

No. 735,910.

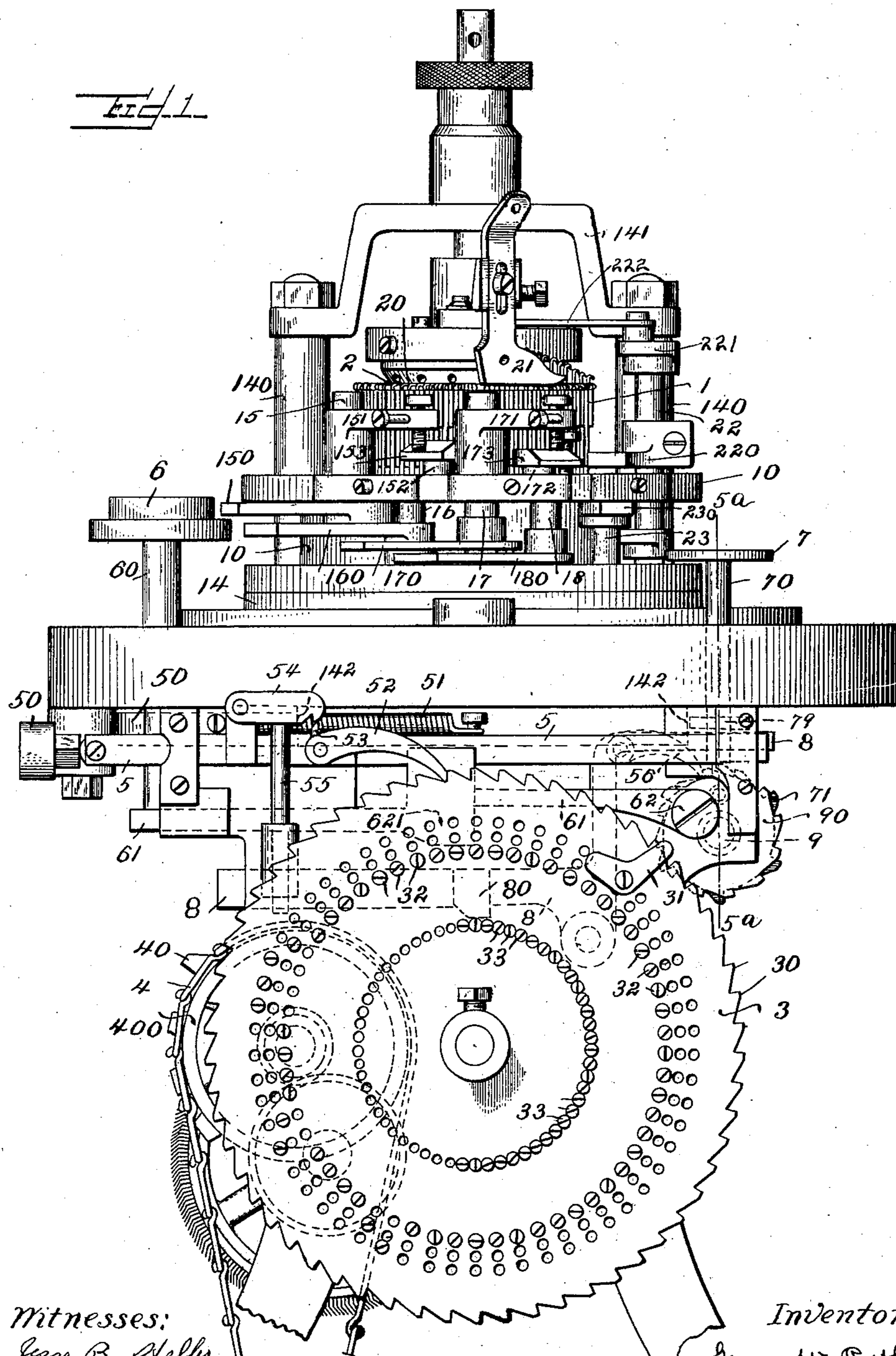
PATENTED AUG. 11, 1903.

G. W. RUTH.  
AUTOMATIC RIB KNITTING MACHINE.

APPLICATION FILED AUG. 1, 1901.

NO MODEL.

4 SHEETS—SHEET 1.



Witnesses:  
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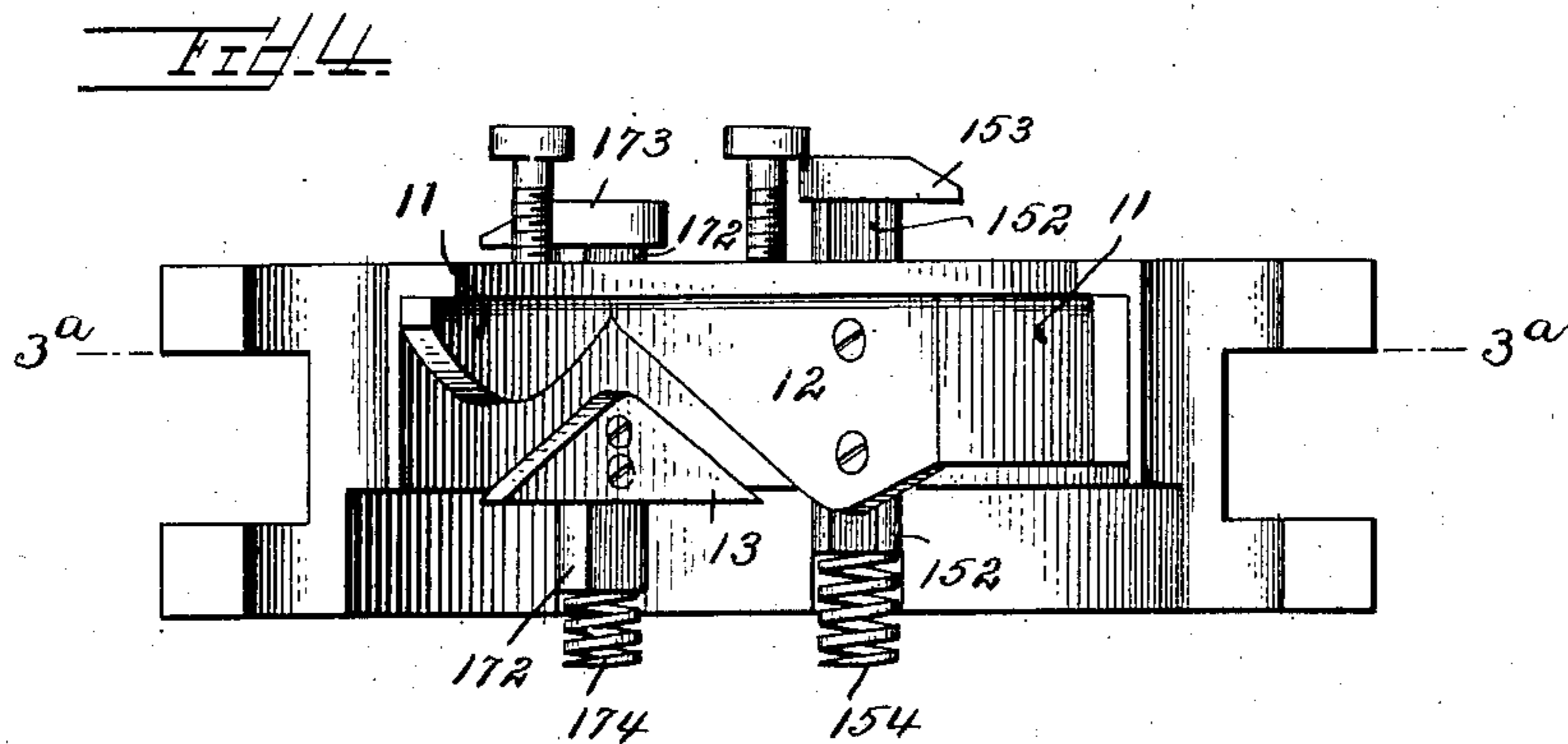
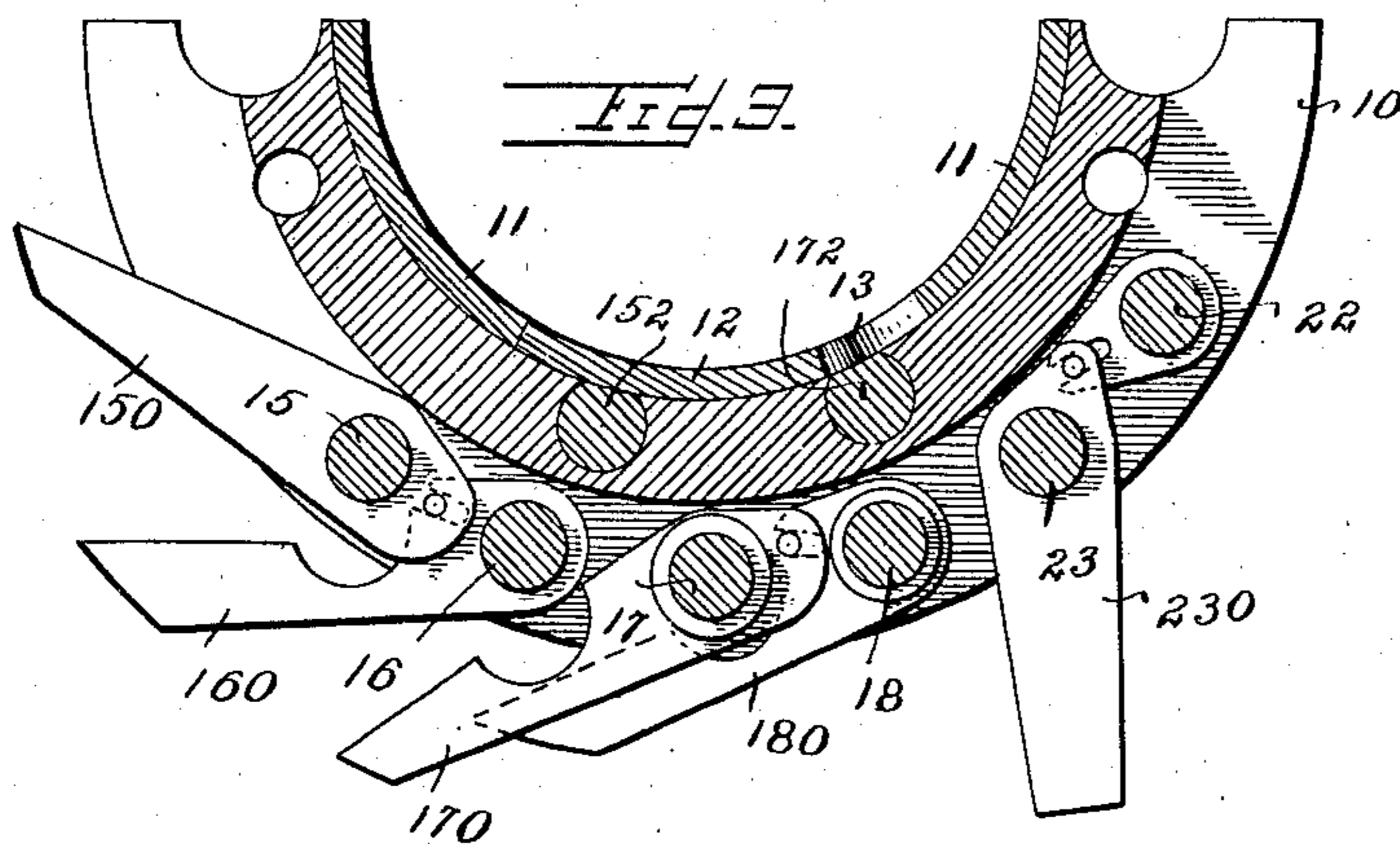
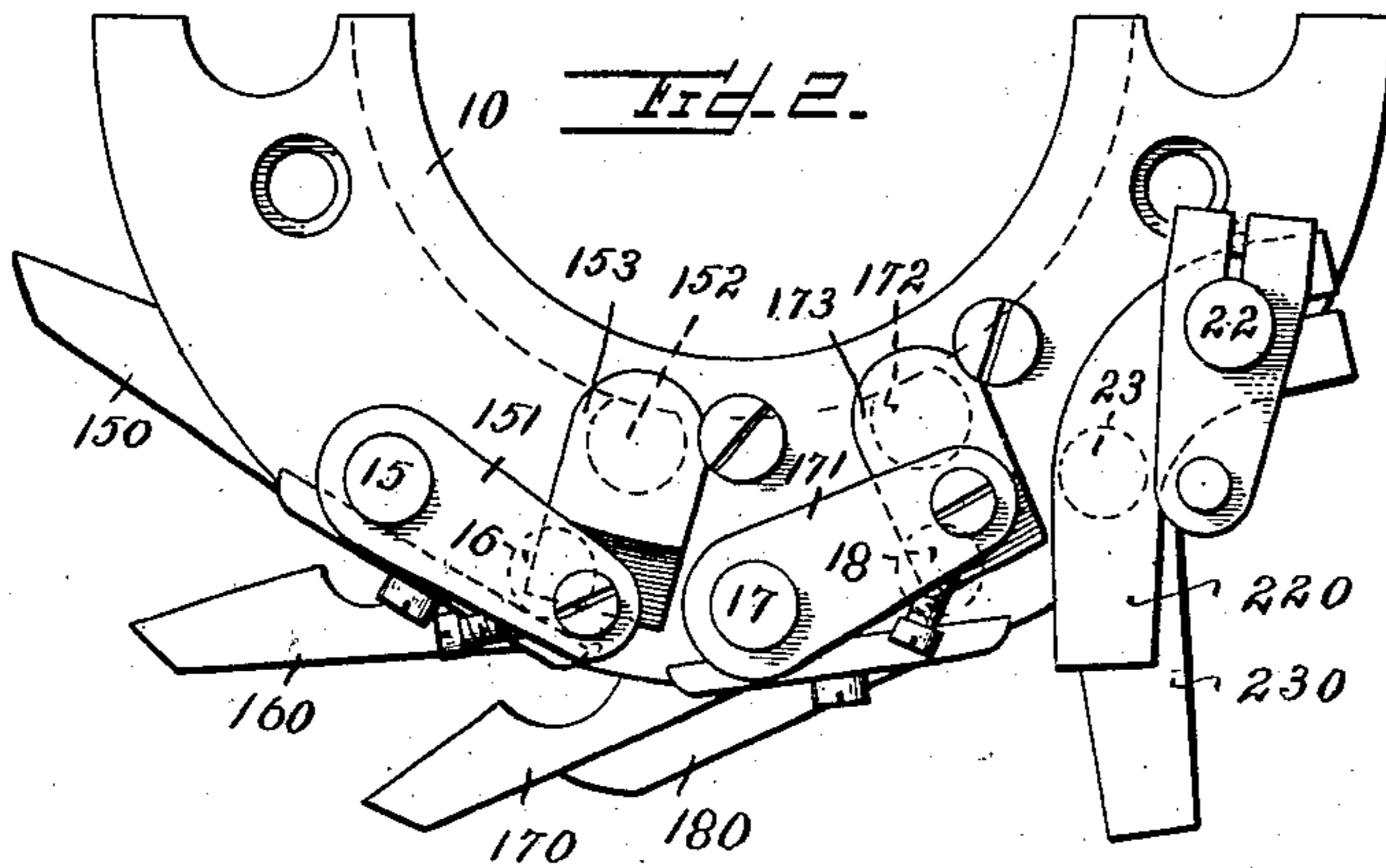
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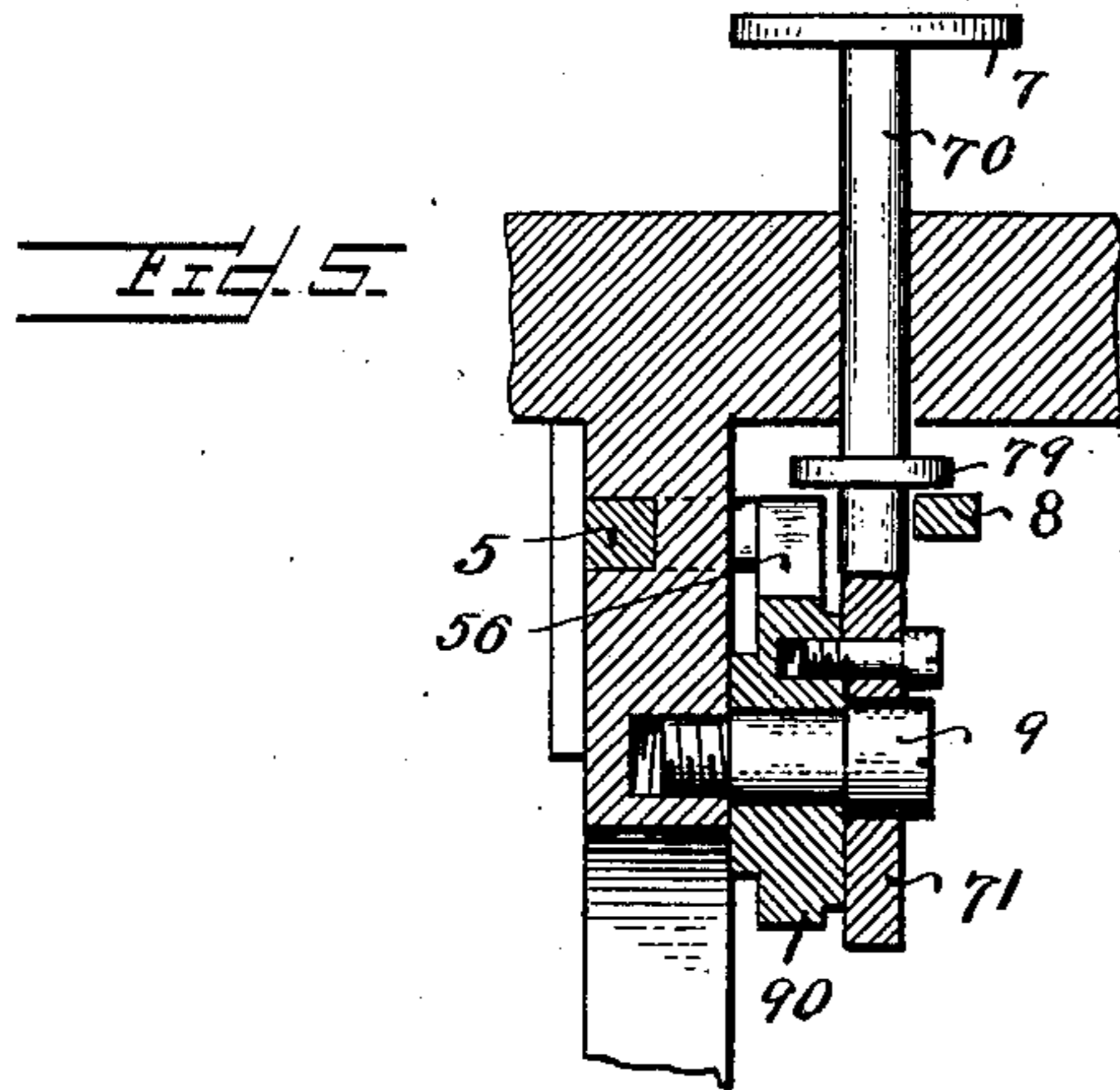
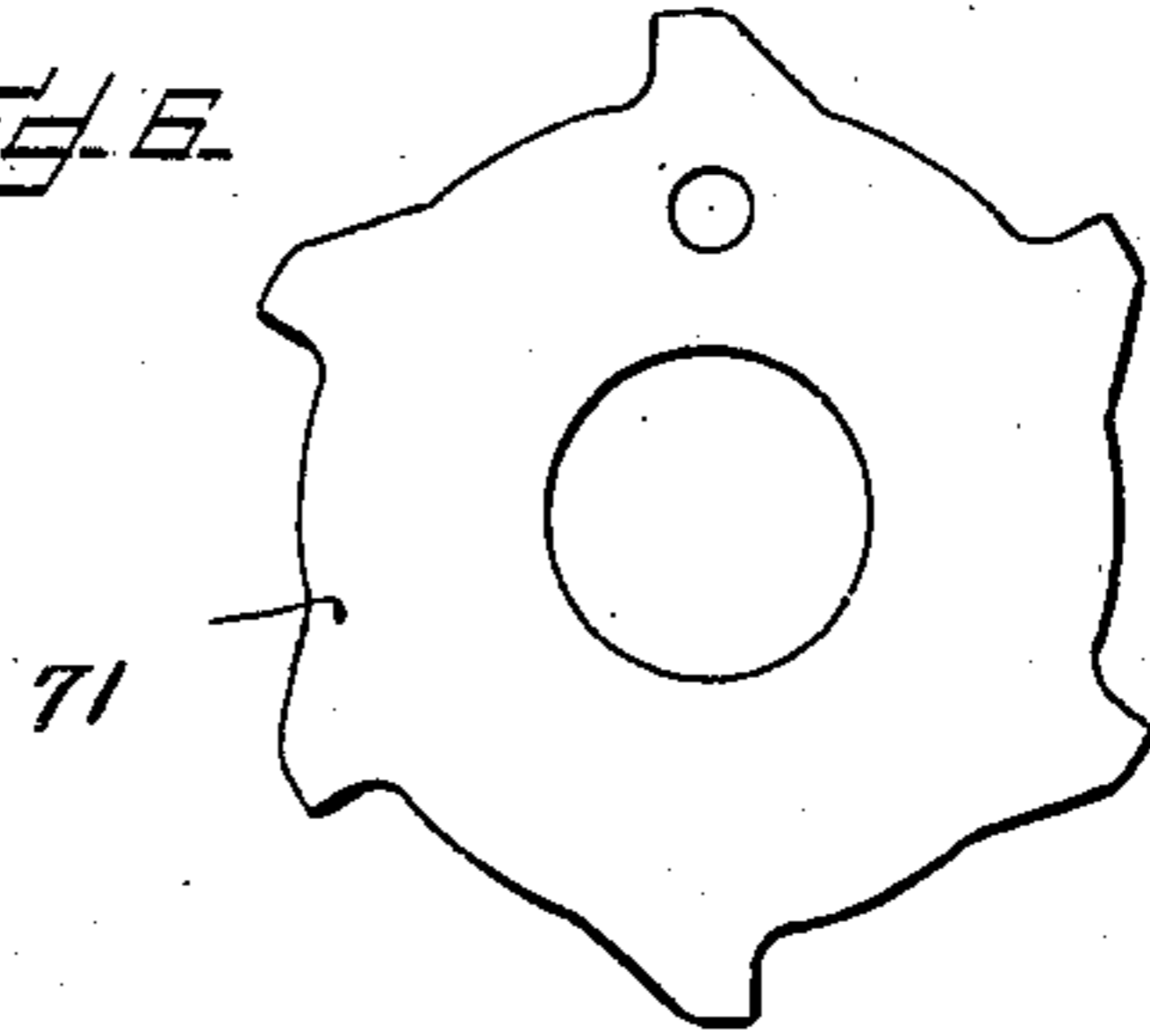
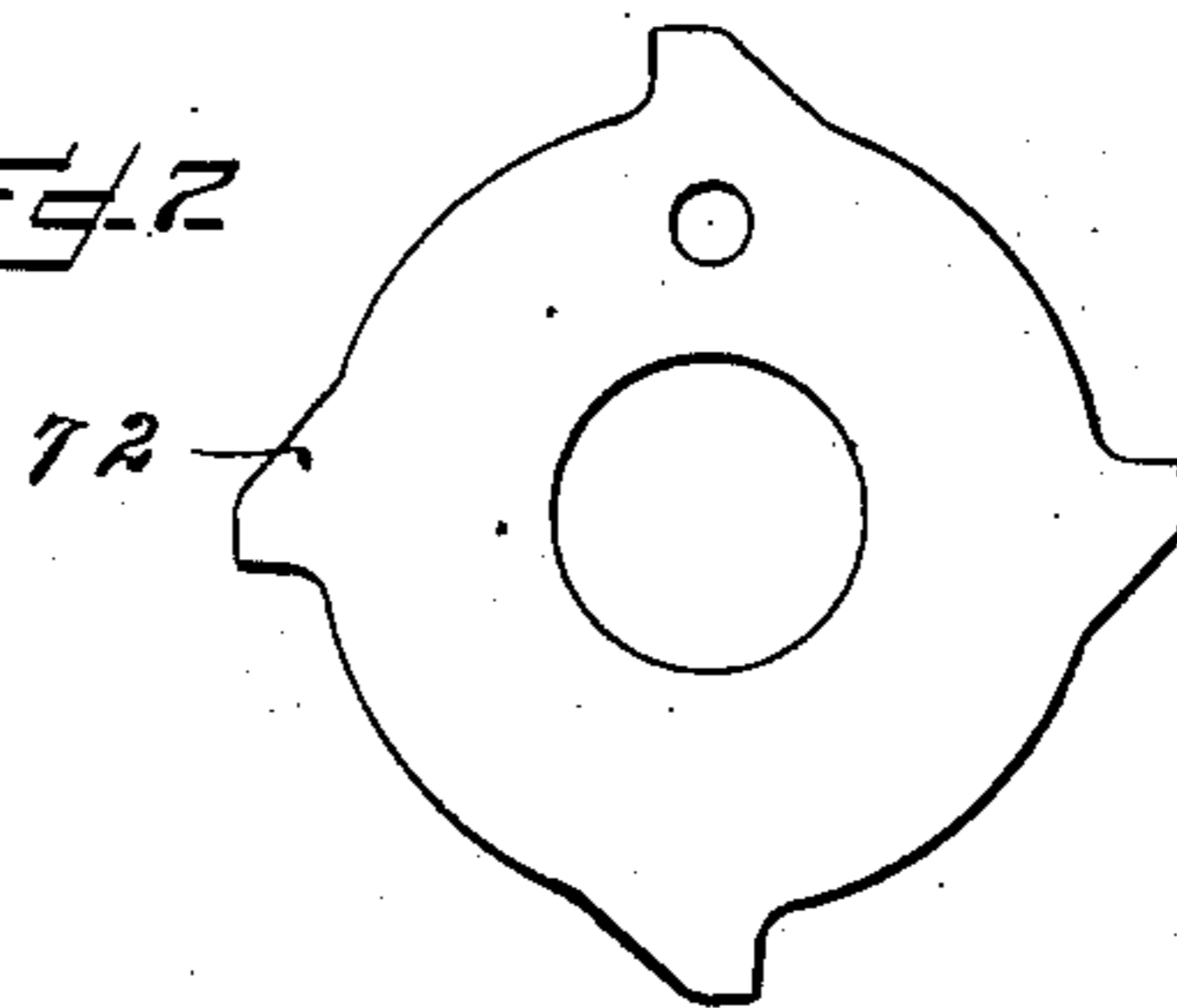


Fig. 5.



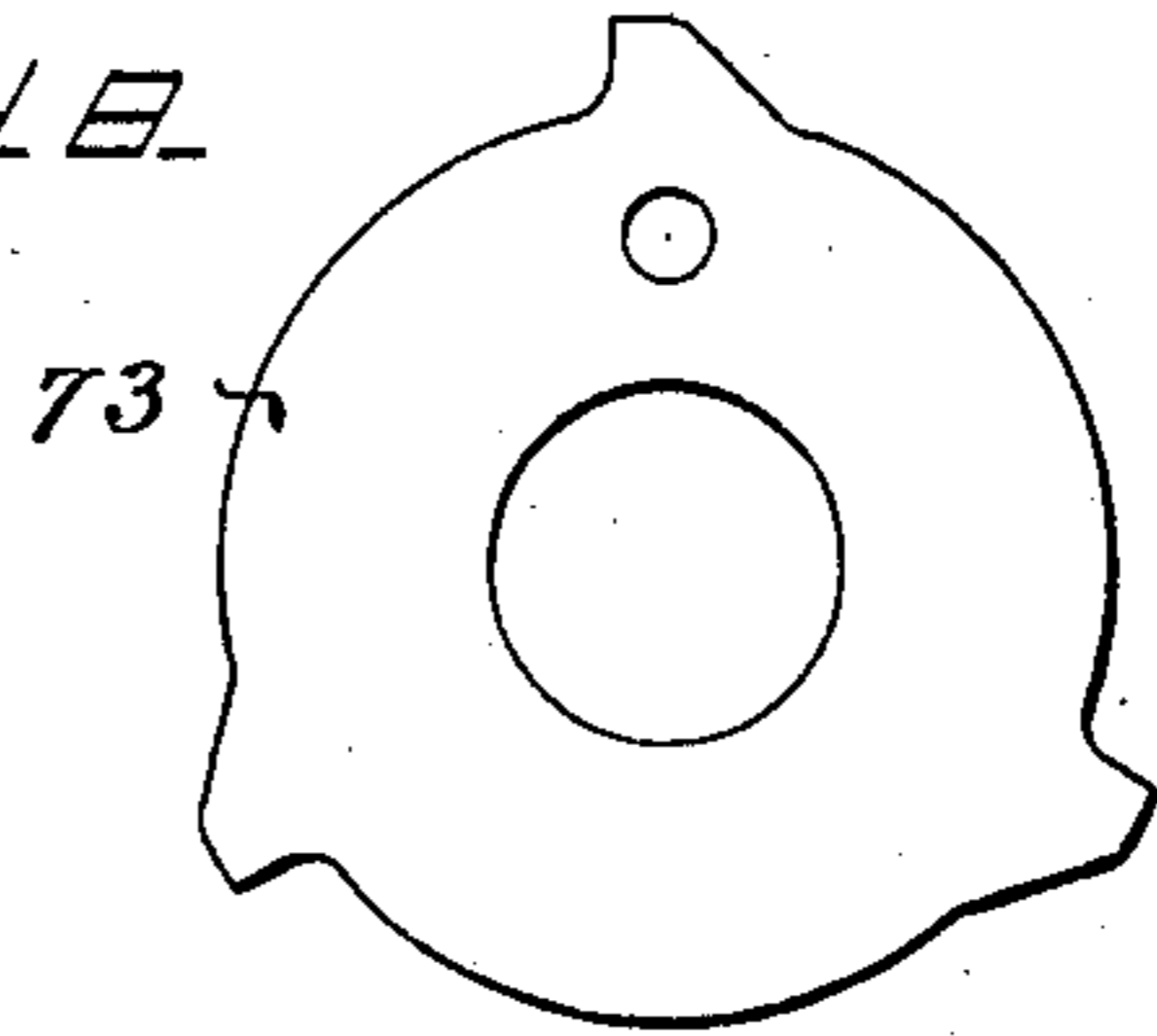
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Fig. 7.



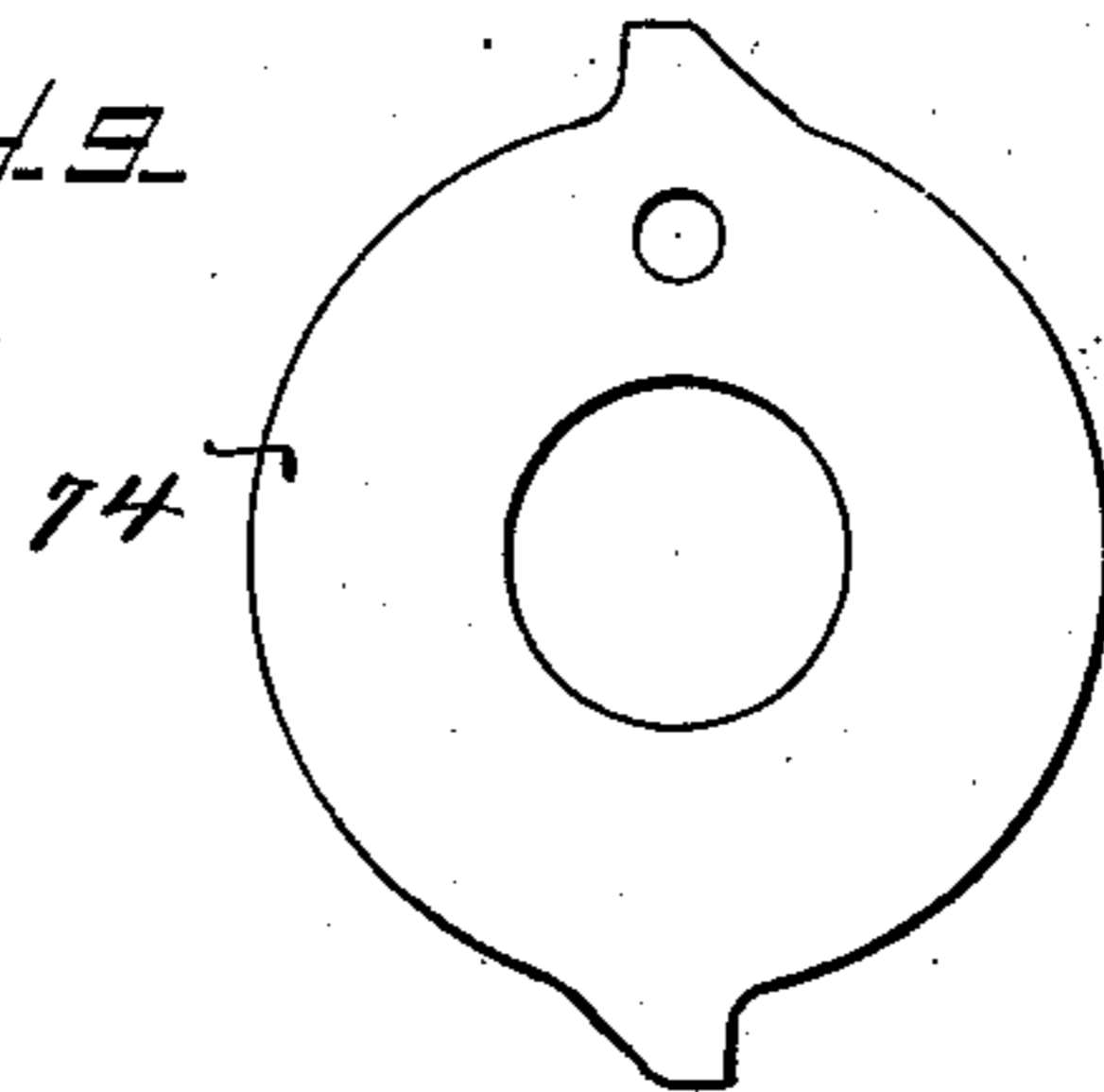
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Fig. 8.



73

Fig. 9.



74

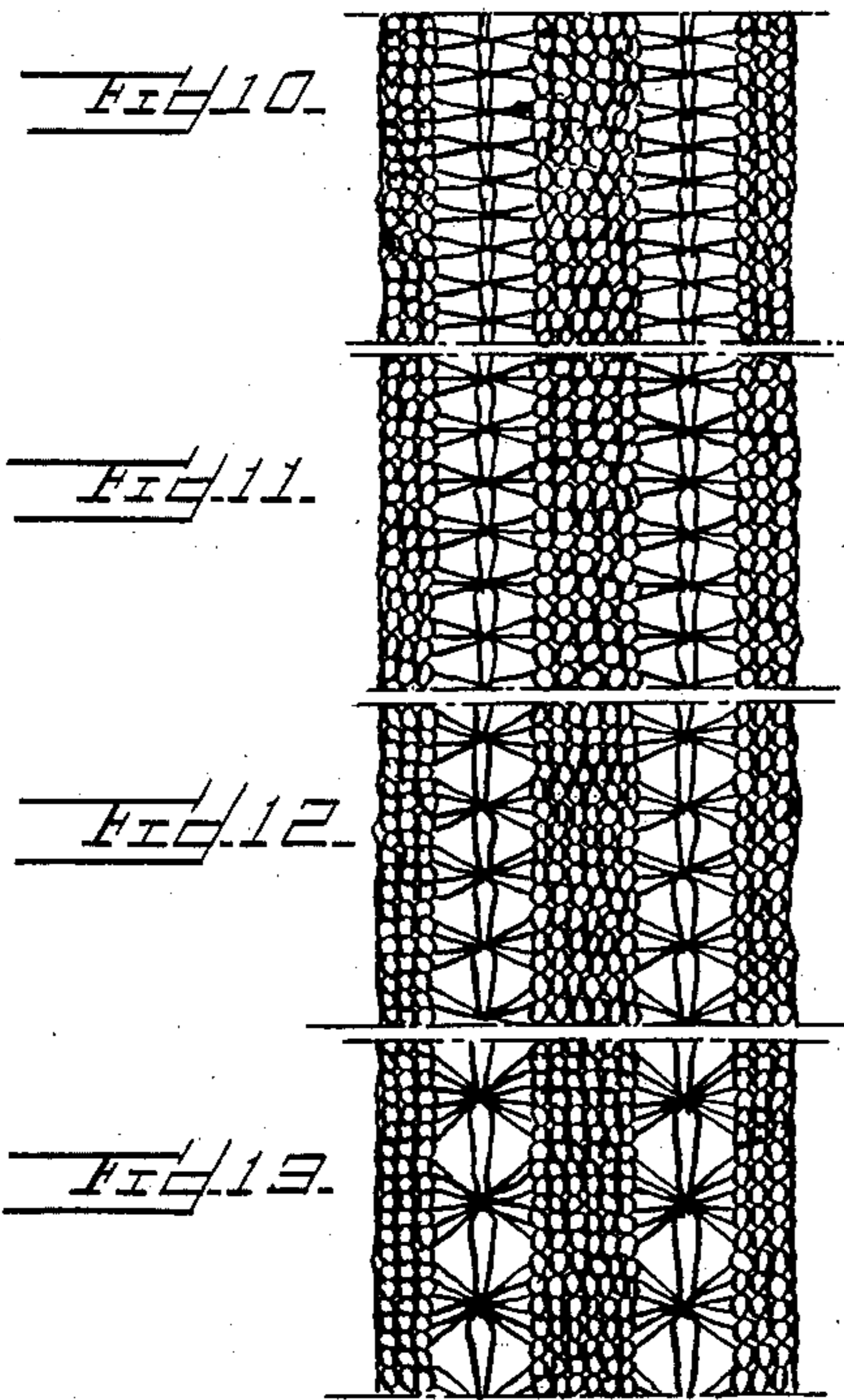


Fig. 10.

Fig. 11.

Fig. 12.

Fig. 13.

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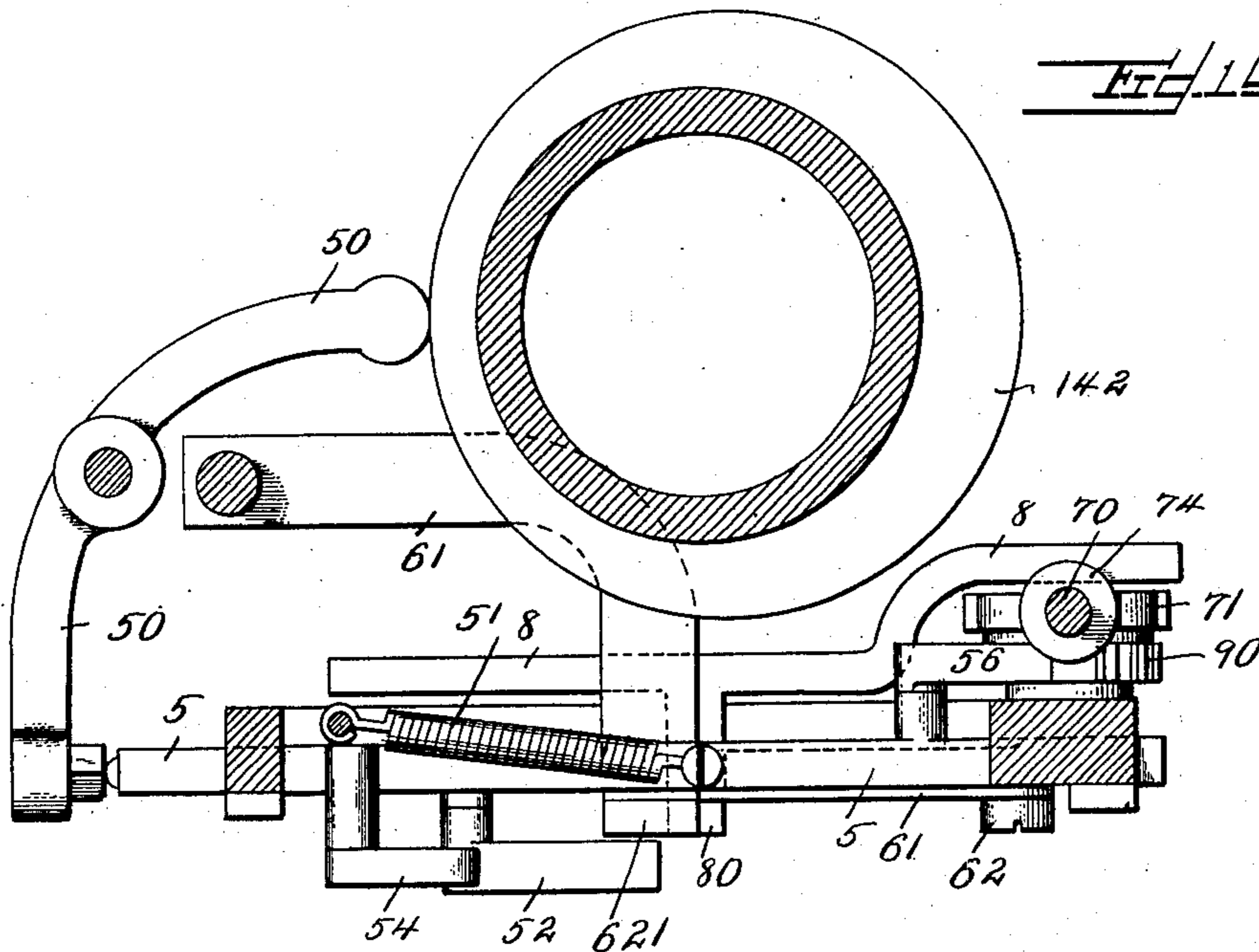
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4 SHEETS—SHEET 4.



WITNESSES:

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# UNITED STATES PATENT OFFICE.

GEORGE W. RUTH, OF NORRISTOWN, PENNSYLVANIA, ASSIGNOR TO RUTH  
AUTOMATIC KNITTING MACHINE COMPANY, OF NORRISTOWN, PENN-  
SYLVANIA.

## AUTOMATIC RIB-KNITTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 735,910, dated August 11, 1903.

Application filed August 1, 1901. Serial No. 70,440. (No model.)

*To all whom it may concern:*

Be it known that I, GEORGE W. RUTH, a citizen of the United States, residing at Norristown, county of Montgomery, and State of Pennsylvania, have invented a new and useful Improvement in Automatic Rib-Knitting Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, which form a part of this specification.

My invention relates to rib-knitting machines.

It has for its object the provision of means whereby there may be formed in a ribbed fabric open-work effect in which more than two threads will be tied together in a single loop.

It also has for its object the provision of means whereby there may be formed in a rib fabric open-work effect in which any desired number of threads may be tied together in a single loop.

It also has for its object the provision of means whereby in a rib-knitting machine having a constantly-operated pattern-chain and an intermittently-operated pattern-wheel the pattern-wheel-operating mechanism may be automatically engaged and disengaged from the pattern-wheel at the proper time.

In the drawings, Figure 1 is a side elevation of the rib-knitting machine. Fig. 2 is a plan view of the cam-casing. Fig. 3 is a section through the cam-casing on the line 3<sup>a</sup> 3<sup>a</sup> of Fig. 4. Fig. 4 is an inside side elevation of the cam-casing. Fig. 5 is a partial section on the line 5<sup>a</sup> 5<sup>a</sup> of Fig. 1. Figs. 6, 7, 8, and 9 are face views of interchangeable pattern-wheels. Figs. 10, 11, 12, and 13 are views of portions of a knit fabric, showing the open-work effect produced, respectively, by the pattern-wheels of Figs. 6, 7, 8, and 9. Fig. 14 is a partial sectional plan view immediately below the bed-plate of the machine.

1 is the stationary needle-cylinder, adapted to carry the cylinder-needles or vertical needles.

2 is the stationary dial adapted to carry the dial-needles or radial needles.

140 140 are upright posts secured to the rotatable cam-ring 14. Connecting these posts is the yoke 141, carrying the dial-cam plate 20,

to which are secured the fixed cam and movable cam (not shown) for operating the dial-needles.

21 is a rotary thread-guide secured to the dial-cam plate 20.

10 is a casing encircling the cylinder 1 and secured to the cam-ring 14. Secured to this casing are the fixed cam 11, the stitch-cam 12, and the needle-raising cam 13 for operating the vertical needles.

22 and 23 are parallel shafts secured to the casing 10 and connected together by a slot-and-pin connection, so as to turn in opposite directions. To these shafts are secured, respectively, projecting arms 220 and 230. The shaft 22 is connected to the movable dial-needle cam by means of a crank 221 and link 222.

15 and 16 are parallel shafts secured to the casing 10, connected together by a similar slot-and-pin connection and carrying, respectively, the arms 150 and 160.

151 is a crank secured to shaft 15.

152 is a plunger secured to the stitch-cam 12. This plunger is vertically slidable in guides in the casing 10 and is provided at the top with a cam 153. A spring 154 normally holds plunger 152 in its uppermost position. When the shaft 15 is turned so as to cause the crank 151 to engage the cam 153, the latter and plunger 152 and stitch-cam 12 are depressed. When the shaft 15 is turned in the opposite direction, so as to cause the crank to pass off the cam 153, the latter and plunger 152 and stitch-cam 12 are raised by the action of spring 154.

3 is the pattern-wheel, having the ratchet 30.

4 is the pattern-chain, passing around the sprocket-wheel 400, which is continuously rotated.

5 is the slide-bar, sliding in guides in the main frame. The slide-bar is constantly reciprocated by the following means: 142 is an eccentric on the cam-ring 14. 50 is a bell-crank pivoted to the main frame, one end of the bell-crank being in line of travel with the eccentric, while the other end engages one end of the slide-bar. 51 is a spring, one end of which is secured to the main frame, while the other end is secured to the slide-bar. As the

cam-ring rotates it rocks the bell-crank at each revolution, causing the slide-bar to move forward against the action of the spring. As the eccentric moves out of engagement with the bell-crank the spring draws the slide-bar back to its original position, returning the bell-crank also to its original position in line of travel with the eccentric. The slide-bar is thus moved forward at each revolution of the cam-ring 10. 52 is a pawl pivoted to the slide-bar. When the pawl is dropped into engagement with the ratchet 30, it turns the pattern-wheel a distance of one tooth at each revolution of the cam-ring 14.

I have provided the following mechanism for throwing the pawl 52 into and out of engagement with the ratchet: 53 is a projection secured to the pawl 52. 54 is a latch pivoted to a bracket on the slide-bar. 55 is a plunger slidable vertically in a guide on the main frame, its upper end engaging the latch 54 and its lower end resting on the pattern-chain 4. 40 is a lug on the pattern-chain 4. 31 is a lug on the pattern-wheel 3. Supposing the pawl 52 to be in engagement with the ratchet 30, the projection 53 at the end of its extreme backward movement at each reciprocation stops just short of the latch 54, and the pattern-wheel is turned until the lug 31 engages the pawl 52, lifting it and causing the projection 53 to engage, lift, and drop back of the latch 54. The latch 54 immediately drops of its own weight, maintaining the pawl in a raised position. The slide-bar now continues to reciprocate without effecting the turning of the pattern-wheel until the pattern-chain 4 feeds the lug 40 under the plunger 55, causing the latter to rise, lift the latch 54, and free the pawl, which at once drops into engagement with the next tooth of the ratchet. The pattern-wheel is now rotated, as before described, until it makes a complete revolution, when it is once again thrown out of action, as before described.

6 is a disk having portions of smaller and larger diameters secured to the plunger 60, which is slidable vertically in guides on the main frame. This plunger rests upon one end of a lever 61, pivoted at 62 to the main frame. Between its ends the lever 61 has a lug 621, which rests upon the pattern-screws 32 of the pattern-wheel. The disk 6 is raised and lowered by the pattern-screws 32 moving up and down the lug 621 for the purpose of actuating the arms 220, 230, 150, and 160, thereby actuating the stitch-cam 12 and the movable cam of the dial-cam plate 20 in the manner necessary to form loose courses and welts, as is well understood in the art.

I have provided the following mechanism for operating the needle-raising cam 13: 17 and 18 are parallel shafts secured to the casing 10, connected together by a slot-and-pin connection similar to that connecting the shafts 22 and 23 and the shafts 15 and 16. These shafts 17 and 18 carry, respectively,

the arms 170 and 180. 171 is a crank secured to the shaft 17. 172 is a plunger secured to the needle-raising cam 13. This plunger is vertically slidable in guides in the casing 10 and is provided at the top with a cam 173. A spring 174 normally holds the plunger 172 in its uppermost position. When the shaft 17 is turned so as to cause the crank 171 to engage the cam 173, the latter and plunger 172 and needle-raising cam 13 are depressed. When the shaft 17 is turned in the opposite direction, so as to cause the crank to pass off the cam 173, the latter and plunger 172 and needle-raising cam 13 are raised by the action of the spring 174. When the shaft 17 is turned so as to hold the crank 171 out of engagement with the cam 173, the arm 180 projects out at a considerable distance from the periphery of the casing 10 and the arm 170 is turned in, so as to lie close to the periphery of the casing 10. When the arm 180 is moved inwardly, the shaft 18 is turned in one direction and the shaft 17 in the opposite direction, causing the crank 171 to engage the cam 173 to depress the needle-raising cam 13, as before described, and throwing the arm 170 outwardly. When the arm 170 is moved inwardly, the parts, including the needle-raising cam 13, are restored to their original position.

I have provided the following mechanism for actuating the arms 170 and 180: These arms, as the drawings show, are at different elevations. 7 is a disk on a plunger 70, adapted to slide vertically in guides in the frame of the machine. When this disk and plunger are raised so as to cause the disk to be in line of travel of the arm 170, the arm 170 is moved in toward the casing 10, permitting the spring 174 to hold the needle-raising cam in its upper position. When the disk and plunger are depressed, the disk is brought in line of travel of the arm 180, and on the first revolution the arm 180 is moved in, causing the needle-raising cam to be depressed. When the disk and plunger are again raised, the disk is brought in line of travel of the arm 170, causing the arm 170 to be moved in on the first revolution, thus again permitting the spring 174 to move the needle-raising cam to its upper position.

I have provided the following mechanism for raising and depressing the disk 7: 8 is a lever pivoted between its ends to the frame of the machine, one end engaging the lower face of a collar 79 on the plunger 70, while the other end is weighted. Normally, therefore, the plunger 70 and disk 7 are held in a raised position. 80 is a lug on the heavy end of lever 8. 33 represents pattern-screws on the pattern-wheel 3. These screws extend only part way around the pattern-wheel 3. When the pattern-wheel is in such position that the lug is out of engagement with the pattern-screws 33, the plunger 70 and disk 7 are held in their raised position. When the pattern-wheel is turned so as to cause the

screws to engage the lug 80, the heavy end of lever 8 is lifted, depressing the other end of the lever and permitting the plunger 70 and disk 7 to drop.

5 In making the leg of the stocking the pattern-wheel is normally idle, and when it is being rotated it is ineffective to actuate the disk 6 so long as the regularly-arranged segment of the pattern-screws 32 engages the lug 62. It is only when the irregularly-arranged segment of the pattern-screws 32 engages the lug 62 to lift and depress it varying distances that the disk 6 is actuated, and this actuation of the disk 6 occurs only when the courses are knitted to form the welts and loose courses that constitute the end of one leg and the beginning of the next. Similarly the row of pattern-screws 33 are broken away at such a point that the lug 80 rests between the ends of the row of pattern-screws 33 only during the formation of the said last few and first few courses of a stocking-leg. During the major part of the operation, therefore, the lug 80 rests on the pattern-screws 33, and the lighter end of the lever 8 is depressed and the disk 7 is free to drop. It is, however, during the major part of the operation alternately raised and lowered by the following mechanism:

30 9 is a stud-shaft secured to the frame of the machine. 90 is a ratchet-wheel loose on said shaft and acting as a pattern-wheel carrier, as hereinafter described. 56 is a pawl on the slide-bar 5. This pawl engages and turns the ratchet-wheel a part of a revolution at each reciprocation of the slide-bar 5. As shown, the ratchet-wheel contains twelve teeth, so that the same is turned one-twelfth of a revolution at each reciprocation of the slide-bar or one-twelfth of a revolution at each rotation of the needle-operating cams or at each round of the machine. 71 is a toothed pattern-wheel (shown in detail in Fig. 6) loose on the shaft 9 and fastened to the ratchet-wheel 90 by means of a single screw 91. This permits the toothed wheel to be readily removed and replaced. The toothed wheel shown in the drawings is provided with six teeth. The lower end of plunger 70 is in line of travel of the tooth-wheel 71. The result is that the disk 7 is raised at one reciprocation of the slide-bar 5 and depressed at the next or raised at one round of the machine and depressed at the next round, and so on during the formation of the major part of the stocking. It follows that the needle-raising cam 13 is raised and lowered at successive rounds of the machine.

60 In ordinary knitting the raising and lowering of cam 13 has no effect upon the stitches, for the cam when at its lowest position is sufficiently high to cause the ordinary vertical needles to be raised to the height necessary to cause the latches to pass beyond and cast off the loops of the previous round, and the same operation occurs when the cam 13 is raised. In open-work effect, however, a ver-

tical needle with a long latch is provided, and one or more of the vertical needles are removed on each side of the needle with the long latch. When the needle-raising cam is at its lower position, the needle with the long latch is raised with the others; but it is not raised to a sufficient height to cause the latch to pass beyond and cast off the thread or loop of the previous round. When, however, the needle-raising cam is raised, it will raise the needle with the long latch sufficiently high to pass beyond and cast off the thread and loop of the previous rounds. Inasmuch as the cam 13 is raised only every other revolution, as before described, the result is that the needle with the long latch forms a loop only at every other revolution—that is, forms a tuck-stitch—the resultant fabric showing a combined open-work and tuck-stitch effect, as illustrated in Fig. 10.

I have provided the following means whereby open-work effect may be produced in which any desired number of threads more than two may be bound together in a single loop. This I accomplish by raising the needle-raising cam 13 regularly at the end of any desired number of revolutions. I have illustrated and described devices whereby the needle-raising cam may be raised at the end of every third revolution, every fourth revolution, or every sixth revolution, causing the long-latched needle to bind three, four, or six threads in a single loop. This I accomplish by a simple change in the machine that requires but a few seconds to effect.

To cause the needle-raising cam to be operated every third revolution, I remove the toothed wheel 71 and replace it by the toothed wheel 72, (see Fig. 7,) which differs from 71 only in that it is provided with four teeth instead of six. One tooth of this wheel engages and lifts the disk 7 at one revolution, raising the cam 13, while during the next two revolutions the disk 7 drops, depressing the cam 13. The result is that during two rounds the threads are not cast off by the long-latched needle, while on the third round the two loose threads and the thread used to form the preceding loops are cast off together and bound in a single loop, forming the open-work effect shown in Fig. 11.

To cause the needle-raising cam to be operated every fourth revolution, I substitute for 71 or 72 the toothed wheel 73, (see Fig. 8,) which is provided with three teeth. One tooth of this wheel engages and lifts the disk 7 at one revolution, raising the cam 13, while during the next three revolutions the disk 7 drops, depressing the cam 13. The result is that during three rounds the threads are not cast off by the long-latched needle, while on the fourth round the three loose threads and the thread used to form the preceding loop are cast off together and bound in a single loop, forming the open-work effect shown in Fig. 12.

To cause the needle-raising cam to be op-

erated every sixth revolution, I substitute for 71, 72, or 73 the toothed wheel 74, (see Fig. 9,) which is provided with two teeth. One tooth of this wheel engages and lifts the disk 7 at  
 5 one revolution, raising the cam 13, while during the next five revolutions the disk 7 drops, depressing the cam 13. The result is that during five rounds the threads are not cast off by the long-latched needle, while on the  
 10 sixth round the five loose threads and the thread used to form the preceding loop are cast off together and bound in a single loop, forming the open-work effect shown in Fig. 13.

During the last few courses of a stocking-  
 15 leg the pattern-wheel 3 is turned so as to cause the row of pattern-screws 33 to ride from under the lug 80, as before described. The lug 80 then drops, causing lever 8 to tilt and raise and hold the disk 7 in its upper position  
 20 and the plunger 70 out of engagement with the toothed wheel during the desired number of rounds of knitting. During this time the cam 13 is raised and held raised and the long-latched needle, like the ordinary vertical needles, casts off the thread and forms a loop at  
 25 each round of knitting.

As many rows of open-weft effect may be made as is desired by providing a corresponding number of long-latched needles and omit-  
 30 ting the desired number of ordinary vertical needles on each side of the long-latched needle. The toothed wheels may be formed with any number of teeth. If the full advantage of my invention is to be availed of by pro-  
 35 viding a plurality of interchangeable toothed pattern-wheels, the number of teeth in each wheel must be a divisor of the number of revolutions of the needle-operating cams required to turn such toothed wheel one com-  
 40 plete revolution. The arrangement of teeth on any toothed wheel may be varied as desired, it being obvious that various patterns of open-work effect may be produced by various arrangements of said teeth.

45 It will be understood that the mechanism described is capable of being utilized in connection with the formation of open-work effect in a knitting-machine in which the dial-needles are not used.

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

1. In a machine of the character described, the combination, with the regular needles and  
 55 the tuck-stitch needle, of a pattern-wheel carrier to which one of a plurality of interchangeable tuck-stitch pattern-wheels provided with different numbers of projections is adapted to be removably secured, one of said pattern-  
 60 wheels being so secured to said carrier, means whereby said projections control the tuck-stitch needle, connections to said carrier from the rotary part of the machine adapted to impart thereto one complete rotation to a num-  
 65 ber of rounds of the machine, whereby interchangeable pattern-wheels having different

numbers of projections may be secured to and removed from said carrier thus causing the tuck-stitch needle to hold the thread for any one of several predetermined numbers of  
 70 rounds.

2. In a machine of the character described, the combination, with the regular needles and a needle having a long latch, of a movable  
 needle-raising cam adapted when raised to lift  
 75 the long-latch needle a distance sufficient to cast off the preceding thread or threads, mechanism for raising and depressing said cam, a rotary pattern-wheel carrier to which one of a plurality of interchangeable tuck-stitch pat-  
 80 tern-wheels provided with different numbers of projections is adapted to be removably secured, one of said pattern-wheels being so secured to said carrier, said pattern-wheel being adapted to actuate said cam mechanism,  
 85 and connections to said carrier from the rotary part of the machine adapted to impart thereto one complete revolution to a plurality of rounds of the machine.

3. In a machine of the character described,  
 90 the combination, with the regular needles and a needle having a long latch, of a movable needle-raising cam adapted when raised to lift the long-latch needle a distance sufficient to cast off the preceding thread or threads, mech-  
 95 anism for raising and depressing said cam, a ratchet-wheel to which one of a plurality of interchangeable tuck-stitch pattern-wheels provided with different numbers of projections is adapted to be removably connected,  
 100 one of said pattern-wheels being so secured to said carrier, said pattern-wheel being adapted to actuate said cam mechanism, a pawl adapted to actuate said ratchet-wheel, and connections to said pawl from the rotary  
 105 part of the machine adapted to reciprocate the same, whereby interchangeable pattern-wheels may be used to hold said cam depressed for different numbers of rounds.

4. In a machine of the character described,  
 110 the combination, with the regular needles and a needle having a long latch, of a movable needle-raising cam adapted when raised to lift the long-latch needle a distance sufficient to cast off the preceding thread or threads,  
 115 mechanism for raising and depressing said cam, a rotary pattern-wheel carrier to which one of a plurality of interchangeable tuck-stitch pattern-wheels provided with different numbers of projections is adapted to be re-  
 120 movably secured, the number of projections on each pattern-wheel being a divisor of twelve, one of said pattern-wheels being so secured to said carrier, said pattern-wheel being adapted to actuate said cam mechan-  
 125 ism, and connections to said carrier from the rotary part of the machine adapted to impart thereto one complete revolution to a number of rounds of the machine divisible by twelve, whereby interchangeable pattern-wheels hav-  
 130 ing different numbers of projections may be secured to or removed from said carrier, thus

causing said cam to be held depressed for any one of several predetermined numbers of rounds.

5. In a machine of the character described, the combination, with the regular vertical needles, a vertical needle having a long latch, and the dial-needles, of a movable cam for the dial-needles, a movable stitch-cam for operating the vertical needles, a movable needle-raising cam adapted when raised to lift the long-latch needle a distance sufficient to cast off the preceding thread or threads, projecting parts connected respectively to the movable dial-cam, the movable stitch-cam, and the movable needle-raising cam, and adapted when operated to move the same, means arranged on the stationary part of the machine adapted to be moved into the path of travel of the projecting parts connected with the movable stitch-cam and the movable dial-cam, pattern devices adapted to actuate said means, separate means arranged on the stationary part of the machine adapted to be moved into the path of travel of the projecting parts connected to the movable needle-raising cam, and separate pattern devices adapted to actuate the last-named means.

6. In a machine of the character described, the combination, with the regular needles and the dial-needles, of a movable cam for the dial-needles, a movable stitch-cam for operating the vertical needles, a movable needle-raising cam, projecting parts connected respectively to the movable dial-cam, the movable stitch-cam, and the movable needle-raising cam, and adapted when operated to move the same, means arranged on the stationary part of the machine adapted to be moved into the path of travel of said projecting parts whereby the latter will be operated to move their respective cams, pattern mechanism for the movable dial-cam and the stitch-cam, and separate pattern mechanism for the needle-raising cam, said pattern mechanism being adapted to actuate said means.

7. In a machine of the character described, the combination, with the regular vertical needles, a vertical needle having a long latch, and the dial-needles, of a movable cam for the dial-needles, a movable stitch-cam for operating the vertical needles, and a movable needle-raising cam adapted when raised to lift the long-latch needle a distance sufficient to cast off the preceding thread or threads, projecting parts connected respectively to the movable dial-cam, the movable stitch-cam, and the movable needle-raising cam, and adapted when operated to move the same, means arranged on the stationary part of the machine adapted to be moved into the path of travel of said projecting parts whereby the latter will be operated to move their respective cams, pattern mechanism for the movable dial-cam and the stitch-cam, and separate pattern mechanism for the needle-

raising cam, said pattern mechanism being adapted to actuate said means.

8. In a machine of the character described, the combination with the needle-cylinder and needles arranged thereon, there being a vacant space on each side of one of said needles whereby open-work is formed, the last-named needle being adapted to be actuated to hold, for one or more revolutions, the thread previously engaged therewith from being cast off, of mechanism for actuating said needle to so hold said thread, interchangeable pattern devices adapted to so actuate said mechanism for different numbers of revolutions, and connections between the rotary part of the machine and such pattern device adapted to actuate the pattern device.

9. In a machine of the character described, the combination, with the vertical needles, of a movable needle-raising cam, a projecting part connected with said cam, a disk, a plunger secured thereto arranged on the stationary part of the machine, said disk being in line of travel of said projecting part, a pattern-wheel having projections said plunger being in the path of said pattern-wheel, a lever engaging the plunger and adapted to hold it out of the path of travel of said pattern-wheel, and pattern mechanism adapted to actuate said lever.

10. In a machine, of the character described, the combination, with the vertical needles, of a movable needle-raising cam, a projecting part connected with said cam, a disk, a plunger secured thereto arranged on the stationary part of the machine, said disk being in line of travel of said projecting part, a pattern-wheel having projections, a ratchet-wheel connected to said pattern-wheel so as to actuate the same, a second pattern-wheel having a ratchet, a slide-bar carrying pawls, said pawls being adapted to actuate said ratchets, connections between the rotary part of the machine and the slide-bar adapted to actuate the latter, and connections from the last-named pattern-wheel to the plunger adapted to cause the same to move into and out of the path of travel of the first-named pattern-wheel.

11. In a machine of the character described, the combination, with the vertical needles, of a movable needle-raising cam, a projecting part connected with said cam, a disk, a plunger secured thereto arranged on the stationary part of the machine, said disk being in line of travel of said projecting part, a pattern-wheel having projections, connections between the rotary part of the machine and said pattern-wheel adapted to actuate the same, pattern mechanism, and connections from the latter to the plunger adapted to cause the same to move into and out of the path of movement of said pattern-wheel.

12. In a machine of the character described, the combination, with the vertical needles, of a movable needle-raising cam, a projecting part connected with said cam, a disk, a plun-

ger secured thereto arranged on the stationary part of the machine, said disk being in line of travel of said projecting part, a pattern-wheel having projections, a ratchet-wheel connected to said pattern-wheel so as to actuate the same, a second pattern-wheel having a ratchet, a slide-bar carrying pawls, said pawls being adapted to actuate said ratchets, connections between the rotary part of the machine and the slide-bar adapted to actuate the latter, pattern-screws on the last-named pattern-wheel, a lever pivoted between its ends, one end of the lever engaging said plunger and the other end in the path of travel of said pattern-screws, whereby said pattern-screws actuate said lever to move the plunger out of the path of movement of the first-named pattern-wheel.

13. In a machine of the character described, the combination, with the regular vertical needles, a vertical needle having a long latch, and the dial-needles, of a movable cam for the dial-needles, a movable stitch-cam for operating the vertical needles, a movable needle-raising cam adapted when raised to lift the long-latch needle a distance sufficient to cast off the preceding thread or threads, projecting parts connected respectively to the movable dial-cam, the movable stitch-cam, and the movable needle-raising cam, and adapted when operated to move the same, means arranged on the stationary part of the machine adapted to be moved into the path of travel of the projecting parts connected with the movable stitch-cam and the movable dial-cam, pattern devices adapted to actuate said means, separate means arranged on the stationary part of the machine adapted to be moved into the path of travel of the projecting parts connected to the movable needle-raising cam, and separate pattern devices adapted to normally actuate the last-named means, connections to the last-named means engaged by the first-named pattern devices adapted to disengage the last-named means from their normally actuating pattern devices.

14. In a machine of the character described, the combination with the needle-cylinder and needles arranged thereon, there being a vacant space on each side of one of said needles whereby open-work is formed, the last-named needle being adapted to be actuated to hold, for one or more revolutions, the thread previously engaged therewith from being cast off, of mechanism for actuating said needle to so hold said thread, a pattern-wheel adapted to normally actuate said mechanism, a ratchet-wheel, a slide-bar, a pawl carried thereby, connections between the rotary part of said machine and said slide-bar adapted to actuate the latter, pattern mechanism, and a lever pivoted between its ends adapted to be engaged by said pattern mechanism to move the needle-actuating mechanism out of operative relation to said pattern-wheel.

15. In a machine of the character described,

the combination, with a pattern-wheel having a discontinuous circular row of pattern-screws, of a second pattern-wheel having projections, needle-actuating mechanism normally in the path of movement of said projections, connections between the rotary part of said machine and said pattern-wheels adapted to actuate them simultaneously, and a lever in the path of movement of the pattern-screws adapted to be actuated to move said needle-actuating mechanism out of the path of movement of said projections.

16. In a machine of the character described, the combination, with needle-actuating mechanism, of a pattern-wheel having projections adapted to actuate the needle-actuating mechanism, a shaft, a ratchet-wheel thereon, said pattern-wheel being adapted to be slipped on and off said shaft and connected to said ratchet-wheel, a reciprocating slide-bar, a pawl carried thereby and engaging said ratchet, connections between the rotary part of the machine and said slide-bar adapted to reciprocate the same, pattern mechanism, and connections between the pattern mechanism and the needle-actuating mechanism adapted to be moved by said pattern mechanism to cause said needle-actuating mechanism to be moved into and out of operative relation with said pattern-wheel.

17. In a machine of the character described, the combination, with needle-actuating mechanism, of a pattern-wheel having projections adapted to actuate the needle-actuating mechanism, a shaft, a ratchet-wheel thereon, said pattern-wheel being adapted to be slipped on and off said shaft and connected to said ratchet-wheel, a reciprocating slide-bar, a pawl carried thereby and engaging said ratchet, connections between the rotary part of the machine and said slide-bar adapted to reciprocate the same, pattern mechanism, a lever pivoted between its ends one end being adapted to be engaged by the pattern mechanism and the other end adapted to engage the needle-operating mechanism, whereby said lever is moved to bring said needle-operating mechanism into and out of the path of travel of said pattern-wheel at predetermined times.

18. In a machine of the character described, the combination, with a pattern-wheel, a slide-bar, connections from the rotary part of the machine and said slide-bar adapted to reciprocate the same, a pawl carried by the slide-bar, a ratchet for rotating the pattern-wheel, said pawl normally engaging said ratchet, a latch adapted to hold said pawl out of engagement with said ratchet, a pattern-chain, a lug on the pattern-chain adapted to disengage said latch from the pawl, and a lug on the pattern-wheel adapted to move said pawl into engagement with the latch.

19. In a machine of the character described, the combination, with a pattern-wheel, of a slide-bar, connections from the rotary part of the machine and said slide-bar adapted to re-

5 ciprocate the same, a pawl carried by the  
slide-bar, a ratchet for rotating the pattern-  
wheel, said pawl normally engaging said  
ratchet, a latch adapted to hold said pawl out  
of engagement with said ratchet, a pattern-  
chain, a lug on the pattern-chain, a plunger  
in line of travel of said lug and adapted to be  
moved thereby to actuate the latch to release  
said pawl, and a lug on the pattern-wheel  
10 adapted to move said pawl into engagement  
with the latch.

20. In a machine of the character described,  
the combination, with a pattern-wheel, and a  
pattern-chain, of a slide-bar, connections be-  
15 tween the rotary part of the machine and said  
slide-bar adapted to reciprocate the same, a  
pawl carried by the slide-bar, a ratchet for  
rotating the pattern-wheel, said pawl nor-  
mally engaging said ratchet, a projection on  
20 said pawl, a pivoted latch on said slide-bar, a

plunger adapted to raise said latch, a lug on  
the pattern-wheel, the pawl being in line of  
travel of said lug, whereby, at a predeter-  
mined point in the rotation of the pattern-  
wheel said lug actuates said pawl to cause the 25  
projection to engage and drop back of said  
pivoted latch and be held thereby disengaged  
from the ratchet, and a lug on the pattern-  
chain, said plunger being in the path of travel  
of said lug, whereby at a predetermined time 30  
said lug engages said plunger, thereby mov-  
ing said latch and disengaging said pawl.

In testimony of which invention I have here-  
unto set my hand, at Philadelphia, on this  
29th day of July, 1901.

GEORGE W. RUTH.

Witnesses:

FRANK L. BUSSER,  
M. F. ELLIS.