

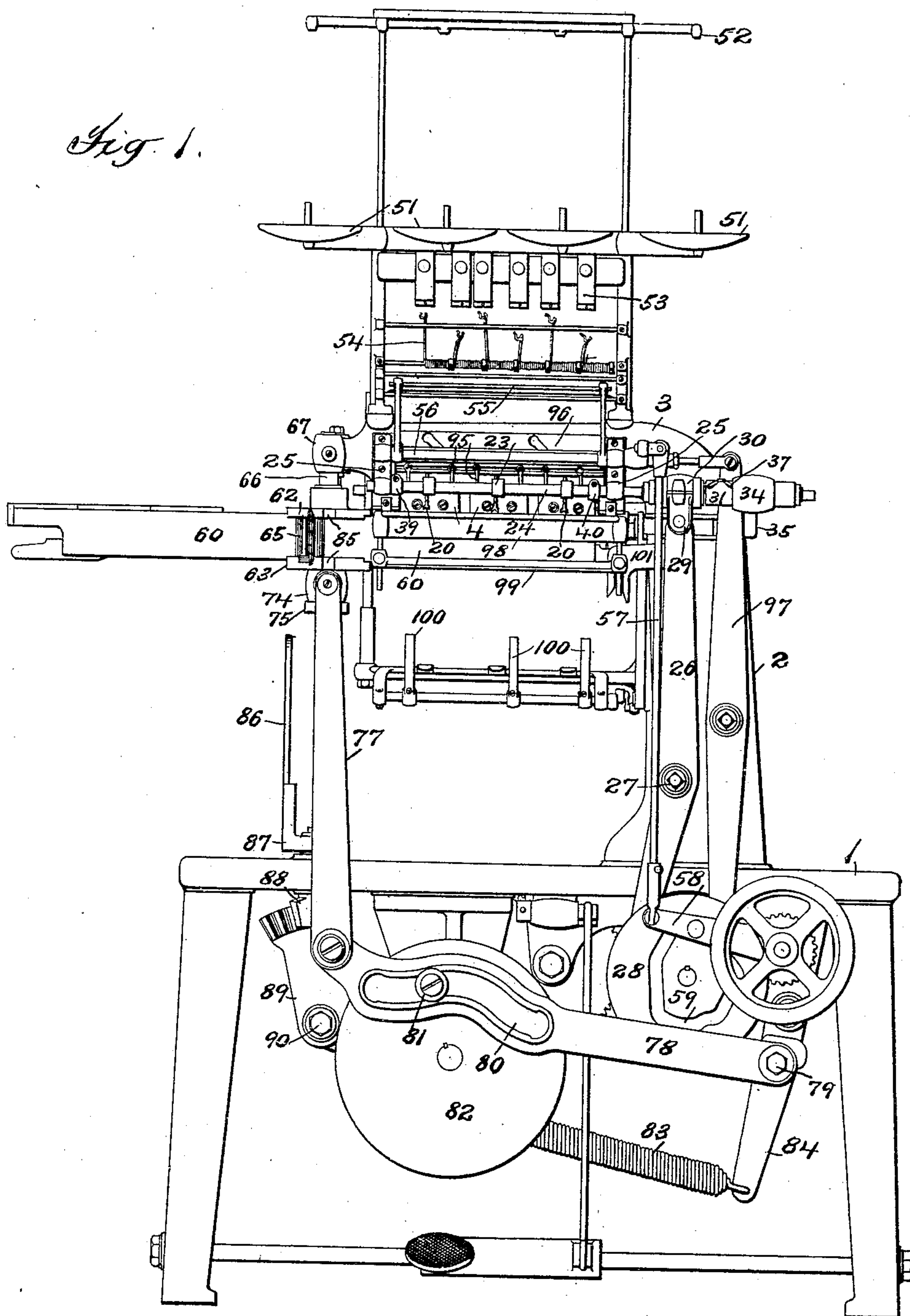
930,229.

J. R. REYNOLDS.
BOOK SEWING MACHINE.
APPLICATION FILED FEB. 27, 1905.

Patented Aug. 3, 1909.

5 SHEETS—SHEET 1.

Fig. 1.



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6 SHEETS—SHEET 2.

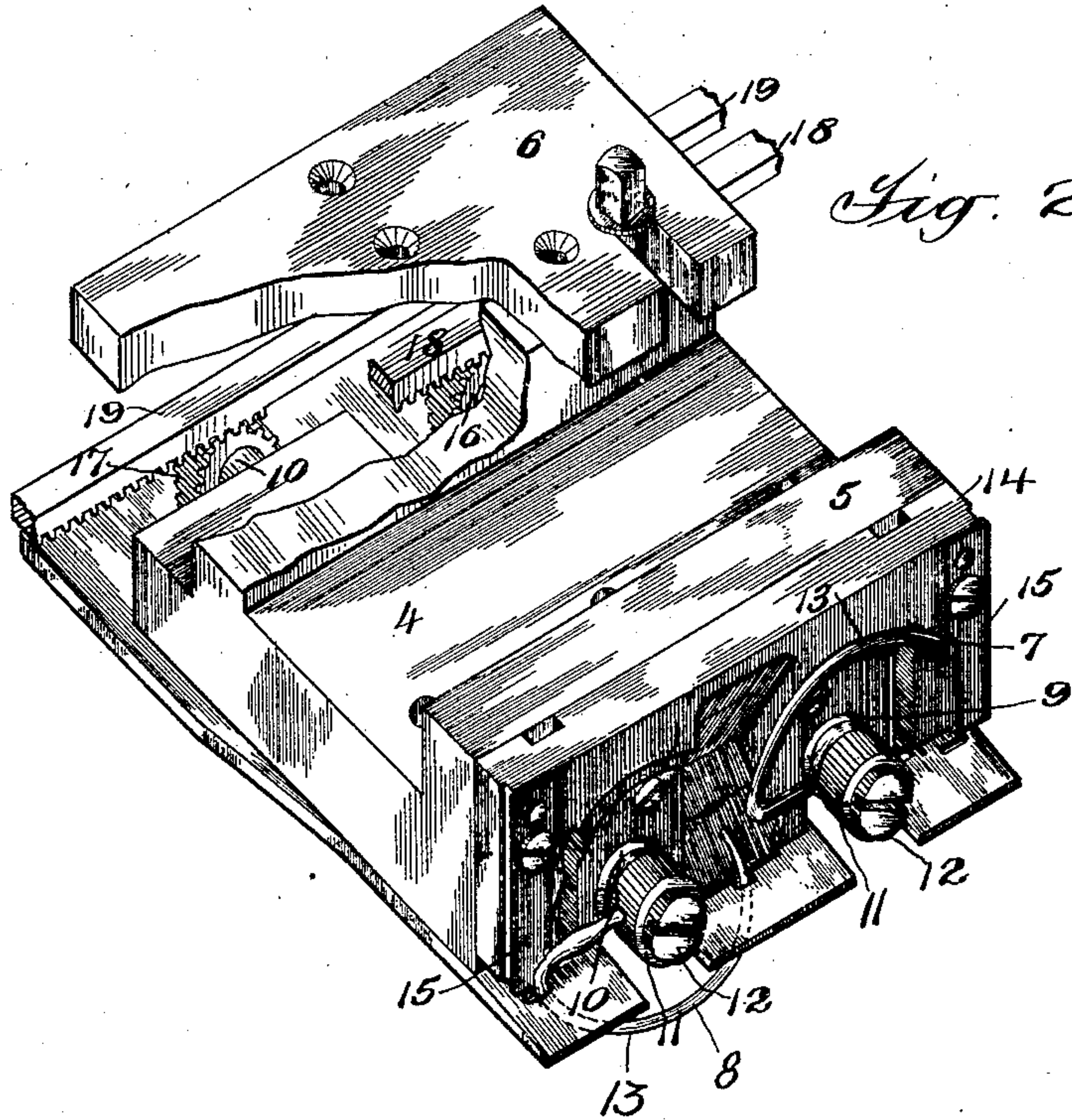


Fig. 2.

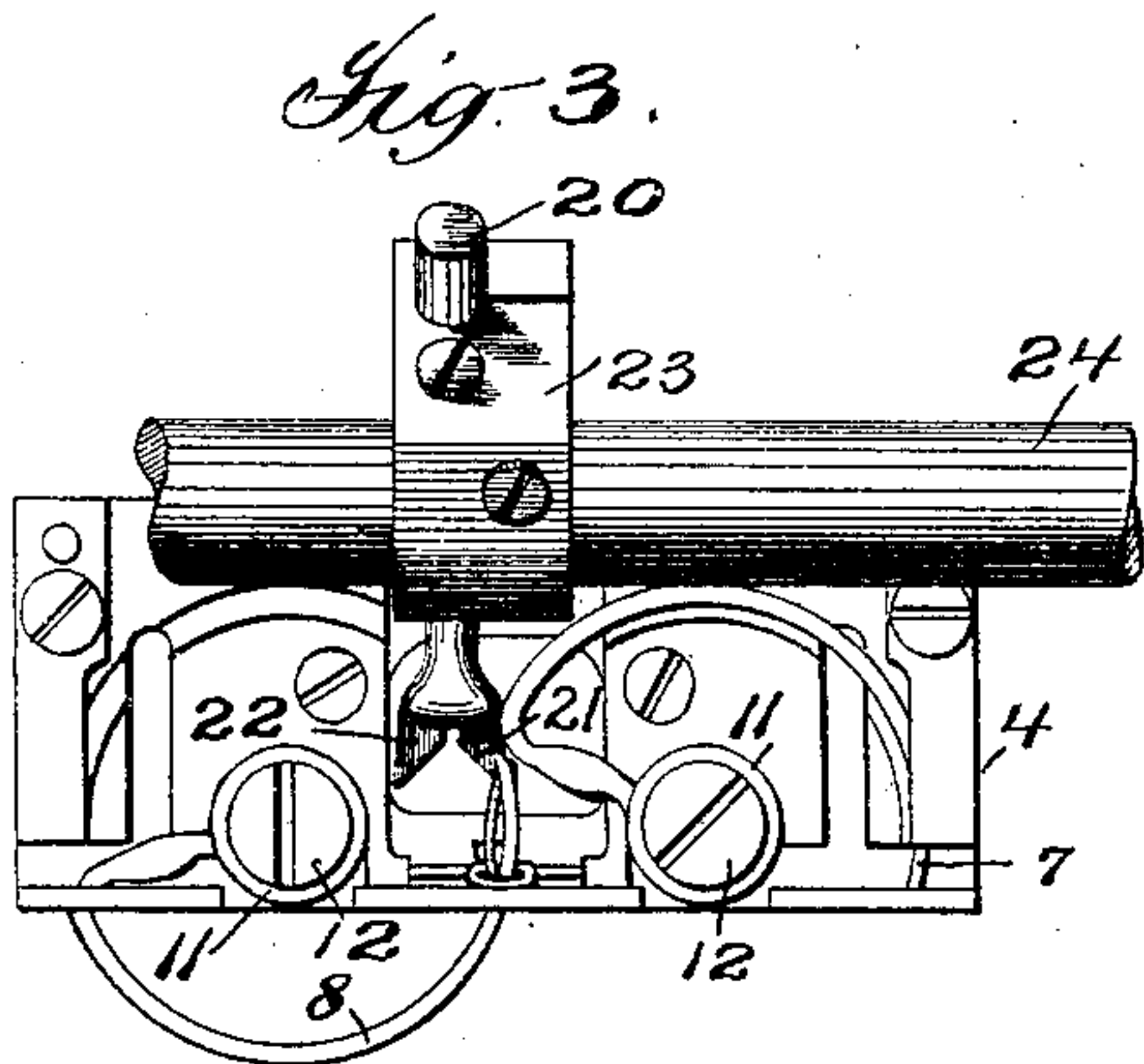


Fig. 3.

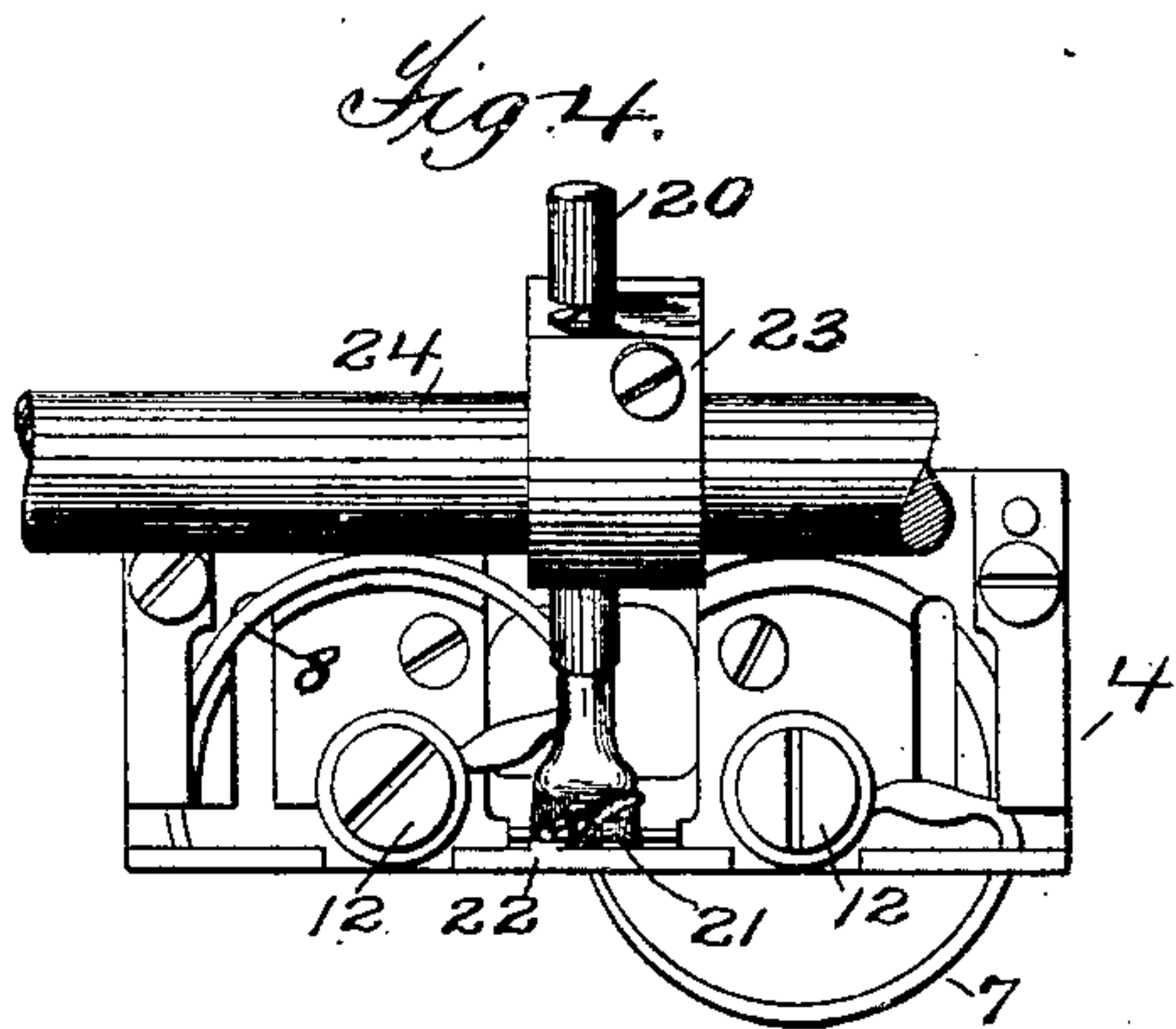
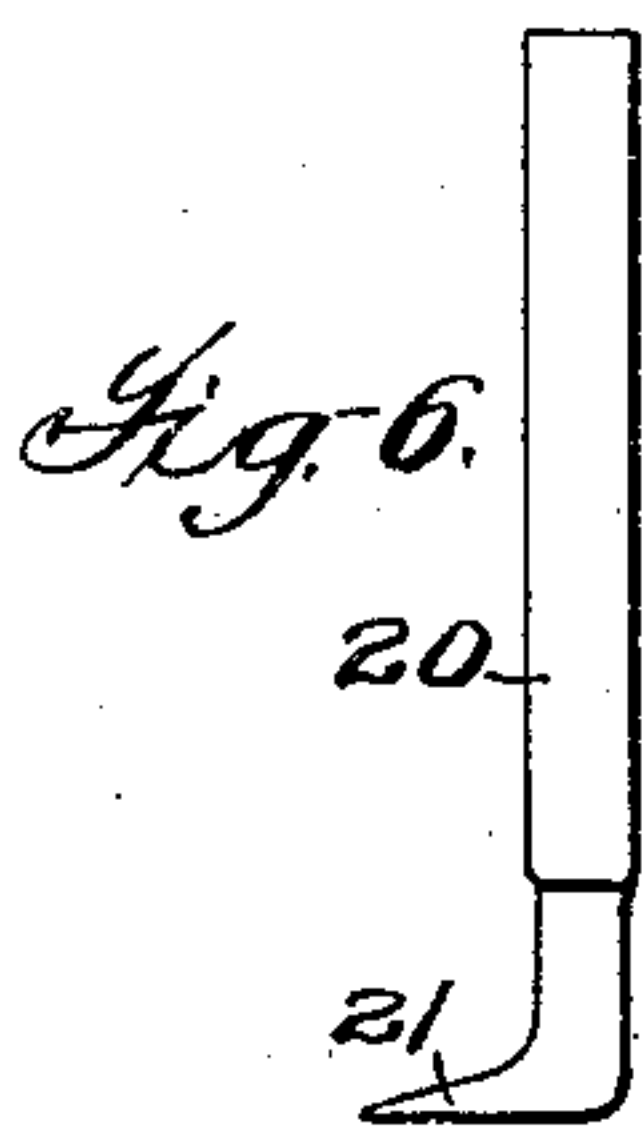


Fig. 4.



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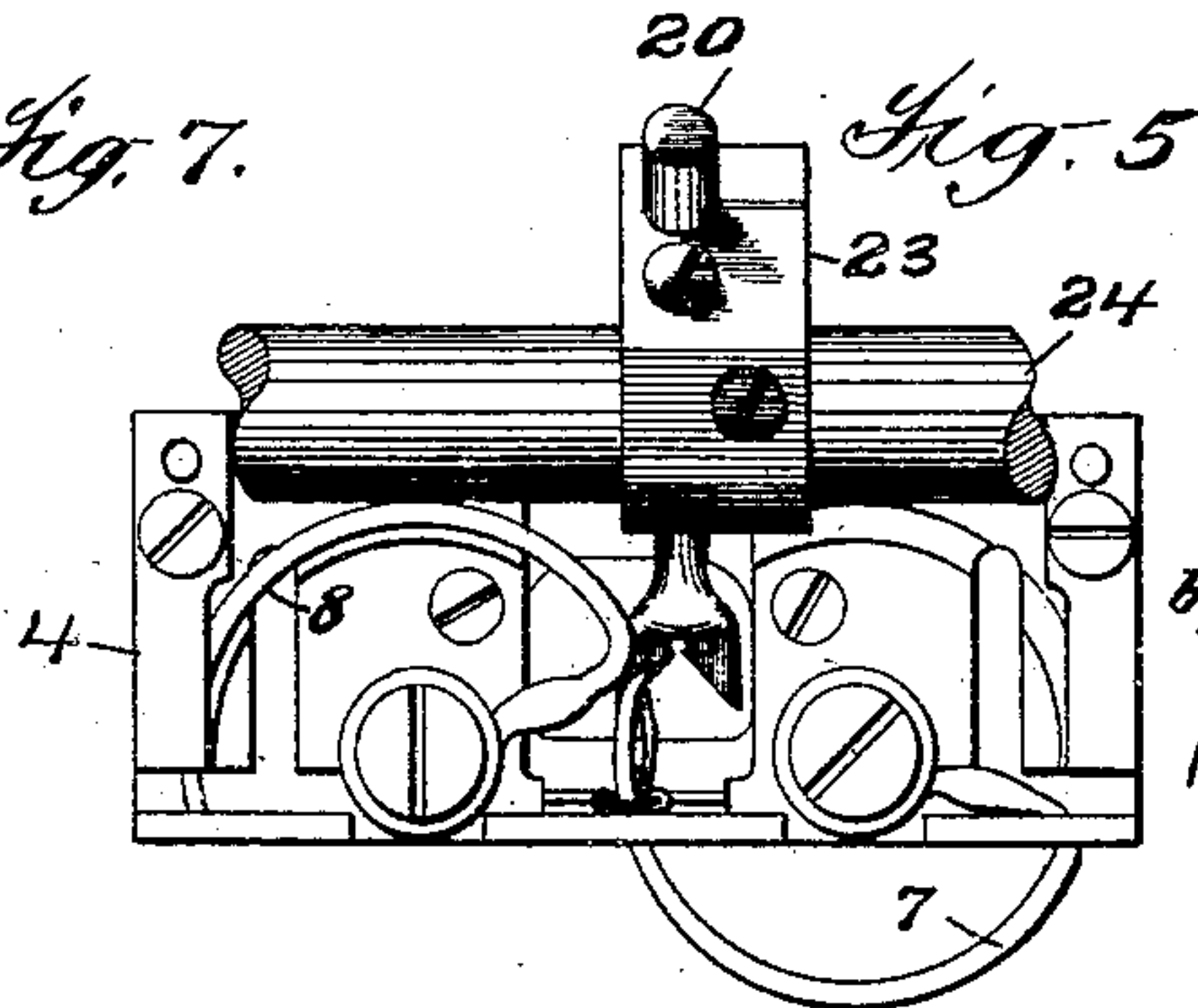


Fig. 5.

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Fig. 8.

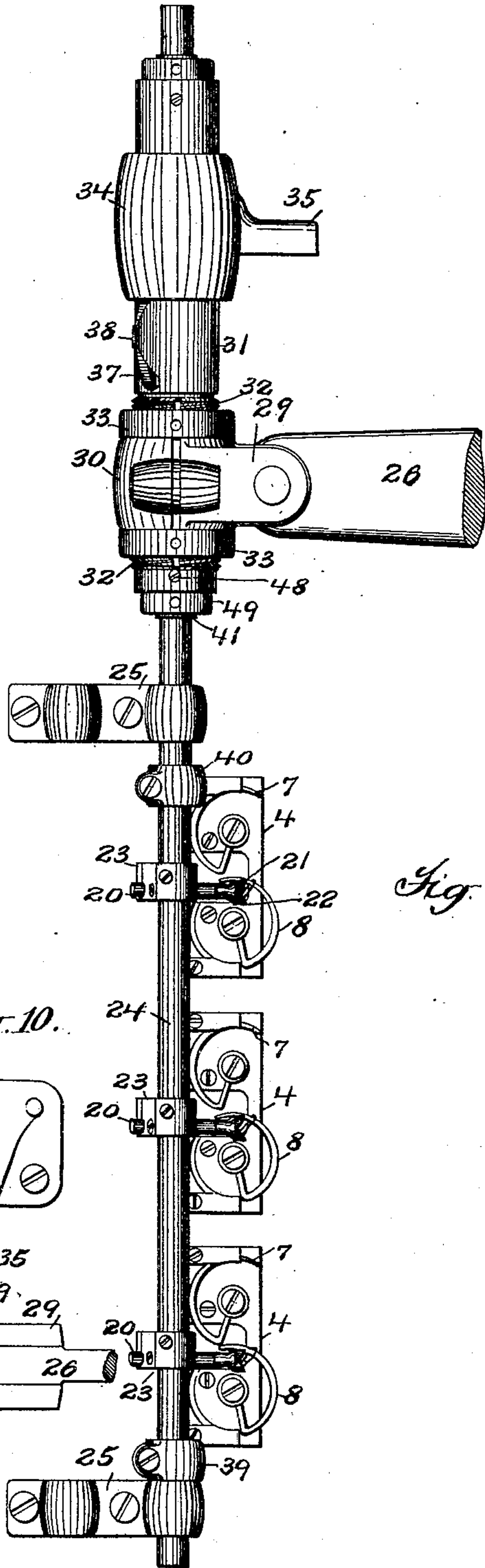


Fig. 10.

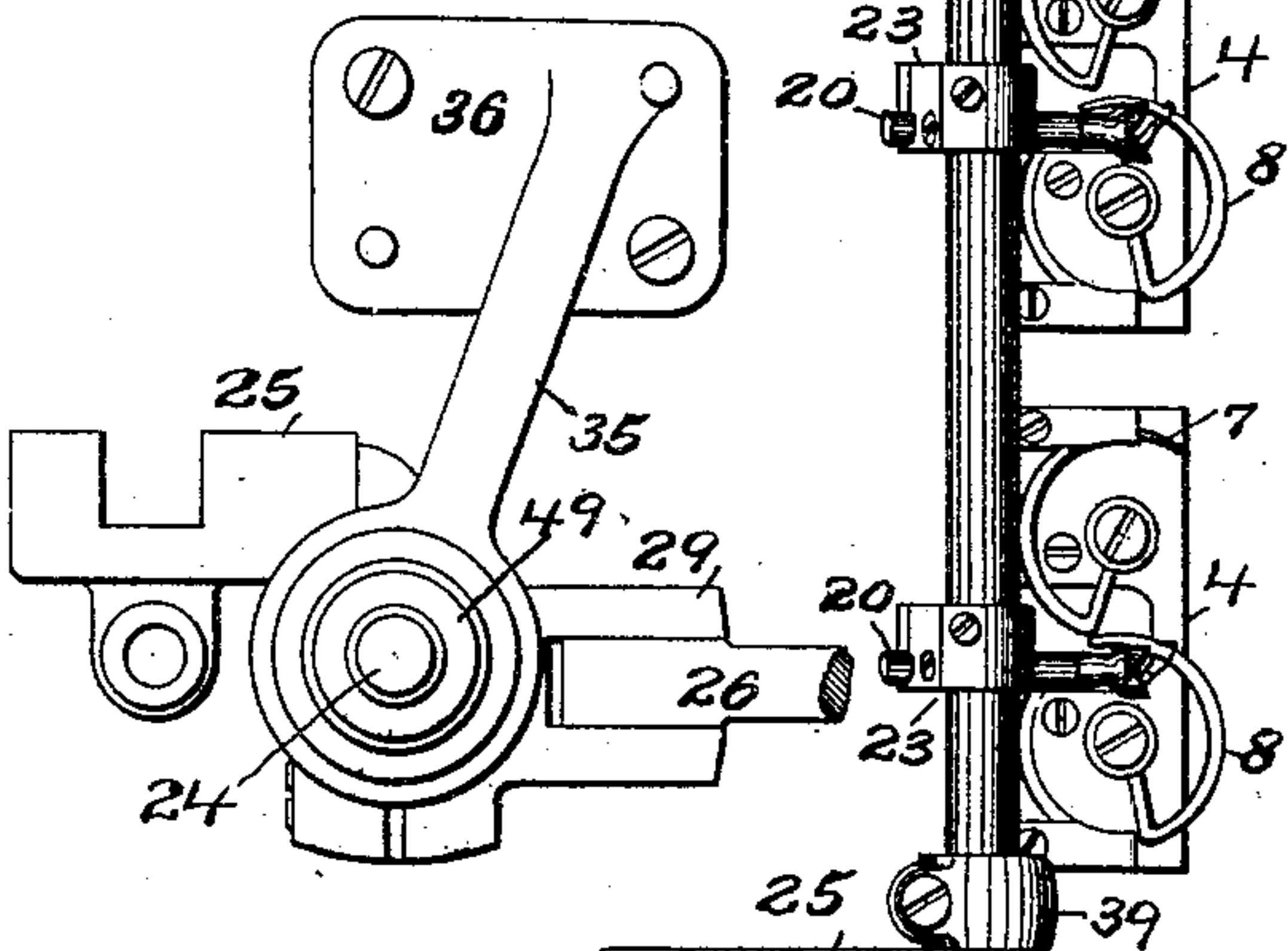
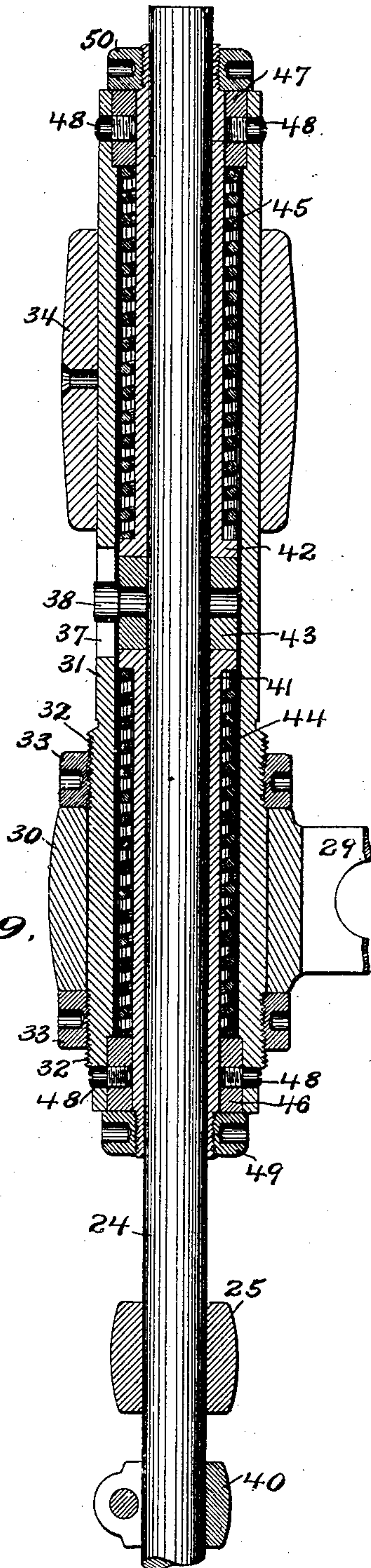


Fig. 9.



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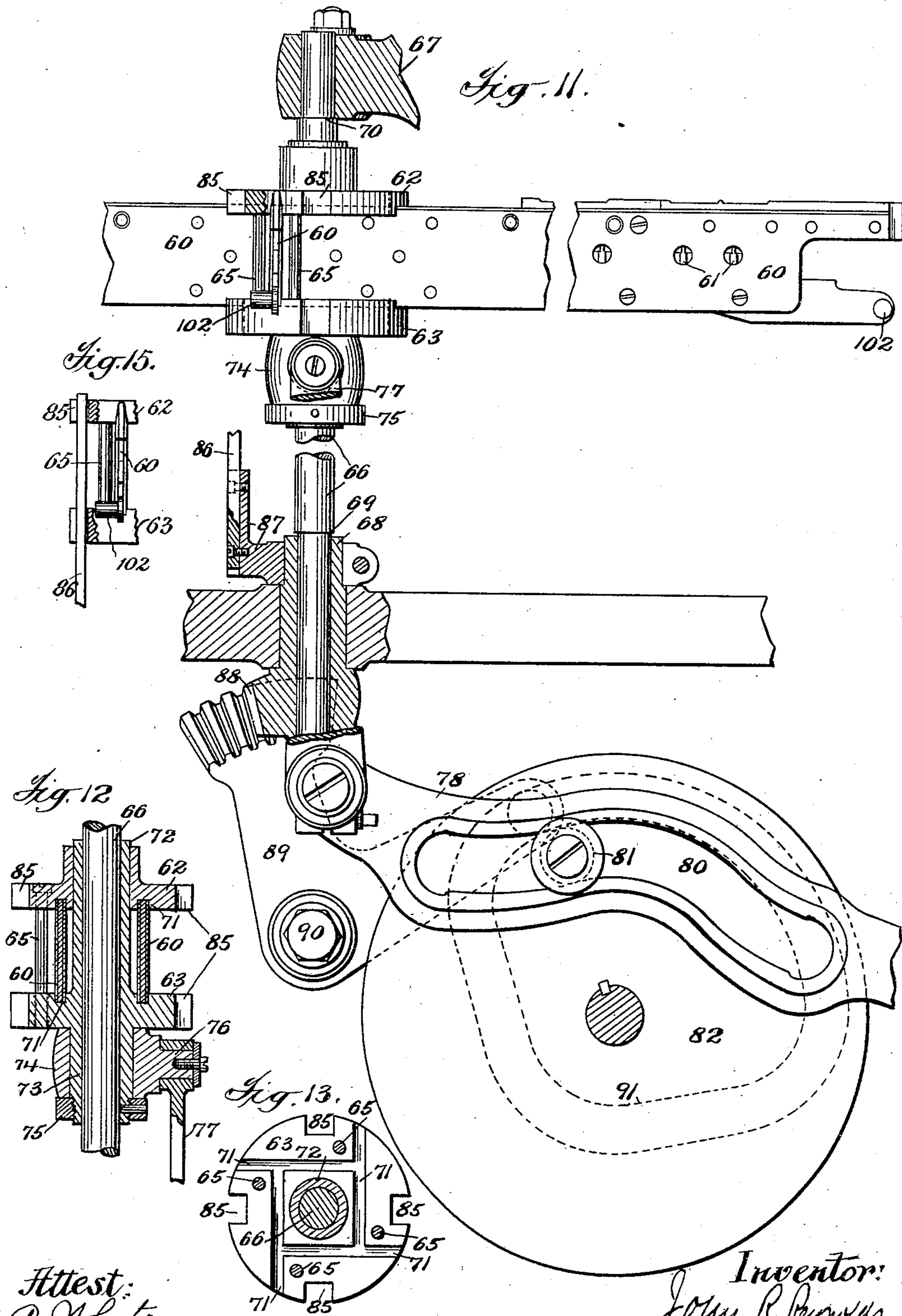
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BOOK SEWING MACHINE.
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5 SHEETS—SHEET 4.



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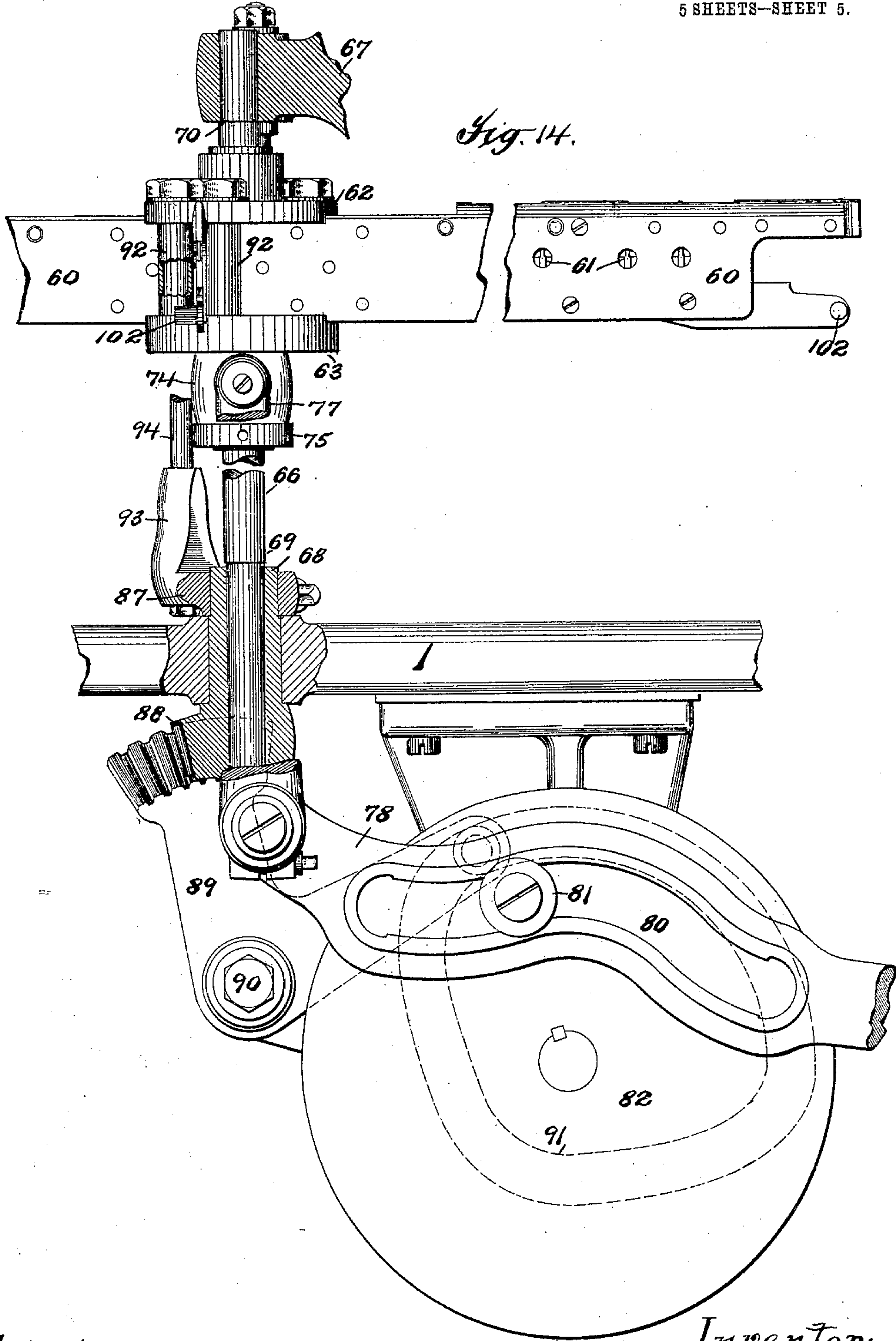
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5 SHEETS—SHEET 5.

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UNITED STATES PATENT OFFICE.

JOHN R. REYNOLDS, OF HARTFORD, CONNECTICUT, ASSIGNOR TO THE SMYTH MANUFACTURING COMPANY, OF HARTFORD, CONNECTICUT, A CORPORATION OF CONNECTICUT.

BOOK-SEWING MACHINE.

No. 930,229.

Specification of Letters Patent.

Patented Aug. 3, 1909.

Application filed February 27, 1905. Serial No. 247,443.

To all whom it may concern:

Be it known that I, JOHN R. REYNOLDS, a citizen of the United States, residing at Hartford, county of Hartford, and State of Connecticut, have invented certain new and useful Improvements in Book-Sewing Machines, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

This invention relates to certain improvements in book sewing machines.

In book sewing machines employing pairs of needles in which the needles of each pair are brought in succession to what may be termed the sewing line, or line of the seam across the back of the signatures, the loop of thread being taken from one needle after the needle has passed through the signature and enchained with a loop taken from the other needle of the pair after that needle has passed through the signature, it has been customary to employ a single looper for each pair of needles. In order to operate a looper of this character, it had to be finely adjusted, and, furthermore, it was difficult to maintain the adjustment, especially when the machine was running at high speeds, and any slight variation in its position interfered seriously with its operation. Furthermore, in machines employing signature carrying bars which were rotated and raised and lowered to bring the signatures into position with respect to the sewing devices, the signature carrying bars, of which four were employed, were held in position in a head comprising a pair of disks, the bars being located in radial grooves in the disks, the rotation of the head being effected by devices which operated on the bars. It is difficult to firmly hold in position bars mounted in this manner without unduly increasing the diameter of the disks, because the length of bar held between the disks is necessarily less than the radius of the disk circle for at best the ends of the bars could not be brought nearer the center of the disk circle than the circumference of the shaft on which the disks are supported and rotated. This fact and the further fact that the head and bars were rotated by devices acting on the bars themselves tended to loosen the bars in the head. Furthermore, the device which rotated the bars was of fork shape embracing the bars, and the continual engagement

and disengagement of this fork with the bars caused the bars to wear, the rotating device scoring the bars.

It is one of the objects of this invention to produce an improved sewing mechanism for book sewing machines employing a pair or pairs of needles in which the looper mechanism can be readily adjusted and in which this mechanism is not liable to get out of adjustment when the machine is running rapidly.

A further object of the invention is to produce a book sewing machine having improved devices for holding and operating the signature supporting bars.

A further object of the invention is to produce an improved book sewing machine which shall be inexpensive in its construction as compared with prior machines, which shall be reliable in operation, and which shall be capable of running at high speeds.

With these and other objects not specifically referred to in view, the invention consists in certain constructions, and in certain parts, improvements and combinations as will be hereinafter fully described and then specifically pointed out.

Referring to the drawings—Figure 1 illustrates a front view of one form of book sewing machine embodying the invention. Fig. 2 is an enlarged detail view of one of the needle carrying blocks employed in the machine, showing one pair of needles and their arbors in position. Figs. 3, 4 and 5 are enlarged detail views illustrating the operation of the loop taking device employed in the machine. Figs. 6 and 7 illustrate the best construction of looper in side elevation and plan respectively. Fig. 8 is a view of the bar carrying the loop taking devices. Fig. 9 is an enlarged sectional view of the operating end of the looper carrying bar. Fig. 10 is an end view of the supporting bracket for the looper carrying bar. Fig. 11 is an enlarged detail view, certain parts being shown in section and certain parts being broken away, illustrating the construction for mounting and operating the signature presenting bars. Figs. 12 and 13 are detail views illustrating more fully certain constructions shown in Fig. 11, and Fig. 14 illustrates a modified form of the construction for mounting and operating the signature presenting bars. Fig. 15 is a detail view of part of the construction illustrated in Fig. 11 showing the

bar for the signature support carrying head in engagement with the head.

Referring to the drawings, which illustrate a concrete embodiment of the invention, 1 indicates a frame or standard on which is mounted an overhanging arm 2 which serves to support the sewing mechanism to be hereinafter described. The sewing mechanism of machines embodying the invention may be widely varied in construction. In the machine selected to illustrate the invention, the horizontal portion 3 of the overhanging arm serves to support a plurality of blocks 4 in which the needles and their operating devices are mounted. The number of blocks may be varied but in the machine illustrated three such blocks are shown. While the blocks may be attached to the overhanging portion of the arm in any desired manner, in the construction shown, the blocks are provided with a wide recess in the top, the shoulder 5 (see Fig. 2) forming the front side of this recess. The blocks are applied to the underside of the arm, the lower edge of the arm fitting in the recess and the blocks are held on the arm by a locking plate 6 the front edge of which engages a groove, not shown, in the rear side of the arm.

In the particular machine selected to illustrate the invention, semi-circular needles are employed, although this form may be departed from in some instances, if desired. While the manner of mounting these needles and their arrangement may be varied within wide limits, in the construction shown each block is provided with two needles, marked 7 and 8, these needles being mounted on shafts or arbors 9 and 10 extending through the block. While the needles may be secured to the arbors in any desired manner, in the construction shown collars 11 are employed for this purpose, these collars being held in position by screws 12. In the particular construction shown, the needles are guided in their movement by shoulders 13 formed on a face plate 14 and also by plates 15 secured to the front of this face plate. In the particular machine illustrated, the needles are arranged in sets, one set including one needle of each of the pairs and the other set including the other needle of each of the pairs. These sets of needles, in the particular machine illustrated, are brought successively to the sewing line or within the range of action of the looping devices to be hereinafter described.

The particular mechanism for operating the needles when they are arranged in the manner described, may be varied within wide limits. In the construction shown, however, each of the shafts 9 is provided with a pinion 16 and each of the shafts 10 is provided with a pinion 17. The pinions 17 are offset with respect to the pinions 16 and these pinions are operated by sliding racks

18 and 19 which are in turn actuated by levers, not shown, pivoted on the rear of the upstanding portion of the overhanging arm 2. These racks are alternately actuated so as to drive one set of needles through one signature and the next set of needles through the next succeeding signature. It will further be noted that in the particular machine shown the needles of each pair turn in opposite directions.

After the needles of a set, when a set of needles is employed, have been driven through a signature, a loop of thread is taken from each needle of the set by a suitable looping device and held, the signature being advanced through the machine and another signature being presented to the sewing devices. The needles of the second set are then caused to pass through the fold of this second signature and the loops held by the loopers are cast by them over these needles, the loops from these needles being taken and held by the loopers.

In the particular machine shown, a loop taking device is employed with each pair of needles. While the details of construction of this loop taking device may be varied widely, there will be employed a loop taker for each needle of a pair. In the particular construction shown, each loop taking device comprises a shank 20 having two loop taking projections 21, 22. The loop taking devices may be mounted and operated in various ways. In the construction shown, the shanks 20 extend from collars 23, these collars being secured to a bar 24. In the construction illustrated, the bar 24 is given movements to cause the loop taking projections 21 to take the loops from the needles 8, hold the loops while the needles withdraw, move the loopers to cast the loops over the needles 7, after these needles have penetrated the next signature, and then cause the projections 22 to take the loops from the needles 7, these loops being in turn transferred to the needles 8. In the particular machine shown, the operations described require a forward and backward movement of the loopers, which is effected by rocking the bar 24 and a sidewise movement which is effected by giving the bar 24 an endwise movement. The means for giving the bar 24 the endwise movements may be widely varied. As shown this bar is supported in hangers 25 bolted onto the front of the part 3 of the overhanging arm and is free to move endwise through these hangers, the endwise movement being derived from a lever 26 pivoted at 27 to the upright portion 2 of the overhanging arm, this lever being given its movement by a cam groove, not shown, in the rear side of a cam disk 28 mounted on a suitable shaft located beneath the bed plate on the standard 1. This lever 26 also serves, in connection with devices to

be hereinafter referred to, for giving the bar the rocking movements, although these movements might be obtained through any suitable means. In the construction shown, the lever 26 is pivoted to ears 29 on a hub 30, this hub being mounted on a sleeve 31 (see Fig. 8). In the particular construction shown, the sleeve is provided with threaded portions 32 which are engaged by nuts 33, these nuts serving to form the connection between the hub and the sleeve and to permit an adjustment between these parts. The sleeve is additionally supported by a bearing 34, this bearing being carried on a bracket 35, the plate 36 of which is secured by screws, or in any other suitable manner, to the back of the upright portion of the overhanging arm 3. This sleeve 31 is provided, in the particular construction shown, with a cam slot 37 which is engaged by a pin 38 extending through the bar 24. In the operation of this looper bar, the bar is first given the endwise movement and then the rocking movement. In order to effect this, in the particular construction shown, the connection between the bar and its driving means, which in this construction include the lever 26 and the sleeve 31, is of such a character that after the bar has been given its endwise movement, it is stopped and a continued movement of the driver produces, through the means described, or any other suitable means, the rocking movement. The means for stopping the bar after the required endwise movement has been effected may be of any suitable character. In the particular construction shown, the bar is given an endwise operating movement in both directions, and it is necessary, therefore, to limit this movement in both directions. For this purpose, two stops are employed, these stops as shown consisting of collars 39 and 40, the stop 39 coöperating with one of the hangers, 25, and the stop 40, coöperating with the other hanger, 25. While the connection between the driving means and the bar may, as has been indicated, be varied widely, this connection will, in its best form, include a spring, or, when as in the particular construction illustrated, the bar is to be moved in both directions, it will include two springs.

In the drawings (see Figs. 8 and 9) two end bushings 41, 42 are provided, these bushings abutting against a collar 43 which is held in position on the bar 24 by the pin 38, these two bushings 41, 42 serving to support springs 44, 45, the springs bearing at their inner ends against shoulders formed on the bushings and at their other ends against collars 46, 47 which collars are secured by screws 48, or in any other suitable manner, to the bushing 31. Nuts 49, 50 are provided on the end of each of these bushings 41, 42. In the best constructions, these

springs 44, 45 will be held under tension between the shoulders on the bushings and the collars 46, 47.

Fig. 8 illustrates the position of the parts after the endwise movement of the bar to the left has taken place, the stop 39 being against the left hand hanger 25. In this position of the parts, the loop taking projections 22 have taken loops from the needles 7 and are holding them, these loops having been entered by the needles 8. The sleeve 31 operated by the lever 26 now continues its movement to the left and the cam slot 37, acting on the pin 38, rocks the bar 24, which movement causes the projections 22 of the loop taking device to cast off the loops held by them onto the needles 8. The position of the parts at this time is illustrated in Fig. 3. The sleeve 31 now begins its movement to the right, but the bar 24 does not have any endwise movement, because the spring 45 which has been compressed by the movement of the sleeve to the left is still under strong tension and prevents any endwise movement of the bar. This movement of the sleeve to the right, however, produces a rocking movement of the bar which causes the loop taking devices to move forward or toward the needles and on this movement the loop taking projections 21 take the loops from the needles 8. As soon as this has been accomplished, which will be at the time when the pin 28 has reached a position midway of the slot 37, the movement of the sleeve acting through the spring 44, begins to move the bar to the right, which movement continues until the stop 40 strikes the right hand hanger 25. At this time, the loop taking projections 21 are in the position shown in Fig. 4, that is, they are holding the loops in position to be entered by the needles 7. The continued movement of the sleeve 31 now, through the action of the slot 37 on the pin 38, again rocks the bar, causing the loop taking projections 21 to cast off the loops held by them onto the needles 7, this position of the parts being illustrated in Fig. 5.

It will be observed that the springs 44, 45 cause the rocking movements of the bar to be absolutely positive, since they hold the bar and the stops firmly in contact while the rocking movements of the parts are taking place. Further, the fact that the springs are under tension causes the endwise movement of the bar to be practically positive also, the normal tension of the springs being sufficient to overcome the inertia of the bar and any pull which may be exerted on the bar by the tension of the loops held by the loopers, and the friction of the bar in its bearings.

The thread will be supplied to the needles in any suitable manner, as, for instance, from spools mounted in cups 51, the thread being led from the spools through a thread guide 52. From the guide 52 the threads

from the several spools are led between tension plates 53 and slack take-up springs 54, after which the threads pass over a take-up bar 55 which bar is operated from a shaft 56. This shaft 56, in the construction shown, is rocked by a connecting rod 57 operated from a lever 58 which lever is provided with a cam roller working in a cam groove 59 cut in the cam disk 28 before referred to. The thread supplying devices just described may be of any usual or ordinary construction, the construction illustrated being well-known in the art.

The devices by which the signatures are successively presented to the sewing devices may be of any well-known type. In the particular construction illustrated, however, the signatures are presented to the sewing devices by signature carrying bar 60 which are or may be provided with perforating devices 61 (see Figs. 11 and 12). While the particular construction of the bar may be varied in the best constructions the bars will be of the type illustrated in Patent No. 837,341, dated Dec. 4, 1906, granted to The Smyth Manufacturing Co. as assignee of J. R. Reynolds. While these signature supporting bars may be mounted and operated in any desired manner, in the best constructions, they will be mounted in a head consisting of upper and lower disks 62, 63, these disks being tied together by screws 65 and the head being mounted to rotate on a supporting rod 66 which is stepped in an upper-bearing 67 suitably connected to the machine frame and in a sleeve 68 mounted in the table of the frame 1, the rod being provided with shoulders 69, 70 which prevent its having any vertical movement. The bars may be held in the disks in any suitable manner, but in the best constructions, grooves 71 will be provided for this purpose, these grooves being arranged as indicated in Fig. 13, that is, they will be at right angles to each other and are not cut on radial lines. By this arrangement of the grooves, a long bearing for each of the bars is obtained, so that the bars are firmly held in the head and this is accomplished without unduly increasing the diameter of the disks. In the particular construction illustrated, the lower disk 63 is formed with an upwardly projecting boss 72 over which the upper disk fits, though the construction may be varied in this respect if desired. In the particular construction illustrated, the head is given rotating movements to cause each signature supporting arm to bring its signatures into position to be acted upon by the sewing devices, and after each signature is thus brought into position, the head is lowered to cause it to clear the signature, so that the head has both rotating and rising and falling movements. The construction by which the head carrying the signature arms is raised and low-

ered at the proper times may be of any suitable character. As shown, the disk 63 has a downwardly extending piece 73 which is embraced by a collar 74, this collar being held in place by a nut 75. The collar 74 has a projection 76 extending therefrom, this projection being secured to a connecting rod 77 which at its other end is pivoted to a cam lever 78. This cam lever is pivoted at 79 to a bracket extending from the bottom of the frame table and is provided with a slot 80 taking over a crank roller 81 mounted on a crank disk 82. A balance spring may, if desired, be employed in connection with this lever, this spring being shown at 83 and being connected to an arm 84 which is fast to the lever 78.

The particular construction for giving the head its rotating movement which will be a step by step movement, may be widely varied. Two forms of construction for this purpose are shown. In what is regarded as the best form, illustrated in Fig. 11, the upper and lower disks are provided with rectangular recesses 85, these recesses being located in the edge of the disks. These recesses are arranged to be engaged by a squared bar 86 which is mounted in an arm 87, this arm being secured to the sleeve 68. The lower part of this sleeve is shouldered off and has a segmental gear 88 formed thereon, the teeth of which are in mesh with a toothed or rocking segmental lever 89 which is pivoted at 90 to a bracket depending from the frame table, this lever being operated from a cam groove 91 cut in the rear side of the disk 82. The bar 86 is of such length that when the head is lowered, it will engage the recesses 85, after which, through the segmental gearing referred to, the head, in the particular construction shown, is given a quarter turn.

While the construction which has just been described is regarded as the best construction for the reason that it is inexpensive to make, other forms of construction may be adopted, and one other form is illustrated in Fig. 14. The construction shown in this figure is, in many respects, similar to that just described, but bolts 92 are employed for holding the disks together, and these bolts are made hollow. The arm 87 is provided with an upwardly extending lug 93, this lug carrying a long pin 94 which is arranged to pass through the openings in the bolts 92 when the head is lowered.

Whatever form of construction is employed for rotating the head, this construction, in its best form, will be of such a character that the rotating devices may engage the head itself instead of the signature carrying bars, as in prior constructions, thus avoiding wear on the bars and decreasing the tendency of the bars to work loose in the head.

Various devices well-known in the art may be employed to control the signature after it has been brought into position to be acted upon by the sewing devices and some of these devices are shown. The devices referred to include hold back fingers 95 operated from a cam plate 96 which has a vertical movement produced by a lever 97, a pressure bar 98, a stop bar 99 and fingers 100 which operate on the bottom of the sheet. A gab-hook 101 is also shown which operates the perforators in the signature bar, this gab-hook taking over pins 102 as the bars are brought into position, and being then given a backward and forward movement by a lever, not shown, for raising and lowering the perforators.

Changes and variations may be made in the construction by which the invention is carried into effect. The invention is not, therefore, to be limited to the specific construction hereinbefore described and illustrated in the accompanying drawings.

What is claimed is:—

1. The combination with a pair of needles, of a signature holder, means for producing relative movements between the holder and the needles, a loop taking device coöperating with the needles, said device having a loop taker for each needle, means for bringing the needles successively within the range of action of the loop taking device, and means for operating said device to cause each loop taker to take the loop from its own needle and cast it off onto the other needle.

2. The combination with a pair of needles, of a signature holder, means for causing a needle of the pair to penetrate alternate signatures only and the other needle of the pair to penetrate intermediate signatures only, a loop taking device coöperating with the needles, said device having a pair of loop takers, one for each needle, and means for causing the loop taker for each needle to coöperate with the needle after it has penetrated a signature, each loop taker operating to transfer the loop from one needle to the other.

3. The combination with a pair of needles, of a signature holder, means for producing relative movements between the holder and the needles, a loop taking device coöperating with the needles, said device having a loop taker for each needle, means for moving the needles in semi-circular paths to bring them successively within the range of action of the loop taking device, and means for operating said device to cause each loop taker to take the loop from its own needle and cast it off onto the other needle.

4. The combination with a pair of needles, of a signature holder, means for causing a needle of the pair to move in a curved path and penetrate alternate signatures only and

the other needle of the pair to move in a curved path and penetrate the intermediate signatures only, a loop taking device coöperating with the needles, said device having a pair of loop takers, one for each needle, and means for causing the loop taker for each needle to coöperate with the needle after it has penetrated a signature, each loop taker operating to transfer the loop from one needle to the other.

5. The combination with a pair of needles, of a signature holder, means for producing relative movements between the holder and the needles, a loop taking device comprising a shank provided with loop taking projections, one for each needle, means for bringing the needles successively within the range of action of the loop taking device, and means for operating said device to cause each loop taking projection to take the loop from its own needle and cast it off onto the other needle.

6. The combination with a plurality of pairs of needles, the needles of said pairs being arranged in sets, a signature holder, means for producing relative movements between the holder and the needles, a carrier, a plurality of loop taking devices, one for each pair of needles, mounted on said carrier, each of said devices having a loop taker for each needle of the pair, means for bringing the sets of needles successively within the range of action of the loop taking devices, and means for operating the carrier to cause each loop taker to take the loop from its own needle and cast it off onto the other needle of the pair.

7. The combination with a plurality of pairs of needles, the needles of said pairs being arranged in sets, of a signature holder, means for producing relative movements between the holder and the needles, a carrier, a plurality of loop taking devices, one for each pair of needles, mounted on said carrier, each of said loop taking devices having a loop taker for each needle of the pair, means for causing the needles of one set to penetrate alternate signatures only and the needles of the other set to penetrate intermediate signatures only, and means for operating the carrier to cause the loop taker for each needle of the set to take a loop from that needle of the set after it has penetrated the signature and transfer it to a needle of the other set.

8. The combination with a plurality of pairs of needles, the needles of said pairs being arranged in sets, of a signature holder, means for causing one set of needles to move in a curved path and penetrate alternate signatures only and the other set to move in a curved path and penetrate the intermediate signatures only, a carrier, a plurality of loop taking devices, one for each pair of needles, mounted on said carrier, each of said loop

taking devices having a loop taker for each needle of the pair, and means for operating the carrier to cause the loop taker for each needle of the set to take a loop from that
 5 needle of the set after it has penetrated the signature and transfer it to a needle of the other set.

9. The combination with a pair of needles, of a signature holder, means for producing
 10 relative movements between the holder and the needles, a carrier, a loop taking device mounted on the carrier, said device having a loop taker for each needle, and means for operating the carrier to cause each loop
 15 taker to take the loop from its own needle and cast it off onto the other needle.

10. The combination with a plurality of pairs of needles, said needles being arranged in sets, of a signature holder, means for pro-
 20 ducing relative movements between the holder and the needles, a carrier, a plurality of loop taking devices, one for each pair of needles, mounted on the carrier, each of said loop taking devices having a loop taking
 25 projection for each needle of its pair, means for bringing the sets of needles successively within the range of action of the loop taking devices, and means for giving the carrier swinging and endwise movements to cause
 30 each loop taker to take a loop from its own needle and cast it off onto the other needle of the pair.

11. The combination with a plurality of pairs of needles, said needles being arranged
 35 to form sets, of a signature holder, a bar, a plurality of loop taking devices, one for each pair of needles, mounted on the bar, said loop taking devices each comprising a shank and two loop taking projections, one for each
 40 needle of the pair, means for bringing the sets of needles successively within the range of action of the loop taking devices, and means for giving the bar swinging and end-
 45 wise movements to cause each loop taking projection to take the loop from its own needle and cast it off onto the other needle of the pair.

12. The combination with a pair of needles, of a signature holder, means for pro-
 50 ducing a relative movement between the needles and the holder, a bar, a loop taking device mounted on the bar and cooperating with the needles, said device having a loop taking projection for each needle, means for
 55 giving the bar endwise movements to position the loop taking device so that each loop taking projection may take a loop from its own needle, and means for giving the bar a rocking movement to cause each loop taking
 60 projection to cast off and take its loop.

13. The combination with a pair of needles, of a signature holder, means for producing a relative movement between the needles and the holder, a bar, a loop taking

device mounted on the bar and cooperating
 65 with the needles, driving means for giving the bar endwise movements in both directions, stops for limiting the movement of the bar in both directions, connections be-
 70 tween the driving means and the bar which permit the means to continue to move after the bar has stopped its movement in either direction, and means operated by the con-
 75 tinued movement of the driving means in either direction for giving the bar rocking movements, whereby the loop taking device is caused to cast off and take loops from the needles.

14. The combination with a pair of needles, of a signature holder, means for producing
 80 a relative movement between the needles and the holder, a bar, a loop taking device mounted on the bar and cooperating with the needles, said loop taking device having a loop taking projection for each needle, driv-
 85 ing means for giving the bar endwise movements in both directions, stops for limiting the movement of the bar in both directions, connections between the driving means and the bar which permits the means to continue
 90 to move after the bar has stopped, and means operated by the continued movement of the driving means for giving the bar rocking movements, whereby the loop taking de-
 95 vice is caused to cast off and take loops from the needles.

15. The combination with a pair of needles, of a signature holder, means for producing
 100 a relative movement between the needles and the holder, a bar, a loop taking device mounted on the bar and cooperating with the needles, driving means for giving the bar endwise movements in both directions, stops for limiting the movement of the bar
 105 in both directions, springs between the driving means and the bar which permit the means to continue to move after the bar has stopped its movement in either direction, and means operated by the continued move-
 110 ment of the driving means in either direction for giving the bar rocking movements, whereby the loop taking device is caused to cast off and take loops from the needles.

16. The combination with a pair of needles, of a signature holder, means for producing
 115 a relative movement between the needles and the holder, a bar, a loop taking device mounted on the bar and cooperating with the needles, said loop taking device having a loop taking projection for each needle,
 120 driving means for giving the bar endwise movements in both directions, stops for limiting the movement of the bar in both directions, springs between the driving means and the bar which permit the means to con-
 125 tinue to move after the bar has stopped, and means operated by the continued movement of the driving means for giving the bar

rocking movements, whereby the loop taking device is caused to cast off and take loops from the needles.

17. The combination with a pair of needles, of a signature holder, means for producing relative movements between the needles and the holder, a bar, a loop taking device co-operating with the needles and mounted on said bar, a driver for giving the bar endwise movements in both directions, stops for limiting the movement of the bar in both directions, springs normally under tension between the driver and the bar which permit the driver to continue to move after the bar has stopped, and means operated by the continued movement of the driver for giving the bar rocking movements, whereby the loop taking device is caused to cast off and take loops from the needles.

18. The combination with a pair of needles, of a signature holder, means for producing relative movements between the needles and the holder, a bar, a loop taking device mounted on the bar and coöperating with the needles, said device having a loop taking projection for each needle, a driver for giving the bar endwise movements in both directions, stops for limiting the movement of the bar in both directions, springs normally under tension between the driver and the bar which permit the driver to continue to move after the bar has stopped, and means operated by the continued movement of the driver for giving the bar rocking movements, whereby the loop taking device is caused to cast off and take loops from the needles.

19. The combination with a pair of needles, of a signature holder, means for producing relative movements between the needles and the holder, a bar, a loop taking device co-operating with the needles and mounted on said bar, a driver for giving the bar endwise movements in both directions, stops for limiting the movement of the bar in both directions, springs under tension between the driver and the bar which permit the driver to continue to move after the bar has stopped, and a cam mechanism operated by the continued movement of the driver for giving the bar rocking movements, whereby the loop taking device is caused to cast off and take loops from the needles.

20. The combination with a pair of needles, of a signature holder, means for producing relative movements between the needles and the holder, a bar, a loop taking device mounted on the bar and coöperating with the needles, said device having a loop taking projection for each needle, a driver for giving the bar endwise movements in both directions, stops for limiting the movement of the bar in both directions, springs under tension between the driver and the bar

which permit the driver to continue to move after the bar has stopped, and a cam mechanism operated by the continued movement of the driver for giving the bar rocking movements, whereby the loop taking device is caused to cast off and take loops from the needles.

21. The combination with a plurality of pairs of needles, the needles of the pairs being arranged in two sets, of a signature holder, means for producing relative movements between the holder and the needles, a bar, a plurality of loop taking devices, one for each pair of needles, mounted on the bar, each of said devices having a loop taking projection for each needle of its pair, means for bringing the needles successively within the range of action of the loop taking devices, a driving sleeve in operative position with respect to the bar, springs under tension between the sleeve and the bar, means for reciprocating the sleeve to move the bar in both directions, stops for limiting the movement of the bar in both directions, and a cam actuated by the sleeve for rotating the bar.

22. In a signature support for book sewing machines, the combination with a head, of means for rotating the head, and a plurality of signature supporting arms mounted therein, the inner ends of the arms extending past the center of rotation of the head.

23. In a signature support for book sewing machines, the combination with a head comprising upper and lower disks, of means for securing the disks together, a plurality of signature supporting arms held between the disks, and the ends of the arms extending inward beyond the center of rotation of the head, and means for rotating the head.

24. In a signature support for book sewing machines, the combination with a head comprising upper and lower disks, of means for securing the disks together, means for rotating the head, and a plurality of signature supporting arms held between said disks and arranged at an angle to each other, the ends of the arms extending inward beyond the center of rotation of the head, and the end of each arm lying opposite another arm between the ends thereof.

25. In a signature support for book sewing machines, the combination with a head comprising upper and lower disks, one of said disks being provided with four grooves, said grooves being arranged at right angles to each other and the inner ends of the grooves extending inwardly beyond the center of rotation of the disks, of means for rotating the head, four signature supporting arms mounted in the grooves, and means for securing the disks together.

26. In a signature support for book sewing machines, the combination with a head,

of means for giving the head a rising and falling movement, means for giving the head a step by step rotating movement, and a plurality of signature supporting arms mounted in the head, the inner ends of the arms extending past the center of rotation of the head.

27. In a signature support for book sewing machines, the combination with a head comprising upper and lower disks, of means for securing the disks together, means for giving the head a rising and falling movement, means for giving the head a step by step rotating movement, and a plurality of signature supporting arms held between the disks, and the ends of the arms extending inward beyond the center of rotation of the head.

28. In a signature support for book sewing machines, the combination with a head comprising upper and lower disks, of means for securing the disks together, means for giving the head a rising and falling movement, means for giving the head a step by step rotating movement, and a plurality of signature supporting arms held between said disks and arranged at an angle to each other, the ends of the arms extending inward beyond the center of rotation of the head, and the end of each arm lying opposite another arm between the ends thereof.

29. In a signature support for book sewing machines, the combination with a head comprising upper and lower disks, one of said disks being provided with four grooves, said grooves being arranged at right angles to each other and the inner ends of the grooves extending inwardly beyond the center of rotation of the disks, of means for giving the head a step by step rotating movement, means for giving the head a rising and falling movement, four signature supporting arms mounted in the grooves, and means for securing the disks together.

30. In a signature support for book sewing machines, the combination with a head, of a plurality of signature supporting arms mounted therein, a driver, means for causing the driver to be directly engaged with and disengaged from the head, and means for operating the driver to give the head a step by step movement.

31. In a signature support for book sewing machines, the combination with a head comprising upper and lower disks, of a plurality of signature supporting arms held between the disks, a driver, means for causing the driver to directly engage the head and to be disengaged therefrom, and means for giving the driver a step by step movement to rotate the head.

32. In a signature support for book sewing machines, the combination with a head comprising upper and lower disks, said disks

having recesses in their edges, of a plurality of signature supporting arms held between the disks, a driver, means for causing the driver to directly engage the edge recesses in the disks, and means for giving the driver a step by step movement to rotate the head.

33. In a signature support for book sewing machines, the combination with a head comprising upper and lower disks, of a plurality of arms held between the disks, the inner ends of the arms extending inward beyond the center of rotation of the head, means for giving the head rising and falling movements, a driver so positioned as to directly engage the head when the head is lowered, and means for giving the driver a step by step rotating movement.

34. In a signature support for book sewing machines, the combination with a head comprising upper and lower disks, said disks having recessed edges, of a plurality of arms held between the disks, the inner ends of the arms extending inward beyond the center of rotation of the head, means for giving the head a rising and falling movement, a driver positioned so as to engage the recesses in the disks when the head is in its lowered position, and means for giving the driver a step by step rotating movement.

35. In a signature support for book sewing machines, the combination with a head comprising upper and lower disks having squared recesses in their edges, of a plurality of signature supporting arms held between the disks, means for raising and lowering the head, a driver including a rectangular block positioned so as to engage the recesses in the disks when the head is in its lowered position, and means for giving the driver a rotating movement whereby the head is given a step by step advancing movement.

36. In a signature support for book sewing machines, the combination with a head comprising upper and lower disks having squared recesses in their edges, of a plurality of signature supporting arms held between the disks, the inner ends of the arms extending inward beyond the center of rotation of the disks, means for raising and lowering the head, a driver including a rectangular block positioned so as to engage the recesses in the disks when the head is in its lowered position, and means for giving the driver a rotating movement whereby the head is given a step by step advancing movement.

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

JOHN R. REYNOLDS.

Witnesses:

J. A. GRAVES,
A. WHITE.