

H. L. ROBERTS.

THREAD STITCHING MACHINE FOR PAMPHLETS AND SIMILAR ARTICLES.

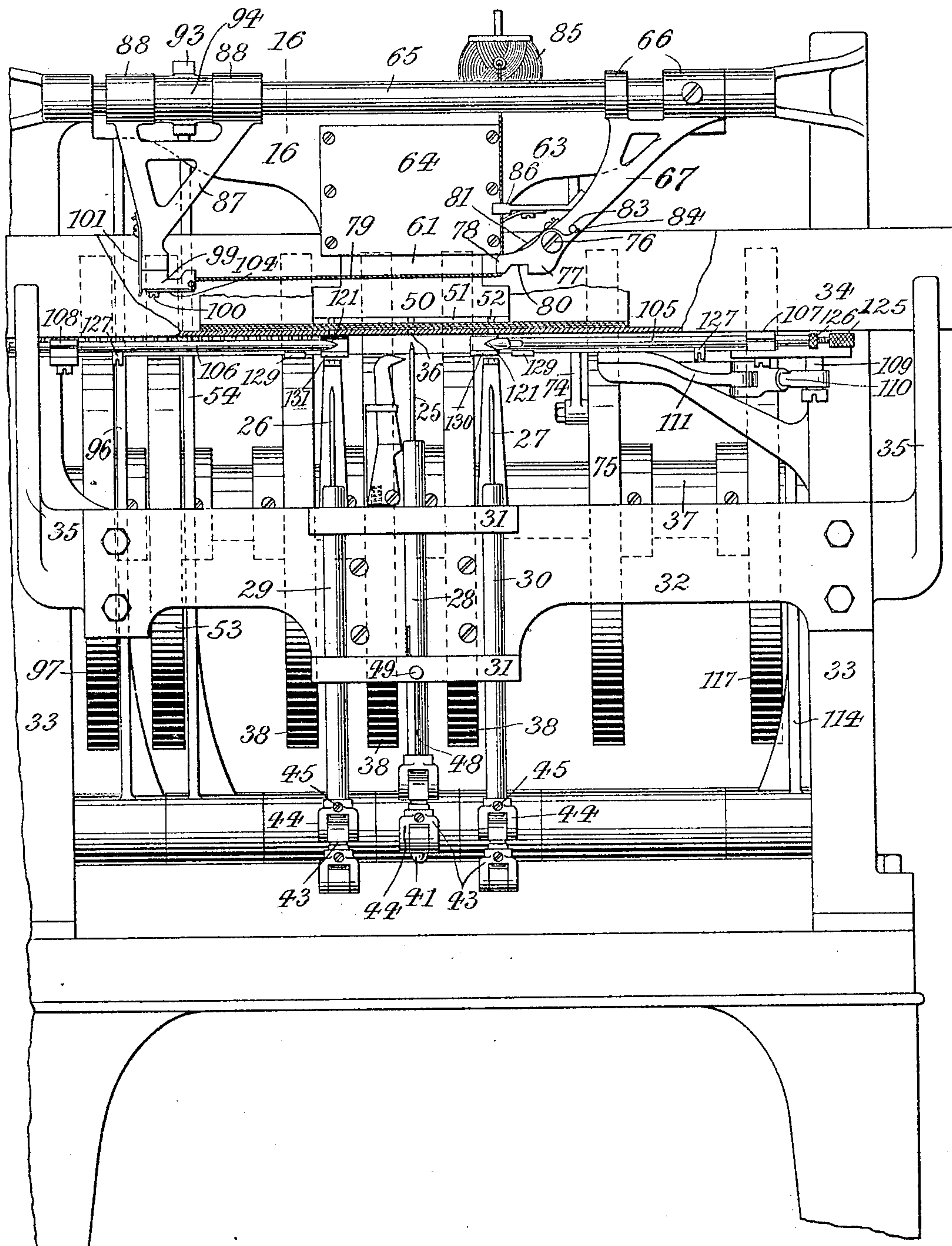
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5 SHEETS—SHEET 1.

Fig. 1.



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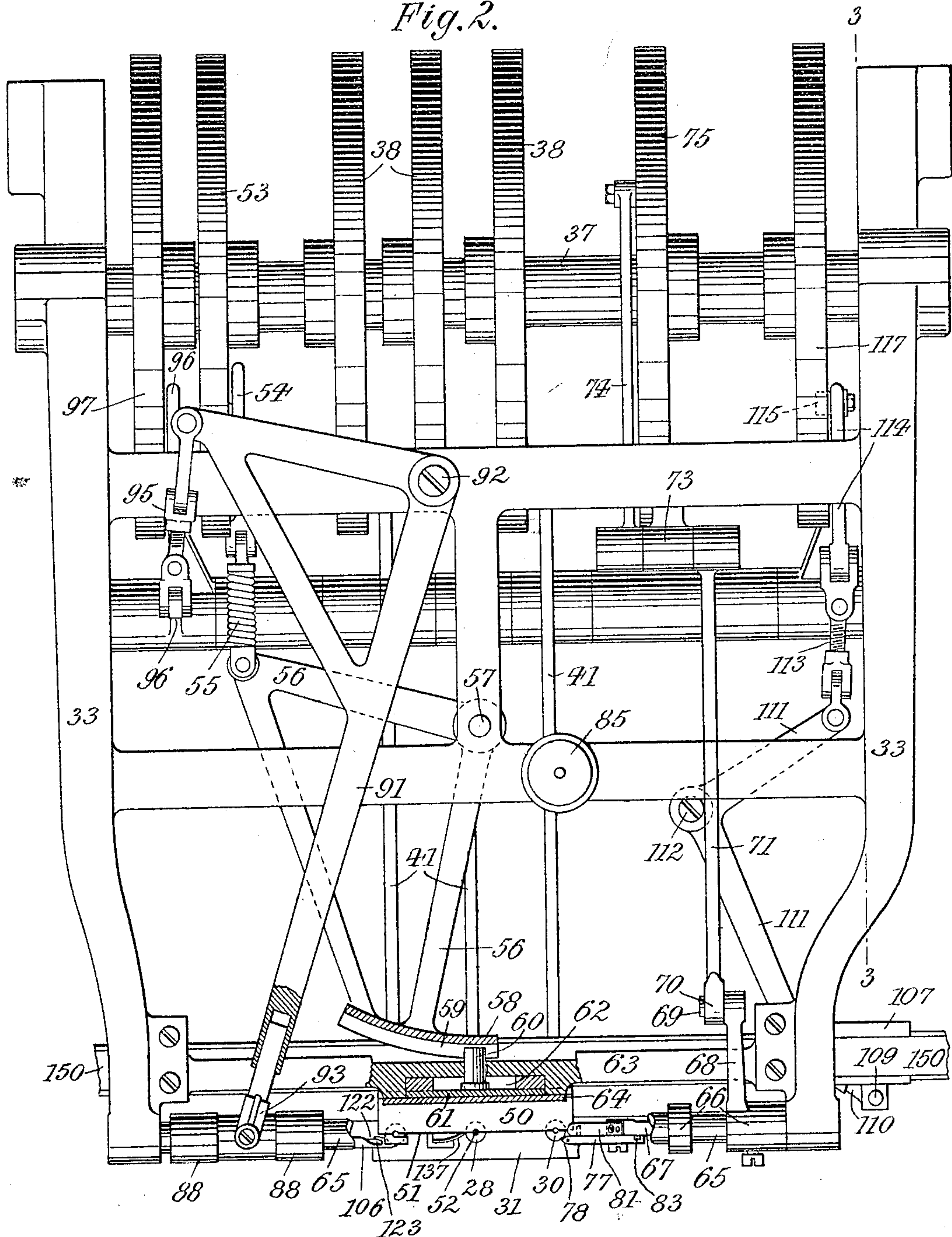
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Fig. 2.



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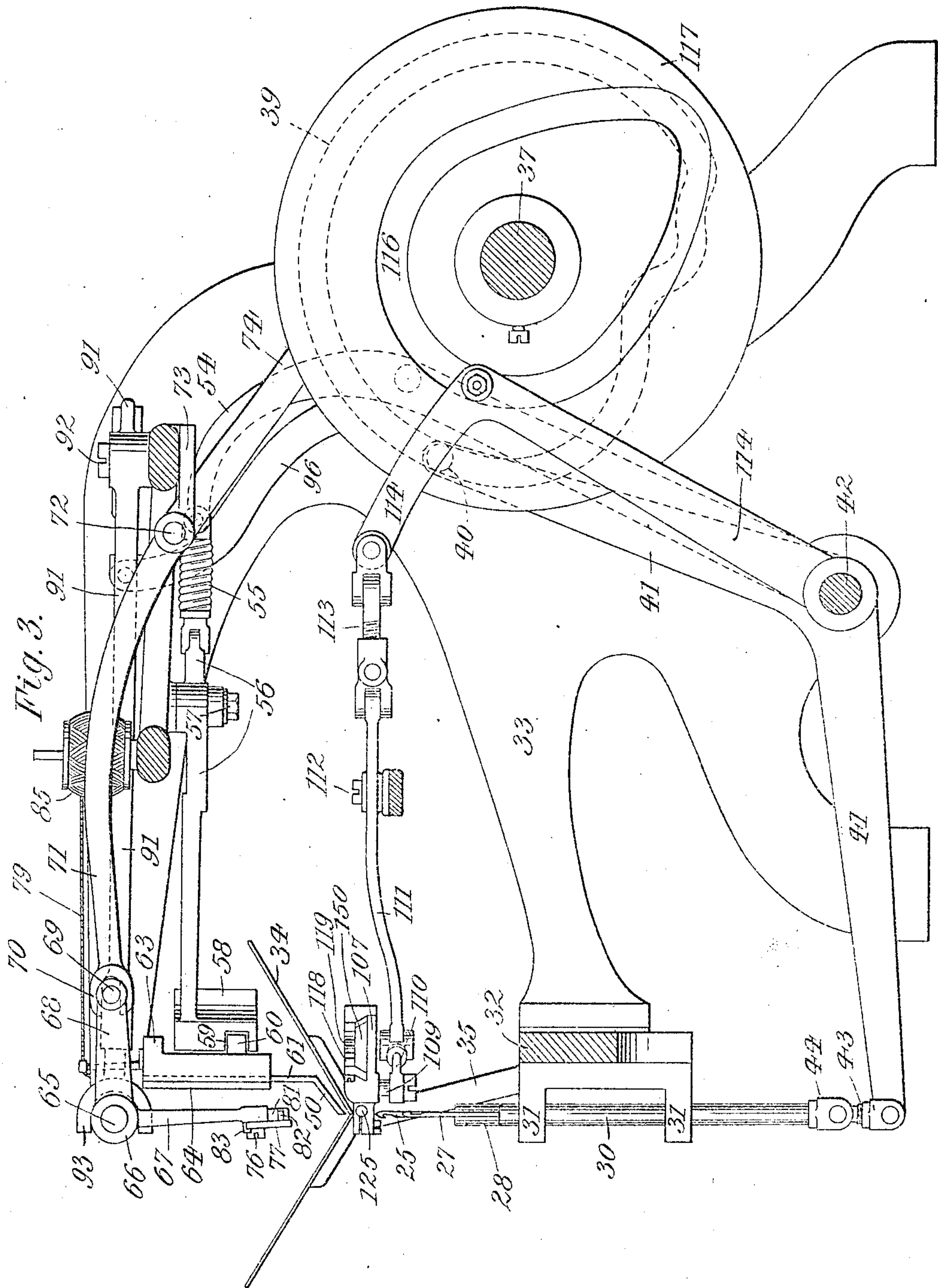
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5 SHEETS—SHEET 3.



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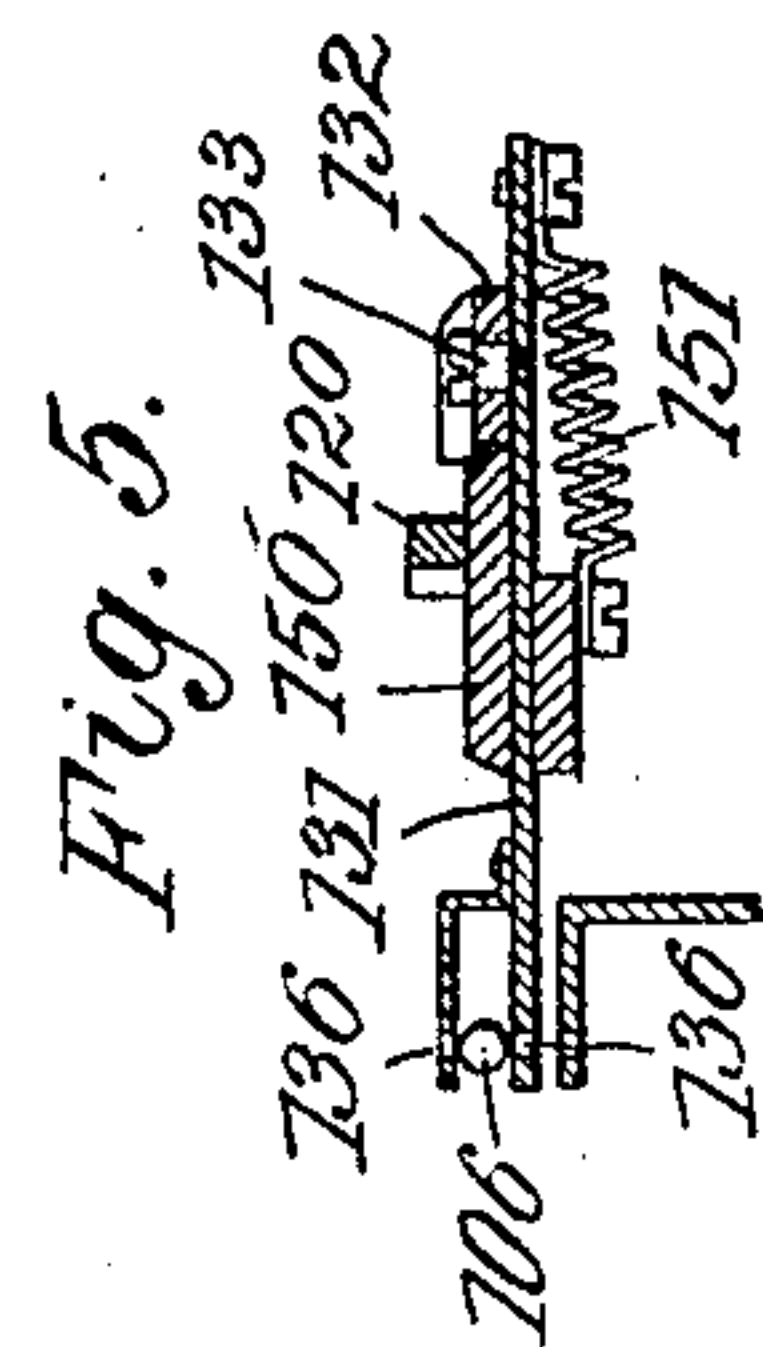
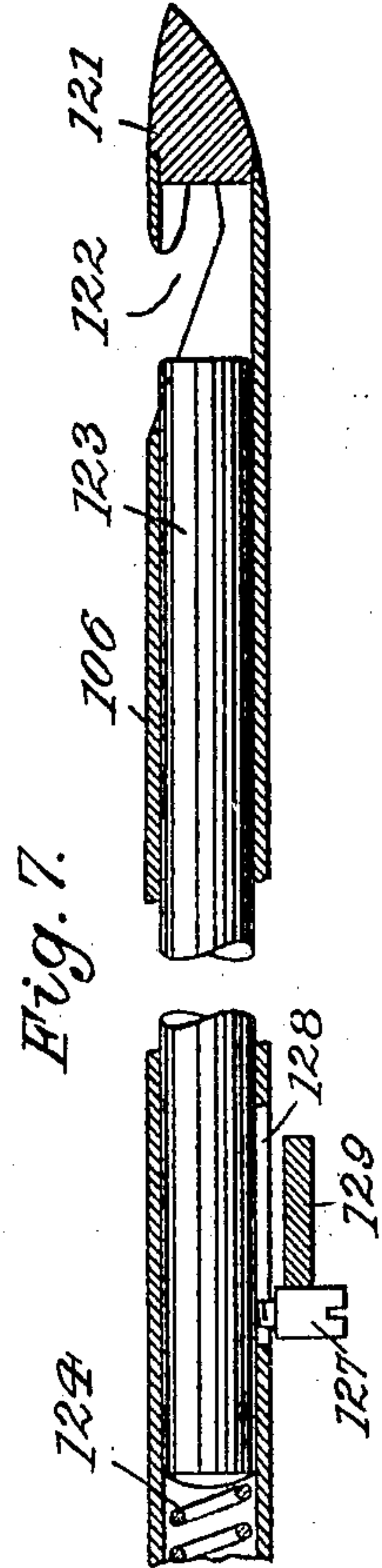
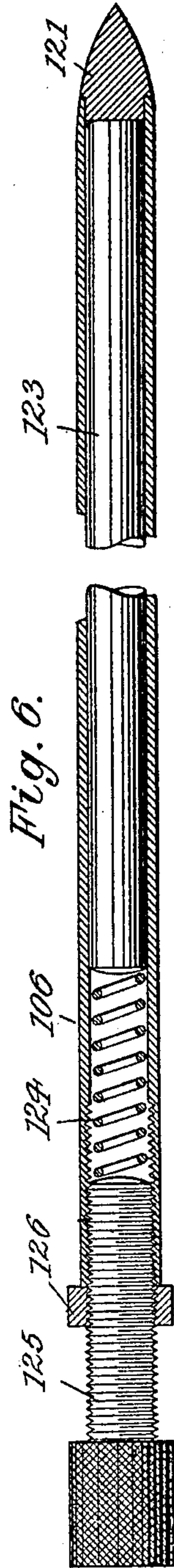
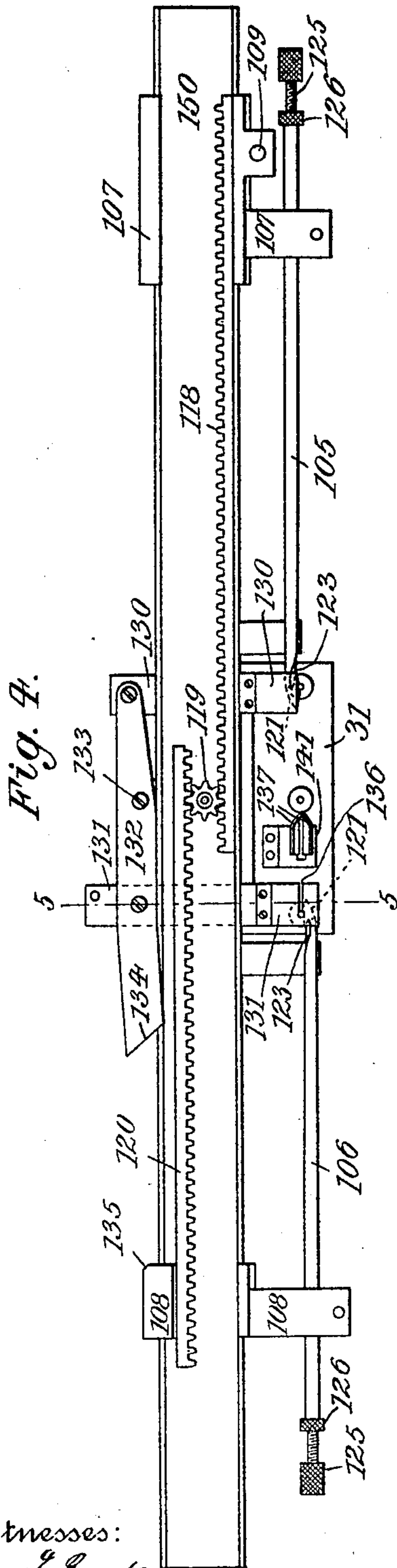
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5 SHEETS—SHEET 4.



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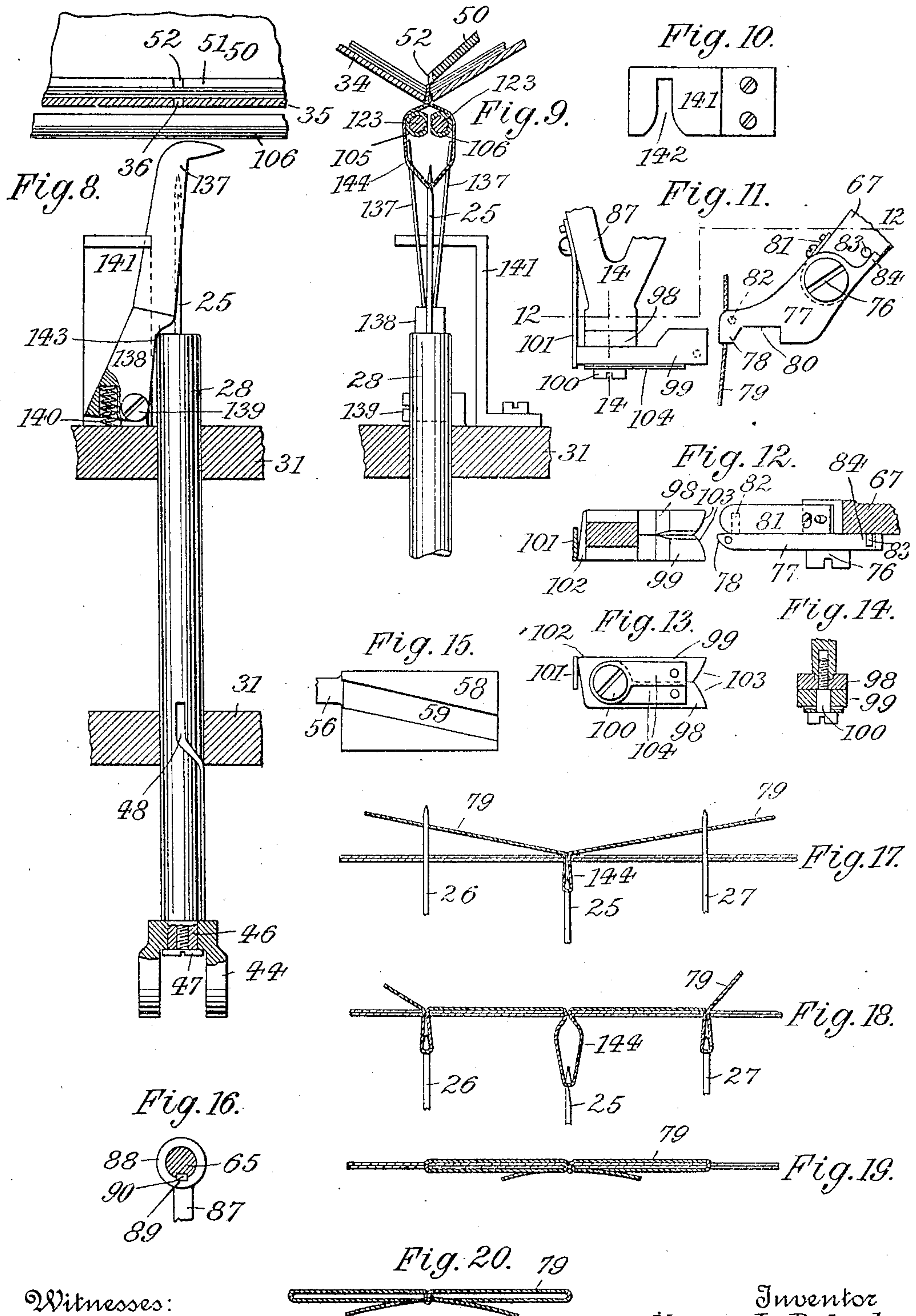
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5 SHEETS—SHEET 5.

944,051.



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UNITED STATES PATENT OFFICE.

HORACE L. ROBERTS, OF NEW YORK, N. Y.

THREAD-STITCHING MACHINE FOR PAMPHLETS AND SIMILAR ARTICLES.

944,051.

Specification of Letters Patent. Patented Dec. 21, 1909.

Application filed December 21, 1908. Serial No. 468,415.

To all whom it may concern:

Be it known that I, HORACE L. ROBERTS, a citizen of the United States, residing at New York city, Brooklyn, county of Kings, State of New York, have invented new and useful Improvements in Thread-Stitching Machines for Pamphlets and Similar Articles, of which the following is a specification.

This invention relates to thread stitching machines for uniting the sheets of a pamphlet, book or similar article, in such a manner that the neat appearance of a hand stitch is obtained.

The machine is so constructed that the needles pierce the paper from the outside toward the inside, so that the burs formed by them are concealed within the fold and thus do not detract from the appearance of the finished article.

In the accompanying drawings: Figure 1 is a front elevation, partly broken away, of my improved thread stitching machine; Fig. 2 a plan, partly in section, thereof; Fig. 3 a cross section on line 3—3, Fig. 2, with some of the parts omitted; Fig. 4 a plan of the looper-operating mechanism; Fig. 5 a cross section on line 5—5, Fig. 4; Fig. 6 an enlarged longitudinal section through one of the loopers, showing it closed; Fig. 7 a similar section, partly broken away, of the looper, showing it open; Fig. 8 a detail front view, partly in section, of the central needle and loop opener; Fig. 9 a side view, partly in section, of the upper part of Fig. 8, showing the loop opened; Fig. 10 a plan of the guide for the loop opening shanks; Fig. 11 a detail front view of the thread guide and cutter, showing the parts in a position immediately preceding the cutting operation; Fig. 12 a horizontal section on line 12—12, Fig. 11; Fig. 13 a bottom view of the cutter; Fig. 14 a vertical section on line 14—14, Fig. 11; Fig. 15 a front view of the presser foot actuating cam; Fig. 16 a cross section on line 16—16, Fig. 1; Figs. 17, 18 and 19 show consecutive stages of the stitch formed by my improved machine, and Fig. 20 is a detail of the complete stitch, with the pamphlet omitted.

The numerals 25, 26, 27 indicate three needles for forming the stitch, needle 25 being the center needle and being flanked by needles 26, 27. Needles 25, 26, 27, are so fitted into vertically reciprocating plungers 28, 29, 30, respectively, that the beak or hook of needle 25 points forward,

while the beaks of needles 26 and 27 point backward. Plungers 28, 29, 30 are guided in a pair of flanges 31 projecting forwardly from a cross bar 32 that connects the standards 33 of the machine frame. The needles are arranged vertically below the bottom edge of a preferably V-shaped table 34 upon which the pamphlet A, to be stitched, is placed with its back downward. Table 34 is mounted upon suitable brackets 35 and has apertures 36 which are vertically alined with the needles. Center needle 25 receives a periodically interrupted upward and downward movement and is adapted to be turned through an angle of 90° for the purpose hereinafter described, while needles 26 and 27 are capable of interrupted reciprocation only. Plungers 28, 29, 30 receive their movement from a suitably driven power shaft 37 mounted in standards 33 and provided with a fixed cam 38 for each of the plungers. The groove 39 of each cam is engaged by a cam roller 40 carried by the rear arm of an elbow lever 41 which turns loosely on an axle 42. The front arms of levers 41 are, by adjustable links 43, connected to forks 44 on the lower ends of plungers 28, 29 and 30. Forks 44 of plungers 29, 30 are rigidly secured to the latter by means of set screws 45, while plunger 28 is adapted to turn in its fork 44. For this purpose, plunger 28 is stepped into a corresponding bore of fork 44, as at 46, a screw 47 preventing a disengagement of fork and plunger, (Fig. 8). Plunger 28 is provided with a longitudinal cam groove 48 engaged by a stud or screw 49 tapped into lower flange 31. Groove 48 is so shaped that the beak of needle 25 points forwardly during the main part of the stroke of plunger 28, while, when the needle approaches its lowermost position, it is turned through an angle of 90°, so that the beak points toward the right.

In order to hold the article to be stitched down upon the table 34, during the upward movement of the needles, a presser foot 50 is provided. The latter consists of an inclined plate, the front edge 51 of which is vertically alined with the lower edge of table 34 and which is recessed as at 52 for accommodating the needles. Presser foot 50 is lowered after a pamphlet has been properly placed on table 34, and is raised after the stitch has been formed, to allow the stitched article to be removed. The

means for operating presser foot 50 comprise a cam 53 actuating a lever 54 loosely mounted upon axle 42. Lever 54 is, by spring 55, connected to the rear arm of an elbow lever 56 pivoted at 57 to the machine frame. The front arm of lever 56 carries at its free end a segmental cam 58 having an inclined groove 59. The latter is engaged by a pin 60 secured to the rear side of a flat shank 61 projecting upwardly from foot 50. Shank 61 is guided in a groove 62 formed in an upper cross bar 63 that connects standards 33, groove 62 being closed by a suitable front plate 64.

The means for supplying the necessary thread to the needles, are as follows: Vertically above support 34 and parallel thereto, there is mounted in standards 33 a rock-shaft 65. Upon the latter is rigidly mounted the divided hub 66 of a thread holding arm 67. Hub 66 is further provided with a rearwardly extending arm 68 carrying at its free end a pin 69. The latter is straddled by the forked end 70 of a lever 71 keyed to a pintle 72 which turns loosely in a fixed bearing 73. To pintle 72 is secured a cam lever 74 actuated by a corresponding groove of a cam 75 which is secured to shaft 37, so that the swinging movement imparted to lever 74 by cam 75, will result in a corresponding rocking movement of shaft 65. To the free end of arm 67 is pivoted, at 76, a finger 77 provided with a perforated beak or eye 78 for the passage of the thread 79 and with a transverse bottom recess 80. Finger 77 is normally turned downward by a spring 81 secured to arm 67 and engaging a pin 82 of finger 77. An excessive movement of finger 77 is prevented by a pin 83 on arm 67 which is engaged by a tail 84 of the finger. Thread 79 is supplied from a spool 85, a suitable tension device 86 being interposed between spool and finger 77.

Upon shaft 65 is slidably mounted a thread carrier 87 which is provided with means for cutting the thread after a length sufficient for forming one stitch has been supplied to the needles. Carrier 87 has a divided hub 88, the rotation of which on shaft 65 is prevented by a longitudinal groove 89 in the latter, which is engaged by a corresponding key 90 of hub 88. Carrier 87 is adapted to be reciprocated on shaft 65 by an elbow lever 91 pivoted to the machine frame at 92. The front arm of lever 91 carries a fork 93 which is pivoted to a sleeve 94 loosely mounted on shaft 65 between hub-sections 88. To the rear arm of lever 91 is connected, by adjustable link 95, the free end of a cam lever 96, loosely mounted on axle 42. Lever 96 is actuated by a cam 97 keyed to shaft 37, so that the oscillation of lever 96 will be transformed through link 95, elbow lever 91, fork 93 and sleeve 94, into a reciprocating movement of thread carrier

87. To the lower end of the latter is rigidly secured one jaw 98 of a combined thread clamp and cutter, the other movable jaw 99 of which is pivoted as at 100. Jaw 99 is held in its closed position by a spring 101 engaging the beveled tail 102 of the jaw. Jaws 98, 99, which are beveled at their free ends, as at 103, carry at their lower sides a pair of cutters 104.

Below the edge of support 34 and parallel thereto, there are arranged a pair of axially movable loopers 105, 106, which are designed to carry the free ends of the thread through the central loop formed in manner hereinafter described, and to subsequently tighten said loop. The correlation of the parts is such that looper 105 moves in a line back of a vertical plane drawn through the axes of needles 26, 25, 27, while looper 106 moves in a line in front of said plane. Loopers 105 and 106 are made tubular and are clamped to a pair of slides 107, 108, engaging a transverse rail 150 which is supported on brackets 35. Slide 107 is provided with a depending pin 109 engaged by a link 110 which is in turn connected to one arm of an elbow lever 111 pivoted at 112. The other arm of lever 111 is, by link 113, connected to a bent lever 114 loosely mounted on axle 42. Lever 114 carries a cam roller 115 engaging a groove 116 of a cam 117 keyed to shaft 37. It will be seen that the oscillation of lever 114 will thus produce a reciprocating movement of slide 107 and consequently of looper 105. To slide 107 is secured a rack 118 meshing into a pinion 119 mounted on rail 109 at the center thereof. Pinion 119 engages a rack 120 secured to slide 108, so that any movement imparted to looper 105 by cam 117 will cause a corresponding movement of looper 106 in the opposite direction. Each looper is provided at its inner end with a pointed hook 121, and a throat 122, the throat of looper 105 opening toward the front, while throat 122 of looper 106 opens toward the rear of the machine. Loopers 105, 106 are each provided with a plunger 123 influenced by a spring 124, the tension of which may be regulated by a screw 125 and lock nut 126. Plunger 123 has a screw stud 127 passing through a slot 128 of the looper and adapted to be engaged by a fixed abutment 129. The latter is so positioned that plunger 123 is advanced by spring 124 toward its seat during the main part of the looper stroke, (Fig. 6). When the looper, however, approaches the end of its forward stroke, stud 127 engages abutment 129, so that when the looper comes to a standstill at the end of its stroke, throat 122 is opened, (Fig. 7), for the reception of the thread, as will be hereinafter more fully described.

In order to place the thread into the open throats of the loopers, a pair of recipro-

eating push bars 130, 131 are slidably secured to the bottom of rail 150. Bars 130, 131 have forked free ends, (Figs 1 and 5), and are simultaneously reciprocated in opposite
 5 directions by a two-arm lever 132, pivoted at 133 to rail 150. One arm of lever 132 has a beveled edge 134 adapted to be engaged by an abutment 135 on slide 108. Bar 130 terminates directly back of needle 27,
 10 while bar 131 extends forward beyond needle 26, a slot 136 of bar 131 accommodating needle 26 during its upward movement. Bars 130, 131, are held in their normal position by a spring 151, (Fig. 5).

15 The parts are so dimensioned and timed that loopers 105 and 106, when approaching each other, come to a standstill as soon as the throat of looper 105 has arrived opposite needle 26 and the throat of looper
 20 106 has arrived opposite needle 27. In this position of the loopers, both needles 26 and 27 are lowered beneath table 34, so as to draw a loop through the pamphlet and through the table perfora-
 25 tions, as will be more fully described. The loop held by needle 27 extends in front of bar 130, while the loop held by needle 26, passes through slot 136 of bar 131. During the last part of the inward race of the loop-
 30 ers, above referred to, abutment 135 engages lever 132 and tilts the same in such a manner that bar 130 is advanced, while bar 131 is retracted. In this way bar 130 will push the loop of needle 27 into the rearwardly
 35 opening throat of looper 106, while slotted bar 131 will draw the loop of needle 26 into the forwardly opening throat of looper 105. The loopers, during their travel, have to pass through the center loop formed by
 40 needle 25, for which purpose said loop must be opened. The loop-opening means comprise a pair of beaked springy shanks 137 carried by a block 138 and tending owing to their resiliency to spread or diverge at
 45 their beaked ends. Block 138 is pivoted at 139 to upper flange 31, a spring 140 forcing block 138 toward plunger 28. Shanks 137 are engaged by a guide 141 having a gradually widened slot 142 within which the
 50 shanks are received. Block 138 is cut away, as at 143, in such a manner that when plunger 28 is raised, the block and consequently shanks 137 are forced away from needle 25. When plunger 28 is lowered, recess 143 will
 55 permit spring 140 to tilt shanks 137 toward needle 25, whereby they are spread owing to their engagement with the widened section of slot 142.

Before describing the operation of the
 60 machine, it may be stated that during one complete rotation of shaft 37, all the various movements for stitching one pamphlet take place. Means may be provided for automatically arresting the machine after each
 65 complete rotation, but as such means are

well known in the art and do not form part of the present invention, they have not been shown.

After one book or pamphlet has been
 stitched and the machine comes to a stand- 70
 still, presser foot 50 is raised to permit the removal of the stitched book and the inser-
 tion of an unstitched book. Further, a length of thread 79 is stretched between car-
 75 rier 87 and holder 67, the carrier and holder being so set that needle 25, in rising, will pass lightly back of the thread. The machine is then started to first cause the descent
 of foot 50 by means of cam 53, lever 54, 80
 spring 55, lever 56, cam 58 and pin 60, so that the pamphlet is forced into the furrow
 of the table. The center needle 25 rises prior to the other needles, and will thus
 pierce the pamphlet. This movement of
 needle 25 is effected by the center cam 38, 85
 lever 41, link 43 and plunger 28. After the needle has arrived at its most elevated position, shaft 65 is slightly rocked to swing
 carrier 87 and holder 67 backward and
 thereby place the thread into the hook of the 90
 needle, the rocking of shaft 65 being effected by cam 75, levers 74, 71 and arm 68. Needle
 25 then descends and draws a loop 144 through the pamphlet and support, (Fig.
 95 17). During this movement the free end of thread 79 has been firmly held by clamp 98,
 99, so that the necessary thread has been unwound from spool 85. Meanwhile, needles
 26, 27 have also been raised by their respec- 100
 tive cams 38 and cooperating parts. After the needles have reached their highest position,
 shaft 65 is partly turned by cam 75, in such a way that carrier 87 and holder 67
 swing forward and thus place the thread 105
 into the hooks of needles 26, 27. All three needles will now descend, the center needle
 forming a large loop before the flanking
 needles draw the thread through the pam-
 phlet. After this large loop has been formed,
 needles 26, 27 will draw the thread through 110
 the pamphlet and will temporarily stop when having arrived slightly beneath loopers
 105 and 106. During the descent of
 needle 26, the free end of the thread will be
 drawn out of clamp 98, 99, while the thread 115
 of needle 27 will extend upward through eye 78 to spool 85. During the last part of the
 downward movement of needle 25, the latter
 will be turned through an angle of 90° by
 the engagement of stud 49 with groove 48, 120
 while simultaneously the upper end of
 plunger 28 will arrive opposite recess 143. Shanks 137 will thus swing to the right, to
 first enter the center loop and to then spread
 the same while the loop is still engaged by 125
 needle 25, (Figs. 9 and 18). Loopers 105,
 106 have meanwhile started their inward
 movement which is effected through cam
 117, lever 114, link 113, lever 111, slide 107,
 rack 118, pinion 119, rack 120 and slide 108. 130

During the last part of their travel, studs 127 encounter abutments 129 whereby plungers 123 are retarded to open the throat 122 of each looper. Bar 130 will now advance
 5 to force the thread held by needle 27 into looper 106, while bar 131 will recede to draw the thread held by needle 26 into looper 105, such movements being effected by the engagement of lever 132 with abutment 135.
 10 Meanwhile carrier 87 has traveled toward the right, this movement being effected through cam 97, lever 96, link 95 and lever 91. During the last part of the movement of carrier 87, beak 78 of finger 77 enters be-
 15 tween jaws 98, 99, and thereby opens front jaw 99, simultaneously placing the thread depending from beak 78 between the jaws and also between cutters 104. Finally, beak 78 enters the recessed top of jaws 98, 99 to
 20 permit spring 101 to throw jaw 99 against jaw 98, whereby the upper section of the thread is firmly grasped by the jaws, while the lower section is severed by the cutters. Carrier 87 now returns to its original posi-
 25 tion, (Fig. 1), thereby unwinding a corresponding length of thread from spool 84.

After the loops engaged by needles 26, 27 have been introduced into the open throats 122 of loopers 105, 106, in the manner de-
 30 scribed, the needles descend and the loopers return toward their original position. During the first part of this receding movement of the loopers, plungers 123 will remain stationary, but when the beaks of the loopers
 35 abut against the plungers, the latter will be taken along, thereby holding the threads with a clamping power corresponding to the tension of springs 124. The movements of the needles and loopers should be so timed,
 40 that the loopers are not closed until after the free end of each loop has cleared the looper, so that but a single thread is grasped by the latter. During the movement de-
 45 scribed, needle 25 has been partly raised to liberate the center loop 144, previously held thereby, so that the loopers, during the re-
 50 mainder of their return stroke, in pulling their threads, will close said loop upon the free ends 145, 146, of the stitch thus formed, whereby said ends will gradually slip out of the looper throats. By properly setting
 screws 125, to regulate the tension of springs 124, the force with which loop 144 is locked may be readily adjusted.

55 It will be seen that in my improved machine the sheets of a pamphlet, book or similar article may be automatically united by a stitch which has, substantially, the appearance of a hand-made stitch. As the needles
 60 pierce the pamphlet from the outside toward the inside, the burs will project from the inner fold of the paper, so that they are concealed from view and will not detract from the appearance of the finished article.
 65 Though three needles have been shown, it is

obvious that their number may be multiplied if desired. Furthermore, the machine permits the uniting of different numbers of leaves without requiring any adjustment for
 70 this purpose. This ready adaptability of the machine is due to the spring interpolated between the presser foot and its actuating cam. It will be seen that the greater the thickness of the pamphlet, the more will the
 75 spring become compressed, so that in this way the pamphlet is held down with a force increasing with the thickness of the pamphlet. Thus the tendency of the needles to
 80 raise the sheets, when piercing the same, and which tendency increases with the thickness of the pamphlet, is compensated for.

I claim—

1. A stitching machine, comprising a support adapted to receive the article to be
 85 stitched, means for stretching a length of thread along said support, a center needle adapted to engage said thread and loop the same through said article, a pair of flanking
 90 needles adapted to separately pass the thread through said article, and a pair of loopers adapted to engage said thread and draw the same through the loop.

2. A stitching machine, comprising a support adapted to receive the article to be
 95 stitched, means for stretching a length of thread along said support, a center needle adapted to engage said thread and loop the same through said article, a pair of flanking
 100 needles adapted to draw the thread through the article, means for distending the loop below the article, and a pair of loopers adapted to engage the thread and draw the same
 105 through the loop.

3. A stitching machine, comprising a center needle, a pair of flanking needles, a thread
 105 holder, a combined thread clamp and cutter adapted to engage the thread holder, means for rocking said holder and clamp, and a pair of reciprocating loopers adapted to co-
 110 operate with the needles.

4. In a stitching machine, a center needle, a pair of flanking needles, a rock shaft, a
 115 thread holder secured thereto, a spring-influenced finger pivoted to said holder, a thread carrier slidable on the rock shaft, a combined thread clamp and cutter secured
 120 to the carrier and adapted to be operatively engaged by the finger, and a pair of reciprocating loopers adapted to cooperate with the needles.

5. In a stitching machine, a center needle, a pair of flanking needles, a pair of loopers
 125 cooperating with the needles, a rock shaft, a thread holder secured thereto, a perforated spring-influenced finger pivoted to said holder, a thread carrier slidable on the rock
 130 shaft, a jaw rigidly secured to the carrier, a cooperating spring-influenced movable jaw adapted to be engaged by the finger, and a pair of cutting blades secured to the jaws.

6. In a stitching machine, a center needle, a pair of flanking needles, a first looper movable back of a plane drawn through the needles, a second looper movable in front of said plane, means for reciprocating the first looper, and means for operatively connecting the second looper to the first looper for simultaneously reciprocating said loopers in opposite directions.

7. In a stitching machine, a center needle, a pair of flanking needles, a first looper movable back of the needles, a second looper movable in front of the needles, a first slide supporting the first looper, a second slide supporting the second looper, racks secured to the slides, and a pinion engaging the racks.

8. In a stitching machine, a needle, a tubular slotted looper having a throat, means for reciprocating the looper to carry its throat opposite the needle, a plunger within the bore of the looper, a spring contained within the looper and engaging the plunger, a stud on the plunger engaging the looper-slot, and an abutment adapted to be engaged by the stud.

9. In a stitching machine, a vertically reciprocative plunger, a needle secured thereto,

a pivoted block having a recess that is adapted to be engaged by the plunger, a spring engaging the block and holding the block in engagement with the plunger, a pair of diverging shanks secured to the block, and a slotted guide engaging said shanks.

10. A stitching machine, comprising a support adapted to receive the article to be stitched, means for stretching a length of thread above and along said support, a center needle adapted to engage said thread and loop the same through said article, means for rocking the center needle, an opener adapted to enter the loop formed by the center needle and to distend said loop, a pair of needles flanking the center needle and adapted to separately pass the thread through the article, and a pair of loopers adapted to engage said thread and draw the same through the loop.

Signed by me at New York city, (Manhattan,) N. Y., this 19th day of December 1908.

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Witnesses:

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