

A. H. DE VOE.
RUFFLING AND STITCHING MACHINE.
APPLICATION FILED AUG. 8, 1908.

989,579.

Patented Apr. 18, 1911.

3 SHEETS—SHEET 1.

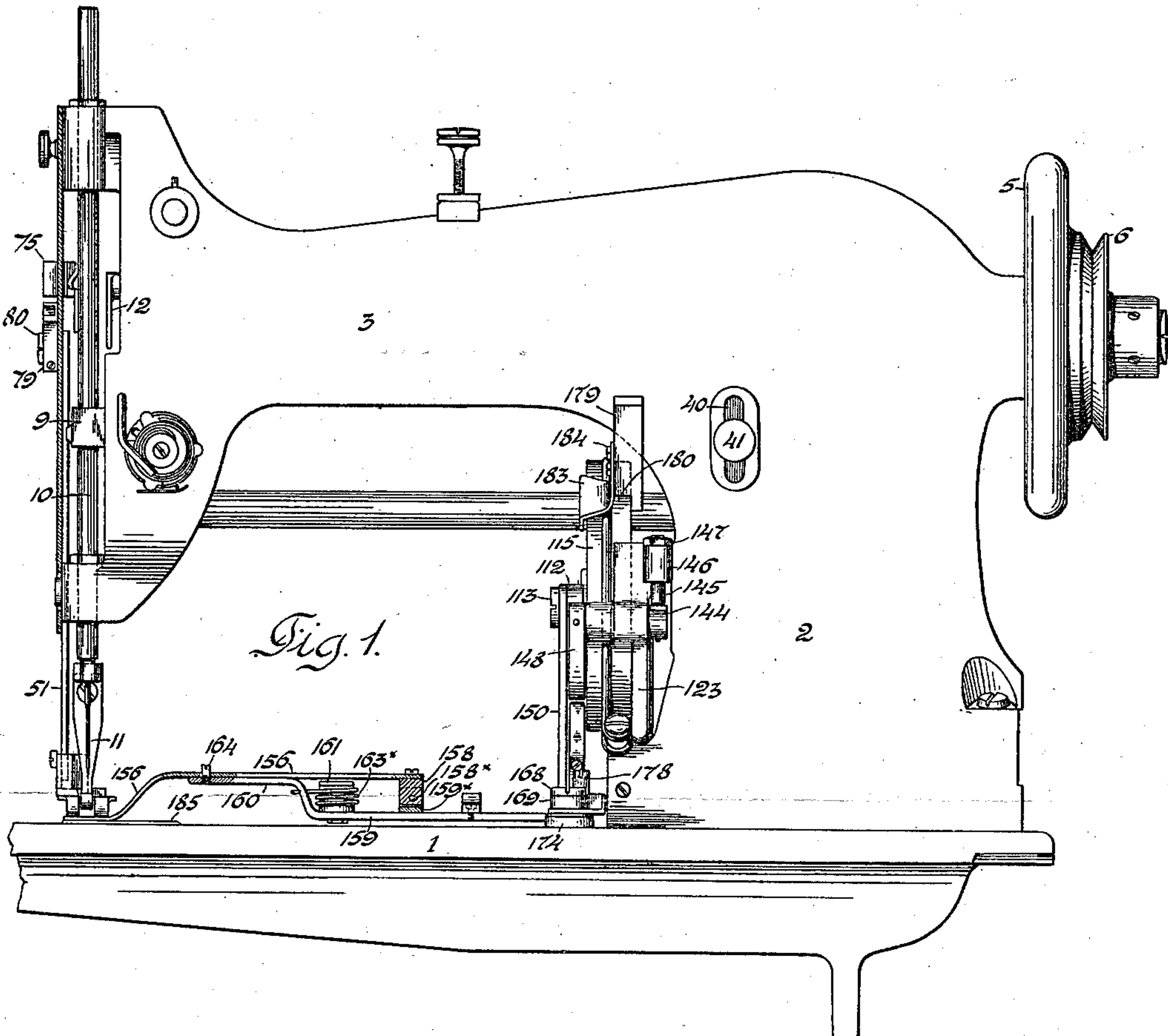


Fig. 9.

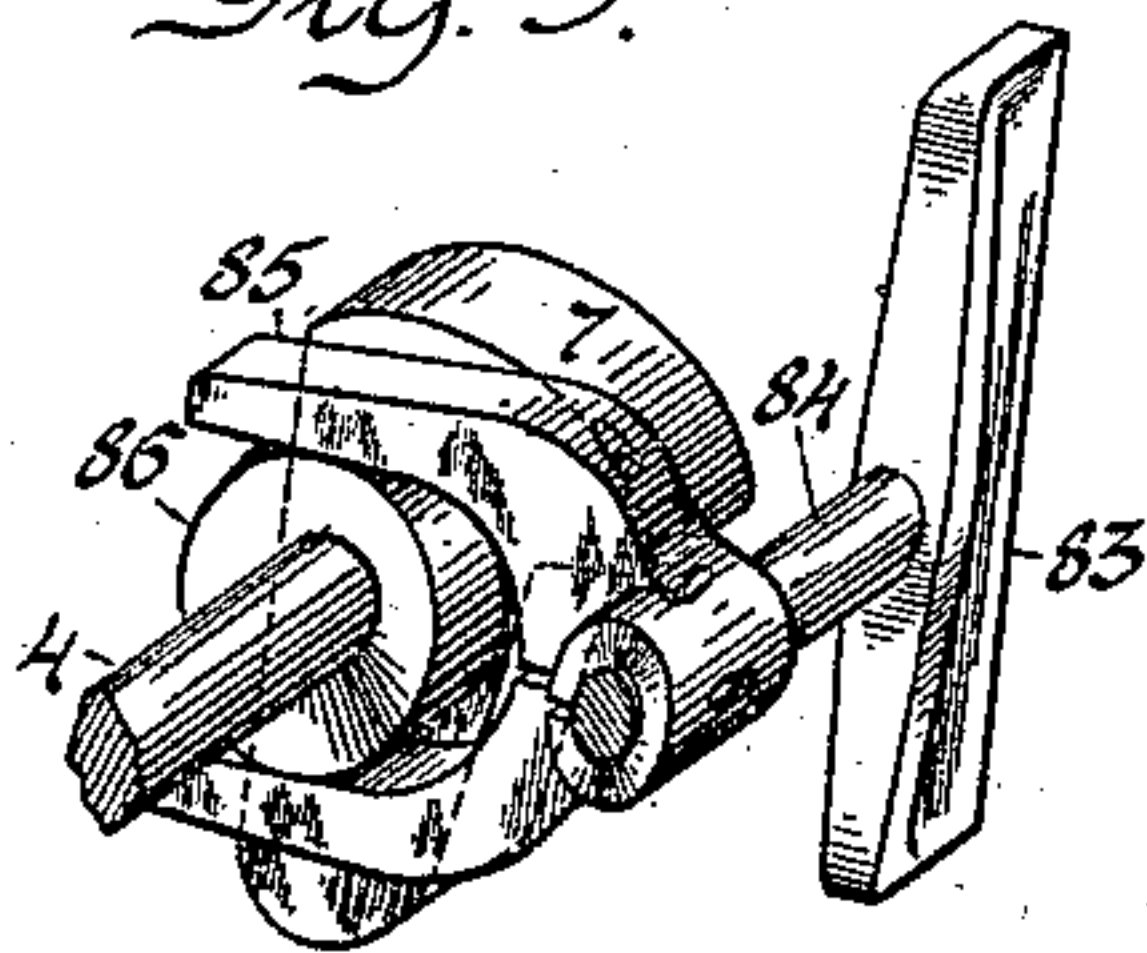


Fig. 11.

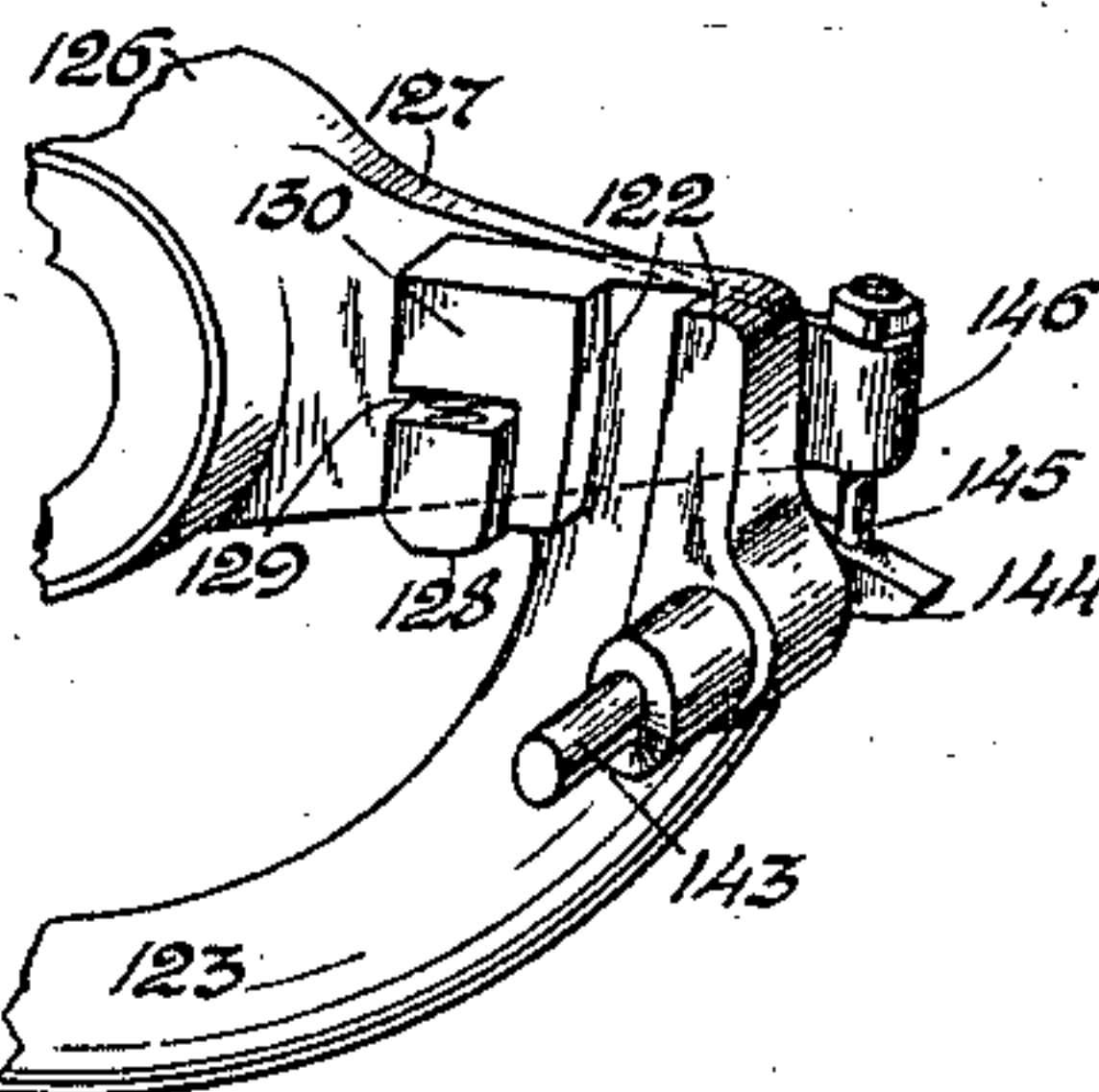
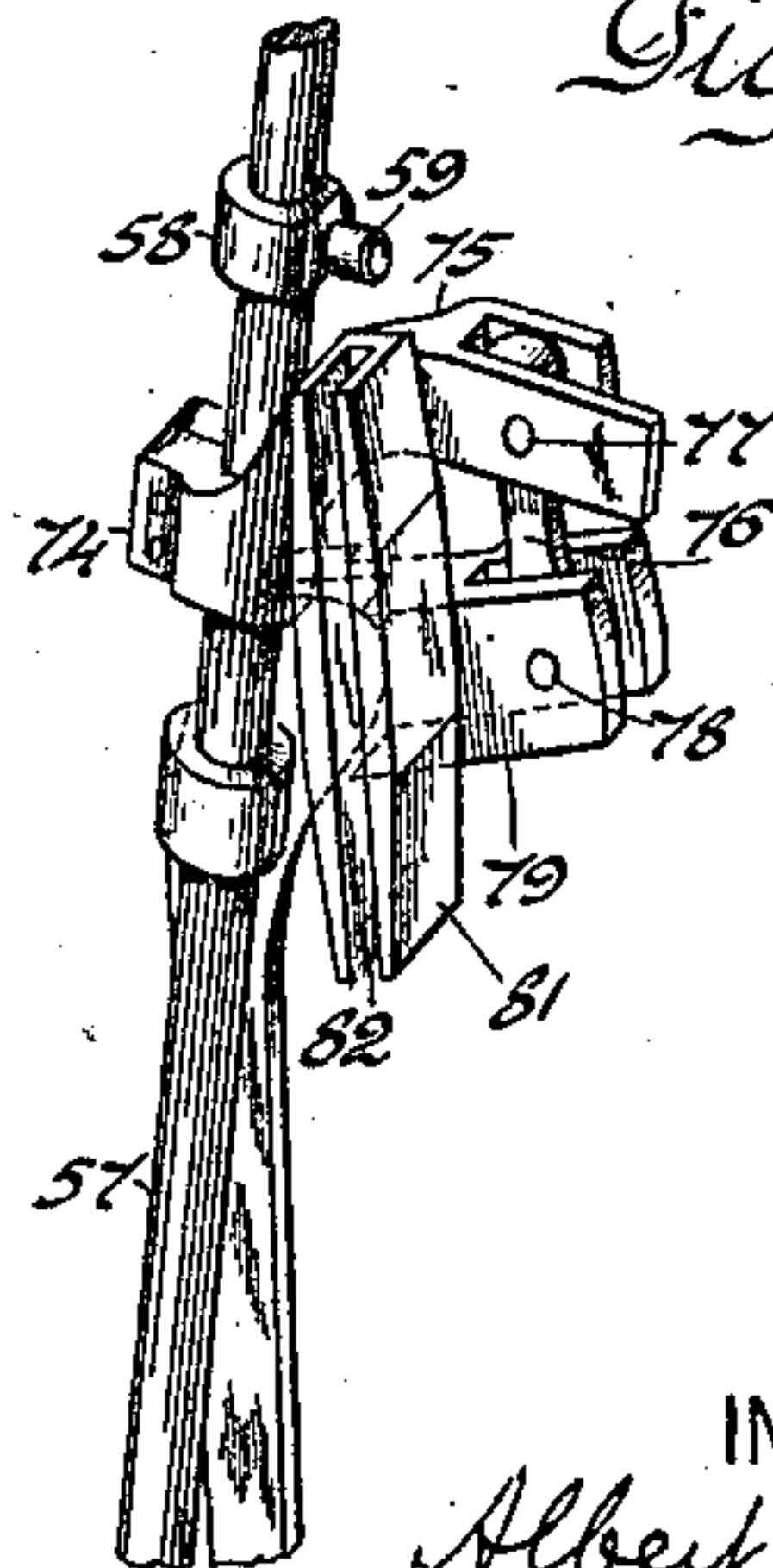


Fig. 10.

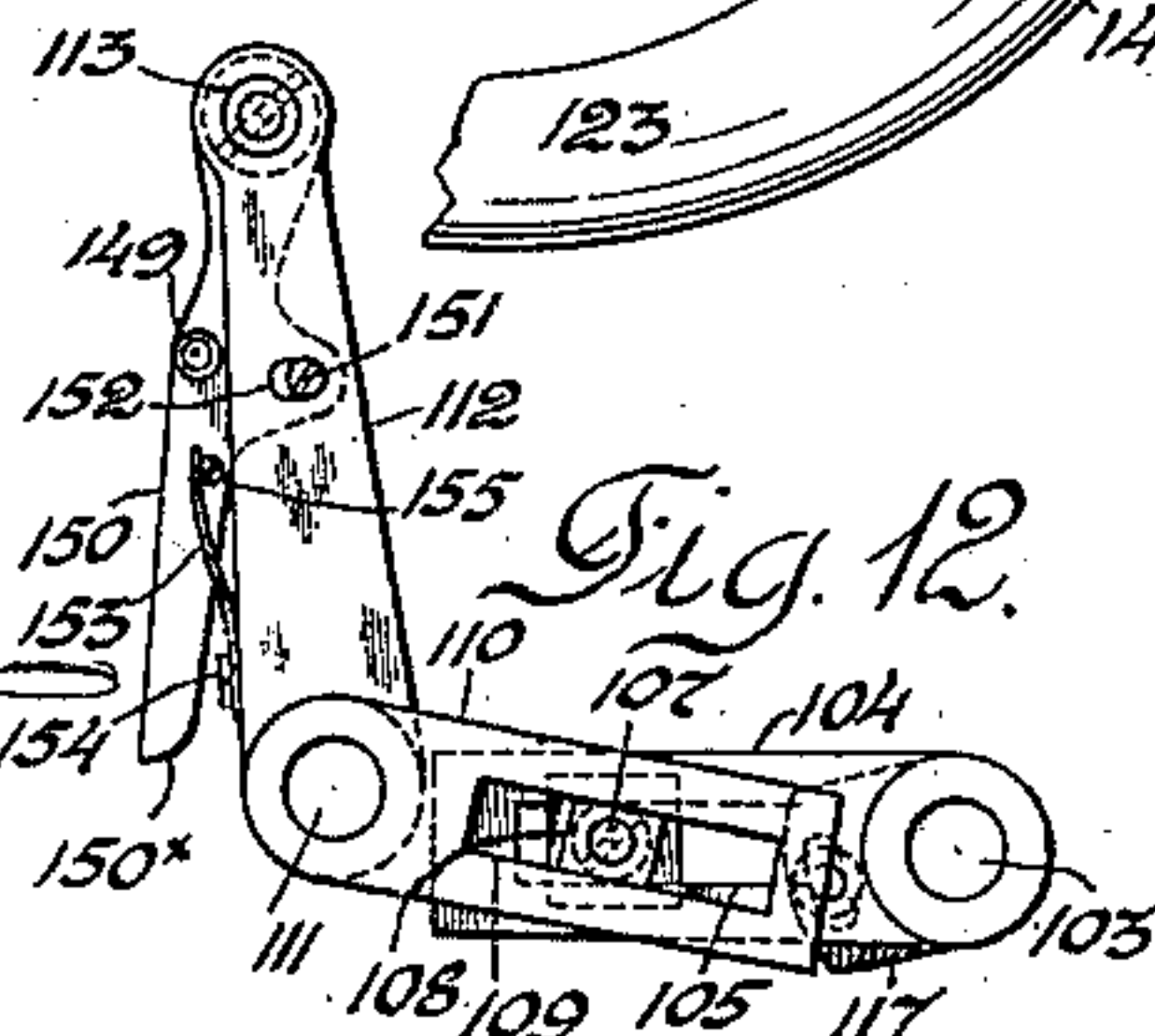


WITNESSES:

Geza Terna

H. K. Kummam

Fig. 12.



INVENTOR

Albert H. De Voe

BY

Harry J. Miller

ATTORNEY

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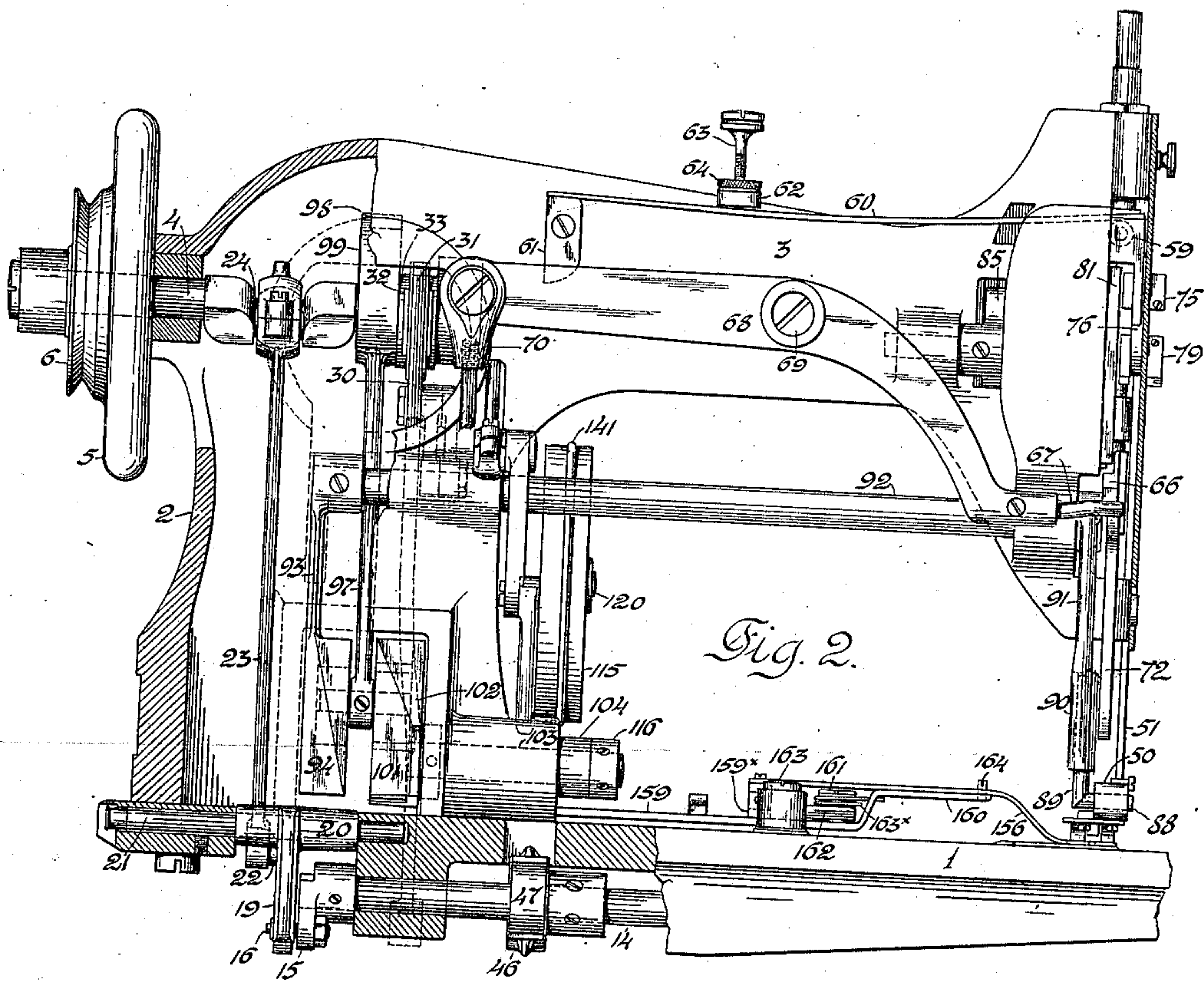


Fig. 2.

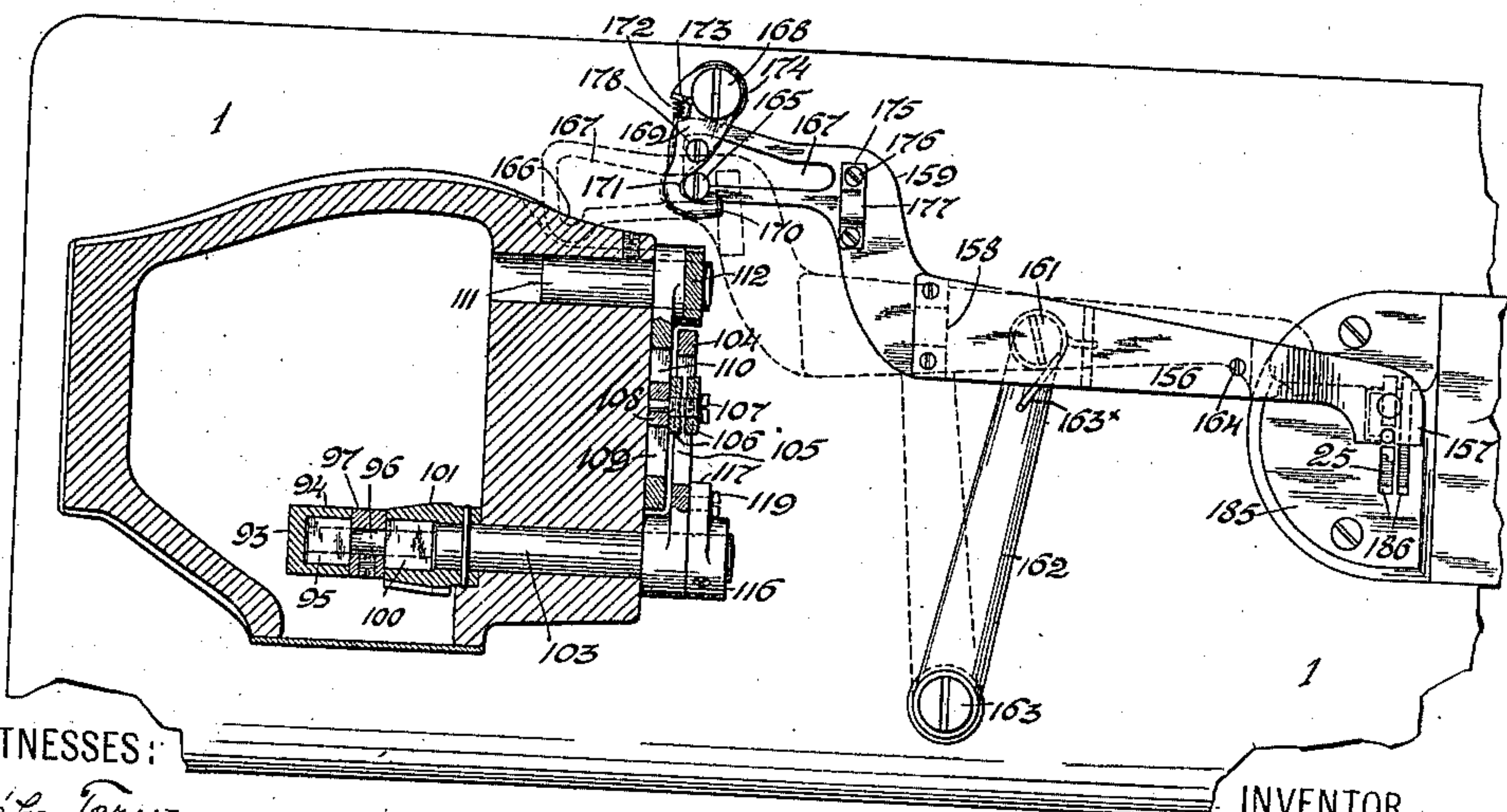


Fig. 3.

WITNESSES:

Geza Terenyi
Max Krumm

INVENTOR

Albert H. DeVoe
BY *Kurt Miller*
ATTORNEY

989,579.

3 SHEETS—SHEET 3.



Fig. 7.

WITNESSES:

Geza Terna

W. A. Kornemann

INVENTOR

Albert H. S. Noz

BY *Henry J. Miller*
ATTORNEY

UNITED STATES PATENT OFFICE.

ALBERT H. DEVOE, OF ELIZABETH, NEW JERSEY, ASSIGNOR TO THE SINGER MANUFACTURING COMPANY, A CORPORATION OF NEW JERSEY.

RUFFLING AND STITCHING MACHINE.

989,579.

Specification of Letters Patent.

Patented Apr. 18, 1911.

Application filed August 8, 1908. Serial No. 447,506.

To all whom it may concern:

Be it known that I, ALBERT H. DEVOE, a citizen of the United States, residing at Elizabeth, in the county of Union and State of New Jersey, have invented certain new and useful Improvements in Ruffling and Stitching Machines, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention has for its principal object the provision of a sewing machine in which superposed layers or plies of material are presented to the stitch-forming mechanism by upper and lower feeding members, one of which latter is automatically controlled to vary the speed of movement of the ply of material which it engages in relation to that engaged by the other feeding member, whereby one of such plies is fulled or gathered as it is stitched to the other ply.

The invention has for its further object the provision of a stitching and ruffling or gathering machine for operation upon articles of irregular shapes, such as Japanese tabis, of which the component parts are simple in construction and effective in arrangement for the performance of their several functions, while the machine as a whole is compact and easily handled.

The invention consists in the various constructive features herein shown and described and set forth in the appended claims.

In the accompanying drawings, Figure 1 is a front side elevation of a machine embodying the present improvements, Fig. 2 a rear side elevation, partly in section, of the same, Fig. 3 a sectional plan of the machine taken in a plane slightly above the top of the bed-plate, Fig. 4 a front end view of the machine with the face plate of the bracket-arm removed, and Fig. 5 a transverse sectional elevation of the machine, taken in a plane rearward of the stitch-forming mechanism and looking backwardly. Fig. 6 is a perspective view representing the upper feeding mechanism and its controlling means, the upper feeding member being shown in its relation to the presser-foot of special form and the needle. Figs. 7 and 8 are perspective views showing respectively the upper and lower sides of the throat-plate with the edge-gage carried thereby, and Fig. 8^a is an edge view of the edge-gage and its carrier, with the throat-plate indicated in dotted lines. Figs. 9 and 10 are perspective

views showing in detail certain portions of the mechanism for alternating the lift of the presser-foot and upper feeding member, and Fig. 11 a similar view of the upper feed controlling cam clutch mechanism. Fig. 12 shows a detail of the mechanism.

The present improvement constitutes a modification of the ruffling and stitching machine forming the subject of my pending United States patent application Ser. No. 416,444, filed February 18, 1908, but is shown embodied in a flat-bed machine of which the frame comprises the bed-plate 1 and the bracket-arm including the upright columnar portion 2 and horizontal arm 3. In the bracket-arm is journaled the longitudinally extending main-shaft 4 carrying at its rearward end the balance wheel 5 and belt-pulley 6.

The main-shaft carries at its forward end the usual crank-plate 7 having a crank-pin embraced by one end of a pitman 8 whose opposite end embraces a lateral pin upon a collar 9 fixed upon the needle-bar 10 journaled in the forward end of the bracket-arm and carrying a needle 11. The link take-up 12, actuated from an offset crank carried by the needle-bar actuating crank-pin, is of well-known construction and operation.

The loop-taker, which carries the usual bobbin case 13, is of the well-known Singer oscillating shuttle type, and derives its oscillatory movements from a driver mounted upon the oscillating shaft 14 provided with a crank 15 having a pin 16 carrying a slide-block 17 embraced by the slide-way 18 of a forked arm 19 upon a rocker 20 journaled upon a pin 21 mounted in the machine frame, said rocker being provided with a lateral arm 22 pivotally connected with the lower end of a pitman-rod 23 whose upper end embraces the actuating crank 24 formed in the main-shaft 4.

The lower or primary feed-dog 25 is mounted upon the usual feed-bar 26 having its rearward end pivotally connected with spaced upright arms 27 carried by the feed rock-shaft 28 provided in its rearward end portion with a lateral crank-arm 29 which is pivotally connected with the lower end of a link-bar 30 having at its upper end the yoke 31 embracing a block 32 fitted upon the feed-actuating eccentric 33 on the main-shaft 4. The link-bar 30 is mounted adjacent its yoke 31 upon a fulcrum-stud 34 carried by a

swinging link 35 which is itself fulcrumed upon a screw-pin 36 carried by the depending arm 37 of an angle-lever pivotally mounted by means of the screw-stud 38 upon the bracket-arm and having a lateral arm 39 passing through a slot 40 in the side of the columnar portion 2 of the bracket-arm and carrying a thumb-screw 41 by which such feed-regulating angle-lever may be shifted to determine the position of the supporting stud 36 of the fulcrum-carrying link 35. in effecting the desired up-and-down movement of the link-bar 30 to produce the desired degree of oscillation of the feed rock-shaft 28, and hence the operative movement of the feed-dog 25. The means for producing and controlling the extent of oscillatory movements of the feed rock-shaft above described is that of many of the machines of the well-known Singer type, as shown and described in the United States patent to L. B. Miller and P. Diehl No. 229,629, of July 6, 1880.

The feed-bar 26 is forked at the opposite end from its connection with the feed rock-shaft to embrace a stud 42 upon the lateral arm 43 of the feed-lifting rock-shaft 44 having upon its rearward end portion a lateral arm 45 with yoke 46 embracing a feed-lifting cam 47 upon the shuttle-actuating rock-shaft 14.

The upper feeding member comprises a bifurcated foot portion 48 having downturned hooked forward ends 49 secured to the bottom of a block 50 having a vertically slotted socket entered by the lower end of the upper feed-bar 51 secured therein by means of the fastening screw 52. Means are provided for alternately lifting from contact with the work the feeding foot 48 and the presser-foot 53, which is provided in its under face with a transverse notch or recess 54 rearward of its needle-hole 55, the shank 56 of the presser-foot being secured in a manner well-known to the lower end of the presser-bar 57, upon the upper end portion of which is fixed the collar 58 having a lateral roller-stud 59 engaged by the free end of a flat pressure spring 60 having its opposite end secured upon the bearing lug 61 upon the bracket-arm 3 with its intermediate portion disposed beneath the lug 62 through which passes the pressure adjusting screw 63 with set-nut 64. The presser-bar is also provided with a fixed collar 65 having a projecting finger 66 adapted for engagement by a rod 67 carried by the forward end of the presser-lifting rock-lever 68 fulcrumed upon the screw-stud 69 upon the bracket-arm and having its opposite end connected with a treadle actuated rod 70. The finger 66 is also adapted for engagement by the cam portion 71 of the finger-lever 72 fulcrumed at 73 adjacent the presser-bar for lifting the same by hand.

Fixed adjustably upon the presser-bar 57 is still another split collar 74 having a rigid rearwardly projecting arm 75 forked at its outer end to embrace the upper end of a link 76 pivotally connected therewith by means of a pin 77 and having its lower end similarly pivoted by means of the pin 78 within the forked outer end of a cross-bar 79 fulcrumed by means of a screw-pin 80 to the laterally extending upper end of the upper feed-bar 51. The cross-bar 79 is attached transversely to a slide-block 81 having a slideway 82 fitted to and embracing the cross-bar 83 fixed upon one end of the rock-shaft 84 which is journaled in the head of the bracket-arm and is provided at its opposite end with a yoke 85 embracing a cam 86 upon the main-shaft 4 adjacent the crank-plate 7. As will be observed, the rocking of the cross-bar 83 by means of the cam 86 causes corresponding movements of the slide-block 81 and its cross-bar 79 which acts through the connecting link 76 to alternately draw together and separate the collar 74 and fulcrum-stud 80 so as to change the height of the feeding foot relatively to the presser-foot and thus produce the alternate action of said members on the work. By forming a sliding connection between the tilting cross-bar 79 and its actuating rock-shaft 84, it is evident that the presser-foot and upper feeding member may be raised from engagement with the work by the rock-lever 68 or the cam-lever 72, and that these members are permitted to accommodate themselves to any variations in thickness of the material operated upon.

The block 50 is provided with a rearward extension 87 having a transverse aperture entered by a lateral pin 88 upon the bottom of a slide-rod 89 which is slidably fitted within a socket 90 upon the lower end of a depending crank-arm 91 which is mounted upon the forward end of the actuating rock-shaft 92 mounted parallel with the main-shaft in suitable bearings in the bracket-arm. Upon the rearward end of this rock-shaft is mounted a depending arm 93 having upon the forward side of its lower portion the parallel wings 94 forming a guide-way for a slide-block 95 pivotally mounted upon a transverse-pin 96 carried by the lower end of a pitman-rod 97 whose upper end is formed with a strap 98 embracing an actuating eccentric 99 upon the main-shaft. The opposite end of the pin 96 carries a second slide-block 100 fitted to a guide-way formed intermediate the wings 101 of a guide-block 102 mounted upon the rearward end of a rock-shaft 103. As will be observed, the pitman-rod 97 makes one reciprocation for each rotation of the main-shaft 4, and the lateral motion communicated thereto for swinging the depending arm 93 of the upper feed-actuating rock-shaft 92 is

determined by the angular relation of the guide-block 102 to the main-shaft.

As in my prior application Serial No. 416,444, above mentioned, the rock-shaft 103 is provided upon its forward end with a crank-arm 104 formed with a longitudinal slot 105 in which are fitted the reduced inner portions of a pair of clamp-blocks 106 connected by means of a clamp-screw 107 with the inner end entering an aperture in a slide-block 108 fitted to a corresponding slot 109 in a lateral arm 110 of an angular lever mounted upon the fulcrum-pin 111 and having an upwardly extending arm 112 which carries at its upper end a screw-stud 113, the inner end of which is preferably surrounded by a roller entering a groove 114 in the controlling cam-disk 115. Unlike the mechanism of my said former application, the crank-arm 104 is loosely mounted upon the rock-shaft 103, but is adjustably secured to a flange 117 of a collar 116 fixed upon said rock-shaft, said flange having a segmental slot 118 entered by the shank of a clamp-screw 119 tapped into a suitably threaded aperture in the arm 104.

It will be observed that in its step-by-step rotary motion, the cam-groove 114 of the cam-disk 115 acts upon the roller-stud 113 to rock the angular lever 110 112, the lateral arm of which communicates through the adjustable connection comprising the blocks 106 108 and screw 107 a vibratory movement to the crank-arm 104 which imparts to the guide-block 102 through the shaft 103 rocking movements serving to vary its angular relation with the main-shaft, whereby the amplitude of swinging movements of the arm 93 is varied, as before described. As will be readily seen, the adjustment of the clamp-blocks 106 within the slot 105 of the arm 104 toward and from the rock-shaft 103 adjusts the relative rocking movement communicated to the guide-block 102 from the vibrating arm 110 for regulation of the degree of oscillation of the rock-shaft 92 and the consequent operative or feeding movement of the upper feeding member.

The cam-disk 115 is carried by a short shaft 120 mounted upon the columnar portion 2 of the bracket-arm, and its rearward face is provided with an annular flange 121 embraced by the spaced and similarly curved jaws 122 at the free end of the curved clutch-lever 123 having its opposite end pivotally connected by means of a pin 124 with one arm 125 of an operating lever having a boss 126 fitted loosely upon the shaft 120 and provided with an oppositely extending arm 127 formed with a lateral lug 128 having a socket in which is seated one end of a spring 129 with its opposite end fitted within a similar socket of a lateral

lug 130 upon the clutch-lever 123, whereby the pivotally connected members are forced slightly apart to cause the jaws 122 to assume a slightly eccentric relation to the flange 121 to produce a cramping action thereon in a well known manner. The lever-arm 125 is formed with an angular extension arm 131 projecting upwardly from the pivotal pin 124 and provided with a boss 132 to which is pivotally connected by means of the pin 133 one end of a connecting rod 134 whose opposite end is provided with a strap 135 embracing an adjustable eccentric 136 upon the main-shaft.

As shown and described more fully in my application Serial No. 416,444, the eccentric 136 has an elongated aperture 137 embracing the main-shaft, and is carried by a slide-plate 138 which is fitted to a transverse guide-way in a fixed collar 139 upon the main-shaft, a transverse adjusting screw 140 intermediate the slide-plate 138 and collar serving to shift the eccentric 136 upon the main-shaft 4 to vary the action of the eccentric upon the lever 125 127 through the rod 134. It is evident that the yielding action of the spring 129 in the oscillation of the levers 125 127 and 123 causes a cramping action of the jaws 122 upon the flange 85 in one direction and the release of the same in moving in the opposite direction, whereby the cam receives a step-by-step rotary motion in one direction only, which acts through its connections with the guide-arm 102 to cause the variable operation of the feeding foot 48 during the combined stitching and gathering or fulling action of the machine.

To insure against retrograde motion in the downward movement of the operating lever, the cam is provided with the usual peripheral groove in which is arranged the encircling band 141 whose opposite ends are formed with eyes entered and fastened adjustably to a fixed abutment of the sewing machine frame by a screw 142, as shown in dotted lines in Fig. 5.

Adjacent the outer jaw 122 of the lever 123 is journaled transversely therein a rocking pin 143 which carries at one end a clutch-releasing finger 144 normally resting in contact with the adjacent end of the contact-screw 145 mounted in a lug 146 at the end of the lever-arm 127 and provided with a lock-nut 147 to maintain it in fixed adjustment in the threaded aperture of said lug 146. The tripping finger 148 upon the opposite end of the pin 143, lies in the path of movement of a lateral pin or roller-stud 149 carried by the depending tripping lever 150 fulcrumed upon the screw-stud 113 carried by the vibrating lever-arm 112, said tripping lever having a second laterally projecting roller-stud 151 entering a transverse slot 152 in the lever-arm 112 against the

rearward end of which said roller-stud is normally maintained seated by means of a flat spring 153 secured by means of a fastening screw 154 to the edge of the lever-arm 112 and bearing upon a pin 155 carried by the tripping lever 150. As the lever-arm 112 moves outwardly to the extreme outer points of the cam-groove 114, it carries the tripping lever 150 with it to cause the roller-stud 149 to approach the adjacent edge of the tripping finger 148. The parts are so arranged and proportioned that in the extreme outer position of the lever-arm 112, the tripping lever 150 does not necessarily carry the roller-stud 149 into operative engagement with the tripping finger 148 so as to turn the rock-shaft 143 sufficiently to discontinue the operation of the clutch-levers 123 and 127 for interruption of the rotation of the cam-wheel 115; this action being produced only when the lower end of the tripping lever is forcibly held outwardly from its carrying lever 112, by means presently to be described, so as to bring the roller-stud 149 in opposition to the spring 153 beyond its normal position in relation to the lever-arm 112.

To adapt the machine for gathering or pulling an upper ply of material, a longitudinally extending separator-plate 156 is provided having a forwardly extending offset operative end 157 formed with the usual sharpened edge with needle-receiving notch, the separator-plate having secured thereto by means of suitable fastening screws a block formed with a tongue 158 pivotally secured by means of a pin 158^x between spaced lugs of a block 159^x secured upon the flat carrying bar 159 which is of angular form with offset forward portion 160, such bar being pivoted by means of the stud-screw 161 to the free end of a swinging lever 162 whose opposite end is fulcrumed upon a stud-screw 163 near the rearward edge of the bed-plate 1. To maintain a fixed relation between the plate 156 and the carrying bar 159, while permitting the former to rise and fall freely when in operation, the bar 159 is provided with a screw-pin 164 entering an aperture in the plate 156 and serving to steady the latter. A spring 163^x encircling the stud-screw 161 and having one arm attached to the lever 162 and the other arm inserted in a suitable aperture in the bar 159 is provided to induce a tendency of the rearward end of the carrying bar 159 to approach the fulcrum-screw 163, which action is prevented by the provision of a fixed screw-stud 165 upon the bed-plate which is normally engaged by a lateral notch 166 in a longitudinal tapering slot 167 in the adjacent portion of the bar 159, which not only prevents the swinging of the bar 159 upon its fulcrum 161, but detains the same from retrograde movement in relation to the stitch-

forming mechanism and longitudinally of the bed-plate from the full line position of Fig. 3 to the dotted line position which is permitted to take place when the bar 159 is given a slight lateral motion by the operator to disengage its notch 166 from the fixed stud 165.

Mounted upon a fixed fulcrum-stud 168 near the front edge of the bed-plate is a cam-lever 169 having in its outer end a transverse cam projection 170 with its upper face beveled toward the fulcrum-pin 168, a lateral notch or recess 171 being provided in such cam-lever adjacent its transverse cam projection, which latter is normally maintained across the path of movement of the correspondingly beveled lower extremity 150^x of the tripping lever 150 by means of a spring 172 interposed between a lateral lug 173 upon the lever 169 and an adjacent fixed shoulder provided upon the washer 174. Slightly beyond the forward end of the slot 167 the separator-plate carrying bar 159 is provided with a cam-piece 175 secured thereon by means of fastening screws 176 and provided with a beveled cam projection 177 similar in form to the cross-section of the cam projection 170 of the lever 169, but of slightly less thickness, so that when such parts are abutted together the cam-member 170 affords a slight shoulder above the top of the cam-member 177.

The parts are so proportioned that when the higher cam-member 170 is displaced from its normal position in the path of movement of the extremity 150^x of the lever 150, the clutch mechanism may be maintained inoperative through the engagement of the part 150^x of the tripping lever with the lower cam-member 177, the retraction of which from beneath the lever 150 permits the latter to move freely with the lever-arm 112, while the lever 169 is detained from assuming normal operative position by engagement of the extremity of its cam-member 170 with the side of the tripping lever. As the lever-arm 112 moves inward toward the shaft 120, however, the tripping lever is disengaged from the cam-member 170 and the lever 169, under the action of the spring 172, is caused to assume its operative position across the path of movement of the tripping lever 150.

In the ordinary use of the machine, the arm 104 is so adjusted upon its rock-shaft 103 that when the roller-stud 113 is at one of the extreme outer positions of the cam-groove 114 in the cam-disk 115 the upper feed rock-shaft 92 will receive from its actuating eccentric 99 such movements that the upper feeding member 48 will have the same throw as the lower feeding member 25, whereby the upper and lower plies of material will be advanced equally; and the separator-plate being in the retracted posi-

tion represented in dotted lines in Fig. 3, its cam projection 177 retains the cammed lower extremity 150^x of the tripping lever 150 in extended relation with its carrying lever-arm 112 so that the tripping stud 149 rests in forcible engagement with the finger 148 whereby the clutch-actuating mechanism of the pattern-cam 115 is held inactive and the cam remains at rest.

10 In the retracted position of the bar 159, the cam projection 177 abuts against the adjacent extremity of the cam-member 170 of the lever 169 and maintains the same displaced from normal operative position in
15 which it extends partially across the path of lateral movement of the cammed extremity 150^x of the lever 150. When the operator shifts the separator-plate forwardly, the stud 165 bears against the straight edge of
20 the cam-slot 167 of the bar 159 so as to guide the operative edge of the separator-plate transversely of the feed and in advance of the needle-path until the stud reaches the pocket or notch 166 in the cam-slot, when the
25 separator-plate is permitted under the action of its spring to advance so that its notch embraces the needle-path, as indicated by the full line position represented in Fig. 3. In the movement of the bar 159 from re-
30 tracted to operative position, the cam-piece 175 is withdrawn from contact with the end of the cam-member 170, thus permitting the lever 169 to advance the end of the cam-member 170 until the movement of the lat-
35 ter is checked by its engagement with the side of the lower end of the lever 150 depending slightly below the top of the same. The lever 150 is thus relieved from the detaining influence of the cam-member 177,
40 and is also unrestrained by the cam-member 170, and is thus permitted to return to initial relation with its carrying lever-arm 112, whereby its tripping stud 149 is withdrawn from operative engagement with the finger
45 148 of the clutch-releasing device to restore the action of the cam-driving mechanism. As the rotation of the cam thus restored causes the movement of the lever-arm 112 toward its axis of rotation, the cammed
50 lower extremity 150^x of the tripping lever 150 swings upwardly about the fulcrum-pin 111 as an axis and releases the cam portion 170 of the lever 169, which latter is thus permitted to move under the action of its
55 returning spring 172 into initial operative relation across the path of movement of the extremity 150^x of the tripping lever.

As the roller-stud 113 arrives at the succeeding high point or outer position of the
60 cam-groove 114, the lower extremity of the tripping lever 150 returns toward its initial position, but its engagement with the beveled upper face of the cam portion 170 of the lever 169 causes it to move outwardly slightly
65 in opposition to its spring 153 while its ful-

crum-pin 113 continues to move laterally, whereby the tripping stud 149 is thrown forcibly into contact with the finger 148 of the clutch-releasing device, and the controlling cam is brought to rest and the up- 70 per and lower feeding members are restored to initial relation in which they move in unison. The separator-plate 156 is now forcibly retracted by the operator into the dotted line position of Fig. 3, wherein the 75 operative portion of the cam-member 170 is displaced by the cam-member 177 carried by the bar 159, and the machine is thus set in readiness for a succeeding ruffling or gathering operation. 80

For convenience in retracting the cam-lever 169 from operative to inoperative position with the tripping lever 150 when re- required while the carrying bar 159 is not in retracted position, a stud-pin 178 is applied 85 to such lever to be grasped by the fingers of the operator in moving such lever.

In order to turn the cam-wheel 115 by hand when desired, a lever 179 is provided with a lateral notch 180 fitted to the annular 90 flange 121 of the cam-wheel and provided with a flat spring 181 secured thereto by means of screws 182 with its slightly up-turned free end resting upon the periphery of said flange, a cheek piece 183 being se- 95 cured to the side of such lever by means of screws 184 and adapted to engage the opposite edge of the cam-wheel to maintain the lever 179 thereon. As will be observed, in the normal rotation of the cam-wheel the 100 lever 179 is carried into contact with the clutch-lever arm 127 against which it rests idly in the movement of said cam, but when moved forwardly it is caused to grip the cam and pressure by the operator in the di- 105 rection of the clutch-lever arm 127 causes a cramping action thereon which imparts the desired rotation to the cam-wheel.

In operation upon tabis, requiring the stitching along the adjacent convergent 110 edges of the curved toe portions, it is impracticable to employ an edge-gage, although it is desirable to employ edge-guiding means to insure uniform spacing of the stitching along the edges in other portions of the ar- 115 ticle, and I have therefore provided the throat-plate 185 with a receding edge-gage for the purpose. Adjacent and at one side of the usual feed-openings 186 and the needle-hole 187 in the throat-plate is dis- 120 posed a slot 188 parallel with the feed-openings and through which projects an up-turned guide-lip 189 upon the plate 190 which is set in a transverse channel 191 formed in the bottom of the throat-plate 125 and rigidly secured to the transverse outer portion of an arm 192 having a transversely disposed opposite end 193 journaled in a bearing rib 194 of a block 195 set in a second transverse channel 196 formed in the bottom 130

of the throat-plate and secured therein so as to be adjustable transversely of the direction of feed by means of the fastening screw 197 entering the slot 198 in the throat-plate; the block 195 having also secured thereto by means of the screws 199 one end of a flat spring 200 whose opposite end extends beneath the plate 190 and maintains the same yieldingly seated within the channel 191 with the guide-lip 189 extended slightly above the surface of the throat-plate to afford an edge-gage for the work. As will be observed, the forward edge 189* of the guide-lip is slightly beveled so that when portions of the article operated upon which extend across the stitch-line come in contact with the forward end of the guide-lip they will depress the same in opposition to the spring 200, and the article may therefore be guided independently thereof until a free edge of the article is again presented to the stitching devices, when the guide-lip returns to operative relation with the work.

In the initial position of the various parts of the machine, the needle, presser-foot and feeding foot or upper feeding member are raised, the separator-plate is retracted as indicated in dotted lines in Fig. 3, and the vibrating lever 112 of the upper feed-controlling mechanism is in its extreme position in front of the cam-shaft 120 to which it is carried by engagement of its roller-stud with one of the outer points of the cam-groove 114. While the initial lengths of feed of the lower or primary feeding member and the upper or secondary feeding member may bear any suitable relation, depending upon the class of work to be performed, in the stitching of tabis the arm 104 is secured in such position of adjustment in relation to the collar 116, by means of the screw 119, that the upper feeding member normally receives operative movements not only concurrent with but equal to those of the lower feeding member, whereby the upper and lower plies of material are normally propelled at the same speed, the edge of the lower and heavier ply being fed to the stitch-forming and feeding mechanisms in contact with the edge-guide 189. When the toe portion of the article is reached the separator-plate 156 is thrown forwardly and guided by means of the fixed pin 165 and cam-slot 167 into a position intermediate the superposed plies of material and between the upper and lower feeding members, with its needle-receiving notch in register with the needle-path, which causes the withdrawal of the cam projection 177 from engagement with the tripping lever 150 whereby the tripping finger 148 is released and the actuating clutch thrown into operation so as to cause the forward movement of the pattern-cam wheel 115.

The cam-groove 114 is so formed that the

parts intermediate its outer or high points produce, through the rocking pins 111 and 103 and their connections, a gradual tilting to-and-fro of the guide-member 102, which causes a gradual increase and subsequent decrease of the feeding or work-advancing movements of the upper feeding member in rounding the divided toe portions of the article. As the stitching approaches the inner end of the slit between the two portions of the tabi, the beveled forward edge of the edge-guide 189 is engaged thereby and the guide depressed while the work continues to move, the upper feed acceleration produced by the pattern-cam having in the meantime been interrupted by the disengagement of the actuating clutch through the tripping mechanism brought into operation by the outward movement of the vibrating lever 112. At the time the acceleration of the upper feeding member ceases, the separator-plate is manually disengaged from its holding means and allowed to be retracted under the action of its spring 163* into inoperative position indicated in dotted lines in Fig. 3, its cam member 177 displacing the cam-member 170 carried by the spring-pressed cam-lever 169 without materially affecting the position of the tripping lever 150 whose lower end alternately bears against the same while the clutch is held inactive. As the stitching continues, and a free edge is presented to the edge-guide 189, the latter again rises into operative position to insure the proper spacing of the line of stitching from the edge of the sole portion of the article.

The actuating mechanism of the feeding foot 48 is so adjusted that when the feeding movement of said member exceeds that of the primary feeding member the downturned hooked forward ends or claws 49 engage the upper ply of fabric in advance of the needle and deposit the slack thus formed beneath the arched portion of the presser-foot 53 and rearward of the needle, whereby the slack portion of the goods is not penetrated by the needle but is embraced between successive punctures thereof and is held in such position by the intervening threads of the same.

As will be observed, the offset or arched form of the separator-plate at the side of the stitching and feeding mechanisms affords clearance for the work in stitching certain classes of articles, while the hinging of the separator-plate horizontally upon its carrying bar 159 permits the same to rise and fall freely in the operation of the machine and especially in its introduction between the partially stitched plies of material adjacent the parts to be gathered or fulled. By maintaining the edge-guide 189 upon a yielding carrier 192, such guide is not only adapted to accommodate itself to the form

of the article to be stitched, as before described, but accommodates itself to the thickness of the lower ply of material beneath the superposed operative portion of the separator-plate, which latter serves an additional function as a pressure plate to receive the downward thrust of the claws 49 of the upper feeding member in maintaining the necessary pressure of the lower ply of material upon the feed-dog 25.

The feeding foot 48 is preferably formed of a thin elastic plate, and the bifurcation of the forward portion of the same forms two work-engaging members which are thus relatively yielding and adapted to closely conform with the work operated upon.

While the several parts of the present improvement are shown and described herein in the specific forms and constructions which are provided for the work for which the present improvement has been especially designed, it is to be understood that the machine is susceptible of modification to a very considerable degree without departure from the present invention.

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

1. In a sewing machine, the combination with an upper feeding member and a lower feeding member, and actuating means whereby feeding movements are simultaneously imparted to said members throughout the operation of the machine, of controlling means whereby the relative operation of said feeding members is varied, and automatically acting means for interrupting the movement of said controlling means.

2. In a sewing machine, the combination with opposed upper and lower feeding members, and actuating means therefor, of a separator-plate adapted for introduction intermediate said feeding members but normally retracted therefrom, controlling means including a pattern-cam for the actuating means for one of said feeding members, operating means for said pattern-cam including a clutch-device, means connected with said separator-plate and acting upon said clutch in establishing the rotation of said pattern-cam, and means acting upon the clutch for interrupting the movement of the pattern-cam.

3. In a sewing machine, the combination with opposed upper and lower feeding members, and actuating means therefor, of a separator-plate adapted for introduction intermediate said feeding members but normally retracted therefrom, controlling means including a pattern-cam for the actuating means for one of said feeding members, operating means for said pattern-cam including a clutch-device, means connected with said separator-plate and acting upon said clutch in establishing the rotation of said pattern-cam, and automatically acting

means connected with said clutch-device for interrupting the movement of the pattern-cam.

4. In a sewing machine, the combination with upper and lower feeding members and actuating means therefor, of controlling means whereby the action of one of said feeding members is varied in relation to the other and comprising a pattern-cam wheel formed with an annular flange, a clutch-lever provided with spaced cramping jaws embracing said flange, a rock-lever to which said clutch-lever is pivotally connected, means for yieldingly maintaining said levers in fixed relation, means for actuating said rock-lever, and means for varying the relation of said rock-lever and clutch-lever for throwing the latter into and out of operative relation with the pattern-cam wheel.

5. In a sewing machine, the combination with upper and lower feeding members and actuating means therefor, of controlling means whereby the action of one of said feeding members is varied in relation to the other and comprising a pattern-cam wheel formed with an annular flange, a clutch-lever provided with spaced cramping jaws embracing said flange, a rock-lever to which said clutch-lever is pivotally connected, means for yieldingly maintaining said levers in fixed relation, automatically acting means for shifting the relation of said rock-lever and clutch-lever to render the latter inoperative, and manually actuated means for re-establishing the operative relation of said clutch-lever with the rock-lever.

6. In a sewing machine, the combination with upper and lower feeding members and actuating means therefor, of controlling means whereby the action of one of said feeding members is varied in relation to the other and comprising a pattern-cam wheel formed with an annular flange, a vibrating lever receiving its operative movements from said pattern-cam, a clutch-lever provided with spaced cramping jaws embracing said flange, a rock-lever to which said clutch-lever is pivotally connected, means for yieldingly maintaining said levers in fixed relation, means for actuating said rock-lever, a tripping device carried by one of said levers and adapted to shift the one in relation to the other, a tripping lever pivotally mounted upon the cam-actuated vibrating lever and provided with a stud adapted to operatively engage and actuate said tripping device, and an independently and movably mounted fulcrum point adapted to engage said tripping lever and support the same in its engagement of such tripping device.

7. In a sewing machine, the combination with upper and lower feeding members and actuating means therefor, of controlling means whereby the action of one of said

feeding members is varied in relation to the other and comprising a pattern-cam wheel, a vibrating lever receiving its operative movements from said pattern-cam wheel, a clutch-device operatively connected with said pattern-cam wheel, and including a clutch-lever by means of which driving relation is established and interrupted between said clutch-device and pattern-cam wheel, means for actuating the clutch-lever to impart operative movements to the pattern-cam wheel, a tripping device adapted to shift said lever into inoperative relation with the interengaging parts of the clutch, a tripping lever pivotally mounted upon the cam-actuated vibrating lever and adapted to engage said tripping device, and means for locking said tripping lever from movement upon its supporting vibrating lever and for releasing the same to permit such relative movement.

8. In a sewing machine, the combination with upper and lower feeding members and actuating means therefor, of controlling means whereby the action of one of said feeding members is varied in relation to the other and comprising a pattern-cam wheel, a vibrating lever receiving its operative movements from said pattern-cam wheel, a clutch-device operatively connected with said pattern-cam wheel and including a clutch-lever by means of which driving relation is established and interrupted between said clutch-device and pattern-cam wheel, means for actuating the clutch-lever to impart operative movements to the pattern-cam wheel, a tripping device adapted to shift said lever into inoperative relation with the interengaging parts of the clutch, a tripping lever pivotally mounted upon the cam-actuated vibrating lever and adapted to engage said tripping device, automatically acting means for locking said tripping lever from movement upon its supporting vibrating lever, and manually operated means for releasing the same to permit such relative movement.

9. In a sewing machine, the combination with upper and lower feeding members and actuating means therefor, of controlling means whereby the action of one of said feeding members is varied in relation to the other and comprising a pattern-cam wheel formed with an annular flange, a vibrating lever receiving its operative movements from said pattern-cam wheel, a clutch-lever provided with spaced cramping jaws embracing said flange, a rock-lever to which said clutch-lever is pivotally connected, means for yieldingly maintaining said levers in fixed relation, means for actuating said rock-lever, a tripping device carried by one of said levers and including a rocking pin carrying a releasing finger for engagement with the other of said levers and a tripping

finger, a tripping lever pivotally mounted upon the cam-actuated vibrating lever and adapted to engage said tripping finger, and means for locking said tripping lever from movement upon its supporting vibrating lever and for releasing the same to permit such relative movement.

10. In a sewing machine, the combination with upper and lower feeding members and actuating means therefor, of controlling means whereby the action of one of said feeding members is varied in relation to the other and comprising a pattern-cam wheel formed with an annular flange, a vibrating lever receiving its operative movements from said pattern-cam wheel, a clutch-lever provided with spaced cramping jaws embracing said flange, a rock-lever to which said clutch-lever is pivotally connected, means for yieldingly maintaining said levers in fixed relation, means for actuating said rock-lever, a tripping device carried by one of said levers and including a rocking pin carrying a releasing finger and a tripping finger, an adjustable contact pin carried by the other of said levers and adapted to engage said releasing finger upon the rocking pin, a tripping lever pivotally mounted upon the cam-actuated vibrating lever and adapted to engage said tripping finger, and means for locking said tripping lever from movement upon its supporting vibrating lever and for releasing the same to permit such relative movement.

11. In a sewing machine, the combination with a primary feeding member and means for actuating the same, of a secondary feeding member, an actuating rock-shaft, an operative connection intermediate said rock-shaft and the secondary feeding member, a swinging arm upon said rock-shaft, a reciprocating and laterally moving actuating member having a sliding connection with said swinging arm, a guide-member normally stationary with relation to said actuating member and with which the latter is also movably connected, and means for varying the angular relation of said guide-member with the swinging arm of said rock-shaft.

12. In a sewing machine, the combination with a primary feeding member and means for actuating the same, of a secondary feeding member, an actuating rock-shaft, an operative connection intermediate said rock-shaft and the secondary feeding member, a swinging arm upon said rock-shaft, a reciprocating and laterally moving actuating member having a sliding connection with said swinging arm, a pivotally mounted guide-member with which said actuating member is also slidingly connected, and means for varying the angular relation of said guide-member with the swinging arm of said rock-shaft.

13. In a sewing machine, the combination with a primary feeding member and means for actuating the same, of a secondary feeding member, an actuating rock-shaft, an operative connection intermediate said rock-shaft and the secondary feeding member, a swinging arm upon said rock-shaft provided with a slideway, a reciprocating and laterally moving actuating member, slide-blocks carried by said actuating member one of which is fitted to the slideway in said swinging crank-arm, a pivotally mounted guide-member formed with a slideway fitted to the other of said slide-blocks, and means for varying the angular relation of said guide-member with the swinging arm of said rock-shaft.

14. In a sewing machine, the combination with a primary feeding member and means for actuating the same, of a secondary feeding member, an actuating rock-shaft, an operative connection intermediate said rock-shaft and the secondary feeding member, a swinging arm upon said rock-shaft, a reciprocating and laterally moving actuating member having a movable connection with said swinging arm, a guide-member normally stationary with relation to said actuating member and with which the latter is also movably connected, and means for adjusting the initial relation of said guide-member with the swinging arm of said rock-shaft.

15. In a sewing machine, the combination with a primary feeding member and means for actuating the same, of a secondary feeding member, an actuating rock-shaft, an operative connection intermediate said rock-shaft and the secondary feeding member, a swinging arm upon said rock-shaft, a reciprocating and laterally moving actuating member having a movable connection with said swinging arm, a pivotally mounted guide-member with which said actuating member is also movably connected, means for adjusting the initial relation of said guide-member with the swinging arm of said rock-shaft, and means for varying the angular relation of said guide-member in relation to its initial position.

16. In a sewing machine, the combination with a primary feeding member and means for actuating the same, of a secondary feeding member, means for raising and lowering the secondary feeding member, an actuating rock-shaft, a crank-arm on said rock-shaft, a sliding pivotal connection intermediate said crank-arm and the secondary feeding member, and means for actuating said rock-shaft.

17. In a sewing machine, the combination with a primary feeding member and means for actuating the same, of a secondary feeding member, means for raising and lowering the secondary feeding member, an actuating

rock-shaft, a crank-arm on said rock-shaft provided with a radial socket, a slide-rod pivotally connected to the secondary feeding member and fitted to said socket of the crank-arm, and means for actuating said rock-shaft.

18. In a sewing machine, the combination with stitch-forming mechanism including a reciprocating needle, a primary feeding member and means for actuating the same, of a presser-foot with arched under or operative face, a secondary feeding member bifurcated to embrace said presser-foot and provided with downturned work-engaging claws at opposite sides of the same, and actuating means from which the claws of the secondary feeding member derive operative movements from a point in advance of the needle to a position adjacent the arch of said presser-foot.

19. In a sewing machine, the combination with stitch-forming mechanism including a reciprocating needle, a primary feeding member and means for actuating the same, of a presser-foot with arched under or operative face and a needle-hole disposed substantially in advance of the arch therein, a secondary feeding member bifurcated to embrace said presser-foot and provided with downturned work-engaging claws at opposite sides of the same, and actuating means from which the claws of the secondary feeding member derive operative movements from a point in advance of the needle to a position adjacent the arch of said presser-foot.

20. In a sewing machine, the combination with stitch-forming mechanism including a reciprocating needle, a primary feeding member and means for actuating the same, of a presser-foot with arched under or operative face, a secondary feeding member having a yieldingly sustained downturned work-engaging claw, and actuating means for said claw including a vertically swinging bar carrying said claw and having a fulcrum disposed rearwardly of the needle-path, and operating means connected therewith below said fulcrum, whereby the claw of the secondary feeding member derives operative movements from a point in advance of the needle to a position adjacent the arch of said presser-foot.

21. In a sewing machine, the combination with stitch-forming mechanism including a reciprocating needle, a primary feeding member and means for actuating the same, of a presser-foot with arched under or operative face and a needle-hole disposed substantially in advance of the arch therein, a secondary feeding member bifurcated to embrace said presser-foot and provided with independently yielding downturned work-engaging claws at opposite sides of the same, and actuating means from which the claws

of the secondary feeding member derive operative movements from a point in advance of the needle to a position adjacent the arch of said presser-foot.

5 22. In a sewing machine, the combination with stitch-forming mechanism including a reciprocating needle, a primary feeding member and means for actuating the same, of a presser-foot formed rearward of the
10 needle-path with an arch in its operative face, a secondary feeding member having downturned work-engaging claws, actuating means from which the claws of the secondary feeding member derive operative move-
15 ments from a point in advance of the needle to a position adjacent the arch of said presser-foot, and a separator-plate intermediate the primary and secondary feeding members, and movable into and out of op-
20 erative relation with the feed members both within and transversely of the direction of feed.

23. In a sewing machine, the combination with stitch-forming mechanism including a
25 reciprocating needle, a primary feeding member and means for actuating the same, of a presser-foot formed rearward of the needle-path with an arch in its operative face, a secondary feeding member having
30 downturned work-engaging claws, actuating means from which the claws of the secondary feeding member derive operative movements from a point in advance of the needle to a position adjacent the arch of said
35 presser-foot, means for varying the extent of the operative movements of the secondary feeding member while the machine is in operation, and a separator-plate intermediate the primary and secondary feeding mem-
40 bers.

24. In a sewing machine, the combination with a primary feeding member and means for actuating the same, of a secondary feed-
45 ing member opposed to the primary feeding member, a feed-bar to which the same is attached, means operatively connected with the actuating means of the primary feeding member for imparting operative or feeding
50 movements to said secondary feeding member, a presser-foot adjacent the secondary feeding member, a presser-bar to which the same is attached, means for yieldingly forcing the presser-bar toward the primary feed-
55 ing member, a rocker upon which said feed-bar is fulcrumed to swing, a connection between said rocker and the presser-bar, and an actuator having a sliding connection with said rocker and adapted to impart rocking movements thereto.

60 25. In a sewing machine, the combination with a primary feeding member and means for actuating the same, of a secondary feeding member opposed to the primary feeding member, a feed-bar to which the same is at-
65 tached, means for imparting operative or

feeding movements to said secondary feed-
ing member, a presser-foot adjacent the sec-
ondary feeding member, a presser-bar to
which the same is attached, means for yield-
ingly forcing the presser-bar toward the 70
primary feeding member, a rearwardly projecting arm rigidly secured upon the presser-
bar, a rocker, a pivotal connection between
said rigid arm and the rocker, a fulcrum
upon said rocker upon which said feed-bar 75
is mounted to swing, and an actuator having a sliding connection with said rocker and adapted to impart rocking movements thereto.

26. In a sewing machine, the combination 80
with a primary feeding member and means for actuating the same, of a secondary feed-
ing member opposed to the primary feed-
ing member, a feed-bar to which the same is
attached, means for imparting operative or 85
feeding movements to said secondary feed-
ing member, a presser-foot adjacent the sec-
ondary feeding member, a presser-bar to
which the same is attached, means for yield-
ingly forcing the presser-bar toward the 90
primary feeding member, a rocker compris-
ing a slide-block and a cross-bar overlying
the same, pivotal connections intermediate
the cross-bar at opposite sides of said slide-
block and the presser-bar and feed-bar re- 95
spectively, and an actuator having a guide-
member embracing said guide-block and
movable thereon across said cross-bar and
adapted to impart operative movements to
said rocker. 100

27. In a sewing machine, the combination
with a primary feeding member and means
for actuating the same, of a secondary feed-
ing member opposed to the primary feeding
member, a feed-bar to which the same is at- 105
tached, means for imparting operative or
feeding movements to said secondary feed-
ing member, a presser-foot adjacent said
secondary feeding member, a presser-bar to
which the same is attached, a lateral arm 110
fixed upon said presser-bar, means for yield-
ingly forcing the presser-bar toward the pri-
mary feeding member, a rocker comprising
a slide-block and a cross-bar, a pivotal con-
nection intermediate the feed-bar and said 115
cross-bar at one side of the slide-block, a
link connection intermediate said cross-bar
at the opposite side of said slide-block and
the lateral arm of said presser-bar, and an
actuator having a member movably fitted to 120
said slide-block and adapted to impart oper-
ative movements to said rocker.

28. In a sewing machine, the combination
with stitch-forming mechanism including a
reciprocating needle, opposed upper and 125
lower feeding members, and actuating means
whereby differential operative movements
may be imparted to said feeding members,
of a separator-plate, a swinging lever to
which the same is pivotally attached, a lat- 130

erally movable fulcrum for said lever and means for guiding said separator-plate into operative position intermediate said feeding members and in advance of the stitch-forming mechanism.

29. In a sewing machine, the combination with stitch-forming mechanism including a reciprocating needle, opposed upper and lower feeding members, and actuating means whereby differential operative movements may be imparted to said feeding members, of a separator-plate formed with an operative edge provided with a needle-receiving notch, a swinging lever with which the same is pivotally connected, a laterally movable fulcrum upon which said lever is mounted for movement of the separator-plate both in and transversely of the direction of feed, and means applied to and adapted for controlling the swinging movements of said lever and the oscillation of the separator-plate thereon whereby the latter is guided into operative position intermediate said feeding members with its notch embracing the needle-path.

30. In a sewing machine, the combination with stitch-forming mechanism including a reciprocating needle, opposed upper and lower feeding members, and actuating means whereby differential operative movements may be imparted to said feeding members, of a separator-plate, a swinging lever with which the same is pivotally connected, a carrying member for said separator-plate provided with a cam-slot, and a fixed stud entering said cam-slot and cooperating therewith in guiding the separator-plate to and from operative position intermediate the feeding members.

31. In a sewing machine, the combination with stitch-forming mechanism including a reciprocating needle, opposed upper and lower feeding members, and actuating means whereby differential operative movements may be imparted to said feeding members, of a separator-plate formed with an operative edge provided with a needle-receiving notch, a swinging lever with which the same is pivotally connected, a carrying member for said separator-plate provided with a cam-slot having an operative edge substantially parallel with the operative edge of the separator-plate and a lateral recess substantially parallel with the needle-receiving notch of the latter, and a fixed stud entering said cam-slot and cooperating therewith in guiding the separator-plate to and from operative position intermediate the feeding members.

32. In a sewing machine, the combination with stitch-forming mechanism including a reciprocating needle, opposed upper and lower feeding members, and actuating means whereby differential operative movements may be imparted to said feeding members,

of a separator-plate formed with an operative edge provided with a needle-receiving notch, a swinging lever with which the same is pivotally connected, a carrying member for said separator-plate provided with a cam-slot, having an operative edge substantially parallel with the operative edge of the separator-plate and a lateral recess substantially parallel with the needle-receiving notch of the latter, a fixed stud entering said cam-slot and cooperating therewith in guiding the separator-plate to and from operative position intermediate the feeding members, and a spring interposed between said swinging lever and the separator-plate for maintaining the latter yieldingly in operative position with the fixed stud in the lateral recess of said cam-slot.

33. In a sewing machine, the combination with stitch-forming mechanism, opposed upper and lower feeding members, and actuating means whereby differential operative movements may be imparted to said feeding members, of a separator-plate with its operative portion adapted for introduction between said feeding members and its adjacent portion extended laterally of the direction of feed and offset above the same.

34. In a sewing machine, the combination with stitch-forming mechanism, opposed upper and lower feeding members, and actuating means whereby differential operative movements may be imparted to said feeding members, of a separator-plate with its operative portion adapted for introduction between said feeding members, a carrying bar therefor, a laterally movable fulcrum for said carrying bar and a horizontal pivotal connection intermediate said carrying bar and the separator-plate whereby the latter is adapted to freely rise and fall with the feeding members.

35. In a sewing machine, the combination with a stitch-forming mechanism, a throat-plate provided with a feed aperture and an adjacent guide aperture, opposed upper and lower feeding members, and actuating means whereby differential operative movements may be imparted to said feeding members, of an edge-guide within the aperture therefor in said throat-plate and normally extending above the latter, and a yielding carrier for said edge-guide disposed beneath the throat-plate.

36. In a sewing machine, the combination with stitch-forming mechanism, a throat-plate provided with a feed aperture and an adjacent guide aperture, opposed upper and lower feeding members, and actuating means whereby differential operative movements may be imparted to said feeding members, of an edge-guide within the aperture therefor in said throat-plate and normally extending above the latter, a yielding carrier for said edge-guide disposed beneath the

throat-plate, and a separator-plate interposed between said feeding members and overlying the top of said edge-guide.

37. In a sewing machine, the combination
5 with stitch-forming mechanism, a throat-plate provided with a feed aperture and an adjacent guide aperture, opposed upper and lower feeding members, and actuating means whereby differential operative movements
10 may be imparted to said feeding members, of an edge-guide within the aperture therefor in said throat-plate and normally extending above the latter, a vertically swinging carrier for said edge-guide, a spring for
15 yieldingly maintaining said carrier in raised position with the edge-guide above the face of the throat-plate, and a separator-plate interposed between said feeding members.

38. In a sewing machine, the combination

with stitch-forming mechanism, a throat- 20
plate provided with a feed aperture and an adjacent guide aperture, opposed upper and lower feeding members, and actuating means whereby differential operative movements
25 may be imparted to said feeding members, of an edge-guide within the aperture therefor in said throat-plate and normally extending above the latter, a yielding and laterally adjustable carrier for said edge-guide, and a separator-plate interposed between 30
said feeding members.

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

ALBERT H. DEVOE.

Witnesses:

D. P. BIRNIE,

H. J. MILLER.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."
