

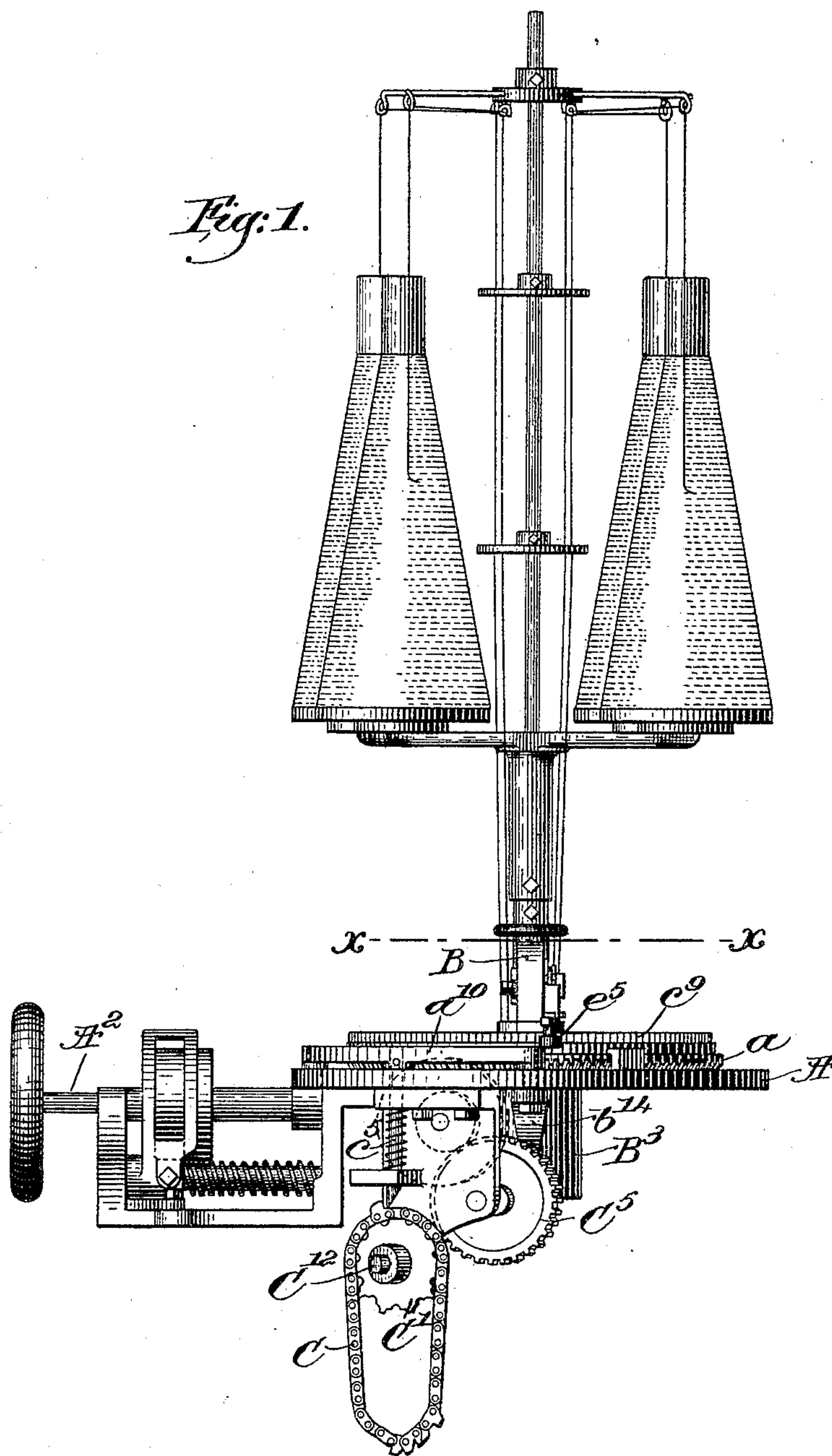
(No Model.)

4 Sheets—Sheet 1.

J. H. RICE.  
KNITTING MACHINE.

No. 604,638.

Patented May 24, 1898.



Witnesses.  
Edward F. Allen.  
Thomas J. Hammond.

Inventor  
John H. Rice.  
by Crosby & Gregory,  
attys.

(No Model.)

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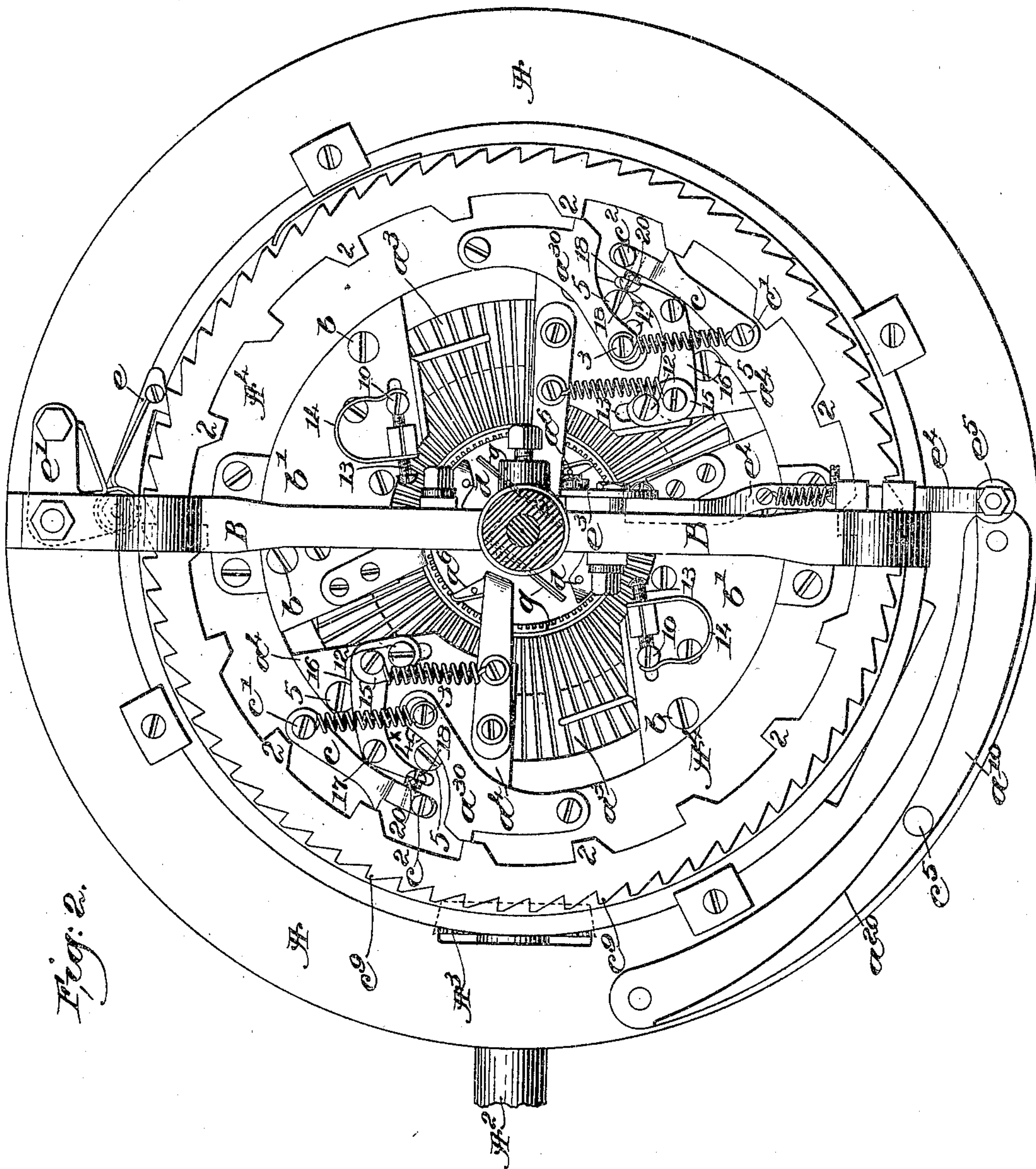


Fig. 2.

Witnesses,  
Edward F. Allen.

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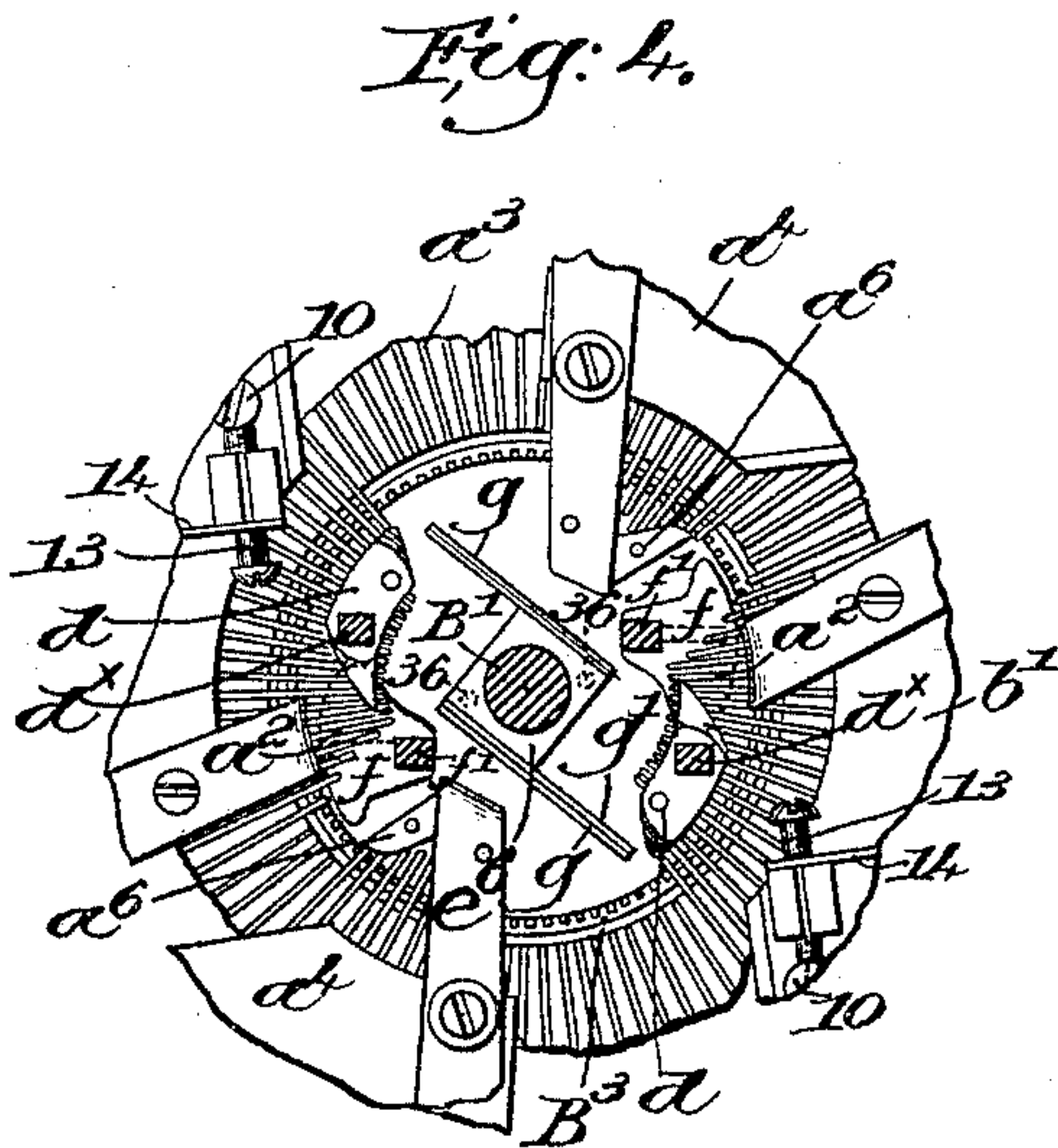
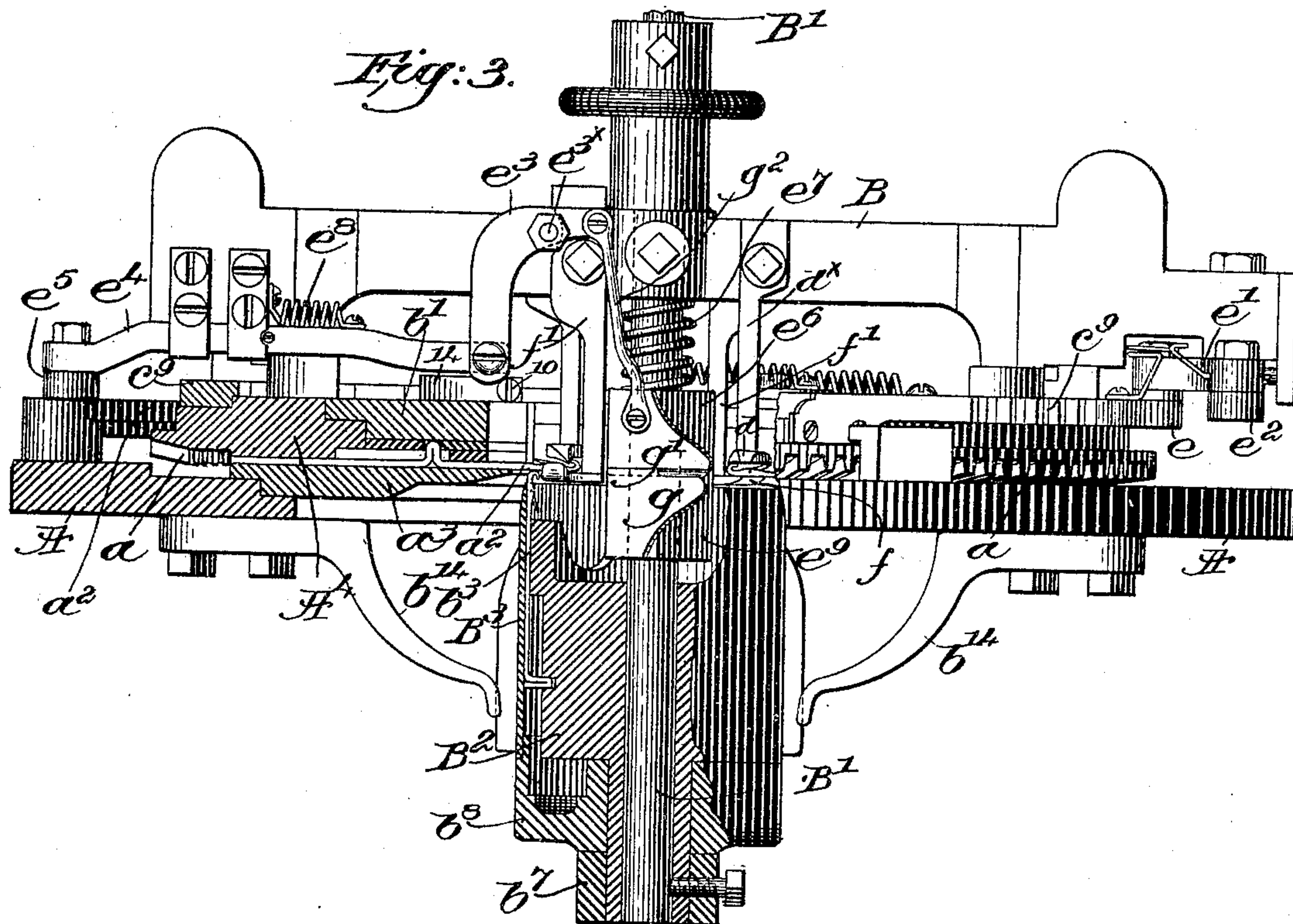
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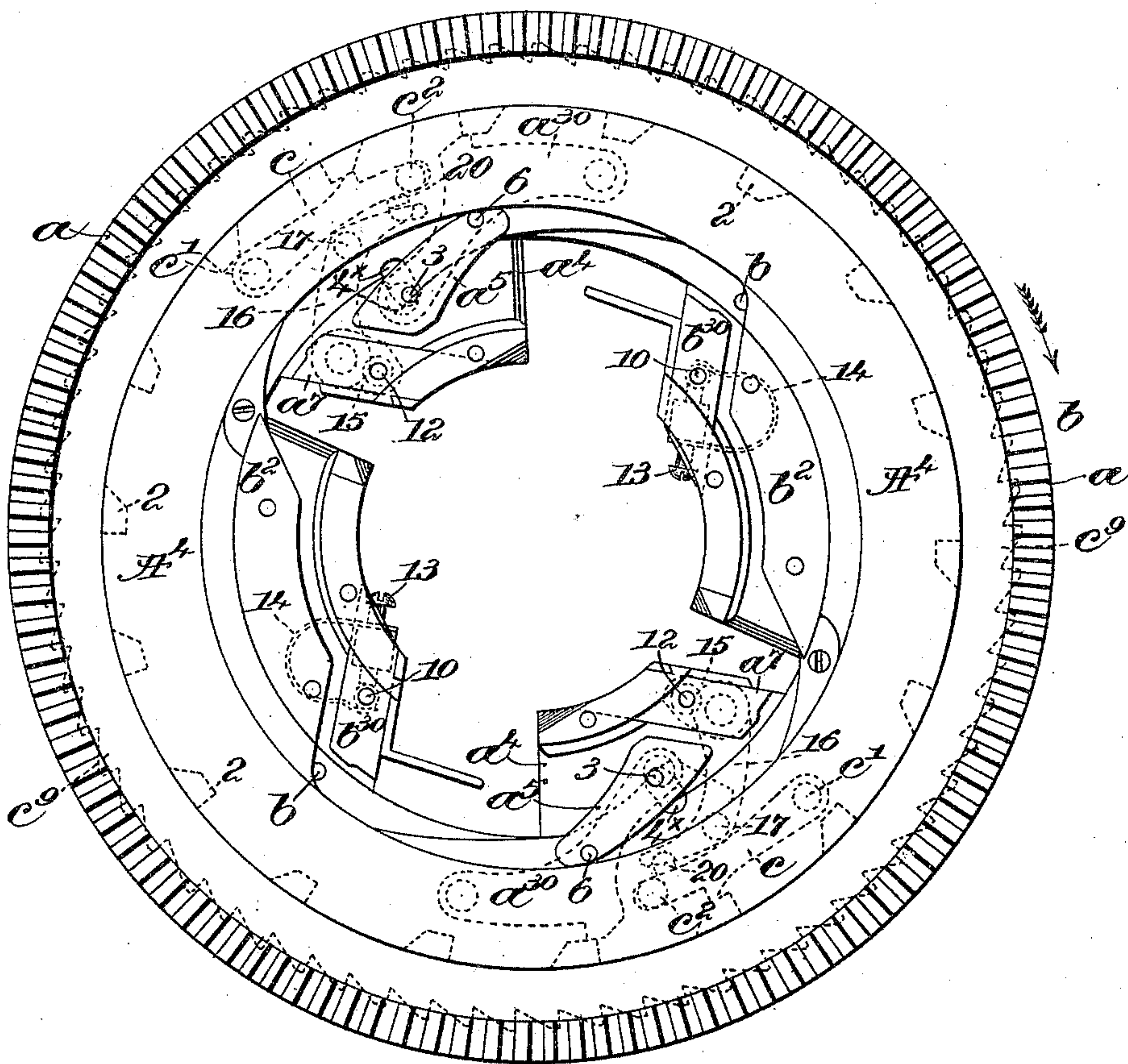
Inventor.  
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4 Sheets—Sheet 4.

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Fig: 5.



*Fig: 6.*



Thomas J. Drummond.

ILLUSTRATOR:  
 JOHN H. PRICE.  
 BY LROSBY GREGORY.  
 Atty.



# UNITED STATES PATENT OFFICE.

JOHN H. RICE, OF MANCHESTER, NEW HAMPSHIRE, ASSIGNOR TO THE  
LEIGHTON MACHINE COMPANY, OF SAME PLACE.

## KNITTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 604,638, dated May 24, 1898.

Application filed June 18, 1897. Serial No. 641,215. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN H. RICE, of Manchester, in the county of Hillsborough and State of New Hampshire, have invented an  
5 Improvement in Knitting-Machines, of which the following description, in connection with the accompanying drawings, is a specification, like letters and figures on the drawings representing like parts.  
10 This invention has for its object the production of an improved knitting-machine adapted to produce in novel manner a fabric presenting at desired intervals plain-rib and tuck or royal rib knitting.  
15 Rib-knitting is commonly done on two sets of needles, and when the fabric is to be made of that form called "tuck" or "royal" rib it has been customary to place the needles of one set in such position with relation to the  
20 thread guide or guides used to supply such needles with thread that said needles will receive the yarn, but will not be immediately withdrawn far enough to cast off their loops and knit, said needles, however, knitting  
25 when brought into such relation to a second thread-guide that they may receive thread, the needles casting their loops and knitting after they have taken the thread from the second thread-guide or from the same guide  
30 the second time as when there is but one thread-guide. The thread-guides referred to always supply threads to the needles whether knitting tuck or royal rib or plain rib. In this way it will be seen that when tuck or  
35 royal rib is being knitted the needles actually knit only at alternate thread-guides, and consequently only half the number of courses will be knitted as when plain rib is being knitted, for during the knitting of plain rib  
40 every needle knits its thread before taking another thread. I have aimed to keep up the product of this class of machines and knit as many courses when working the machine for tuck or royal rib as when knitting plain rib,  
45 and I have effected my object by providing the machine with a plurality of auxiliary-thread guides, each having its own thread, said auxiliary-thread guides having combined with them auxiliary cams to operate the needles  
50 to knit only while tuck or royal rib is being made, the needles at such time taking

thread also from the auxiliary-thread guides. These auxiliary cams are placed under the control of a pattern-surface, and they may consequently be brought automatically into  
55 operation at any desired time. The auxiliary threads put into the fabric when knitting tuck or royal rib are cut off by a suitable cutting device when plain-rib knitting is to be resumed, and the cut end of the thread lead-  
60 ing to the bobbin is held by a suitable clamp or holder, so that it will not fly out of the guide.

Figure 1, on a small scale, shows in side elevation a knitting-machine containing my  
65 invention. Fig. 2, on a larger scale, shows a plan view below the dotted line *x*, Fig. 1. Fig. 3 shows in elevation, partially broken out, the machine shown in Fig. 2. Fig. 4 is a top or plan view showing a part of the dial  
70 or plate needle bed and the devices located in the space bounded by the latched ends of the dial or plate-needles. Fig. 5 is an under side view of the dial-needle cam-plate, and Fig. 6 is a detail showing the clamp for hold-  
75 ing the end of the auxiliary thread.

The bed-plate A for supporting the working parts, it being erected in practice upon a suitable stand or legs, (not shown,) the dial-needle bed *a*<sup>3</sup>, the dogs *b*<sup>14</sup>, the spindle B', the  
80 yoke B, the body of the dial-needle cam-plate A<sup>4</sup>, toothed at *a*, the main shaft A<sup>2</sup>, it in practice having a bevel-gear A<sup>3</sup> to engage the teeth *a* and rotate the dial-needle cam-plate, the dial or plate needles *a*<sup>2</sup>, the cam-cylinder B<sup>2</sup>  
85 for actuating the cylinder-needles *b*<sup>3</sup>, it being fast on said spindle B', the cylinder-needle bed B<sup>3</sup>, having lugs (see Fig. 3) embraced by the dogs *b*<sup>14</sup>, the washer *b*<sup>8</sup>, on which the cylinder-needle bed rests, the collar *b*<sup>7</sup>, the toothed  
90 gear C<sup>5</sup>, driven from the teeth *a* of the dial-needle cam-plate through an intermediate gear and pinion, (shown by dotted lines in Fig. 1,) the pattern-shaft C<sup>12</sup>, having an attached sprocket-wheel C', the chain C, carried  
95 by said sprocket-wheel, the rod *c*<sup>5</sup>, resting on the pattern-chain and carrying at its upper end a cam to be described, the ratchet-wheel *c*<sup>9</sup>, mounted loosely on the top of the dial-needle cam-plate, and the spring-pressed pawl *e*,  
100 mounted on the bell-crank lever *e*', it having an attached roller or other stud *e*<sup>2</sup>, which is



actuated by the cam carried by the said rod  $c^5$ , are and may be all substantially as shown and designated by like letters in United States Patent No. 573,275, dated December 15, 1896.

5 This present invention differs, however, from the invention shown and described in said patent chiefly in the construction of the cams carried by the dial-needle cam-plate and in the shape of the cam carried by the rod  $c^5$  and  
10 the shape of the pattern-teeth movable with the ratchet-ring  $c^9$ .

The rod  $c^5$  herein has a cam  $a^{10}$ , provided with a curved acting face  $a^{20}$ , said cam, when raised to put its acting face in the plane occupied by the roller or other stud  $e^2$  of the elbow-lever  $e'$ , acting to move said lever and cause it to turn the ratchet-ring  $c^9$ , as described in said patent; but herein the said ring is shown as cut away at its inner edge to  
20 leave a series of pattern projections 2, which in the rotation of said ratchet-ring are made to act on the toes of levers  $a^{30}$ , mounted on the dial-needle cam-plate  $A^4$ . This cam-plate has connected to it by suitable screws 5 auxiliary segments  $a^4$ , having slots  $4^x$ , said slots receiving stud-screws 3, which are connected with and rise from cams  $a^5$ , pivoted at 6 on the said auxiliary segments. These stud-screws 3 are also embraced by the levers  $a^{30}$ ,  
30 so that when the projections 2 of the ratchet-ring meet the toes of the said levers the cams  $a^5$  will be put into the full-line position, Fig. 5, in which position they will act to move all the plate-needles far enough in to pass their latches fully into the loops on their shank and at the same time take thread from the auxiliary-thread guide  $a^6$ , and when the said needles are drawn outwardly or back they will knit the auxiliary thread taken from the auxiliary-thread guide, said auxiliary thread being, however, drawn or laid against the inner sides of the usual cylinder-needles  $b^3$ , which at this particular point stand high enough to enable the said auxiliary thread to be laid  
45 against them and into their hooks, which are then open.

When the levers  $a^{30}$  are not moved inwardly, as described, by the projections 2 of the ratchet-ring, said ring being at such time  
50 at rest, then said cams  $a^5$  occupy their dotted-line positions, Fig. 5, and the butts of the needles when passing the said cams are not thrown forward thereby far enough to take thread from the auxiliary-thread guides, and consequently the needles are in such positions in the said cams  $a^5$  that they are not moved to take thread and knit. The dial cam-plate has also attached to it by screws  $b$  (see Fig. 2) what I shall call the "main segments"  $b'$ , they having at their under sides the usual throwing-out cams  $b^2$  and a draw-cam  $b^{30}$ , also of usual construction. The auxiliary segments  $a^4$  also have connected with them like draw-cams  $a^7$ . Each of these draw-cams  $b^{30}$  and  $a^7$  have, respectively, studs 10  
65 and 12, which are extended upwardly through suitable slots in the said segments. The

studs 10 are acted upon by a screw 13, mounted in a split ear rising from said segment, and a spring 14 acts to keep the stud 10 pressed  
70 against the screw 13 in its adjusted position. The studs 12 are each embraced by a short link 15, attached to one end of a lever 16, pivoted at 17, said lever having at its inner end an ear 18, which bears against the head  
75 of an adjusting-screw 20, inserted in one end of a lever  $c$ , pivoted at  $c'$ , said lever being split at its end where it is threaded to receive the screw 20, so that by or through a screw  $c^2$  the said screw 20 when adjusted  
80 into position may be firmly clamped and held immovable. The cams on the main segment are in action at all times, whatever may be the character of the knitting, and they actuate all the dial-needles to take thread from  
85 the main-thread guides  $d$ , and each of said threads is knit to form a course of stitches at each rotation of the dial-needle cam-plate.

During the times that plain-rib work is being knitted the auxiliary cams  $a^5$  are held, as  
90 described, out of action, and only the main threads in the main-thread guides are used to knit; but when the tuck or royal rib stitch is to be knitted then the cams  $a^5$  are automatically thrown into operative position, so  
95 that they actuate the said dial or plate needles in such manner that they take thread from the auxiliary-thread guides located between the main-thread guides, and then both the main and the auxiliary cams work the  
100 said plate-needles to effect the knitting of two courses of stitches at each rotation of the dial-needle cam-plate, they knitting the same number of tuck courses that the main cams knit plain-rib courses.

Prior to this my invention it has been customary in machines adapted to knit plain-rib and then tuck or royal rib stitch, said machines using two feeds, to so regulate the dial-needles when the tuck or royal rib stitch was  
110 to be done that they would take thread for the tuck-stitch at one of the continuing feeds, as  $d$ , and knit the thread off at the other of the two feeds, and consequently the fabric being knitted grew in length only one course  
115 for each rotation of the machine. This reduced the production of the machine while running it to knit tuck or royal rib, and to obviate this loss of product when knitting tuck or royal rib I have added to this otherwise substantially old machine the auxiliary cams  $a^5$  and the auxiliary feeds  $a^6$ . The pattern projections 2 of the ratchet-ring are so spaced that when one acts to move the lever  $a^{30}$  another one acts to move the lever  $c$   
125 to cause it to open the draw-cam  $a^7$ , cooperating with the auxiliary cam  $a^5$ , to draw the dial-needles to knit stitches in the auxiliary thread before the said plate-needles in the rotation of the dial cam-plate are again acted  
130 upon by the cams  $b^2$   $b^{30}$  of the main segments.

This invention is not limited to the particular shape shown for the cams  $a^5$  and  $b^2$ , nor to the devices shown for moving the cams  $a^5$



into and out of operative position, nor to the particular cams shown for controlling the length of the ribs knitted, and instead I may use any well-known equivalent device, for it would be obvious that these features may be changed by only the skill of the mechanic and without any invention.

It will be understood that the auxiliary thread taken from the auxiliary-thread guide  $a^6$  will be introduced only when the tuck or royal rib stitch is being knitted, and when the knitting is to be changed to plain-rib stitch then these auxiliary threads must be discontinued, and I have therefore provided cutting mechanism or devices to automatically cut off these auxiliary threads at the proper times. The said cutting mechanism consists, as herein shown, essentially of two stationary blades  $g$  and two movable blades  $g'$ , each pair of blades operating to cut its own thread. The movable blades are connected with a block  $e^6$ , mounted to slide on the spindle  $B'$  and acted upon by a spring  $e^7$ , which normally keeps the blades closed. This block has connected to it a link  $g^2$ , attached to an elbow-lever  $e^8$ , pivoted at  $e^{3x}$ , said lever having joined to its opposite end a slide-bar  $e^4$ , having at one end a roller or other stud  $e^5$ , said stud when the auxiliary threads are to be cut off being acted upon by the cam  $a^{20}$ , it being at that time raised, as described, by the pattern-surface acting on the rod  $c^5$ , the said cam separating the blades to permit auxiliary threads to get in between them, and as soon as the roller  $e^5$  passes off from the end of the cam in the rotation of the dial-plate then the springs  $e^7$  and  $e^8$  act to close the cutters and sever the said thread. The two stationary blades  $g$  are attached to opposite sides of a block  $e^9$ , fixed on the said spindle  $B'$ , and suitable pins, as 36, (see Fig. 4,) carried by the block  $e^6$ , enter holes in the block  $e^9$ , thus insuring the proper cutting relation at all times of the two sets of blades. The plate-needles take the auxiliary threads from the under sides of the auxiliary-thread guides  $a^6$ , and when the plate-needles are not actuated to take the said auxiliary threads then the said threads, during the rotation of the dial cam-plate, are drawn under the usual needle-supports  $f$ , connected to the lower ends of the staffs  $f'$ , and they are finally drawn between the open blades of the cutter, and when passing under the supports  $f$  the said threads are drawn each under a clip or finger  $f^3$ , (see Fig. 6,) which clamps and holds the cut thread near its end, thus keeping said thread from escaping from the thread-guide  $a^6$  when tuck or royal rib stitch knitting is not being done.

The method of knitting tuck or royal rib stitches herein described is novel and forms an important part of this invention.

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

1. In a knitting-machine employing two

sets of needles, one or more main-thread guides to constantly supply said needles with thread, and means to actuate said needles to knit plain-rib stitch, combined with one or more auxiliary sets of cams and one or more auxiliary-thread guides which are not in action when the machine is operated to knit plain-rib stitch, and with means to put said auxiliary cams into operative position to cause them to also actuate said plate-needles to take said auxiliary threads and enable tuck or royal rib stitch to be knitted at desired times, substantially as described.

2. In a knitting-machine, the following instrumentalities, viz: a cylinder-needle bed to contain cylinder-needles, a cylinder-needle cam to actuate said needles, a dial-needle bed to contain a series of plate-needles, a dial-needle cam-plate having a plurality of main cams to actuate said plate-needles, a plurality of main-thread guides having threads to at all times supply said plate-needles with thread for plain-rib knitting, a plurality of auxiliary cams carried by said dial-needle cam-plate, a plurality of auxiliary-thread guides which occupy their inoperative position when the machine is actuated to knit plain-rib stitch, and means under the control of a pattern-surface to put said auxiliary cams into their operative position to actuate said plate-needles to take thread from said auxiliary-thread guides at points intermediate the said main-thread guide when tuck or royal rib is to be knitted, and means to effect the putting of the said auxiliary cams out of operative position when plain-rib knitting is to be carried on following tuck or royal rib knitting, substantially as described.

3. In a knitting-machine, the following instrumentalities, viz: a cylinder-needle bed to contain cylinder-needles, a cylinder-needle cam to actuate said needles, a dial-needle bed to contain a series of plate-needles, a dial-needle cam-plate having a plurality of main cams to actuate said plate-needles, a plurality of main-thread guides to supply said plate-needles at all times for plain-rib knitting, a plurality of auxiliary-thread guides, a plurality of auxiliary cams, and means under the control of a pattern-surface to put said auxiliary cams into operative position to actuate said plate-needles to take thread from said auxiliary-thread guides at points intermediate the said main-thread guide when tuck or royal rib is to be knitted, and means to effect the putting of the said auxiliary cams out of operative position when plain-rib knitting is to be carried on following tuck or royal rib knitting, and means to cut off said auxiliary threads, substantially as described.

4. In a knitting-machine, the following instrumentalities, viz: a cylinder-needle bed to contain cylinder-needles, a cylinder-needle cam to actuate said needles, a dial-needle bed to contain a series of plate-needles, a dial-needle cam-plate having a plurality of main cams to actuate said plate-needles, a plural-



ity of main-thread guides to supply said plate-needles at all times for rib-knitting, a plurality of auxiliary-thread guides, a plurality of auxiliary cams, and means under the control of a pattern-surface to put said auxiliary  
 5 cams into operative position to actuate said plate-needles to take thread from said auxiliary-thread guides at points intermediate the said main-thread guide when tuck or royal  
 10 rib is to be knitted, and means to effect the putting of the said auxiliary cams out of operative position when plain-rib knitting is to be carried on following tuck or royal rib knitting, and means to clamp and hold the  
 15 ends of said auxiliary threads, substantially as described.

5. In a knitting-machine, a dial-needle cam-plate, a pair of blades occupying a position within the central opening of the said  
 20 plate, and a dial or plate needle bed, a cam mounted therein, and a pattern-surface to actuate said cam, combined with means intermediate one of said blades and said cam to actuate the same at the proper time to cut  
 25 a thread placed between them, substantially as described.

6. The dial-needle cam-plate, and the ratchet-toothed ring having spaced cam projections 2 and mounted thereon, a pawl to  
 30 move said ratchet-toothed ring on said cam-plate, a plurality of sets of auxiliary cams, levers  $a^{30}$ , and 16, connected with said cams, and a lever  $c$ , said levers  $a^{30}$  and  $c$  being acted upon by said cam projections and actuating  
 35 said auxiliary cams, substantially as described.

7. The dial-needle cam-plate, its cams  $a^5$  and  $a^7$ , two levers  $a^{30}$  and  $c$  connected with said cams, and a third lever having an adjusting device, combined with a ring having  
 40 cam projections to actuate said levers  $a^{30}$  and  $c$ , substantially as described.

8. In a machine for knitting plain-rib stitch and tuck or royal rib stitch, the following instrumentalities, viz: a cylinder-needle bed to  
 45 contain cylinder-needles, a cam-cylinder to actuate said needles, a dial or plate needle bed, a series of plate-needles therein, a plurality of main-thread guides containing threads to be used in plain-rib knitting, and  
 50 a plurality of auxiliary-thread guides to contain threads to be used only when tuck or royal rib stitch is being made, a dial-needle cam-plate provided with a plurality of main cams to operate said plate-needles, to take  
 55 the threads from the main-thread guides for plain-rib knitting, and a plurality of auxiliary cams, and means to automatically put them in operative position to impart to said plate-needles during each rotation of said  
 60 cam-plate extra knitting movements to engage the threads of said auxiliary-thread guides only when tuck or royal rib stitch is being knitted, substantially as described.

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

JOHN H. RICE.

Witnesses:

T. J. HOWARD,

F. T. E. RICHARDSON.