

No. 607,798.

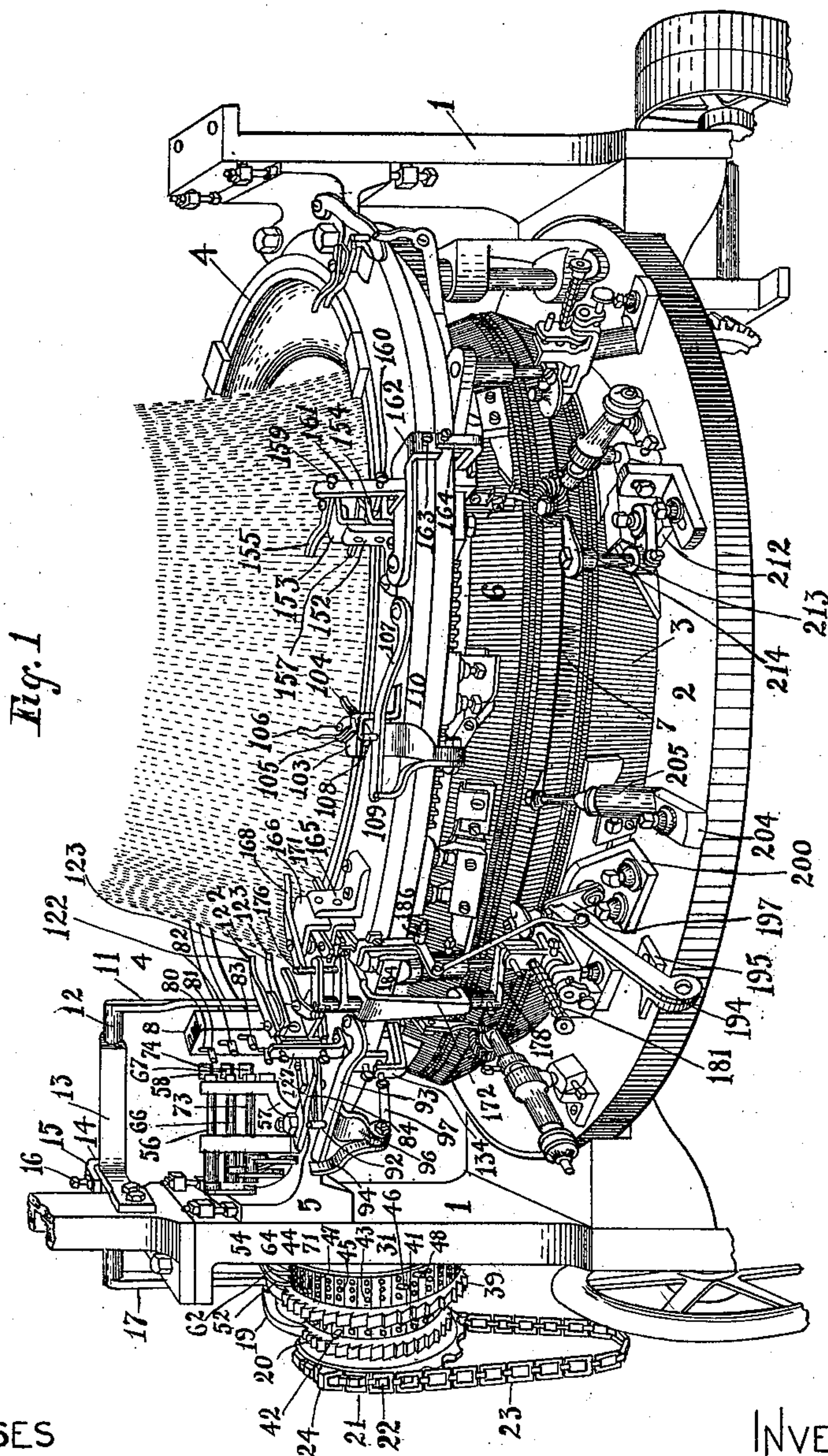
Patented July 19, 1898.

D. HURLEY.  
CIRCULAR KNITTING MACHINE.

(Application filed Dec. 3, 1897.)

(No Model.)

5 Sheets—Sheet 1.



WITNESSES

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5 Sheets—Sheet 2.

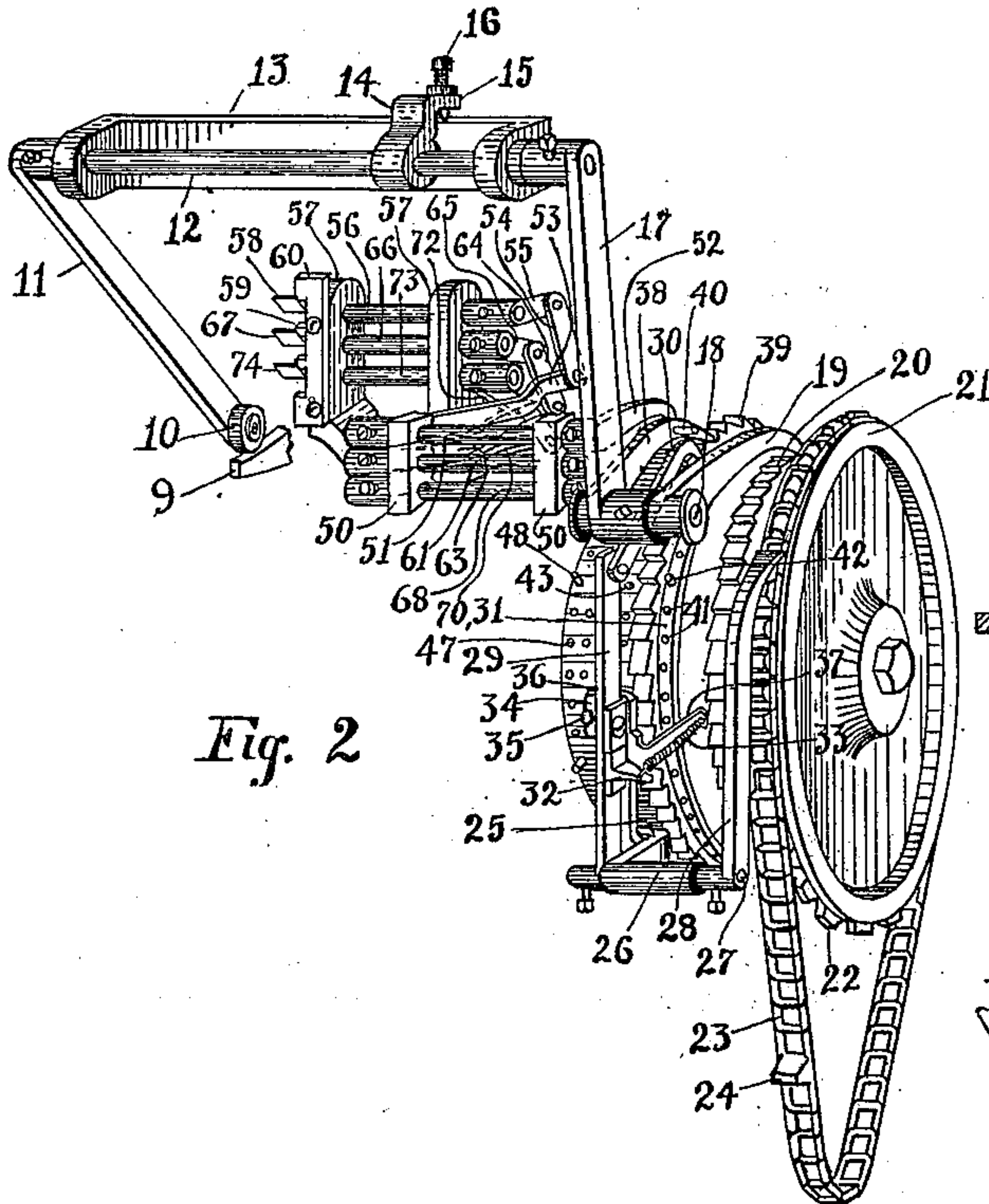


Fig. 2

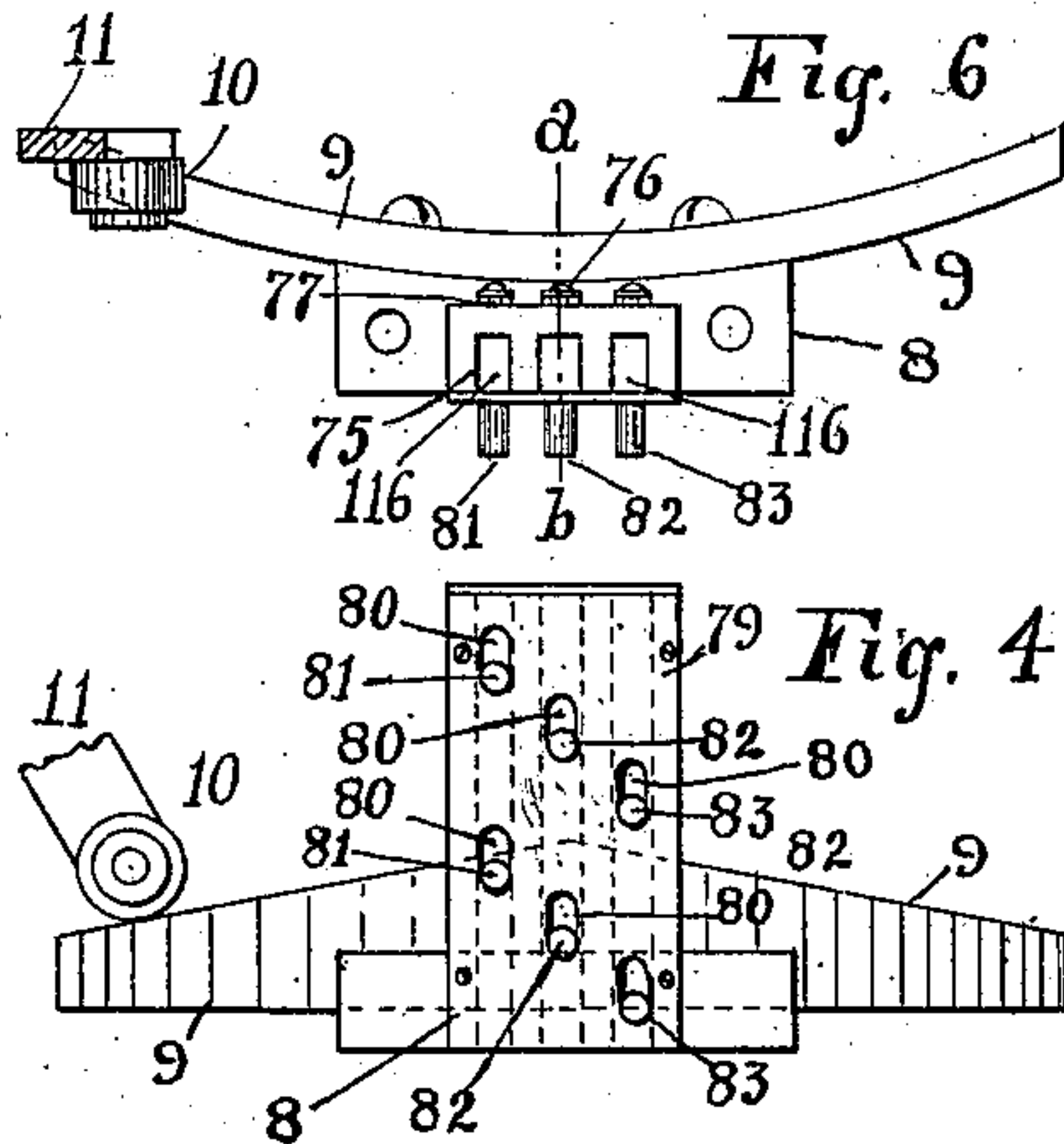


Fig. 4

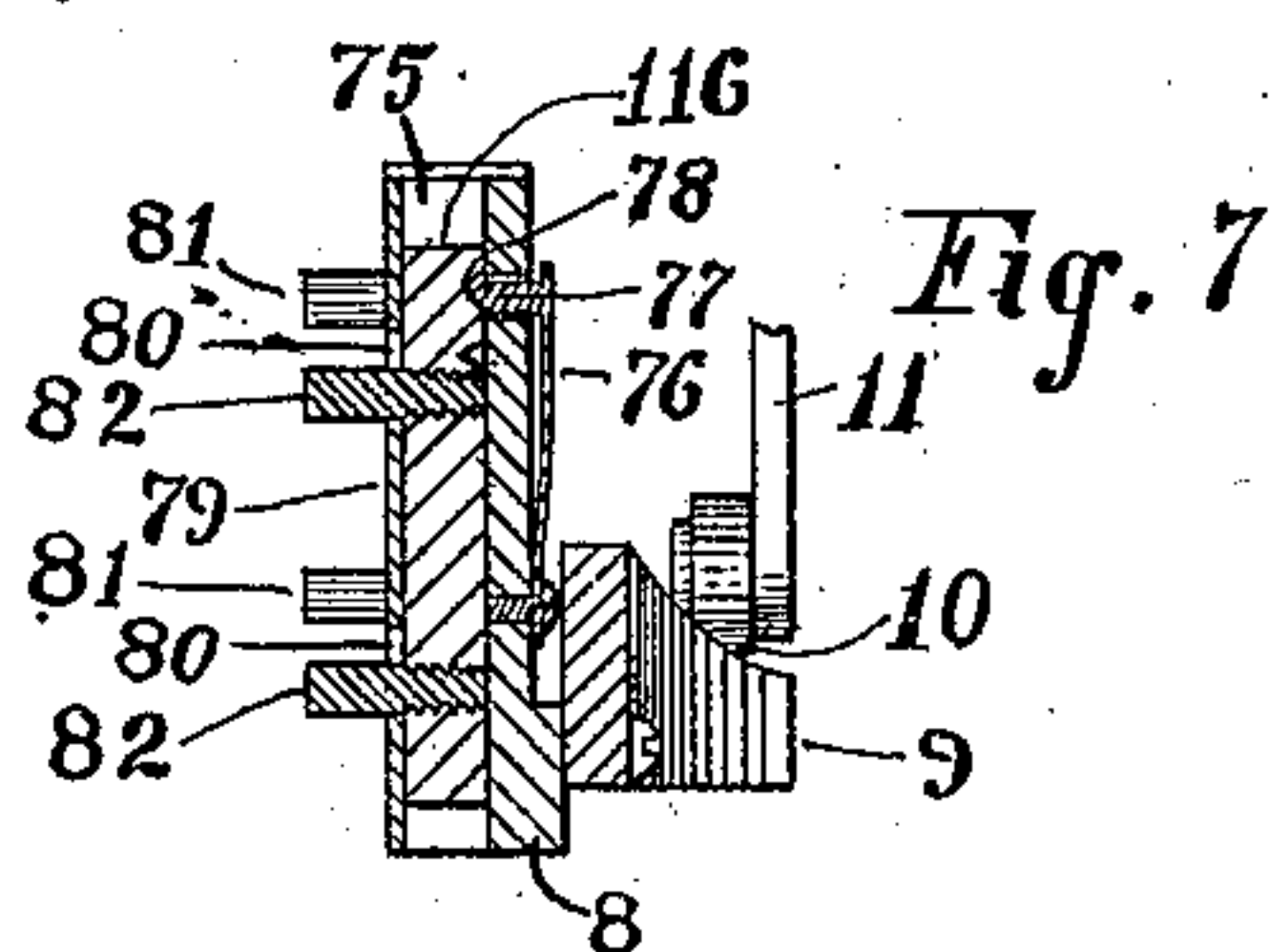


Fig. 5

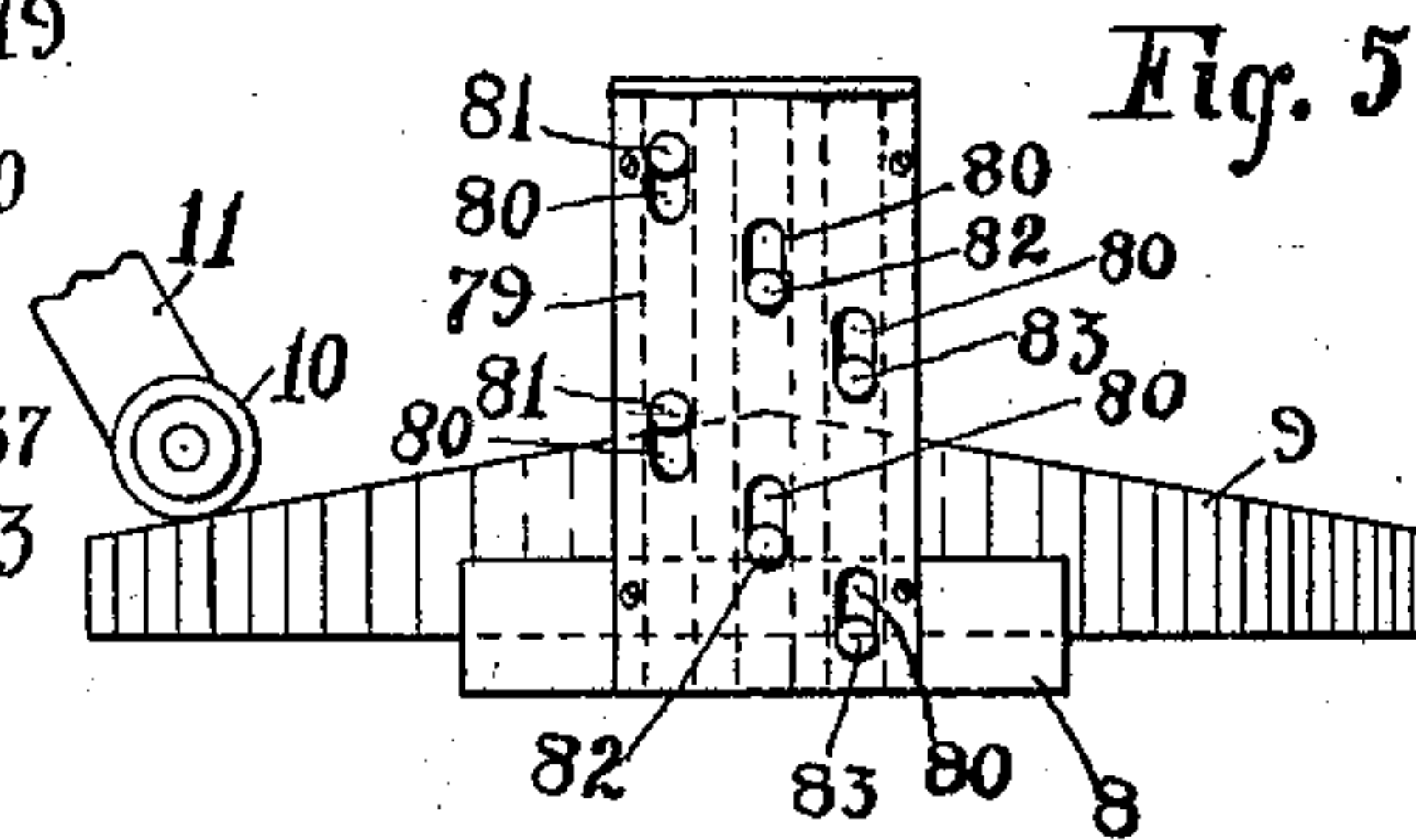


Fig. 6

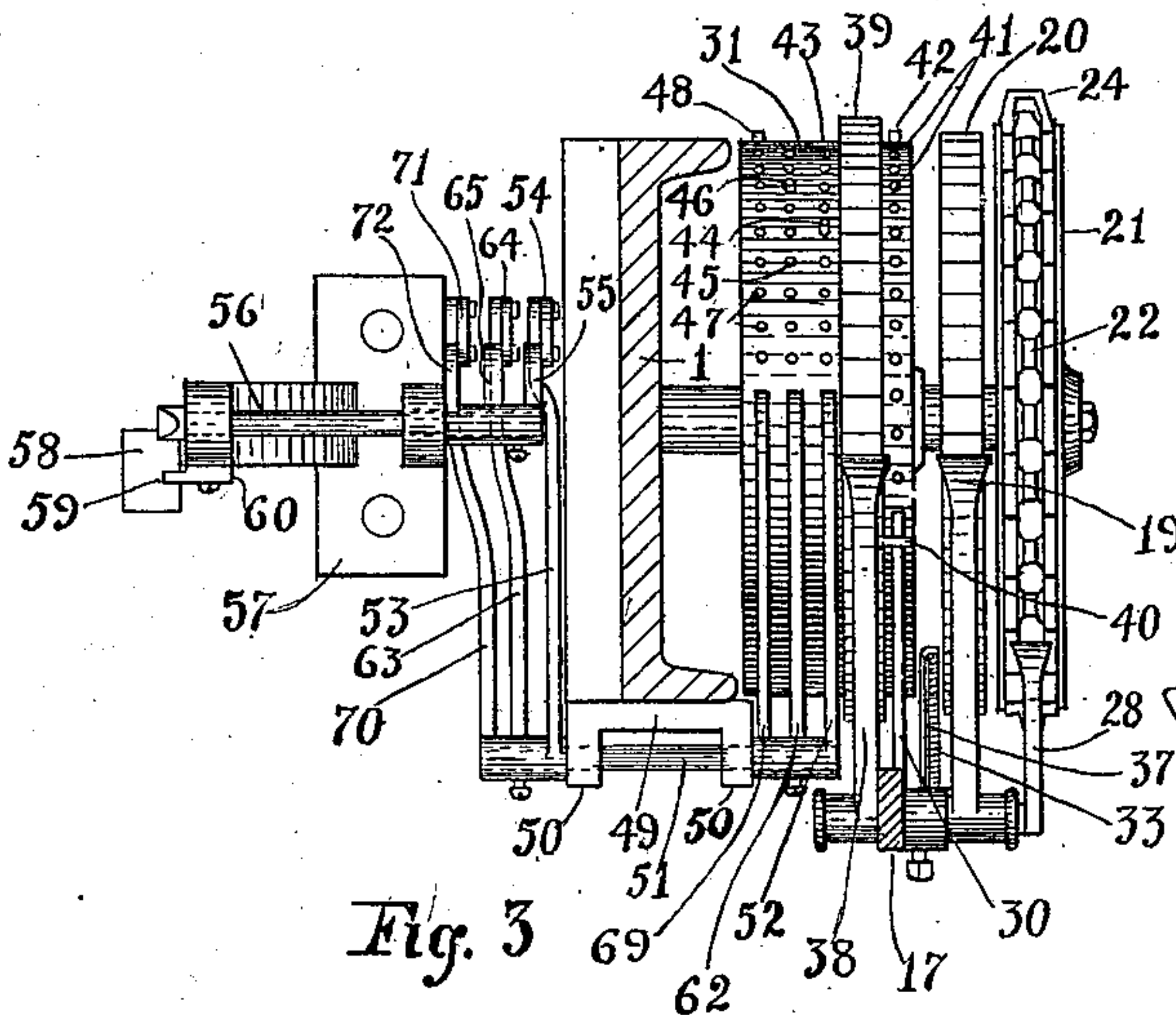


Fig. 7

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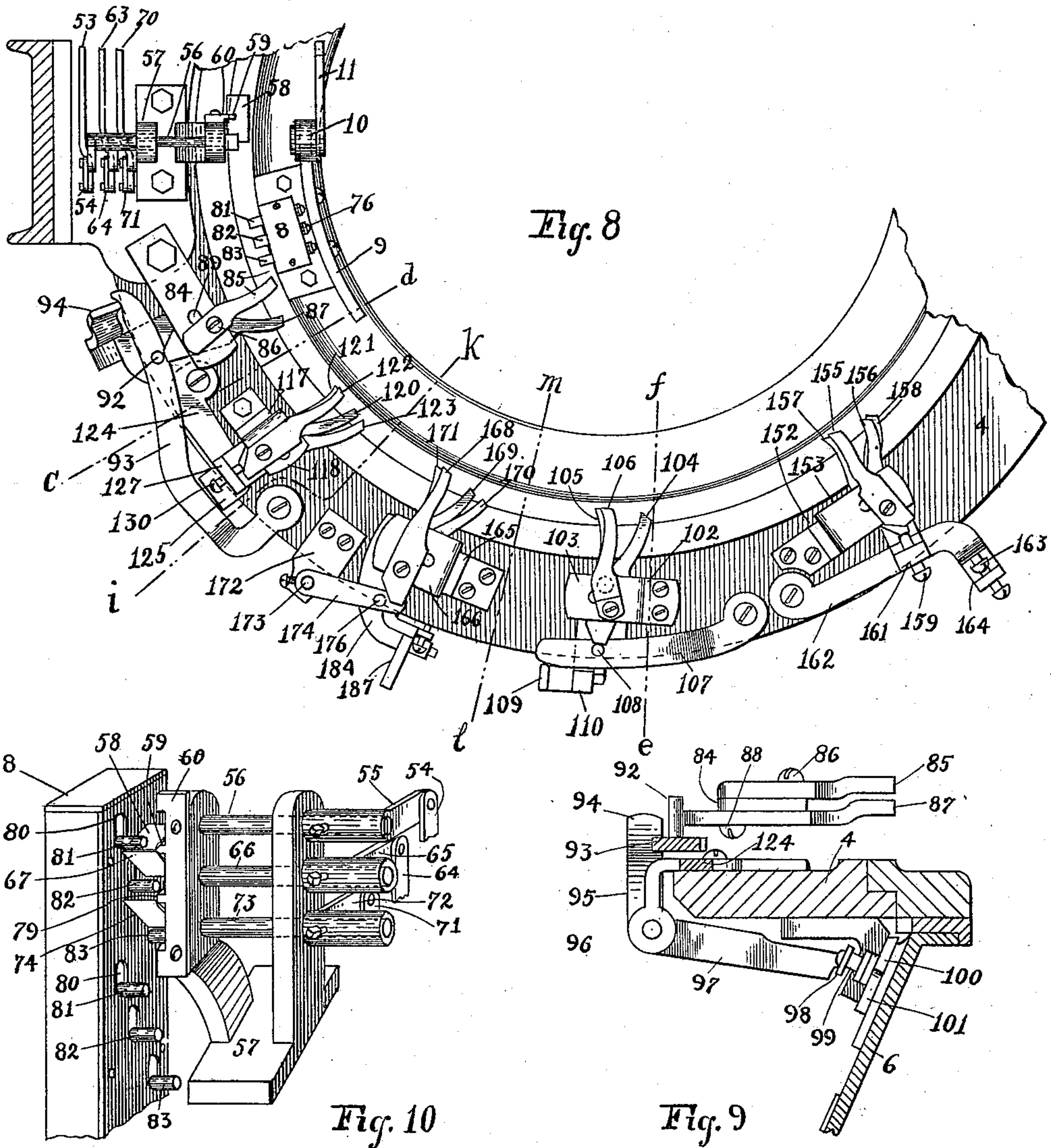
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5 Sheets—Sheet 4.

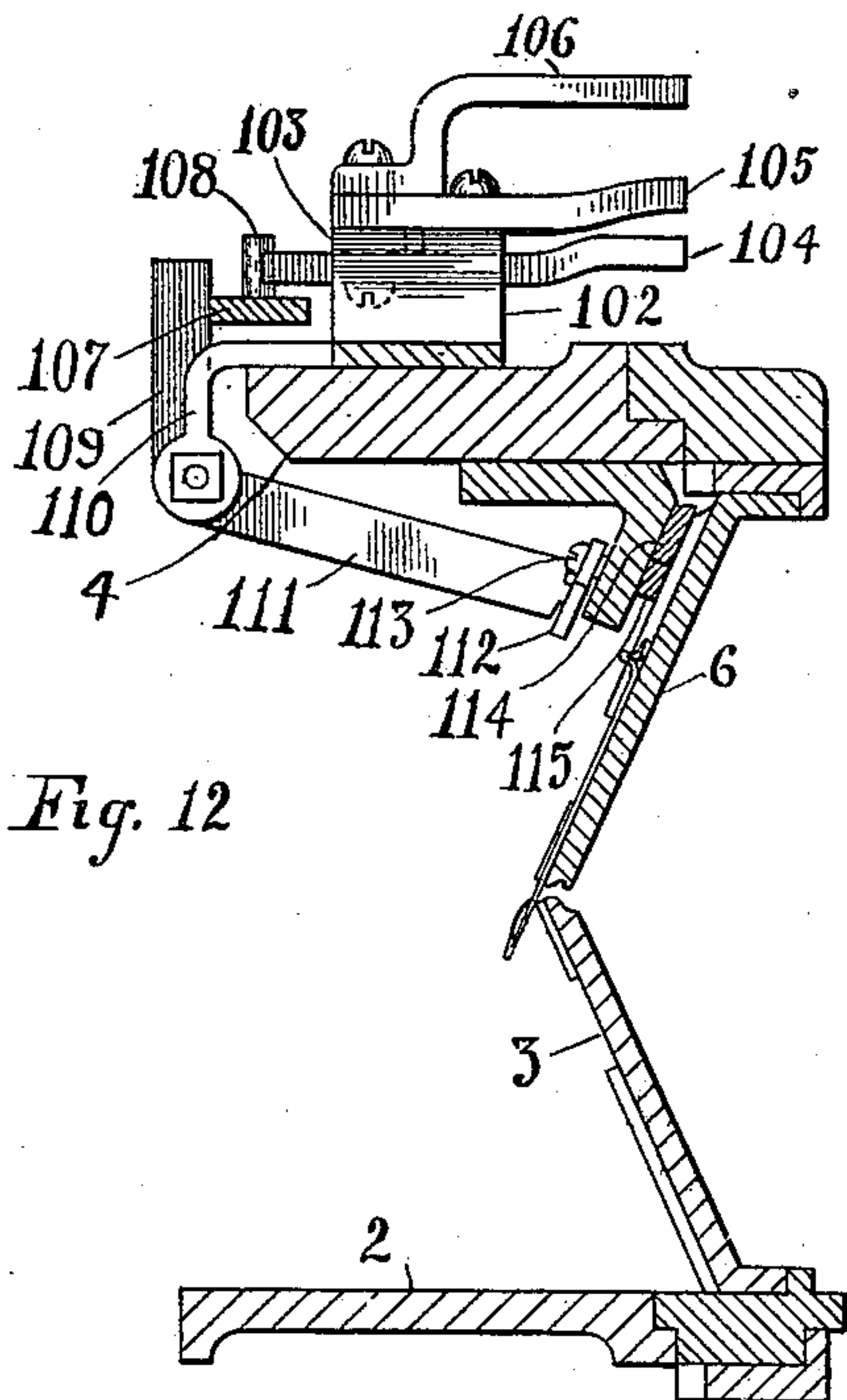


Fig. 12

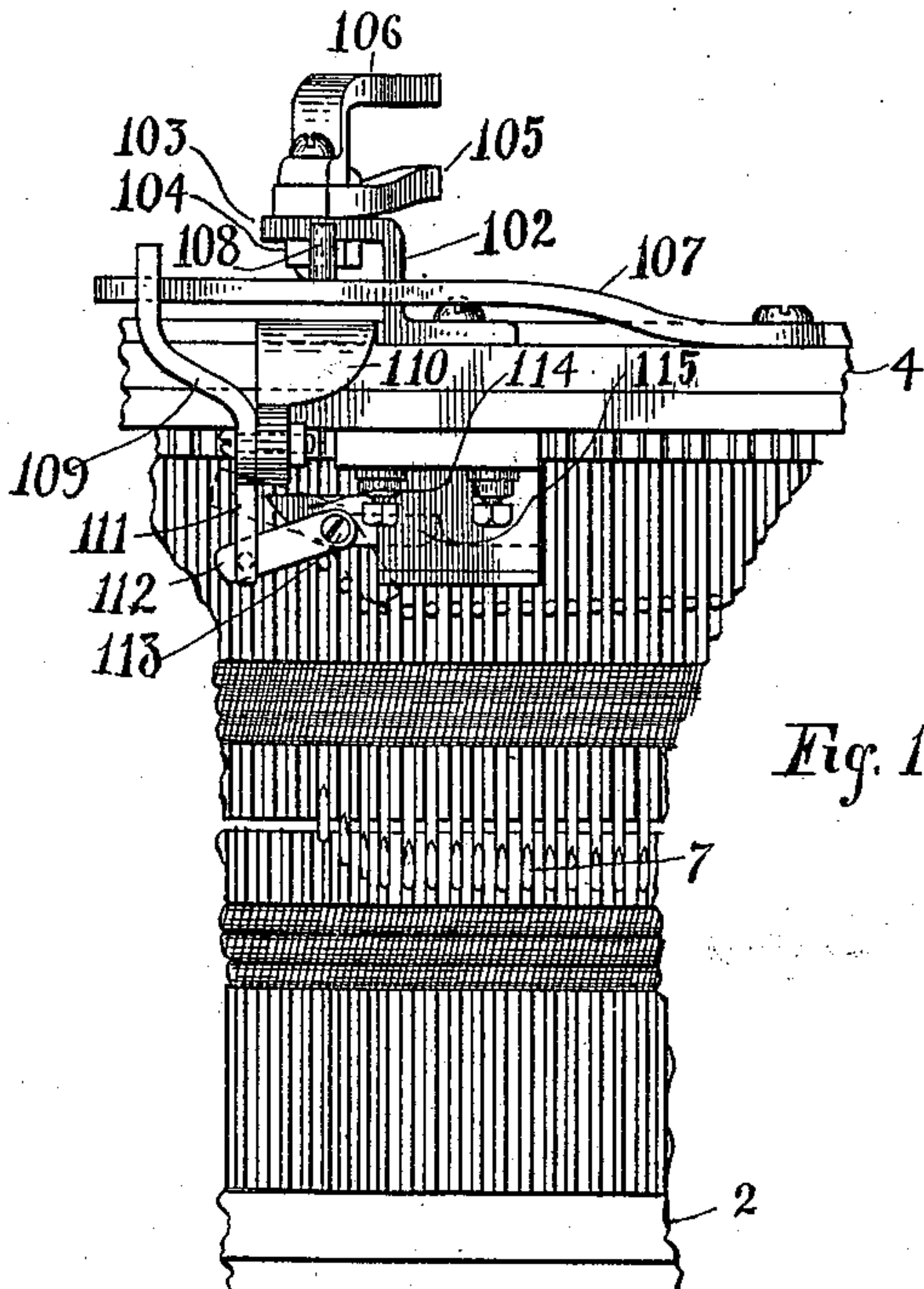


Fig. 11

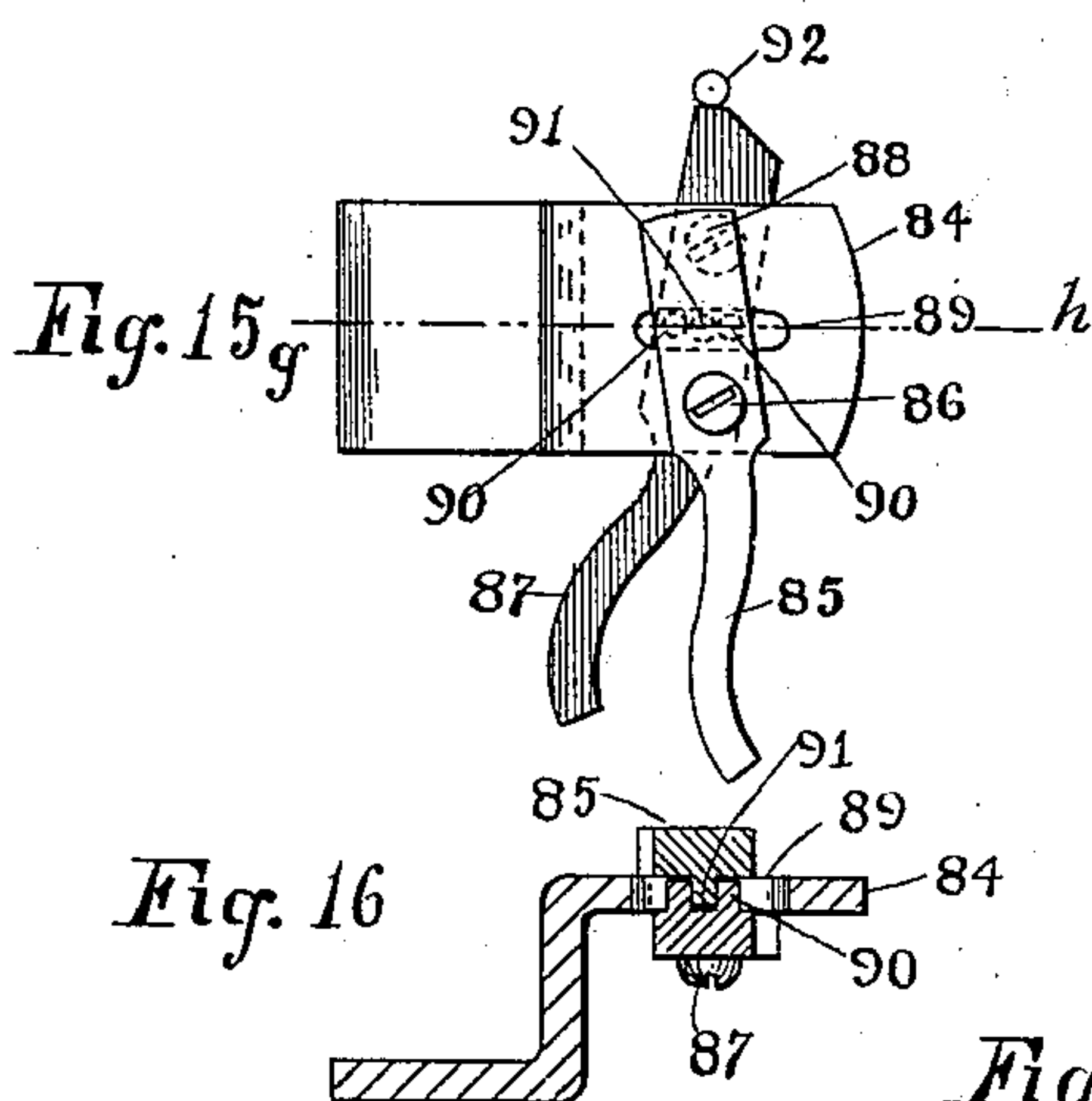


Fig. 15g

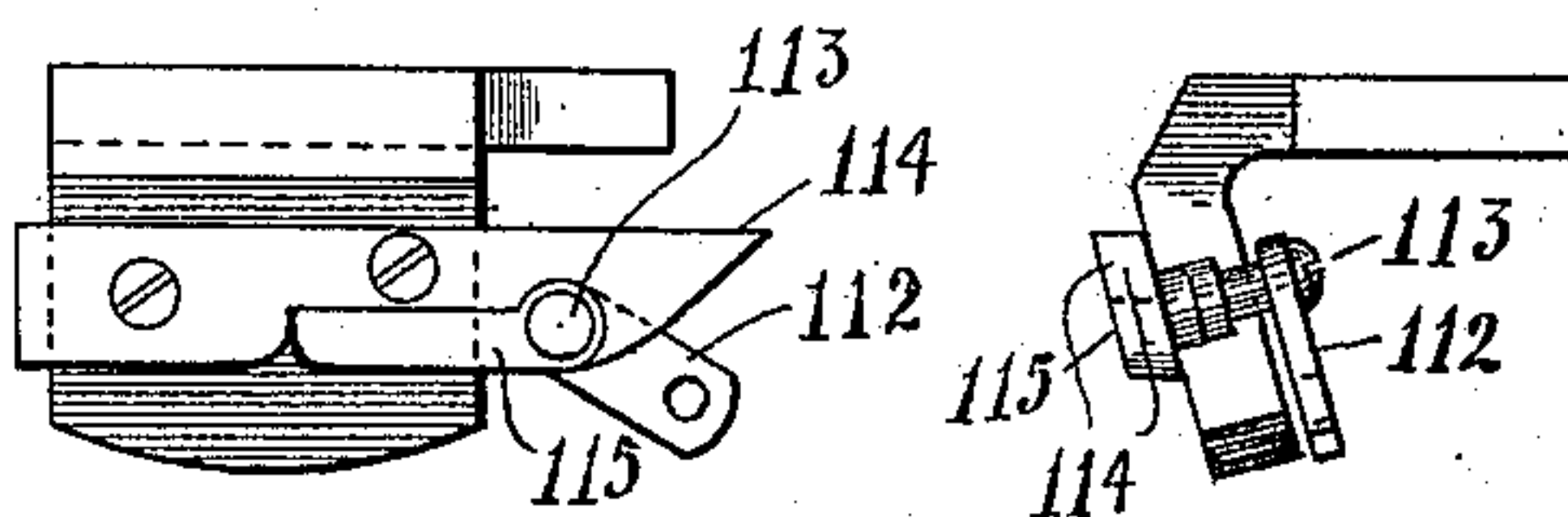


Fig. 13

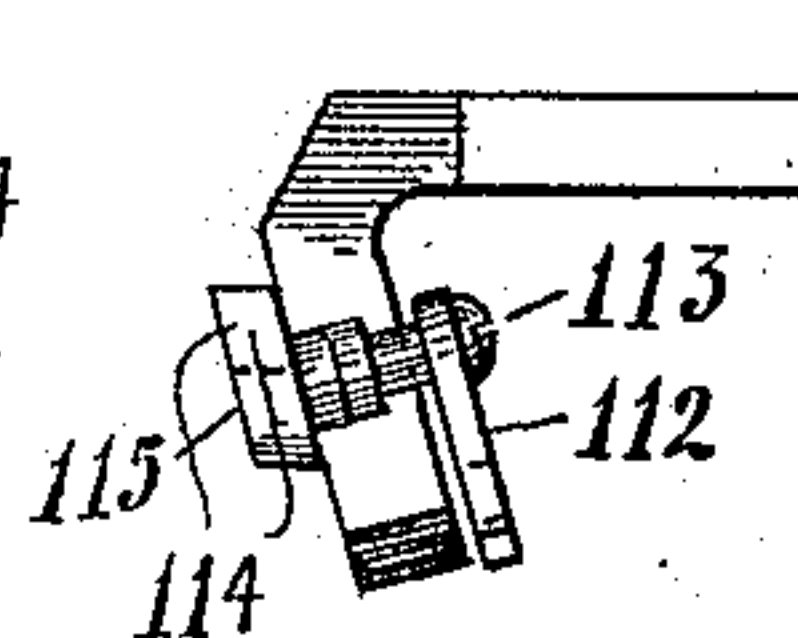


Fig. 14

Fig. 16

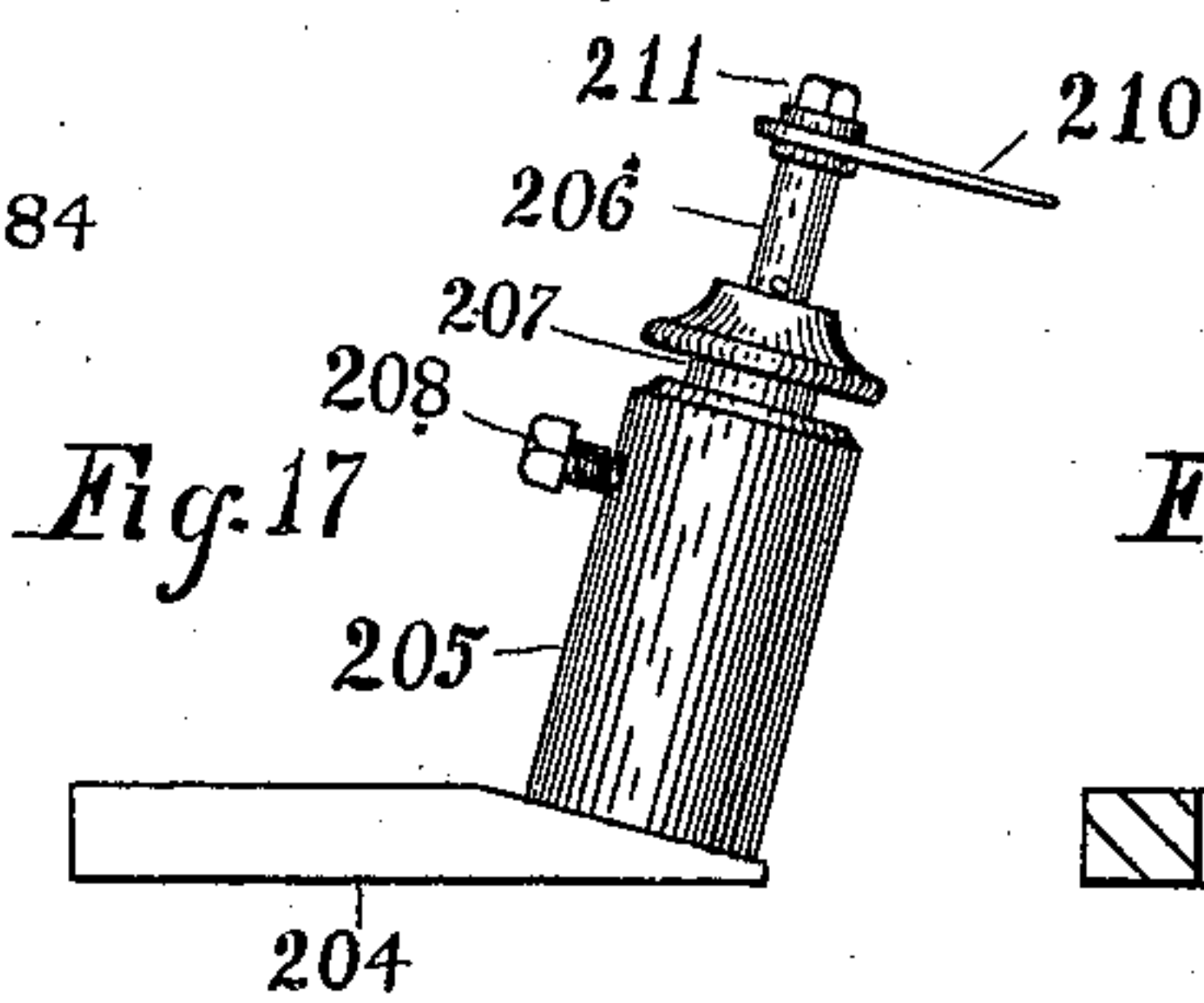


Fig. 17

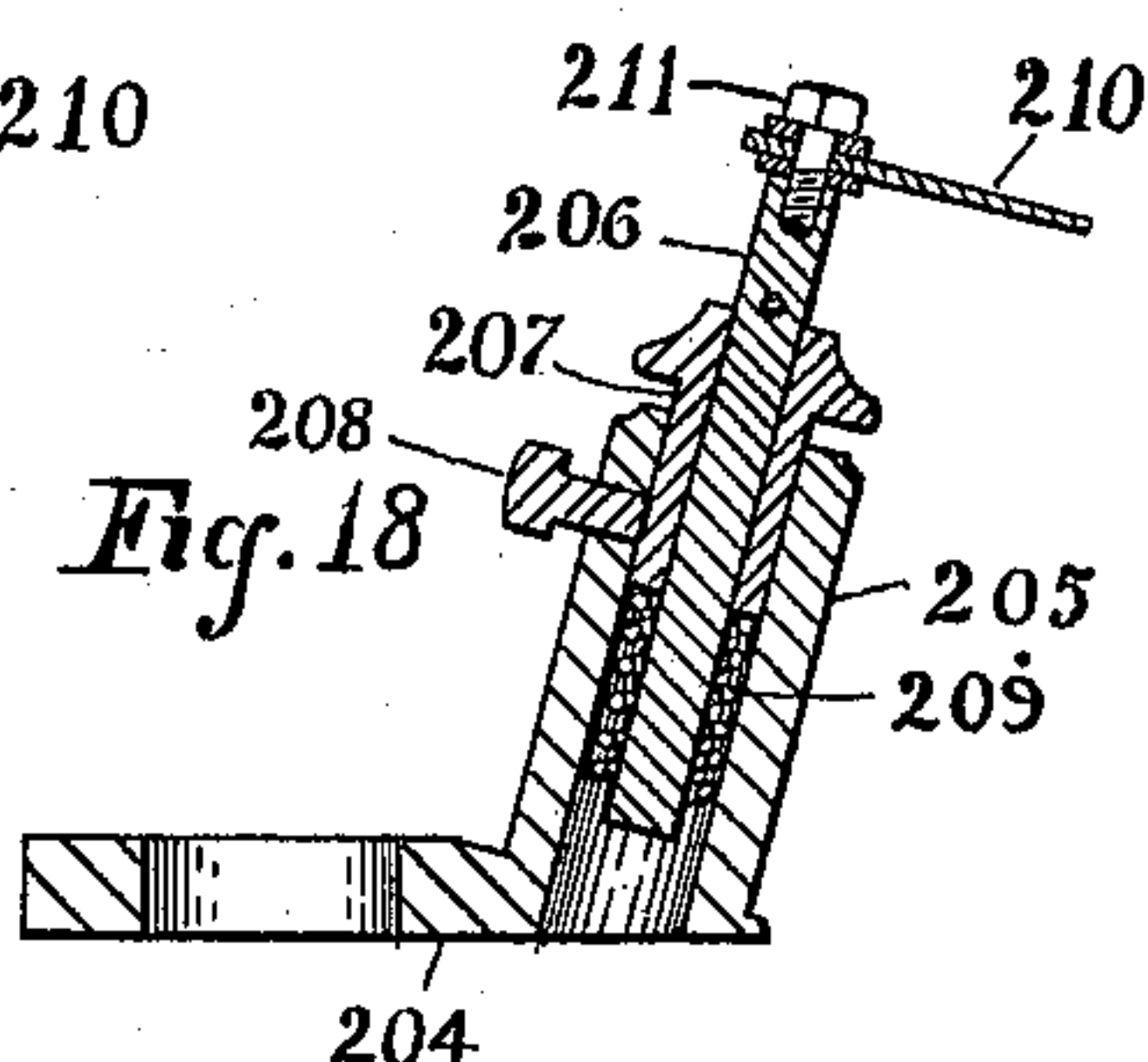


Fig. 18

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5 Sheets—Sheet 5.

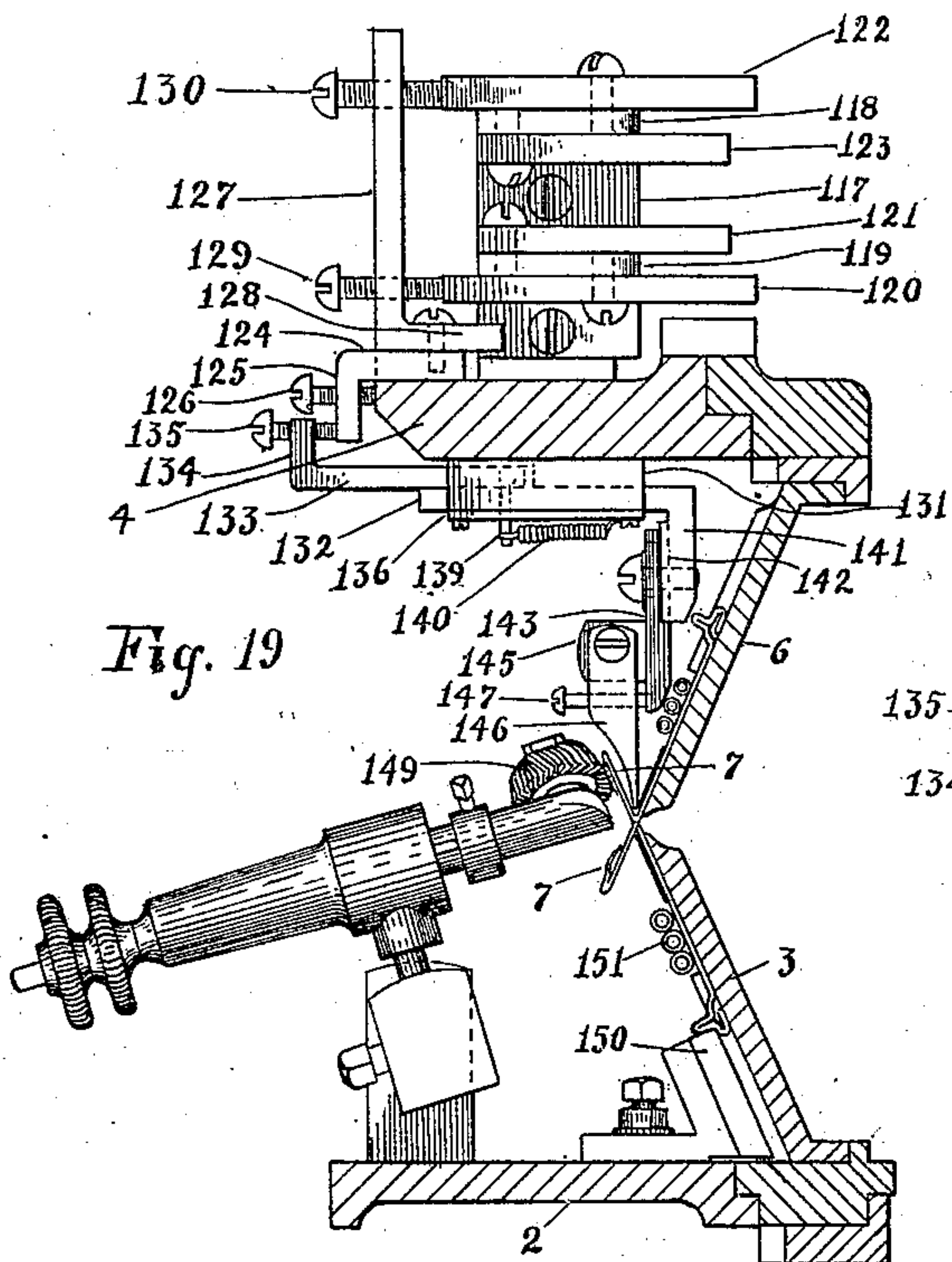


Fig. 19

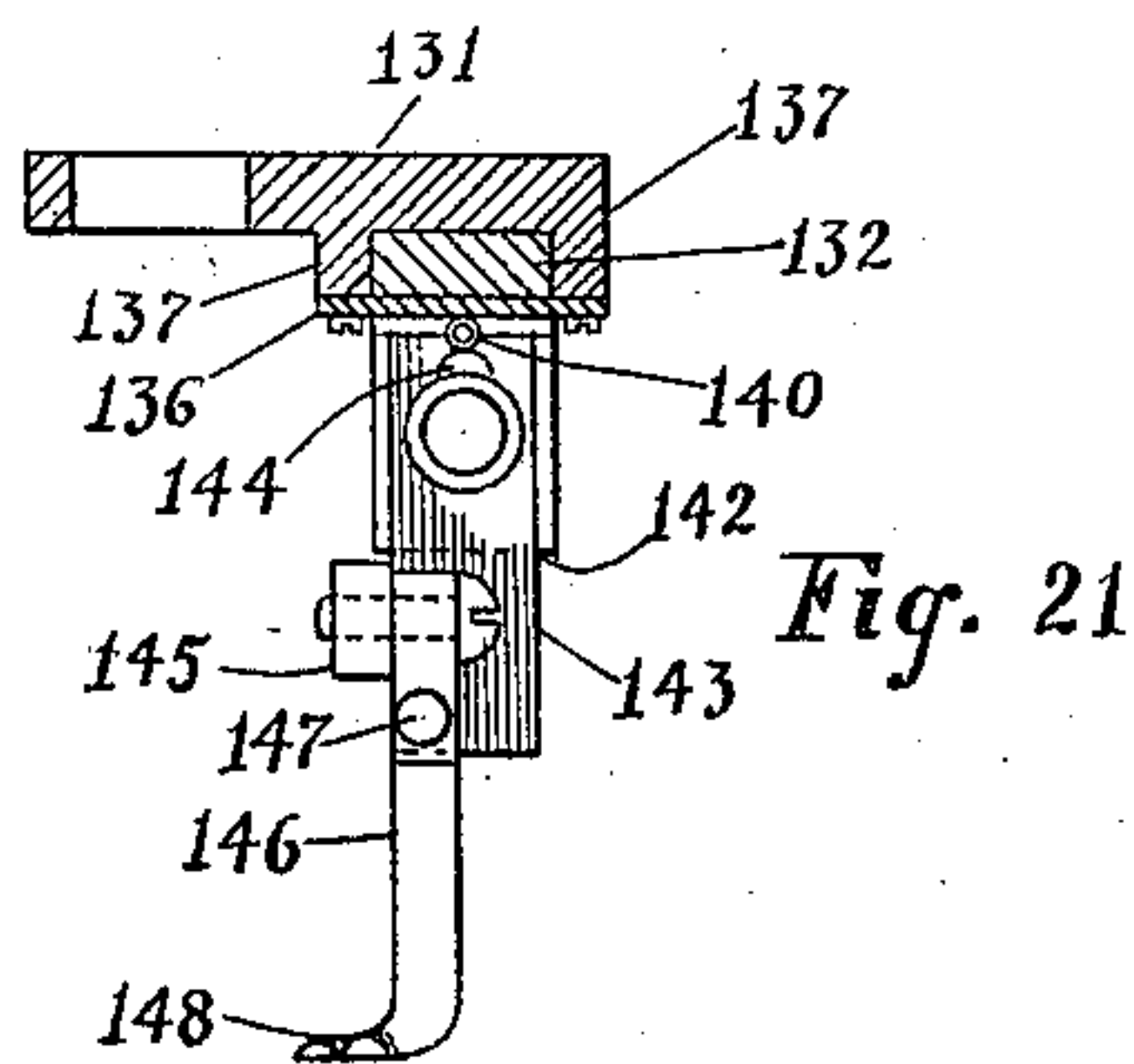


Fig. 21

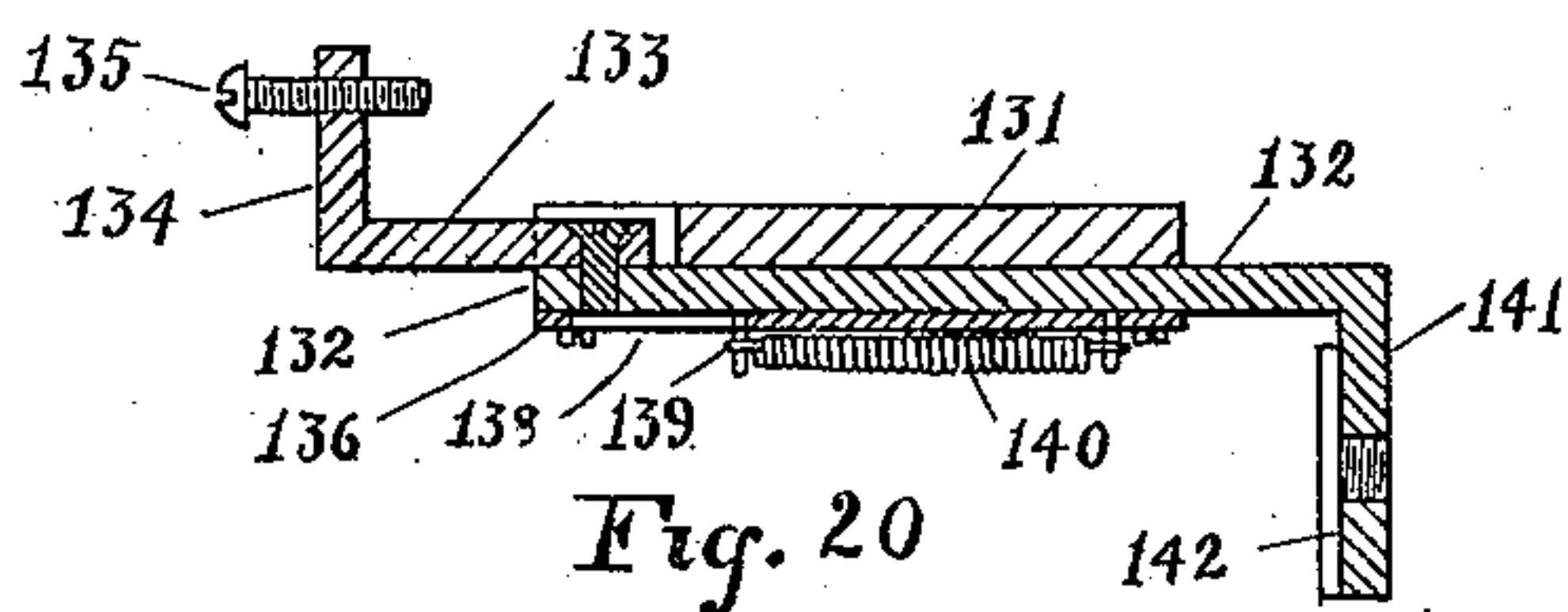


Fig. 20

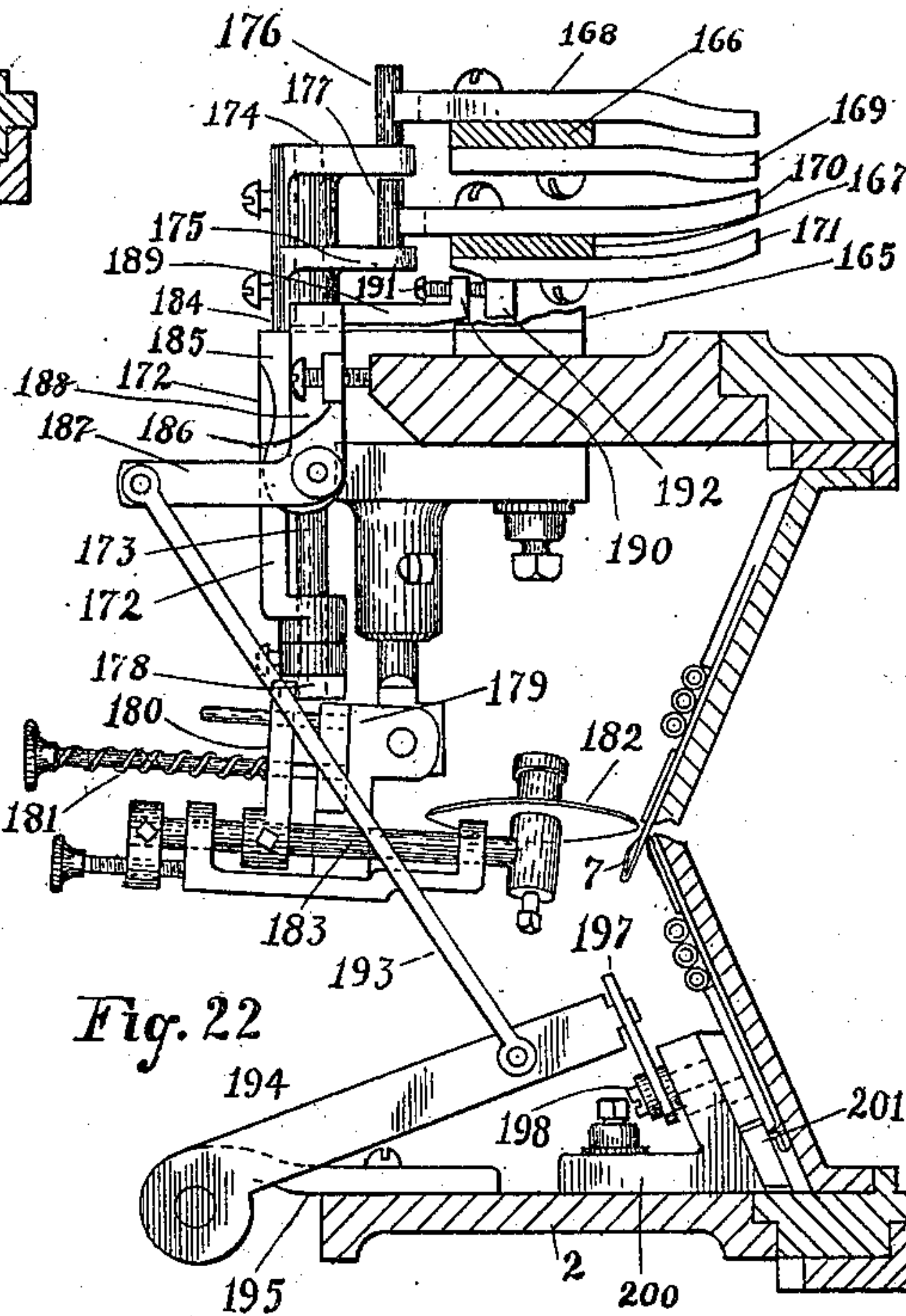


Fig. 22

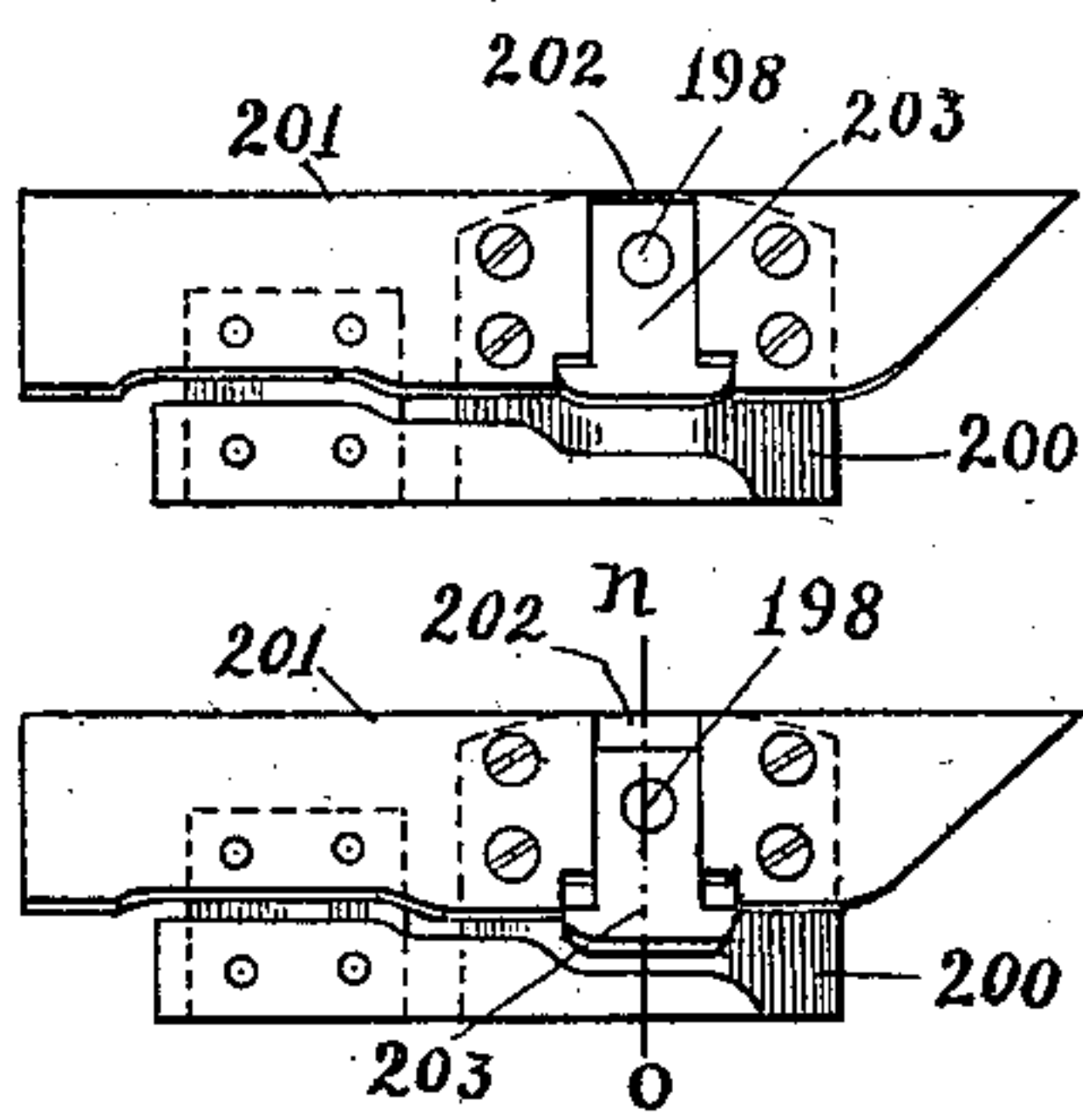


Fig. 23

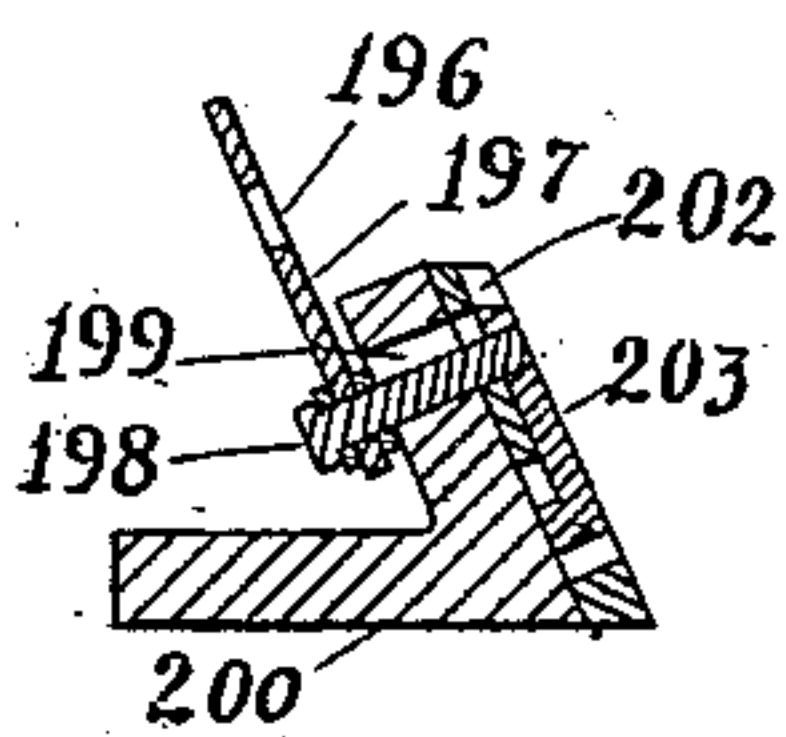


Fig. 25

Fig. 24

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# UNITED STATES PATENT OFFICE.

DANIEL HURLEY, OF BENNINGTON, VERMONT, ASSIGNOR TO CHARLES COOPER, OF SAME PLACE.

## CIRCULAR-KNITTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 607,798, dated July 19, 1898.

Application filed December 3, 1897. Serial No. 660,674. (No model.)

*To all whom it may concern:*

Be it known that I, DANIEL HURLEY, a citizen of the United States, residing at Bennington, in the county of Bennington and State of Vermont, have invented certain new and useful Improvements in Circular Spring-Needle Rib-Top Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, which form part of this specification.

My invention relates to that class of circular-knitting machines in which double cylinders are used with spring-needles in each cylinder, and has for its object to produce a welt which serves as a finish on the ends of cuffs, drawer-bottoms, bottoms for shirts, tops of socks, and for such other purposes as desired, which is produced by a certain system of pattern-wheels, operating-pawls, and levers that act upon other levers, cams, and pressers to shorten the stitch and throw the needles of the upper cylinder out of action until the welt is knitted, when the upper needles are again brought into use, doubling the knitted welt over upon itself and joining it to the body of the fabric; and my invention consists in the construction and details of parts hereinafter described, and more particularly pointed out in the claims.

Heretofore welts have been made on a straight-rib machine, and also a very inferior welt has been made with a latch-needle on a circular-rib machine; but there is great objection to the use of the latch-needle in making welts, as the stitches are required to be drawn very tight, and as each needle draws its own loop the strain in drawing the yarn through several needles at one time causes frequent breakage of the yarn or it is knitted very loose, unless it is very strong, and at the same time removes the elasticity from the yarn and renders the fabric non-elastic and less desirable on that account, and in tender yarn the strain is so great as to frequently cause holes to be produced in the fabric, while in the use of spring-needles the loop is put in with a sinker-wheel and stitch-former

and is then left loose in the head of the needle until it is pressed, when the needles are carried down just far enough to cast off without putting strain on the yarn, and by this process with the spring-needle all of the before-named objections to the latch-needles are overcome, and a welt is made on my circular spring-needle machine even finer and as perfect and out of the same degree of fineness of yarn as that heretofore made on the straight-rib or flat machine.

Referring now to the drawings, Figure 1 is a front perspective view showing part of a circular-knitting machine with my improvements attached thereto. Fig. 2 is a rear perspective view showing the pattern-wheels and mechanism connected therewith for changing the position of the shipping-pins. Fig. 3 is a top plan view of the pattern-wheels and levers connected therewith for operating the switch-plates. Fig. 4 is a front elevation of the shipping-pin stand, showing the pins in their depressed position. Fig. 5 is a front elevation of the shipping-pin stand, showing the first series or row of pins in an elevated position and the other series in a depressed position. Fig. 6 is a top plan view of the shipping-stand with the top plate removed. Fig. 7 is a vertical transverse section of the shipping-stand, taken on the line *a b* of Fig. 6. Fig. 8 is a partial top plan view showing the ring-plate with my improved attachments thereon. Fig. 9 is a vertical section through the ring and upper needle-cylinder on the line *c d* of Fig. 8. Fig. 9<sup>a</sup> is a front view of the parts shown in Fig. 9. Fig. 10 is an enlarged rear perspective view showing the switch and shipping-pin stands, with one of the switch-plates in position for raising one series of the shipping-pins. Fig. 11 is a front elevation showing one pair of levers, with their connecting-arms for operating a cam, the needle-cylinders being broken away on their sides. Fig. 12 is a vertical section taken on the line *e f* of Fig. 8, showing one pair of levers, with connecting mechanism for operating a cam. Fig. 13 is a rear elevation of one of the movable cams. Fig. 14 is an end elevation of a movable cam. Fig. 15 is a top plan view of one pair of levers, showing



ing their general construction. Fig. 16 is a lateral transverse section of Fig. 15 on line *g h*. Fig. 17 is a side elevation of a spring-presser. Fig. 18 is a vertical sectional view of Fig. 17. Fig. 19 is a vertical transverse section through the needle-cylinders on the line *i k* of Fig. 8, showing two pairs of levers and their connecting mechanism for operating a stitch-former in regulating the length of the stitch in the stitch-wheel. Fig. 20 is a longitudinal vertical section of one of the movable arms in a bracket for operating the stitch-former. Fig. 21 is a vertical transverse section of a bracket and a movable arm therein for operating the stitch-former. Fig. 22 is a vertical transverse section taken on the line *l m* of Fig. 8, showing two sets of levers and their connecting mechanism for operating a presser-wheel and an adjustable cam. Fig. 23 is a rear elevation of an adjustable cam in its normal position for making the regular work. Fig. 24 is a rear elevation of an adjustable cam with the adjustment raised as it is changed after making the stitch of the regular work; and Fig. 25 is a vertical transverse section of the cam, taken on the line *n o* of Fig. 23.

Like numerals indicate corresponding parts in each figure of the drawings.

1 indicates the frame on which the machine is mounted, and 2 the bed resting on the frame, and 3 the lower cylinder seated in the bed.

4 represents a ring-plate which is properly secured to brackets 5 on the frame above the bed, and in this ring-plate 4 is seated the upper cylinder 6. The cylinders 3 and 6 are conical in shape, the lower one extending upward and outward from the bed 2, while the upper one extends downward and outward from the ring-plate 4. The two cylinders are arranged to come within a short space of each other, and each is provided with the usual spring-needles 7, and they are made to revolve uniformly one with the other by means of any well-known power.

The upper inner side of the cylinder 6 is provided with a stand 8, which has arranged therein a series of movable shipping-pins which are adapted to come in contact with and operate on a series of levers, as hereinafter described.

On the inner side of the stand 8 there is a cam 9, which revolves with the stand on the cylinder. At each revolution of the cylinder the cam 9 comes in contact with a roller 10, secured to the lower end of an arm 11, which projects upward and backward and is adjustably attached to a rock-shaft 12, which has its bearings in a bracket 13, secured to one side of the frame 1 above the bracket 5.

In the rear of the frame there is attached to the rock-shaft 12 an adjustable stop 14, which has a bent arm 15, projecting upward and forward over the base of the bracket 13, and is provided in its end with an adjustable screw-bolt 16, which controls the limit of the

downward movement of the arm 11 by engaging the upper edge of the bracket 13.

On the outer end of the rock-shaft 12 there is rigidly secured a downwardly-extending arm 17, having in its lower end a lateral journal 18, on the outer end of which there is pivotally connected a pawl 19. This pawl operates in a ratchet 20, rigidly secured on the side of the regular pattern-wheel 21, and revolves the pattern-wheel one notch at each revolution of the cylinders 3 and 6. The pattern-wheel has sprockets 22 on its periphery, over which a link-belt chain 23 is fitted and revolves with it. This chain may be of any desired length in accordance with the pattern of work to be made, and one or more of the links are made to form a cam 24 for starting the movement of a second pattern-wheel at proper times after said second pattern-wheel has been stopped in the manner hereinafter described.

To the rear of frame 1, beneath the bracket 5, there is attached a bracket 25, as shown in Fig. 2, which extends outward and has a bearing 26 on its outer end, through which passes a journal 27. The outer end of this journal has a lever 28 adjustably secured thereto, which works over the chain 23 and comes in contact with the cam-link 24, which raises the lever and thereby operates to move an arm 29 on the inner end of the journal 27 to change the stitch, as hereinafter described.

The arm 29 is adjustably secured to the inner end of the journal 27, and extends upward to about the same height as the lever 28, and has loosely pivoted to its upper end a lever 30, which is raised on screw-head projections 42 on a pattern-wheel 31 for the purpose of stopping said wheel while making the desired lengths of the different kinds of knitted fabric.

At the side of the vertical arm 29 there is a lateral arm 32, holding a coil-spring 33, which acts to draw the lever 28 and arm 29 toward the pattern-wheels 21 and 31 and keep them down to their work. There is also secured to the side of the arm 29 a lateral arm 34, extending inwardly, in which there is an adjustable screw 35, that comes in contact with a vertical stop 36, that is attached to the main portion of the bracket 25 for the purpose of limiting the forward movement of the lever 28 to prevent its coming in contact with and resting on the link-belt chain 23 except at such times as it is intended to be raised by the cam-link 24 for the purpose of throwing back the lever 30 from off the screw-pins 42 in the holes 41 in starting the pattern-wheel 31 in making the loose stitch, the welt, the royal rib, or the regular work when the said wheel has been stopped while making the royal rib. An arm 37 is attached to the side of the stop 36, which projects forward between the ratchet 20 and pattern-wheel 31, and is bent on its inner end to form a hook for holding one end of the coil-spring 33.

On the inner end of the lateral journal 18



of the arm 17 is loosely mounted a pawl 38, which operates in a ratchet 39, that is located near the center of the pattern-wheel 31. The pawl 38 is provided with a pin 40 in one side 5 and is regulated in its action on the ratchet of the pattern-wheel by the lever 30, extending from the vertical arm 29.

The pattern-wheel 31 operates to change the stitches in making that which is known as the "welt," the "royal rib," the "loose course," or in returning to the regular work, and for the purpose of accomplishing each of these objects a series of screw-holes are placed in the periphery of the pattern-wheel opposite the seat of each tooth of the ratchet. The series of screw-holes 41, placed on one side of the ratchet 39, is provided with stop-screws 42, inserted therein at such points as it is desired to stop the pattern-wheel 31. In this 20 operation as the wheel 31 revolves the lever 30 is drawn up on the screw head or projection 42, and as it is raised the upper projecting part comes in contact with the lateral pin 40 in the side of pawl 38 and raises the said 25 pawl out of the ratchet and stops the action of the pattern-wheel.

A second series of screw-holes 43 encircle the pattern-wheel 31 next to and on the other side of the ratchet 39 from the first series 41. 30 In this series of holes 43 screw-pins 44 are inserted at such points as is desired for the purpose of lifting the end of a lever 52 in making a loose course in the work, and a third series of screw-holes 45 encircle the 35 wheel next to holes 43, in which screw-pins 46 are inserted at proper intervals for raising a lever 62 as the wheel revolves in making the royal rib in the work, and a fourth series of screw-holes 47 encircle the wheel on its inner periphery for screw-pins 48, placed at desired intervals for raising a lever 69 for the 40 purpose of making the welt on rib-tops for socks, anklets for drawers, shirt borders, and cuffs.

In the rear of bracket 5 there is attached to the frame a bracket 49, having double bearings 50, in which three journals are supported one above the other. The upper journal 51 carries the lever 52, which is rigidly secured 50 to its outer end and extends forward over the series of holes 43 in the pattern-wheel 31, and when the pattern-wheel is turned operates on the screw-pins 44, inserted therein, for making the loose or slack course. On the inner 55 end of the journal 51 there is rigidly secured a lever 53, that extends forward over the bracket 5 and is pivotally attached to a link 54, that extends backward and upward and is pivoted to an arm 55, that is rigidly secured 60 to a shaft 56, that is supported in a double bearing-bracket 57, that is attached to the bracket 5. On the inner end of the shaft 56 there is a switch-plate 58, projecting forwardly and laterally therefrom, and when the 65 shaft is turned axially the free edge of the plate parallel with the shaft will work up or down between stops 59, formed on a plate 60,

screwed to one edge of the bracket 57, and such stops will limit the movement of the plate. 70

To the outer end of the middle journal 61, supported in the bracket 49, is secured the lever 62, that extends forward over the holes 45 in the pattern-wheel 31, and as the wheel is revolved for making the royal-rib stitch 75 the lever is drawn up on the screw-pins 46, inserted in the holes.

On the inner end of the journal 61 there is secured a lever 63, that extends forward and is pivotally attached to a link 64, that projects backward and upward and is pivotally 80 attached to an arm 65, that is rigidly secured to a shaft 66. This shaft is supported in the middle bearings of bracket 57, and on its inner end there is a switch-plate 67, arranged 85 to operate in the same manner as the switch-plate 58.

To the outer end of the lower journal 68 is rigidly attached the lever 69, which projects over the holes 47 in the pattern-wheel 31, and 90 as the wheel is revolved for making the welt the lever is drawn up on the screw-pins 48, which are inserted in the holes. On the inner end of the journal 68 there is rigidly attached a lever 70, that extends forward and 95 is pivotally attached to a link 71. This link extends rearwardly and upwardly and is pivotally connected to an arm 72, that is rigidly secured to shaft 73, which is supported in the lower bearings of bracket 57, and on the inner 100 end of this shaft there is also a switch-plate 74, arranged to operate in the same manner as the switch-plates 58 and 67.

The stand 8, which is rigidly attached to the inner side of the upper cylinder and made 105 to revolve with it, has therein three series of shipping-pins for operating on and changing levers in producing the different stitches desired in making the various kinds of work on the machine. Each series of pins is arranged 110 on a movable slide 116, and these slides work up and down in grooves 75 in the stand. The upper pins of the three series are adapted to be respectively engaged by the switch-plates 115 58, 67, and 74, and these plates being inclined said pins will be moved positively up or down, according to the direction of the inclination of the plates, and such inclination will be changed by the axial turning of the shafts 56, 66, and 73, respectively, and the 120 lower pins of the three series will thus be moved into or out of operative position to accomplish the purposes hereinafter described. On the rear of the stand there are three flat springs 76, each having a projecting point 77, 125 extending through the back and adapted to engage in one or the other of a pair of depressions 78 in the respective slides, as shown in Fig. 7, for the purpose of holding said slides in elevated or depressed positions after the 130 switch-plates pass out of engagement with the pins. The front plate 79 of the stand is provided with a series of slots 80, through which the shifting pins project.



Each vertical series of slots in the plate 79 is arranged at an angle of about forty-five degrees to the other series for the purpose of adjusting the pins at different heights. When these pins are lowered to the bottom of the slots, the machine is then adjusted for making its regular work. The shipping-pins 81 are adjusted to the upper extremity of their slots for the purpose of bringing the lower pin 81 in contact with certain levers for changing the stitch from the regular work to that of the loose course, and the shipping-pins 82 are adjustable to the upper part of their slots for the purpose of bringing the lower pin 82 in contact with certain levers for changing the stitch from the regular work to that of the royal rib, and the shipping-pins 83 are adjusted to the upper part of the slots for the purpose of bringing their lower pin 83 in line with other certain levers for the purpose of changing the stitch from the regular work to that of making the welt.

As shown best in Fig. 8, the series of levers upon which the adjustable pins of the stand 8 are made to operate at such times as is desired to change the stitch during the revolutions of the cylinders are arranged at different points on the ring-plate 4 of the upper needle-cylinder 6. These levers are arranged in pairs and are all constructed and operated substantially on the same plan. As shown, Figs. 1, 8, and 9, and detailed in Fig. 15, it will be seen that one pair of these levers are attached to a slotted bracket-plate 84, which is secured to the bracket 5 before described. The lever 85 is pivoted at 86 to the rear of said plate, while the other lever 87 is pivoted at 88 to the front of the plate. The bracket-plate 84 has a slot 89 therein, extending at right angles to the length of the levers, and the lever 87 has two laterally-projecting pins 90, which are separated by a short space, that project into said slot, and the lever 85 on the other side of the bracket-plate has a single projecting pin 91 in the center of its width, which also extends into the slot and is seated between the pins 90 of the lever 87. The forward end of said lever is formed to provide a cam which when said lever is in its normal position engages a pin 92, projecting from a pivoted arm 93, and thereby holds said arm in its forward position, as hereinafter more fully stated. In this arrangement of levers in pairs it will be readily understood that when the arm of the lever 85 is carried forward by the shipping-pins 83 in the stand 8 the front end of the lever 87 will be thrown forward and released from the pin 92, and the levers will remain in this position until the shipping-pin in the stand is adjusted to come in contact with the arm of the lever 87, when it will be thrown forward into engagement with the pin 92 and operate thereon to force the lever-arm 93 back and into its original position.

As above stated, the pin 92 projects from the upper surface of a lever-arm 93, one end

of which is pivotally attached to the top of the ring-plate 4 of the upper cylinder, while the other end extends loosely back over the edge of the ring and rests against the up-turned end 94 of an angle-lever 95, which is pivoted in a depending bracket 96, that is rigidly secured to the top of the ring. The lower arm 97 of the lever 95 extends backward beneath the ring-plate and is loosely connected with the end of a link 98. The other end of the link is rigidly secured at one end of a journal 99, that has its bearing in a stationary cam 100, and on the other end of the journal there is attached a movable cam 101, which is thrown up by the operation of said lever 85, for the purpose of enabling the needles to remain elevated on the upper cylinder and leave them out of engagement with the lower needles while passing through the feed in making the welt. The cam 101 is depressed by the lever 87, after the welt is made, to bring the needles back into their operative position for the regular work.

On the upper side of the ring-plate 4, as shown in Figs. 1, 8, 11, and 12, an angle-bracket 102 is attached, which extends upward and has a lateral slotted plate 103, that supports another pair of levers constructed and arranged to operate substantially the same as those hereinbefore described. The lower lever 104 is pivoted to the under side of the slotted plate 103, while the upper lever 105 is pivoted to the upper side of the plate. Both of these levers are operated by the shipping-pin 83 the same as the levers 85 and 87, before described, when the machine is making the welt. The cam operated by the levers 104 and 105, as hereinafter described, in making the welt is also operated for the purpose of changing the regular stitch to a loose course, and when so operated it must be without operating the cam 101, and in order to accomplish this a supplemental lever 106 is rigidly secured to the front end of lever 105 in position to be operated by the elevated lower shipping-pin 81 without bringing into action the lower shipping-pin 83, that operates the levers 85 and 87 when it is elevated.

An arm 107 is loosely pivoted at one end on the upper surface of the ring-plate 4, while the other end extends loosely over the front edge of the ring-plate in front and beyond the levers 104 and 105. A vertical pin 108 is in the arm in front of the levers, and when the shipping-pin 83 is brought in contact with the arm of the lower lever 104 the outer end of the lever is turned and comes in contact with the pin 108, pressing the arm 107 forward and carrying with it a right-angled arm 109, which projects above the ring. This arm is pivoted to a bracket 110, extending downward from the top of the ring, while its lower arm 111 extends inward beneath the ring and is loosely connected at one end to a link 112, while the other end of the link is rigidly secured to a pintle 113, which has its bearing



in a stationary cam 114. The other end of the pintle has rigidly secured thereto a movable cam 115, which is in its depressed position, as shown in Fig. 12, when the levers 104 and 105 occupy the position shown in Fig. 8, and the cam 115 is firmly maintained in such position as long as the lever 104 engages the pin 108 and holds the arm 107 forward. When in this position, the cam 115 acts on the needles in the upper cylinder to depress them in the usual manner to do regular work. When, however, it is necessary to make a loose course or welt, the cam 115 must be raised, and this is accomplished by the lower shipping-pin 81 engaging the lever 106 or the lower shipping-pin 83 the lever 105, as the case may be, and thereby disengage the lever 104 from the pin 108, when the cam will be free to be moved up by the needles and the latter will remain elevated and out of engagement with the needles of the lower cylinder.

When the lower elevated shipping-pin 81 is carried around by the cylinder until it reaches a point opposite the bracket 57 after operating on the lever 106 to raise the cam 115, the switch-plate 58 in its normal inclined position comes in contact with the upper pin 81 and presses it down as the pin passes under the plate, when the pin assumes its original depressed position with the other pins for making the regular work, and when the lower shipping-pin 83 comes in contact with the lower lever 104 the cam 115 will be again depressed, throwing the needles of the upper cylinder down at this point, where they will again engage in making the regular work until the switch-plates have changed the shipping-pins to operate on levers for making the welt.

Another vertical bracket 117 is attached to the upper surface of the ring-plate 4, as seen in Figs. 1, 8, and 19, and is provided with an upper lateral slotted plate 118 and a lower lateral plate 119. Each of these plates has a pair of levers which are constructed to operate upon each other in substantially the same manner as those hereinbefore described and shown in Figs. 15 and 16.

The lower set of levers 120 and 121 are secured to the plate 119 of the bracket and are used through a system of arms for pressing the needles into the stitch-wheel for lengthening the stitch in making the regular work and for withdrawing the needles and shortening the stitch in making the welt. When the needles are pressed into the stitch-wheel by the lower levers for making the regular work, the upper set of levers 122 and 123 may be brought into action and the connecting-arms forced out still farther, thereby pressing the needles farther into the stitch-wheel and lengthening the stitch for the purpose of making the loose course. With this object in view a swinging arm 124 is loosely pivoted to the ring-plate 4 at one side of the bracket 117 and is extended to the front of the bracket, where it has a depending arm 125, holding an

adjustable screw 126, that works against the ring-plate 4. To the upper side of the arm 124 and immediately in front of the levers there is a vertical standard 127, that is rigidly attached to the arm by a foot-piece 128. This standard extends above the upper pair of levers and has therein two adjusting-pins. The lower pin 129 extends through the standard and is adapted for adjustment and to be operated on by the end of the lever 120 to throw the standard outward. The upper pin 130 passes through the standard near its upper end and is adjustable in or out and is adapted to be operated on by the end of the upper lever 122 to throw the standard 127 outward still farther than by the lower lever 120, as is desired in making the loose stitch or course.

A bracket 131 is attached to the under side of the ring-plate below the levers and has a sliding arm 132 working in ways therein. To the front end of said arm there is rigidly attached an arm 133, having its front end bent upward in front of the depending arm 125, and an adjusting-screw 135 in the upwardly-projecting part thereof that comes in contact with and works on the side of the lower portion of the arm 125 in regulating the depth of the stitches made.

A retaining-plate 136 is secured to the under side of the bracket 131, over the guide-ways 137, for holding the sliding arm 132 in position. The plate 136 has a slot 138 near its front end, through which a pin 139 projects, which is secured in the sliding arm 132.

One end of a coil-spring 140 is attached to the rear end of the retaining-plate 136, and the other end of the spring is secured to the pin 139 for the purpose of forcing the sliding arm 132 back to the limit of the slot in which the pin is made to operate, and thereby carry with it the arm 133, the swinging arm 124, and the vertical standard 127 when the levers are moved off from the pins 129 and 130.

The sliding arm 132 has on its rear end a downwardly-projecting arm 141, which has a groove 142 therein, in which is placed an adjusting-slide 143, which is held in raised or lowered position by means of the screw in the slot 144. The slide 143 has a forwardly-projecting arm 145 near its lower end, to which is pivotally connected a downwardly-extending arm 146, having an adjusting-screw therein for moving the arm forward toward the needles or back from them, as desired, and to the lower end of this arm there is attached a foot-piece 148, standing at right angles to the arm and having a serrated edge for pressing the needles into the stitch-wheel 149 as they are forced up by the cam 150 under the coil-springs 151, which hold them on the cylinders. By this arrangement of parts it will readily be seen that when the levers 120 and 122 are not pressed against the adjusting-pins 129 and 130 the coil-spring 140 will operate to draw the arms 133 and 124 and the standard 127 back toward the ring-plate 4



and with them carry back the arms 141 and 146, together with the foot-piece 148, and thereby partially release the needles 7 from the stitch-wheel 149 for the purpose of shortening the stitch in making the welt, and that when the lever 120 is adjusted to come in contact with the end of the screw-pin 129 the standard 127 is thrown outward, carrying with it the arms 124 and 133, thereby drawing the arm 146 nearer to the needles and forcing them into the stitch-wheel for lengthening the stitch in making the regular work, and that when it is desired to still further lengthen the stitch for making the slack or loose course the lever 122 is forced against the pin 130, which is adjusted inward farther than said pin 129, driving the standard 127 out beyond the point it was carried by the lower lever 120.

As shown in Figs. 1 and 8, there is also another bracket 152, attached to the upper surface of the ring-plate 4, which has lateral supporting slotted plates 153 and 154, that are provided with upper levers 155 and 156 and lower levers 157 and 158, that operate against adjusting screw-pins 159 and 160, which are held in a vertical standard 161. These operate through a swinging arm 162, having an adjusting-screw 163, and a sliding arm 164, with the other connecting parts to perform the same functions at another feed on the needle-cylinders as the levers 120, 121, 122, and 123 on the bracket 117, hereinbefore described.

A bracket 165 is attached to the ring-plate 4 next in line to the bracket 117, as shown in Figs. 1 and 8 and as broken away in Fig. 22, which has projecting from its side the usual upper and lower slotted plates 166 and 167, to which are attached an upper pair of levers 168 and 169 and a lower pair of levers 170 and 171, which are constructed with interlocking pins in the slotted plates to operate one upon the other in substantially the same manner as those hereinbefore described and shown in Figs. 15 and 16. At one side of the bracket on the ring-plate there is secured a downwardly-extending bracket 172, having bearings in its upper and lower ends, supporting a vertical shaft 173. This shaft extends above the upper bearing and has adjustably secured thereto two crank-arms 174 and 175, one above the other, each of which extends at right angles to the shaft 173 to a point in front of the levers, each of which has an upwardly-projecting pin near its end.

The crank-arms 174 and 175 are adjusted inwardly to bring their vertical pins 176 and 177 within a short space of the levers 168 and 170, which operate upon them to swing the arms outward. On the lower end of the shaft 173 there is adjustably attached a foot-piece 178, that is at right angles to the shaft and extends over the top of the bracket 179 of the well-known spring-presser attachment below and is held in front of the vertical bar 180 of the presser and is forced in toward the needle-cylinders by the coil-spring 181 on the presser-rod to hold the presser-wheel 182

against the needles of the upper cylinder to press off the stitch in making the regular work.

When it is desired to withdraw the presser-wheel 182 from the needles to leave the beards of the needles open, as is necessary in making the welt and the royal rib, the lever 168 or 170 is forced against the pins 176 or 177, driving the end of the arms 174 or 175 outward, thereby turning the shaft 173 and swinging the foot-piece 178 outwardly, carrying with it the vertical bar 180, that is rigidly attached to the journal 183, that holds the presser, thereby withdrawing the presser-wheel 182 from contact with the needles of the upper cylinder.

Between the brackets 165 and 172 there is also attached to the ring-plate 4 a bracket 184, as seen in Fig. 22, which is extended to the front of the plate on a line with the levers 168 and 170 and has a downwardly-projecting arm 185. To the lower end of this arm there is pivotally attached a crank-arm composed of a forwardly-projecting arm 187 and a vertical arm 188, on the side of which vertical arm there is a lug and stop-screw 186 for limiting the movement of the arm. As the vertical arm reaches the upper surface of the bracket 184 it is bent back, forming a lateral arm 189, which extends over the bracket, its rear end being bent upward to form a stop 190, in which there is an adjusting-screw 191, that is adapted to contact with a depending lug 192 near the end of the lower lever 171 on the bracket 165, hereinbefore described.

The outer end of the arm 187 has loosely attached thereto a connecting-rod 193, that is pivotally attached to an adjusting-bar 194, one end of which is pivoted to a bracket 195, extending in front of the bed-plate 2, while the other end is loosely inserted in a hole 196 in the end of a link 197. The other end of the link is rigidly secured to the outer end of a pintle 198, that passes through a slot 199 in a bracket 200, that is attached to the bed-plate and which has a cam 201 rigidly secured to its opposite side, which rests against the needles of the lower cylinder. This stationary cam has a recess 202 on its inner side, as shown in Figs. 23, 24, and 25, and in this recess there is a T-shaped sliding cam 203, which is attached to the inner end of the pintle 198 and is moved up or down in the recess to regulate the length of the stitch on the lower needles as may be necessary in changing from making regular work to making a welt, or vice versa.

In making the regular work the cam 203 is pressed downward and is held in that position by the lug 192 on the lever 171, which forces screw-pin 191 in the end of arm 189 outwardly, and the crank-arm 186 is tilted downward, carrying with it the connecting-rod 193 and the bar 194, which, through the link 197, depresses the cam to its lowest point, where it is held.

When it is desired to change the stitch to



that of making a welt, the lever 171 is moved off the end of the screw-pin 191, when the cam 203 is at once forced up into its seat by the strain of the yarn in drawing up the needles and is held in that position by that means until the lever 171 again forces the cam down.

On the upper surface of the bed-plate 2, near the bracket 200, there is attached a bracket 204, as seen in Figs. 1, 13, and 14, having an upwardly-inclined socket 205, in which there is placed the well-known presser-rod 206. This rod has a sleeve 207 inserted in the socket and is retained in a fixed position therein by a set-screw 208. The lower end of the rod has one end of a coil-spring 209 secured thereto, while the other end of the spring is attached to the sleeve. The upper end of the rod is provided with a presser-finger 210, which is adjustably secured thereon by a screw 211.

In operation the coil-spring is so adjusted as to bring mild pressure on the finger 210, which extends in between the needle-cylinders, in order to keep the regular work forced back, and in making the welt, where several courses are knit on the lower needles alone, to keep the work forced back between the cylinders until the courses are finished, when the needles of the upper cylinder are again brought into operation and the knitted courses turned over upon themselves and their edge joined to the regular work to complete the welt.

A bracket 212 is attached to the bed-plate 2 in front of each stitch-wheel 149 for the purpose of supporting a standard 213, adjustably held therein, which has a guard-finger rigidly attached to its upper end. This finger is in front and near the needles at their crossing-point between the cylinders and is extended to the foot-piece 148 on the arm 146 and is for the purpose of keeping the needles from being raised out of their slots in case of a bunching up until they have passed by the foot-piece.

In Fig. 1 of the drawings I have omitted some of the cams used to push the needles of the lower cylinder up, and I have also omitted the stationary pressers which act on the barbs of the lower needles. It is to be understood, however, that these parts will be employed and they may be of any ordinary or well-known construction suitable to do the knitting in the usual manner on circular-knitting machines, and they are omitted for the purpose of preventing obscurity in the drawings. An illustration of such cams and pressers is found in the patent to Carr, No. 431,801, of July 8, 1890. It is also to be understood that the action of the needles of the lower cylinder is the same in making regular work, a loose course, the royal rib, or the welt. In the machine illustrated four feeds will be employed and may be referred to as No. 1, No. 2, No. 3, and No. 4, Nos. 1 and 2 being illustrated, and No. 1 being to the

left of Fig. 1, and Nos. 3 and 4 following in the regular order of succession after No. 2.

The special mechanism for changing the stitch at each feed is duplicated, with the following exceptions: The lever 106 will be employed only between the feeds Nos. 1 and 2; the levers 122 and 123 or 155 and 156, which are for the same purpose, will be omitted at the feeds Nos. 3 and 4; levers 170 and 171 and the mechanism operated by them will be present at feed No. 1 only, and levers 168 and 169 and the mechanism operated thereby will be present at feeds Nos. 1 and 3. It is not, however, to be understood that my invention is limited to machines with four feeds only, as the number of feeds may be increased or decreased, as desired. Should the feeds be increased, the additional feeds should be provided with the special mechanism similar to feeds Nos. 3 and 4.

In operation, when the machine is engaged in making the regular work, the levers are in position as shown in Fig. 8, with levers 87 and 104 forcing the pins 92 and 108, respectively, outward, carrying with them lever 95 and arm 109, which depress the cams 101 and 115, thereby forcing the needles downward, and with the levers 120 and 158 forced outward, carrying with them the standards 127 and 161, the arms 124 and 162 and 134 and 164 and their connections, thereby drawing the foot-piece forward against the needles, pressing them into the stitch-wheels for making the stitch of the usual length, and with lever 171 in position to force the pin 191 outward, which carries outward with it the angle-arm 186, and through its connecting-rod 193 depresses the adjustable cam 203.

During the operation of the machine the wheel 21 will be kept moving step by step, carrying the pattern-chain with it, but while the machine is knitting regular work the pattern-wheel 31 will be at rest, the pawl 38 being held out of engagement with the ratchet 39 by means of the pin 40 and lever 30, the latter being elevated by a pin 42 in the pattern-wheel.

To change the stitch from the regular work, it will be necessary to start the pattern-wheel, and to do this the pattern-chain will be arranged on the wheel 21 to bring one of its cam-links 24 into engagement with the lever 28 at the proper time, which will lift the latter, and thereby move the lever 30 off the pin 42 and permit the pawl 38 to engage its ratchet, and the pattern-wheel will then be moved. It is also to be understood that when the pattern-wheel is at rest and the machine is doing regular work the levers 52, 62, and 69 will rest at their free ends on the periphery of the wheel.

If it is desired to knit a loose course, a pin 43 will be inserted in the pattern-wheel just behind the free end of the lever 52, and when the pattern-wheel is moved the lever 52 will ride upon such pin, which will result in turning the journal 51 and, through the medium



of the lever 53 and arm 55, will change the inclination of the switch-plate 58 to bring its free edge downward, so that when the cylinders are revolved the upper shipping-pin 81 will ride upon the inclined surface of the switch-plate and bring the lower pin 81 into operative position, and it will remain in this position during one revolution of the cylinders.

As the stand 8 is carried around by the cylinder the lower shipping-pin 81, thus raised, comes in contact successively with levers 122 and 155, forcing them against the pins 130 and 159 in front, moving the standards 127 and 161 farther out than before, carrying with them the connecting-arms and forcing the foot-pieces closer upon the needles, crowding them still farther into the stitch-wheels, thereby lengthening the stitch. Said shipping-pin 81 also strikes the lever-arm 106, forcing it forward, and thereby moving the lever 104 out of engagement with the pin 108, releasing the angle-arm 109, when the needles will carry the cam 115 up, and thus prevent the upper needles from being forced down at this point while the slack course is knitted on the needles of the lower cylinder.

Just before the completion of the revolution above referred to the roller 10 will pass over the cam 9, and thereby operate the pawl 38 and move the pattern-wheel one notch, which will move the pin 43 from below the lever 52 and permit the free end of the latter to fall on the periphery of the pattern-wheel, and thereby reverse the inclination of the switch-plate 58. As the stand 8 is carried around the shipping-pin 81 comes under the switch-plate 58, and the series of pins 81 are thereby forced down in the slots to their original position, when the lower pin 81 will come in contact with levers 123 and 156, carrying them forward and moving levers 122 and 155 off the screw-pins in front, thereby enabling the standards 127 and 161, with all their connecting-arms, to drop back toward the cylinders, carrying with them the foot-pieces 148, releasing the pressure on the needles, and changing the stitch to that of the regular length. In the same revolution of the stand 8 the lower shipping-pin 81 strikes the lever 104, carrying it forward against the pin 108, thereby throwing the lever 107 outward and tilting the angle-arm 109, which forces the cam 115 down to its original position for depressing the needles of the upper cylinder for making the regular work.

In placing the machine in position for making the royal rib a lever 62 is drawn upon the head of the screw-pin 46, previously placed in the desired position in the pattern-wheel 31, thereby tilting the journal 61 in the bearings 50, raising the lever 63, which rocks the shaft 66, throwing the switch-plate 67 down against the stop 59 for the purpose of raising the second series of shipping-pins in the stand 8. As the cylinder revolves the upper pin 82 in the stand is forced up over

the incline surface of the switch-plate 67, and the series is raised in the slots and held in position by the spring 76. As the stand is carried around the lower pin 82 comes in contact with the lever 168, rocking it into engagement with the pin 176, thereby throwing the arm 174 forward, turning the shaft 173, and moving the foot-piece 178 outward, which carries with it the journal 183, removing the presser-wheel 182 from contact with the needle-beards on the upper cylinder for the purpose of leaving them in a raised position at this point, so the thread will pass under the beard and be held on the needle while the courses of the royal rib are being knit, while at a point farther around on the upper cylinder a like presser-wheel is performing its regular work in pressing down the beards of the needles for the purpose of allowing the stitches to pass over the beards and be cast off the needles.

To set the mechanism for knitting the royal rib, the pattern-wheel is started by the pattern-chain in the manner already described—namely, by a cam-link 24 engaging the lever 28, and thereby permitting the pawl 38 to drop into its ratchet. When the pattern-wheel is moved one notch, the lever 62 will ride upon a pin 46, and the same movement of the pattern-wheel will move a pin 42 under the lever 30, which will again lift the pawl 38 out of engagement with the ratchet, and the pattern-wheel will remain at rest with the lever 62 elevated until the desired number of royal-rib courses have been knitted. The number of courses will be governed by the pattern-chain, which will have a second cam-link 24 at the proper distance behind the link 24 which started the pattern-wheel, and as soon as this second link engages the lever 28 the pattern-wheel will be again started and move the pin 46 from below the lever 62, dropping the end of the lever down on the wheel, rocking the connecting levers and arms, and thereby tilting the switch-plate 67 up into its original position. As the shipping-pin 82 passes around under the plate it is forced down to its lowest position in the slot 80 when in its course it comes in contact with the lever 169, carrying its end forward and throwing lever 168 off the pin 176, thereby enabling the arm 174 to swing back, turning the shaft 173 and foot-piece 178, when the spring 181 forces the presser-wheel back on the needles, placing the machine again in condition for performing the regular work. The same movement of the pattern-wheel which releases the pin 46 from the lever 62 may also, if desired, move another pin 42 under the lever 30 and stop the movement of the pattern-wheel, as before described.

To change the stitch for making the welt, the pattern-wheel 31 will be moved to bring a pin 48 into engagement with a lever 69, and there will be as many pins 48 arranged in succession as may be necessary to keep the lever elevated while the necessary number of



courses in the welt are knitted. Raising the end of the lever 69 rocks the shaft 68 and raises the lever 70 and through the link 71 tilts the arm 72 upward, carrying the switch-plate 74 downward on the lug 59, where it remains as long as the courses are being made for the welt. As the stand 8 is moved around the third series of shipping-pins are raised to the top of the slots 80 by the upper pin 83 being forced up and over the inclined switch-plate 74. As the stand moves forward the lower pin 83 comes in contact with the levers 85 and 105, carrying their ends forward, and thereby moving the levers 87 and 104 off the pins 92 and 108, enabling the arms 93 and 107 to move in toward the cylinders, when the needles will force the cams 101 and 115 up and out of action, and the knitting is done on the lower needles. The pin 83 also comes in contact with levers 121 and 157, moving their ends forward, and thereby turning the levers 120 and 158 off the screw-pins in front, permitting the standards 127 and 161 to move in toward the cylinders, thereby releasing the connecting levers and arms, enabling the coil-springs 140 to draw the sliding arms 132 back, carrying with them the downward-extending arms 146 and the foot-pieces 148 to prevent forcing the needles into the stitch-wheel, and thereby shortening the stitch. The same pin 83 strikes the end of lever 17 and moves it into engagement with pin 177, turning the arm 175 outward, rotating the vertical shaft 173, carrying the foot-piece 178, and with it the journal 183, thereby removing the presser-wheel 182 from the beards of the upper-cylinder needles. As the pin 83 turns the lever 170 the lever 171 is moved so that its lug 192 is released from the screw-pin 191, when the knitted work draws up the connected cam 203, pressing upward the link 197 and the arm and connecting-rod 193, tilting back the crank-arm 186 for releasing the strain on the yarn when passing the cam. When the number of courses have been made for the desired width of the welt by this process, the machine is then changed to perform the regular work, and the courses of the welt are folded over upon themselves, and the two edges of the welt are united by bringing into action the upper-cylinder needles.

In returning the machine to the regular work the lever 69 drops off the head of the screw-pins on the pattern-wheel 31, thereby tilting the shaft 68, lever 70, arm 72, and the connecting-shaft 73 and raising the switch-plate 74 to its original position. As the stand 8 is moved around the pin 83 passes under the switch-plate and is forced down into its normal position, and when it is turned around on the cylinder it comes in contact with the levers 87 and 104, carrying their ends forward in contact with the pins 92 and 108, forcing the arms 93 and 107 outward against the angle-arms 95 and 109, tilting them outward, and forcing the cams 101 and 115 downward, thereby depressing the needles for the

regular work. The same pin 83 in its revolution comes in contact with levers 120 and 158 and again brings their front ends in contact with the pins in front, forcing the standards 127 and 161 outward, which carry with them the connecting-arms, again bringing the foot-pieces on the downwardly-extending arms farther forward, pressing the needle deeper into the stitch-wheels, and thereby lengthening the stitch, as is necessary in the regular work. This pin 83 also strikes the levers 171, removing the lever 170 from contact with the pin 177, when the crank-arm 175 is forced inward by the action of the coil-spring 181 through its connecting arms and shaft, and the presser-wheel 182 is again brought into contact with the needles of the upper cylinder when it is in position for doing its regular work. As the shipping-pin 83 strikes the lever 171 the lug on its front end is brought into contact with the pin 191, forcing the arm 189 outward, carrying with it the crank-arm 186, thereby depressing the rod 193 and the bar connected therewith and the link 197, forcing the sliding cam 203 downward into its normal position for making the regular work.

As a modification of my invention the upper pins 81, 82, and 83, which are engaged by the switch-plates to throw the lower pins into or out of operative position, may be omitted and the switch-plates be so arranged as to be in the path of the lower pins 81, 82, and 83 and act on them directly. It is also to be understood that other changes in the form, proportions, and minor details of construction may be resorted to without departing from the scope or sacrificing any of the advantages of my invention.

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

1. In a circular-knitting machine, the combination with the revoluble needle-cylinders, spring-needles, stitch-wheels, pressers adjacent to the stitch-wheels, and needle-actuating cams, of a series of levers connected with said pressers, a second series of levers connected to said cams and means for operating both series of levers to control the action of the cams and pressers on the needles to change the stitch, as and for the purpose set forth.

2. In a circular-knitting machine, the combination with the needle-cylinders, spring-needles, stitch-wheels, pressers adjacent to the stitch-wheels, and needle-actuating cams, of means for automatically changing the positions of the cams and pressers to change the stitch produced, as and for the purpose set forth.

3. In a circular-knitting machine, the combination with the needle-cylinders, spring-needles, stitch-wheels, pressers adjacent to the stitch-wheels, and needle-actuating cams, of a pattern-wheel, shipping-pins controlled by the pattern-wheel and carried by a needle-cylinder, and means connected with said cams



and pressers and operated by the shipping-pin to change the stitch, as and for the purpose set forth.

4. In a circular-knitting machine, the combination with the needle-cylinders, needles, stitch-wheels, pressers adjacent to said stitch-wheels, and needle-actuating cams, of shipping-pins carried by a needle-cylinder, switching devices for adjusting said pins automatically, and means controlled by said shipping-pins to change the positions of the cams and pressers, as and for the purpose set forth.

5. In a circular-knitting machine, the combination with needle-cylinders, needles, stitch-wheels, pressers adjacent to said stitch-wheels, and needle-actuating cams, of a pattern-wheel; switches controlled by the pattern-wheel, shipping devices controlled by said switches, and a series of levers connected with said cams and another series of levers connected with said pressers and operated by the shipping devices to change the positions thereof, as and for the purpose set forth.

6. In a circular-knitting machine, the combination with the revoluble needle-cylinders, of a pattern-wheel having a series of projecting pins, means for operating said pattern-wheel, levers arranged in the paths of said pins, switch-plates connected with said levers and operated thereby, shipping-pins carried by one of the needle-cylinders operated by said switch-plates, and means controlled by the shipping-pins to change the stitch, as and for the purpose set forth.

7. In a circular-knitting machine, the combination with the revoluble needle-cylinders, needles, stitch-wheels, pressers adjacent to said stitch-wheels, and needle-actuating cams, of a pattern-wheel having a series of projecting pins, means for operating the pattern-wheel, levers arranged in the path of said pins, shipping-pins carried by a needle-cylinder, switch-plates connected with said levers and operated thereby to actuate the shipping-pins, and a series of levers supported by a stationary part and controlled by said shipping-pins and connected with the cams and pressers, as and for the purpose set forth.

8. In a circular-knitting machine, the combination with the revoluble needle-cylinders, the needles, shipping-pins carried by a needle-cylinder, means for operating the shipping-pins, and devices engaging the needles for controlling the character of stitch produced thereby, of a series of levers supported by a stationary part and arranged in pairs and projecting into the paths of said shipping-pins, pivoted levers controlled by said series of levers and mechanism connecting said pivoted levers with the needle-engaging devices, as and for the purpose set forth.

9. In a circular-knitting machine, the combination with the revoluble needle-cylinders, the needles, the needle-controlling devices embodying movable needle-actuating cams, stitch-wheels, pressers adjacent to the stitch-wheels, and presser-wheels, of a series of le-

vers supported by a stationary part and arranged in pairs adjacent to the upper needle-cylinder, mechanism operated by said pairs of levers for controlling the position of the cams, and another mechanism operated by said pairs of levers for controlling the position of the presser-wheels, shipping-pins carried by a needle-cylinder for operating the levers, a pattern-wheel, and a switch-plate controlled by said pattern-wheel and operating said shipping-pins, as described, whereby the machine may be set to knit the regular course, the royal rib, and the welt, and changed automatically from one to another, as and for the purpose set forth.

10. In a circular-knitting machine, the combination with the revoluble needle-cylinders, and the needles, of means for changing the stitch automatically, said means embodying a series of levers supported on a stationary part, means operated by said levers for controlling the action of the needle, shipping-pins on one of the cylinders for operating said levers, a pattern-wheel, means for operating the pattern-wheel, and switch-plates operated by the pattern-wheel to actuate the shipping-pins, as and for the purpose set forth.

11. In a circular-knitting machine, the combination with revoluble needle-cylinders, of means for changing the stitch automatically, embodying a pattern-wheel intermittently operated by actuating devices moved by one of the revoluble cylinders, a second pattern-wheel, actuating devices therefor connected with the actuating devices of the first pattern-wheel, means for rendering the actuating devices of the second pattern-wheel inoperative at predetermined intervals, means operated by the first pattern-wheel to restore the actuating devices of the second pattern-wheel to operative position, and mechanism controlled by the second pattern-wheel to govern the action of the needles, as and for the purpose set forth.

12. In a circular-knitting machine, the revoluble needle-cylinders, needles, a pattern-wheel 31, a pawl and ratchet for imparting motion thereto, and means controlled by said pattern-wheel to govern the action of the needles, in combination with a second pattern-wheel 21, a cam 24 movable therewith, a second pawl and ratchet for imparting motion to said wheel 21, means actuated by one of the cylinders for actuating the pawls to drive the pattern-wheels 21 and 31 independently, a pivoted lever arranged in the path of said cam, a second lever adjacent to said first-mentioned pawl adapted to lift the latter out of engagement with its ratchet, means for holding said second lever elevated at intervals, and means connecting the second lever with the first lever, whereby when the latter is moved by the cam the former will be moved out of engagement with its elevating means, as and for the purpose set forth.

13. In a circular-knitting machine, the combination with the revoluble needle-cylinders,



the needles, the needle-actuating cams, the stitch-wheels, and the pressers adjacent to said stitch-wheels, of the pattern-wheel 31, means controlled by said pattern-wheel to  
 5 determine the positions of the cams and pressers, a pattern-wheel 21, independent actuating devices for the pattern-wheels 21 and 31 operated by one of the revolving cylinders, and mechanism operated by the pattern-wheel  
 10 21 to start the actuating device for the pattern-wheel 31, as and for the purpose set forth.

14. In a circular-knitting machine, the combination with the needle-cylinders and needles, of pattern-wheels 21 and 31, mechanism  
 15 for operating said pattern-wheels consisting of pawls and ratchets, connected levers adjacent to the pattern-wheels, one of said levers being arranged so that when elevated it will raise the pawl of the pattern-wheel 31 out  
 20 of engagement with the ratchet thereof, means movable with said pattern-wheel 31 for raising the lever at determined intervals, sprocket-teeth on said pattern-wheel 21, a sprocket-chain engaging the teeth and having a cam-link to engage the other of said levers and re-  
 25 engage the raised pawl with its ratchet, and means operated by said pattern-wheel 31 to control the character of stitch produced, as and for the purpose set forth.

30 15. In a circular-knitting machine, the combination with the revoluble needle-cylinders, of the independently-movable pattern-wheels 21 and 31, a ratchet for each of said pattern-wheels, a cam 9 on one needle-cylinder, a  
 35 rock-shaft, an arm depending from one end of said rock-shaft having means to engage said cam and thereby rock said shaft once at each revolution of the needle-cylinder, an  
 40 arm depending from the other end of said rock-shaft, pawls carried by the latter arm and engaging said ratchets, means for lifting the pawl out of engagement with the ratchet of pattern-wheel 31 without affecting the pawl  
 45 for the pattern-wheel 21, means operated by said pattern-wheel 21 for reengaging said raised pawl with its ratchet, and mechanism controlled by the pattern-wheel 31 to govern the action of the needles, as and for the purpose set forth.

50 16. In a circular-knitting machine, the combination with the revoluble needle-cylinders, of the independently-movable pattern-wheels 31 and 21, ratchets 39 and 20 for the respective pattern-wheels, sprocket-teeth on pat-  
 55 tern-wheel 21, a chain engaging said sprocket-teeth and having a cam-link, a cam 9 on one needle-cylinder, a rock-shaft 12, an arm depending from one end of said rock-shaft and having means to engage the arm, an arm de-  
 60 pending from the other end of said rock-shaft and having a bearing at its lower end, a journal in said bearing, a pawl fast on one end of said journal and engaging ratchet 20, a pawl loose on the other end of said journal and en-  
 65 gaging ratchet 39, a lateral projection from the loose pawl, a journal 27, a lever on one end of the journal having its free end in the

path of said cam-link, a spring-pressed arm projecting from the other end of said journal 27, a lever 30 pivoted to the upper end of said  
 70 arm and arranged adjacent to said lateral projection, projections from the pattern-wheel 31 to lift the lever 30, and mechanism controlled by the pattern-wheel 31 to govern the action of the needles, as and for the pur-  
 75 pose set forth.

17. In a knitting-machine, means for changing the stitch automatically, said means comprising a pattern-wheel 31 having a series of  
 80 perforations, pins removably set in said perforations, a ratchet for said pattern-wheel, a pawl engaged with the ratchet, means for operating the pawl to turn the pattern-wheel, a pivoted lever in the path of said pins and in  
 85 engagement with said pawl to disengage said pawl from the ratchet at determined intervals, means operated by said pattern-wheel to control the action of the needles, a pattern-wheel 21, means for operating said wheel,  
 90 and mechanism operated by said pattern-wheel 21 to disengage the lever from said pins and thereby cause the pawl to be reengaged with the ratchet, as and for the purpose set forth.

18. In a knitting-machine, means for chang- 95  
 ing the stitch automatically consisting of a pattern-wheel 31 having a series of perforations, pins removably set in said perforations, a ratchet for said pattern-wheel, a pawl en-  
 100 gaged with said ratchet, means for operating the pawl to turn the pattern-wheel, a pivoted lever arranged in the path of the pins and in engagement with the pawl, to disengage the pawl from the ratchet at predetermined in-  
 105 tervals, means operated by said pattern-wheel to control the action of the needles, a pattern-wheel 21, means for operating the same, a cam moved by said wheel 21, a lever engaged by the cam, the journal carrying the  
 110 latter lever, and an arm to which the first-mentioned lever is pivoted, said arm being carried by the journal, as and for the purpose set forth.

19. In a knitting-machine, the combination 115  
 with the shipping-pins, and mechanism, operated thereby to control the action of the needles, of a series of pivotally-supported switch-plates, a perforated pattern-wheel hav-  
 120 ing pins removably set in its perforations, levers operated by said pins, and connections between the levers and switch-plates, as and for the purpose set forth.

20. In a knitting-machine, the combination 125  
 with the shipping-pins, and mechanism operated thereby to control the action of the needles, of a pattern-wheel having lines of projections, a series of journals adjacent to  
 130 said pattern-wheel, a series of levers on said journals arranged to be operated by the projections, a series of shafts above those just mentioned, switch-plates carried by the latter series of shafts, and arranged to actuate the shipping-pins, and a series of levers, links and arms connecting the upper and



lower series of shafts, as and for the purpose set forth.

21. In a circular-knitting machine, the combination with the rotating needle-cylinders, the needles, the needle-actuating cams, the stitch-wheels, the pressers adjacent to the stitch-wheels, and, of the shipping-pins carried by the upper needle-cylinder, mechanism operated by the shipping-pins to control the positions of the cams and pressers, the pivotally-supported switch-plates to actuate the shipping-pins, and a pattern-wheel to operate mechanism to move the switch-plates, as and for the purpose set forth.

22. In a knitting-machine, the combination with the switch-plates, and means for operating the same, of a series of pairs of shipping-pins, the upper shipping-pin of each pair being arranged to be operated by the switch-plates to actuate the lower shipping-pin of each pair, and mechanism operated by said lower shipping-pins to control the action of the needles, as and for the purpose set forth.

23. In a circular-knitting machine, the combination with the revoluble needle-cylinders, the relatively stationary switch-plates, and means for operating said switch-plates, of a stand carried by the upper needle-cylinder, a series of slides in said stand, said slides having depressions in their inner surfaces, springs at the rear of the slides, pins supported by said springs for engaging said depressions, shipping-pins projecting from the outer surface of said slides, the upper series of pins being arranged to engage the switch-plates to actuate the lower series of pins and means operated by said lower series of pins to control the action of the needles, as and for the purpose set forth.

24. In a circular-knitting machine, the combination with a revoluble needle-cylinder and needles, of a movable needle-actuating cam, a lever operatively connected with the cam, and a pair of pivoted levers on a stationary part to control the first lever, and means carried by the cylinder to actuate said pair of levers, as and for the purpose set forth.

25. In a circular-knitting machine, the combination with the revoluble needle-cylinder, the shipping-pins carried thereon, means for operating the shipping-pins, and a movable cam supported on a stationary part, of a pair of pivoted levers operated by the shipping-pins, and a lever controlled by said pair of levers and operatively connected with said movable cam, as and for the purpose set forth.

26. In a circular-knitting machine, the combination with a movable cam, the revoluble needle-cylinders and the needles, of a link carrying said cam, an angle-lever one arm of which is connected with said link, a pivoted lever engaged with the other arm of said angle-lever, and means actuated by one of the cylinders for operating the pivoted lever, as and for the purpose set forth.

27. In a circular-knitting machine, the com-

bination with a movable cam, the needle-cylinders, and the revoluble needles, of a link carrying said cam, an angle-lever one arm of which is connected with said link, a pivoted lever engaged with the other arm of said angle-lever and having a projection, a lever to engage said projection, and means carried by one of the cylinders for operating the latter lever, as and for the purpose set forth.

28. In a circular-knitting machine, the combination with a movable cam, the needle-cylinders and needles, of a link carrying said cam, an angle-lever one end of which is connected with the link, a pivoted lever engaged with the other arm of the angle-lever, the pivoted lever having a projection, a pair of levers connected to move in unison and one of which engages the projection, a movable shipping-pin carried by the needle-cylinder for operating said pair of levers, and means for moving said shipping-pin automatically, as and for the purpose set forth.

29. In a circular-knitting machine, the combination with the revoluble needle-cylinder, a pattern-wheel, connections between the needle-cylinder and the pattern-wheel whereby the latter is operated by the former, the needles, and a movable cam to engage the needles, of a switch-plate controlled by said pattern-wheel, shipping-pins carried by the needle-cylinder and actuated automatically by the switch-plates, a pair of levers supported on a stationary part and arranged to be operated by said shipping-pins, and mechanism operated by said levers and connected with the cam, as and for the purpose set forth.

30. In a knitting-machine the combination with the revoluble needle-cylinders and needles, and means for controlling the action of the needles consisting of cams 101 and 115, of mechanism for automatically raising and lowering the cams embodying a pair of levers, means connecting said levers on a stationary part with one of the cams, a second pair of levers on a stationary part, means connecting the same with other of said cams, and mechanism carried by one of the cylinders for operating said levers, as and for the purpose set forth.

31. In a knitting-machine, the combination with the revoluble needle-cylinders and needles, and means for controlling the action of said needles, said means embodying movable cams 101 and 115, and mechanism for automatically raising and lowering the cams to change the stitch, said mechanism including a pair of levers on a stationary part, means connecting said levers with one of the cams, a second pair of levers and means for connecting them with the other of said cams, shipping-pins carried by the upper cylinder to operate said levers, and means for raising and lowering the shipping-pins, as and for the purpose set forth.

32. In a knitting-machine, the combination with the revoluble needle-cylinders, the nee-



dles and means for controlling their action, said means embodying movable cams 101 and 115, and mechanism for automatically raising and lowering said cams to change the stitch, 5 a pair of levers on a stationary part, means connecting the levers with one of said cams, a second pair of levers and means for connecting the same with the other of said cams, shipping-pins carried by the upper cylinder 10 to operate said levers, a switch-plate for raising and lowering the shipping-pins, a pattern-wheel and means operated by said pattern-wheel for changing the position of the switch-plate, as and for the purpose set forth.

15 33. In a knitting-machine, the combination with the needle-cylinders and needles, and means for controlling the action of the needles consisting of movable cams 101 and 115, and means for automatically raising and lowering the cams, consisting of a pair of connected levers 85 and 87, a lever 93 having a projection to engage the end of the lever 87, an angle-lever, one arm of which is engaged by the lever 93, a link connecting the other 20 arm of the angle-lever with the cam 101, a second pair of connected levers 104 and 105, a lever 107 having a projection to engage the end of lever 104, an angle-lever one arm of which is engaged by the end of lever 107, a 30 link connecting the other arm of said angle-lever with cam 115, and means for operating said levers 85 87, 104 and 105, as and for the purpose set forth.

34. In a knitting-machine, the combination 35 with the revoluble needle-cylinders and needles, and cams 101 and 115 for controlling the action of the needles, of means for automatically raising and lowering the cams consisting of a pair of connected levers 85 and 87, a 40 lever 93 having a projection to engage the end of lever 87, an angle-lever one arm of which is engaged by lever 93, a link connecting the other arm of said angle-lever with cam 101, a second pair of connected levers 45 104 and 105, a lever 107 having a projection to engage the end of lever 104, an angle-lever one end of which is engaged by the end of lever 107, a link connecting the other arm of said angle-lever with cam 115, shipping-pins 50 carried by the upper cylinder for operating levers 85, 87, 104 and 105, a switch-plate for raising and lowering the shipping-pins, and a pattern-wheel controlling the action of the switch-plate, as and for the purpose set forth.

55 35. In a knitting-machine, the combination with a movable cam 115, the needle-cylinders and needles, of a pair of pivoted levers operatively connected with said cam, a supplemental lever connected with said pair, a device 60 to engage said pair of levers, and a separate device to engage the supplemental lever, as and for the purpose set forth.

36. In a knitting-machine, the combination 65 with a movable cam 115, the revoluble needle-cylinders and needles, of a pair of pivoted levers, connections between said levers and the cam, a supplemental lever connected with

the pivoted levers, and independently-adjustable shipping-pins carried by the needle-cylinder for operating said levers, as and for the 70 purpose set forth.

37. In a knitting-machine, the combination with a movable cam 115, the revoluble needle-cylinders and needles, and a pivoted lever operating said cam, of a pair of levers 75 connected and arranged to operate said pivoted lever, a supplemental lever connected with said pair of levers, a movable shipping-pin to engage said pair of levers, an independent movable shipping-pin to engage the 80 supplemental lever, the shipping-pin being carried by one of the needle-cylinders, switch-plates for moving the shipping-pins, and a pattern-wheel controlling the switch-plates, as and for the purpose set forth. 85

38. In a knitting-machine, the combination with the needle-cylinders and needles, and cams 101 and 115 for controlling the action of the needles, of means for automatically throwing the cams into and out of action 90 consisting of a pair of levers, means connecting the same with one of the cams, a second pair of levers and means connecting them with the other of said cams, a common means for shifting said levers, a supplemental lever 95 operatively connected with one of said pairs of levers, and means independent of said shifting means, for operating the supplemental lever, as and for the purpose set forth.

39. In a knitting-machine, the combination 100 with a revoluble needle-cylinder and needles, and cams 101 and 115 for controlling the action of the needles, of means for automatically throwing the cams into and out of action consisting of a pair of levers, connections be- 105 tween the levers and one of the cams, a second pair of levers and connections between the same and the other of said cams, a shipping-pin carried by the needle-cylinder and operating successively upon one lever of each 110 pair to throw the respective cams into action and upon the other lever of each pair to throw the cams out of action, a supplemental lever connected with one pair of levers, and a shipping-pin operating said supplemental lever 115 to move one cam without affecting the position of the other cam, as and for the purpose set forth.

40. In a knitting-machine, the combination with the needle-cylinders and needles and 120 means for controlling the action of the needles, comprising a stitch-wheel and a device for pressing the needles into said stitch-wheel, of means operatively connected with said pressing device, and mechanism for operat- 125 ing said means, to force the presser away from the stitch-wheel, inward into the stitch-wheel and farther into the same, as and for the purpose set forth.

41. In a knitting-machine, the combination 130 with the needle-cylinders and needles, and means for controlling the action of the needles consisting of a stitch-wheel and a presser adjacent thereto, of a movable standard, con-



nections between said standard and presser, and means for moving said standard to different parts to adjust said presser relatively to the stitch-wheel, as and for the purpose set forth.

42. In a knitting-machine, the combination with the needle-cylinders and needles, and means for controlling the action of the needles embodying a stitch-wheel and a pressing device adjacent thereto, of a movable standard for controlling the position of the pressing device relatively to the stitch-wheel and means for operating the standard to cause the needles to be pressed considerably into the stitch-wheel, a less distance thereinto or away from the same, as and for the purpose set forth.

43. In a knitting-machine, the combination with the needle-cylinder and needles, and means for controlling the action of the needles, embodying a stitch-wheel and a presser adjacent thereto, of a movable standard, connections between said standard and presser, a spring connected with the standard, and means for forcing the standard forward against the action of the spring, as and for the purpose set forth.

44. In a knitting-machine, the combination with the needle-cylinders and needles, and means for controlling the action of the needles, comprising a stitch-wheel and a presser adjacent thereto, of a movable standard, connections between the standard and presser, a spring connected with the standard, a lever for forcing the standard against the action of the spring, and means for releasing the lever from the standard, as and for the purpose set forth.

45. In a knitting-machine, the combination with the needle-cylinders and needles, and means for controlling the action of the needles, consisting of a stitch-wheel and a presser adjacent thereto, of a movable standard connected with said presser, a spring connected with said standard, levers for pressing said standard forward against the spring to different points, and means for operating the levers automatically, as and for the purpose set forth.

46. In a knitting-machine, the combination with the needle-cylinders and needles, means for controlling the action of the needles comprising a stitch-wheel and a device for pressing the needles into the stitch-wheel, of shipping-pins and means connected with the pressing device and operated by said shipping-pins to control the action of the pressing device on the needles, as and for the purpose set forth.

47. In a knitting-machine, the combination with the stitch-wheel and the presser adjacent thereto, of a double pair of levers, means for operating the levers, a movable standard with adjustable screws projecting therefrom into position to be operated on by said levers, and means connecting the standard with the presser, as and for the purpose set forth.

48. In a knitting-machine, the combination with the needle-cylinders and needles, and means for controlling the action of the needles, embodying a stitch-wheel and a pressing device adjacent thereto, of a movable standard controlling the position of the said pressing device, said standard having projections extending inwardly therefrom, two pairs of levers, one lever of one pair being arranged to engage one of said projections to move the standard a certain degree and one lever of the other pair being arranged to engage the other projection and move said standard a further extent, and shipping-pins for operating said levers, as and for the purpose set forth.

49. In a knitting-machine, the combination with the stitch-wheel and the presser adjacent thereto, of a standard, a double pair of levers operated to force the standard forward different extents, a swinging arm carrying the standard, a sliding arm connected with the swinging arm, a spring for holding said parts against the action of the levers, and means connected with the sliding arm for supporting the presser, as and for the purpose set forth.

50. In a knitting-machine, the combination with the needle-cylinders and needles, and means for controlling the action of the needles embodying a stitch-wheel and a presser adjacent thereto, of a swinging arm, a standard carried thereby, means for forcing said standard forward, a sliding arm forced forward by the movement of said standard, a spring for returning said sliding arm and standard to rearward position, and means connected with said sliding arm for supporting the presser, as and for the purpose set forth.

51. In a knitting-machine, the combination with the needle-cylinders and needles, of a stitch-wheel, a spring-actuated sliding arm having a depending end, means to move said arm against the force of the spring, an adjusting-slide in said end, a presser pivotally connected with said slide, and a screw for adjusting said presser in its pivot, as and for the purpose set forth.

52. In a knitting-machine, the combination of the stitch-wheel, a pivoted presser adjacent thereto, means for adjusting said presser on its pivot, a slide carrying said presser and adjusted to raise and lower the same, and mechanism for automatically carrying the presser into and away from the stitch-wheel, as and for the purpose set forth.

53. In a knitting-machine, the combination with the needle-cylinders and needles, and means for controlling the action of the needles, consisting of a stitch-wheel and pressers adjacent thereto, of a swinging arm having a depending end, an adjusting-screw extending through the end and working against a relatively-fixed part of the machine, a sliding arm having an upwardly-extending end, an adjusting-screw extending through said



end against the depending end of the swinging arm, connections between the sliding arm and presser, and means for operating said swinging arm, as and for the purpose set forth.

54. In a knitting-machine, the combination with the stitch-wheel and the presser adjacent thereto, of a swinging arm, a sliding arm operated by said swinging arm, means for operating the swinging arm, and connections between the sliding arm and presser, as and for the purpose set forth.

55. In a knitting-machine, the combination with the stitch-wheel, and the presser adjacent thereto, of a swinging arm, a sliding arm operated by the swinging arm, means for adjusting the sliding arm relatively to the swinging arm, means for operating the swinging arm, and connections between the sliding arm and presser, as and for the purpose set forth.

56. In a knitting-machine, the combination with the needle-cylinders and needles, a ring-plate and means for controlling the action of the needles consisting of a stitch-wheel and device for pressing the needles into the stitch-wheel, of a swinging arm pivoted to the ring-plate and having a depending end, an adjustable screw extending through said end and engaging the ring-plate, a bracket attached to the under side of the ring-plate, a sliding arm in said bracket having an upwardly-extending end, an adjustable screw extending through said end and engaging the depending end of the swinging arm, a retaining-plate in the bracket having a slot, a pin extending through said slot from the sliding arm, a spring attached to said pin and retaining-plate, an arm projecting downward from said sliding arm and having a groove, an adjusting-slide in the groove, the presser pivotally attached to said slide, an adjusting-screw for the presser, a vertical standard carried by the swinging arm, two adjustable screws projecting from said standard, two pairs of connected levers, one lever of each pair being designed to engage one of the latter screws, and means for operating said levers, as and for the purpose set forth.

57. In a circular-knitting machine, the combination with the needle-cylinders and needles, the stitch-wheels, and the shipping-pins, of movable cams, means operated by said shipping-pins to control the positions of the cams, devices for pressing the needles into the stitch-wheels, and means operated by the shipping-pins to adjust the needle-pressing devices so as to crowd the needles into the stitch-wheel an extent sufficient for knitting the regular course and farther inward to knit the loose course, and away from the stitch-wheel in knitting the welt, as and for the purpose set forth.

58. In a circular-knitting machine, the combination of the needle-cylinders and needles, the stitch-wheels, and the devices for pressing the needles into the stitch-wheels, of movable cams, levers operatively connected with

said cams, means connected with the needle-pressing devices constructed to press the needles a regular extent or farther into the stitch-wheels, and means for controlling the position of said cams and pressing devices, as and for the purpose set forth.

59. In a circular-knitting machine, the combination with the needle-cylinders and needles, movable cams, the stitch-wheels and devices for pressing the needles into the stitch-wheels, of a series of levers connected with the cams, levers operating the needle-pressing devices to cause the same to press the needles a regular extent or farther inward into said stitch-wheels for knitting the regular and loose courses, and means for operating said cams and pressing devices, as and for the purpose set forth.

60. In a circular-knitting machine, the combination with the revoluble needle-cylinders and needles, shipping-pins carried by one of the needle-cylinders, and means for operating the shipping-pins, of devices for engaging the needles to control the character of stitch produced thereby, a series of separate levers each operatively connected with a needle-engaging device, and means arranged in the path of said shipping-pins for operating the series of levers, as and for the purpose set forth.

61. In a circular-knitting machine, the combination with the revoluble needle-cylinders and needles, the independently-adjustable shipping-pins carried by one of the needle-cylinders, and means for operating the shipping-pins, of devices engaging the needles to control the character of stitch produced, a series of separate levers each operatively connected with the needle-engaging device and having a projection, and the series of pairs of levers each arranged in the path of a shipping-pin, and one lever of each pair engaging one of said projections, as and for the purpose set forth.

62. In a knitting-machine, the combination with the revoluble needle-cylinders and needles, and the presser-wheel to engage the needle-beards, of shipping devices carried by one of the needle-cylinders, and means operatively connected with the presser-wheel and operated by the shipping devices to withdraw the presser-wheel from the needle-beards automatically, as and for the purpose set forth.

63. In a knitting-machine, the combination with the revoluble needle-cylinders and needles and the presser-wheel to engage the needle-beards, of shipping devices carried by a needle-cylinder, a shaft having a crank-arm, connections between said shaft and presser-wheel, and means arranged in the paths of said shipping devices to engage the crank-arm in the manner and for the purpose set forth.

64. In a knitting-machine, the combination with the revoluble needle-cylinders and needles, and the presser-wheel to engage the needle-beards, of shipping-pins carried by a needle-cylinder, switch-plates to adjust the shipping-pins automatically, a pattern-wheel con-



trolling the action of the switch-plates, levers arranged to be operated by the shipping-pins, and connections between the levers and presser-wheel, as and for the purpose set forth.

65. In a knitting-machine, the combination with the revoluble needle-cylinders and needles, a presser-wheel to engage the needle-beards, and a support for said presser-wheel, of a pattern-wheel, switch-plates controlled by said pattern-wheel, shipping-pins carried by one of the needle-cylinders and adjusted by switch-plates, a shaft having its lower end operated in connection with the support of the presser-wheel and projections at its upper end, and levers arranged to engage said projections and to be operated by said shipping-pins, as and for the purpose set forth.

66. In a knitting-machine, the combination of the shaft having a crank-arm, a lever to engage the crank-arm and turn the shaft, means for operating said lever automatically, a foot-piece projecting from the lower end of the shaft, the bracket 179, the journal 183, a bar 180 extending from said journal into position to be engaged by said foot-piece, and the presser-wheel connected with said journal, as and for the purpose set forth.

67. In a knitting-machine, the combination with the revoluble needle-cylinders and needles, and a presser-wheel to engage the needle-beards, of two pairs of levers, devices carried by a needle-cylinder for operating said levers, a shaft having crank-arms, pins projecting from said crank-arms into position to be operated on by said levers, and means operated by said shaft for moving said presser-wheel, as and for the purpose set forth.

68. In a knitting-machine, the combination with the needle-cylinders and needles, the presser-wheel for engaging the needle-beards, the pivoted bracket 179, the journal supporting said presser-wheel, the bar projecting from said journal, the spring 181, of a shaft 173, crank-arms projecting from the upper end thereof, pins projecting from said crank-arms, a foot-piece projecting from the lower end of said shaft into operative relationship with said bar, the double pairs of levers arranged to engage said pins, and devices to engage said levers, as and for the purpose set forth.

69. In a knitting-machine, the combination with the revoluble needle-cylinders, and needles, the presser-wheel for engaging the needle-beards, the pivoted bracket 179, the journal 183, the bar 180 projecting from said journal, and the spring 181, of a pattern-wheel, switch-plates controlled thereby, shipping-pins carried by one of the cylinders operated by the switch-plates, two pairs of levers on a stationary part operated by the shipping-pins, a shaft, crank-arms projecting from the upper end of the shaft, pins projecting from said crank-arms into position to be engaged by said levers, and a foot-piece projecting from

the lower end of the shaft into operation with said bar 180, as and for the purpose set forth.

70. In a knitting-machine, the combination with the stationary cam 201, a relatively-movable cam 203, the revoluble needle-cylinders, shipping devices carried by a needle-cylinder, a lever in the path of said shipping devices, and means connecting said lever with the movable cam, as and for the purpose set forth.

71. In a knitting-machine, the combination with a revoluble needle-cylinder, shipping devices carried thereby, switch-plates for operating the shipping devices, a pattern-wheel for controlling the action of the shipping devices, and a lever arranged in the path of said shipping devices to be operated thereby, of a stationary cam, a movable cam, and mechanism operated by said lever to control the position of said movable cam, as and for the purpose set forth.

72. In a knitting-machine, the combination with the revoluble needle-cylinders and shipping devices carried by one of the cylinders, of a lever arranged to be operated by the shipping devices, a lug projecting from said lever, a crank-arm having a rearwardly-extending part engaging said lug, a stationary cam, a movable cam, and means connecting said crank-arm with the movable cam, as and for the purpose set forth.

73. In a knitting-machine, the combination with the revoluble needle-cylinder, the shipping devices carried by one of the cylinders, and lever arranged to be operated by the shipping devices and having a lug, of a stationary cam, a movable cam, a link carrying the movable cam, a pivoted actuating-bar, a crank-arm, a rod connecting one member of said crank-arm with the adjusting-bar, and an arm extending rearward from the other member of the crank-arm into position to engage the lug, as and for the purpose set forth.

74. In a knitting-machine, the combination with the revoluble needle-cylinders, shipping devices carried by one of the cylinders, and a lever arranged to be operated by said shipping devices, and having a lug, a crank-arm, an arm extending inward from the other end of said crank-arm, an adjustable screw projecting from said inwardly-extending arm into engagement with the lug, an adjustable screw projecting from one member of said crank-arm into engagement with a fixed part of the frame, a stationary cam, a movable cam, and means connecting said movable cam with the crank-arm, as and for the purpose set forth.

75. In a knitting-machine, the combination with the revoluble needle-cylinders, a presser-wheel, a stationary cam, and a movable cam, of shipping devices, levers arranged in the path of said shipping devices, means operated by said levers for forcing the presser away from the needle-beards, and mechanism operated by said levers for adjusting the movable cam, as and for the purpose set forth.



76. In a knitting-machine, the combination  
with the needle-cylinders, a presser-wheel, a  
stationary cam, a movable cam, of two pairs  
of levers, a shaft having projecting parts ar-  
5 ranged to engage one lever of each pair, means  
connecting said shaft with the presser-wheel,  
to remove it from the needles, a lug project-  
ing from one of said levers, a crank-arm ar-  
ranged to operate on said lug, and means con-

necting said crank-arm with the movable cam, 10  
and means for actuating the levers, as and for  
the purpose set forth.

In testimony whereof I affix my signature  
in presence of two witnesses.

DANIEL HURLEY.

Witnesses:

CHARLES S. KEHOE,  
JAMES HAYES.