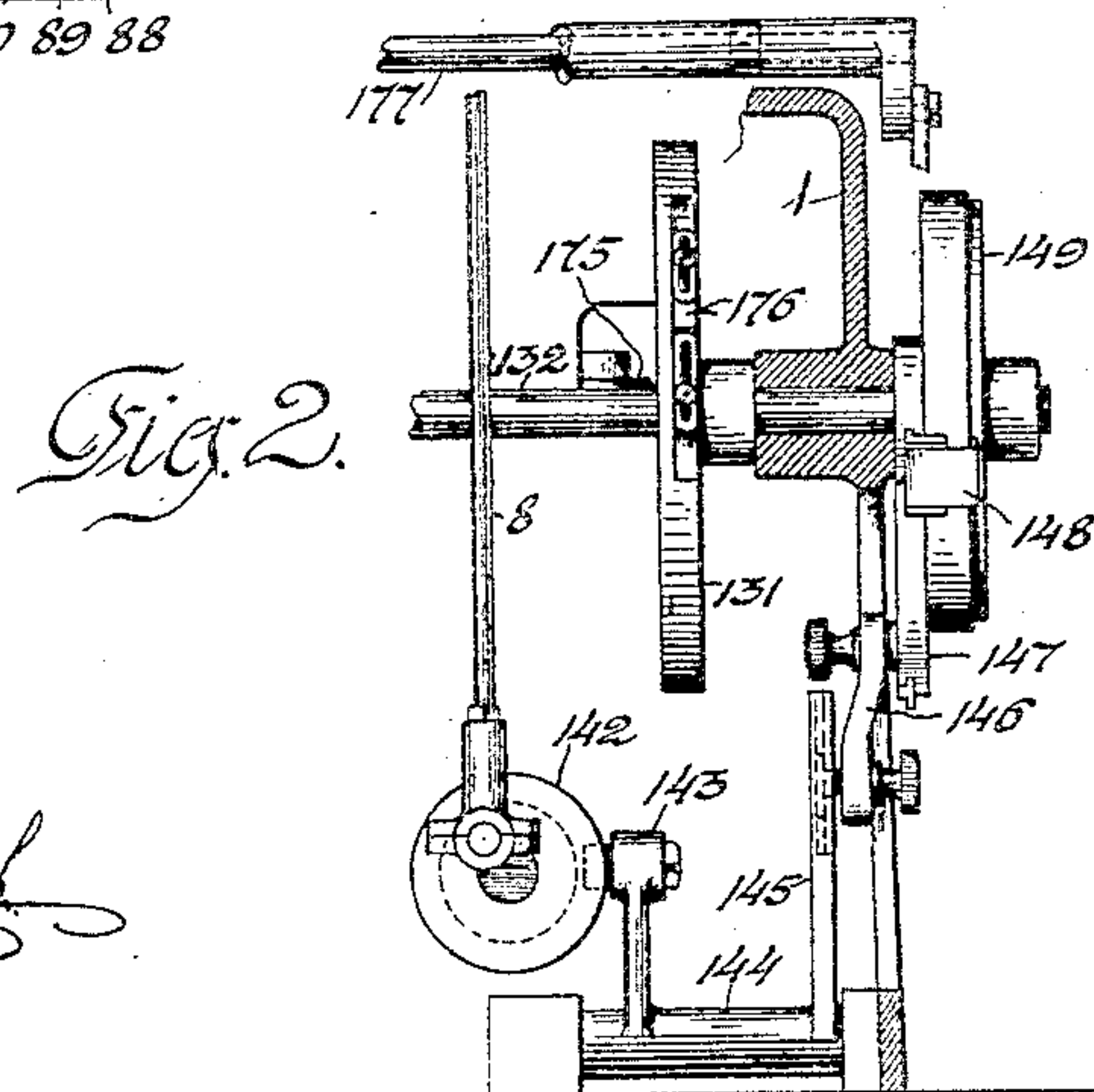
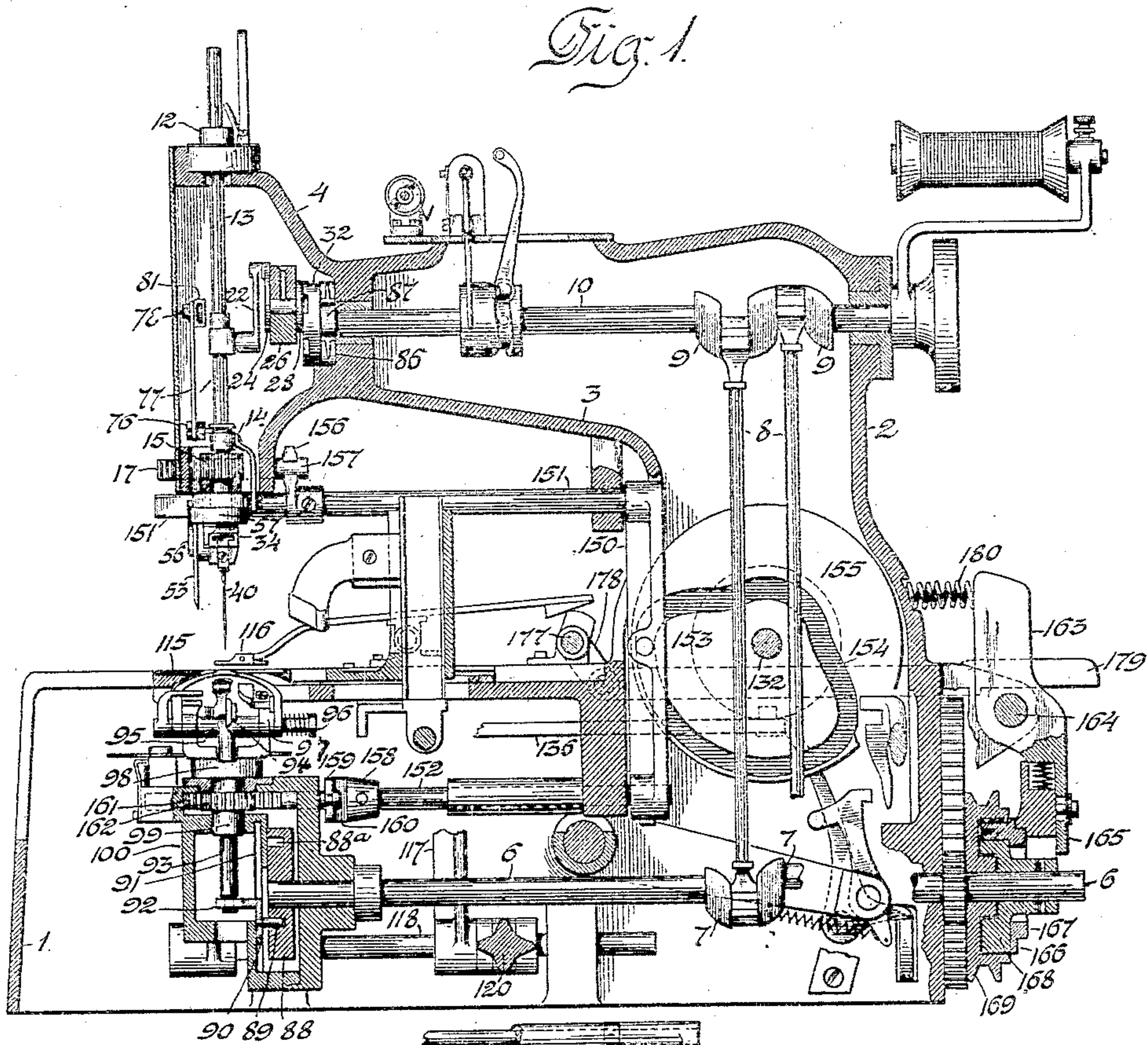


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 BUTTONHOLE SEWING MACHINE.  
 APPLICATION FILED DEC. 18, 1908.

945,148.

Patented Jan. 4, 1910.  
 3 SHEETS—SHEET 1.



WITNESSES

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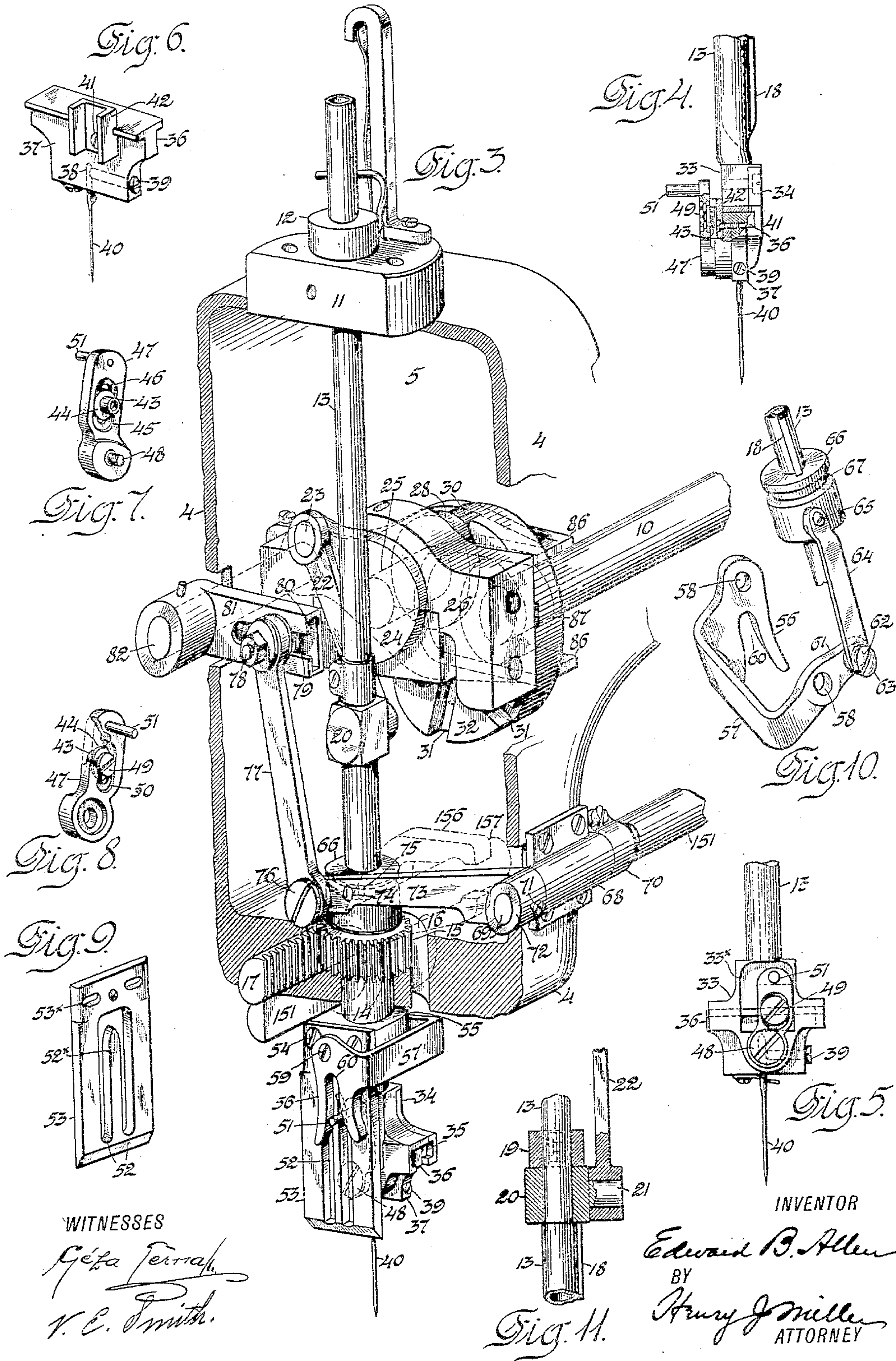


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3 SHEETS—SHEET 2.



WITNESSES

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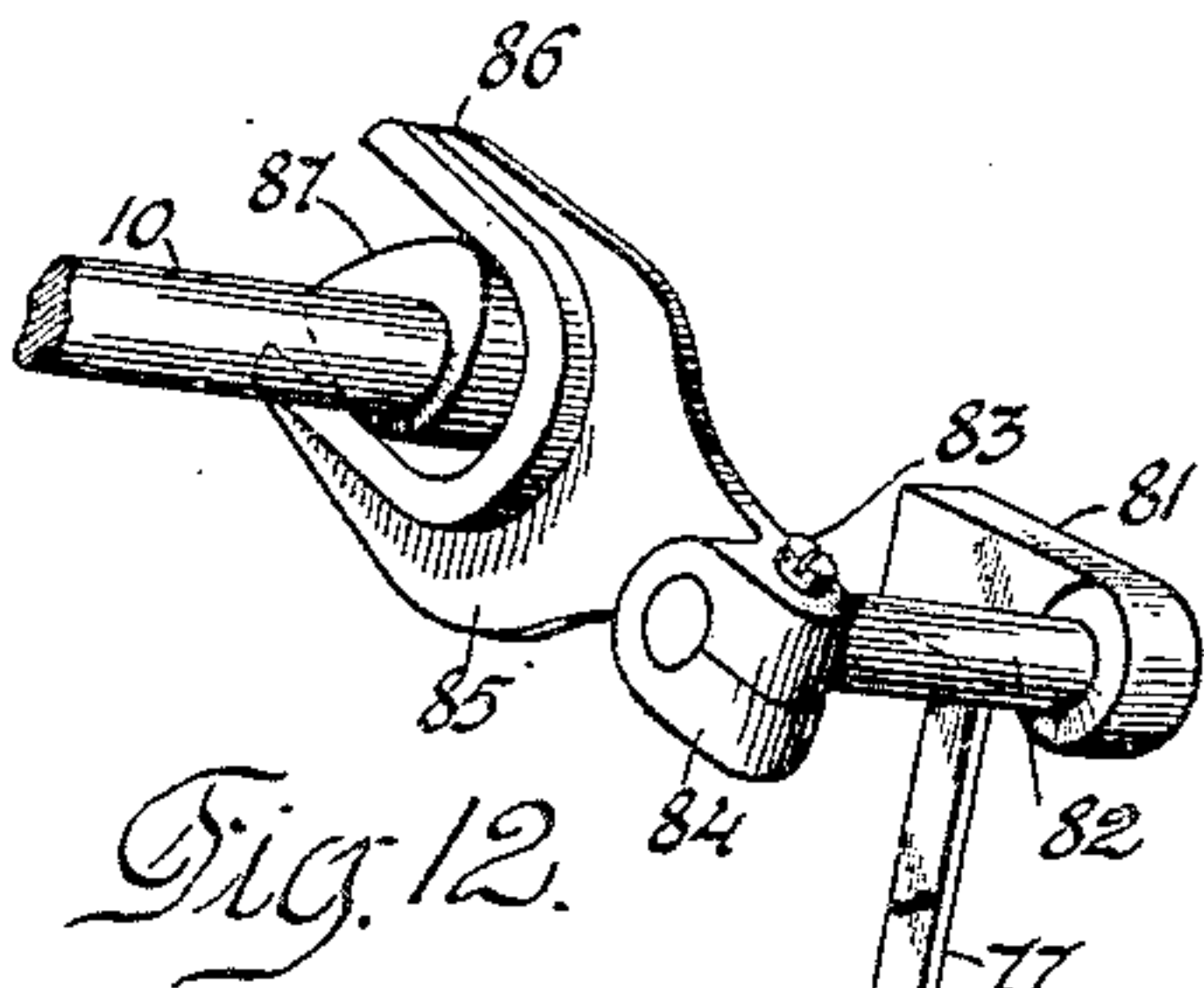


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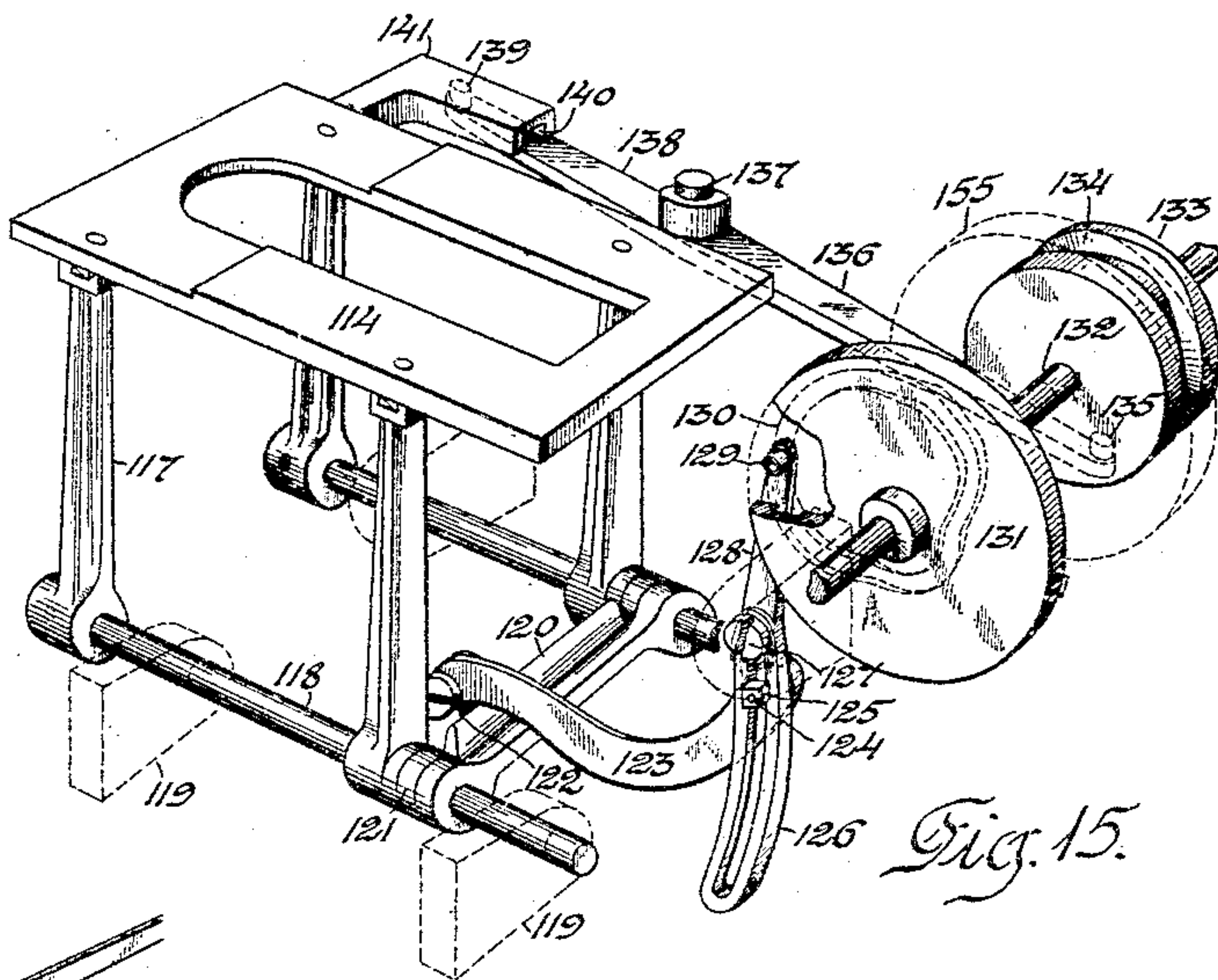
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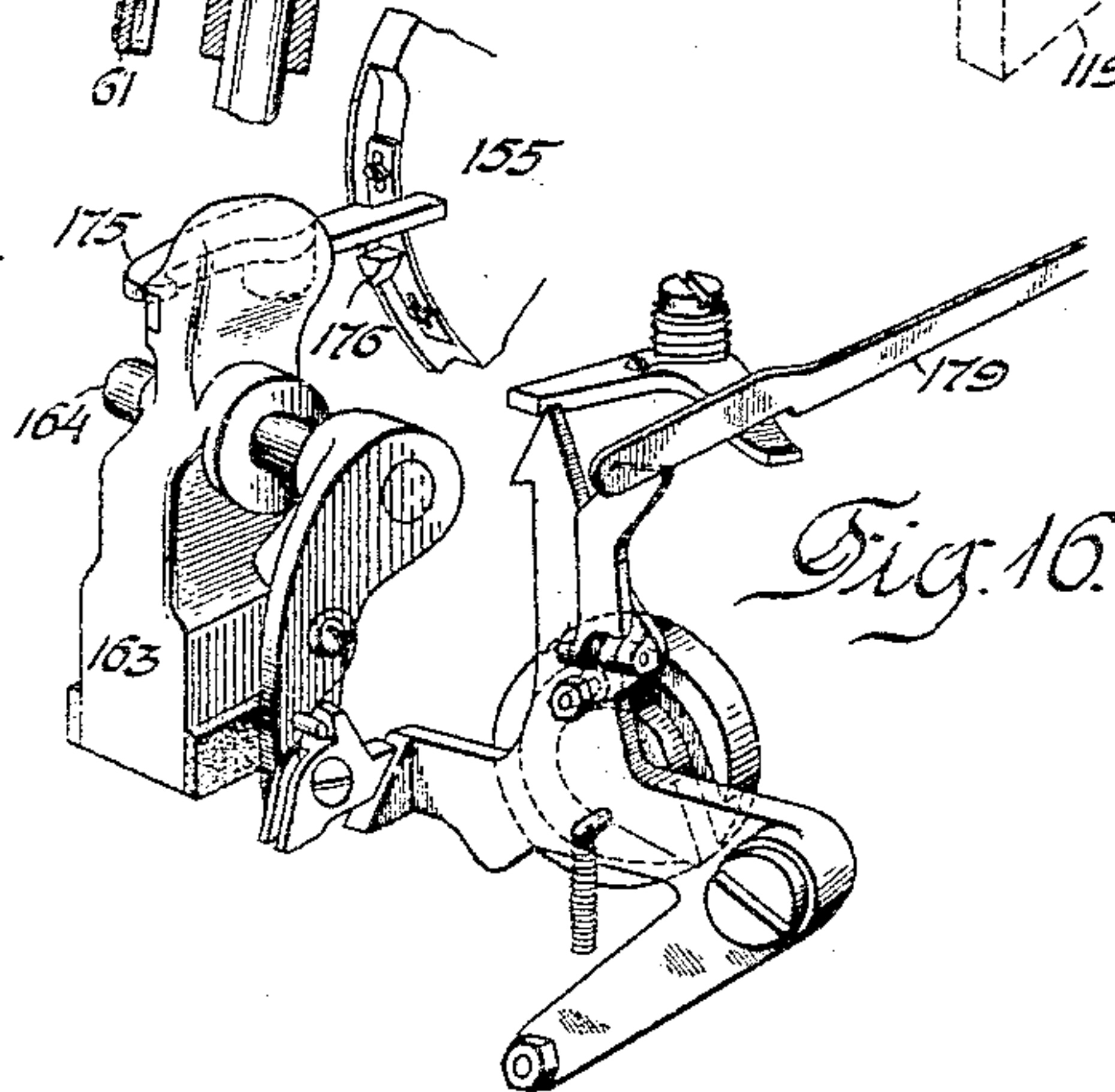
3 SHEETS—SHEET 3.



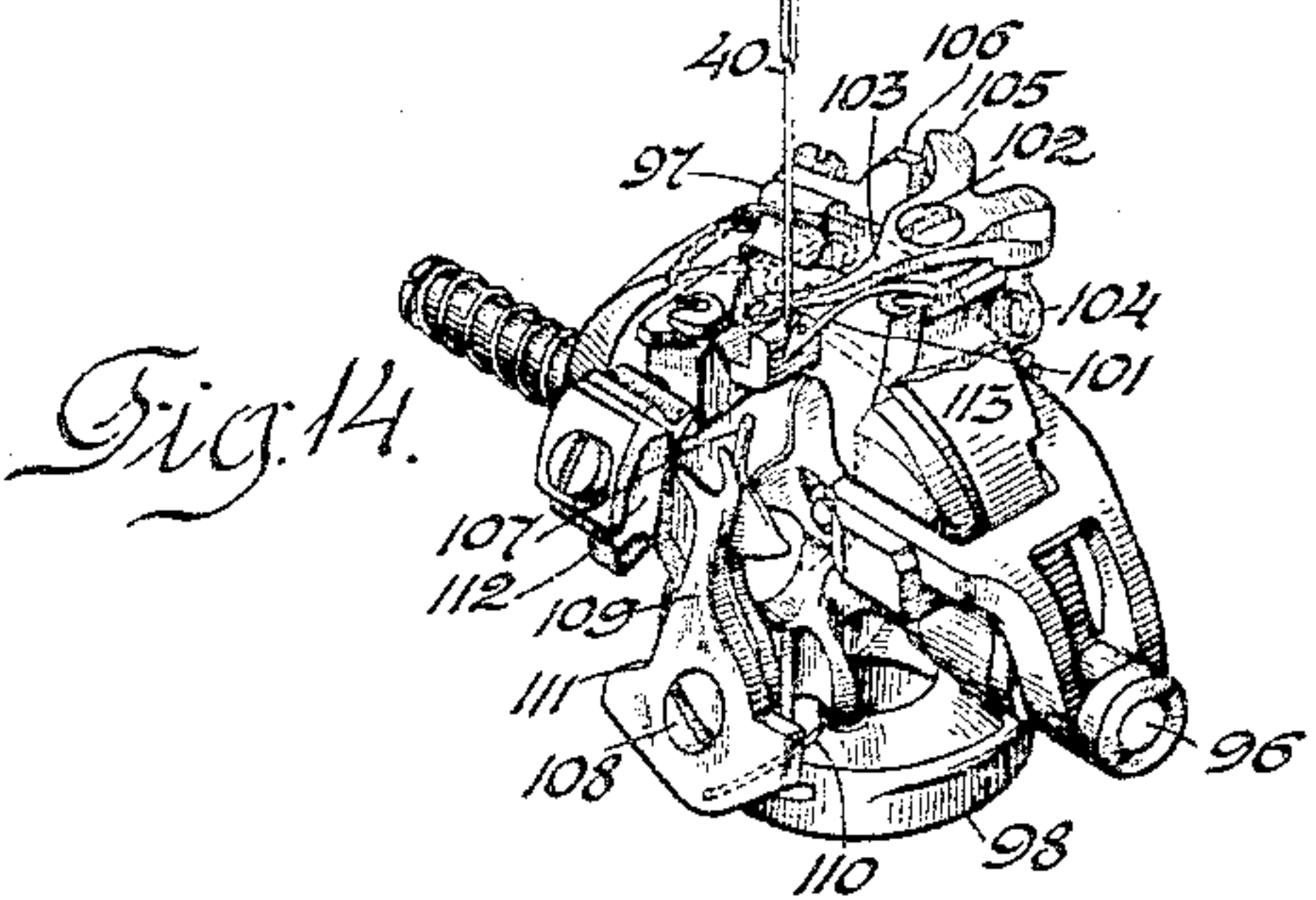
*Fig. 12.*



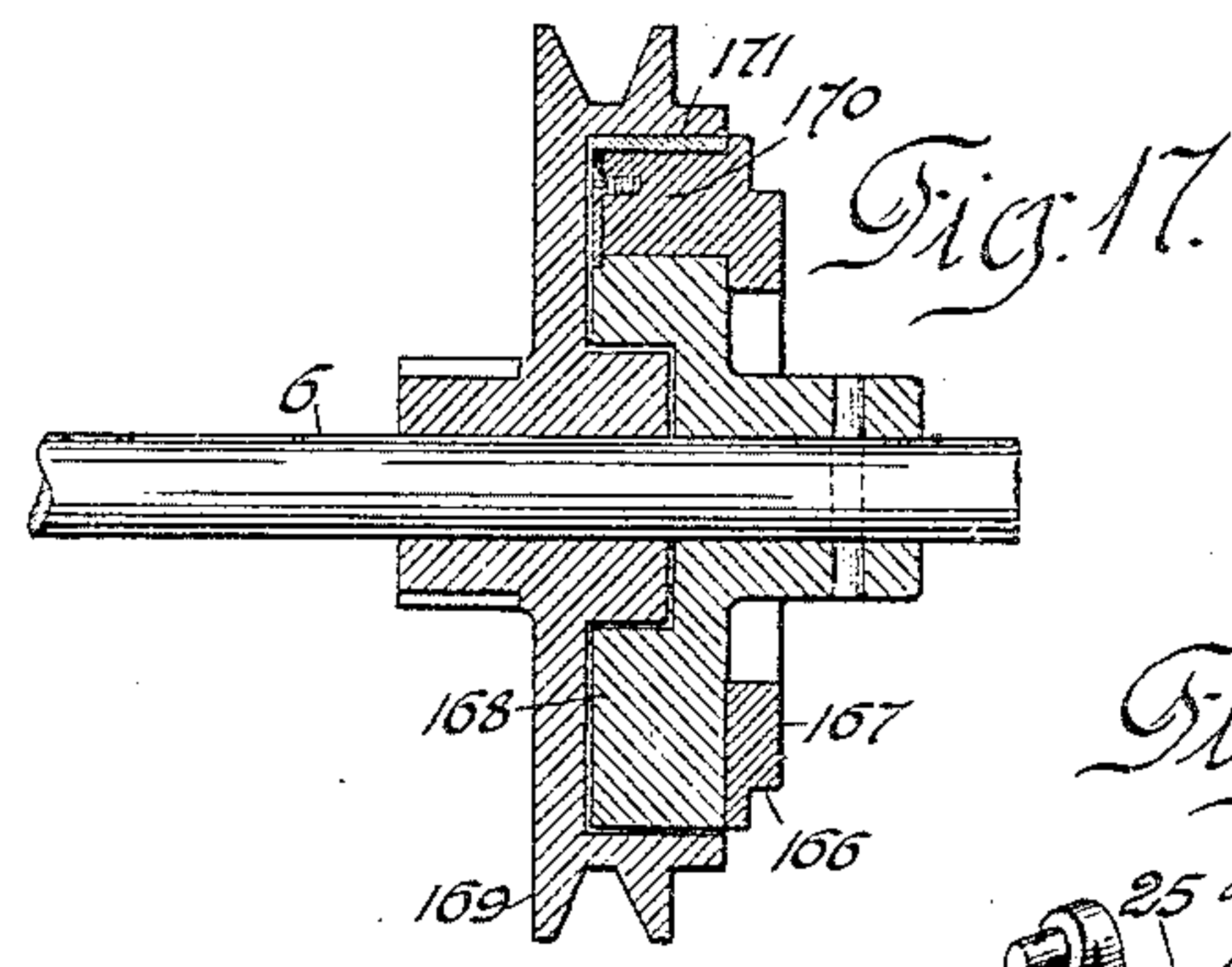
*Fig. 15.*



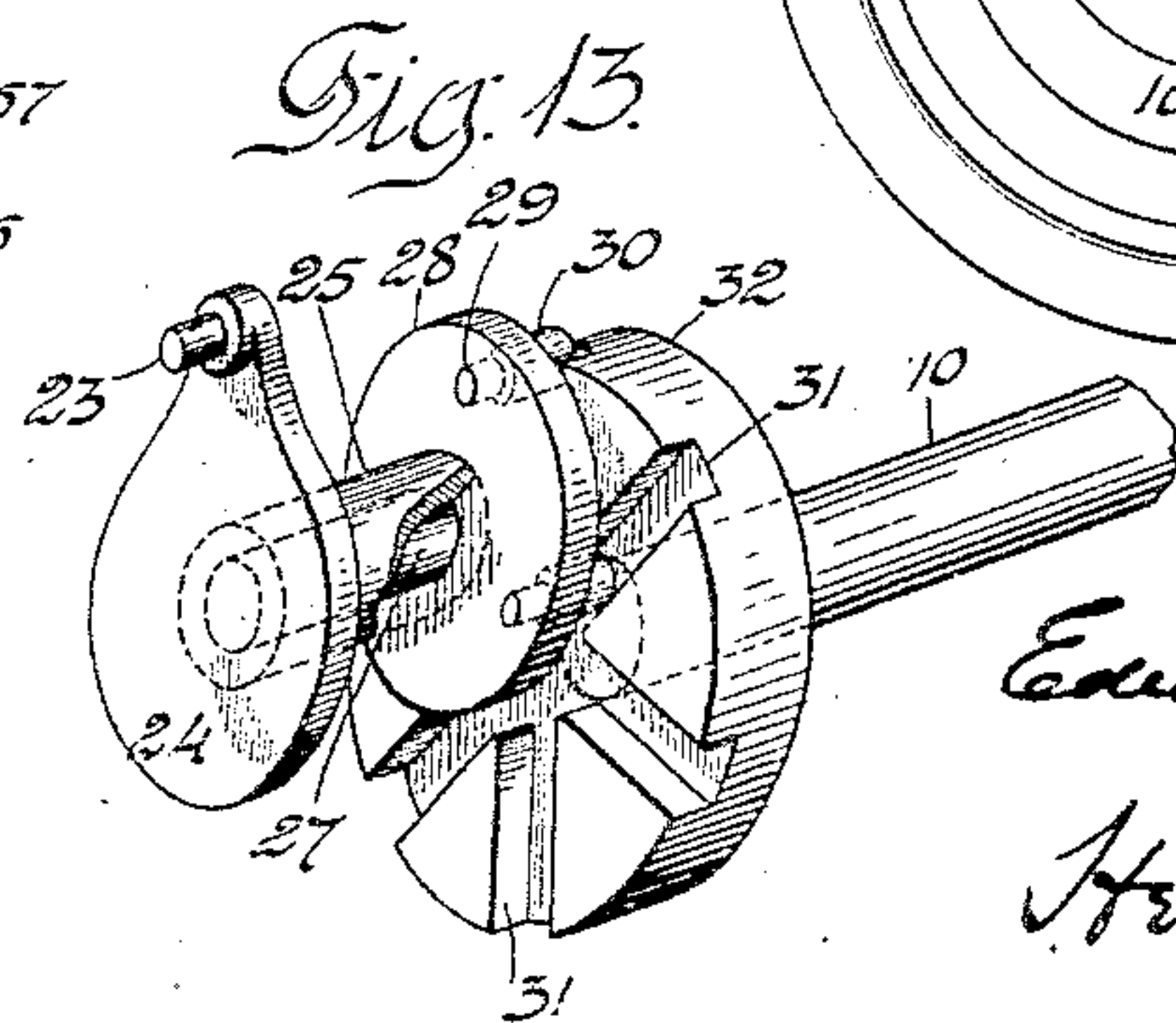
*Fig. 16.*



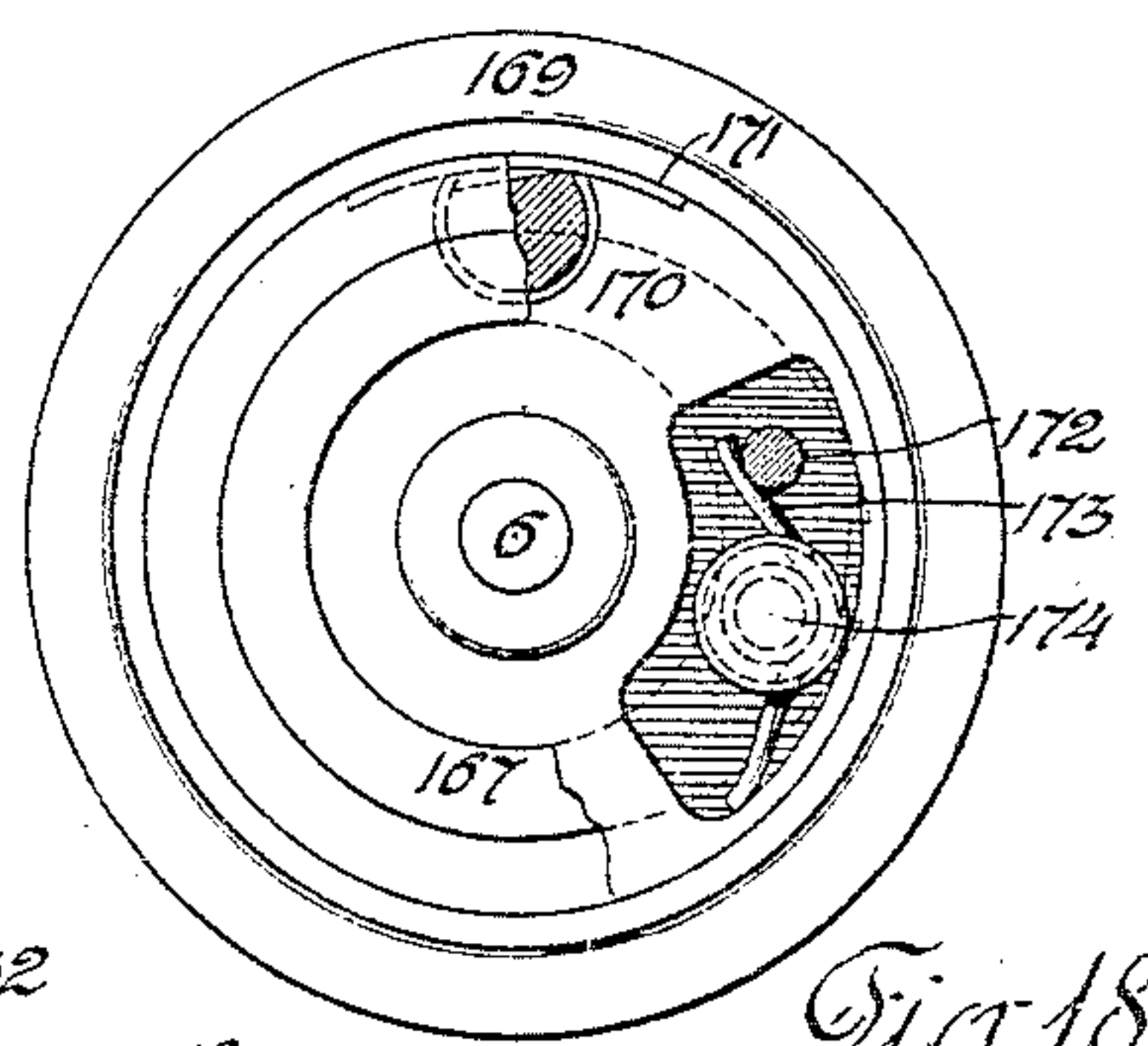
*Fig. 14.*



*Fig. 17.*



*Fig. 13.*



*Fig. 18.*

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# UNITED STATES PATENT OFFICE.

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## BUTTONHOLE-SEWING MACHINE.

945,148.

Specification of Letters Patent.

Patented Jan. 4, 1910.

Application filed December 18, 1908. Serial No. 468,253.

*To all whom it may concern:*

Be it known that I, EDWARD B. ALLEN, a citizen of the United States, residing at Bridgeport, in the county of Fairfield and State of Connecticut, have invented certain new and useful Improvements in Button-hole-Sewing Machines, of which the following is a specification, reference being had therein to the accompanying drawings.

The machine forming the subject of my United States Patent No. 864,144, dated August 27, 1907, is designed to produce eyelet buttonholes by the use of rotary stitch-forming mechanism comprising two out-of-time reciprocating thread-carrying needles in conjunction with a threaded and a non-threaded looper each adapted to seize the loops presented by one of the needles and to present such loop or a loop of its own thread to the other needle in the production of a three-thread overseam for binding the edges of the buttonhole and producing a bar across the narrow end of the same.

The present invention has for its object to adapt such machine for the production of a two-thread overseam, by the employment of a single laterally moving and reciprocating needle and cooperating threaded and non-threaded loopers with adjacent spreaders all mounted upon a single oscillating carrier, substantially according to the United States patents to J. G. Greene, No. 360,434 and No. 360,435, of April 5, 1887 as embodied in the well known Singer I. B. H. machine of the No. 3 class.

The invention has for its further object to provide a buttonhole stitching machine capable of producing the two-thread overseam stitch and adapted to fulfil the requirements demanded by the trade for running at high speeds.

According to the present invention, the longitudinally grooved rotary needle-bar guide of the prior patent is omitted and the rectilinearly reciprocating needle-bar has its lower bearing in a rotary sleeve in which it is splined and from which it receives the requisite turning movements for stitching the eye of the buttonhole and the return movements utilized in the stitching of the bar at the narrow end of the buttonhole. The needle-bar carries a needle-clamp slide-block to which, in the upper position of the needle-bar, lateral motion is communicated for producing the jog of the needle requisite

in forming the overseam described. It is to be understood, however, that in the broader aspect of the present invention it is immaterial whether or not the needle-bar partakes of the jogging movements of the needle-clamp, inasmuch as, in any case, the needle-clamp is mounted for lateral movement upon said needle-bar.

In the preferred embodiment of the improvement, the needle is mounted in its clamp so as to be eccentric to and upon the same side of its axis of rotation in both its depth-stitch and edge-stitch positions, so that in the rotation of the stitch-forming mechanism for stitching the eye of the buttonhole the stitches will be laid in substantially radial relation with the round end of the buttonhole slit; and the degree of eccentricity of the needle, as well as its range of lateral movement, is made adjustable to suit different classes of work.

By the shifting of the work-holder and the rotation of the stitch-forming mechanism at the end of the second side stitching operation substantially as described in my United States Patent No. 734,794, dated July 28, 1903, a strong and substantial bar is produced by the present machine similar in general character to that forming the subject of my United States Patent No. 735,433, dated August 4, 1903.

In the present machine the looper and spreader mechanism is actuated by a direct connection with the main-shaft mounted in the base of the machine and is thus adapted to perform a single cycle of operation for each rotation of the latter; while the needle receives its reciprocatory movements from an upper shaft rotating in unison with the main-shaft by connection with the usual crank-and-pitman needle driving mechanism of the needle-bar through a trammel device at the forward end of the upper shaft for imparting to the needle-driving crank an accelerated movement whereby the needle is given two complete reciprocations for each cycle of oscillatory movements of the looper mechanism. By this means all parts of the stitch-forming and feeding mechanisms excepting the needle reciprocating mechanism may be actuated from the main-shaft or a shaft rotating in unison therewith to perform the cycle of movements necessary for the production of a complete overseam stitch involving the laying of threads



through and around the margin of the material along the buttonhole slit, while the arrangement of the more rapidly operating needle-reciprocating mechanism at the front of the machine reduces to a minimum the weight of the parts moving at an accelerated speed, thus imposing the lightest possible load upon the stop-motion mechanism which is commonly employed in this class of machine and reducing the shock of stopping the machine while increasing the rapidity, at the beginning of a stitching operation, of attaining full speed of the operative parts. As the cam-shaft for operating the feed of the work to space the stitches is commonly driven by a friction clutch mechanism, the quick attainment of full speed at the beginning of a stitching operation is obviously conducive to uniformity of the work in beginning the first side of the buttonhole, which is another advantage derived from the needle-driving mechanism of the present improvement.

In the accompanying drawings, Figure 1 is a side elevation of a buttonhole cutting and stitching machine embodying the present improvements, and Fig. 2 a detail sectional end view representing the actuating mechanism for the feed-cam shaft. Fig. 3 is a perspective view, partly in section, of the head of the bracket-arm, the needle-bar and needle, and actuating mechanism therefor. Fig. 4 is a side view and Fig. 5 a front view of the lower portion of the needle-bar with the needle-clamp and needle. Figs. 6, 7, 8, 9 and 10 are perspective views representing detached certain of the parts of the needle actuating mechanism for producing the sidewise movements of the needle and controlling the same while in the work, and Fig. 11 is a detail sectional elevation of a portion of the needle-bar with the pitman connection with the crank for imparting its reciprocating movements. Fig. 12 is a perspective view of the speed accelerating device from which the needle-bar receives its reciprocating movements. Fig. 13 is a perspective view of the actuating cam and a portion of the connections between the same and the needle for imparting to the latter its lateral movements. Fig. 14 is a perspective view of the looper mechanism with the thread-carrying looper and spreader in position for presenting the lower thread loop for passage of the needle. Fig. 15 is a perspective view of the work-clamp supporting plate and the means for communicating thereto its sidewise and endwise movements. Fig. 16 is a perspective view of the controlling mechanism for actuating the stop-motion device in stopping the machine. Figs. 17 and 18 are respectively, a transverse sectional view and a face view of the belt-wheel and the coöperating clutch members of the stop-motion device.

As represented in the drawings, the frame of the machine is constructed with the hollow base 1 and overhanging bracket-arm comprising the upright portion 2 and the laterally extending portion 3 with the head 4 provided with a cavity 5 to receive the actuating devices for the needle. Within the base 1 is arranged the driving shaft 6 provided with quartering cranks 7 connected by pitmen 8 with similarly arranged cranks 9 upon the upper needle driving shaft 10 which rotates in unison with the shaft 6.

The head 4 of the bracket-arm is provided at the top with a block 11 formed with a boss 12 affording the upper bearing for the rectilinearly reciprocating needle-bar 13 which has a lower bearing afforded by the centrally apertured rotary sleeve or bushing 14 fitted to a suitable bearing aperture provided in the lower member of the head 4 of the bracket-arm. The sleeve 14 has fixed upon its upper end the toothed pinion 15 whose lower face is seated upon the bottom of a recess 16 in the lower member of the head 4, and meshes with the teeth of the rack-bar 17 adapted to reciprocate in a transverse bearing or guideway therefor in the head 4, by which the sleeve may receive a partial rotation in the stitching of the eyed end of the buttonhole and may be subsequently returned in stitching the opposite end of the buttonhole. The needle-bar is provided in its lower portion with a spline or feather 18 fitted to a longitudinal groove in the sleeve 14 by means of which it is caused to follow the circular movements of the sleeve.

As represented in Fig. 11, the upper portion of the needle-bar is reduced in diameter to afford a thrust shoulder between which and the collar 19 fixed upon the reduced portion of the needle-bar is loosely fitted a sleeve 20 having a lateral stud 21 embraced by the eyed lower end of the pitman 22 whose similarly eyed upper end embraces the lateral pin 23 upon a crank-plate 24 fixed upon the end of a tubular shaft 25 mounted in a bearing formed therefor in a cross-bar 26 provided in the head 4 of the bracket-arm. Within the tubular shaft 25 is fixed a stud 27 projecting forwardly from a disk 28 which is shown provided with three studs 29 carrying anti-friction rollers 30 entering the three intersecting diametrical grooves 31 of the disk 32 fixed upon the forward end of the upper or needle-driving shaft 10. As indicated in the drawings, the shaft 25 is journaled eccentrically to the shaft 10, and directly above the same, its eccentricity corresponding with that of its studs 29, as is usual in the well-known tram-mel mechanism, the crank-plate 24 thus receiving two rotations for each complete rotation of the rotary shaft 10, thus imparting correspondingly to the needle-bar two recip-



rocations for each rotation of the upper shaft 10 and lower main-shaft 6.

The needle-bar has fixed to its lower end the head 33 with the cap-plate 34, and is provided with a transverse T-shaped undercut guideway 35, to which is fitted the correspondingly shaped slide-block 36 formed with a depending portion 37 provided with a needle socket 38 in which is secured by means of the clamp-screw 39 the eye-pointed needle 40. The needle-clamp block 36 has secured to its forward side by means of the fastening screw 41 the vertically disposed guide-block 42 extending through a cut-away portion of the head 33 and receiving within its vertical channel the reduced inner end portion of a stud 43 provided with a flange 44 which is seated within a countersink 45 surrounding a slot 46 in a lever 47 fulcrumed by means of the screw-stud 48 upon a depending portion of the head 33. The stud 43 is hollow and is threaded to receive the shank of a clamp-screw 49 whose head is seated in a countersink 50 in the outer face of the lever 47. The lever 47 has a range of vibration which is uniform for all adjustments of the machine, and variations in the lateral throw of the needle-clamp block 36 and needle 40 carried thereby are produced by changing the position of the stud 43 within the channeled guide-block 42 relative to the fulcrum-stud 48 of such lever.

The lever 47 carries at its upper end an outwardly projecting pin 51 which moves alternately in the vertical slots or runways 52 of a guide-plate 53 secured by means of fastening screws 54 to a suitable lateral seat upon a collar 55 fixed upon the lower end of the rotary sleeve or bushing 14 and serving as a thrust member, in conjunction with the pinion 15, to confine the sleeve 14 from end-wise movement with the needle-bar within its bearing in the bracket-arm member 4. As represented more particularly in Fig. 9, the tongue 52<sup>x</sup> intermediate the slots 52 of the guide-plate is wedge-shaped at its upper end, and the slots are connected together above the same to permit the pin 51 to move from one to the other of said slots. Overlying the upper portion of the guide-plate 53 is a depending arm 56 of a rocking yoke 57 provided with fulcrum apertures 58 for screws 59, one of which is represented in Fig. 3 as tapped into the guide-plate 53, and the other of which is in practice tapped into the fixed collar 55. The arm 56 is provided with the flaring slot or recess 60 adapted to embrace the pin 51 as it moves upwardly in one of the guide-slots 52 and shift the same laterally into register with the upper end of the other guide-slot for a succeeding reciprocation. One of the apertured members of the yoke 57 is formed with a rearward extension 61 provided with a threaded aper-

ture 62 entered by a screw-pin 63 embraced by the eyed lower end of a pitman 64 whose eyed opposite end is entered by a screw-pin 65 tapped into a sliding sleeve 66 fitted upon and adapted to turn with the splined needle-bar 13 and formed with an annular groove 67.

Upon one side of the head 4 of the bracket-arm is provided a bearing 68 in which is journaled a pin 69 having upon one end the thrust-collar 70 and secured adjustably upon its opposite end by means of the set-screw 71 the boss 72 of a lever 73 having secured upon the face adjacent the sleeve 66, by means of the screw 74, the block 75 fitted within the annular groove 67 of the collar 66. The outer extremity of the lever 73 carries a screw-stud 76 embraced by the eyed lower end of a pitman 77 whose similarly formed opposite end embraces a bolt 78 whose head 79 is fitted to the undercut groove or slot 80 in a lateral crank-arm 81 pinned to the forward end of the rock-shaft 82 which is journaled in a suitable bearing carried by the head 4 of the bracket-arm. Upon the rearward end of the rock-shaft 82 is secured by means of the clamp-screw 83 the split hub 84 of a laterally extending lever 85 formed with a yoke 86 embracing the triangular cam 87 fixed upon the rotary upper shaft 10 adjacent the diametrically slotted disk or tram-mel plate 32. The actuating cam 87 is of such form that it serves to rock the shaft 82, and through the parts 77, 73, 75, 66 and 64, to vibrate the arm 56 of the yoke 57 to shift the pin 51 laterally only as the needle approaches its highest position, its actuations being of one-half the frequency of the needle reciprocations, whereby the pin 51 is caused to travel alternately in the spaced parallel guide-slots 52, whereby the jog of the needle occurs at the time of the reversal of its direction of reciprocation while the crank-pin 23 is going over its center of rotation, the lateral movement of the needle thus being accomplished during a very small proportion of its range of vertical reciprocation and during its lowest speed of movement when at the upper end of its stroke.

As the lateral throw of the pin 51 must be the same under all circumstances in order that it may properly register with the fixed spacing of the guide-slots 52, it is evident that the adjustment of the pivotal bolt 78 upon the crank-arm 81 is designed only for initially insuring the proper throw of the yoke 57 to produce such register, and is not intended for change thereafter. The needle-clamp block 36 is in practice so arranged in relation to the lever 47 that the needle 40 is in eccentric relation to its axis of circular movement in both its depth stitch and edge stitch positions, but the degree of eccen-



tricity may be readily changed by loosening the clamp-screw 83 and shifting the yoke-lever 85 upon the rock-shaft 82 so as to change the extreme positions of the rocking yoke 57. In order to accommodate this change, the fastening screw apertures 53<sup>x</sup> in the guide-plate 53 of the elongated form and disposed transversely, whereby the guide-plate may be shifted laterally to bring its guide-slots or runways 52 into register with the extreme positions of the pin 51 under this adjustment of the needle jogging mechanism.

The shaft 6 has fixed upon its forward end the cam-wheel 88 having a cam-groove 88<sup>a</sup> entered by a stud 89 projecting from a slide-plate 90 movable vertically in ways 91 provided therefor in the machine frame and having a forwardly projecting lug 92 in which is swiveled the notched or necked lower end of a vertical pin 93 whose upper end is pivotally connected with an arm 94 of a looper-carrier 95 pivotally mounted upon a transverse pin 96 intermediate the upright arms 97 of the looper-supporting frame 98 having depending tubular hub 99 journaled within the fixed bearing member 100 of the frame and surrounding the pin 96.

As in the United States Patent No. 734,794, before mentioned, the looper-carrier is formed with divergent arms of which one is provided with a seat having fixed thereon the eye-pointed looper 101 and has a fulcrum-screw 102 for the superposed spreader 103 with forked operative end and acted upon by a spring 104 normally maintaining its fork in register with the eye of the looper 101 but having a rearwardly and laterally extending finger 105 adapted to engage the fixed cam-member 106 upon the frame 97 for shifting the spreader to distend the looper-thread for passage of the needle, as represented in Fig 14. The other arm of the looper-carrier has fixed thereon the non-threaded looper 107 and carries a fulcrum-screw 108 upon which is mounted the overlying forked spreader 109, which is acted upon similarly to the spreader 103 by the spring 110 to maintain its thread-engaging finger in superposed relation with the thread-engaging member of the non-thread carrying looper, but adapted to be rocked to distend the needle-thread loop entered by both looper and spreader by engagement of the shoulder 111 with the fixed cam-block 112 upon the looper-carrier supporting frame.

In the coöperation of the needle and loopers in the production of overseam stitches, the needle makes a depth-thrust through the material back from the edge of the slit, and presents its loop which is entered by the superposed points of the non-threaded looper 107 and its spreader 109, the loop being retained by the oppositely projecting shoul-

ders presented by the respective loop-seizing members and carried forward to extreme advance position, during which movement the tail of the spreader engages its respective cam-block 112 upon the frame 97 by which the spreader is shifted laterally and the loop is spread for passage of the needle in its succeeding descent, the needle meanwhile rising to its highest position and moving laterally in readiness for its next descent. In the succeeding edge-thrust of the needle through the buttonhole slit, it passes through its previous distended thread-loop and presents a second loop which is entered by the threaded-looper 101 and its overlying spreader 103, while the non-threaded looper and its co-operating spreader are simultaneously withdrawn to shed the depth stitch loop. As the needle rises and the threaded looper continues to advance, the tail of the spreader 103 engages its respective cam 106 upon the frame 97, by which the spreader is shifted laterally to form and spread a loop of looper-thread extending from the eyed point of the looper upwardly to the material through the needle-throat formed in the arched member 113 mounted upon the looper-carrier supporting frame, the looper-loop being maintained distended for passage of the needle in the subsequent depth-stitch thrust for presentation of a succeeding loop for seizure by the non-threaded looper and its respective spreader, as before described.

As represented in the Patent No. 864,144, before mentioned, the plate or table 114 which supports the traveling work-clamp, comprising the lower clamp-plate 115 and upper clamping foot 116, is jointed to the upper ends of swinging arms 117, attached to sliding rods 118 longitudinally movable to lugs or supports 119 of the base 1. The rods 118 are connected together by means of a cross-bar 120 forked and apertured at its opposite ends to loosely embrace said portions which are provided within said forked ends of the cross-bar 120 with fixed collars 121 to prevent the movement of the cross-bar 120 longitudinally upon the supporting rods 118 while permitting the latter to rock freely in relation to the member 120. To provide for the endwise movement of the table 114 for producing the spacing of the side stitches of the buttonhole, the cross-bar 120 is provided with a perforated lug 122 to which is pivotally connected the rearward end of a bent link 123 whose opposite end is adjustably connected by means of the screw 124 and clamp-nut 125 with the slotted segmental arm 126 of a rock-lever mounted upon the fixed fulcrum-stud 127 and carrying upon its other arm 128 a roller-stud 129 entering a cam-groove 130 formed in one side of the cam-wheel 131 which is mounted upon the cam-shaft 132. The lateral movements of the table 114 are



derived from a cam-cylinder 133 fixed upon the cam-shaft 132 and provided with a peripheral cam-groove 134 entered by a roller-stud 135 upon the rearward arm 136 of a rock-lever mounted upon a fixed fulcrum-stud 137 having a forwardly projecting arm 138 provided with a stud 139 entering a longitudinal groove 140 in a rigid arm 141 extending laterally from the table 114. As also described in the Patent No. 864,144, the feed-cam shaft derives its step-by-step rotary movements from actuating mechanism connected with the main-shaft 6, and comprising a cam-wheel 142 upon the latter having a groove entered by a roller-stud upon one of the arms 143 of a rocking sleeve 144 provided with a second arm 145 to which is adjustably connected one end of a link 146 whose opposite end is connected with a lever 147 loosely mounted upon the cam-shaft and disposed in operative relation with cramping dogs 148 embracing the rim of a clutch-wheel 149 fixed upon the cam-shaft.

To produce the rotary movements of the stitch-forming mechanism for stitching around the eyed end of the buttonhole and forming a bar across the opposite end of the same, a reciprocating frame is employed comprising a cross-bar 150 and rigidly attached slide-rods 151 152 suitably journaled in the bracket-arm and the base, respectively, the member 150 being provided with a stud 153 entering a cam-groove 154 in the cam-disk 155 fixed upon the shaft 132. The forward portion of the rod 141 carries a rigid arm 156 notched to embrace the necked rearward end 157 of the rack-bar 17 which meshes with the pinion 15 upon the rotary sleeve 14, and the forward end of the rod 152 carries a block 158 having a laterally slotted member 159 embracing the necked rearward end 160 of a rack-bar 161 mounted in a suitable slideway in the fixed bearing member 100 of the machine base 1 and meshing with a pinion 162 fixed upon the tubular hub 99 of the looper-carrier supporting frame.

The cam-grooves 130, 134 and 154 are such as to impart movements to the work-support and the stitch-forming mechanism similar to those described in the Patent No. 734,794, before mentioned, so as to produce a buttonhole similar in general appearance to those represented in my Patent No. 735,433, previously mentioned, although differing specifically therefrom in comprising a two-thread overseam stitch instead of the three-thread overseam stitch therein represented. According to the present invention, the needle is at all times offset from the axis of the needle-bar upon the side on which it makes its depth thrust in the material and as this axis, in the stitching of the opposite sides of the buttonhole, approaches and recedes from

the center of the eye, the work receives a slight lateral movement to bring the axis of the needle-bar into and out of the center of the buttonhole eye, the longitudinal feed of the work being interrupted when the needle-bar reaches such relation, and the stitching mechanism makes a semi-rotation to lay the stitches radially of the rounded end of the eye. As the stitching of the second side of the buttonhole reaches the narrow end of the slit, the longitudinal feed of the material again ceases, while the work is shifted transversely to bring the depth-thrust position of the needle into register with the slit, and the other extreme thrust of the needle into alinement with the depth thrust position assumed in the stitching of the first side, after which the stitching mechanism is slowly turned through a semi-rotation so as to restore the stitching mechanism to initial position, thereby producing a bar at the narrow end of the buttonhole slit, such as that represented in Fig. 5 of the Patent No. 735,433. By imparting to the work a short to-and-fro step-by-step feeding movement while the stitching mechanism is returning in forming the bar, a square bar may be formed similar to that represented in Fig. 4 of said patent.

The present machine is provided with a stop-motion device including the vibrating stop-lever 163 mounted upon the rock-shaft 164 and carrying a vertically movable spring-pressed clutch-block 165 adapted to engage the periphery of the cam-rib 166 of the clutch-ring 167 which is in practice operatively connected with a clutch-disk 168 fixed upon the main-shaft 6 and fitted within a suitable annular chamber in the belt-pulley 169 loosely mounted upon the rearward end portion of the main-shaft. The clutch-disk 168 has in its outer edge a segmental recess entered by a cam projection 170 upon the clutch-ring 167, the lateral movement of the latter serving to turn the cam projection 170 into binding relation with a wearing plate 171 within the chamber of the pulley 169. The clutch-ring has also upon its inner face a pin 172 engaged upon its inner side by one arm of a spring 173 coiled around a stud 174 carried by the clutch-disk 168 and having its other arm resting against the periphery of a recess formed therefor in said disk, the function of said spring being to press the pin 172 outwardly, so as to cause the operative edge of the cam projection 170 to yieldingly engage the wearing plate 171 in clutching the fixed and movable members 168 and 169 together for rotating the main-shaft. The lever 163 is held in normal retracted inoperative position by means of the spring-pressed latch-lever 175 pivoted upon the machine frame and having a tail portion disposed in the path of movement of a tripping lug 176 upon the cam-wheel 155.

In my prior patent No. 864,144, the machine



is shown provided with cutting mechanism whose operation is controlled by a starting device actuated from the clamp-closing rock-shaft 177 through a crank-arm 178 thereon to which is pivotally connected a push-bar 179 adapted to trip into action a cutter controlling lever whose automatic movement at the completion of the cutting operation serves to retract the stop-lever 163 in opposition to its spring 180 to disengage its spring-pressed clutch-block 165 from the notched periphery of the clutch-ring 167. While I have shown in the accompanying drawings these connections with the work-clamp closing device, the same is not specifically described herein, as the manual shifting of the stop-lever 163 into engagement with its latch 175 for starting the stitching mechanism of the machine is all that is necessary to the disclosure of the present improvement.

As will be readily observed from the foregoing description, the employment of the rigid guide-ways 52 for positively determining the position of the lever 47 throughout all that portion of each reciprocation during which the needle is in the work insures absolutely against overthrow of the needle regardless of the speed of operation of the machine and insures perfect alinement of the needle punctures so as to provide for uniformity of the overseam throughout each buttonhole stitching operation, any lost motion produced by wear of the actuating mechanism of such lever having absolutely no effect upon the precision with which the needle is caused to enter the work.

It is obvious that the present improvement is susceptible of material modification in construction and arrangement of its several parts and in its application to various types and varieties of machines, and that the present invention is not therefore limited to the specific mechanism embodying the same herein shown and described.

Having thus set forth the nature of the invention, what I claim herein is:—

1. In a sewing machine, the combination with a reciprocating needle-bar and means for actuating the same, a needle-clamp mounted for lateral movement upon said needle-bar, a needle mounted in said clamp, and loop-taking mechanism coöperating with said needle, of jogging means including a movable member adapted for operative connection with said clamp at one extremity only of its reciprocating movements and positively acting means for imparting to said movable member its operative movements, and means independent of said jogging means for preventing the lateral movement of said needle-clamp between the actuations of the needle-jogging means.

2. In a buttonhole stitching machine, the combination with the frame comprising a base and an overhanging bracket-arm, and a

rotary shaft mounted upon said bracket-arm, of a reciprocating needle-bar, a laterally moving needle carried thereby, means connected with said shaft for reciprocating said needle-bar, a rotary sleeve journaled in said bracket-arm and with which said needle is connected to rotate, jogging means normally disconnected from but operatively connected with said needle while above the work, guiding means carried by and rigidly secured to said sleeve and adapted to maintain said needle against lateral movement when disengaged from said jogging means, and loop-taking means coöperating with said needle in the production of stitches and mounted to rotate therewith.

3. In a buttonhole stitching machine, the combination with work-holding devices and feeding mechanism, of stitch-forming mechanism comprising a longitudinally reciprocating and laterally jogging needle and co-operating loop-taking means, means for imparting a partial rotation to said stitch-forming mechanism in working one end of a buttonhole, means for producing a relative lateral shifting movement between the needle and the work in the direction of and in addition to the jogging movements of the needle when the last side of said buttonhole has been worked, and means for imparting a return partial rotation to said stitch-forming mechanism while still in operation so as to form a bar at the other end of the buttonhole.

4. In a buttonhole stitching machine, the combination with work-holding devices, stitch-forming mechanism comprising a reciprocating and laterally jogging needle and coöperating loop-taking means, and feeding mechanism for changing the relative positions of the work and the stitch-forming mechanism, of mechanism for imparting a partial rotation to said stitch-forming devices in working one end of a buttonhole, means whereby the normal depth-stitch thrust of the needle is temporarily shifted into register with the buttonhole slit when the last side of said buttonhole has been worked, and means for imparting a return partial rotation to said stitch-forming devices while they are still operating so as to form a bar at the narrow end of the buttonhole during the return partial rotation of said stitch-forming devices necessary to bring them to their initial positions.

5. In a buttonhole stitching machine, the combination with the frame comprising a base and an overhanging bracket-arm having a head formed with a cavity at its forward end and a bearing member disposed transversely of the same, of a rotary shaft journaled in and disposed longitudinally of said bracket-arm with its forward end terminating in said cavity, stitch-forming mechanism comprising a reciprocating



needle-bar mounted in the head of the bracket-arm and carrying a laterally moving eye-pointed needle, and a complemental loop-taking device mounted in the bed, a disk mounted upon the forward end of the first-named shaft within the cavity of the bracket-arm and provided in its forward face with a plurality of intersecting diametrical grooves, a rotary shaft mounted in the said bearing member of the bracket-arm in eccentric relation with the first-named shaft and carrying at its forward end a crank-plate having a pitman connection with the needle-bar and at its rearward end a plurality of eccentrically arranged studs symmetrically disposed in relation to its axis of rotation and entering the grooves of the first-named disk, means for imparting lateral movements to said needle, and means for actuating the loop-taking device.

6. In a buttonhole stitching machine, the combination with the frame comprising a base and an overhanging bracket-arm having a head formed with a cavity at its forward end and a bearing member disposed transversely of the same, of a rotary shaft journaled in and disposed longitudinally of said bracket-arm, stitch-forming mechanism comprising a reciprocating needle-bar mounted in the head of the bracket-arm and carrying a laterally moving eye-pointed needle, and a complemental loop-taking device mounted in the bed, a disk mounted upon the forward end of the first-named shaft and provided in its forward face with a plurality of intersecting diametrical grooves, a tubular shaft mounted in the said bearing member of the bracket-arm in eccentric relation with the first-named shaft and carrying at its forward end a crank-plate having a pitman connection with the needle-bar, a stud secured within said hollow shaft and provided at its rearward end with a disk having a plurality of studs symmetrically arranged in relation to its axis of rotation and entering the grooves of the first-named disk, means for imparting lateral movements to said needle, and means for actuating the loop-taking device.

7. In a buttonhole stitching machine, stitch-forming mechanism comprising a rectilinearly reciprocating needle-bar, a needle-carrier movably mounted upon said needle-bar, a lever fulcrumed upon the needle-bar and pivotally connected with the needle-carrier, a lateral pin upon said lever, a needle mounted in said carrier, means for imparting reciprocatory movements to said needle-bar, needle-jogging means comprising a vibratory arm formed with a fork directed within but shorter than the path of movement of said pin with the needle-bar and adapted to embrace said pin in the upper position of said needle-carrier, a rock-shaft, means for actuating it, a crank-arm upon

said rock-shaft, and an operative connection intermediate said crank-arm and the forked vibratory arm.

8. In a sewing machine, the combination with a rectilinearly reciprocating needle-bar and means for actuating the same, a needle-clamp mounted for lateral movement upon said needle-bar, a needle mounted in said clamp, and loop-taking mechanism coöperating with said needle, of a pin connected with said needle-clamp, a forked lever pivotally mounted independently of said needle-bar and adapted to embrace said pin in the upper position of said needle-bar, means for imparting to said forked lever to-and-fro lateral movements of less frequency than the needle reciprocations, and means independent of said lever and of the needle-bar for guiding said pin parallel with the movements of the needle intermediate the actuations of said forked lever.

9. In a sewing machine, the combination with a rectilinearly reciprocating needle-bar and means for actuating the same, a needle-clamp mounted for lateral movement upon said needle-bar, a needle mounted in said clamp, and loop-taking mechanism coöperating with said needle, of a pin connected with said needle-clamp, a forked lever pivotally mounted independently of said needle-bar and adapted to embrace said pin in the upper position of said needle-bar, means for imparting to said forked lever to-and-fro lateral movements of less frequency than the needle reciprocations, and a guide-plate sustained independently of said needle-clamp and forked lever and formed with a plurality of guide-slots parallel with the needle path and connected together at the upper ends.

10. In a sewing machine, the combination with the bracket-arm and a rotary shaft disposed longitudinally of the same, of a needle-bar mounted for rectilinear reciprocation in said bracket-arm, a crank-shaft mounted eccentrically to said rotary shaft and adjacent said needle-bar, a trammel connection intermediate said shafts for imparting an accelerated movement to the latter from said rotary shaft, an operative connection intermediate said crank-shaft and the needle-bar for imparting reciprocating movements thereto, a laterally movable needle-clamp mounted upon said needle-bar, a needle mounted in said needle-clamp, a loop-taker and means for actuating it in a plane substantially parallel with the lateral movements of the needle, an actuating cam upon said rotary shaft, and jogging mechanism intermediate said cam and needle-clamp for imparting to said needle-clamp to-and-fro lateral movements of less frequency than the reciprocations of said needle-bar.

11. In a buttonhole stitching machine, the



combination with the frame comprising a base and an overhanging bracket-arm, of a rectilinearly reciprocating needle-bar journaled in the forward end of said bracket-arm, a rotary shaft disposed longitudinally of said bracket-arm and terminating at its forward end adjacent said needle-bar, an operative connection including accelerating means between said needle-bar and said shaft whereby two reciprocations are imparted to the former for each rotation of the latter, a needle-clamp mounted for lateral movement upon said needle-bar, means intermediate said shaft and the needle-clamp and independent of the needle-bar actuating connection for imparting to said clamp to-and-fro lateral movements of less frequency than the reciprocations of said needle-bar, two alternately acting loop-takers each adapted to cooperate with the needle in one of its lateral positions, means connected with said rotary shaft for imparting simultaneous reciprocating movements to said loop-takers, work-feeding means, and means for rotating said needle and loop-takers in unison.

12. In a buttonhole stitching machine, the combination with the frame comprising a base and an overhanging bracket-arm, and a rotary shaft mounted upon said bracket-arm, of a reciprocating needle-bar, a laterally moving needle carried thereby, means connected with said shaft for reciprocating said needle-bar, a rotary sleeve journaled in said bracket-arm and with which said needle is connected to rotate, jogging means including a switch-lever pivotally mounted upon said sleeve, an operative connection between said needle and switch-lever and arranged to assume operative relation in the higher position of said needle, means connected with said shaft for imparting to said switch-lever vibratory movements transverse to the path of reciprocation of said needle but of less frequency, a guide-plate rigidly secured to said sleeve and having parallel ways adapted to engage the needle connection and connected together at the point of operation of said switch-lever therewith, and loop-taking means cooperating with said needle in the production of stitches and mounted to rotate therewith.

13. In a buttonhole stitching machine, stitch-forming mechanism comprising a rectilinearly reciprocating needle-bar, a needle-carrier movably mounted upon said needle-bar and a transversely movable lateral pin connected therewith, a needle mounted in said carrier, means for imparting reciprocatory movements to said needle-bar, needle-jogging means comprising a forked vibratory arm adapted to embrace said pin in the upper position of said needle-carrier, a rock-shaft, means for actuating it, a crank-arm upon said rock-shaft, a loose sleeve fitted to

said needle-bar and movable independently thereof, a link connection intermediate said crank-arm and the loose sleeve, and an operative connection intermediate said sleeve and the vibratory forked arm.

14. In a buttonhole stitching machine, stitch-forming mechanism comprising a rectilinearly reciprocating needle-bar, a needle-carrier movably mounted upon said needle-bar and a transversely movable lateral pin connected therewith, a needle mounted in said carrier, means for imparting reciprocatory movements to said needle-bar, needle-jogging means comprising a forked vibratory arm adapted to embrace said pin in the upper position of said needle-carrier, a rock-shaft, means for actuating it, a crank-arm upon said rock-shaft, a loose sleeve splined to said needle-bar but endwise movable thereon and provided with an annular groove, a vibratory lever provided with a stud entering said groove in the sleeve, a link connection between said lever and the crank-arm of said rock-shaft, a link connection intermediate said sleeve and said vibratory forked arm, and means for rotating said needle-bar.

15. In a buttonhole stitching machine, stitch-forming mechanism comprising a rectilinearly reciprocating needle-bar having a longitudinal spline or feather, a needle-carrier movably mounted upon said needle-bar and a transversely movable lateral pin connected therewith, a needle mounted in said carrier, a rotary sleeve or bushing fitted to said needle-bar and mounted in a fixed bearing, means for rotating said sleeve and needle-bar, means for reciprocating said needle-bar, a collar fixed upon said sleeve or bushing, a forked arm pivotally mounted upon said fixed collar and adapted to embrace said pin in the upper position of said needle-carrier, a rock-shaft, means for actuating it, a crank-arm upon said rock-shaft, a sliding sleeve fitted to and adapted to rotate with said needle-bar, a connection intermediate the crank-arm of said rock-shaft and said sliding sleeve, and a connection intermediate said sliding sleeve and said pivotally mounted forked arm, whereby lateral movements are imparted to said needle.

16. In a buttonhole stitching machine, stitch-forming mechanism comprising a rectilinearly reciprocating needle-bar having a longitudinal spline or feather, a needle-carrier movably mounted upon said needle-bar and a transversely movable lateral pin connected therewith, a needle mounted in said carrier, a rotary sleeve or bushing fitted to said needle-bar and mounted in a fixed bearing, means for rotating said sleeve and needle-bar, means for reciprocating said needle-bar, a collar fixed upon said sleeve or bushing, a guide-plate secured to said fixed collar and provided with spaced guide-slots par-



allel with the direction of reciprocation of said needle and connected together at the upper end and adapted to receive said lateral pin connected with the needle-carrier, a  
 5 forked arm pivotally mounted upon said fixed collar and overlying said guide-plate at the junction of its guide-slots, a rock-shaft, means for actuating it, a crank-arm upon said rock-shaft, a sliding sleeve fitted  
 10 to and adapted to rotate with said needle-bar, a connection intermediate the crank-arm of said rock-shaft and said sliding sleeve, and a connection intermediate said sliding sleeve and said pivotally mounted  
 15 forked arm, whereby lateral movements are imparted to said needle.

17. In a buttonhole stitching machine, stitch-forming mechanism comprising a rectilinearly reciprocating needle-bar, means for  
 20 imparting reciprocatory movements to said needle-bar, a needle-carrier movably mounted upon said needle-bar, a needle mounted in said carrier, a vibratory lever mounted upon a fulcrum reciprocating with said needle-  
 25 bar and carrying a lateral pin, a connection between said needle-carrier and vibratory lever, a guide-plate mounted independently of and adjustable laterally in relation to said needle-bar and provided with parallel  
 30 guide-slots connected together at the upper end and adapted to be traversed by said lateral pin in the reciprocation of said needle, a vibratory forked arm overlying said guide-plate and fulcrumed in fixed relation  
 35 therewith with its fork adapted to register with the connected upper ends of said guide-slots, means including a rock-shaft and intermediate connections for vibrating said  
 40 forked arm to switch said lateral pin from one to the other of said guide-slots, a rotary actuating cam and a crank-arm circularly adjustable upon said rock-shaft and formed with a yoke embracing said cam.

18. In a buttonhole stitching machine, stitch-forming mechanism comprising a rectilinearly reciprocating needle-bar, means  
 45 for imparting reciprocatory movements to said needle-bar, a needle-carrier movably mounted upon said needle-bar, a needle mounted in said carrier, a vibratory lever mounted upon a fulcrum reciprocating with  
 50 said needle-bar and carrying a lateral pin, a connection between said needle-carrier and vibratory lever adjustable toward and from the fulcrum of the latter, a guide-plate mounted independently of and adjustable  
 55 laterally in relation to said needle-bar and provided with parallel guide-slots connected together at the upper end and adapted to be traversed by said lateral pin in the reciprocation of said needle, a vibratory forked arm overlying said guide-plate and fulcrumed in fixed relation therewith with its fork adapted to register with the connected upper  
 60 per ends of said guide-slots, means includ-

ing a rock-shaft and intermediate connections for vibrating said forked arm to switch said lateral pin from one to the other of said guide-slots, a rotary actuating cam, and a  
 70 crank-arm circularly adjustable upon said rock-shaft and formed with a yoke embracing said cam.

19. In a buttonhole stitching machine, the combination with the frame comprising a base and an overhanging bracket-arm, of  
 75 a rotary shaft journaled in and disposed longitudinally of said bracket-arm, stitch-forming mechanism comprising a reciprocating needle-bar mounted in the head of the bracket-arm and carrying a laterally  
 80 moving eye-pointed needle, and a complementary loop-taking device mounted in the bed, a disk mounted upon the first-named shaft and provided in its forward face with a plurality of intersecting diametrical  
 85 grooves, a rotary shaft mounted upon said bracket-arm in eccentric relation with the first-named shaft and carrying at its forward end a crank-plate having a pitman connection with the needle-bar and at its  
 90 rearward end a plurality of eccentrically arranged studs symmetrically disposed in relation to its axis of rotation and entering the grooves of the first-named disk, means connected with the first-named rotary shaft  
 95 and independent of the second-named shaft for imparting lateral movements to said needle, means for actuating the loop-taking device and means for rotating said needle and loop-taking device in unison.  
 100

20. In a sewing machine, the combination with a rectilinearly reciprocating needle-bar and means for actuating the same, of a  
 105 supporting member carried by the needle-bar and provided with a transverse slide-way, a needle-clamp block fitted to and mounted within the slide-way of said member and formed with a needle socket and a guide-slot parallel therewith, a needle  
 110 mounted in said socket of the clamp-block, a vibrating lever fulcrumed upon said supporting member and provided with a lateral stud entering the guide-slot of the needle-clamp block and adjustable lengthwise of  
 115 the latter toward and from the fulcrum of said lever, means for vibrating said lever, means independent of said vibrating means for preventing the lateral movement of said needle-clamp block between the vibratory  
 120 movements of said lever, and a loop-taking device cooperating with said needle in the production of stitches.

21. In a sewing machine, the combination with a rectilinearly reciprocating needle-bar and means for actuating the same, of a  
 125 supporting member carried by the needle-bar and provided with a transverse slide-way, a needle-clamp block fitted to and mounted within the slide-way of said member and formed with a needle socket and  
 130



a guide-slot parallel therewith, a needle mounted in said socket of the clamp-block, a vibrating lever fulcrumed upon said supporting member and provided with a lateral stud entering the guide-slot of the needle-clamp block and adjustable lengthwise of the latter toward and from the fulcrum of said lever, means for vibrating said lever, means including a plurality of relatively fixed parallel guide-ways connected at one end and adapted to embrace the lateral pin of said vibrating lever, whereby the needle is prevented from lateral motion excepting at an extreme end of its path of movement, and a loop-taking device coöperating with said needle in the production of stitches.

22. In a buttonhole stitching machine, stitch-forming mechanism comprising a rectilinearly reciprocating needle-bar, a needle-carrier movably mounted upon said needle-bar, a lever connected with the needle-carrier, a lateral pin upon said lever, a needle mounted in said carrier, means for imparting reciprocatory movements to said needle-bar, needle-jogging means comprising a forked vibratory arm adapted to embrace said pin in the upper position of said needle-carrier, a rock-shaft, means for actuating it, a crank-arm upon said rock-shaft, an operative connection intermediate said crank-arm and the forked vibratory arm, and means acting upon said pin alternately with said forked arm for preventing the lat-

eral motion of the needle-carrier when out of operative relation with said forked arm. 35

23. In a sewing machine, the combination with the bracket-arm and a rotary shaft disposed longitudinally of the same, of a needle-bar mounted for rectilinear reciprocation in said bracket-arm, a crank-shaft mounted eccentrically to said rotary shaft and adjacent said needle-bar, a trammel connection intermediate said shafts for imparting an accelerated movement to the latter from said rotary shaft, an operative connection intermediate said crank-shaft and the needle-bar for imparting reciprocating movements thereto, a laterally movable needle-clamp mounted upon said needle-bar, a needle mounted in said needle-clamp, a loop-taker and means for actuating it, an actuating cam upon said rotary shaft, jogging mechanism intermediate said cam and needle-clamp for imparting to said needle-clamp to-and-fro lateral movements of less frequency than the reciprocations of said needle-bar, and means for rotating said needle and loop-taking device in unison. 40 45 50 55

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses. 60

EDWARD BEECHER ALLEN.

Witnesses:

STANLEY N. SMITH,  
E. L. TOLLES.