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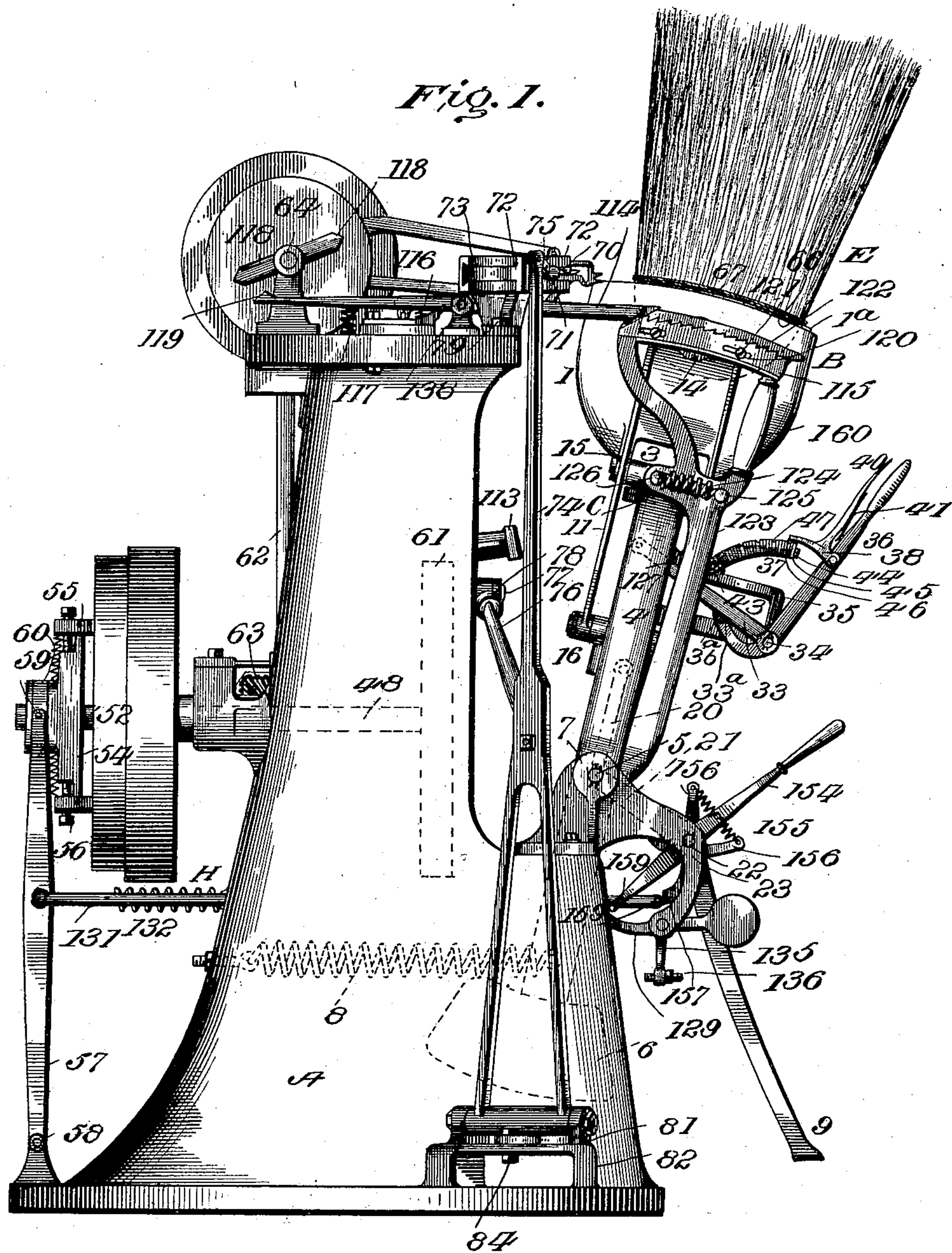
Patented Jan. 31, 1899.

A. E. MILLER.  
BROOM SEWING MACHINE.

(Application filed Jan. 27, 1898.)

(No Model.)

12 Sheets—Sheet 1.



Witnesses

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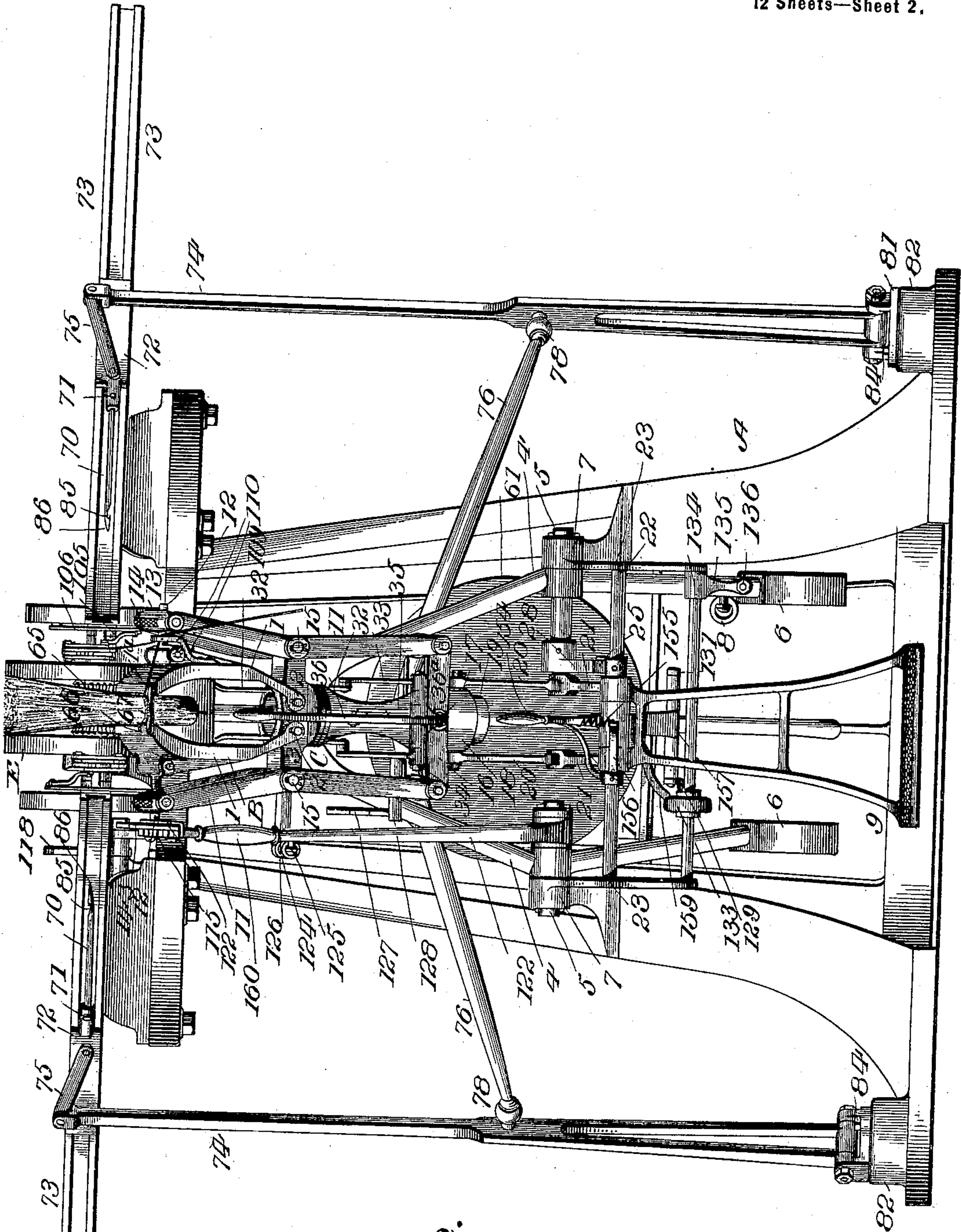


Fig. 2.

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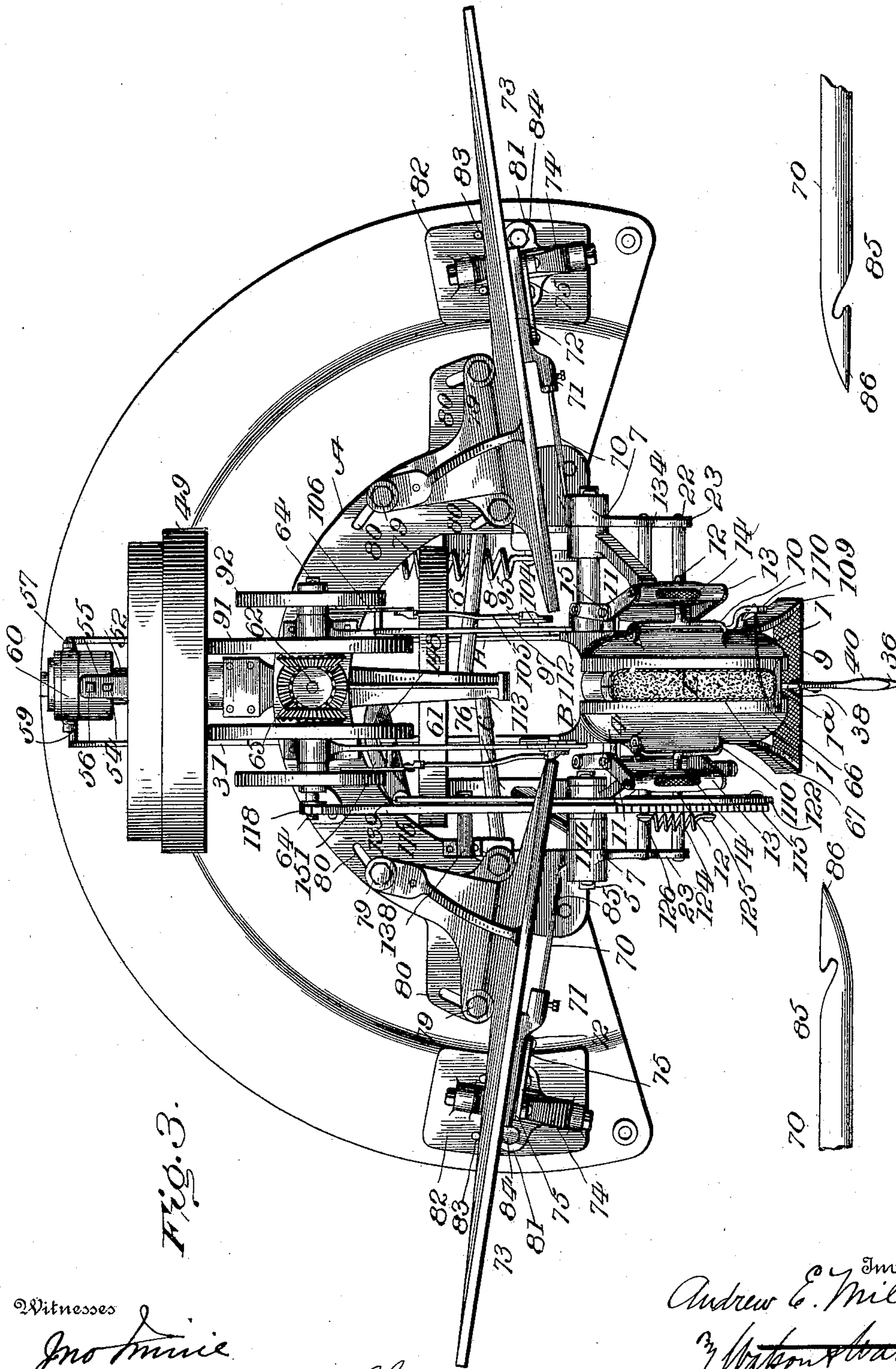


Fig. 3.

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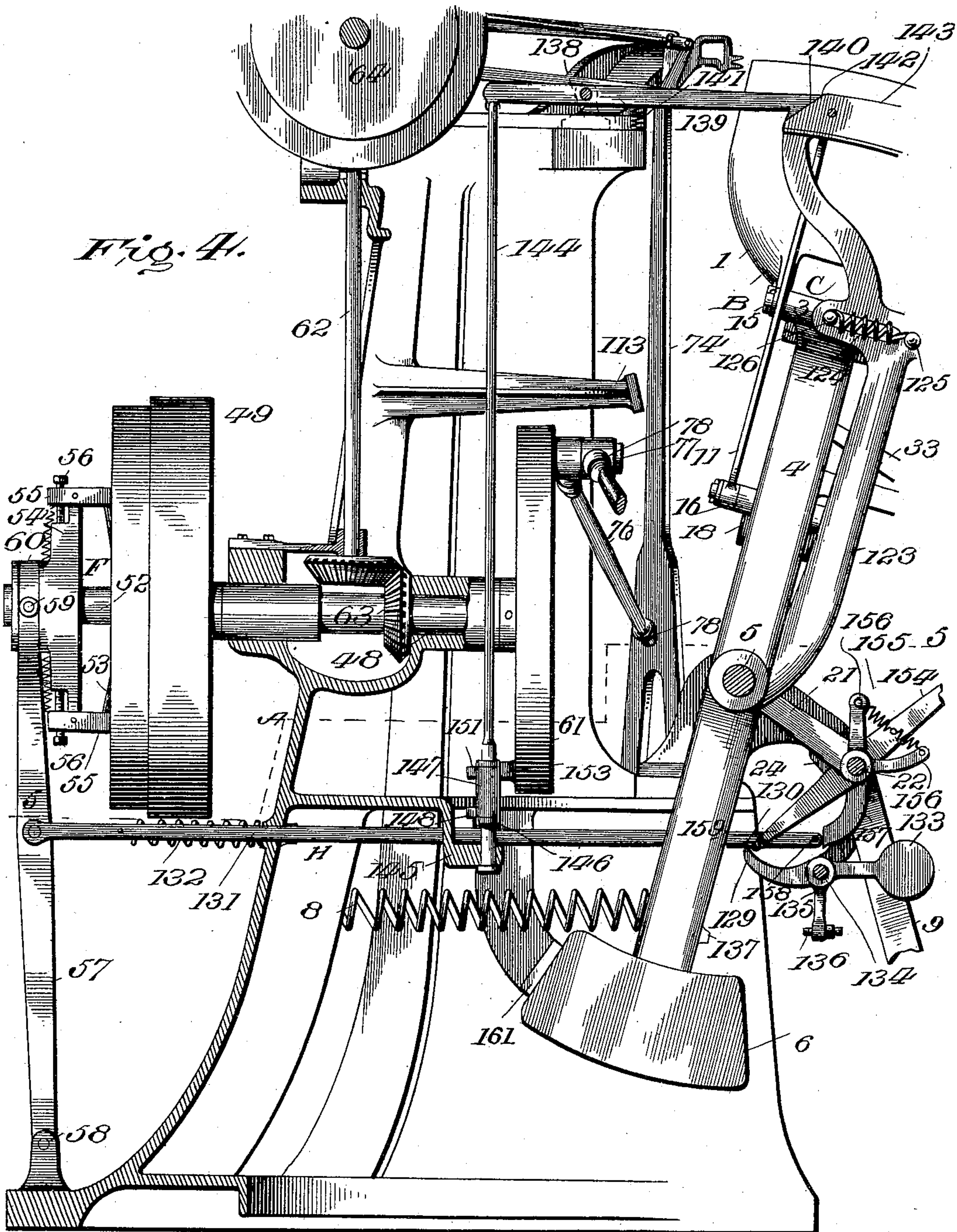
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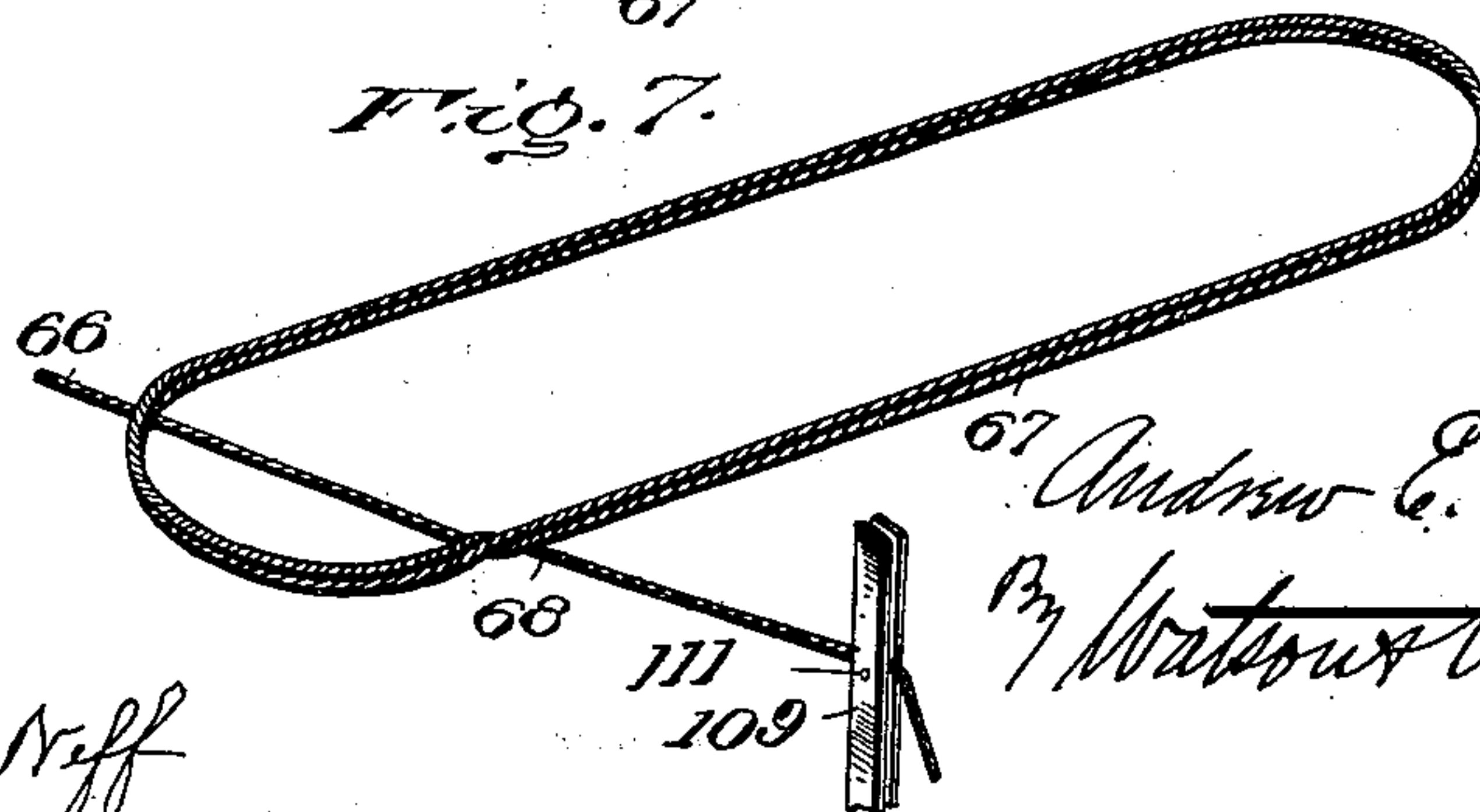
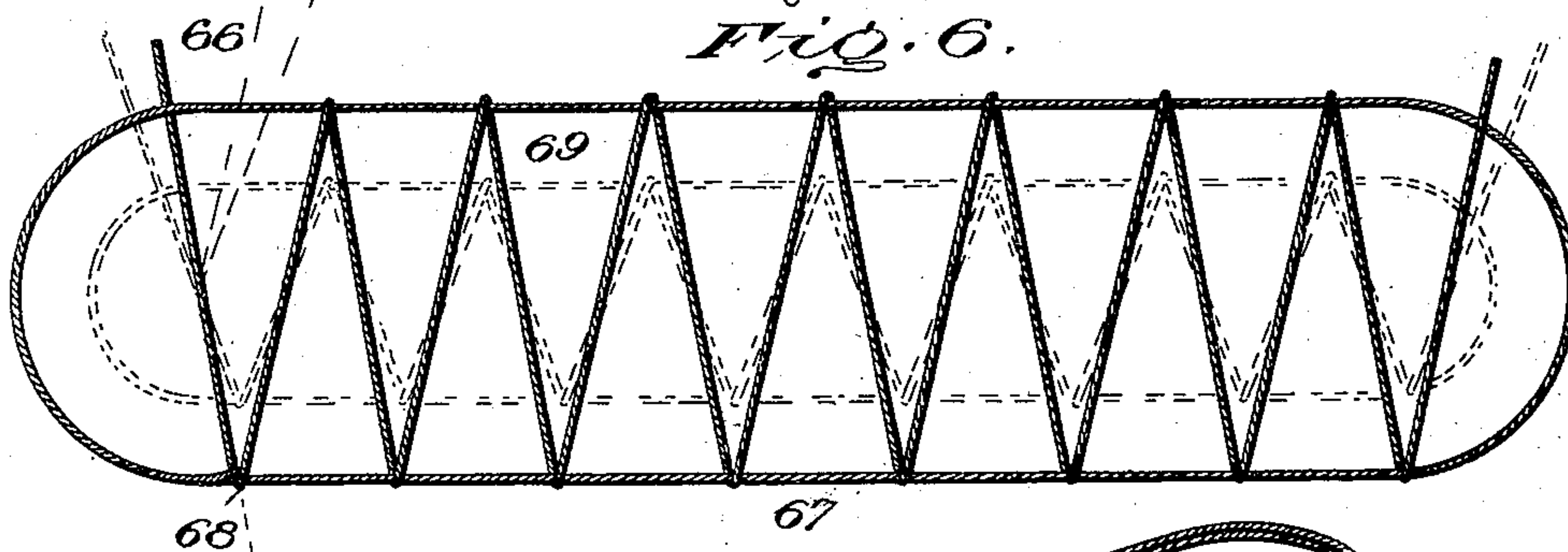
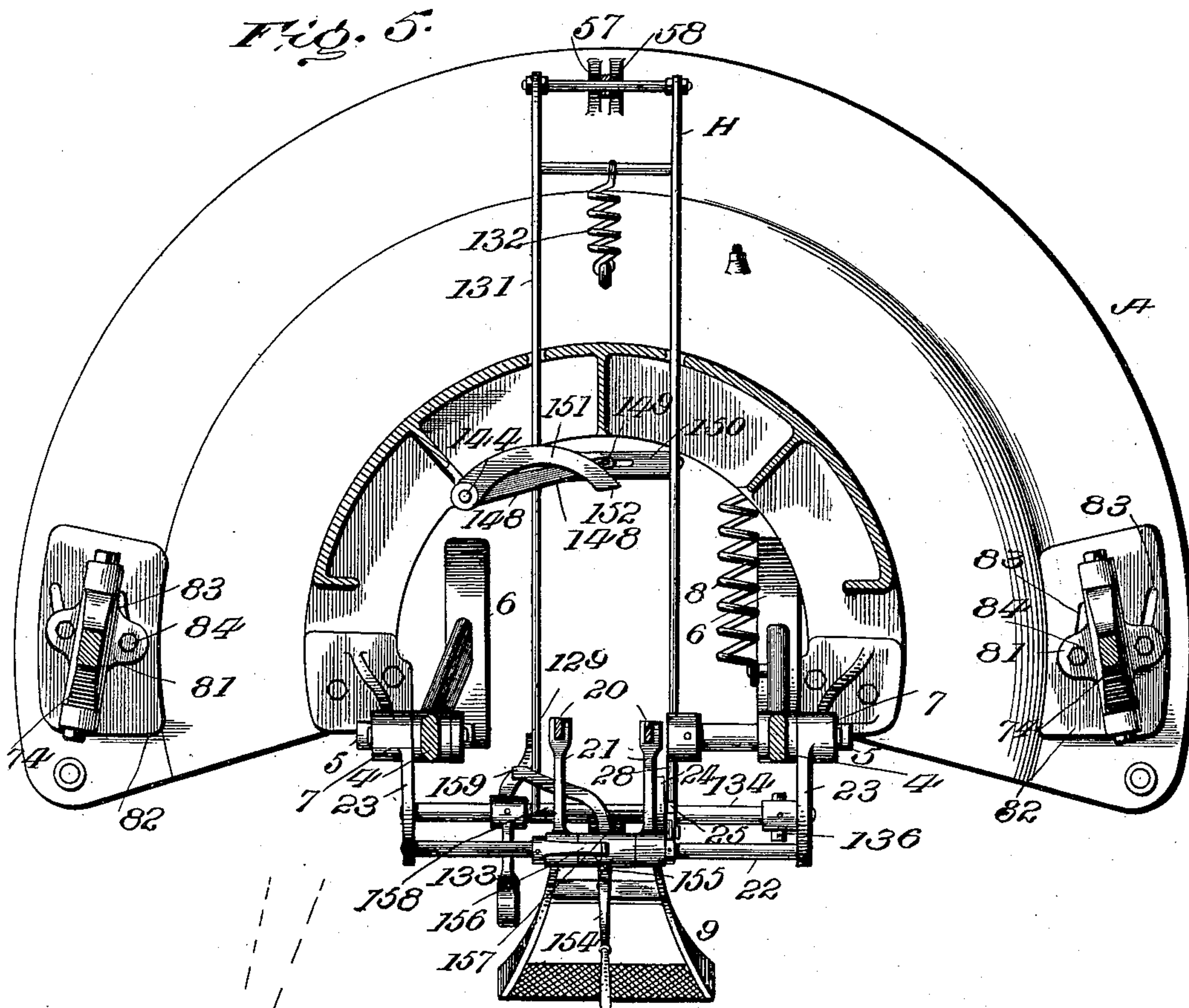
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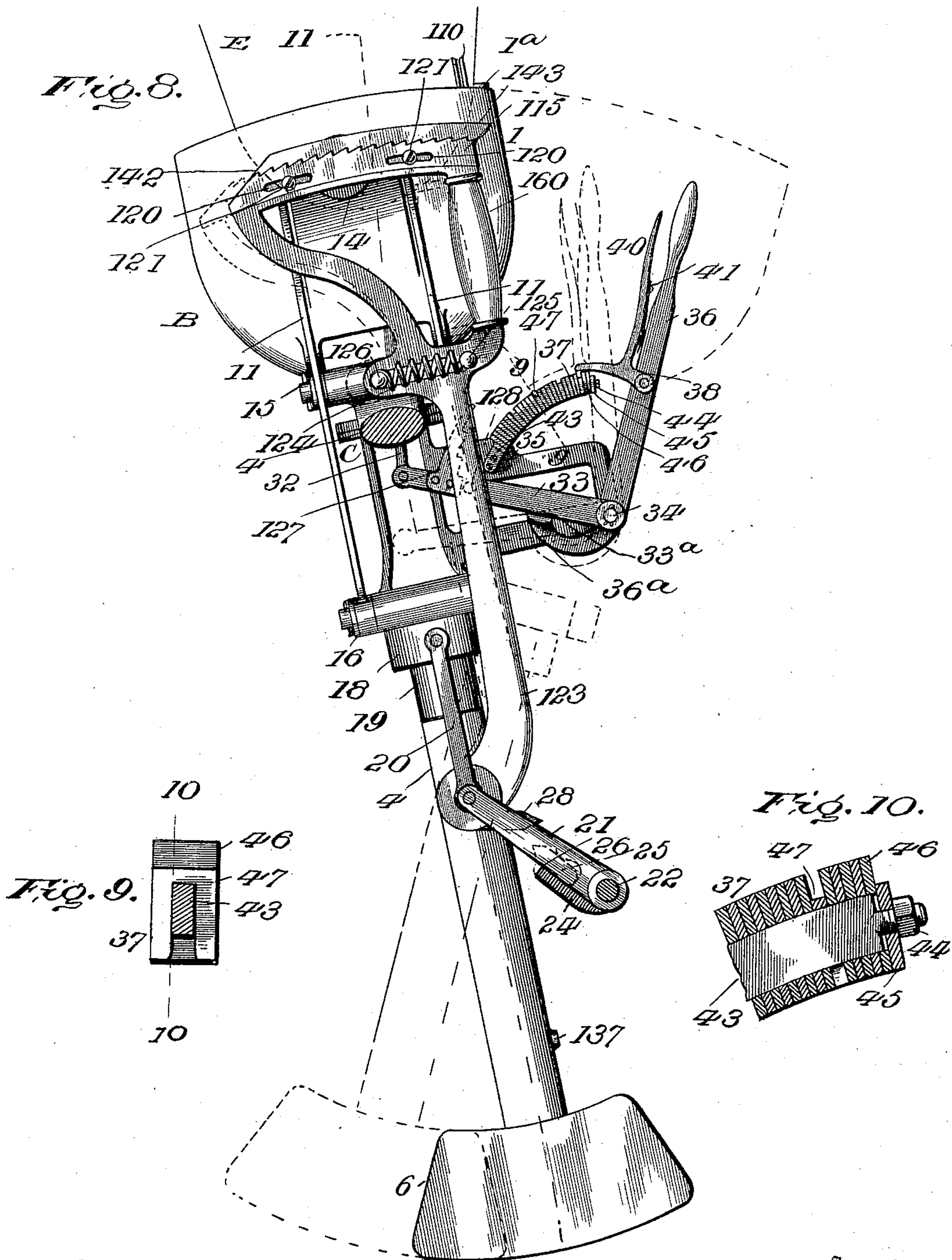
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12 Sheets—Sheet 6.



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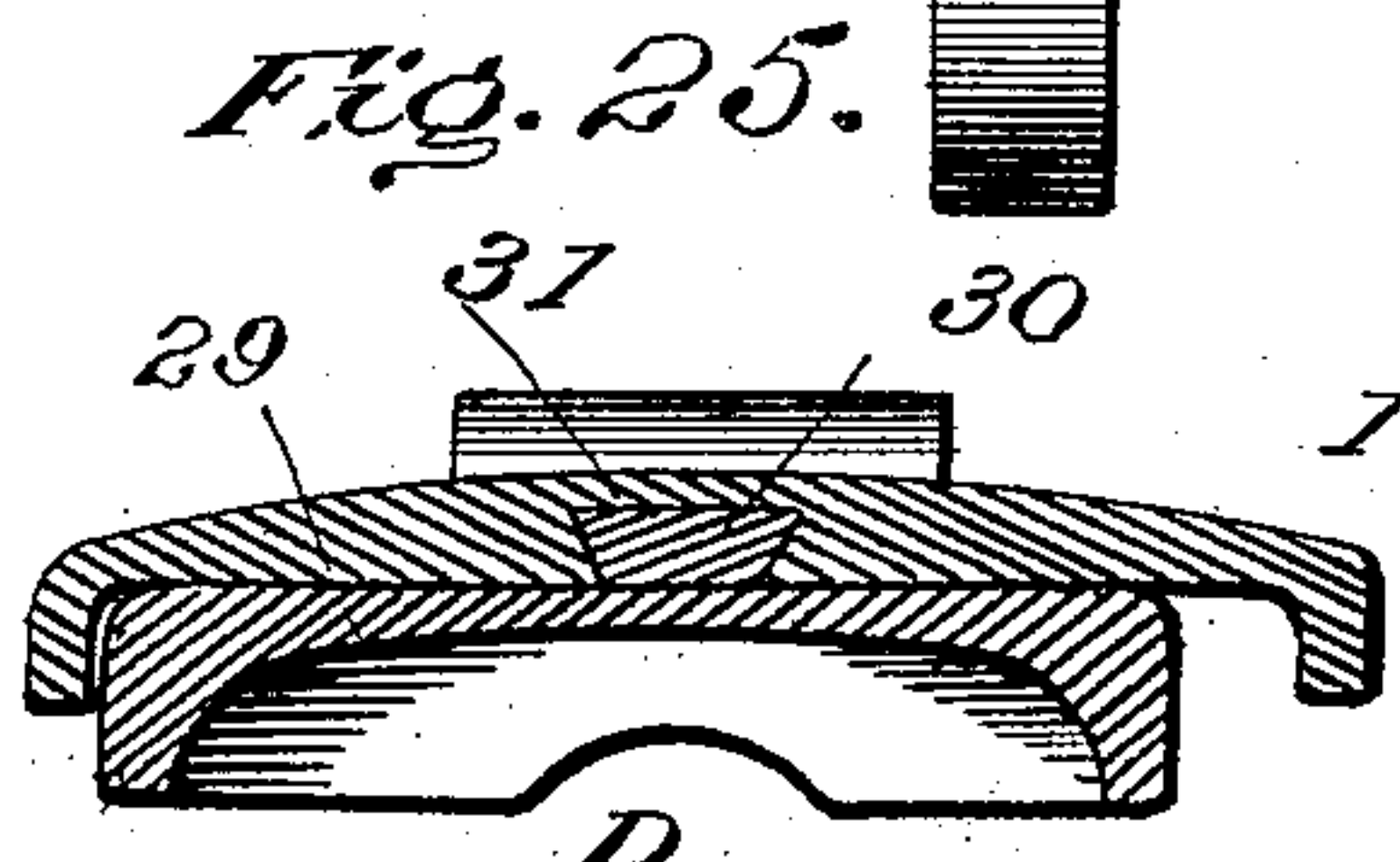
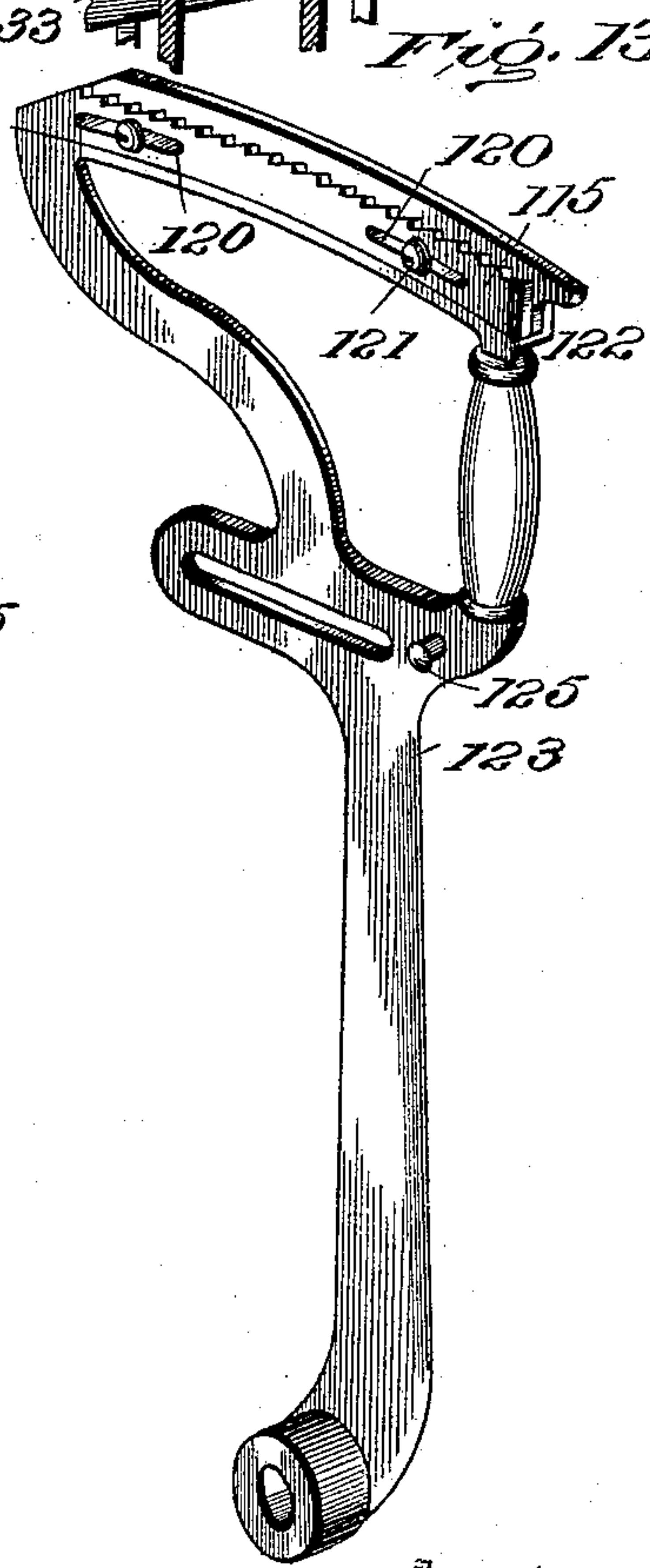
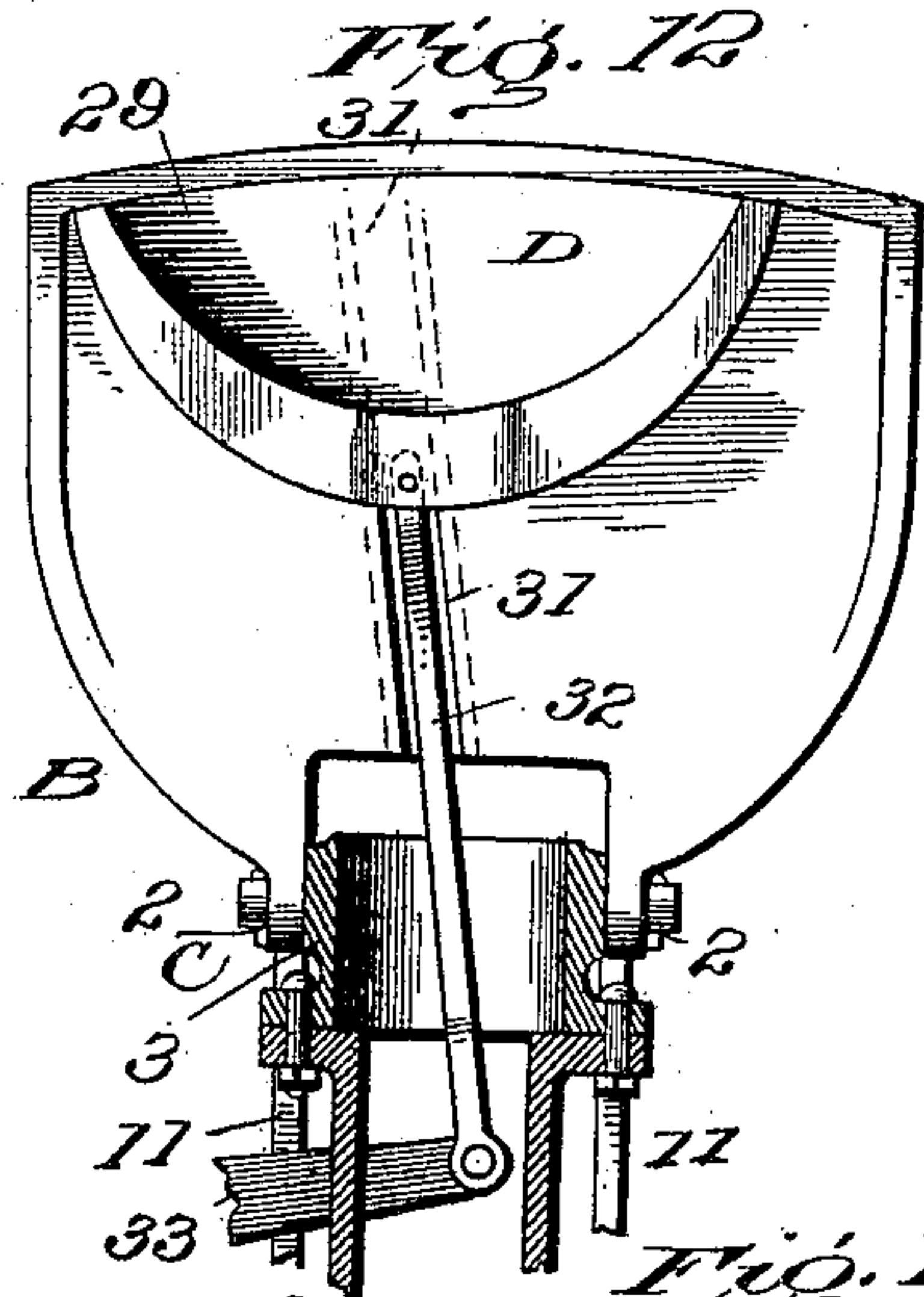
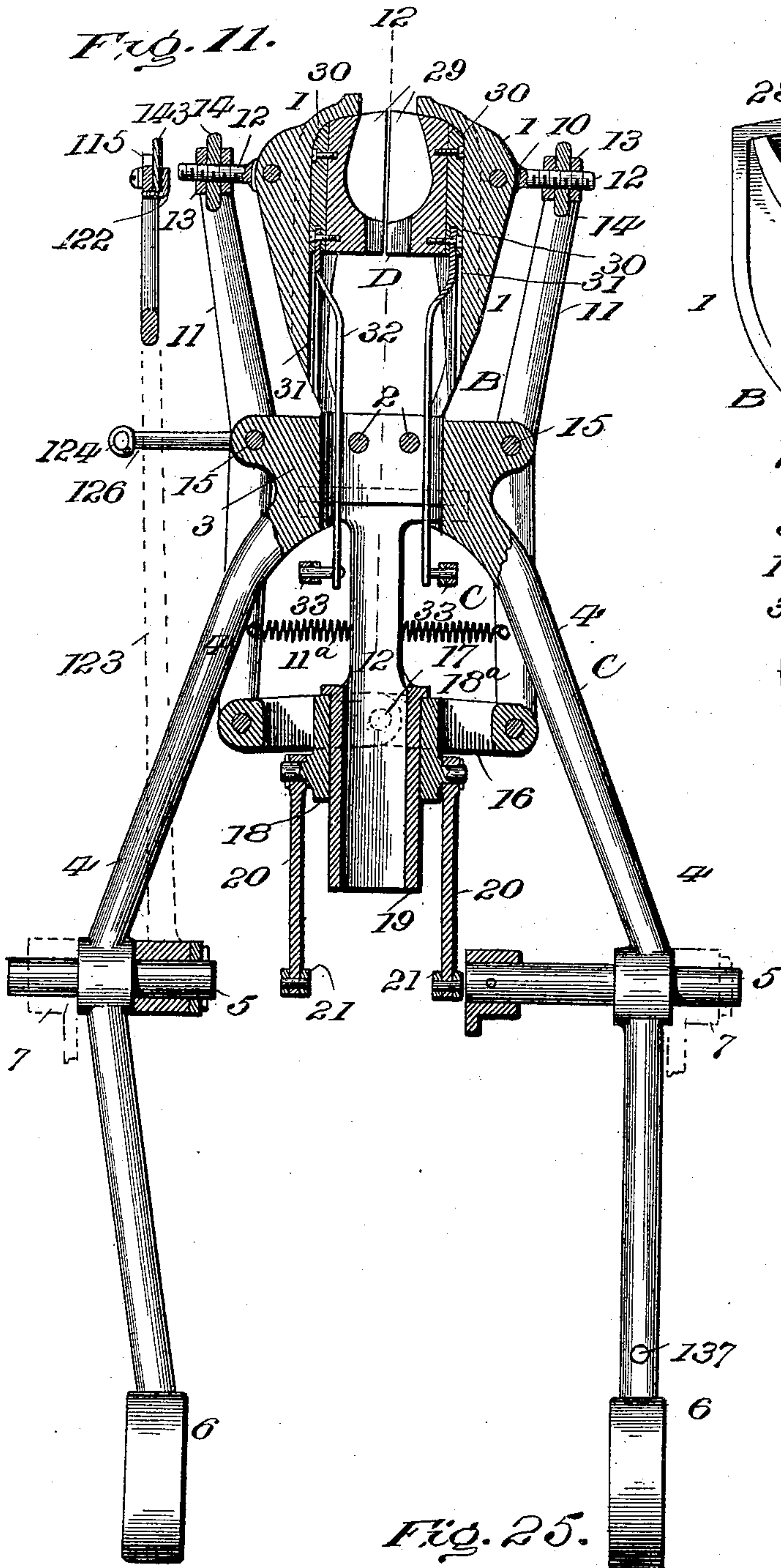
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Fig. 14.

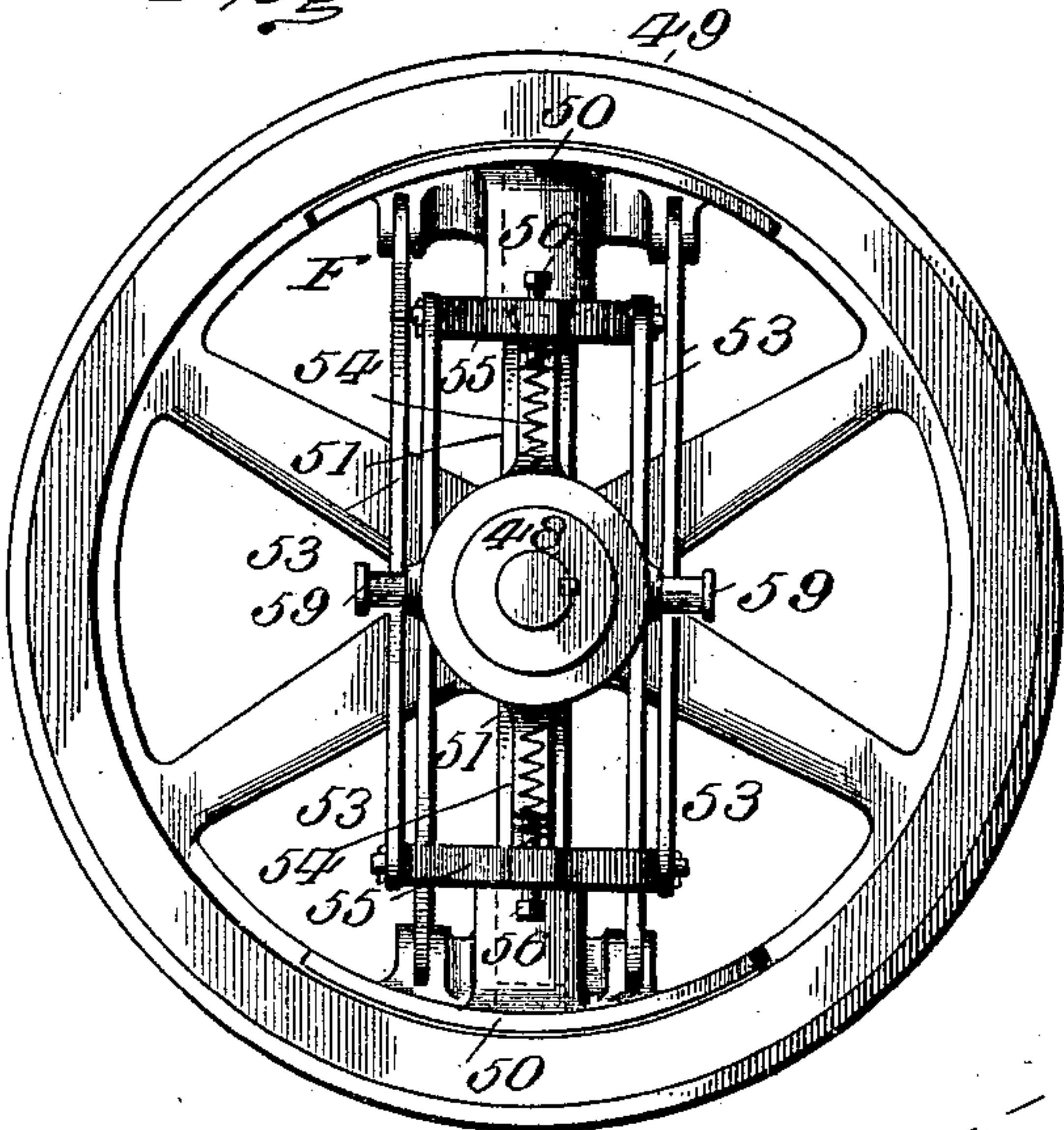


Fig. 15.

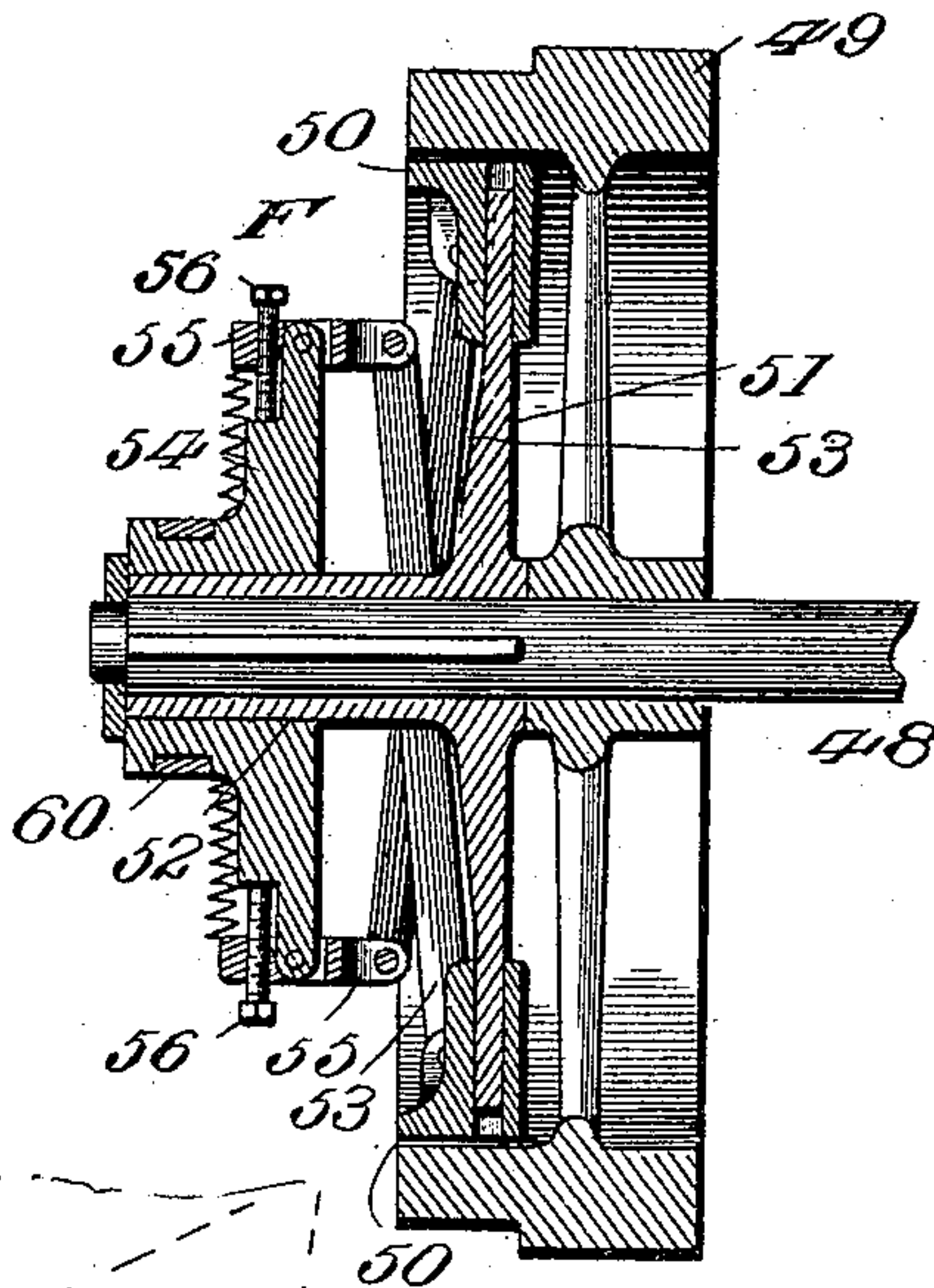
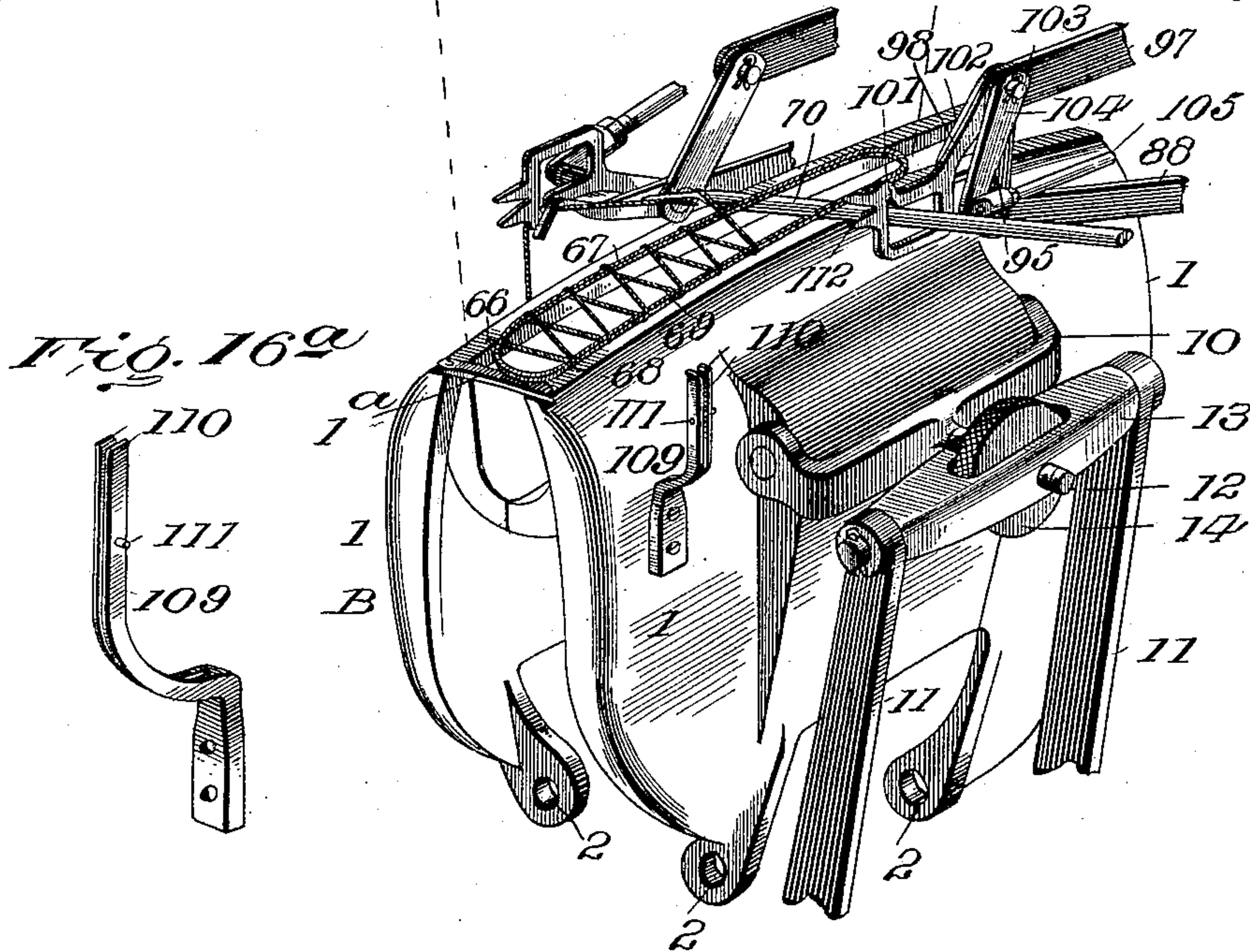


Fig. 16.



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Fig. 17.

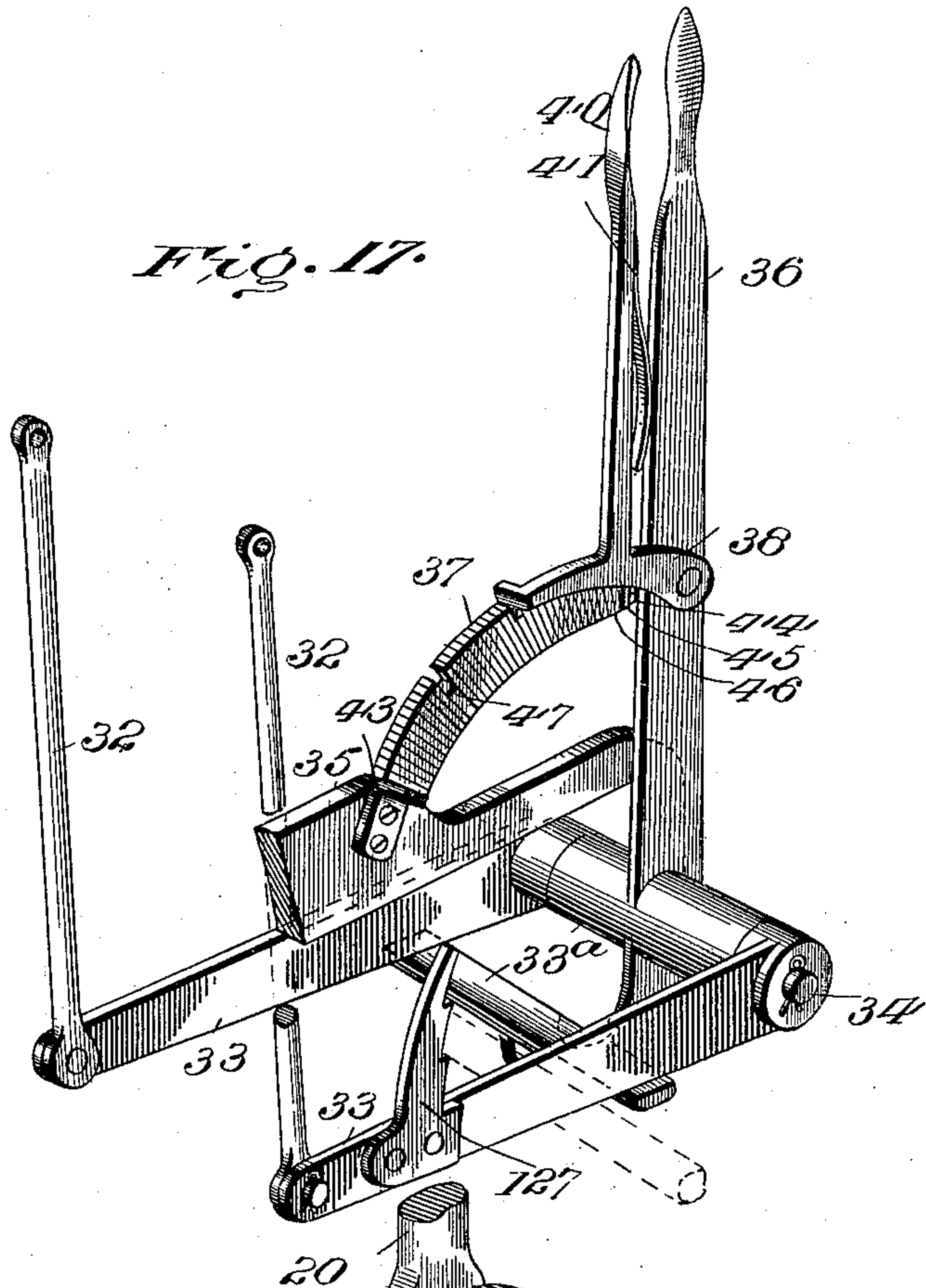


Fig. 18.

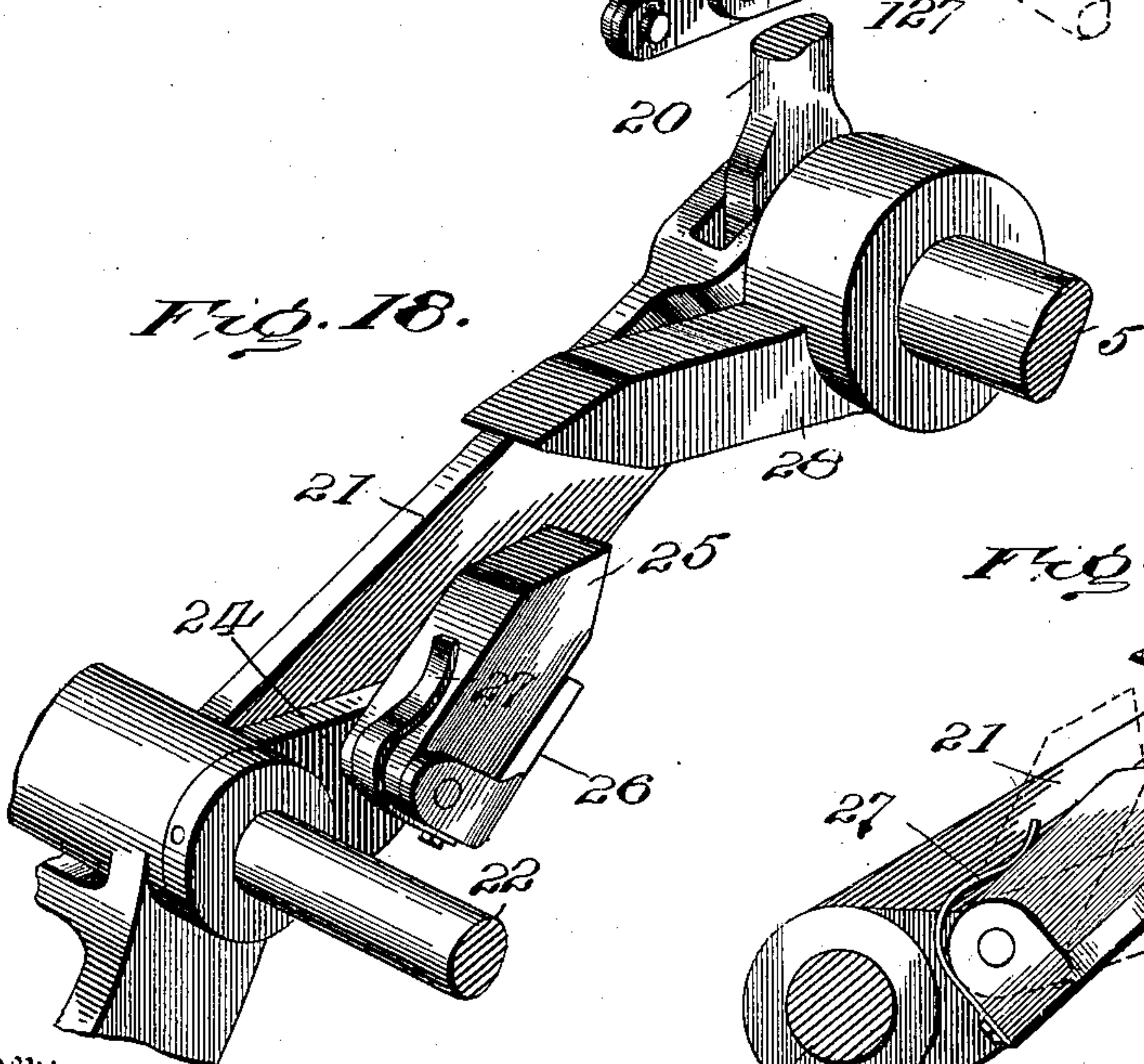
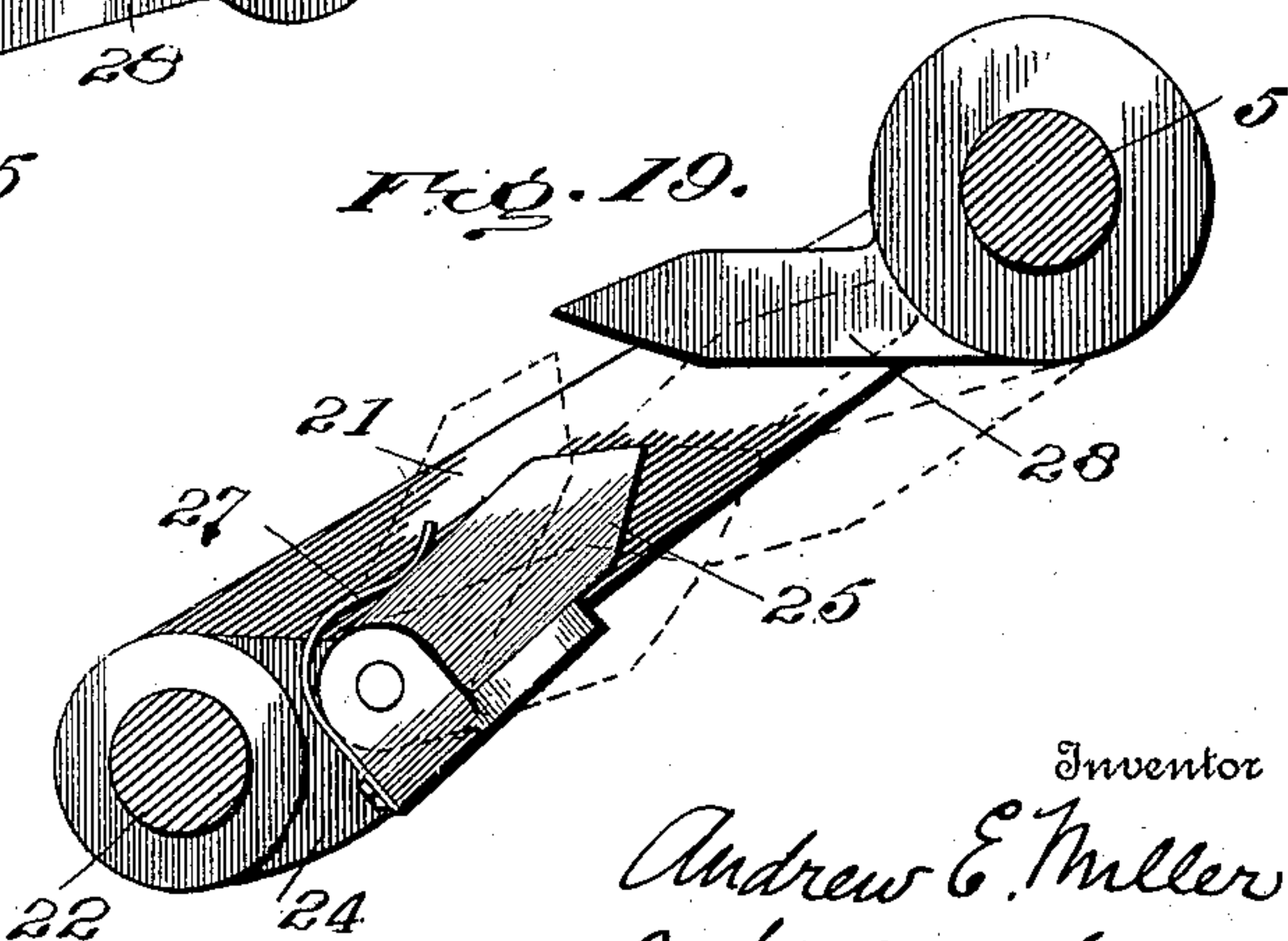


Fig. 19.



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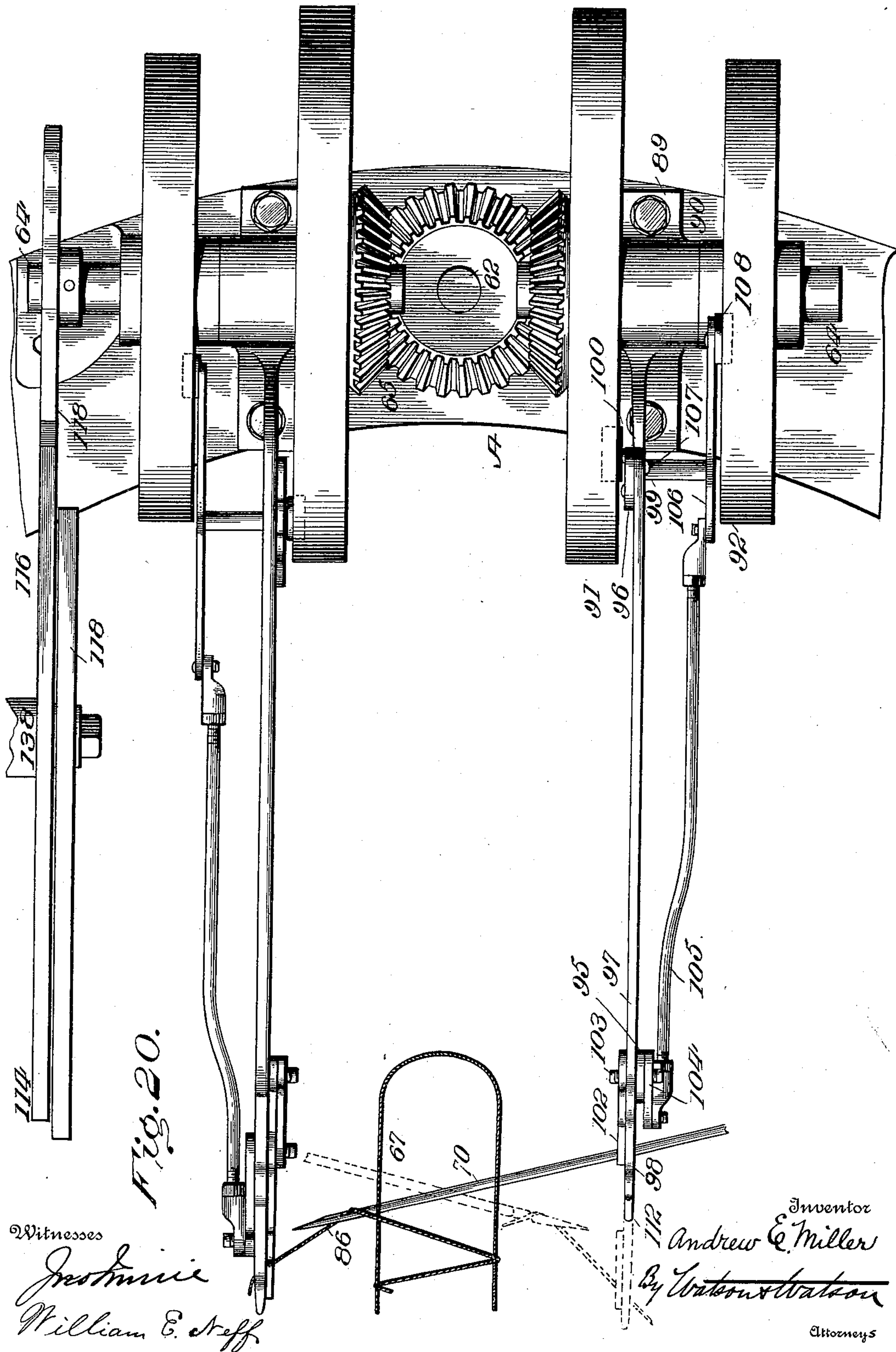
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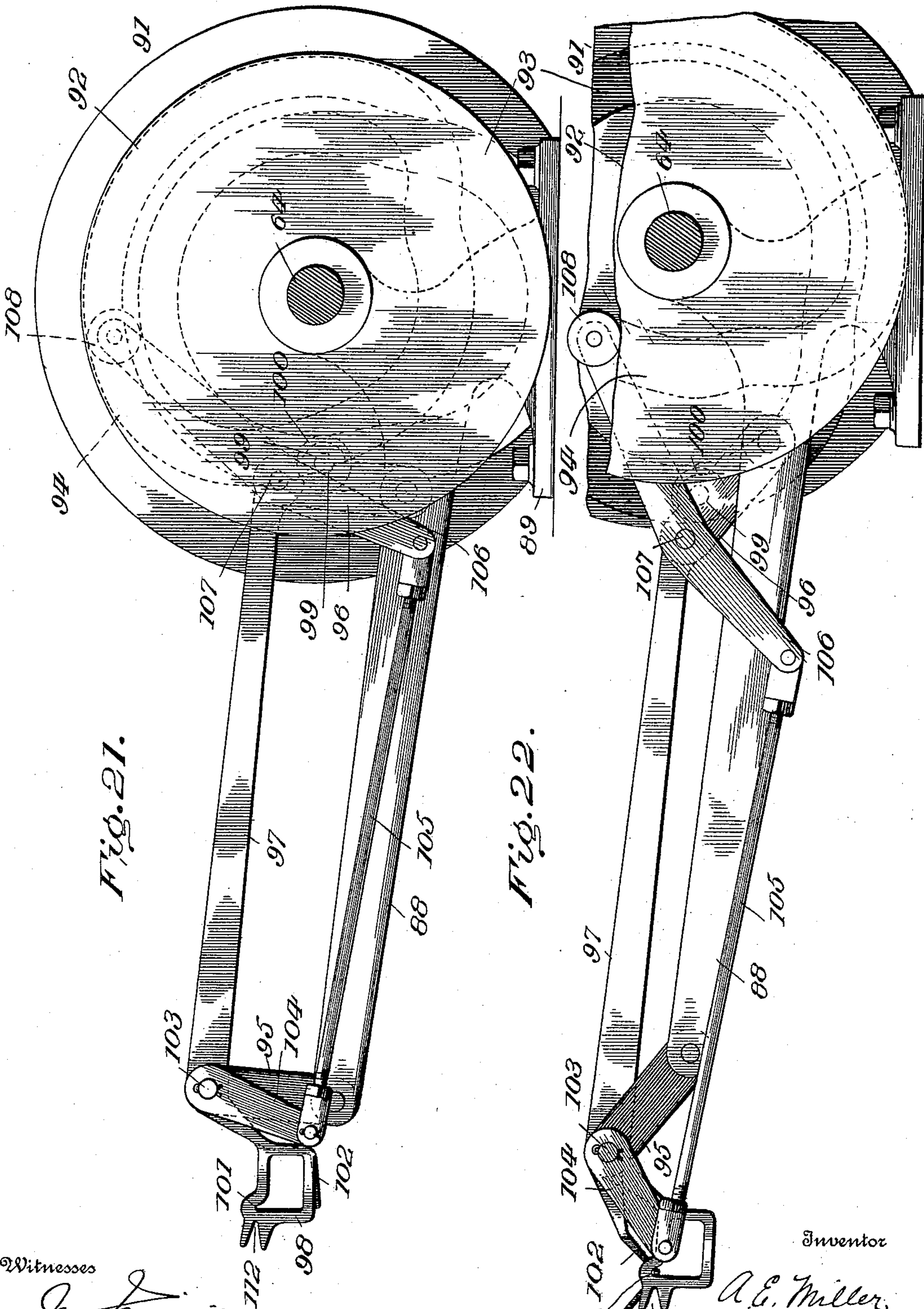


Fig. 21.

Fig. 22.

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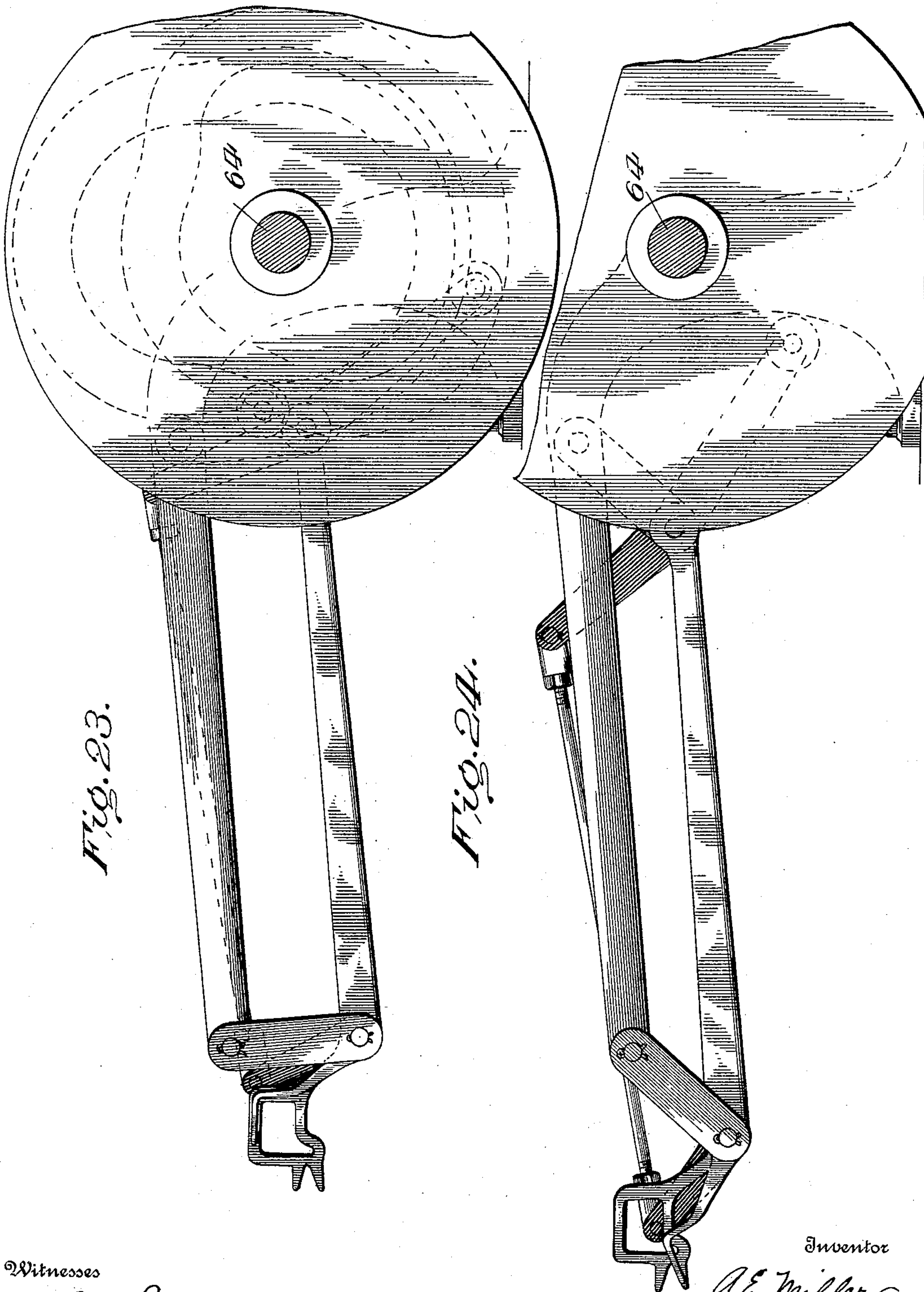
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(No Model.)

12 Sheets—Sheet 12



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# UNITED STATES PATENT OFFICE.

ANDREW E. MILLER, OF BALTIMORE, MARYLAND, ASSIGNOR TO HERBERT CASSARD, OF CHICAGO, ILLINOIS.

## BROOM-SEWING MACHINE.

SPECIFICATION forming part of Letters Patent No. 618,798, dated January 31, 1899.

Application filed January 27, 1898. Serial No. 668,122. (No model.)

*To all whom it may concern:*

Be it known that I, ANDREW E. MILLER, a subject of the Queen of Great Britain, residing at Baltimore city, in the State of Maryland, have invented certain new and useful Improvements in Broom-Sewing Machines, of which the following is a specification.

The object of this invention is to produce a broom-sewing machine which shall be largely automatic in its action and therefore adapted to be run by comparatively unskilled operatives.

Further objects are to produce a machine which is strong and comparatively simple in construction, rapid in operation, and which will in a large measure satisfy the demand for an automatic machine of this character.

Among the salient points of the invention may be enumerated, first, simple and rapid means for vising the broom, the operation being performed by simply depressing a treadle; second, devices for automatically starting the sewing mechanism after the broom is vised; third, automatic means for stopping the sewing mechanism at the termination of each row of stitches; fourth, means for adjusting the angularity of the needles, whereby brooms of different thicknesses can be sewed with stitches of the same length, thereby economizing thread in sewing the thinner brooms; fifth, improved needle-threading mechanism; sixth, a novel adjustment of the broom in the vise by which the first stitch of each of the rows is automatically located at a uniform distance from the edge of the broom; seventh, devices for automatically increasing the number of stitches as the successive rows of stitching become longer, and, eighth, means for variably arranging the stops which regulate the height of a broom in the vise, whereby the distances between rows of stitching may be varied as desired.

The invention further consists in various details of construction and arrangement, all of which will be described in the following specification, reference being had to the accompanying drawings, in which—

Figure 1 is a side elevation of the machine. Fig. 2 is a front elevation. Fig. 3 is a plan view. Fig. 4 is a side elevation, partly in section. Fig. 5 is a plan view of parts of the

machine below the line 5 5, Fig. 4. Figs. 6 and 7 are diagrams illustrating the winding and sewing. Fig. 8 is a side view of the vising mechanism, detached parts being broken away. Figs. 9 and 10 are enlarged sectional views on the lines 9 9 and 10 10 of Figs. 8 and 9, respectively. Fig. 11 is a sectional view on the line 11 11, Fig. 8. Fig. 12 is a sectional view on the line 12 12, Fig. 11. Fig. 13 is a view of the feed-rack detached. Figs. 14 and 15 are rear and sectional views of the clutch. Fig. 16 is a perspective view of the vise, showing a needle-receiving thread. Fig. 16<sup>a</sup> is a perspective view of the thread-holder. Fig. 17 is a perspective view of the devices for raising and lowering the broom-holder. Figs. 18 and 19 are details in perspective of the devices for automatically opening the vise. Fig. 20 is an enlarged plan view of the needle-threading devices and their operating-cams. Figs. 21 and 22 are side views of the right-hand-needle-threading devices. Figs. 23 and 24 are side views of the left-hand-needle-threading devices.

The various working parts of the machine are mounted on a main frame A, which, as shown in Figs. 1 and 2, is in the form of a tapering shell provided with suitable bearings and open on the front side to permit of access to the mechanism within and allow the vise to swing in and out.

*The vising mechanism.*—The vise B, in which the broom is clamped during the sewing operation, consists in a pair of jaws 1, which are connected to the vise-frame C by suitable hinge-joints 2. The vise-frame C has a head 3, to which the vise-jaws are hinged, and two branches or legs 4, which are provided with trunnions 5 about midway of their length, the lower ends of the branches 4 being provided with counterbalancing-weights 6. The trunnions 5 rest in suitable bearings 7 on the front of the main frame. The lower end of the vise-frame is normally drawn to the rear, and the vise therefore normally thrown forward, by a spring 8, which is connected at its forward end to the vise-frame and at its rear end to the main frame, as shown in Figs. 1 and 5.

The vise-jaws 1 are connected with an operating-treadle 9, Figs. 1 and 2, by a system



of levers and connecting devices, which will now be described. Upon the back of each vise-jaw is a pivoted yoke 10, Figs. 11 and 16, which is adjustably connected with vertical  
 5 levers 11 by means of a threaded shank 12, which passes through a cross-head 13, and an adjusting-nut 14, which works in a slot or opening in the cross-head. The cross-head 13 is pivotally connected to the upper ends  
 10 of levers 11, and said levers are pivoted mid-way of their length, at 15, to the head 3 of the vise-frame. The lower ends of the levers 11 are connected to the outer ends of toggle-levers 16, and the inner ends of levers 16 are  
 15 pivoted at 17 to a collar 18, which slides on a cylindrical shank 19, depending from the head of the vise-frame. The collar 18 is connected by links 20 with arms 21, which are rigidly mounted on a rock-shaft 22, having bearings  
 20 in brackets 23, Figs. 1, 2, 5, and 8. To the shaft 22 is also rigidly connected the treadle 9. When the treadle is pressed down, the arms 21 and collar 18 are thrown up until the inner ends of the toggle-levers 16 reach a  
 25 point slightly above the horizontal line between the pivots of the levers, as shown in Fig. 11, and close the vise-jaws on the broom. In this position the vise-jaws are securely located, the elasticity of the broom tending to  
 30 raise the inner ends of links 16 and the collar 18 and their further upward movement being prevented by the shoulder 18<sup>a</sup>. The jaws are adjusted to the average thickness of the brooms to be sewed before beginning  
 35 operations by means of adjusting-nuts 14, and a broom can therefore be vised instantly by simply pressing down the treadle with the foot. When the vise is closed, the pivots which connect the links 20 with the arms 21  
 40 are in the axial line of the trunnions 5, upon which the vise-frame swings, Figs. 8 and 11. The vise-frame may therefore be moved to any position upon its trunnions without unlocking or disturbing the vise-jaws.

45 The vise is automatically opened each time it comes forward into the position of rest, so that the broom may be adjusted to another level or a new broom is inserted, by the following devices: Upon the rock-shaft 22 is an arm 24,  
 50 which carries a pivoted tappet 25. The tappet 25 is pressed against a fixed stop 26 on the arm 24 by a spring 27, the stop and spring being so arranged that the tappet if struck on one side will yield and if struck on the  
 55 other side will carry the arm 24 with it. On one of the trunnions 5 of the vise-frame is a suitably-shaped arm 28, which swings in the plane of the tappet. When the vise-frame is thrown back into the machine, the arm 28  
 60 strikes the under side of the tappet and passes it without operating the arm 24; but when the vise-frame moves forward as it nearly reaches the position of rest the arm 28 engages the upper side of the tappet, as shown  
 65 in dotted lines in Fig. 19, and the further movement of arm 28 presses down the arm 24, rocks the shaft 22, draws down the tog-

gle-arms 16, and unlocks and opens the vise, this movement being assisted by a spring 11<sup>a</sup>. The rapid means for locking the vise and the  
 70 automatic means for opening the vise, above described, are of great importance, as they save much time and labor, which have heretofore been expended by the operatives in performing these operations. 75

While being sewed, the broom is held in a clamp D, consisting of two jaws 29 within the vise-jaws. These inner jaws serve as a former or mold to shape the broom properly, their inner faces being suitably shaped for this purpose. The jaws 29 have dovetailed ribs 30,  
 80 which engage corresponding inclined guide-grooves 31 on the inner faces of the vise-jaws. These grooves, as shown in Figs. 1, 8, and 12, are substantially parallel with the line of the  
 85 front edge of the broom E, so that as the clamp D and the broom are lowered to sew successive lines of stitching the front edge of the broom will maintain a constant relation to the point where the first stitch is taken, as  
 90 will be explained more fully hereinafter. The jaws of clamp D are connected by links 32 with a pair of arms 33 upon a shaft 34, carried by brackets 35 on the vise-frame, Figs. 1, 8, and 9. The broom-clamp is supported  
 95 by the lower curved end 36<sup>a</sup> of a lever 36, which carries a cross-bar 33<sup>a</sup>, upon which the arms 33 rest. The lever 36 is pivoted on shaft 34 and held in position by a notched arc 37, a pawl or latch 38 on the lever being adapted  
 100 to engage the notches in the arc 37. The pawl 38 is provided with a lever 40. When the lever 40 is pressed toward the handle of lever 36, the pawl 38 is disengaged from the notched arc and the lever 36 may be moved  
 105 to any desired position. On releasing the lever 40 a spring 41 throws the pawl into engagement with the notched arc.

To permit the distances between successive rows of stitches on the broom to be varied or  
 110 adjusted to suit the requirements or fancies of different manufacturers, I provide means for variably spacing the locking-notches on the arc 37. As shown in Figs. 8, 9, 10, and 17, this consists of an inner curved bar  
 115 43, having one end rigidly attached to the bracket 35 and the other end screw-threaded and provided with a nut 44 and washer 45. Upon the rod 43 are mounted a series of detachable U-shaped pieces 46, which extend  
 120 considerably above the bar, and several U-shaped spacing-pieces 47, which separate the pieces 46 at intervals and form notches between them. The pieces 46 and 47 are arranged so as to place notches at the desired  
 125 distances apart and then clamped tightly in position by means of the nut 44. It will be seen that the notches can be spaced uniformly or variably, so that the distances between the lines of stitching will be uniform  
 130 or variable, as desired.

In operation the broom is placed in the clamp D while the latter is in its highest position. The vise is then closed and the broom



held in this elevated position until the first line of stitches is completed. While the sewing operation is taking place, the operator is free to shift the lever 36 until the pawl engages the next notch in the arc 37. This lowers the support 33<sup>a</sup>, and the levers 33 are free to drop as soon as the vise is opened. After the line of stitches is completed the vise falls forward and opens automatically, as heretofore described, and the broom-clamp drops automatically until the arms 33 rest on the support 33<sup>a</sup> and the broom is brought into position for the next line of stitches. The parts are shown in Fig. 8 in position for the first line of stitches in full lines and in position for the third line of stitches in dotted lines.

*Driving mechanism.*—Upon the drive-shaft 48, which is mounted in suitable bearings in the main frame, is a constantly-running loose pulley 49, which may be constructed for several speeds, if desired. To start the machine, the pulley 49 is engaged with the shaft by means of a suitable clutch F. As shown in Figs. 14 and 15, the clutch F comprises a pair of shoes 50, which slide radially upon arms 51, connected to a hub 52, which is fast upon the shaft 48. The shoes 50 are moved radially by means of two pairs of links 53, which connect the shoes with a head 54, sliding upon the hub 52. To provide for radial adjustment of the shoes, the links 53 are connected to short levers 55, pivoted on the head 54, the said levers being adjustable by means of set-screws 56, which bear on the head, as shown in Figs. 15 and 16. The clutch-head 54 is moved upon the hub 52 by a lever 57, which has its lower end pivoted to the base of the main frame at 58 and its upper end pivotally connected with projecting pins 59 upon a collar 60, which runs in a groove in the head 54. It will be evident that when the lever 57 is moved forward the clutch will engage the running pulley 49 and the main shaft will start, and vice versa. Upon the inner end of shaft 48 is a crank-disk 61, which drives the sewing-needles. The vertical shaft 62 is driven from the main shaft by bevel-gears 63, and a pair of cam-shafts 64 at the top of the machine are driven in opposite directions by the shaft 62 through bevel-gears 65, Figs. 3 and 4.

*Sewing mechanism.*—The stitches produced by the machine are illustrated in Fig. 6. After a broom is adjusted and clamped in the vise one end 66 of a piece of twine or thread of suitable length is tucked into the broom by a suitable instrument. The thread is then wrapped about the broom just above the vise, forming one or more binding-strands 67, Figs. 6 and 7. The free end of the thread is then fastened by passing it under the binder at the point 68, where the other end was tucked in, and into a thread-holder 109. The machine is then started and the thread is taken from the holder and automatically passed into the eye of the first needle. One of the needles operates above the binder on both sides of the broom and the other operates below

the binder upon both sides, the thread being thus carried across the broom in one direction over the binder and returned under the binder, as clearly shown in Fig. 6. To hold the binder slightly above the vise to insure the right-hand needle passing under it, I provide a guard 1<sup>a</sup> upon the forward end of one of the vise-jaws, Figs. 3 and 16.

I provide for sewing brooms of different thicknesses with stitches of the same length in a very simple manner. This is accomplished by using for all thicknesses a uniform feeding device and changing the angle of the needle-ways with respect to the plane of the broom, the rule being that one-half of the base of the triangle formed by two consecutive stitches should be always equal to the unit of feed movement. For example, in Fig. 6 is illustrated in full lines a thick broom having consecutive stitches at an acute angle with each other. In dotted lines in the same figure is illustrated a thin broom having stitches the same distance apart on its faces and necessarily forming a much less acute angle with each other. By simple adjustments, to be hereinafter described, the machine is readily adapted to sew brooms of different thicknesses with stitches of equal length. In machines as heretofore constructed the length of stitch has been varied with the thickness of the broom, the thinner brooms being sewed with the shorter stitches. This has resulted in unnecessarily increasing the amount of twine and the length of time required to sew thin brooms, besides producing work which lacks uniformity in appearance.

The needles 70 are held by set-screws 71 in suitable sockets in slides 72, which slide in grooves in adjustable ways 73, Figs. 1, 2, and 3. The needle-slides are driven alternately toward and from the center of the machine by connections consisting of rocking arms 74, links 75, connecting the upper ends of the arms with the slides, and pitmen 76, connecting the middle points of the arms with a crank-pin 77 on disk 61. The pitmen 76 are united to the crank-pin 77 and the arms 74 by suitable universal joints 78, so that the arms may be operated in different positions.

The needle-ways 73 are connected with the main frame by bolts 79, which pass through curved slots 80 in the top of the main frame, Fig. 3. These slots are all concentric with the vertical axis of the machine through which the needles pass, and the needle-guides are always adjusted so that the needles will pass through this axis. In order to preserve the proper relation between the arms 74 and the needle-guides in the various adjustments of the latter, said arms are hinged at their lower ends to brackets 81, which are adjustably bolted to steps 82 upon the base of the main frame, with bolts 84 passing through slots 83. These slots are so inclined that the arms 74 may be adjusted about the vertical central line of the machine along with the needle-guides and at the same time adjusted slightly



from and toward said central line, as may be necessary in order to compensate for the lengthening or shortening of the effective lengths of the pitmen 76, due to their angular movement toward or from the plane of the crank-disk 61. The adjustments just described permit the needle guides or ways 73 to be adjusted angularly sufficiently to sew the thickest or thinnest brooms with the same length of stitch, while at all times the needles are driven in paths normal to the vertical axis of the machine, which passes through the middle of the broom during the sewing operation.

The needles are provided with open hook-shaped eyes 85, adapted to draw the thread through the broom as the needle is drawn out. One of the needles (the right-hand needle, as shown) has its eye underneath and its point 86 near the lower edge. This needle passes through the broom close to the vise and underneath the binder. The other needle has the eye above and its point near the upper edge, and it passes through the broom above the binder on both sides.

*Needle-threading mechanism.*—The needle-threading mechanisms on opposite sides of the machine operate alternately, as do the needles, and one is inverted with respect to the other, the one being required to thread the needle upon its under side, while the other threads it upon the upper side. With these exceptions the constructions of the mechanisms for both sides of the machine are exactly alike, and it will be sufficient to describe but one of them in detail.

The right-hand-threading mechanism is supported on an arm 88 of a bracket 89, which carries the bearing 90 of the right-hand cam-shaft 64. Upon said cam-shaft are disks 91 and 92, having cam-slots 93 and 94, respectively, on their adjacent faces, Figs. 3, 16, 20, 21, and 22. Upon the arm 88 are pivotally mounted two links 95 96, and pivoted to the upper ends of these links is a rod 97, upon the forward end of which is a threading-loop 98. Upon the link 96 is a stud 99, carrying a roll 100, which travels in the cam-groove 93. This cam-groove imparts to the links 95 96 a rocking movement, which carries the threading-loop forward and downward and then rearward and upward in the arc of a circle having the length of links for a radius.

The loop 98 has an opening which is wide at the bottom and provided with a narrow recess 101 in the upper forward corner, into which the thread is carried at the proper time by a finger 102. The finger 102 is fixed upon the shaft 103, which passes through the upper end of link 95. Upon this shaft is an arm 104, which is connected by a rod 105 with a cam-lever 106. The cam-lever 106 is pivoted on the pin 107 at the upper end of link 96 and carries upon its upper end a roll 108, running in cam-groove 94 of the disk 92.

After the operator inserts the end of a thread, winds the thread around the broom

to form the binder, and passes the free end of the thread through the binder, as illustrated in Figs. 6 and 7, he passes the free end of the thread into a holder 109, which is attached to the right-hand vise-jaw, Figs. 16 and 16<sup>a</sup>. This holder consists of a fork having spring-tines 110, which hold the thread frictionally. A pin 111, attached to one of the tines and passing through an opening in the other, serves to keep them parallel and as a stop to prevent the thread from going too low in the notch. Upon the loop 98 of the threading mechanism is a notch 112, which takes the thread from the holder 109 and passes it into the eye of the left-hand needle to form the first stitch, when the machine is started, after which the threads are drawn through the loops 98 and held by the fingers 102, as will be explained hereinafter.

The left-hand-threading mechanism is illustrated in detail in Figs. 23 and 24, which correspond with Figs. 21 and 22. It will be observed that the parts are inverted, but otherwise similar to the right-hand-threading mechanism.

*Feeding mechanism.*—After a broom is clamped in the vise and the thread wrapped about it to form the binder and adjusted in the thread-holder 109 the vise-frame is rocked on its trunnions, carrying the vise back to the sewing mechanism until it is stopped by an abutment 113. In this position the vise is caught by a feed-pawl 114, which engages a feed-rack 115, Figs. 1, 4, 8, and 13. The feed-pawl is on a centrally-pivoted lever 116, the pawl being normally pressed into engagement with the rack by a spring 117 and disengaged momentarily from the rack after each stitch by tappets 118 on the left-hand cam-shaft 64, the tappets striking a projection 119 on the rear end of the lever. The rack 115 is provided with slots 120 and adjustably fastened by bolts 121 to a curved arm 122 on the upper end of a rack-lever 123, which is pivoted to one of the trunnions 5 of the vise-frame, Figs. 11 and 13. The rack and also the upper edges of the vise-jaws are curved, having radii equal to their distances from the trunnions of the vise-frame. A spring 124, connected to a pin 125 on the rack-lever, and a stud 126, projecting from the vise-frame, draw the rack-lever rearward against a stepped stop-plate 127, which is carried by one of the arms 33, the rack-lever being provided with a projection 128, which engages the stop-plate, Figs. 1, 8, and 17.

The broom is adjusted, as heretofore described, to the different levels for the several rows of stitching in a line parallel with its forward edge, and hence the first stitch of each row is made at a substantially uniform distance from the forward edge of the broom. The successive rows of stitching, however, become longer and it is desirable that the sewing should stop automatically within a substantially uniform distance from the rear edge of the broom. This is accomplished by means



of the stepped stop 127 and coöperating mechanism to be presently described. When the clutch is disengaged from the driving-wheel 49, it is held in such position by a trigger 129, which engages a notch 130 in one of the side rods 131 of a sliding frame H, which is connected with the clutch-lever 57, Figs. 4 and 5, thus holding the clutch against the action of a spring 132, which tends to draw it into engagement with the drive-wheel. The trigger 129 has a counterweight 133, which presses it into the notch 130. The trigger, which is pivoted on a pin 134, has a downwardly-extending arm 135, provided with an adjustable stud 136, and a lug 137 on the vise-frame strikes stud 136 just as the vise reaches its rearmost position, the trigger being thereby withdrawn from notch 130 and the clutch operated by the spring 132, effecting the automatic starting of the machine.

The machine is stopped automatically after the last stitch in each seam. On the bracket 138, which carries the feed-pawl lever, is pivoted a stop-lever 139, the forward end of which is inclined at 140 and normally drawn down by a spring 141. When the vise is thrown backward, the incline 140 rides up on a corresponding incline 142 on a segmental plate 143, carried by the rack-lever 123. To the rear end of lever 139 is connected a vertical rod 144, the lower end of which is vertically movable in a bearing 145. Supported on a collar 146, near the lower end of rod 144, is a rocking sleeve 147, having an arm 148, which is provided with a pin 149, extending downward into engagement with a slot in a cross-bar 150 of the frame H, which operates the clutch-lever. Another arm 151 on shaft 144 has an inclined face 152, which is engaged by an inclined cam 153 on the crank-disk 61 when the rod 144 and sleeve 147 are raised. When the vise is thrown back and the machine started, the front end of the stop-lever 139 is raised and rests on the plate 143 and the rear end of the lever is thrown down, carrying the arm 151 below the path of the cam projection 153. Immediately after the last stitch is sewed the feed-pawl releases the last tooth of the feed-rack and the vise drops forward, being impelled partly by gravity and partly by the spring 8. At the same instant the stop-lever is drawn down over the inclined end of plate 143, the rod 144 is raised, bringing the arm 151 into the path of cam 153, and as the cam strikes said arm the connected arm 148 throws the frame H backward and disengages the clutch from the drive-wheel. The frame H is engaged and held in this position by the trigger 129 until the proper time to again start the machine.

It sometimes becomes necessary or desirable to start and stop the machine by hand. For this purpose I provide a hand-lever 154, which, as shown, is loosely mounted on the treadle-shaft 22. This lever is normally held in inoperative position by springs 155, connected to fixed arms 156. Below the shaft

22 the lever 154 has an arm 157, which is in position to engage a cross-bar 158 on the frame H, and another arm 159 in position to engage the trigger 129. When the lever 154 is pushed rearward, the arm 159 disengages the trigger and permits the machine to start. By drawing the lever 154 forward the trigger is released from arm 159, and at the same time arm 157 pushes the frame H rearward, thus stopping the machine, the trigger operating to prevent it from again starting until desired.

For convenience in moving the vise a handle 160 is provided, Fig. 1, which handle is attached to rack-lever 123. The rack-lever 123 should be pulled forward by the handle 160 while the broom-clamp D is being raised by the lever 36 to withdraw the stud 128 from the path of the stepped plate 127. The steps of the stepped plate are so proportioned that the successive steps will be presented to the stud 128 as the pawl 38 is dropped into the successive notches in the arc 37. The forward movement of the vise-frame is limited by a suitable stop 161.

Operation: Normally the vise B stands in its forward position ready to receive a broom, and the clutch is disengaged from the driving-pulley, as shown in Fig. 1. When the broom is inserted in the vise, the broom-clamp D should be in its highest position, as it is most convenient to sew the lowest row of stitches first and to drop the broom for the succeeding rows. The vise when in its forward position is normally open, being opened automatically as it falls forward. The needle-ways are adjusted angularly before beginning operations to adapt the machine for the class of brooms to be sewed. The adjustment of the needle-ways may be accomplished by means of suitable gages or graduations, which to facilitate the adjustment may be stamped directly on the machine or attached to it. Assuming the machine to be properly adjusted and the parts to be in the position shown in Fig. 1, a broom is inserted in the clamp D within the vise, the handle passing down through the hollow shank 19, and the operator depresses the treadle 9 with his foot, thus clamping the broom in the vise. A piece of thread or cord of the proper length is then taken by the operator and one end 66 tucked into the forward edge of the broom just above the vise, Figs. 3, 6, 7, and 16. The thread is then wound one or more times about the broom just above the vise to form the binder and the free end tucked under the binder where the other end was inserted in the broom and then passed into the thread-holder 109. The operator now pushes the vise back to the sewing mechanism until the vise-frame is stopped by the abutment 113. Just as the vise reaches its rearmost position the pawl 114 engages the feed-rack 115 and prevents the vise from swinging forward, and at the same time the lower end of the vise-frame strikes the pin 136 and withdraws the trigger



from the notch 130, thus permitting the spring 132 to bring the clutch into engagement with the drive-wheel 49, which starts the mechanism. The left-hand needle passes first  
 5 through the loop 98 of its threading mechanism and then through the broom over the binder, coming out at the point 68, where the end 66 was tucked in. The right-hand-threading mechanism then moves forward  
 10 and downward, causing the notch 112 to take the thread which is held in the holder 109 and carry it across and into the open eye of the left-hand needle. The left-hand needle is then withdrawn, taking the free part of  
 15 the thread with it through the broom and through the loop of the left-hand-threading mechanism. Immediately after the needle is withdrawn from the loop of the left-hand-threading mechanism the finger 102 is rocked  
 20 down by its cam 94, carrying the thread into the lower corner of the loop 98 and holding it there frictionally. This movement takes place while the loop 98 remains stationary. One of the tappets 118 now strikes the lever  
 25 116, raising the pawl 114 momentarily and permitting one tooth of rack 115 to escape, the spring 8 feeding the vise forward to that extent. The right-hand needle is next thrust  
 30 through the loop of the right-hand-threading mechanism and then through the broom under the binder, the forward end of the binder being held up by the guide 1<sup>a</sup>. It may here be stated that the formation of the point of the right-hand needle is such that it raises the  
 35 binder each time it passes through sufficiently to permit it to pass beneath the binder at its succeeding movement. It is therefore only necessary that the binder should be raised at the forward end by the guide 1<sup>a</sup> sufficient to  
 40 permit the right-hand needle to pass under it the first time. As previously stated, the finger of the left-hand-threading mechanism seizes the thread as it is drawn through by the left-hand needle. After the right-hand needle  
 45 has pierced the broom the loop 98 and the finger 102 of the left-hand mechanism are moved together, without changing their relative position, forward and upward to the position shown in Fig. 24, carrying the thread  
 50 under the right-hand needle and up into its open eye. The needle is then withdrawn, pulling the thread through the broom and through the loop of the right-hand-threading mechanism, where it is seized as before and  
 55 held until the broom is fed forward and the left-hand needle again passes through to be threaded. The conformation of the cams 93 and 94 is such that the parts assume the positions shown in Fig. 21 as the needle passes  
 60 through the loop. Immediately after the needle is withdrawn the loop 98 remains stationary, while the finger 102 sweeps the thread into the corner 101, in which it is held. The cams then cause the loop and finger to move  
 65 together to carry the thread forward and up or down, as the case may be, into the eye of the needle.

The stitching is done rapidly in the manner above described, and as the thread is drawn through for the last stitch the last  
 70 tooth of the feed-rack is released and the vise is thrown forward by the spring 8. Simultaneously the vise is unlocked and opened by the engagement of the arm 28 with the pawl  
 75 25. While the stitching is taking place the operator moves the hand-lever 36 forward to the next notch in the arc 37, and therefore when the vise opens the clamp D and the broom are free to drop until the arms 33 reach  
 80 the support 33<sup>a</sup>, and thus the broom is moved down automatically into position for the next line of stitching. As the broom falls the stepped stop 127 is lowered and the rack-lever 123 is permitted to swing rearward to the extent of one or more teeth of the rack. Pro-  
 85 vision is thus made for adding one or more stitches to the next row before the automatic stop mechanism comes into operation. The inclined guides 31 cause the broom to drop in a line parallel with its rear edge, thus caus-  
 90 ing the first stitch of the new line to be the same distance from the edge as the first stitch of the previous line.

Simultaneously with the release and opening of the vise the lever 139 slips off of its  
 95 support 143, and the rear end of the lever raises rod 144, bringing the arm 151 into the path of the cam 153 on the disk 61. The arm 151 is immediately rocked and its connected  
 100 arm 148 pushes frame H rearward, releasing the clutch and stopping the machine. The trigger 129 engages the frame H and holds the clutch from the engagement with the driving-pulley until the operator has vised the  
 105 broom and arranged the thread for the next line of stitching, when the above operations are repeated. The operation of the hand-lever 154 has been heretofore described.

My invention consists in certain broad improvements in broom-sewing mechanism and  
 110 also in various details of arrangement and construction. So far as the broader features of the invention are concerned I desire it understood that I am not limited to the particular devices illustrated and described, as many  
 115 mechanical equivalents may be substituted.

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

1. In a broom-sewing machine, the combination of a vise movable bodily to and from the sewing mechanism, a treadle for closing the vise, and connections between the treadle and the vise-jaws constructed and arranged to permit the vise to move bodily when closed  
 125 without disturbing its relation to the treadle, substantially as described.

2. In a broom-sewing machine, the combination of a vise-frame having a rocking movement on suitable pivots to carry the vise to  
 130 and from the sewing mechanism, vise-jaws movably connected to said frame, a treadle, and a system of levers and connections between the treadle and the vise-jaws, said con-



nections having pivot-joints in line with the vise-frame pivots when the vise is closed, whereby the vise-frame may be rocked without disturbing the relative position of the vise-jaws, substantially as described.

3. In a broom-sewing machine, the combination of a vise-frame constructed to rock on suitable pivots, vise-jaws pivoted to said frame, levers pivoted to the frame and connected to the vise-jaws, toggle-links connected to said levers, a treadle and connections between the treadle and the toggle-links, substantially as described.

4. In a broom-sewing machine, the combination of the vise-frame rocking on suitable pivots, vise-jaws movably connected to the vise-frame, levers connected with the vise-jaws and pivoted to the vise-frame, the toggle-links connected with the levers, the treadle, and connections between the treadle and the toggle-links, said parts being so arranged that the toggle-links are out of line with each other when the vise is closed whereby the vise is locked when closed, substantially as described.

5. In a broom-sewing machine, the combination of the rocking vise-frame, the vise-jaws movably connected to the vise-frame, levers pivotally connected with the vise-frame, adjustable connections between the upper ends of said levers and the vise-jaws, and toggle-links connected with the lower ends of said levers, substantially as described.

6. In a broom-sewing machine, the combination with a rocking vise-frame, vise-jaws pivotally connected to said frame, toggle-links for operating the vise-jaws, said jaws being closed when the links are nearly in line with each other, and adjustable connections between the links and the vise-jaws, substantially as described.

7. In a broom-sewing machine, a rocking vise-frame comprising a head, depending legs pivotally mounted midway of their length, and a counterweight below said pivots, in combination with a vise supported on said frame, and means for opening and closing the vise, substantially as described.

8. In a broom-sewing machine, a rocking vise-frame comprising a head, a pair of separated legs depending from the heads, trunnions midway of the legs, counterweights at the lower ends of the legs, and a hollow guide-piece depending from the head between the legs, in combination with vise-jaws carried by the head, levers for operating said jaws, toggle-links connected to the levers, and a movable collar sliding on the central guide and connected to the toggle-links, substantially as described.

9. In a broom-sewing machine, the combination of a vise having opposing jaws, a broom-clamp movable within said jaws, and inclined guides for said clamp, whereby the broom may be adjusted in the vise in a direction approximately parallel with one of its edges, substantially as described.

10. In a broom-sewing machine, the combi-

nation of a vise having opposing jaws, inclined guideways on the inner faces of said jaws, a broom-clamp having jaws within the vise-jaws and adapted to slide on said guideways, and means for adjusting said clamp upon said guides relatively to the vise-jaws, substantially as described.

11. In a broom-sewing machine, the combination of a vise, a broom-clamp movable within the vise, a lever and connections for adjusting the clamp, and a part having notches for locking the lever, said part consisting of a curved bar and a series of interchangeable pieces mounted on said bar, substantially as described.

12. In a broom-sewing machine, the variable adjusting means consisting of a hand-lever, a latch pivoted to said lever, and a part having notches in which said latch engages, said part consisting of a curved bar, a series of interchangeable pieces mounted on said bar, smaller spacing-pieces for forming notches between said interchangeable pieces, and means for clamping all of said pieces on the bar, substantially as described.

13. In a broom-sewing machine, the combination with the sewing mechanism of a vise having a bodily movement to and from the sewing mechanism, a feed-pawl, and a feed-rack adjustably connected with the vise whereby the length of seam may be varied, substantially as described.

14. In a broom-sewing machine, the combination with the sewing mechanism of a rocking vise-frame, a vise carried by said frame, a feed-rack adjustably connected with the vise-frame whereby the length of seam may be varied, and a feed-pawl cooperating with the rack, substantially as described.

15. In a broom-sewing machine, the combination with the sewing mechanism of a vise-frame mounted to rock upon suitable pivots, a vise carried by said frame, a rack-lever swinging upon the same axis as the vise-frame, a feed-rack carried by said lever, and means for adjusting the lever relatively to the vise-frame whereby the length of seam may be varied, substantially as described.

16. In a broom-sewing machine, the combination with the sewing mechanism, a vise having a bodily movement, and a feed-rack and pawl to regulate the movement of the vise, of a broom-clamp within the vise, means for adjusting the broom-clamp, and connections between said adjusting means and the feed-rack whereby the latter is adjusted relatively to the vise to provide for longer rows of stitching as the broom-clamp is lowered, substantially as described.

17. In a broom-sewing machine, the combination with a vise, an adjustable feed-rack therefor, and a spring tending to draw said rack in one direction, of a clamp movable within the vise, and a variable stop connected with said clamp, said stop being arranged to limit the movement of the feed-rack relatively to the vise, substantially as described.



18. In a broom-sewing machine, the combination with a vise, a feed-rack adjustable relatively to the vise, and a spring tending to move the rack in one direction, of a broom-clamp adjustable within the vise, suitable connections for adjusting the broom-clamp, and a stepped stop connected with the broom-clamp and operating to variably limit the movement of the rack relatively to the vise, substantially as described.

19. In a broom-sewing machine, the combination with the vise-frame constructed to rock on suitable pivots, vise-jaws movably connected to said frame, and a broom-clamp vertically adjustable within the vise-jaws and adapted to be held by the vise when the latter is closed, of an adjustable support for said broom-clamp connected with the vise-frame and capable of being independently lowered while the clamp is sustained by the vise, whereby the clamp may drop automatically to a lower level when the vise-jaws are opened, substantially as described.

20. In a broom-sewing machine, the combination with the rocking vise-frame, the vise supported upon said frame, the broom-clamp adjustable within the vise-jaws, and the arms 33 for supporting said clamp, of the independently-adjustable support for said arms, the hand-lever for said support, and means for locking the hand-lever, substantially as described.

21. In a broom-sewing machine, the combination with the rocking vise-frame and the vise carried thereon, of the rack-lever having a fulcrum concentric with the bearing of the vise-frame, means for adjusting the rack-lever relatively to the vise-frame, a rack adjustably carried on said lever, and a handle on said lever, substantially as described.

22. In a broom-sewing machine, the combination of a broom-holding vise, means for closing the same, sewing mechanism, and devices for automatically opening said vise.

23. In a broom-sewing machine, the combination of a broom-holding vise, means for closing the vise, sewing mechanism, means for moving the vise relatively to the sewing mechanism to produce a row of stitches, and devices for automatically opening said vise at the completion of a row of stitches.

24. In a broom-sewing machine, the combination of a broom-holding vise, means for closing and locking the vise, sewing mechanism, and devices for automatically unlocking and opening said vise.

25. In a broom-sewing machine, the combination of a vise and means for closing and locking the same, sewing mechanism, means for feeding the vise relatively to the sewing mechanism to produce a row of stitches, and means for unlocking and opening the vise at the completion of a row of stitches.

26. In a broom-sewing machine, the combination of a vise and means for closing the same, a broom-clamp within the vise and adapted to be held thereby when the vise is

closed, mechanism for sewing a row of stitches, and devices for automatically opening said vise and automatically dropping the clamp to adjust the broom for a succeeding row of stitches.

27. In a broom-sewing machine, the combination with sewing mechanism, a vise having a bodily movement to and from the sewing mechanism, and a treadle operating to close said vise when depressed, of devices constructed to automatically raise the treadle and open the vise upon the completion of each row of stitches, substantially as described.

28. In a broom-sewing machine, the combination with sewing mechanism and a vise-frame constructed to rock upon suitable pivots to carry the vise to and from the sewing mechanism, of means for closing the vise, and means for opening the vise, said latter means being automatically operated by the return movement of the vise-frame upon the completion of a row of stitches, substantially as described.

29. In a broom-sewing machine, the combination with sewing mechanism, a vise-frame constructed to rock on suitable pivots to carry the vise to and from the sewing mechanism, and an arm carried by said frame, of devices for closing and opening the vise, said devices including a pivoted tappet in the path of the arm of the vise-frame arranged to permit the arm to pass idly in one direction and to be engaged by the arm moving in the opposite direction, whereby the vise is automatically opened upon the completion of a row of stitches, substantially as described.

30. In a broom-sewing machine, the combination of a vise-frame having a rocking movement, a treadle and connections therefrom for closing the vise, an arm connected with the vise-frame, a second arm connected with the treadle and a spring-tappet carried by one of said arms and projecting into the path of the other arm, substantially as described.

31. In a broom-sewing machine, the combination of normally idle sewing mechanism, a broom-holding vise, said vise and mechanism being relatively movable, and means for automatically starting the sewing mechanism when the vise is brought into proper relation with said mechanism for beginning a row of stitches.

32. In a broom-sewing machine, the combination of normally idle sewing mechanism, a broom-holding vise having a bodily movement to and from said mechanism, and means for automatically starting the sewing mechanism when the vise is moved into position for beginning a row of stitches.

33. In a broom-sewing machine, the combination of normally idle sewing mechanism and a broom-holding vise, said vise and mechanism being relatively movable, of means for automatically starting the sewing mechanism when the vise is brought into proper relation with said mechanism for beginning a row of stitches, and means for automatically stop-



pingsaid mechanism when the row of stitches is completed.

34. In a broom-sewing machine, the combination with normally idle sewing mechanism, and a vise movable to and from said mechanism, of means for automatically starting said mechanism when the vise is moved into position for beginning a row of stitches, and means for automatically stopping said mechanism when the row of stitches is finished.

35. In a broom-sewing machine, the combination of normally idle sewing mechanism, a constantly-running driving-wheel, a clutch for engaging said wheel with said mechanism, a broom-holding vise, and means for automatically operating the clutch to start the sewing mechanism when said vise and sewing mechanism are brought into operative relation with each other, substantially as described.

36. In a broom-sewing machine, the combination of a constantly-running drive-wheel, a clutch normally disconnected therefrom, a spring tending to engage the clutch with the wheel, a trigger holding said clutch from the wheel, and means for withdrawing the trigger automatically when the broom is moved into position for beginning a row of stitches, substantially as described.

37. In a broom-sewing mechanism, the combination of a vise supported to rock upon suitable pivots to and from the sewing mechanism, a clutch for bringing the sewing mechanism into action, and means for automatically operating the clutch to start the sewing mechanism when the vise is rocked into position for beginning a row of stitches, substantially as described.

38. In a broom-sewing machine, the combination of a vise movable to and from the sewing mechanism, normally idle sewing mechanism, a clutch for starting and stopping said mechanism, and means for closing said clutch when the vise is moved in one direction and for opening said clutch when the vise is moved in the opposite direction, whereby the sewing mechanism is automatically started and stopped by the movement of the vise, substantially as described.

39. In a broom-sewing machine, the combination of a constantly-running power-wheel, a driving-shaft, a clutch for connecting said wheel with said shaft, a cam on said shaft and means for engaging the clutch-operating mechanism with said cam upon the completion of a row of stitches whereby the clutch is disengaged and the shaft stopped, substantially as described.

40. In a broom-sewing machine, the combination with sewing mechanism and a vise movable to and from said mechanism, of an automatic stopping device for the sewing mechanism comprising a cam movable with said mechanism, a clutch, an arm connected with the clutch, said arm having a horizontal rocking movement to open the clutch and

a vertical movement into and out of the path of said cam, a lever connected with said arm and imparting a vertical movement thereto, and means connected with the broom-vise for holding said arm out of the path of the cam while a row of stitches is being sewed and for bringing said arm into the path of said cam upon the completion of a row of stitches, whereby the sewing mechanism is automatically stopped, substantially as described.

41. In a broom-sewing machine, the combination of a pair of needles having their paths of movement at an angle to each other, means for operating said needles, and means for changing the angle between the paths of movement of said needles, substantially as described.

42. In a broom-sewing machine, the combination of needle ways or guides, and means for changing the angle of said guides with respect to each other whereby brooms of different thicknesses may be sewed with stitches of the same length, substantially as described.

43. In a broom-sewing machine, a feed rack and pawl or equivalent devices for imparting a constant feed movement to the broom, in combination with needles arranged at an angle to each other and means for adjusting the angularity of the needles, whereby the machine is adapted to sew brooms of different thicknesses with stitches of the same length, substantially as described.

44. In a broom-sewing machine, horizontal needle-guides arranged at an angle to each other in combination with means for adjusting said guides angularly about the vertical axis of the machine, substantially as described.

45. In a broom-sewing machine, the combination of horizontal needle-guides arranged at an angle to each other, needle-holding slides upon said guides, needle-driving arms connected to brackets at the base of the machine and having their upper ends connected to said slides, and means for adjusting said needle-guides and brackets angularly, substantially as described.

46. In a broom-sewing machine, the combination of angularly-adjustable needle-guides, needle-carrying slides on said guides, rocking arms connected to said slides, a crank-pin, pitmen connecting said crank-pin with said arms, brackets to which the lower ends of said arms are pivoted and means for adjusting said brackets angularly and radially with respect to the vertical axis of the machine, substantially as described.

47. In a broom-sewing machine, a vise in combination with a thread-holding device supported on the vise and constructed to receive and hold the free portion of the thread after the binder has been placed upon the broom, substantially as described.

48. In a broom-sewing machine, a vise provided with a thread-holding device consisting of a pair of spring-fingers constructed to re-



ceive and hold the free end of the thread after the binder has been wound upon the broom, substantially as described.

49. In a broom-sewing machine, a vise provided with a thread-holding device constructed to receive and hold the free end of the thread in combination with a needle-threading device constructed to carry the thread from said thread-holder into engagement with a needle, substantially as described.

50. In a broom-sewing machine, a vise provided with a thread-holder constructed to re-

ceive and hold the free end of the thread in combination with a needle-threading device provided with a notch adapted to carry the thread from said holder into the eye of the needle, substantially as described.

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

ANDREW E. MILLER.

Witnesses:

SAML. D. BRADFORD,  
LEE PURCELL.