted at its free end by means of the pin and socket as shown to an adjusting and binding clip W which is put under control of the set screw X. Thus by loosening this set screw X and turning the arm V, a proper adjustment of the presser can be effected, when the set screw can be tightened, leaving the presser ready for action. The spring 6, which is attached to the edge of the ring P, bears against the outer end of stem 7 and acts to hold the slurcock and draw-back cam S in their proper positions with the nut 5 bearing against stand 12. If necessary at any time for any cause, the slurcock and drawback cam can be drawn back out of position by means of the thumb nut 4.

Figs. 11 and 12 fully exhibit the details of the mechanism for carrying and actuating the radial needles. These consist of a central non-rotating spindle 50 which is capable of elevation together with all appurtenances which may be connected with it by means the same as or analogous to those shown in my pending application, Serial No. 428,451, for improvement in circular rib knitting machines, filed April 9, 1892. The cam-plate 51 is secured to spindle 50 by screw 65. This plate carries on its under side the needle actuating cams 53 and 54. Beneath this cam-plate the needle dial plate 52 is pivoted on the spindle 50 and is held in working position by the collar 63 and screw 64. Dial-plate 52 is driven by the lug 61 on the needle cylinder which engages a similar lug 60 on its underside. Latch needles 55 are used on the dial plate, the shanks of which as the dial is rotated pass

between cams 53 and 54 whereby they receive their appropriate movements. These cams are stationed abreast the sinker-actuating devices as seen in Fig. 11. The relative adjustment of the dial and cam-plates is preserved by the pin 62 which passes through both of them, whenever it may be necessary to disengage the dial from its driving connection with the needle cylinder by raising the former.

When the latch needles pass under the action of the cams 53 and 54 they are thrown out between the vertical spring needles as shown, their forward ends projecting just beneath the presser T as seen in Fig. 12. If the latch of any needle fails to be opened in pushing through the loop of the stitch it will be opened by the action of the edge of presser T against which it comes in contact.

The operation of the machine is as follows:

A rib or starting piece having first been run onto the needles, the yarn is carried through the yarn guides to the needles at the proper point of intake just in advance of the slurcock. The cylinder being then started carries around with it, by means of the clutches MM, the annular sinker bed N with its equipment of sinkers. If any of the latter are out of position by reason of being pushed in or out a little too far, as they enter the gap or throatway between the cams Q and c c they are brought into their proper positions when they engage the edge of the slurcock R by which they are properly and successively sunk between the needles carrying the yarn with them. Concurrently with these movements the needles have been raised to receive the yarn thus being delivered by the sinkers, and while the sinkers are passing the concentric part of the cam S, the draw down needle cam comes into operation at the same moment that the barbs of the needles pass under the edge of the presser T. The knock-over of the stitches takes place at this stage of the knitting in the usual way, which being effected, as the cylinder moves on the sinker shanks engage the edge of the drawback cam S and by this are withdrawn from their advanced positions, and as they emerge from between the cams S and 9 they are all right for the next feed.

I therefore claim as my invention—

1. The combination of the needle cylinder and means for rotating the same, with an annular rotary sinker bed and provisions connected with said bed for effecting clutch engagement with the needle grooves of the needle cylinder.

2. A horizontal sinker bed for use in knitting machines wherein the sinkers are confined in vertically opening horizontal grooves by gravity alone outside of their specific field of duty, as a provision for effecting their ready removal and insertion, in combination with a

set of fixed guides immediately preceding the sinking devices, a cam for sinking and another for withdrawing the sinkers, a series of sinkers having provisions for engaging said guides, sinking and withdrawing devices, in combination with a needle bed and needles and provisions for actuating said needles and for bringing the sinkers successively under the action of the sinking devices, all arranged to operate substantially in the manner described and for the purposes specified.

3. The combination in a cylinder knitting machine, of the rotating needle cylinder and needles, the rotating sinker bed and sinkers, and means interposed between said cylinder and sinker bed in the nature of a driving coupling whereby one may be driven by the other, and in unison, with a stationary slurcock and a stationary draw-back cam for actuating said sinkers, substantially as specified.

4. The combination of the rotary needle cylinder and barbed needles, the rotary sinker bed and sinkers and an interposed coupling between said cylinder and sinker bed whereby one may be driven by the other, with a stationary slurcock, presser, drawback cam and stationary needle actuating cams, adapted to operate substantially in the manner described and for the purposes specified.

5. The combination with the rotary needle cylinder and needles of the presser T and lever V both radiating from a common pivot adapted to turn in a stationary bearing, and the binding clip W, the whole being constructed and arranged to operate substantially in the manner described and for the purposes specified.

6. The combination of the described rotary needle cylinder and needles, the rotary sinker bed and sinkers and means connected with said needles and sinkers for actuating them, and a driving coupling between said needle cylinder and sinker bed, with a rotary needle bed carrying needles adapted to work between and at right angles with said cylinder needles, for knitting ribs, substantially as specified.

7. The combination of the rotating needle cylinder equipped with the described needle driving jacks and needles, the jack-actuating cams, the rotating sinker bed equipped with sliding sinkers, a coupling device between said cylinder and sinker bed, and stationary means substantially as shown for imparting to said sinkers their appropriate movements substantially as described and for the purposes set forth.

In testimony whereof I have hereto subscribed my name this 16th day of August, A. D. 1892.

ELI TIFFANY.

In presence of—

F. M. TIFFANY,
FRANKLIN SCOTT.