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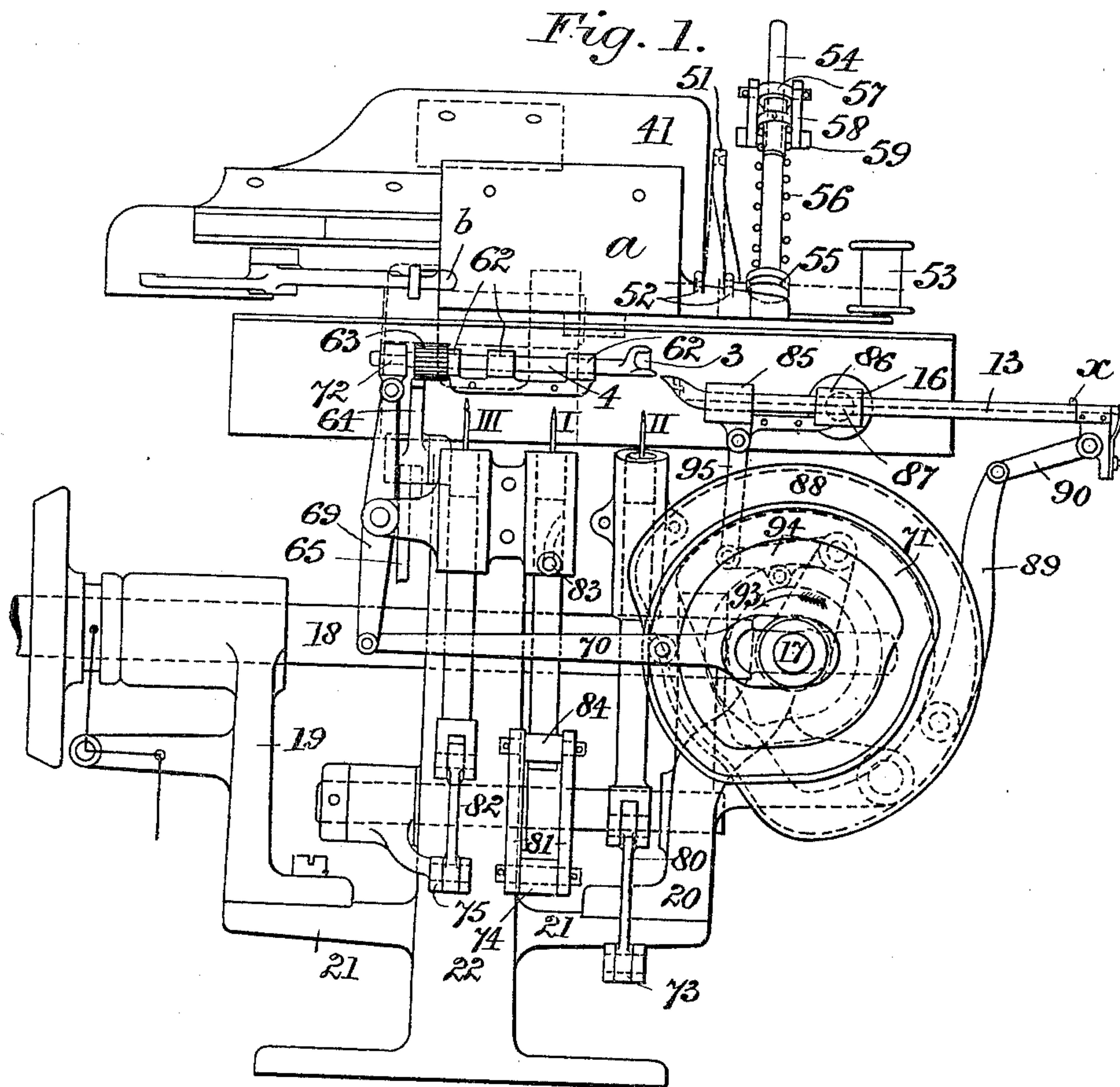
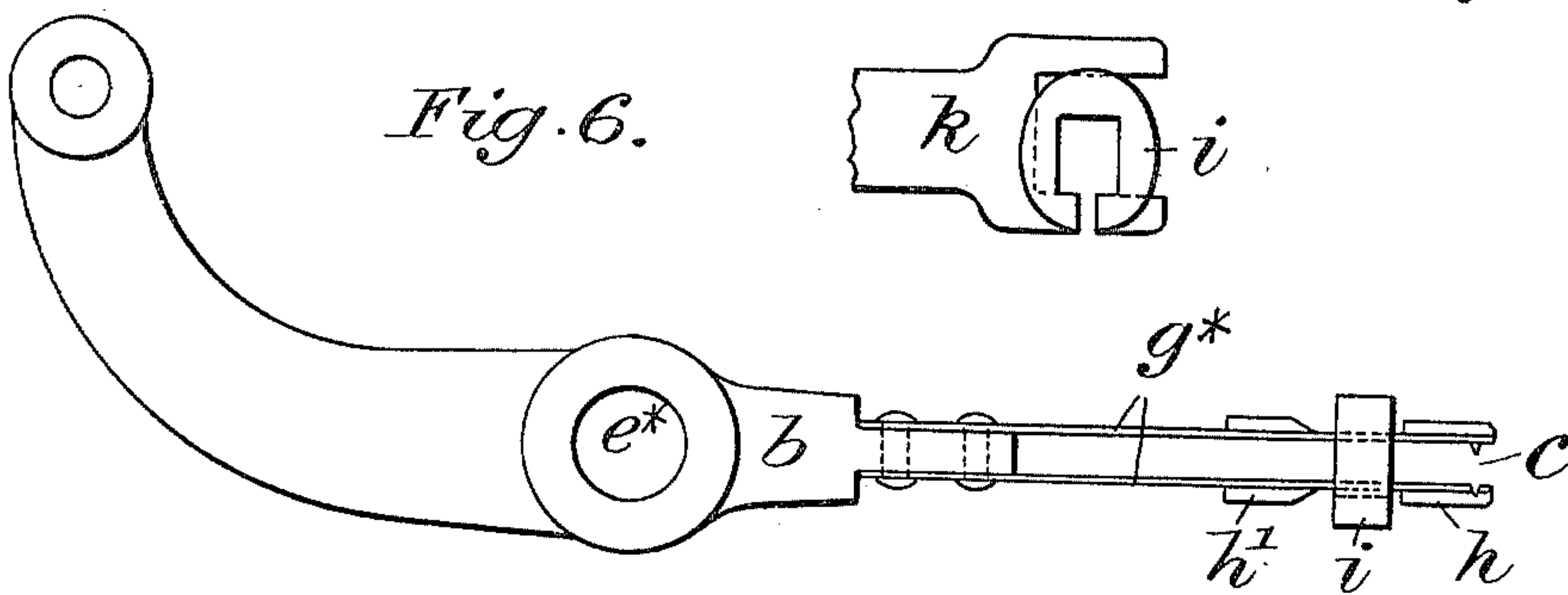
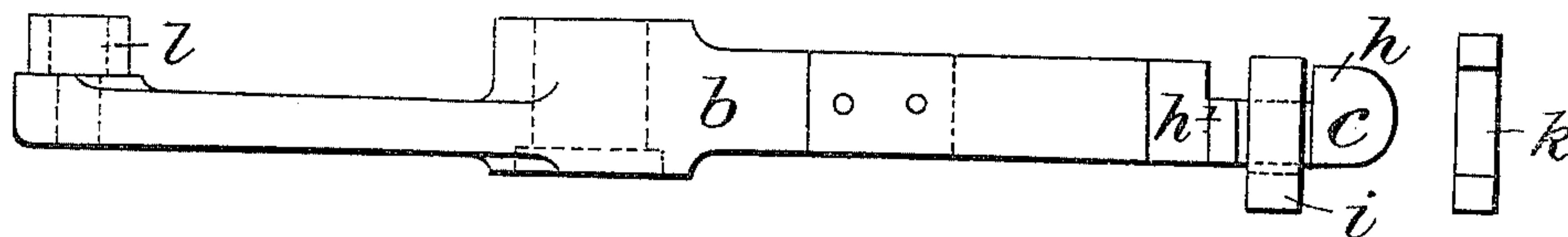
Patented May 15, 1900.

O. KLEINSCHMIDT.
BOOK SEWING MACHINE.

(Application filed May 12, 1899.)

(No Model.)

6 Sheets—Sheet 1.



WITNESSES:

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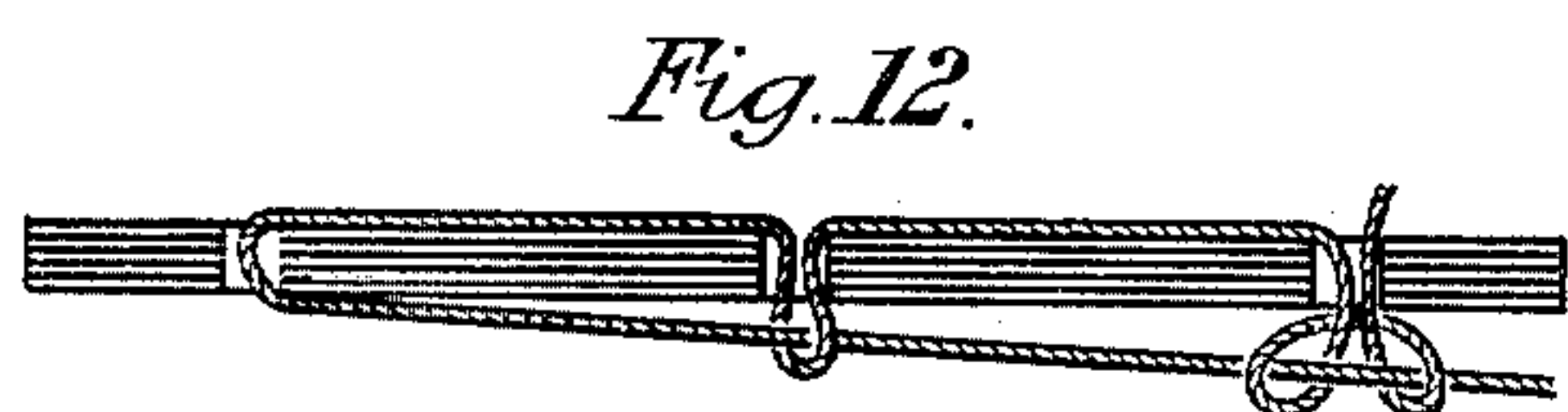
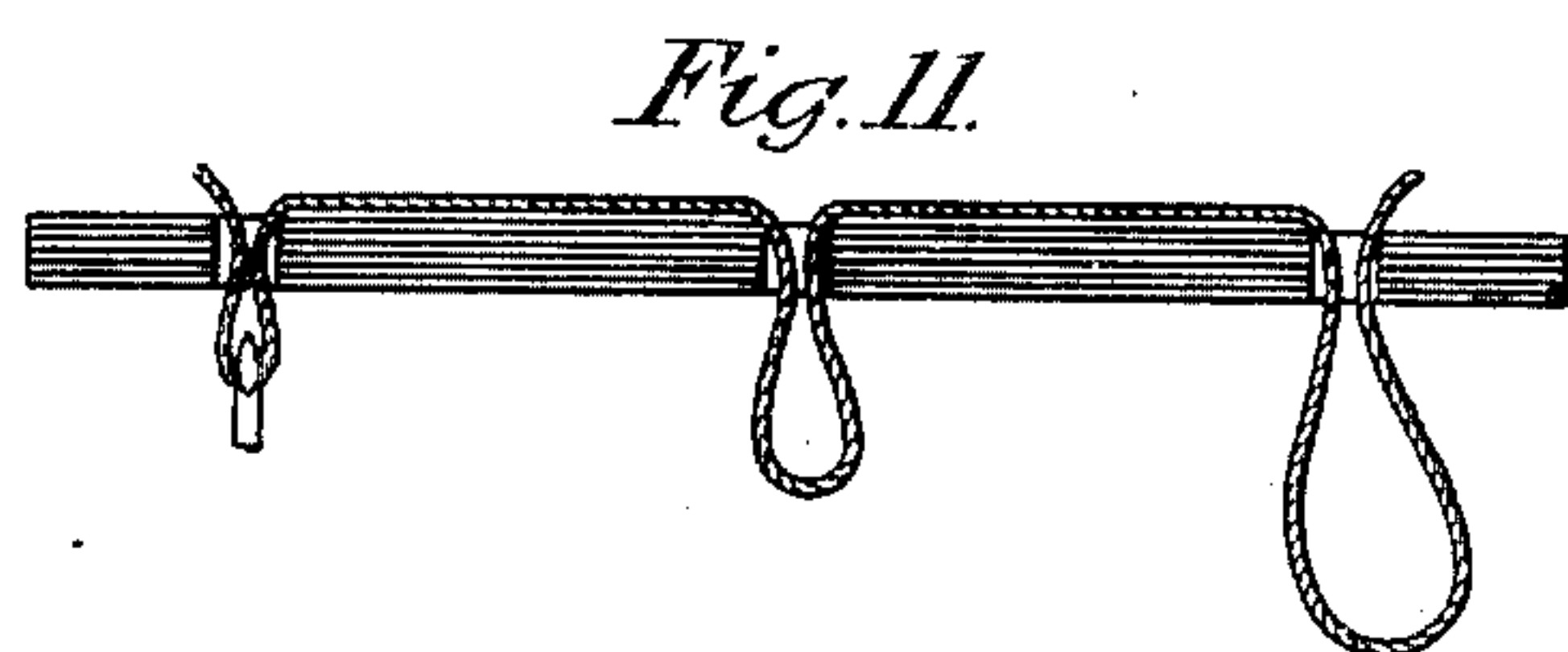
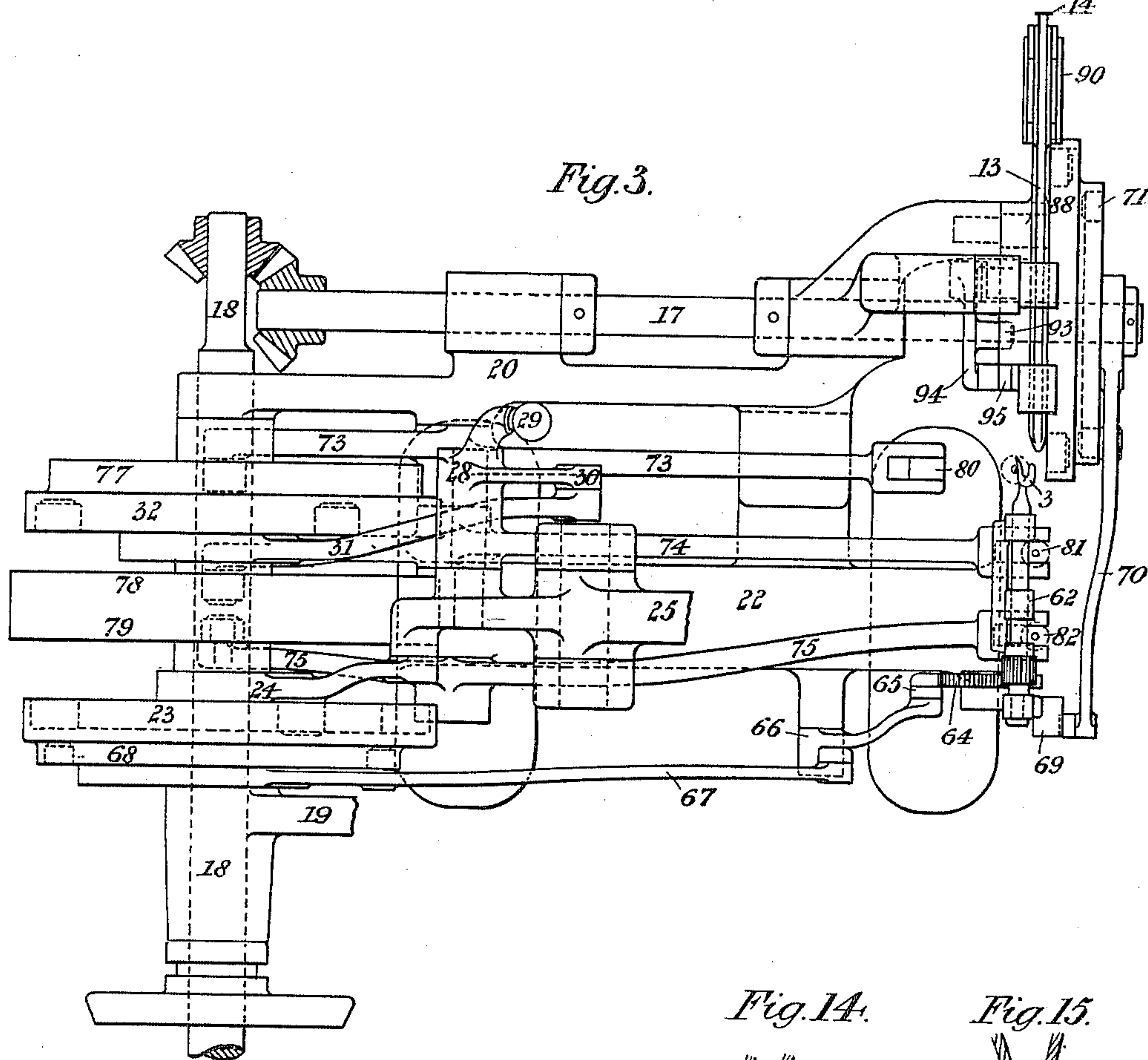
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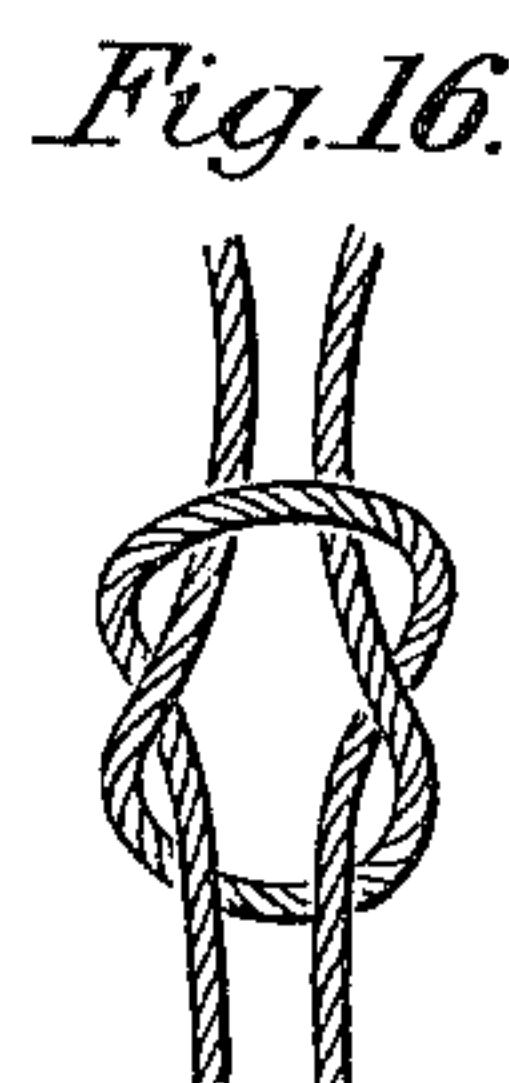
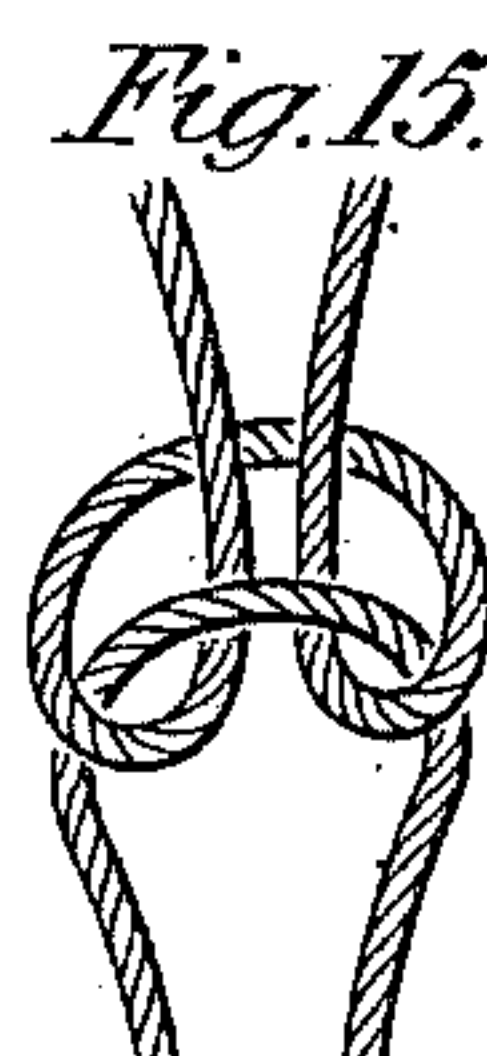
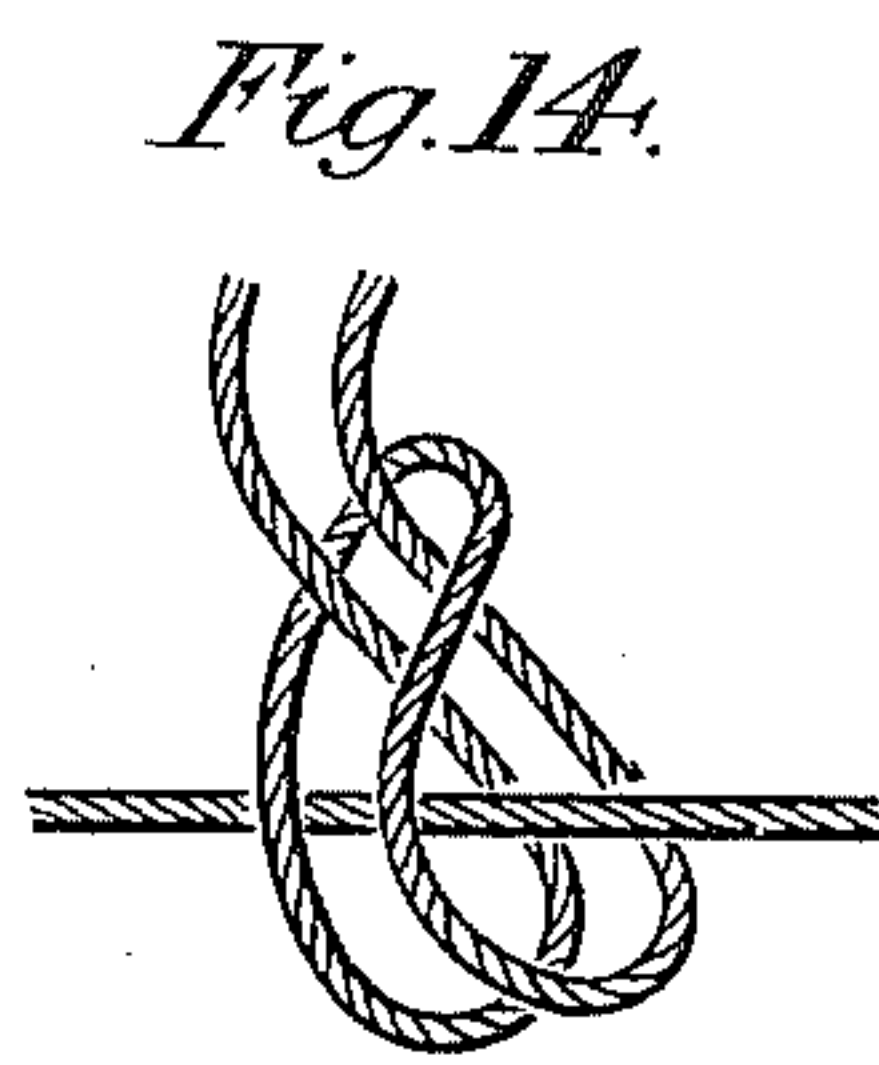
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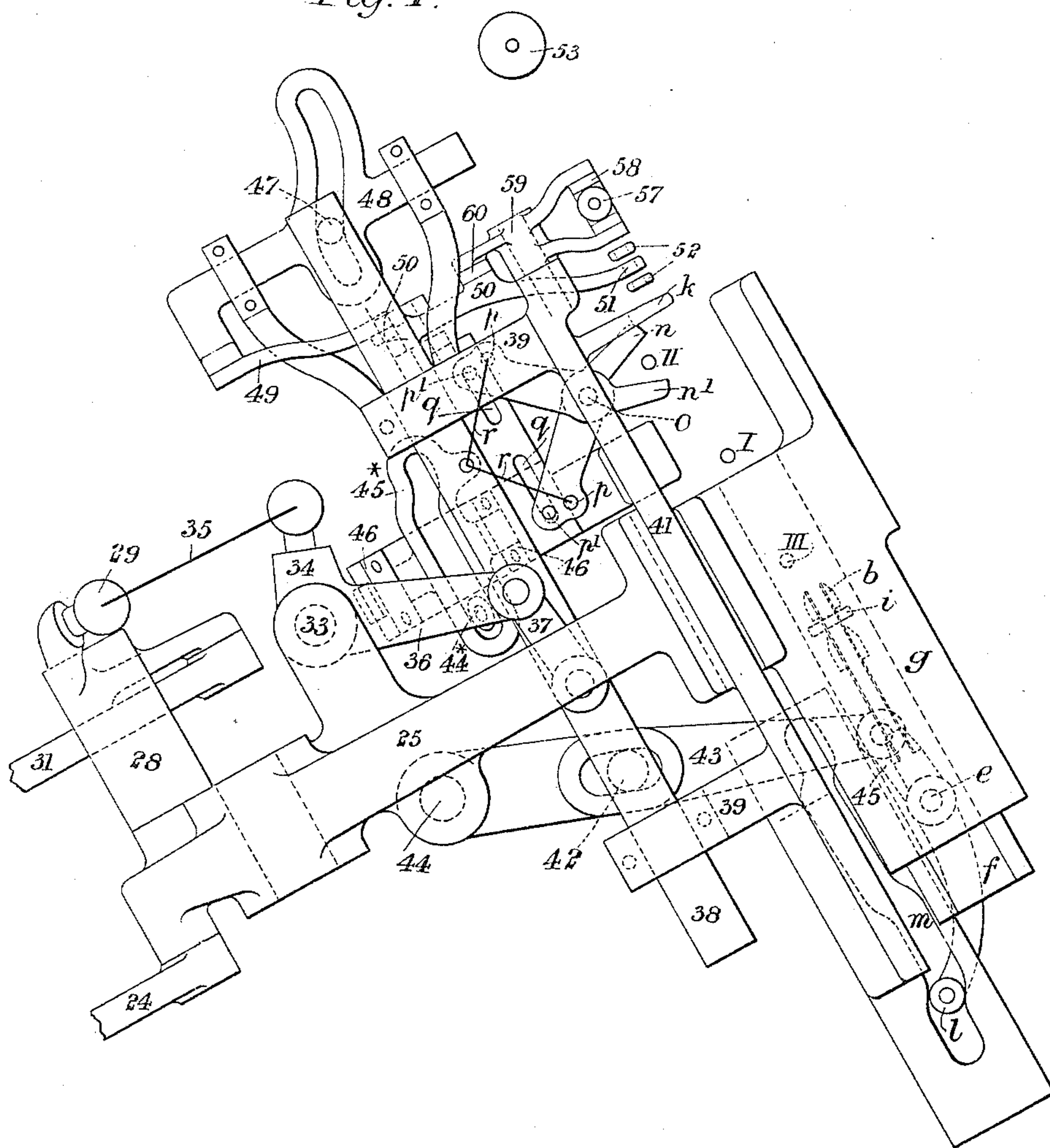
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6 Sheets—Sheet 4.

Fig. 4.



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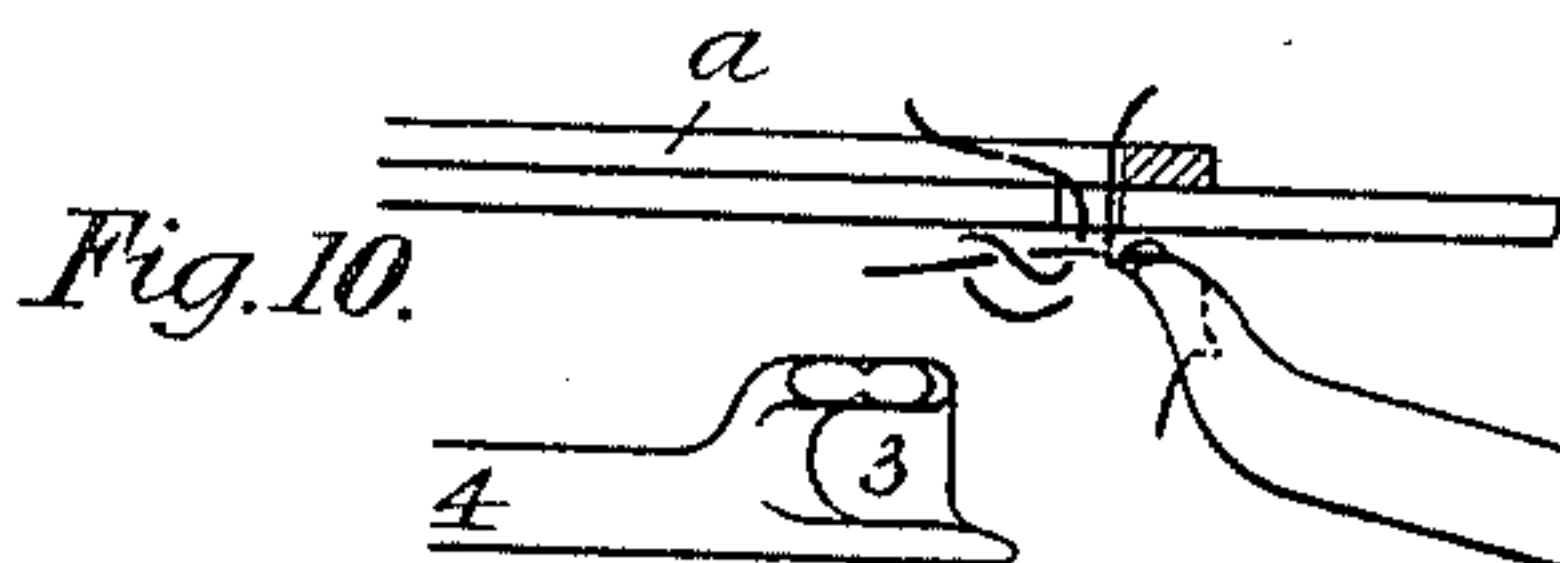
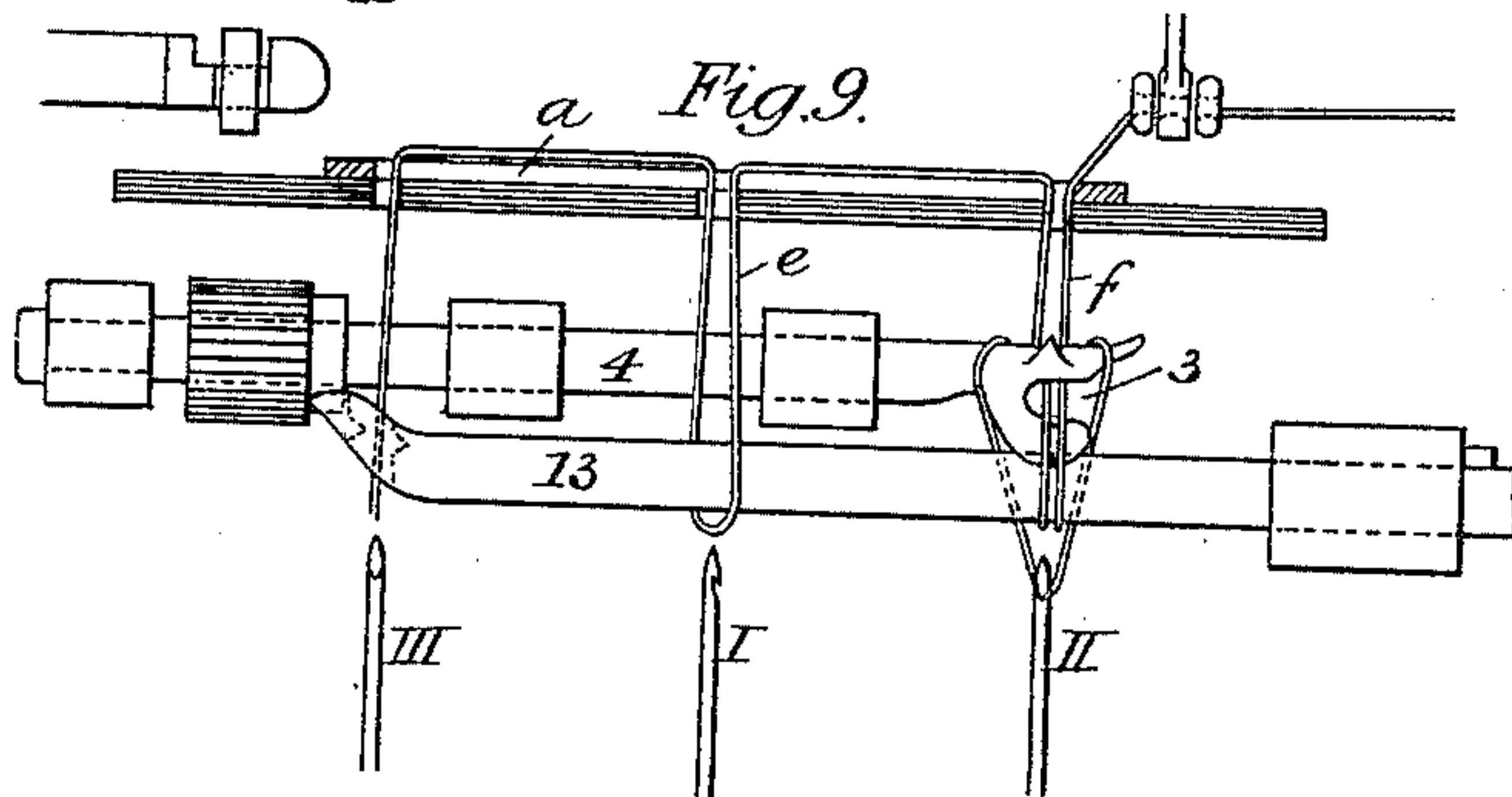
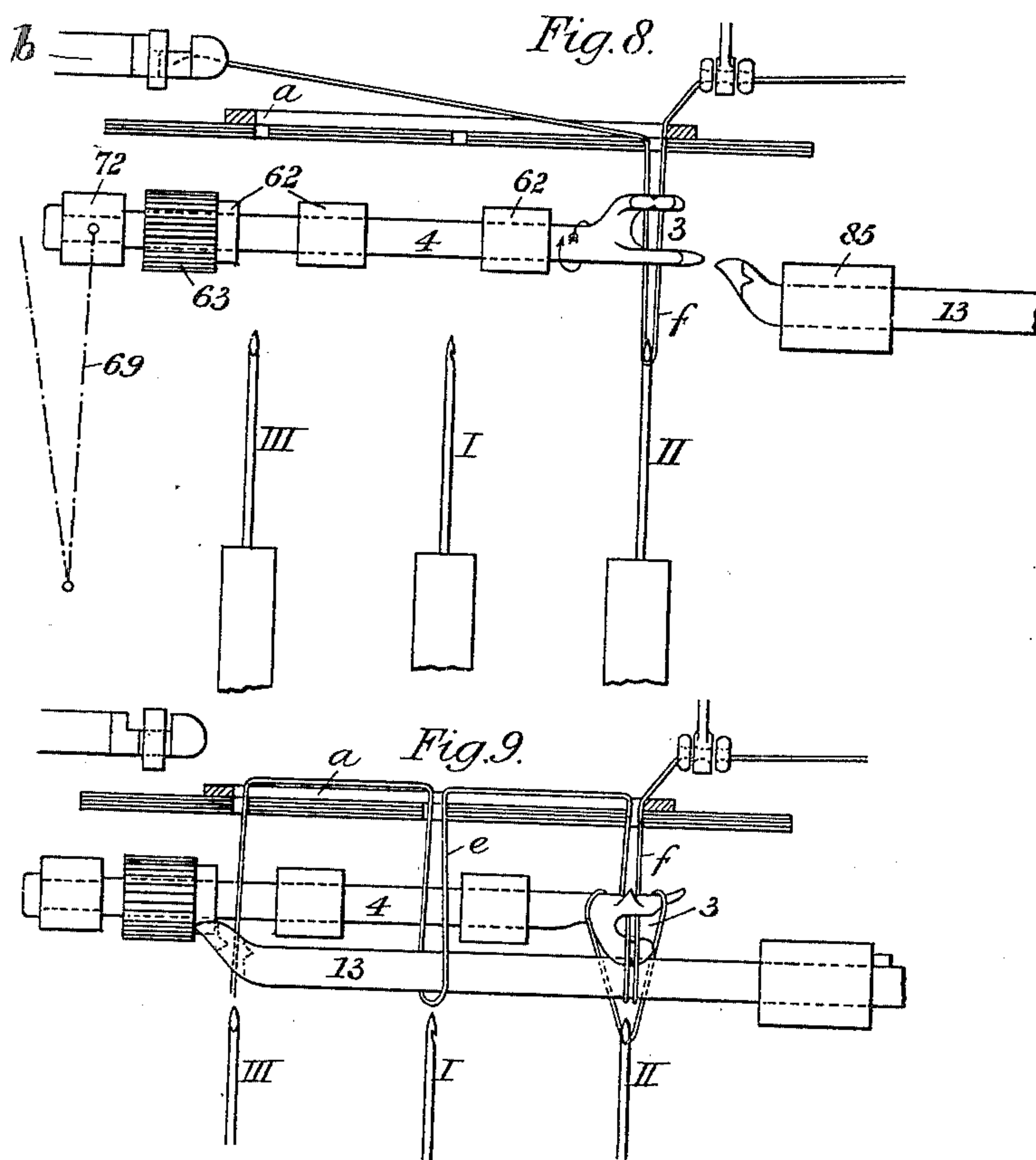
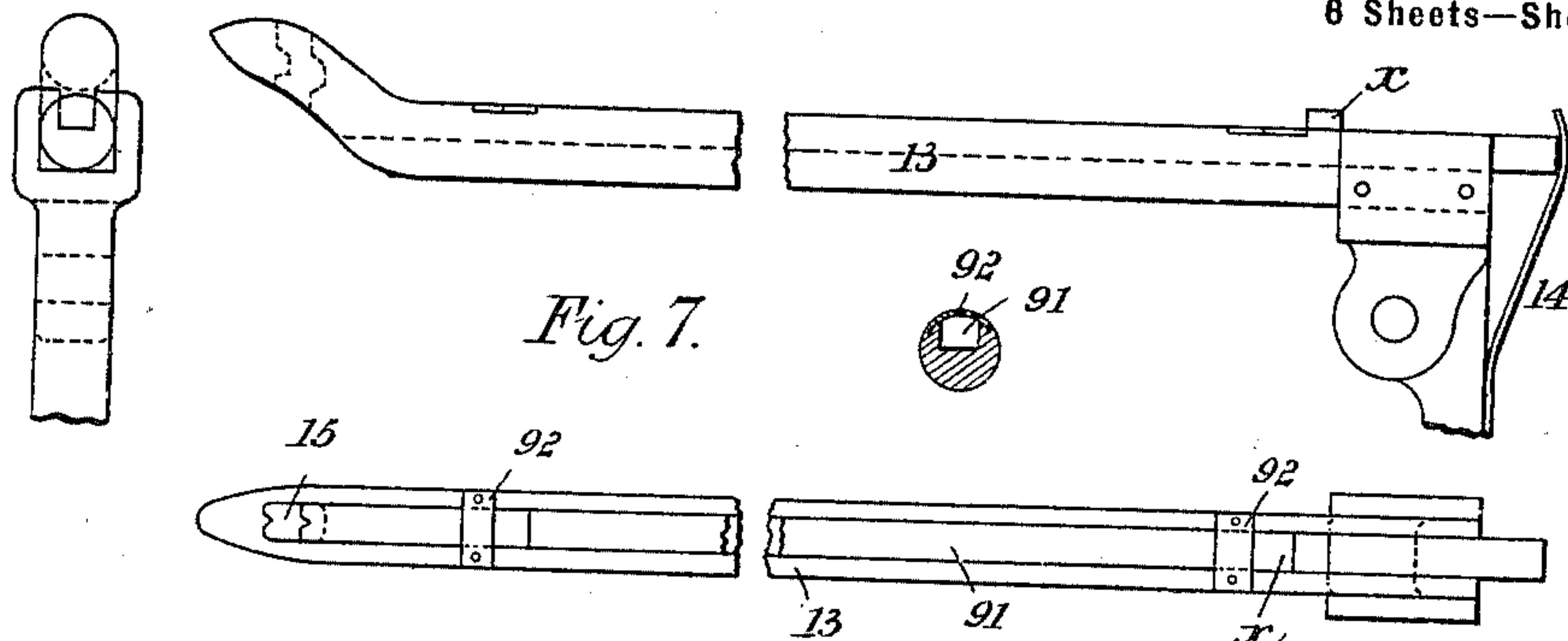
Patented May 15, 1900.

O. KLEINSCHMIDT.
BOOK SEWING MACHINE

(Application filed May 12, 1899.)

(No Model.)

8 Sheets—Sheet 5.



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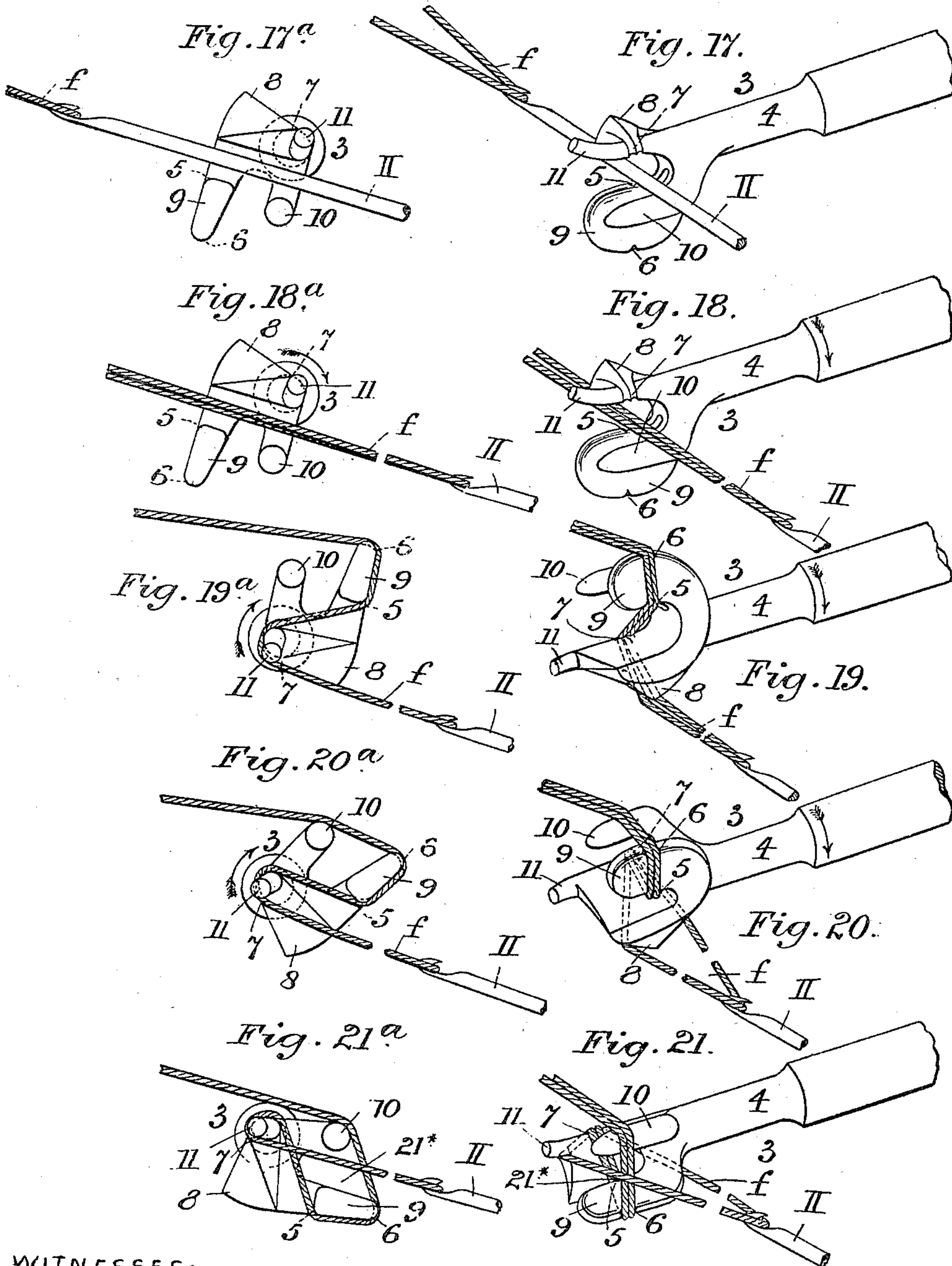
Patented May 15, 1900.

O. KLEINSCHMIDT.
BOOK SEWING MACHINE.

(Application filed May 12, 1899.)

(No Model.)

6 Sheets—Sheet 6.



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UNITED STATES PATENT OFFICE.

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BOOK-SEWING MACHINE.

SPECIFICATION forming part of Letters Patent No. 649,732, dated May 15, 1900.

Application filed May 12, 1899. Serial No. 716,561. (No model.)

To all whom it may concern:

Be it known that I, OSCAR KLEINSCHMIDT, a subject of the Emperor of Germany, and a resident of Leipsic-Plagwitz, in the German

Empire, have invented certain new and useful Improvements in Apparatus for Securing Together by Means of Thread the Leaves of Pamphlets or the Like, which invention is fully set forth in the following specification.

This invention has for its object to provide simple and efficient apparatus for securing together by means of thread the leaves of pamphlets and the like, the stitching being secured by knotting the thread.

In the accompanying drawings, Figure 1 is a front elevation, and Fig. 2 a side elevation, of a machine made in accordance with my invention. Fig. 3 is a plan, with the upper part removed, of the same. Fig. 4 is a plan of the top part with the cutting mechanism in a different position. Fig. 5 shows the cutting mechanism separately in the position in which it is represented in Fig. 2. Figs. 6 and 7 show the grippers separately. Figs. 8, 9, and 10 show parts in various positions, illustrating the operation of the instruments employed in effecting the stitching and knotting of the thread. Figs. 11 to 16 show the way in which the thread is manipulated. Figs. 17 to 21 show in perspective the successive steps in the manipulation of the thread by the fork by which the knot is formed, and Figs. 17^a to 21^a are corresponding end views.

I will describe the invention as applied to a machine in which three needles are employed; but it will be understood that two needles or more than three needles can also be employed, if desired.

The instruments for effecting the stitching and tying the knot consist of a fork-like device 3 (I will refer to it as a "fork") of peculiar shape, as hereinafter described, two or more needles with hooks, and two grippers *b* and 13, one, *b*, above the papers to be stitched and one, 13, below, the fork and grippers moving longitudinally at about right angles to the lines of movement of the hook-neededles. The invention also includes means whereby these instruments are operated at the proper relative times. I will first describe the operations of the instruments and then the mech-

anism by which these operations can be effected.

The upper gripper *b* draws the thread along above the fold of the papers to be secured, and the needle II, which had previously been raised and passed through the fork 3, Fig. 17, and through the papers in its descent, draws the thread through the papers and between the prongs of the fork 3, as shown in Figs. 8 and 18. Then the fork 3 turns upon its axis, as shown in Figs. 19, 20, and 21, so as to wind the thread-loop *f* thus formed around itself and form a loop 21^{*}, Figs. 21 and 21^a, through which the lower gripper 13 passes. (See Fig. 9.) The said gripper also passes through the loop *e* drawn down by the needle I and, catching the thread drawn down by the needle III, carries it back through the loops *e* and 21^{*}, as shown in Fig. 12. Fig. 13 illustrates a case where the needle I is dispensed with. The fork 3 then turns backward and by a longitudinal movement is withdrawn from the loop 21^{*}, and then the thread ends are pulled and the knot is tightened. The hook-needle II moves in a plane different from that in which the gripper 13 moves, so that the said gripper and needle do not come into contact; but the said gripper moves in the same plane as the other needles in order to fetch the thread from the needle III and carry it through the loop *e* formed by the needle I. The formation of the horns of the fork 3 is shown in Figs. 17 to 21 and 17^a to 21^a. The fork is carried upon a stem 4 and is formed at one side with a wedge-shaped projection 8 and a projecting nose 11, with grooves 7 leading to the sides of the wedge, and at the other side with two projections 9 and 10, the projection 9 having grooves or notches 5 and 6 in it in approximately the same plane as the grooves 7. After the upper gripper *b* has pulled the thread beyond the needle II the said needle pierces the papers from below, and then the said gripper moves slightly sidewise, so as to lay the thread close against the said needle, so that when the latter moves down it will catch the thread in its hook and pull it through the papers. The gripper *b* continues its movement in a straight line until it has passed the needle I, which now rises, and the said gripper again

makes a side movement to lay the thread against the needle I to insure its hook also catching the thread. In the meantime the needle II has reached its lowest position, the thread having thereby been drawn through between the prongs of the fork 3, as shown in Figs. 8 and 18, which fork now rotates upon its axis in the direction of the arrows shown in Figs. 18, 18^a, 19, 19^a, 20, and 20^a, and the thread-loop *f* engages the grooves 5 and 6, another part of the loop engaging the grooves 7, and the wedge part 8 opens the loop, as shown in Figs. 19 and 20, and on the continued rotation of the fork 3 the opened loop leaves the wedge part 8 and slips over the other part 9 of the fork, as shown in Fig. 21, and forms a loop 21*, as shown in Figs. 21 and 21^a, through which the lower gripper 13 can pass. The nose 9 on the fork 3 is for the purpose of opening the loop as much as possible to facilitate the passage of the gripper, while the nose 11 is to prevent the thread from slipping off the fork 3. When this loop 21* is so formed, the gripper 13 enters it and passes toward the needle I, which meantime has arrived at its lowest position and has turned on its axis through an angle of ninety degrees, or thereabout, so that the open side of the thread-loop *e* is properly presented for the passage of the gripper 13, which proceeds therethrough toward the needle III. The gripper 13 has a slide-bar 91, working in a groove in the gripper and confined by the straps 92, and a projection *x* is formed on the said bar. The jaw 15, formed by the gripper end and the end of the bar 91, is normally closed by a spring 14. In the motion of the gripper and just before it arrives at the needle III the projection *x* comes against the bearing 16, Fig. 1, and thereby the jaw is opened, at which juncture the said gripper remains at rest, while the needle III ascends through the open jaw, perforates the papers, engages the thread, and descends, drawing the thread down through the papers and the said open jaw. While the needle III is descending the jaw of the upper gripper *b*, Fig. 6, lets the thread go, so that its end may be pulled down by the hook of the needle III. The gripper 13 then moves backward, its jaw under the influence of the spring 14 closing at the commencement of the movement, and the thread is carried by the said gripper through the thread-loops *e* and 21*, Fig. 9, whereupon the tightening of the thread is effected to secure the knot, and the thread is cut off by scissors secured to the upper part of the machine, and the plate *a*, which held the papers down on the angle-plate beneath, is by any suitable means raised to allow of the removal of the stitched papers and of the placement in position of other papers to be sewed. The plate *a* and angled table are of course perforated or shaped to allow of the passage of the needles. The upper gripper *b* moves back as soon as the thread has been released from its jaws.

The machine by which the various opera-

tions described are performed can be arranged as follows: It may be regarded as consisting of two main parts—an upper part above the table and a lower part below the table—on which the papers to be sewed are placed, the upper mechanism including the upper gripper *b*, the scissors or cutting device, and the thread feeding and tension devices and the under mechanism including the lower gripper 13 and the means for effecting the formation of the knot. The latter receive their motion principally from the shaft 17; but the fork 3 is turned from the shaft 18. The said two shafts 17 and 18 are at right angles to each other and are geared together by beveled wheels, as shown in Fig. 3, so that they have equal speeds. 19 and 20 are bearings for the said shafts, carried on projections 21 from the frame 22. The upper part of the machine is carried by the arm 25, centered to the frame at 26, so as to form a lever which is moved up and down by the rod 24, with a roller running in a cam-groove 23. On a center 27 on the short arm of the lever 25 is a bell-crank lever 28, one of the arms of which has connected to it at 30 a connecting-rod 31, with a roller running in a cam-groove 32, while the other arm 28 has a ball-shaped end 29, connected by the link 35 with the bell-crank lever 34 36, centered at 33. The arm 36 of this lever is connected by the link 37 with the slide-bar 38, so as to impart thereto a sliding motion. The position of the arm 29 is such that the movement of the lever 25 causes the least possible relative movement of the bar 38. The slide-bar 38 is guided by the parts 39 and 40 on the plate 41, secured to the lever 25, and the said slide-bar has at 42 a pin carrying a roller acting in a slot in a lever 43, which is centered at 44 on the lever 25. The rod 45 connects the lever 43 with the gripper *b* and imparts motion thereto. The said gripper *b* is pivoted on the pin *e**, which is fastened to the dovetailed slide-plate *f**, sliding in the dovetailed guides *g*. The jaws *c* of the gripper *b* consist of two elastic tongues *g**, Fig. 6, upon which are secured the projections *h* *h'*, the projections *h'* having wedge-shaped ends. Between the said projections is a movable collar *i*, which when the gripper moves toward the right comes against a fixed part *k* and by slipping over the wedge ends of the projections *h'* closes the jaws *c*. The gripper *b* is arranged as a lever, centered at *e** to the slide *f**, the end opposite the gripping end being provided with a roller *l*, guided in the waved groove *m*, Fig. 4, for the purpose of causing the gripper to place the thread close to the needles, as hereinbefore mentioned, for enabling the hooks of the needles to engage the thread. On the sliding bar 38 is a bolt 44* for operating the scissors, the said bolt engaging in a curved slot in the slide 45*, Figs. 2, 4, and 5, which is guided in guides 46 and receives motion at right angles to the slide 38, whereby the scissors *n* *n'* are operated at the proper times. The part

5 *n* of the scissors carries a pin *o*, upon which the part *n'* is centered, and the ends of the arms of each part of the scissors carry two pins *p p'*, the pins *p'* carrying rollers running in slots *q*, while the pins *p* are connected by links *r* to the slide 45*. At the commencement of the movement of the slide 38 in the one direction the slide 45* will be pushed forward, so as to open the scissors and draw them backward, thus clearing the way for the thread and needle II. A third roller 47, Fig. 4, fastened to the slide 38, controls the tension on the thread by moving the slide 48, which is connected by the lever 49 with the bell-crank take-up lever 50. The thread passes through the eye 51 in the said lever 50 and through two stationary eyes 52. When the lever 50 is in its lowest position, the three eyes 51 52 are in line; but when the lever 50 moves upward the thread is pulled up, and thus the slack of the thread, which was required in forming the loops, is drawn back and ultimately the knot tightened. When the gripper *b* moves backward, the lever 50 descends and slackens the thread for the next stitching operation. The thread coming from the spool 53 passes through a tension device before it passes through the eyes 51 52, the said tension device consisting of two disks 55 on the rod 54, provided with a hole for the passage of the thread through it and between the said disks 55, which are acted upon by the spring 56. While the loops are being formed in the thread, as aforesaid, the thread must only have a slight tension put upon it, and this is effected by the collar 57 and connections 58 and lever 59, operated from the lever 50 by the connection at 60, so that when the lever 50 descends the collar 57 is lifted and the tension of the spring 56 is reduced, and vice versa.

45 61, Fig. 2, is a collar which can be set and fixed by a screw so as to adjust the tension exercised by the spring. The fork 3, which makes the loop 21* in the thread, as aforesaid, is carried in bearings 62 and is rotated by means of the pinion 63 and toothed sector 64 and levers and connections 65, 66, and 67 from the cam 68 on the shaft 18. The longitudinal movement of the fork 3 for the purpose of removing the fork from the thread when it has done its work is effected by the lever 69, connected with a collar 72 on the shaft 4 of the fork and operated by the rod 70 from the cam 71 on the shaft 17. The up and down motions of the needles, as hereinbefore described, are effected by the three cams 77, 78, and 79 (shown in Fig. 3, but not in the front and side elevations) through the levers 73, 74, and 75, pivoted on the shaft 76, and connections 80, 81, and 82 to the slides which carry the needles. The axial turning of the needle I through ninety degrees, as aforesaid, is produced by the engagement of a helical groove 83* in the needle-bar thereof with a pin 83 in the guide, in

which the said needle-bar slides. To prevent this turning of the needle-shaft, it is connected to the links 81 (connected to the lever 74) by means of a collar 84, in which it can turn. 70 The lower gripper 13 is mounted in bearings 85 and 86, connected together and capable of turning upon the pin 87. It is operated from the cam 88 on the shaft 17 through the connecting-link 90 and lever 89, centered to the framework and carrying a roller for engaging in the said cam. The gripper 13 consists of two pieces, (see Fig. 7,) one sliding in the other, as hereinbefore described. The jaws are shown open in Fig. 7. Besides the gripper 13 receiving longitudinal movements, its jaws while the fork 3 is being shifted to the left receive upward movement, so as to cause the thread to be pulled, as shown in Fig. 10, after the knot has been formed. 85 This upward movement is effected by the cam 93, Fig. 1, acting on a roller on the lever 94, pivoted to the framing of the machine and connected by a link 95 to the bearings 85 and 86. After the thread has been released from the jaw of the gripper 13 the bearings 85 86 are moved downward a part of the way, and the final downward movement takes place at the starting of the forward motion when the next stitching operation commences, so that 95 the jaw may easily enter the loop.

Having now particularly described and ascertained the nature of the said invention and in what manner the same is to be performed, I declare that what I claim is— 100

1. In apparatus for securing together, by means of thread, the leaves of pamphlets or the like, the combination of a plurality of hook-needles, means for reciprocating the hook-needles longitudinally, a thread-feeding gripper, a fork-like device having in one piece a wedge-shaped part 8 which moves the two sides of a thread-loop apart and a nose 9 with a groove for keeping together the two sides of a different part of the thread-loop and passing that part through the opened part and a nose 11 for preventing the thread from slipping off the fork, means for rotating and longitudinally reciprocating the fork-like device, a lower gripper and means for severing the thread, substantially as set forth. 115

2. In apparatus for securing together, by means of thread, the leaves of pamphlets or the like, the combination of a fork-like device having in one piece a wedge-shaped part 8 which moves the two sides of a thread-loop apart and a nose 9, with a groove for keeping together the two sides of a different part of the thread-loop, and for passing that part through the opened part, and means for rotating and longitudinally reciprocating the said fork-like device, substantially as set forth. 125

3. The herein-described fork-like device for use in pamphlet-stitching, said device having in one piece a wedge-shaped part 8 to move the two sides of a thread-loop apart, and a nose 9 with a groove for keeping together the 130

two sides of a different part of the thread-loop
and passing that part through the opened
part, and a nose 11 for preventing the thread
from slipping off the fork, in combination
5 with hook-needles and means for operating
said fork and hook-needles, substantially as
described.

In testimony whereof I have signed this
specification in the presence of two subscrib-
ing witnesses.

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