

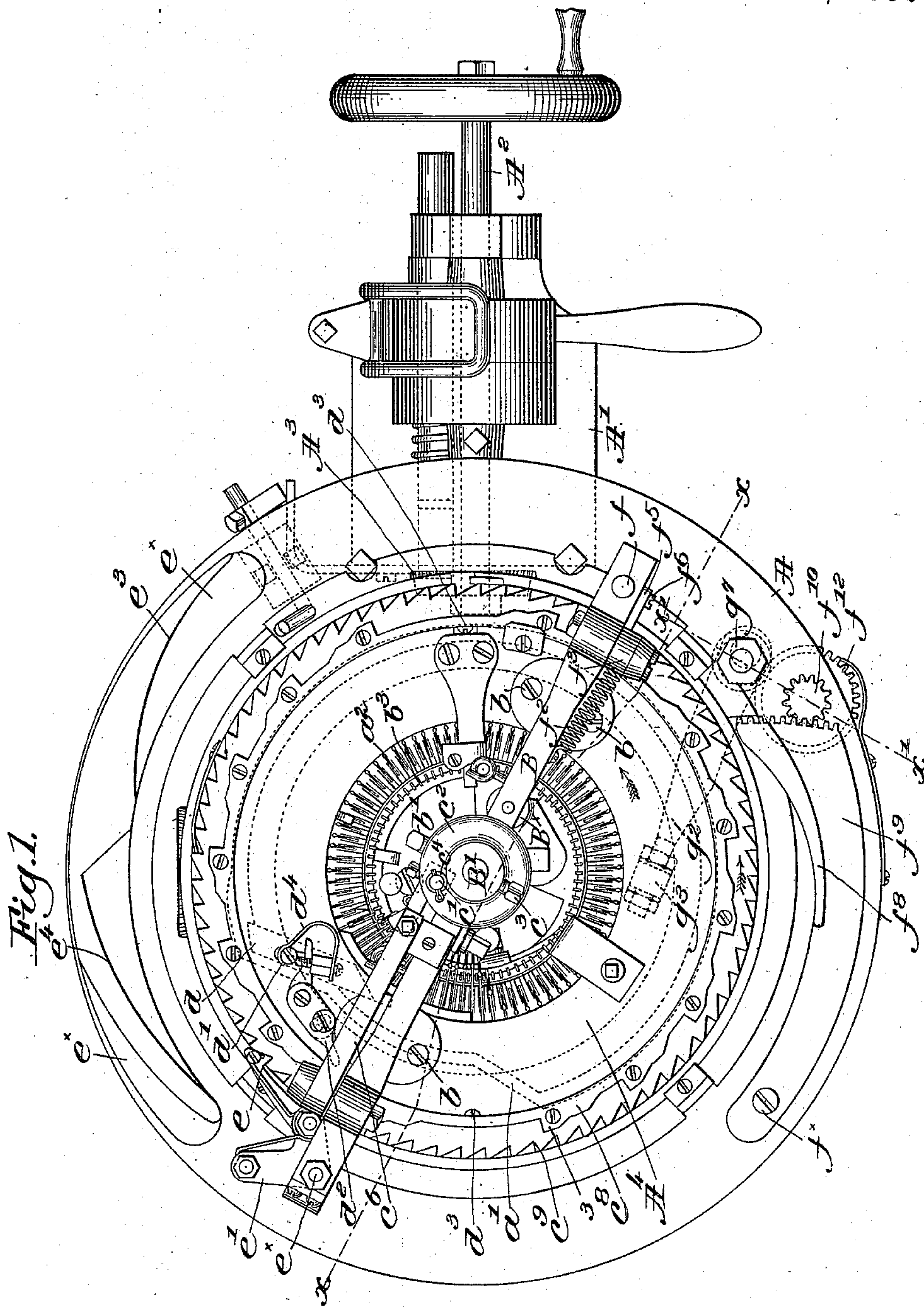
(No Model.)

3 Sheets—Sheet 1.

G. A. LEIGHTON & J. H. RICE.
CIRCULAR AUTOMATIC RIB KNITTING MACHINE.

No. 573,275.

Patented Dec. 15, 1896.



Witnesses:
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Thomas J. Drummond

Inventors:
George H. Leighton.
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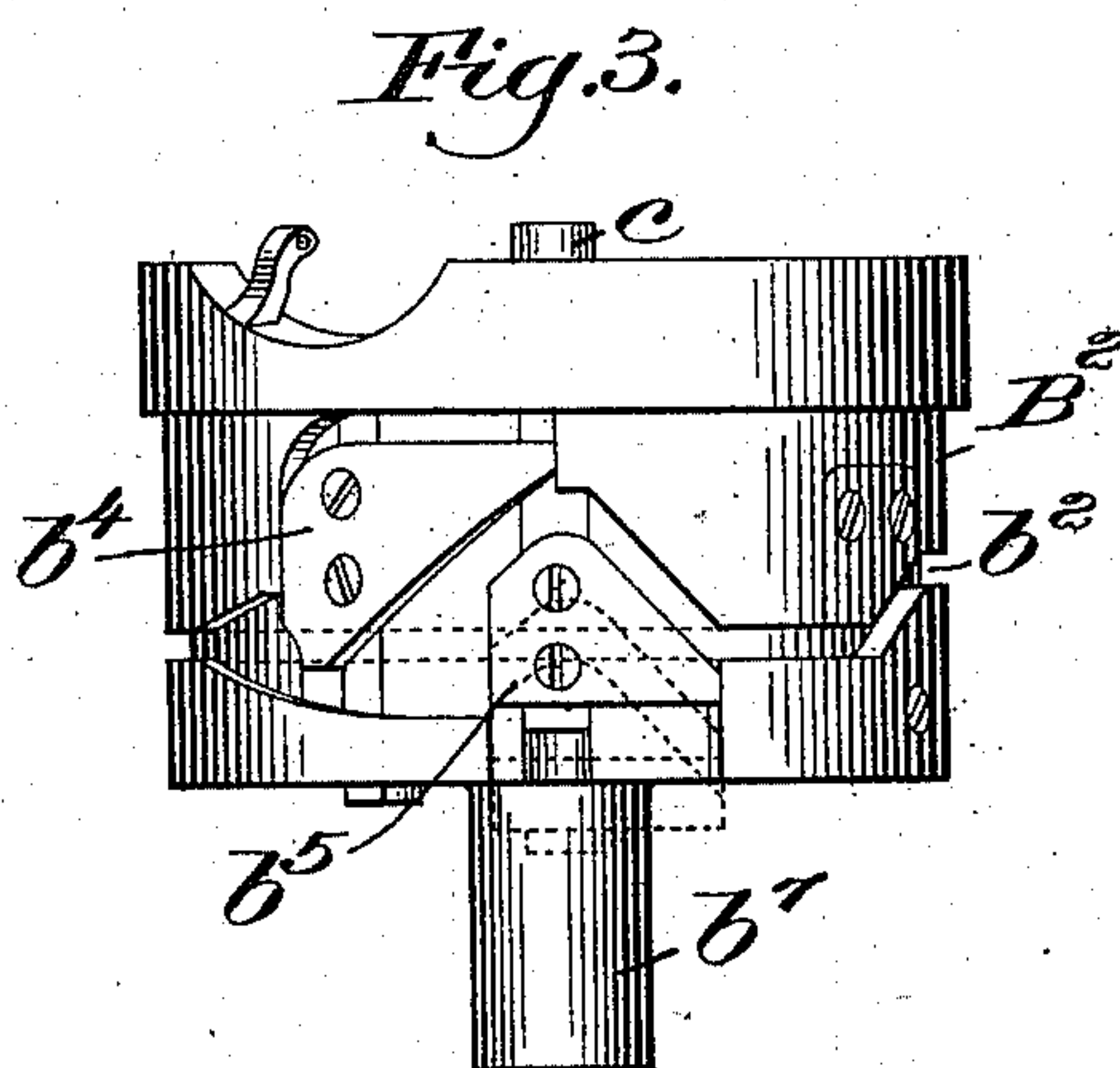
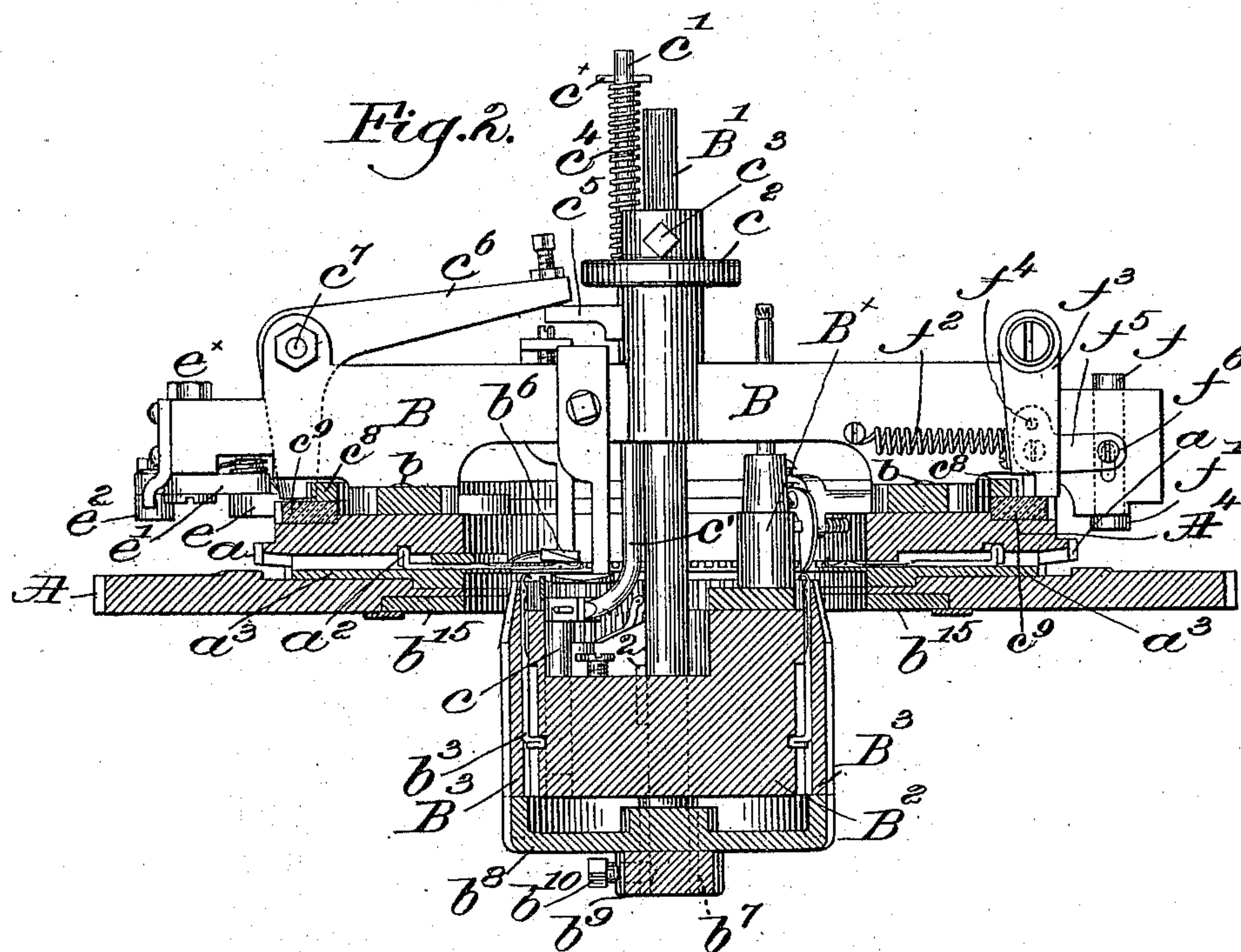
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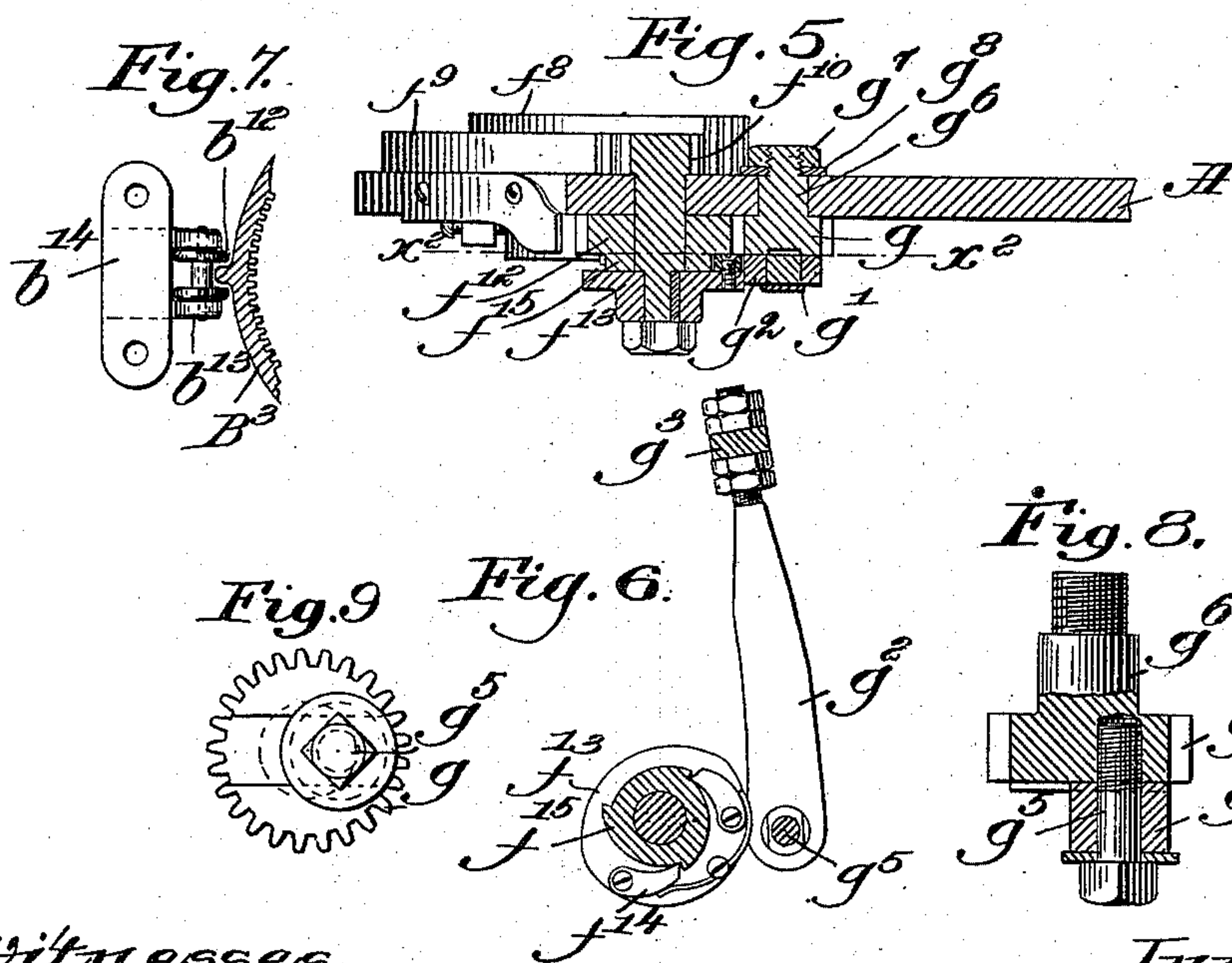
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3 Sheets—Sheet 3.

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UNITED STATES PATENT OFFICE.

GEORGE A. LEIGHTON AND JOHN H. RICE, OF MANCHESTER, NEW HAMPSHIRE, ASSIGNORS TO THE LEIGHTON MACHINE COMPANY, OF SAME PLACE.

CIRCULAR AUTOMATIC RIB-KNITTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 573,275, dated December 15, 1896.

Application filed November 22, 1895. Serial No. 569,766. (No model.)

To all whom it may concern:

Be it known that we, GEORGE A. LEIGHTON and JOHN H. RICE, of Manchester, county of Hillsborough, State of New Hampshire, have
5 invented an Improvement in Circular Automatic Rib-Knitting Machines, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawing representing like
10 parts.

This invention is an improvement on the machine described in United States Patent No. 272,561, dated February 20, 1883, said machine containing a series of plate and of
15 cylinder needles, the carrier and actuating cams for the plate-needles being so constructed that the said needles located at and about the thread-guide might be withdrawn, so as not to knit while the carrier containing
20 the cylinder-needles was racked in one or the other direction for a distance equal to one or more needles, according to the work to be done, and during the racking operation the knitting was discontinued.

We have devised means whereby the racking referred to may be carried on automatically in one and then in the opposite direction and the knitting operation be continued during the operation of racking, thus greatly
30 increasing the productiveness of the machine.

Our improved machine may be used to knit a circular web in such condition as to enable the web to be separated in lengths suitable for collars, cuffs, &c., for knitted goods, and
35 the machine may be used to knit cylindrical webs of any size and of any material.

Our invention consists, among other things, of a knitting-machine containing two sets of needles, devices to effect automatically the
40 withdrawal of the needles of one set of needles from between the needles of the other set of needles, means to automatically rack one set of needles and thus place the individual needles of the racked set in new knitting relation to the needles of the other set, and devices to actuate the set of needles which are
45 not racked in order that they may knit during the racking operation.

Figure 1 is a top or plan view of a sufficient
50 portion of a circular ribbing-machine to en-

able our invention to be understood; Fig. 2, a partial vertical section in the line x , Fig. 1. Fig. 3 shows the cylinder-needle-actuating cam; Fig. 4, a partial side elevation chiefly to show a pattern-surface and the cam controlled by it, which cam controls the action
55 of a pawl for moving the pattern-ring to be described; Fig. 5, a partial section in the dotted line x' , Fig. 1; Fig. 6, a partial section in the dotted line x'' , Fig. 5; Fig. 7, a detail
60 of the needle-cylinder and the devices for controlling the same. Fig. 8 shows the stud g^6 detached and enlarged and partially broken out, and Fig. 9 an under side view of said
65 stud.

The framework consists, essentially, of a bed A, erected on suitable legs. (Not shown.)

The framework supports a driven shaft A^2 , provided with a pinion A^3 , (shown only in Fig. 1,) which in usual manner engages a series of teeth a , connected to and forming a
70 part of the dial-needle cam-plate A^4 , hereinafter designated "dial" for brevity, the said dial being provided at its under side with a suitable dial-needle-actuating cam-groove a' ,
75 (shown by dotted lines in Fig. 1,) in which is placed a drawing-out cam d , the said groove receiving the butts of and actuating the dial-needles a^2 , the said dial-needles being of the
80 hooked variety and being supported and sliding in suitable grooves in the dial-needle bed a^3 , suitably connected with the plate A, all in usual manner.

The dial carries a yoke B, which is suitably secured thereto by screws b , (see Fig. 1,) a
85 hub at or near the center of said yoke receiving therein a spindle B' , which is retained in position by means of a suitable set-screw b' . This spindle has fixed to it the cylinder-needle-actuating cam B^2 , shown as a hub,
90 (see Figs. 2 and 3,) provided with a suitable groove b^2 to receive the butts of and actuate the cylinder-needles b^3 , shown as of the "hooked" variety, the said hub having fixed
95 to it in suitable manner a knitting or drawing-down cam b^4 and a needle-elevating cam b^5 . The cam b^5 in this instance of our invention is the one employed to enable certain of the cylinder-needles at and about the
100 usual thread-guide b^6 to be withdrawn from

knitting position, as will be hereinafter described, to enable one set of needles, say the cylinder-needles, to be racked or moved from a position at one side of the dial-needles into a position at the opposite side of the said dial-needles to thus effect the racking of the stitches when needles are again thrown into operative position.

The hub of the cam B^2 has at its lower end a sleeve b^7 , (shown by full lines, Fig. 3, and dotted in Fig. 2,) which is extended through a flanged washer b^8 , a collar b^9 being thereafter applied to the said sleeve below said washer, a set-screw b^{10} , carried by said collar and sleeve, acting against said spindle.

The hub of the cam B^2 is surrounded by a needle-cylinder B^3 , provided on its inner side with suitable grooves for the reception of the cylinder-needles, said needle-cylinder resting loosely upon the flange of the washer b^8 and having at suitable points upon its exterior projections b^{12} , (see detail Fig. 7,) which are engaged loosely by grooved wheels b^{13} , supported by brackets b^{14} , attached to a ring b^{15} , applied in suitable manner to the under side of the plate A to be revolved thereon, as may be required, the said ring and brackets being common to the said patent.

The ring b^{15} has secured to its under side a stud g^3 , to which is adjustably connected a link g^2 , the opposite end of which embraces an eccentrically-placed stud g^4 , secured by a screw g^5 to a pinion g , provided with a hub g^6 , having a running fit in the bed A and kept from dropping out by a suitable nut g^7 and washer g^8 , the stud entering, preferably, a groove at the under side of the pinion, the said pinion, as it is rotated intermittingly, as will be described, moving with it the ring b^{15} and the needle-cylinder and its needles.

The cam b^5 is secured to a rod c , which in turn has connected to it in suitable manner a second rod c' , which is extended up through a hole in and guided by a collar c^2 , fixed by a set-screw c^3 to the spindle B' , said rod being surrounded above said collar by a spring c^4 , which normally acts on a pin c^x to keep the cam b^5 in its normal or most elevated position, the said cam being lowered by devices which will now be described.

The rod c' has fixed to it a suitable lug or projection c^5 , which is acted upon by a lever c^6 , pivoted at c^7 on ears of the yoke B, the lower end of said lever bearing constantly upon the face of a pattern-ring c^8 , fixed to the ratchet c^9 , shown as a ring mounted in a groove on the top of the dial A^4 , thus enabling the said ratchet and pattern-ring to be revolved independently on the dial, the lower end of the said lever being kept against the pattern-ring by or through the instrumentality of the spring c^4 . The projections on the pattern-ring are of such shape as to effect, through lever c^6 , the depression of the cam b^5 , as herein shown, in two steps, the distance of one set of projections from another set being

more or less, according to the number of racked courses it is desired to show in the article being knit between slack courses, the slack courses being produced by shifting the drawing-out cam d (shown in Fig. 1) of the dial, it having a stud d' extended up through said plate, which is adapted to be acted upon by a lever or device d^2 , which in the rotation of the pattern-ring is struck by suitable projections d^3 , carried thereby, thus enabling the said cam d to draw the needles out farther and make longer loops for a slack course, a spring d^4 thereafter returning the cam into its normal position.

Normally the cam b^5 occupies the full-line position shown in Fig. 3, during which time regular knitting is carried on, but this cam may be automatically depressed into the two different positions represented by dotted lines, the first position being that in which the said cam will act to elevate the cylinder-needles only far enough to take thread in their hooks, but not far enough to cast off the stitches then on their shanks or above their latches, the knitting-cam thereafter acting to draw the said needles down with two loops preparatory to making a tuck-stitch.

The second or lowest position of the cam b^5 prevents the lifting of the cylinder-needles, thus leaving them in their lowest positions with their hooks below the plate-needles, in which position the needle-cylinder may be racked for one or more needles, usually one needle, so that a needle just drawn down at the right of a plate-needle may be lifted to the left of the same plate-needle into a new knitting position, the plate-needles being continued in action, thus racking the stitch and making a finish for a commencing course, as provided for in said patent, or for ornamental knitting, that depending upon the number of courses knit and racked, and this is done without stopping the action of the plate-needles, they continuing to knit.

To effect the rotation of the ratchet-ring c^9 , we have herein employed a pawl e , (see Figs. 1 and 2,) mounted upon a pawl-carrier e' , shown as a lever pivoted upon a stud e^x , carried by the yoke B, the said pawl-carrier having a roller or other stud e^2 , which is at times actuated by the vertical walls of suitable projections $e^3 e^4$, connected to or forming part of a plate e^x , having a guide-rod e^5 and guide-pins e^6 , the said guide-rod being extended through the bed A, and also through a suitable guiding-ear e^7 , the lower end of the rod being in position to be acted upon by projections of a suitable pattern-surface C, to thus effect the lifting of the casting having the said cam projections $e^3 e^4$, as required, to place the said projections in position to be struck by the pawl-carrier in the rotation of the dial-needle cam-plate and cause the pawl carried thereby and engaging a ratchet-tooth to move the ratchet-ring and to then leave one ratchet-tooth, go forward, and engage another tooth preparatory to again moving the

ratchet-ring, the projections of the pattern-ring carried by the ratchet-ring moving the lever c^6 .

The pattern-surface herein partially shown is represented as of the chain variety, it being actuated by a sprocket-wheel C^1 , fast to a shaft C^2 , deriving its rotation from a pawl C^3 , actuated by an eccentric C^4 , fast to a gear C^5 , driven through a pinion and gear actuated from a toothed portion of the dial-needle cam-plate. When the lower end of the lever c^6 rests on the portion 3 of the pattern-ring, the cam b^5 occupies its lowest position and the needle-cylinder may be racked. The pinion g and link g^2 for racking the cylinder are moved by devices which will now be described.

The yoke B has at one end a sliding pin f , provided at its lower end with a roller f' . The pin is normally kept elevated by a spring f^2 , connected to a radius-bar f^3 , the said radius-bar being jointed at f^4 to an elbow-lever f^5 , connected by screw or otherwise as f^6 of the said pin. The lower end of the radius-bar f^3 is so located as to be acted upon by the projections of the pattern-ring at a point diametrically opposite that at which the said cam projections act upon the lever c^6 , so that when the said lever c^6 has acted to put the cam b^5 in its lowest position preparatory to racking the needles the said pin f is lowered to meet the cam projection f^8 of a segment-lever f^9 , pivoted at f^x , the teeth of the lever engaging a pinion f^{10} , having a long hub, which is extended through the bed A and loosely through a pinion f^{12} , after which the said hub has fixed upon it a pawl-carrying plate f^{13} , provided with pawls f^{14} , (see Fig. 6,) which engage teeth of a ratchet f^{15} , suitably fixed to or forming a part of the gear f^{12} , the pawls moving the said gear intermittently, the gear engaging the pinion g , having fixed to its under side the eccentric-stud g' , before described.

It will be remembered that in this machine the operation of knitting continues while the racking operation is being carried on, or, in other words, the knitting is not stopped during the racking operation, and this is of the gist of this invention, we being the first to knit continuously during the operation of racking.

Having described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. A knitting-machine containing two sets of needles, devices to effect automatically the withdrawal of the needles of one set of needles from between the needles of the other set of needles, means to automatically rack one set of needles and thus place the individual needles of the racked set in new knitting relation to the needles of the other set, and devices to actuate the set of needles which are not racked in order that they may knit during the racking operation, substantially as described.

2. The needle-cylinder, its series of needles, a hub located inside said cylinder, its needle-elevating cam, and a movable device to which it is attached, combined with the dial cam-plate, a cam carried by said plate, means to move said cam intermittently on said plate, and devices intermediate said cam and the device carrying the needle-elevating cam, whereby the latter cam is automatically depressed to prevent raising the cylinder-needles their full distance, substantially as described.

3. The dial-needle cam-plate, the ratchet loosely mounted thereon, and provided with a cam-ring having a series of cams, a pawl to engage and move said ratchet, and a cam device to engage and move said pawl, combined with a pattern-surface to move said cam device into position to be struck by said pawl, substantially as described.

4. A circularly-arranged series of cylinder-needles, a yarn-guide, and a cam to move the hooks of the cylinder-needles away from the yarn-guide to draw the yarn and form loops, a cam to push the needles toward the said yarn-guide to take yarn, means to automatically change the position of the latter cam to lessen the movement of the needles toward the said yarn-guide, and a set of plate-needles between which the cylinder-needles work, and a plate-needle cam-plate to actuate said plate-needles, combined with devices to automatically rack the said cylinder-needles with relation to the plate-needles while the plate-needles continue to knit, substantially as described.

5. A circularly-arranged series of cylinder-needles, a yarn-guide, and a cam to move the hooks of the cylinder-needles away from the yarn-guide to draw the yarn and form loops, a cam to push the needles toward the said yarn-guide to take yarn, means to automatically change the position of the latter cam to lessen the movement of the needles toward the said yarn-guide, and a set of plate-needles between which the cylinder-needles work, and a plate-needle cam-plate to actuate said plate-needles, combined with devices to automatically rack the said cylinder-needles with relation to the plate-needles, and to again restore the said cylinder-needles to the position from which they were racked, substantially as described.

6. The needle-cylinder, having an external projection, a movable ring as b^{15} , carrying a device to engage said projection, a series of needles carried by said cylinder, actuating-cams for said needles, the dial-needle cam-plate, a cam-ring thereon, a lever moved by said cam-ring, and a pin controlled by said lever, combined with a toothed segment, gearing rotated thereby and connections between said gearing and said ring b^{15} to rotate the same intermittently at the proper times, substantially as described.

7. The ring b^{15} , its arm b^{13} , the needle-cylinder having a projection engaged by said

arm, the link g^2 connected to said ring, the
eccentric-stud embraced by said link, the
gear g , its driving-gear f^{12} having an attached
ratchet-wheel, and the pawl and pawl-carrier
5 to engage said ratchet-wheel, combined with
the segment-lever, and means to move it to
operate, substantially as described.

In testimony whereof we have signed our

names to this specification in the presence of
two subscribing witnesses.

GEORGE A. LEIGHTON.
JOHN H. RICE.

Witnesses:

FRANK H. COLLEY,
HARRY E. LOVEREN.