

No. 705,203.

Patented July 22, 1902.

D. A. BUCKER.
KNITTING MACHINE.

(Application filed Aug. 1, 1901.)

(No Model.)

3 Sheets—Sheet 1.

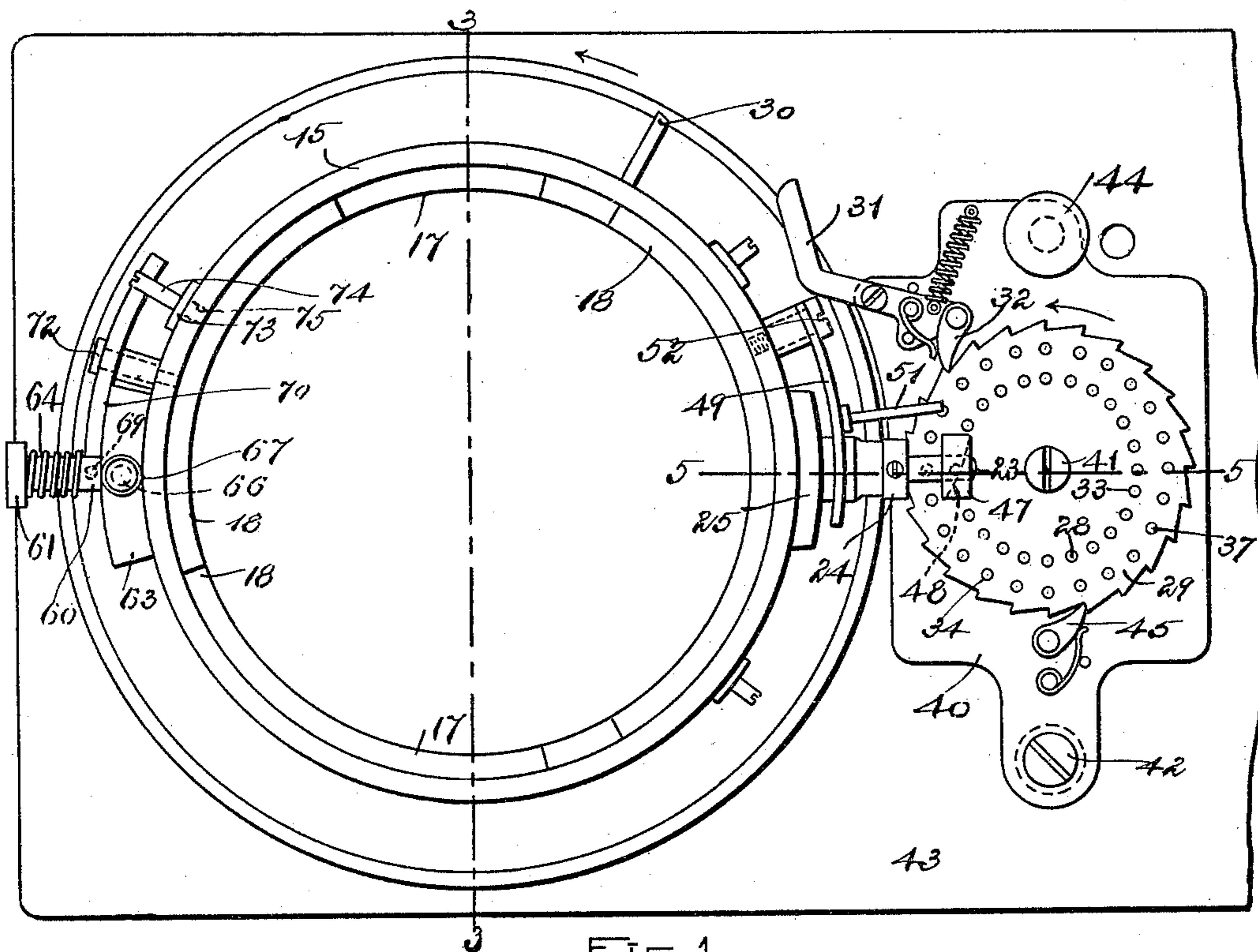


FIG. 1.

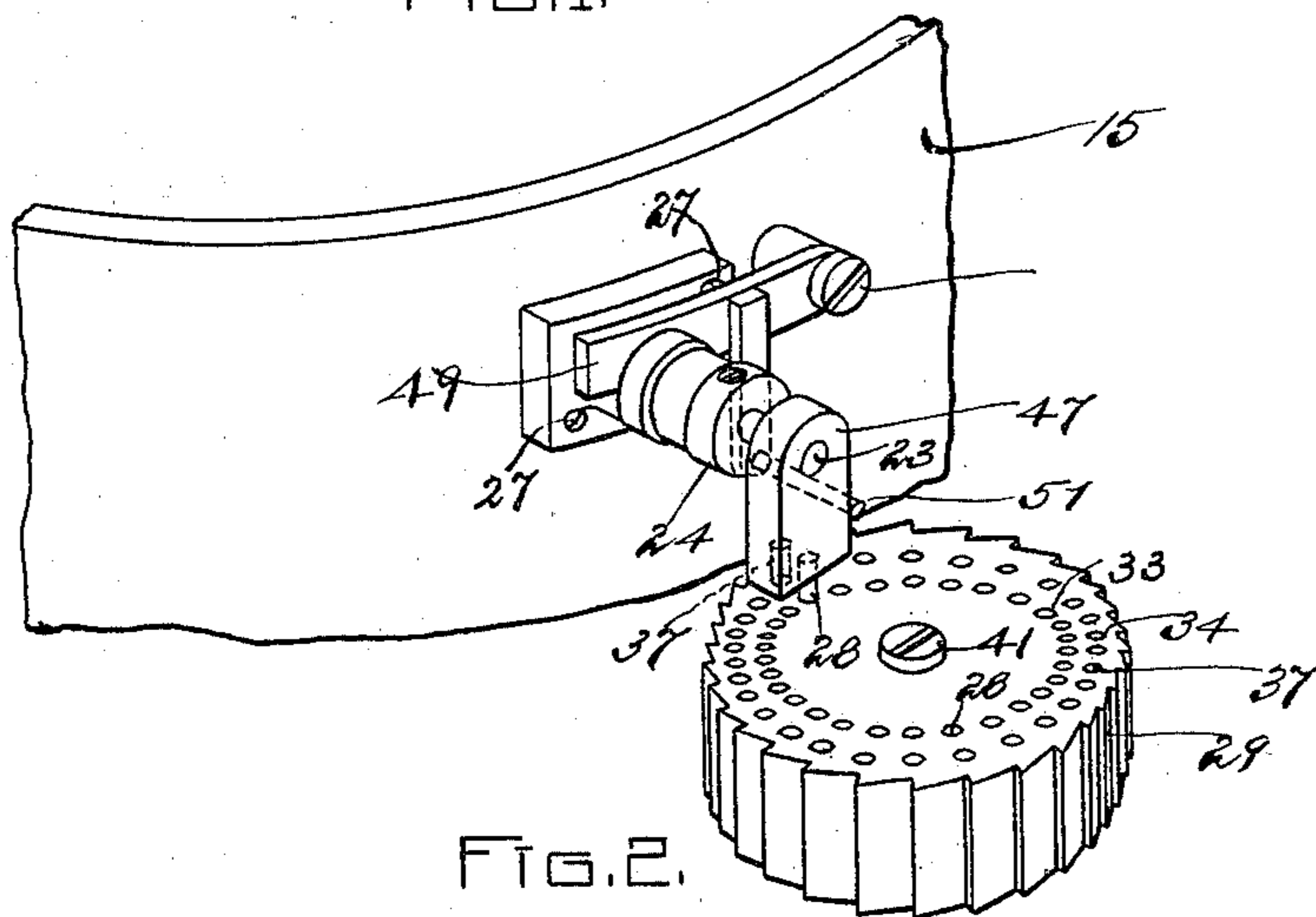


FIG. 2.

WITNESSES:

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FIG. 2a.



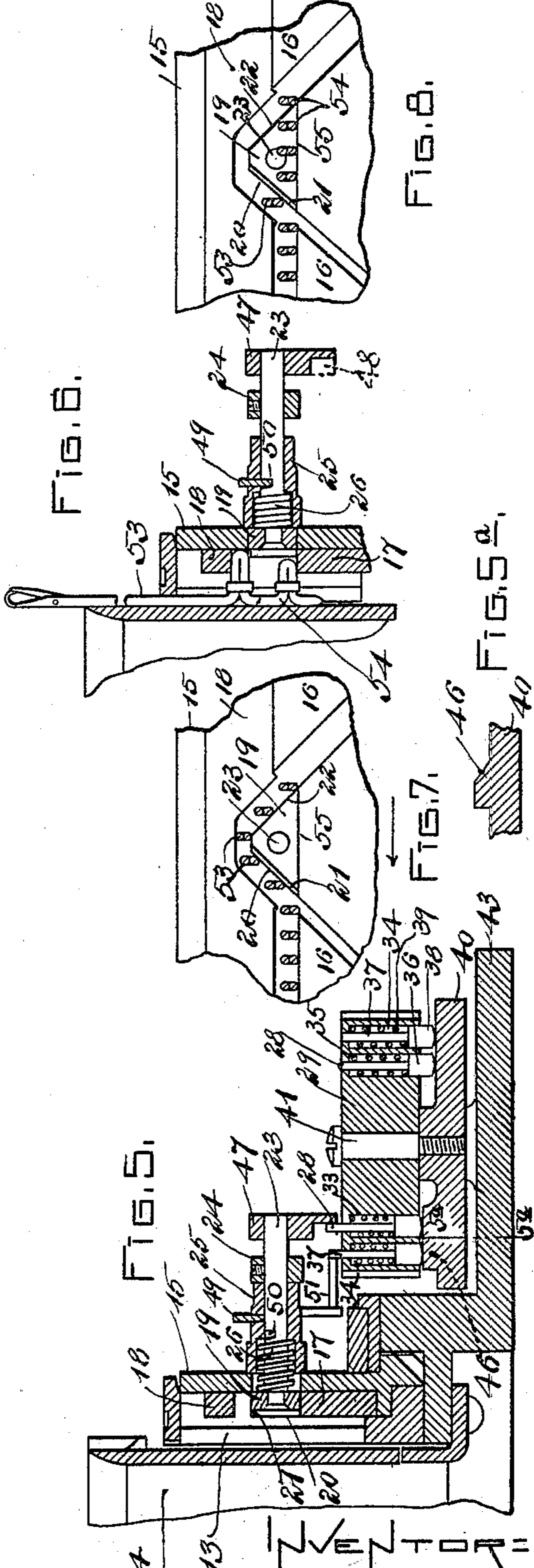
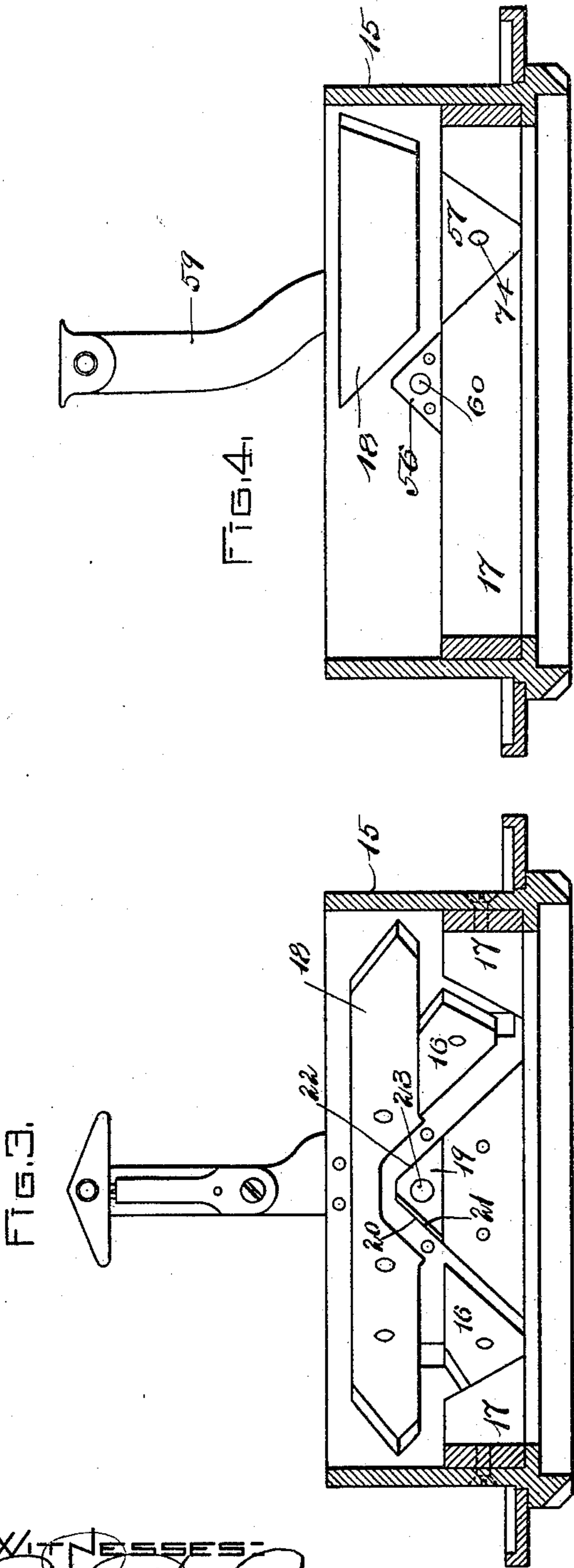
INVENTOR:
Daniel A. Bunker
by *His Attorney*
Charles J. Gooding

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(Application filed Aug. 1, 1901.)

(No Model.)

3 Sheets—Sheet 2.



WITNESSES:
R. Henry Marsh.
Ralph H. Nutter.

Daniel A. Booker,
by his Attorney, Charles S. Gordon.

No. 705,203.

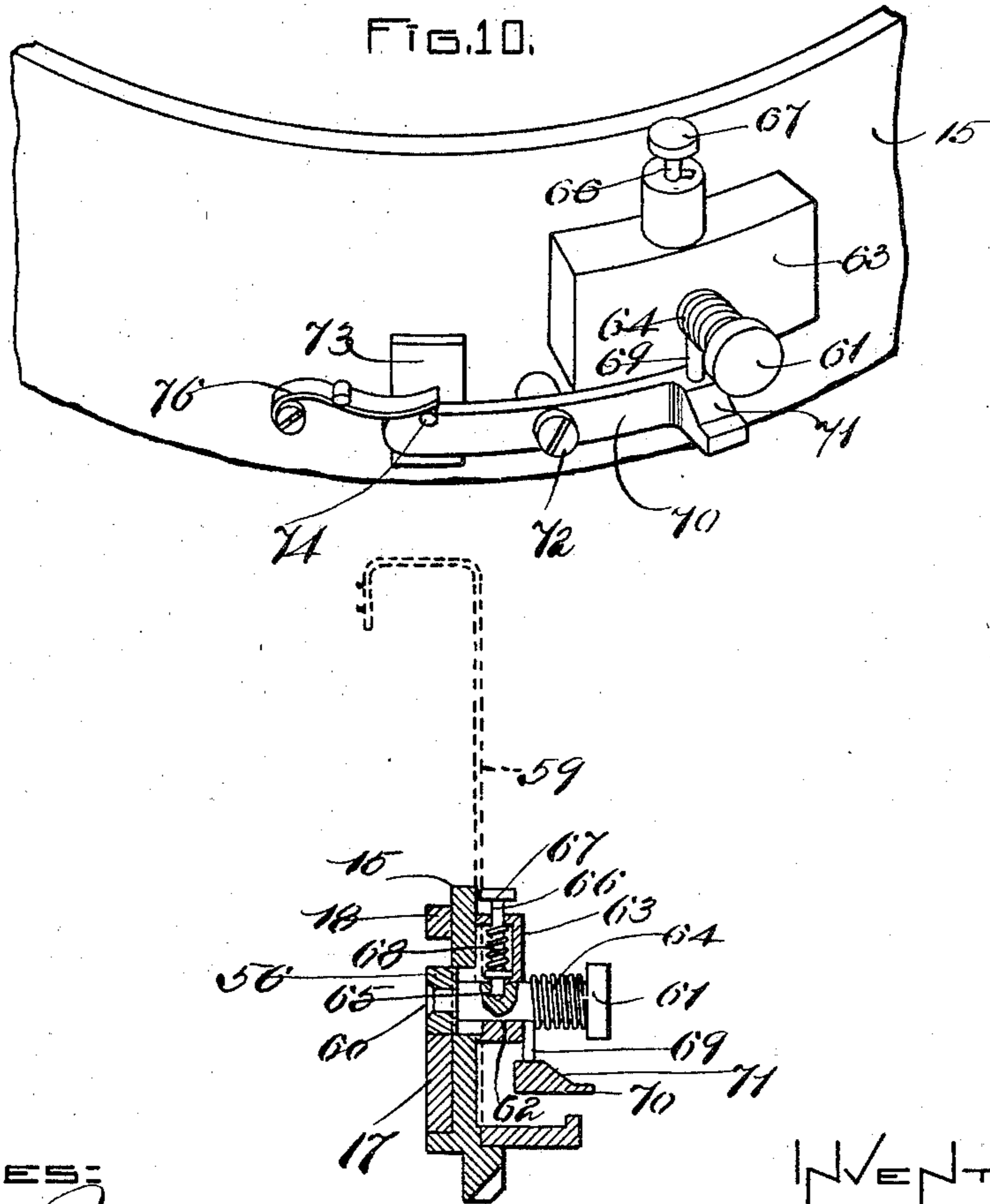
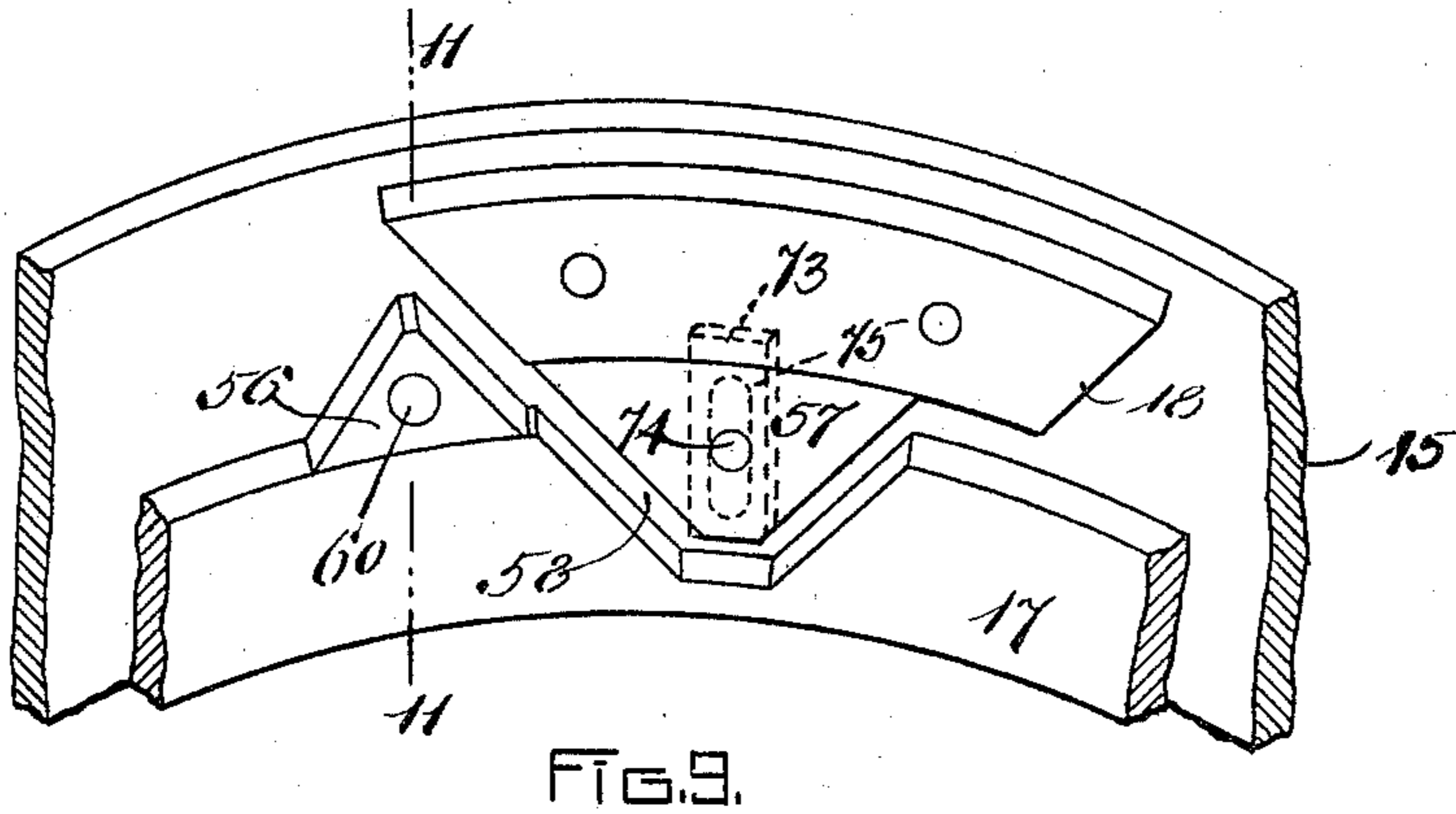
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3 Sheets—Sheet 3.



WITNESSES:
Wm. Henry Marsh
Ralph H. Mitter

INVENTOR:
FIG. 11. *Daniel A. Booker,*
by his Attorney, Charles S. Gooding

UNITED STATES PATENT OFFICE.

DANIEL A. BUOKER, OF WEST PEABODY, MASSACHUSETTS.

KNITTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 705,203, dated July 22, 1902.

Application filed August 1, 1901. Serial No. 70,487. (No model.)

To all whom it may concern:

Be it known that I, DANIEL A. BUOKER, a citizen of the United States, residing at West Peabody, in the county of Essex and State of Massachusetts, have invented new and useful Improvements in Knitting-Machines, of which the following is a specification.

This invention relates to circular-knitting machines, and is similar in construction to that shown and described in the United States patent to W. H. Mayo, No. 319,000, in which two varieties of needles are used—viz., a long and a short heeled needle.

The object of this invention is to provide a machine which may be readily adjusted and changed to knit a variety of fancy stitches or patterns.

The invention consists in an improved needle-elevating cam combined with means for moving said cam toward and away from the center of the cam-cylinder.

The invention again consists in mechanism for moving said needle-elevating cam radially toward and away from the center of the needle and the cam-cylinder for the purpose of locating said needle-elevating cam in a position to elevate all the needles or only a portion of the same during the rotation of the cam-cylinder, and to thus produce a plain or fancy stitch, respectively, said mechanism being so constructed that the needle-elevating cam may be set to operate at each rotation of the cam-cylinder upon the long-heeled needles alone or upon both the long and short heeled needles.

The invention further consists in an auxiliary needle-elevating cam, a stitch-cam, and mechanism connecting said cams, whereby said auxiliary needle-elevating cam is moved radially inwardly or outwardly from the center of said cam-cylinder and the said stitch-cam is raised or lowered, respectively.

The invention further consists in the combination and arrangement of parts set forth in the following specification and particularly pointed out in the claims thereof.

Referring to the drawings, Figure 1 is a plan view of the cam-cylinder of my improved knitting-machine, together with the mechanism by which the needle-elevating cam is moved radially toward and away from the center of said cam-cylinder. Fig. 2 is a de-

tail perspective view of a portion of the mechanism by which the needle-elevating cam is moved radially toward and away from the center of the cam-cylinder, showing the same in its position with relation to a portion of the wall of said cam-cylinder as viewed from the outside thereof. Fig. 2^a is an underneath plan of the plate 47. Fig. 3 is a central vertical section of the cam-cylinder, taken on the line 3 3 of Fig. 1 looking toward the right in said figure. Fig. 4 is a central vertical section of the cam-cylinder, taken on the line 3 3 of Fig. 1 looking toward the left in said figure. Fig. 5 is a detail section taken on line 5 5 of Fig. 1, showing the mechanism by which the needle-elevating cam is moved radially and the relative position of the "cam-cylinder" to the "skeleton cylinder" 13 and the "needle-cylinder" 14, the needle-elevating cam being shown moved to its innermost position. Fig. 5^a is a detail section showing the inclined projection upon the ratchet. Fig. 6 is a detail section similar to Fig. 5, showing the needle-elevating cam moved outwardly and a long and a short heeled needle in position with relation thereto. Fig. 7 is a detail elevation of the needle-elevating cam and a portion of the cam-cylinder viewed as in Fig. 3, with the needle-elevating cam thrown inwardly, as in Fig. 5, and both the long and short heeled needles illustrated as traveling upwardly over said needle-elevating cam. Fig. 8 is a view similar to Fig. 7, showing the needle-elevating cam moved outwardly, the long-heeled needles passing upwardly over said needle-elevating cam and the short-heeled needles not being affected thereby. Fig. 9 is a perspective view of a portion of the cam-cylinder, together with the auxiliary needle-elevating cam and stitch-cam, as viewed from the inside of said cam-cylinder. Fig. 10 is a perspective view of a portion of the cam-cylinder, together with the mechanism for moving the auxiliary needle-elevating cam inwardly and outwardly from the center of said cam-cylinder and for raising and lowering said stitch-cam. Fig. 11 is a vertical detail section taken on line 11 11 of Fig. 9.

Like numerals refer to like parts throughout the several views of the drawings.

In the drawings, 15 is the cam-cylinder. 16 16 are vertically-movable wedge-shaped stitch-

cams located within said cylinder and adapted to be reciprocated in V-shaped recesses formed in the ledge 17. Above the stitch-cams 16 16 is located a guide-plate 18. The
 5 needle-elevating cam 19 is movable radially toward and away from the center of the cam-cylinder 15 and consists of a plate of triangular shape, two sides of said triangle forming
 10 tracks to guide the heels of the needles and raise and lower the same. The inner edge of the upwardly-inclined track 20 projects toward the center of the cam-cylinder, forming a lip 21, the inner edge of said lip being nearer the center of the cam-cylinder than the inner
 15 face of the triangular plate 19, while the inner edge of the downwardly-inclined track 22 is flush with said inner face of the triangular plate 19, so that the lip 21 projects inwardly from the face of the cam-plate 19 about one-
 20 sixteenth of an inch, as shown in Figs. 5 and 6.

The needle-elevating cam 19 is fast to a reciprocatory pin 23, Figs. 4 and 5, having a collar 24 fast thereto, which is held normally against a bracket 25 by a spiral compression-
 25 spring 26, said bracket 25 being fast by screws 27 to the cam-cylinder 15. Normally the needle-elevating cam 19 is held in the position shown in Figs. 3 and 5 by the spring 26, and when in that position—that is, nearest the
 30 center of the cam-cylinder 15—both the long and the short heeled needles pass upwardly over said needle-elevating cam 19 as the cam-cylinder 15 is rotated.

In order to procure different patterns in the
 35 completed work, the needle-elevating cam 19 is moved radially to the right from the position shown in Fig. 5 to that shown in Fig. 6 by means of the pins 28 on the ratchet 29. As the cam-cylinder 15 rotates the radially-projecting pin 30, fast thereto, Fig. 1, strikes a
 40 pawl-lever 31 and rotates the ratchet 29 one tooth by means of the pawl 32, pivotally attached to the lever 31. The ratchet 29 has two sets of holes 33 and 34, arranged in circles
 45 around the center thereof. Each of the holes 33 has a pin 28, arranged to slide vertically therein and being held downwardly by a spiral spring 35, contained within said hole and bearing at one end against the enlarged por-
 50 tion 36 of the pin 28. In each of the holes 34 is a similar pin 37, having an enlarged portion 38 thereon, against which a spiral spring 39 bears. The action of the springs 39 and 35 tends to force the pins 37 and 28, respec-
 55 tively, downwardly against a plate 40, to which the ratchet 29 is attached by a shouldered screw 41 in such a manner as to be capable of being rotated thereon. The plate 40 is pivoted upon a screw 42, fast to the bed-plate 43
 60 of the machine, and the ratchet 29, with its pins 28 and 37, may be thrown entirely out of engagement with the cam-cylinder 15 by moving the plate 40 upon its pivotal screw 42 to the right, Fig. 1, and locking the same
 65 in position by means of a thumb-bolt 44. A stop-pawl 45 prevents the ratchet from turning in the opposite direction from that indi-

cated by the arrow, Fig. 1. As the ratchet 29 is rotated in the manner hereinbefore described each of the pins 28 and 37 arrives at
 70 the line 5 5, Fig. 1, and at the left of the center of said ratchet, fast to the plate 40, is a projection or incline 46, which forces the pins 28 and 37 upwardly until they project above the surface of the ratchet 29. Each of the
 75 pins 28 as it is brought into proper position therefor by means of the pawl 32—viz., to the left of the center of the ratchet 29 and in a line joining the center of said ratchet and the center of the cam-cylinder 15—engages a plate
 80 47, Fig. 5, having an inclined surface 48 upon the under side thereof, and as the needle-cam continues its rotation the pin 23 is thrown toward the right, Fig. 5, drawing the needle-elevating cam 19 from the position shown in
 85 Fig. 5 to that shown in Fig. 6 against the action of the spring 26. When it arrives at the position shown in Fig. 6, a lock-lever 49 drops into a notch 50 in said pin and locks it in the position shown in said Fig. 6. The lock-le-
 90 ver 49 is raised from the position shown in Fig. 6 to release the pin 23 and the needle-elevating cam 19 by one of the pins 37, each of said pins as the ratchet 29 is rotated in the direction shown by the arrow being raised, as
 95 hereinbefore described, when it arrives in a line joining the centers of the cam-cylinder and ratchet, and as the cam-cylinder rotates the horizontally-projecting pin 51, fast to the lock-lever 49, encounters one of said pins 37,
 100 thus rocking the locking-lever 49 upon its pivot 52 and raising said lever out of the notch 50 in the pin 23. It will be seen that the pin 51 is fast to the lock-lever 49 at a point below the pivot 52, and as the pin in rotating en-
 105 gages one of the pins 37 near the top of said pin said lock-lever is rocked upon its pivot, rising as it rocks, and thus clearing the pin 51 from the pin 37. The tops of the pins 37 are preferably rounded or beveled, and the
 110 under side of the pin 51 is also beveled to assist in the lifting action of the lock-lever 49, hereinbefore set forth. Said pin 23 being thus disengaged, the spring 26 forces it forward with the needle-elevating cam 19 from
 115 the position shown in Fig. 6 to that shown in Fig. 5. It is evident that by placing the pins 28 and 37 in varying combinations upon the ratchet 29 the needle-elevating cam will be operated to produce varying patterns of stitch
 120 in the completed work. When the needle-elevating cam is in the position shown in Figs. 3 and 5, both the long-heeled needles 53 and the short-heeled needles 54 will travel over said cam and be operated thereby; but
 125 when the needle-elevating cam 19 is withdrawn to the position shown in Figs. 6 and 8 only the long-heeled needles 53 will be operated by the cam and they will be operated by the projecting lip 21. The short-heeled
 130 needles 54 will not be engaged by said lip 21 when the needle-elevating cam is in the position shown in Figs. 6 and 8 and will there-
 fore not be operated by said needle-elevating

cam. As shown in Fig. 7, both the long-heeled needles 53 and the short-heeled needles 54 will pass over the needle-elevating cam when said cam is in the position shown in Fig. 7; but when the cam is in the position shown in Fig. 6 only the long-heeled needles will pass over the needle-elevating cam, being guided by the lip 21, Fig. 8, and the short-heeled needles will pass along the horizontal line 55, Fig. 8, without being raised by the needle-elevating cam. Assuming the needles to be in the position shown in Figs. 6 and 8, with the needle-elevating cam drawn outwardly, some of the short-heeled needles 54 will be in the position shown in Fig. 8, and the long-heeled needles 53 may be in the position shown in said Fig. 8. If now by the mechanism hereinbefore set forth the needle-cam 19 is released by tripping the locking-lever 49 with one of the pins 37, the spring 26 will carry the cam 19 forward toward the center of the cam-cylinder 15 until the face of said needle-cam comes against the end of the heel of the short-heeled needles 54, which lie in the path of said cam, and the distance thus traveled by the cam before abutting against the heels of the short-heeled needles, Fig. 6, is sufficient to allow the lip 21 to project sufficiently far toward the center of the cam-cylinder to catch both the short and long heeled needles which it encounters in rotating, and as the cam-cylinder rotates the short-heeled needles 54, Fig. 8, which stand in the path of the radial movement of the cam 19 will pass by the surface of the needle-elevating cam. After said short-heeled needles have been so passed the needle-elevating cam will be forced forward to the position shown in Fig. 5 by the spring 26. If it were not for this projecting lip upon the inner surface of the needle-elevating cam, it is evident that the short-heeled needles lying in the radial path of said cam would prevent the cam from being forced forward by the spring sufficiently to divert all of the needles 53 and 54, as hereinbefore described. This needle-elevating cam, therefore, in itself, with the raised lip 21 on the inner surface of the cam, constitutes one of the features of my invention, and while I prefer to make said cam, as shown, with the lip projecting about one-sixteenth of an inch in advance of the face of the cam it is evident that the same purpose would be attained by advancing the inner edge of the upwardly-inclined track 20 a slight distance beyond the inner edge of the downwardly-inclined track 22, and I therefore do not wish to be understood as confining myself to the specific construction of the cam 19 with a projecting lip thereon, as any cam having an upwardly-inclined track 20 and a downwardly-inclined track 22 moving together as one piece and having the inner edge of the upwardly-inclined track projecting beyond the inner edge of the downwardly-inclined track 22 would be within the spirit of my invention.

In addition to the mechanism hereinbefore

described, in which the stitch is produced by having the long-heeled needles operated by the needle-elevating cam 19, I can operate the needles to make plain-stitch work before said needles again pass the cam 19 by means of the auxiliary needle-elevating cam 56 and the stitch-cam 57. These cams 56 and 57 are set by hand, the auxiliary cam 56 being moved radially toward and away from the center of the cam-cylinder and the stitch-cam 57 being raised and lowered by mechanism connected with the operating mechanism of said stitch-cam, so that when the auxiliary cam 56 is pushed inwardly toward the center of the cam-cylinder, as shown in Fig. 9, the stitch-cam 57 will be raised and the needles will then be operated by said auxiliary cam and stitch-cam; but when the auxiliary cam 56 is drawn outwardly, as hereinbefore described, the stitch-cam 57 will be lowered into the V-shaped groove 58, as shown in Fig. 4, and the needles will then pass said cams without being affected by them. The needles in passing the auxiliary cam 56 and stitch-cam 57 take the yarn from an auxiliary yarn-carrier 59, fast to the cam-cylinder 15. The auxiliary cam 56 is moved radially by hand toward and away from the center of the cam-cylinder by means of a pin 60, having a head 61 thereon for convenience in operating. The pin 60 slides in a bearing 62, formed in a bracket 63, fast to the cam-cylinder 15, and is forced toward the right, Fig. 11, by a spiral spring 64, one end of which bears against the head 61 and the other against the bracket 63. The pin 60 has a hole 65 therein, which engages a spring-pin 66 when the auxiliary needle-elevating cam 56 is moved by hand into the position shown in Fig. 11 or toward the left in said figure. Said spring-pin 66 may be withdrawn from the hole 65 by means of the head 67 thereon against the action of the spring 68. The said pin 60 has a vertical pin 69 fast thereto and extending downwardly therefrom, which engages the right-hand end of a lever 70 as said pin 60 is pushed inwardly, and said pin 69 rides up on an incline 71 upon the lever 70, forcing said lever to tip upon a pivotal screw 72, fast to the cam-cylinder 15, and thereby raise the slide 73, said slide being rigidly connected to the stitch-cam 57 by a pin 74, arranged to slide in a slot 75 in said cam-cylinder 15, and the left-hand end of the lever 70 bearing against the under side of said pin 74 raises the slide 73 when the right-hand end of the lever is depressed, as hereinbefore described. The pin 74 is held against the lever 70 by a spring 76, one end of which rests on the pin 74 and the other end is fast to the cam-cylinder 15.

The operation of the hereinbefore-described mechanism for setting the auxiliary needle-elevating cam 56 and the stitch-cam 57 is as follows: Assuming the parts to be in the position shown in Fig. 11, the spring-pin 66 is raised and the pin 60, together with the aux-

iliary cam 56, is carried toward the right, Fig. 11, by the spring 64, moving the auxiliary cam 56 outwardly, and at the same time the stitch-cam 57 is drawn downwardly by the spiral tension-spring 76 into the V-shaped groove 58, and the auxiliary and stitch cams are then out of connection with the needles. By pushing the pin 60 inwardly until the spring-pin 66 engages the hole 65 in the pin 60 the auxiliary cam 56 will be brought into position to operate the needles. At the same time the stitch-cam will be raised, as shown in Fig. 9, to lower said needles.

It will be understood that in the hereinbefore-described knitting-machine the needle-elevating cam 19 is moved inwardly and outwardly from the center of the cam-cylinder during the rotation of said cam-cylinder and that the auxiliary needle-elevating cam 56 is moved inwardly and outwardly toward and away from the center of the cam-cylinder by hand when the cam-cylinder is stationary.

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

1. In a knitting-machine, a cam-cylinder, a needle-elevating cam, an upwardly-inclined track, and a downwardly-inclined track, both of said tracks fast to said needle-elevating cam, the inner edge of said upwardly-inclined track being located nearer the center of said cam-cylinder than said downwardly-inclined track, and means to move said needle-elevating cam alternately toward and away from the center of said cam-cylinder.

2. In a knitting-machine, a needle-elevating cam, consisting of a plate having two inclined sides forming tracks converging toward one another, a lip flush with the working face of one of said tracks fast to said cam and projecting beyond the inner face of said plate, and means to move said needle-elevating cam alternately toward and away from the center of the cam-cylinder.

3. In a knitting-machine, a cam-cylinder, a needle-elevating cam, two tracks integral with said needle-elevating cam converging toward one another, the inner edge of one of said tracks being located nearer the center of said cam-cylinder than the inner edge of the other of said tracks, and means to move said needle-elevating cam alternately toward and away from the center of said cam-cylinder.

4. In a knitting-machine, a cam-cylinder, a needle-elevating cam carried by said cam-cylinder and radially movable thereon, a disk arranged to rotate around a stationary center bearing, projections upon said disk arranged

to impart a radial movement to said needle-elevating cam with relation to said cam-cylinder, and mechanism to impart an intermittent rotary motion to said disk.

5. In a knitting-machine, a cam-cylinder, a needle-elevating cam carried by said cam-cylinder and radially movable thereon, a horizontal ratchet, projections upon said ratchet arranged to impart a radial movement to said needle-elevating cam with relation to said cam-cylinder, and means to raise and lower said projections with relation to the face of said ratchet and mechanism to impart an intermittent rotary motion to said ratchet.

6. In a knitting-machine, a cam-cylinder, a needle-elevating cam carried by said cam-cylinder and radially movable thereon, a rotary disk, projections upon said disk arranged to impart an outward radial movement to said needle-elevating cam, a locking device to lock said needle-elevating cam in its outward position, a spring to carry said needle-elevating cam toward the center of said cam-cylinder, and mechanism to release said locking device.

7. In a knitting-machine, a cam-cylinder, a needle-elevating cam carried by said cam-cylinder and radially movable thereon, a horizontal ratchet, mechanism to impart an intermittent rotary motion to said ratchet, projections upon said ratchet arranged to impart an outward radial movement to said needle-elevating cam with relation to said cam-cylinder, means to raise and lower said projections with relation to the face of said ratchet, a locking device to lock said needle-elevating cam in its outward position, a spring to carry said needle-elevating cam toward the center of said cam-cylinder, and projections upon said ratchet to release said locking device.

8. In a knitting-machine, a cam-cylinder, an auxiliary needle-elevating cam carried by said cam-cylinder and movable radially thereon, a stitch-cam movable vertically of said cam-cylinder, and mechanism connecting said auxiliary and stitch cams, whereby when said auxiliary cam is moved radially away from the center of said cam-cylinder, said stitch-cam will be moved vertically downwardly thereon and vice versa.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

DANIEL A. BUOKER.

Witnesses:

CHARLES S. GOODING,
ANNIE J. DAILEY.