

No. 630,954.

Patented Aug. 15, 1899.

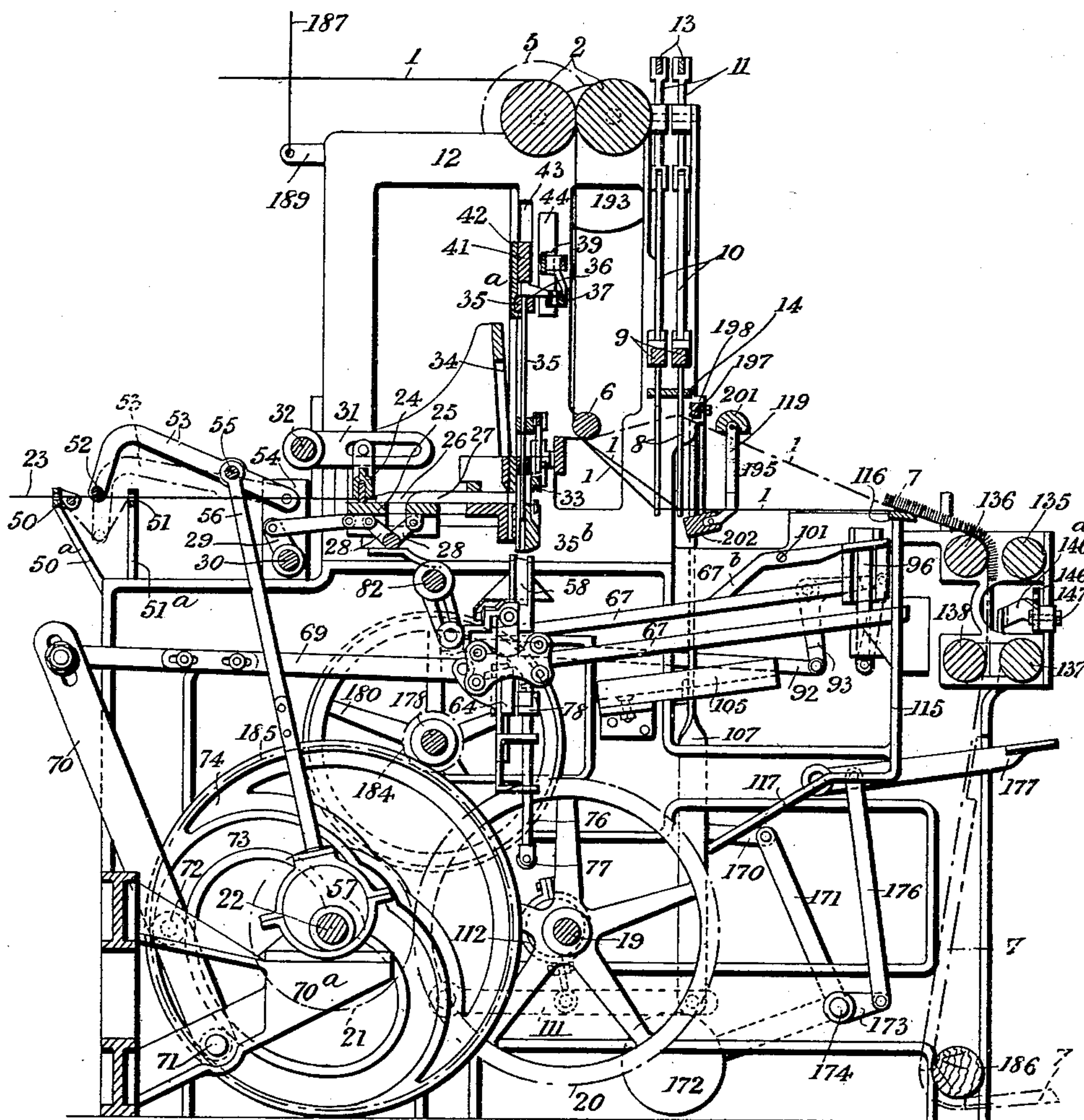
K. WALKER.
MACHINE FOR WEAVING COIR YARN MATS.

(Application filed Nov. 15, 1898.)

(No Model.)

12 Sheets—Sheet 1.

Fig. 1.



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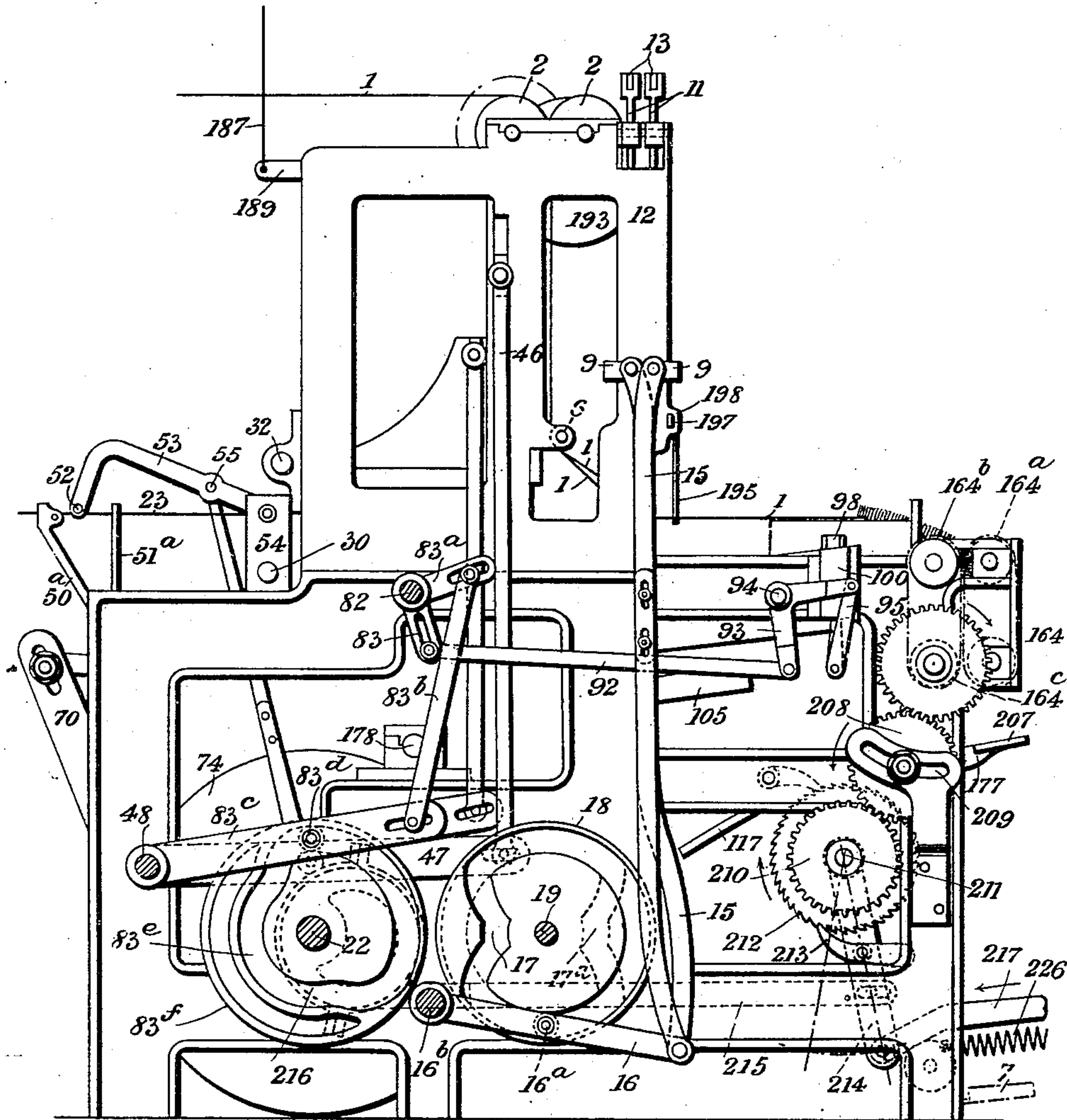
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Fig. 2.



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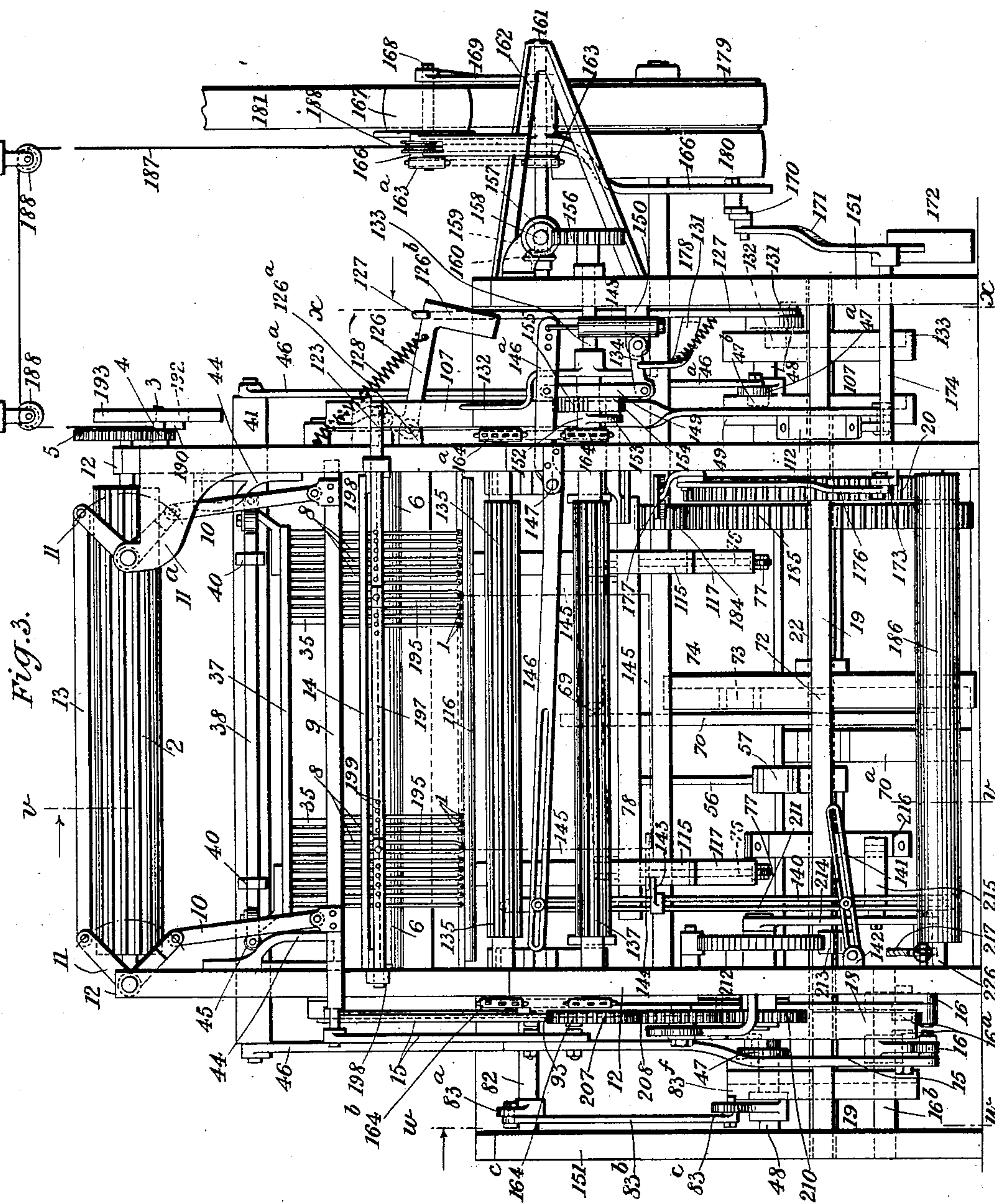
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WITNESSES.
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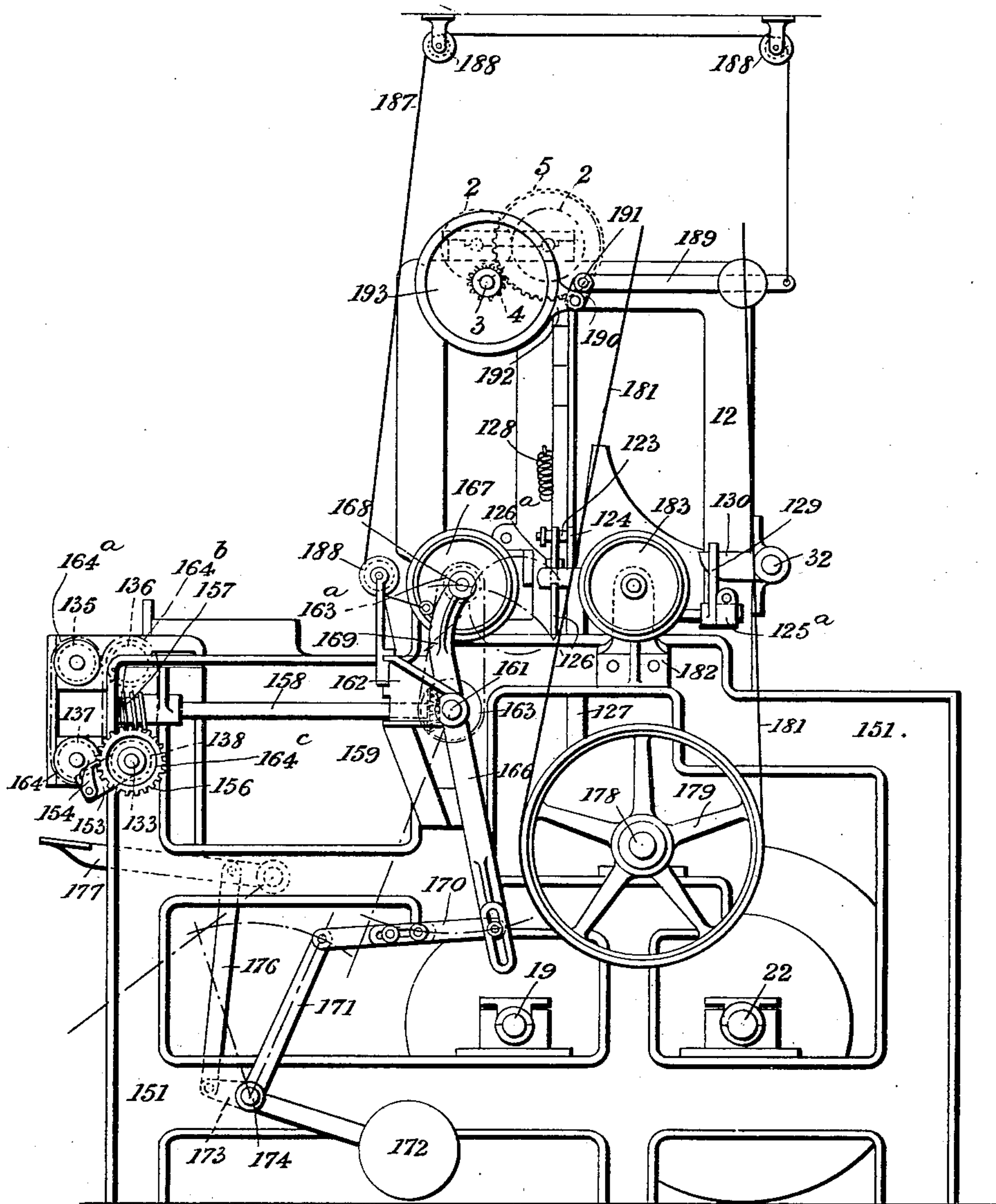
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Fig. 4.



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Fig. 6.

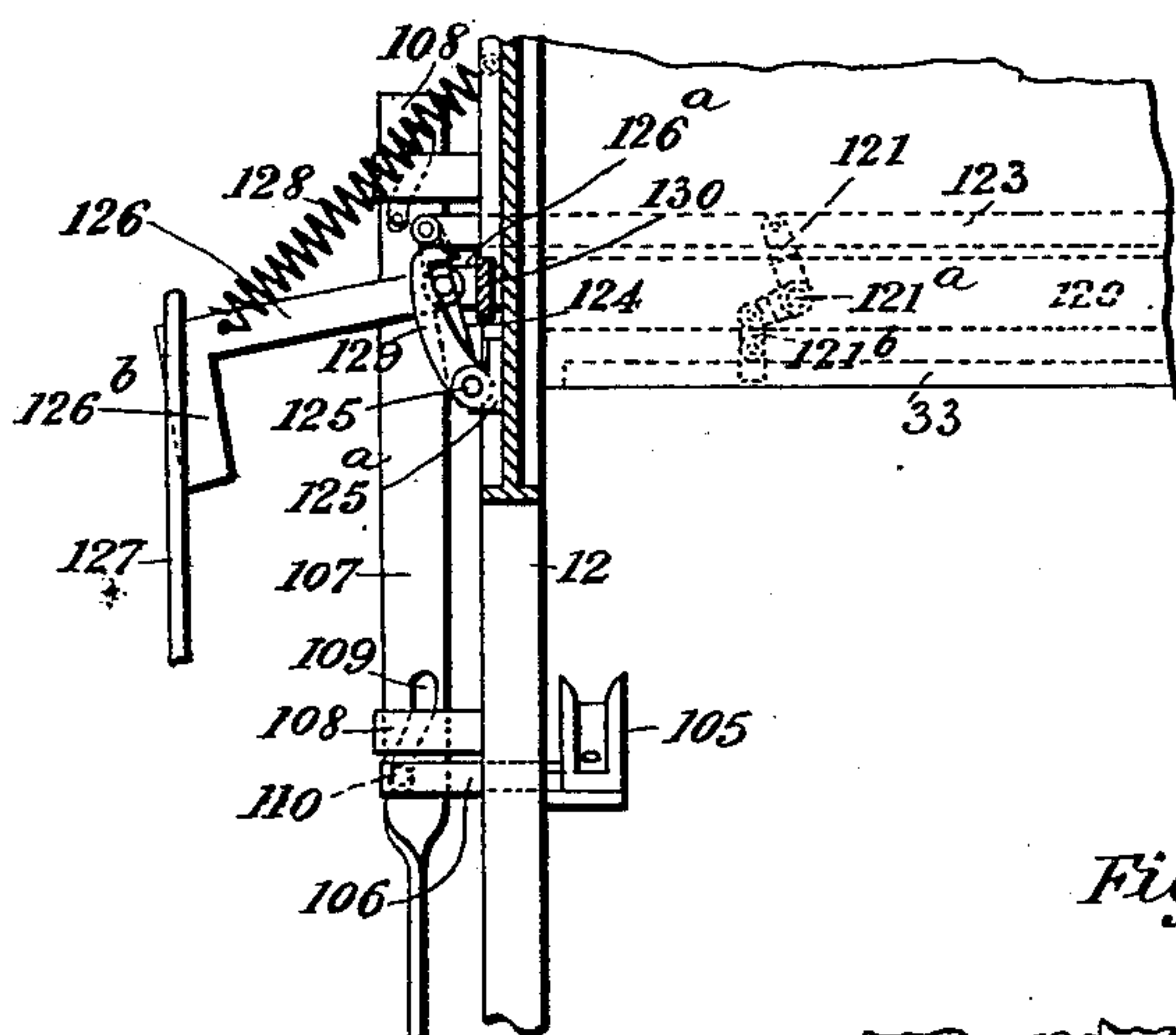


Fig. 6^a.

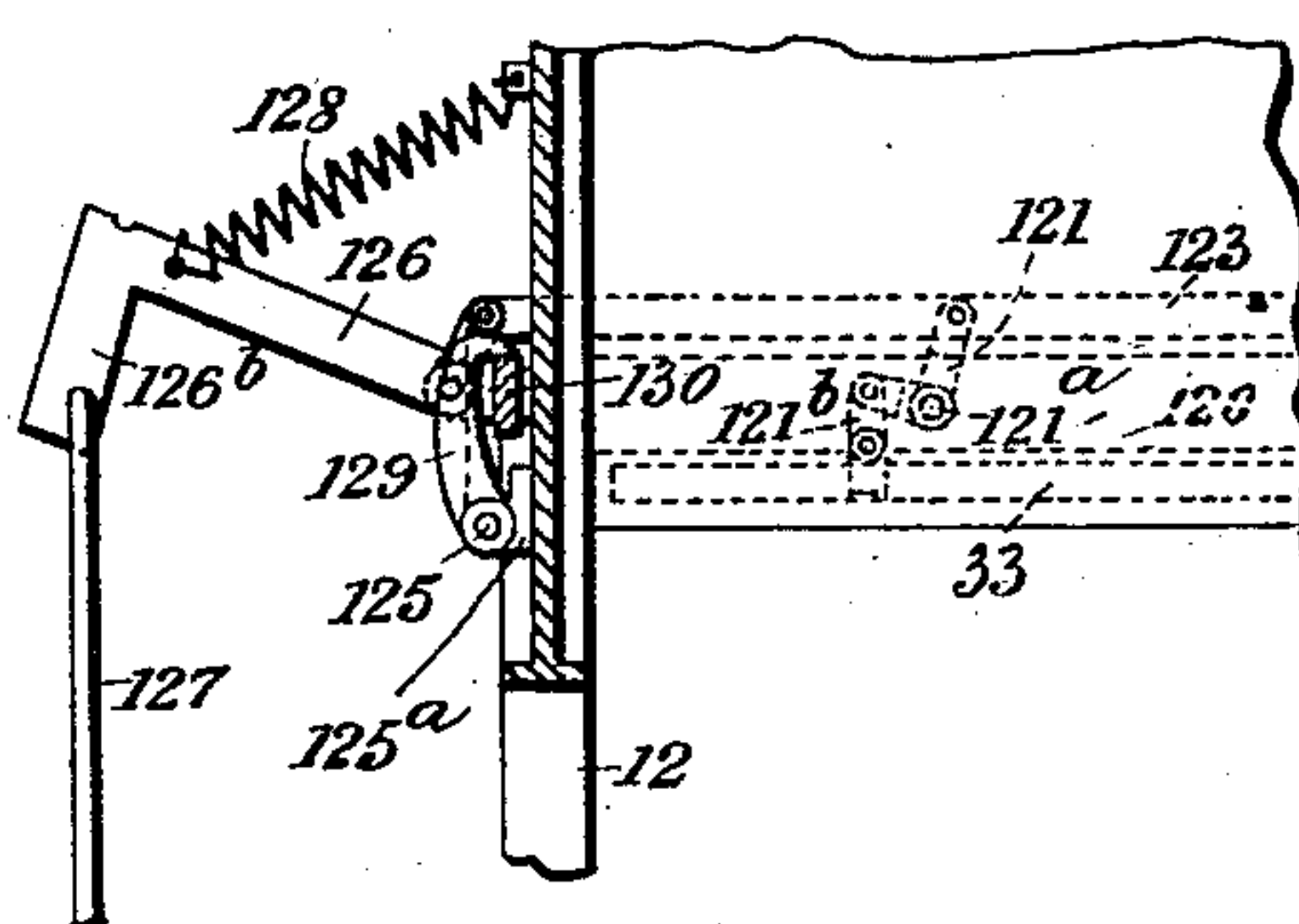
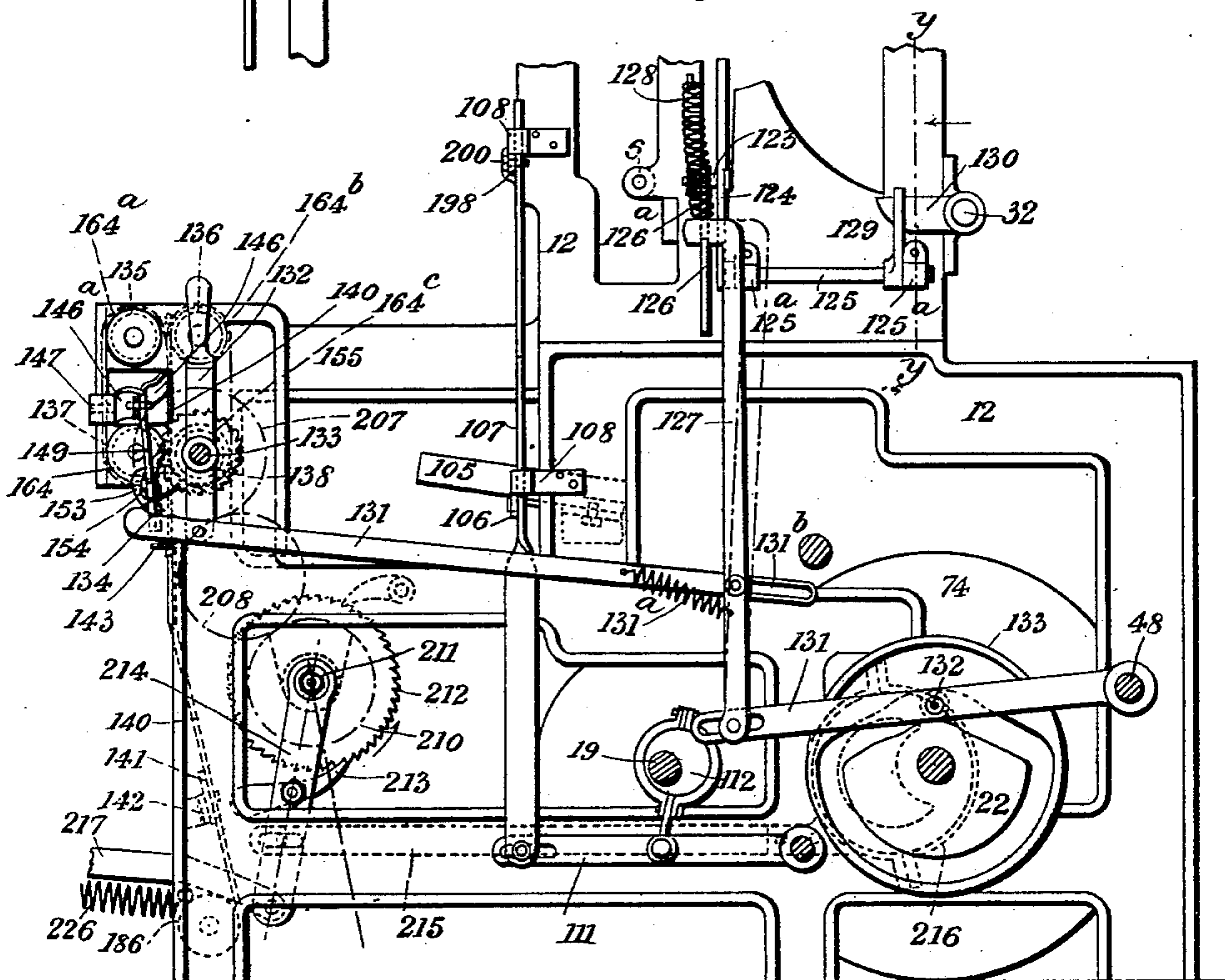


Fig. 5.



WITNESSES.

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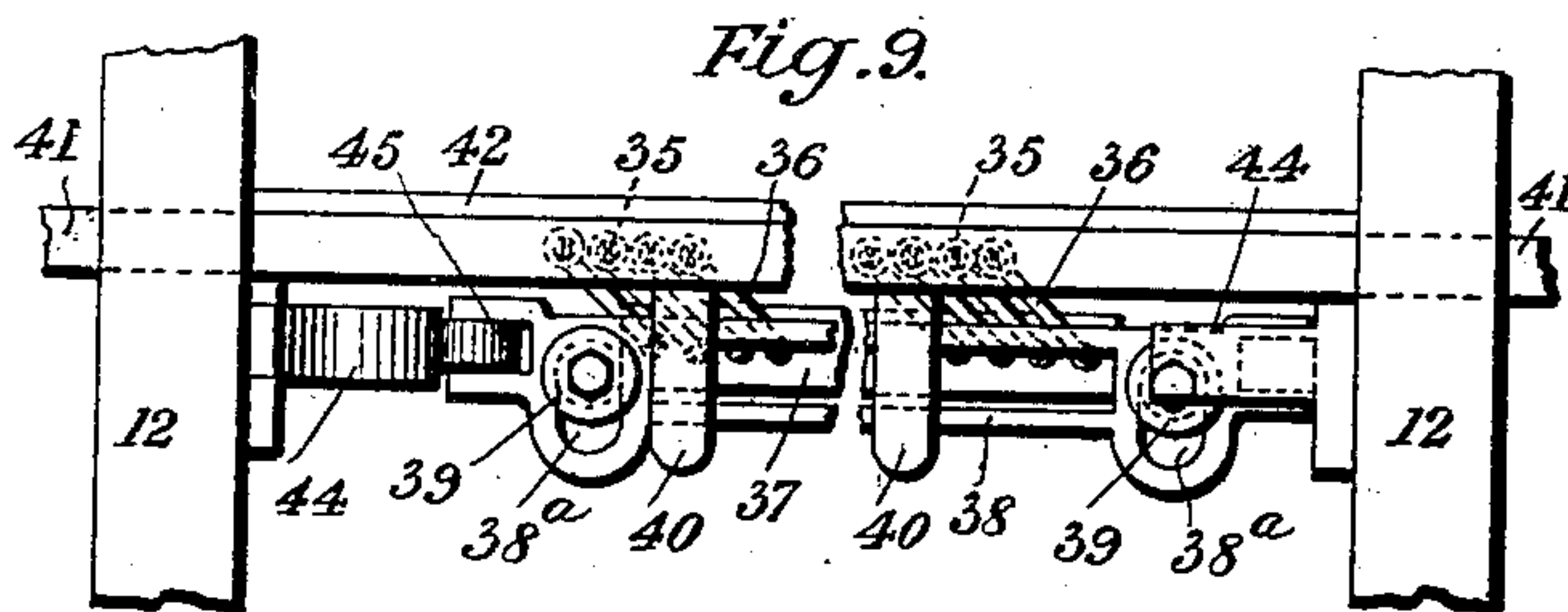
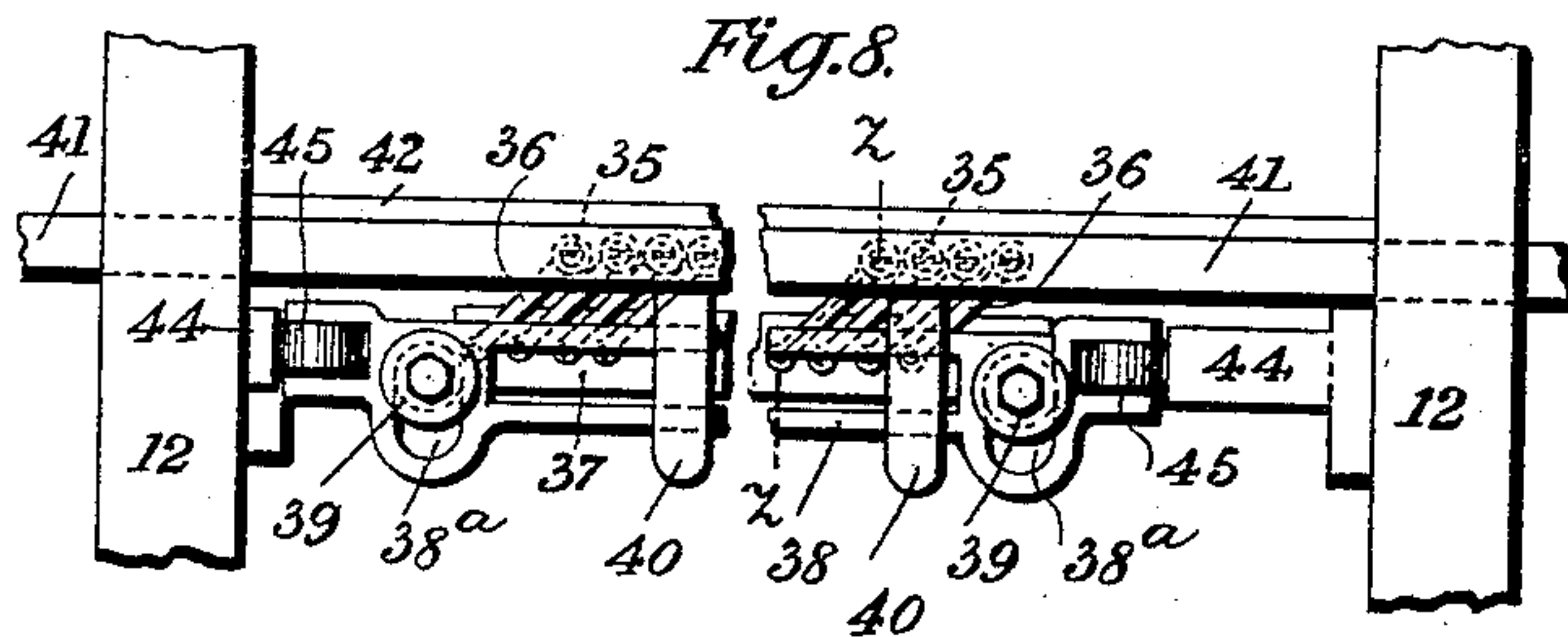
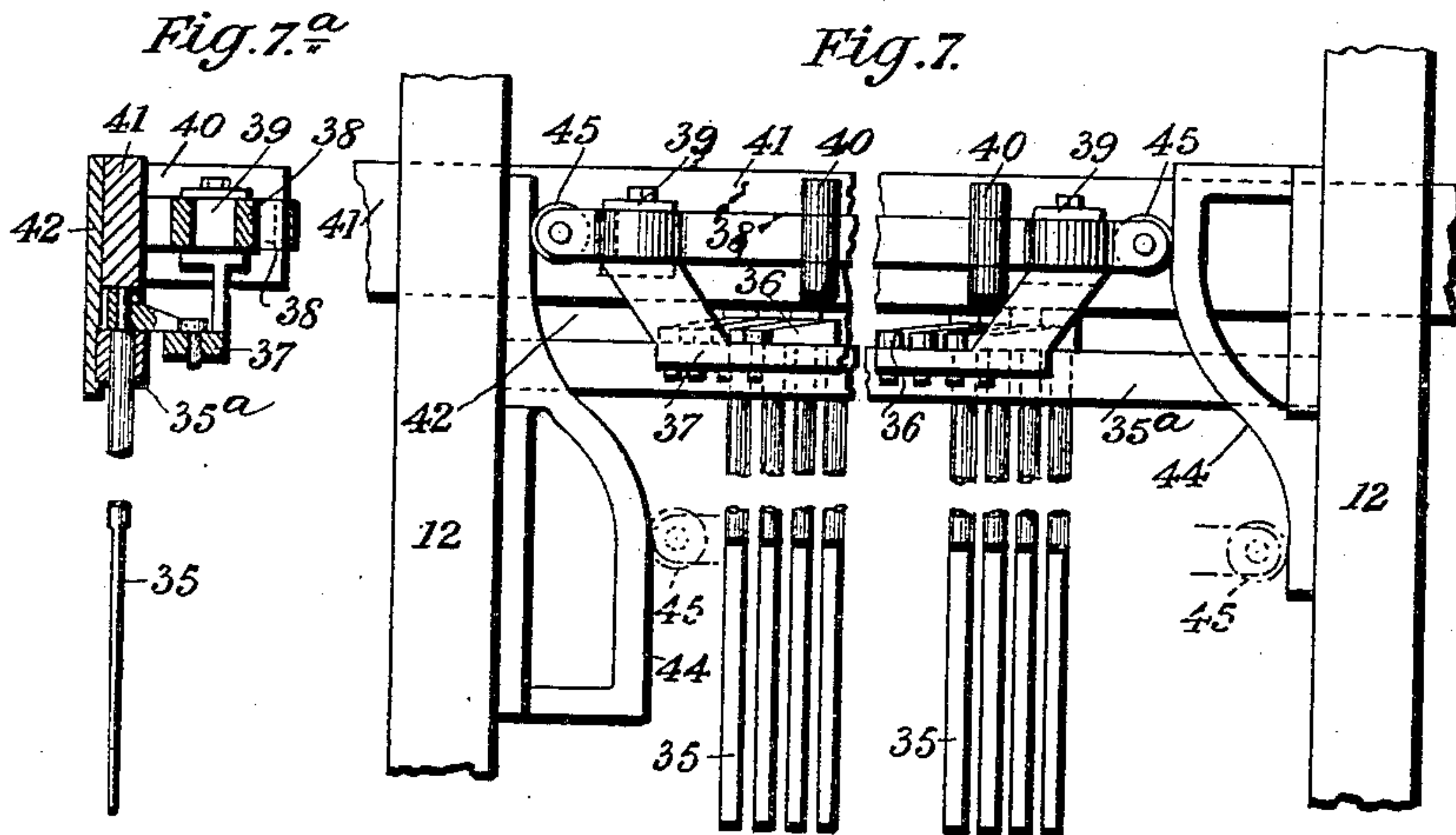
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No. 630,954.

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Fig. 10.

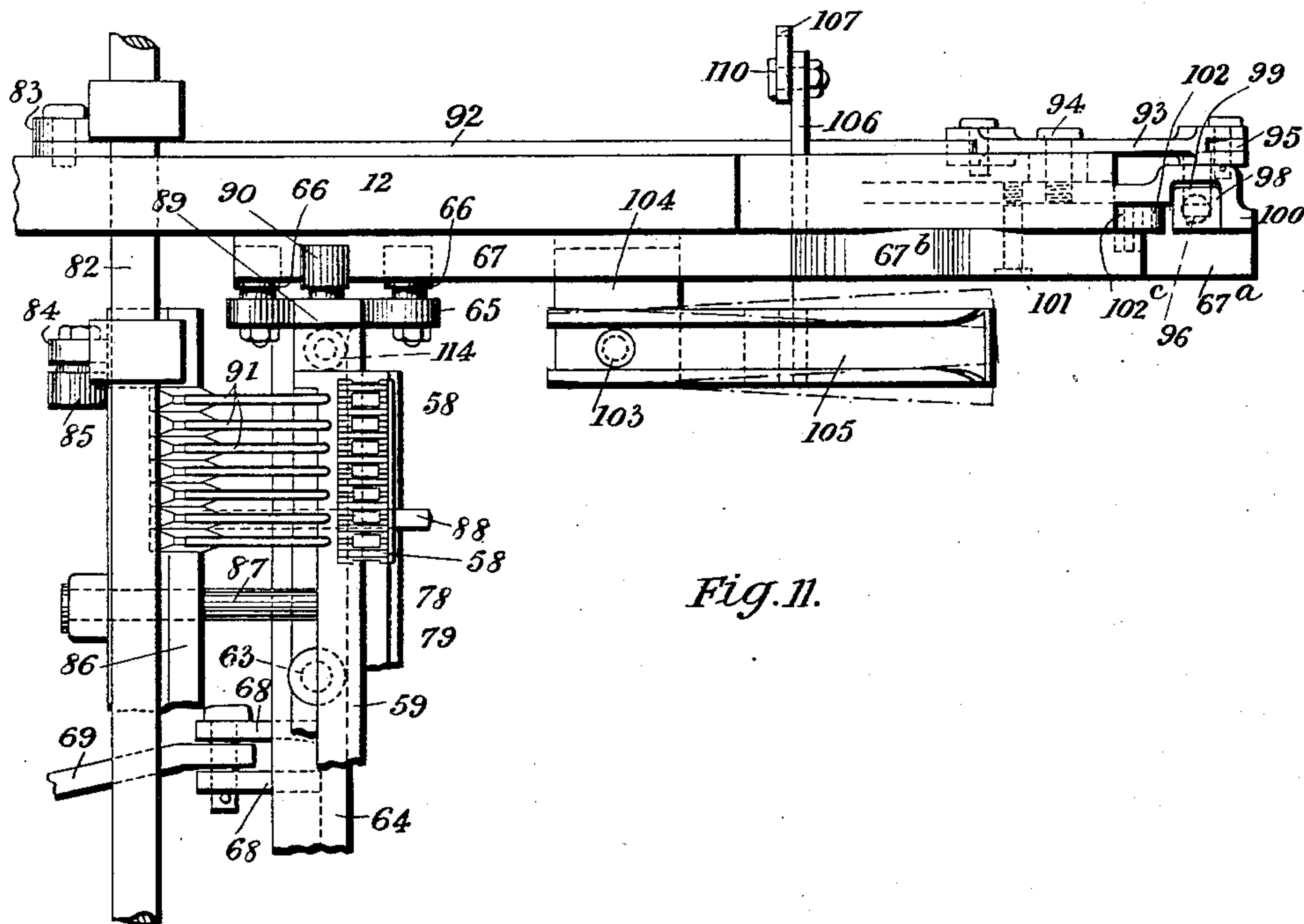
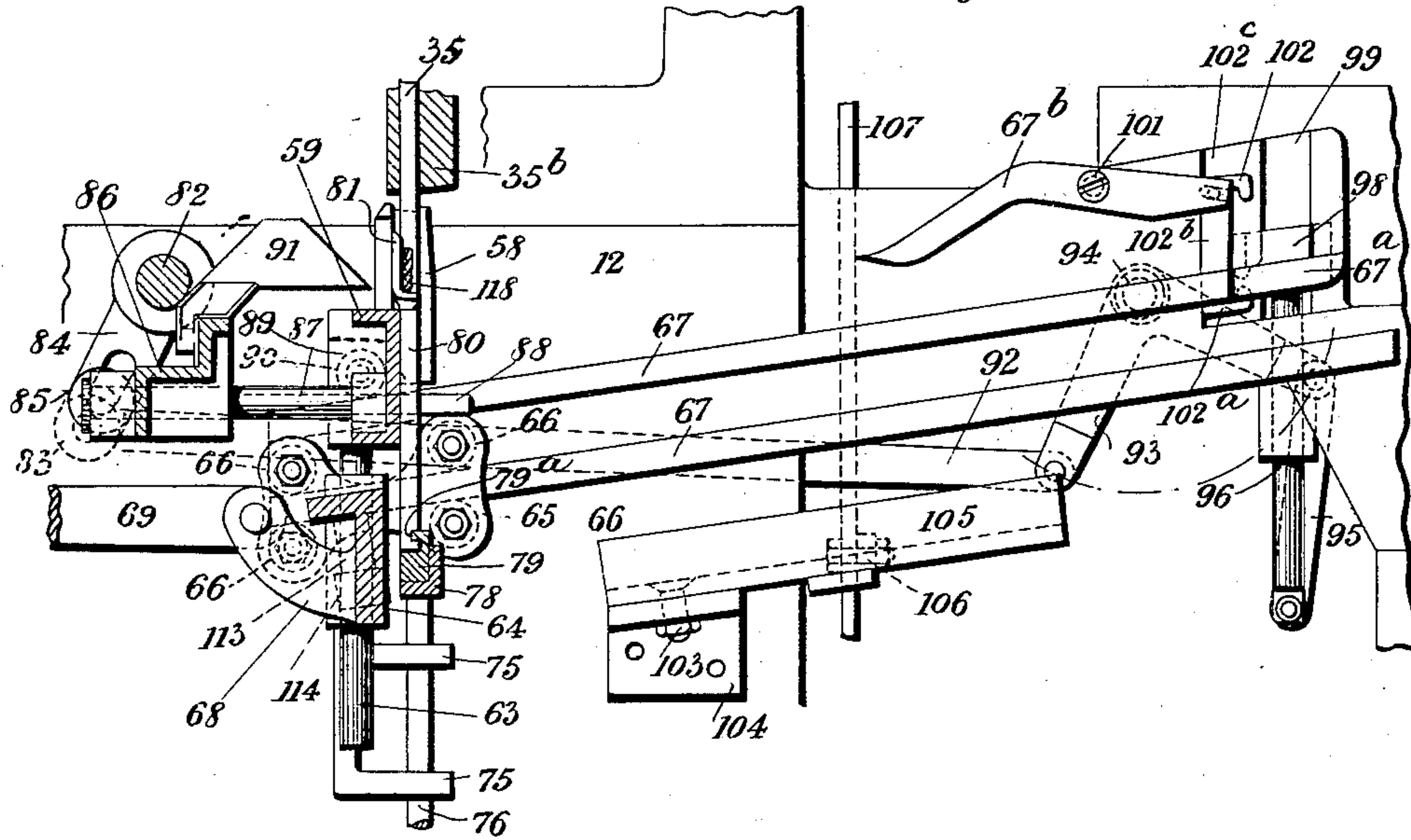


Fig. 11.

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Fig. 12.

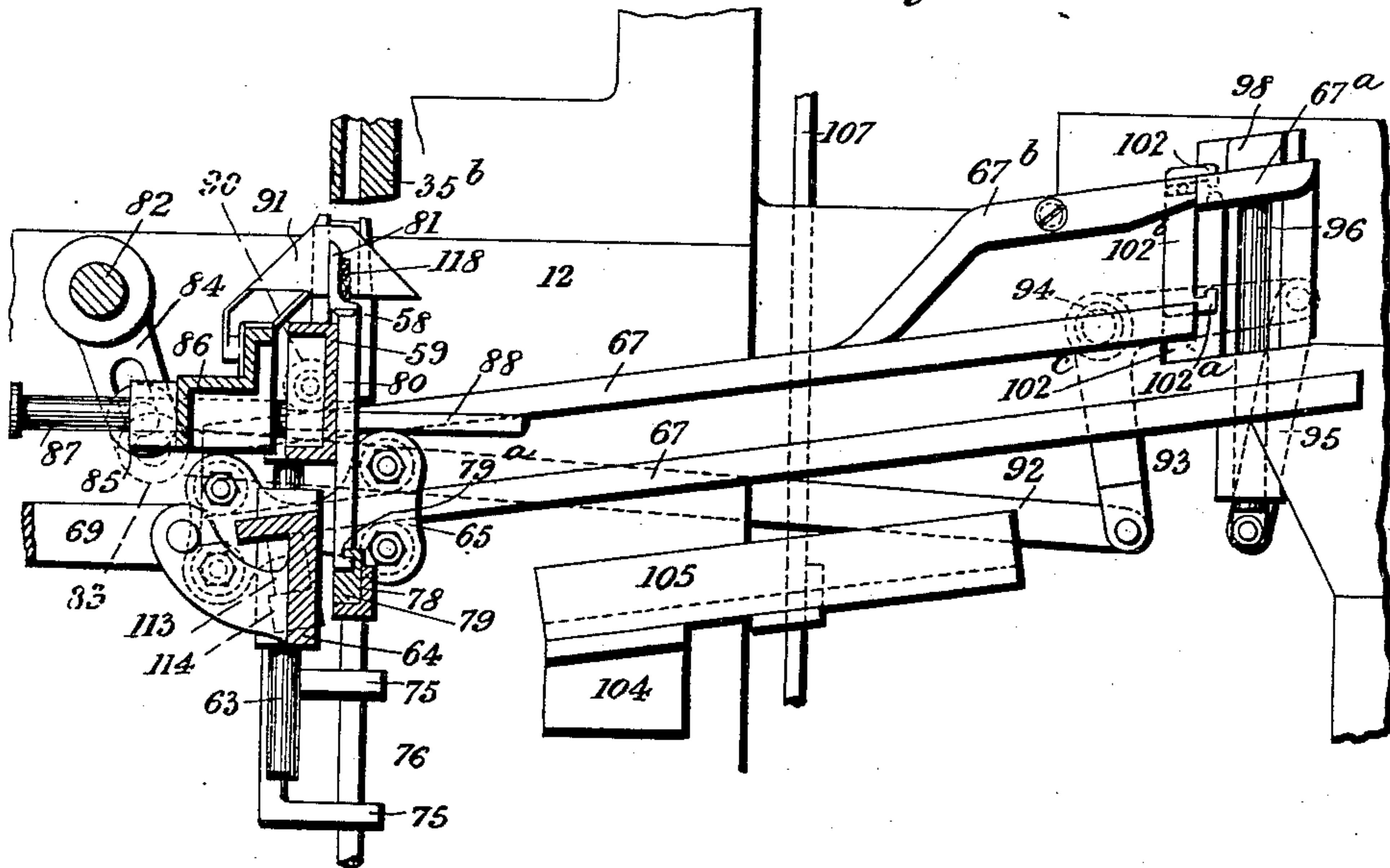


Fig.13.

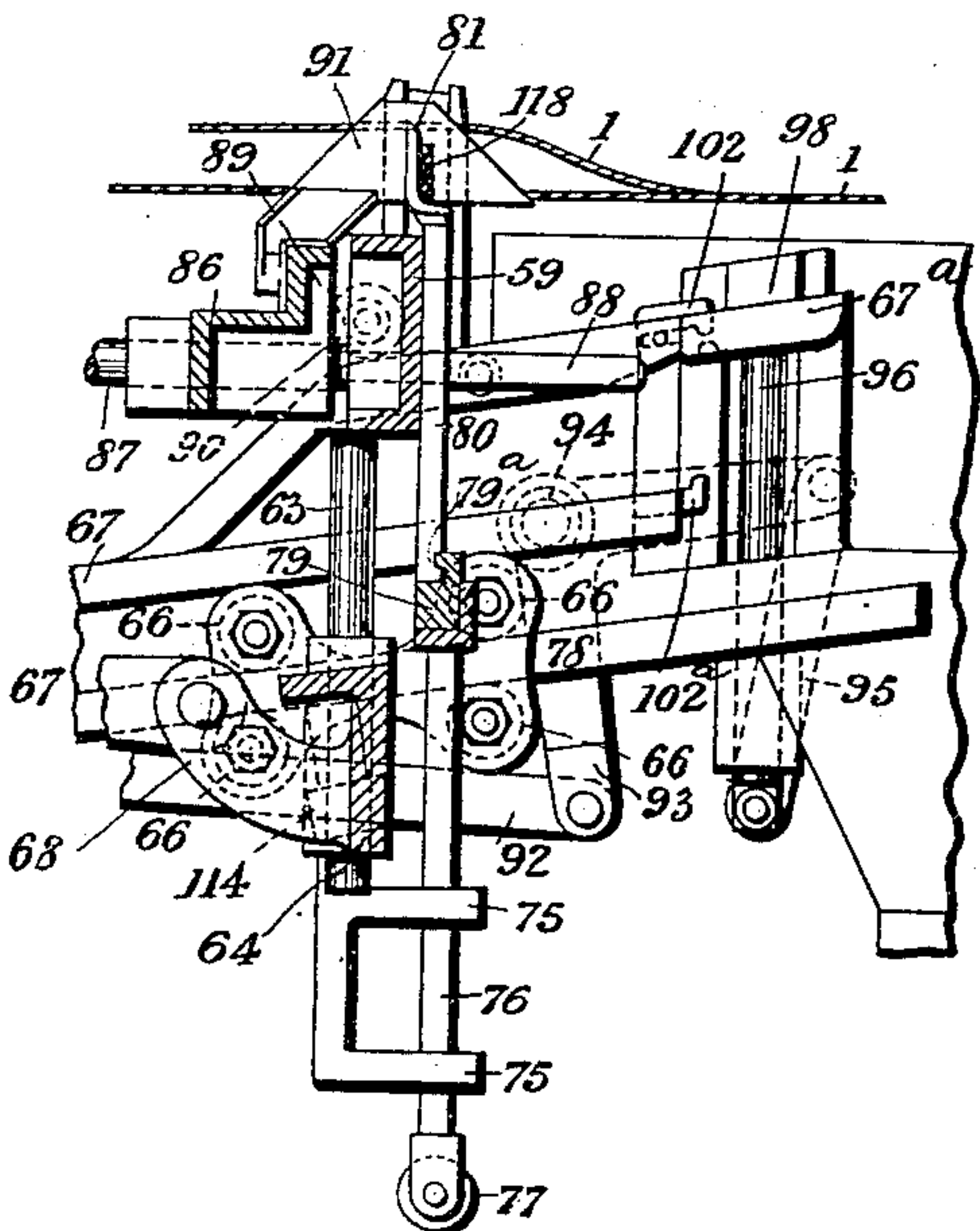
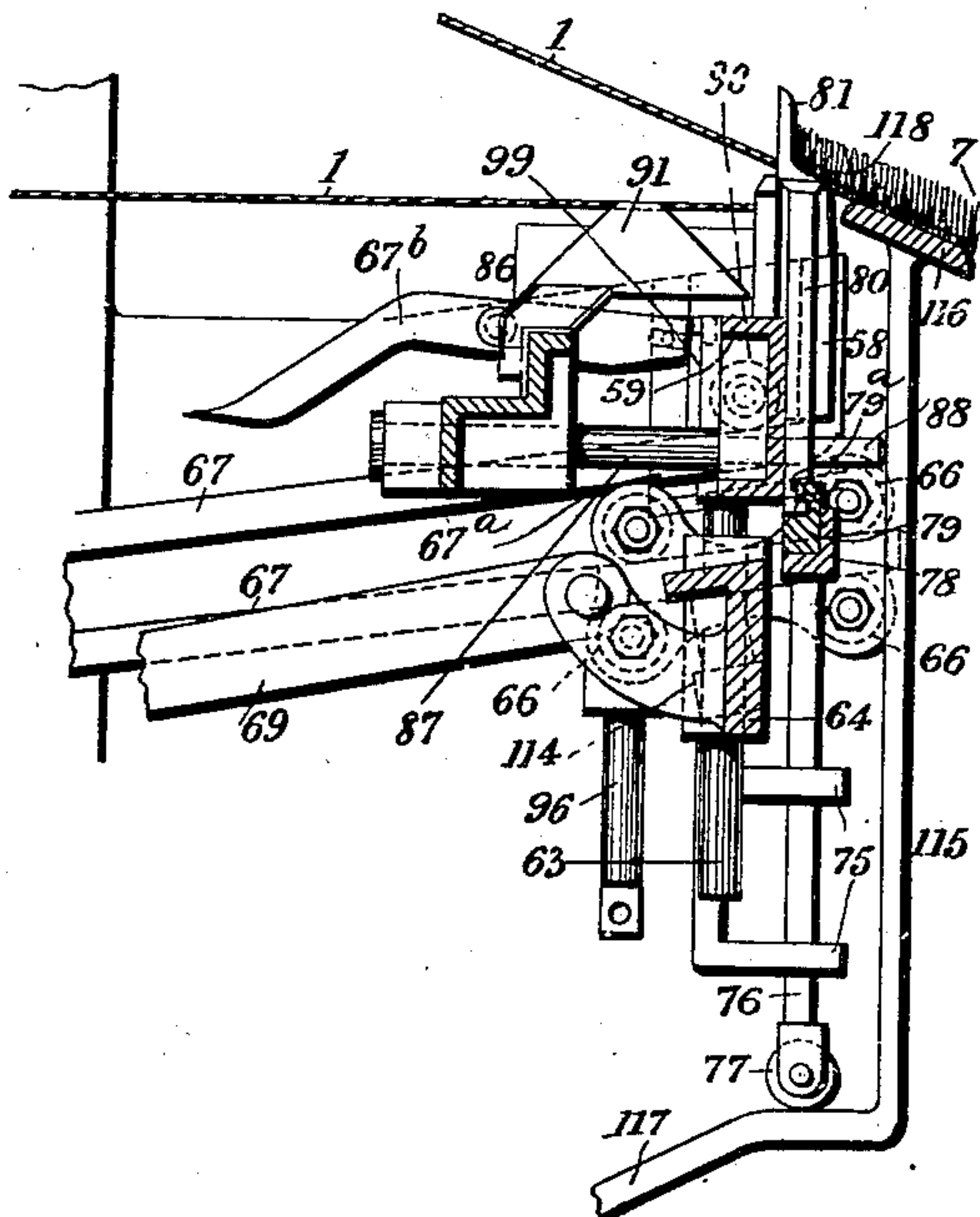


Fig. 14.



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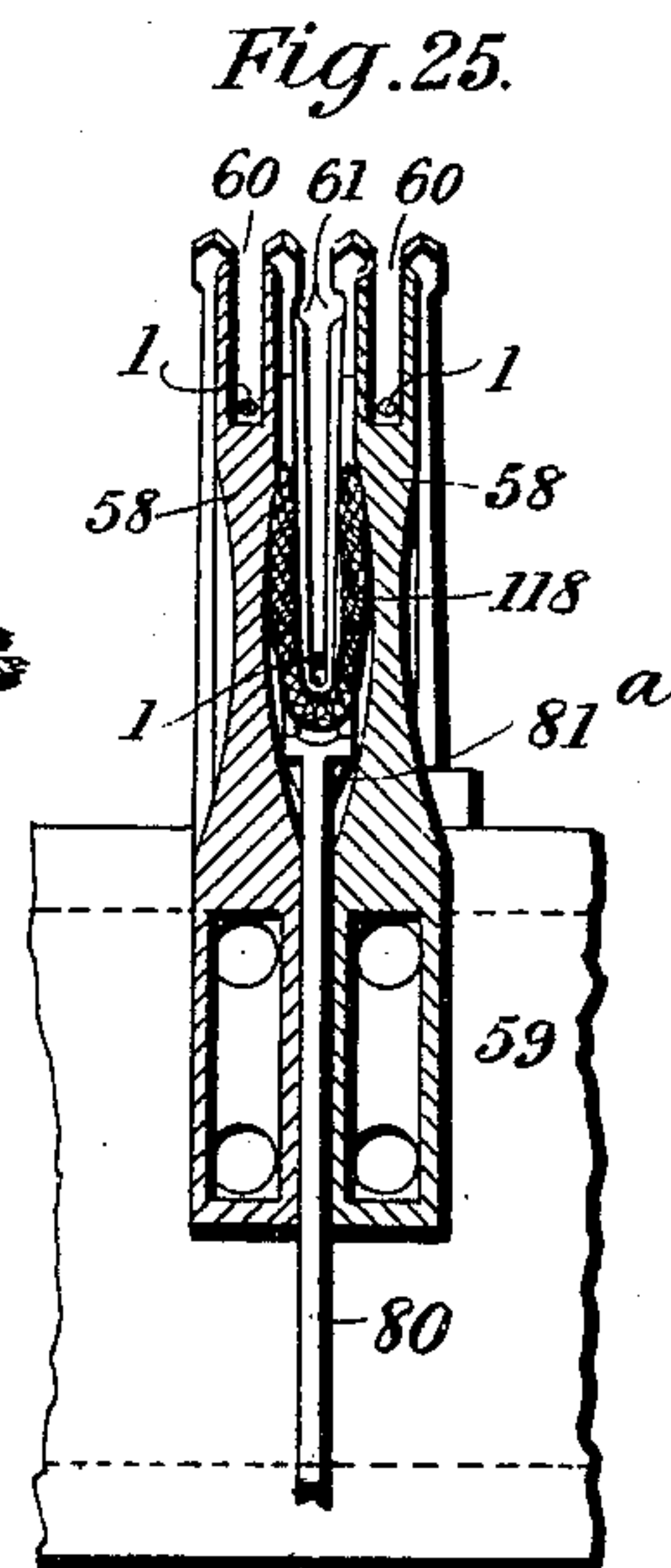
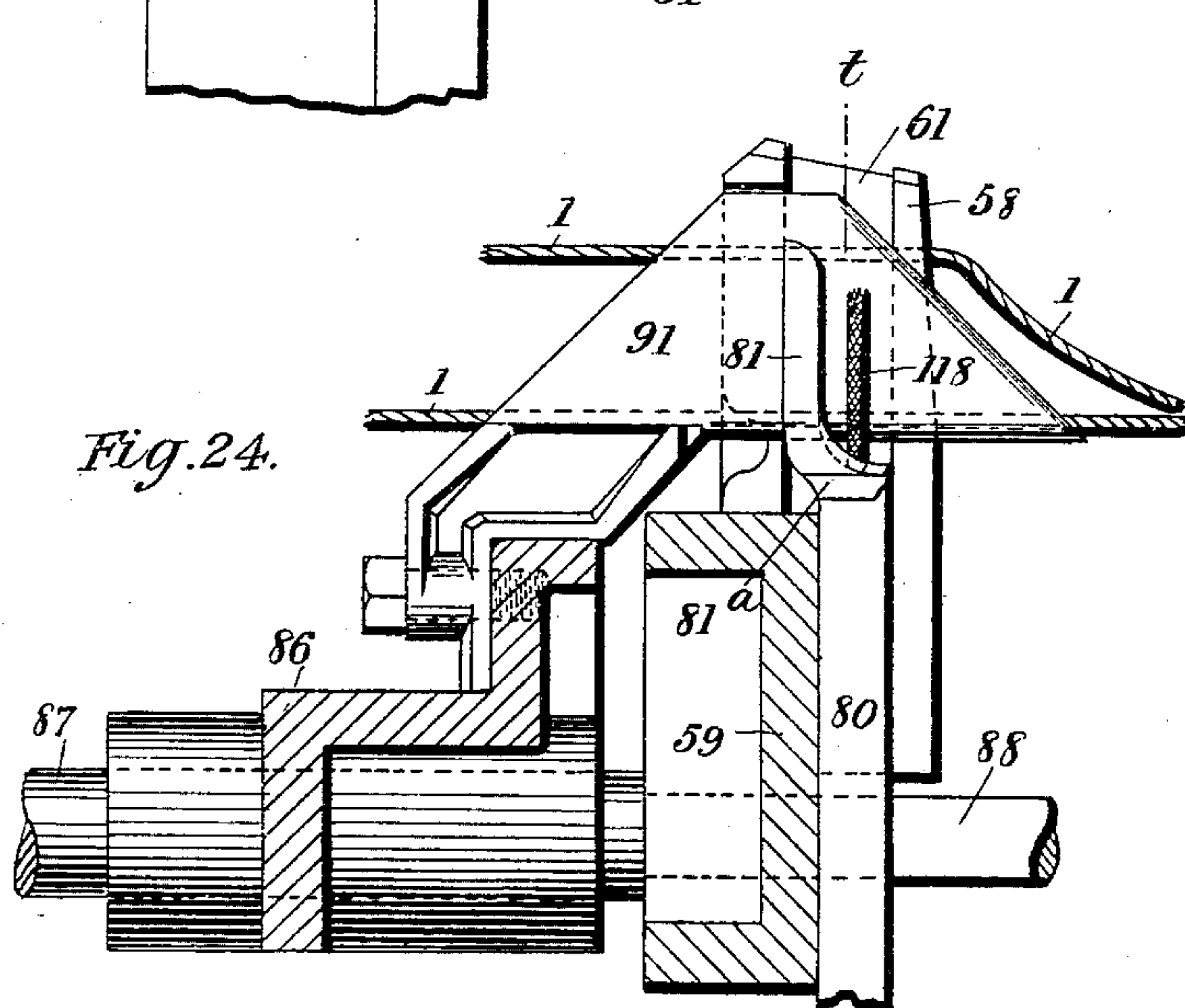
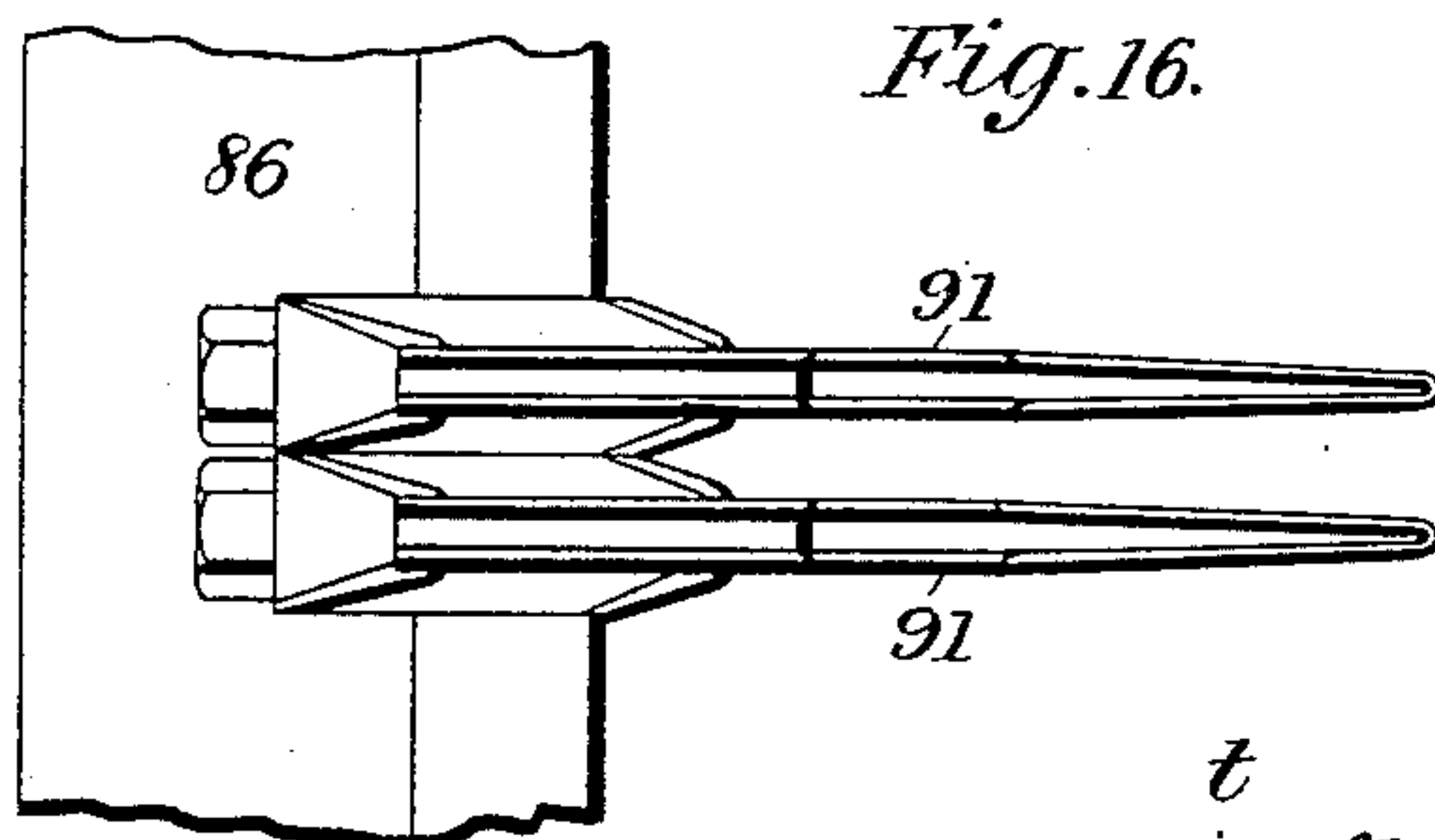
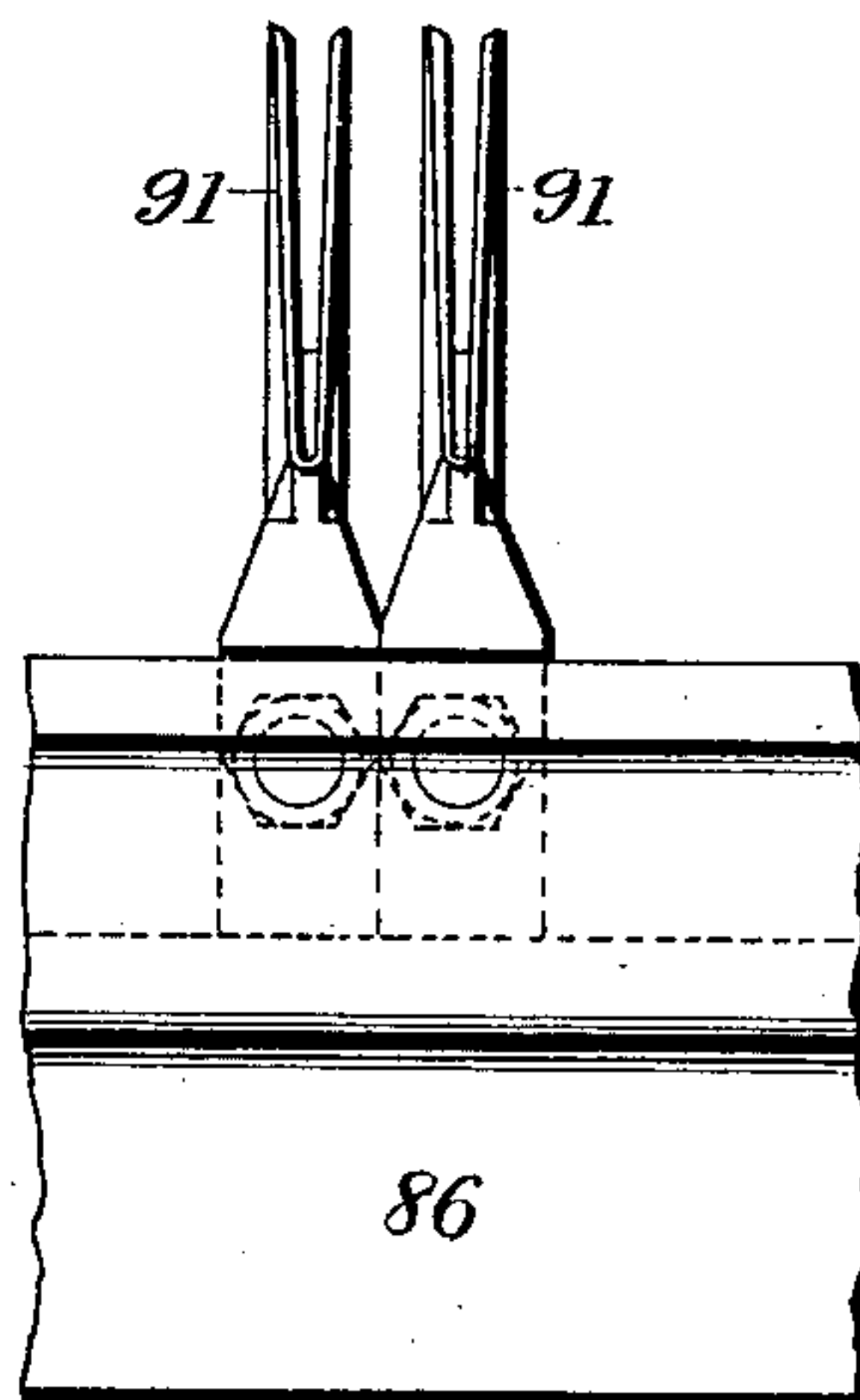
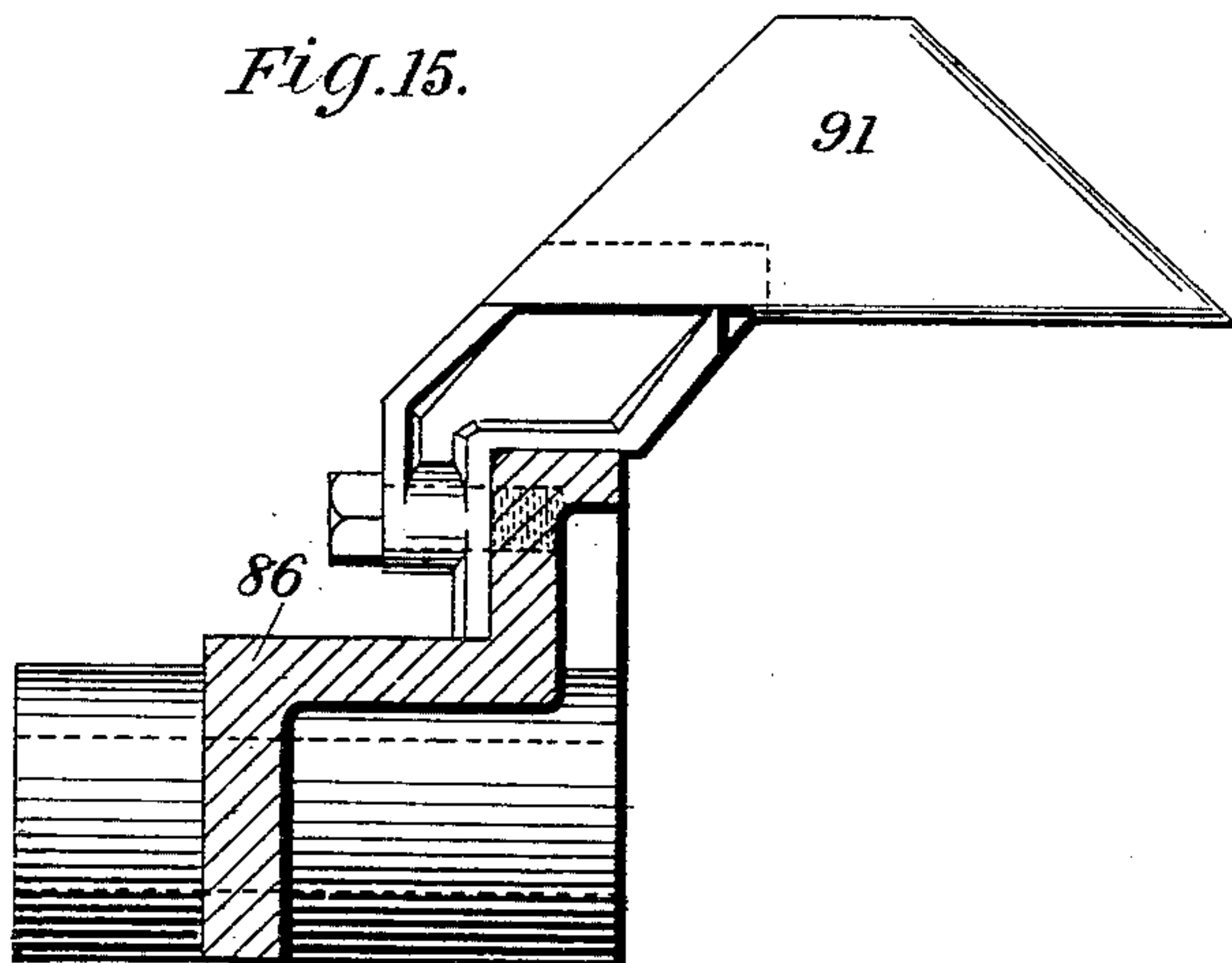
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Fig. 17.



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Fig. 18.

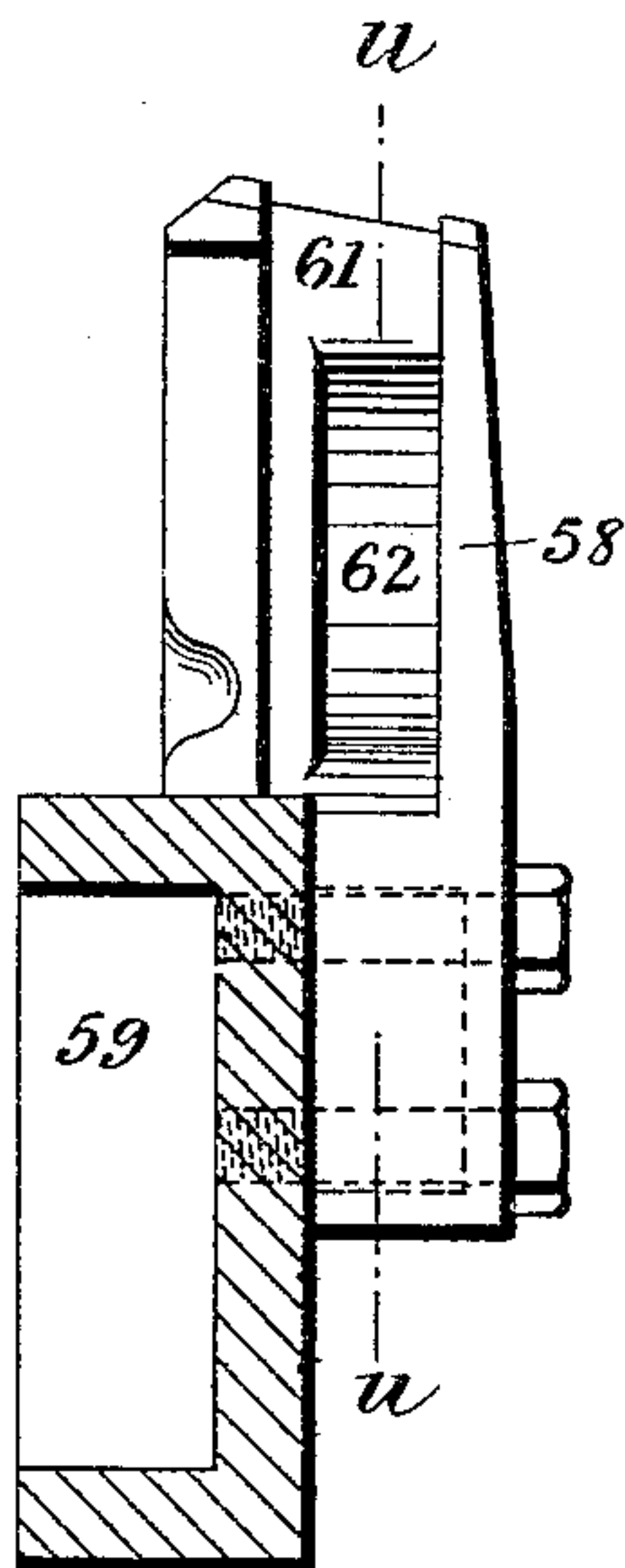


Fig. 20.

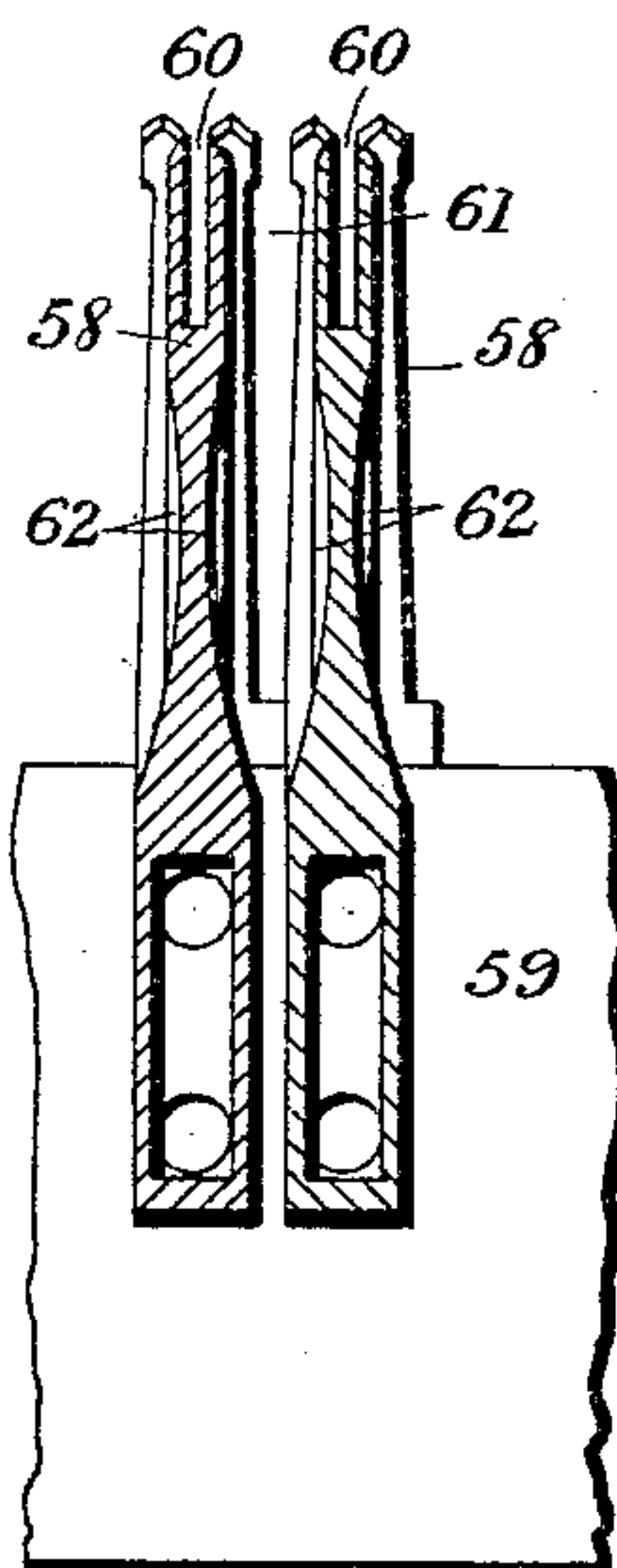


Fig. 21. Fig. 22.

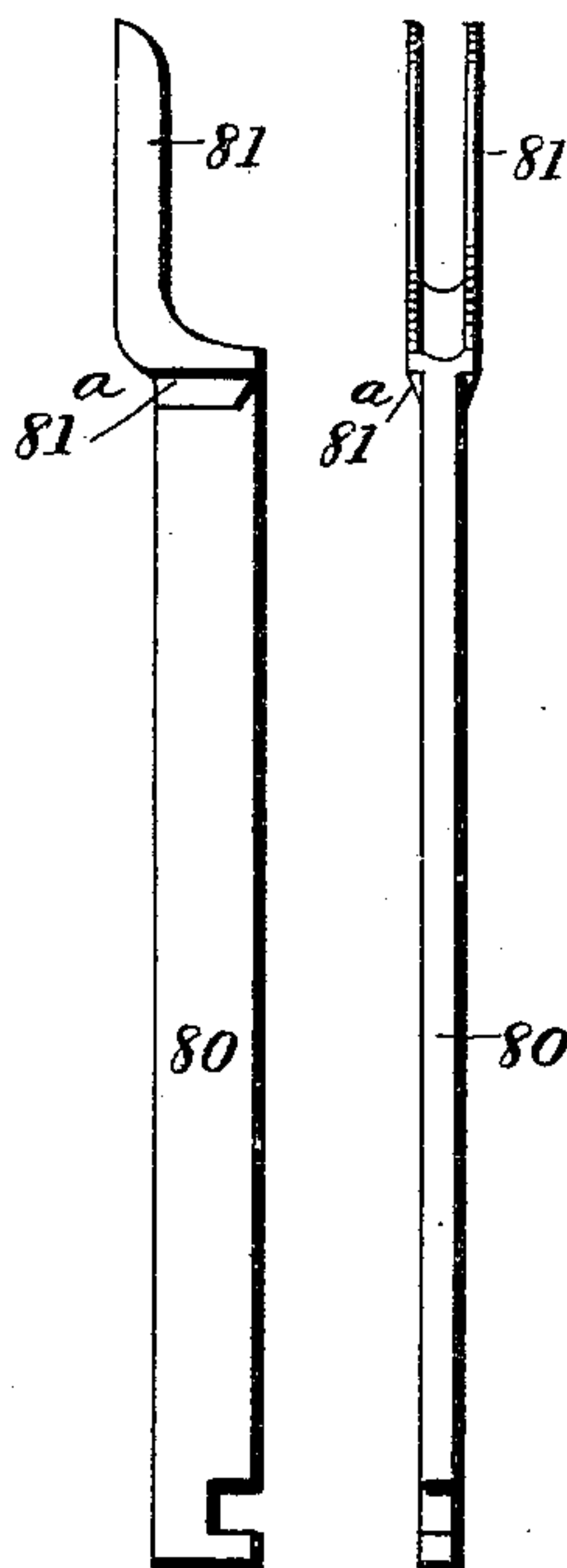


Fig. 19.

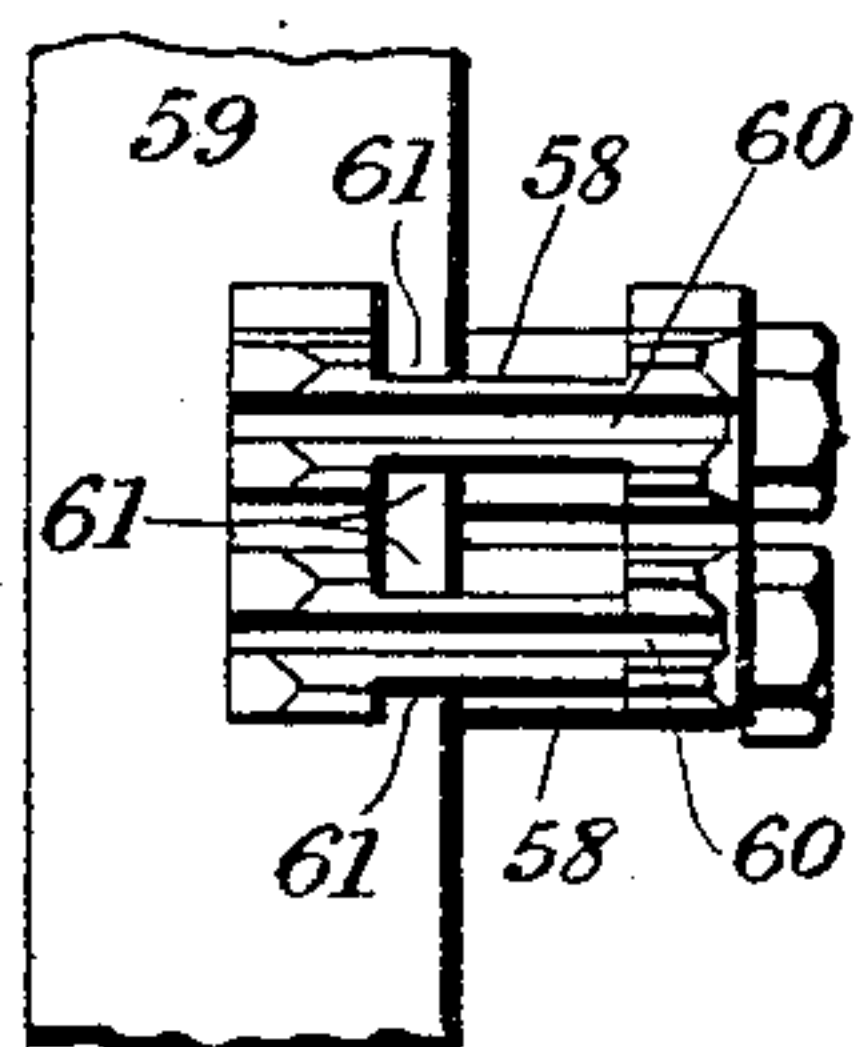
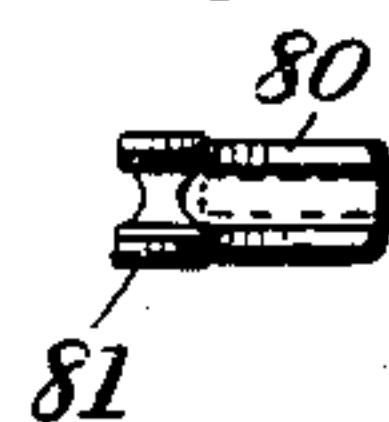


Fig. 23.



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Fig. 26.

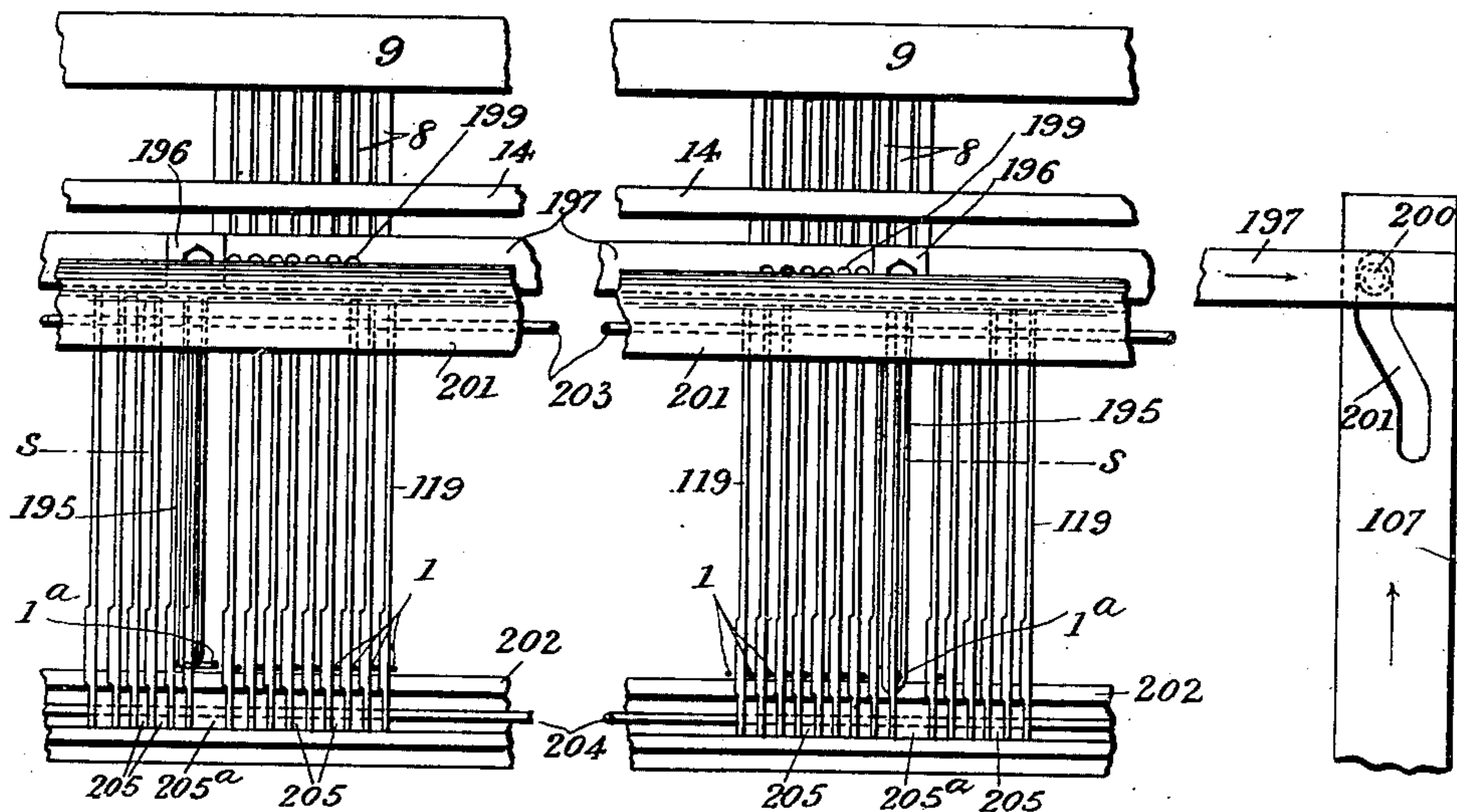
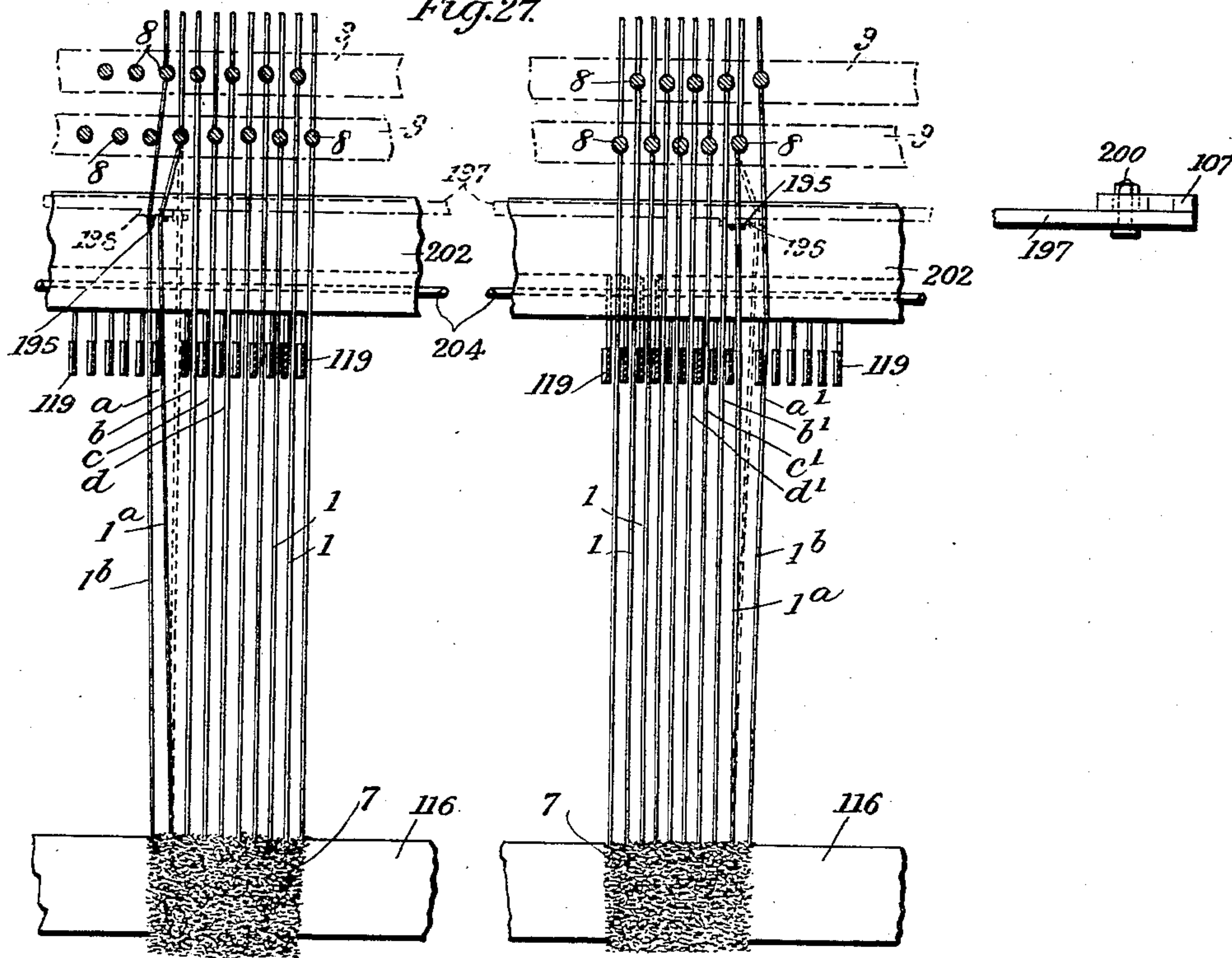


Fig. 27.



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UNITED STATES PATENT OFFICE.

KENNEDY WALKER, OF LONDON, ENGLAND, ASSIGNOR TO THE WILLIAM GOODACRE & SONS, LIMITED, OF SAME PLACE.

MACHINE FOR WEAVING COIR-YARN MATS.

SPECIFICATION forming part of Letters Patent No. 630,954, dated August 15, 1899.

Application filed November 15, 1898. Serial No. 696,564. (No model.)

To all whom it may concern:

Be it known that I, KENNEDY WALKER, a subject of the Queen of Great Britain, residing at London, England, have invented a certain new and useful Improvement in Machines for Weaving Coir-Yarn Mats and Similar Fabrics, of which the following is a specification.

My invention relates to a certain improvement in machines or looms for weaving coir-yarn mats and similar fabrics and may be described as an improvement on or development of the inventions described in the specifications of United States Letters Patent No. 550,174, of November 19, 1895, and No. 612,519, of October 18, 1898.

According to the present invention I modify several of the parts of the machine constructed under the Letters Patent above named for the purpose of obtaining a quicker-running machine and a machine which will produce a more perfect fabric than hitherto has been possible.

In the accompanying drawings are shown my improvements applied to such a loom, sufficient of the other parts of the loom being shown to make my invention clear.

In the drawings, Figure 1 is a longitudinal section on line *vv*, Fig. 3. Fig. 2 is a section on line *ww*, Fig. 3. Fig. 3 is a front elevation with the beater omitted. Fig. 4 is a right-hand side elevation to show principally the dividing apparatus, many other parts being omitted. Fig. 5 is a section, looking also from the right hand, taken on line *xx*, Fig. 3, to show the stop mechanism, other parts being omitted, and a weight forming part of such mechanism, and which is hereinafter described, removed. Fig. 6 is a section on line *yy*, Fig. 5. Fig. 6^a is a similar view showing the parts in another position. Fig. 7 is a front elevation of the plunger mechanism on an enlarged scale. Fig. 7^a is a section on line *zz*, Fig. 8. Fig. 8 is a plan of Fig. 7, showing the parts in one position. Fig. 9 is a plan showing the parts in the opposite position. Fig. 10 is a section, on an enlarged scale, through a part of the loom to show the thrum-box and its guides. Fig. 11 is a plan of a portion of same. Fig. 12 is a similar section with the parts in a different position. Figs. 13 and 14 are further sections to show the

parts in other positions. Fig. 15 is a detail view, on a still larger scale, to show one of the dividers forming part of the thrum mechanism. Fig. 16 is a plan showing two of said dividers. Fig. 17 is a front view of same. Fig. 18 is a detail view of one of the fingers forming part of the thrum mechanism. Fig. 19 is a plan showing two of said fingers. Fig. 20 is a section of two of the fingers on line *uu*, Fig. 18. Fig. 21 is a detail showing one of the delivery-bars forming part of the thrum mechanism. Fig. 22 is a front elevation of same. Fig. 23 is a plan of Fig. 21. Fig. 24 is a detail showing a divider, a finger, and a delivery-bar in one of their positions. Fig. 25 is a section of same on line *tt*, Fig. 24. Fig. 26 is a front elevation, on an enlarged scale, of a part of the beater and healds, together with an appliance for moving the outside warp-threads of the mat being formed. Fig. 27 is a plan of same on line *ss*, Fig. 26. Fig. 28 is a side elevation showing a portion of the front of the loom and the mat-rolling-up device. Fig. 29 is a front elevation of the latter.

In the loom constructed according to my invention the warps 1 are carried between a pair of rollers 2 2, one of these rollers carrying a spur-wheel 5, gearing with pinion 4 on a stud 3, carrying a brake wheel or disk 193, for the purpose hereinafter explained. The warp is drawn down through the rollers by the operation of the mat-drawing-off device hereinafter described and passes under an idle roller 6, placed in such a position that a line drawn from the last shot weft to the under surface of the roller would pass through the center of the space through which the warps travel, so that they are taut when up and down and slacken as they approach the center. This arrangement is shown in Fig. 1, the imaginary line being drawn between the roller and the mat 7. For the purpose of making the shed the two rows of heald-rods 8 are carried by bars 9 9, each of which is suspended by two links 10 10, attached to one end of cranks 11 11, those at one side being pivoted to the inner frame 12 of the loom and those at the other side of the loom being pivoted to a bracket 11^a of said frame. The opposite ends of the cranks are connected by a

bar 13. The healds are suitably guided by passing through a bar 14, and each bar 9 has attached to it at one end connecting-rods 15, Figs. 2 and 3, connected to levers 16 16, pivoted on a shaft 16^b, carried between the inner frame 12 and outer frame 151, Figs. 2 and 3, and carrying rollers 16^a 16^a, which work in cam-grooves 17 17^a, Fig. 2, arranged on opposite sides of a disk 18, mounted on a shaft 19, which is driven by a spur-wheel 20 from a pinion 21 on a main shaft 22. The upward and downward movements of the rods 15 thus produced positively operate the healds in both directions by alternately raising and lowering the bars 9 9 and alternately raising and lowering the two rows of healds. The thrums or U-shaped tufts of coir-yarn which are inserted into the fabric and which go to form the pile of the mat are cut off in lengths from the yarns 23, which are drawn or fed forward by means of a clip or gripping device 24, which is termed the "back" clip, such clip being mounted on a plate 25, carrying what is termed an "inner" tube 26, sliding in an outer tube 27. The two tubes are connected by levers 28, pivoted to a common stud and are operated by a crank 29 on a shaft 30 through a suitable connecting-rod. The clip 24 is raised and lowered at suitable intervals by an arm 31 on a shaft 32, and the feeding movement consists in causing the clip to be lowered to grip the yarns and the two tubes 26 27 to move forward together to draw off the yarns, the forward tubes 27 stopping after a short movement, while the back or inner tubes 26 continue their movement, so as to project a short length of yarn out of the forward end of each tube 27 and bring it under a suitably-operated front clip 33, which holds the end while a length is cut off by a reciprocating knife 34, after which the lengths so cut off are forced down tubes 35^b by plungers 35 in a doubled or U-shaped form, such plungers having a partial rotation given to them, so as to bring the loops so formed at right angles to the warp-threads between which they are about to be inserted.

All the above mechanism has been previously described in Specification No. 612,519, and the means for giving the partial rotation to the plungers in Specification No. 550,174. In this latter specification the means employed for giving this rotation consisted of an arrangement of spiral grooves on the plungers, which in conjunction with other parts caused the same to rotate, and instead of this I prefer to operate the plungers more positively, and to this end I employ the arrangement shown best in Figs. 7 to 9, where the top of each plunger 35, after passing through and being guided by a bar 35^a, has fixed to it a lever 36, carrying at its other end a pin which works freely in a hole in a transverse bar 37. The bar 37 is hung and connected to a bar 38 by pivot-pins 39, which work in slots 38^a 38^a in same. Said bar is held by and is capable of a transverse slid-

ing movement in straps or guides 40 40, attached to a bar 41, which is superposed on the heads or ends of the plungers, and the bars 41 and 35^a are carried by and attached to a bar 42, which can rise and fall in slots 43, Fig. 1, in the frame 12. The frame 12 has guides 44 44, forming concentric paths, secured inside of same and against these bear rollers 45 45. The bar 41 is reciprocated by means of connecting-rods 46 46^a, the former being attached to a lever 47, rocking on a shaft 48, Figs. 2 and 3, and carrying a roller which is operated by an eccentric groove in a disk, the parts being the same as on the other side, where it will be seen that connecting-rod 46^a is attached to a lever 47^a, pivoted on the shaft 48 on the opposite side of the inner frame 12, the lever carrying a roller 47^b, (shown in dotted lines in Fig. 3,) which is operated on by a cam-groove in a disk 49 on shaft 22. It will be seen that the reciprocating motion thus imparted will raise and lower the frame carrying the plungers and that as they (the former) move past the fixed guides 44 a transverse reciprocating motion will be imparted to the bar 37 through the rollers 45 and bar 38, so that the bar 37 will be moved from the position shown in Fig. 8 to that shown in Fig. 9, with the result that the plungers are positively and simultaneously turned.

In order to draw the thrum or pile yarns 23 more slowly from the bobbins, so that less strain is put on the loom, whereby it may run quicker than heretofore, I arrange at the rear end two transverse bars 50 51, having a hole for each of the yarns, forming a guide for same, such bars being carried by uprights 50^a 51^a. Between these bars there bears upon the yarns a transverse roller 52, carried by levers 53, pivoted to brackets 54 on either side of the inner frame 12. The levers are connected by a cross-bar 55, to which is attached a connecting-rod 56, which passes between the yarns 23 and is operated by an eccentric 57 from the shaft 22, the timing being such that when the feeding-tubes 26 27 are at work the eccentric has the roller 52 raised at its highest point and out of the way of the yarns, but as the tubes come to rest the roller is pressed down between the two guides 50 51, and thus draws off the thrum-yarns ready for the next feeding movement of the tubes, which thus draw from a slack body of yarn instead of direct from the bobbins. After these lengths of yarn or thrums are cut off and forced down the tubes 35^b by the plungers it is necessary that they should be carried forward and placed on the warp-threads 1, and to this end I employ instead of the arrangement of parts described in the prior specification, No. 550,174, before referred to, the arrangement shown in Figs. 1 and 2, but on an enlarged scale in Figs. 10 to 25. This consists of a number of fingers 58. Each of these is preferably formed as a separate part and is bolted to a transverse bar 59. Each finger has a slot 60 in its upper end and

grooved sides 61, which are hollowed out slightly, as at 62, Figs. 18 and 20. The bar 59 carries near each end guide-rods 63, which pass through and are guided by a bar 64 beneath the bar 59. At each end of the bar 64 is a head or plate 65, carrying four rollers 66, the two upper ones being arranged to travel between guide-bars 67 67, and the two lower ones to work against the under side of the lower bar 67 to assist in holding the bar 64 in place. The bar further carries lugs 68, to which is pivoted a connecting-rod 69, attached to a lever 70, Figs. 1 and 3, pivoted at 71 in a bracket 70^a, such lever having a roller 72, which works in an eccentric groove 73 of a disk 74 on the shaft 22. The rod 69 is loosely hung in the lugs 68, so that the bar 64 may be able to take a movement laterally. The bar 64 also carries guides 75 75 at either end, through which pass rods 76, there being one at each end of the bar or side of the machine. Each rod terminates in a roller 77 and supports a transverse bar 78, which carries in turn a bar 79, having a hook 79^a, which engages with the notches in the ends of a series of delivery-rods 80, Figs. 21, 22, and 23. These rods have forked heads 81, adapted to seat in the grooves 61 between each two fingers 58, the shoulder 81^a of the bar resting on the bottoms of said grooves, as seen best in Figs. 24 and 25. The grooves act as a guide for the rod as well as for holding the thrums, which latter purpose is hereinafter explained.

Between the frame 12 and having its bearings in same is a shaft 82, having a lever 83 outside of the frame on both sides and levers 84 (one of which only is seen in Figs. 10, 11, and 12) inside the frame on both sides. The levers 84 carry rollers 85, adapted to bear against a transverse bar 86, carried by and slidable on pins 87, having suitable heads to form stops and attached to the bar 59. The bar 86 carries pins 88, one only of which is seen, which passes freely through the bar 58 and projects in front of same.

The shaft 82 is operated from one side of the machine, as shown in Fig. 2, from an arm 83^a, forming a crank with one of the levers 83, and to this is attached a connecting-rod 83^b, pivoted to a connecting-rod 83^c, pivoted in turn on shaft 48. The lever 83^c carries a roller 83^d, which works in an eccentric groove or cam 83^e of a disk 83^f on shaft 22.

The bar 59 has lugs 89 at each end, which carry rollers 90, which slide on the upper side of the upper guide 67. Mounted on and bolted to the bar 86 are a series of dividers 91, which consist of metal fingers of U shape in section, their greatest depth being somewhat less than the depth of the groove 61 of the fingers 58, into which they are adapted to enter and from which depth they taper off forward into a point and preferably, as shown, rearwardly also.

The levers 83, of which there is one at each end of shaft 82, are also attached to connecting-rods 92, Figs. 1, 2, 10, 11, 12, and 13, which

pass to one end of crank-levers 93, pivoted at 94, the other end of said levers being attached to connecting-rods 95, which are pivoted to and support rods 96, which in turn carry heads 67^a, forming in one of their positions, such as that shown in Fig. 10, a continuation or portion of the upper guide or track 67, which I term the "trap." This part 67^a is out of line with rod 96, as seen in Fig. 11, and in order to guide the latter it is provided with a head 98, which works in a groove 99 of an inclosing piece 100, attached outside of the frame 12. (See Fig. 2.)

Pivoted inside of the frame on each side at points 101 are two switch tracks or guides 67^b, one end of which is adapted to lie closely on the top of the upper track 67, while the other is provided with a pivoted latch, the head 102 of which engages with a notch in the side of the head 98 and serves to hold the track or guide 67^b in position when a weight is upon it until the trap 67^a is lowered, as hereinafter described. The latch has a part 102^a corresponding to the head 102, but reversely arranged, and the two are connected by a part 102^b, the whole sliding in a groove 102^c in the frame. The head 67^a is notched both on the upper and under sides to receive the hooked ends of the latch. The upper guide or track 67 extends only to a point where it will abut against the trap 67^a when the latter is in its lowest position, but the lower guide 67 extends some distance beneath and in front of the upper guide. Beneath the lower guide and pivoted on a stud 103 to a bracket 104 is a channel or guide 105, Figs. 1, 5, 6, 10, 11, and 12, rocked by a rod 106 through a vertical reciprocating rod 107, which is guided in eyes 108, as shown in Figs. 5 and 6. The bar 107 has an eccentric slot 109 therein, with which engages a pin 110, carried by a bar 106, so that the latter will be reciprocated by a vertical movement of the rod 107, which movement is effected from a lever 111, pivoted outside frame 12 and connected to the strap of the eccentric 112 on shaft 19.

The transverse bar 64 carries a stud 113 beneath same, having a roller 114, (shown in dotted lines in Figs. 10 to 14,) which is adapted to enter the channel or guide 105.

At the front of the loom are two fixed uprights 115, Figs. 1 and 14, carrying a sloping table 116, on which the mat rests as it is being formed, and at the lower ends two sloping fixed guides 117, against which the rollers 77 of rods 75 are adapted to strike.

The operation is as follows: The plungers 35 force the cut-off thrums 118 through tubes 35^b into the grooves 61 between the fingers 58, where they seat on the upper side of the shoulders 81^a of heads 81 of the rods 80, the parts being in the position shown in Fig. 10. The plungers next begin to retire and the rotation of the shaft 82 through the levers 84 forces forward bar 86, thus thrusting the dividers 91 between the fingers 58 and the forked ends of the rods 80 until these particular parts

are in the position shown in Fig. 24, so that the thrum 118 is held securely in place and is also kept open. The levers 83, also through rods 92, cranks 93, and connected parts, raise the track-pieces 67^a, which thus raise and latch the switches 67^b, bringing all the parts into the position shown in Fig. 12. The rod 69 now begins to move bar 64 forward between the guides 67 and the roller 114 engages the lateral motion guide or channel 105, which moves same to give the fingers the position desired. This is effected by moving the channel 105 into the dotted position, Fig. 11, on the right hand of the central position, so that the roller 114 is caused to move to one side, thus drawing the rollers 66 and 90 farther out on the guides 67, which are made wide enough for the purpose, and shifting the bars 64, 59, and 86 laterally, so that at the end of the forward movement they are in such a position that the thrums carried thereby are placed on the warps which have previously been the idle warps. As the parts move up such guides 67 the roller 90 of the bar 59 travels on the upper side of the upper track 67 until it meets the switch 67^b, when the bar 86, together with bar 59, rises up on same until the parts are brought into the position shown in Fig. 13, where it will be seen that a slight separation of the bars 86 and 59 has taken place by reason of the upward movement of bar 59, so that the dividers 91 have commenced to leave the fingers 58. The grooves 60 of the fingers have also raised and separated the idle warps, the amount of slack in same due to the position of the healds at this point enabling this to be done. The movement has also lifted the delivery-bars 80 by means of their heads, which are held in the fingers 58. The further forward movement of the parts results in the rollers 90 arriving over the trap 67^a, at which moment the rollers 77 are on the top of the inclines 117 and the delivery-bars 80 are held up, the thrums being then around each alternate warp 1, the forked ends 81 embracing the warp and separating them from the idle warp on either side. Previously to this operation, however, the pins 88, carried by bar 86, have come into contact with the uprights 115, and thus the bar 86 and dividers 91 have been forcibly driven back to clear the fingers, so that they may fall and leave the delivery-rods. Almost simultaneously with these two operations the connecting-rod 92 is operated to draw down the trap 67^a through crank 93 and connected parts, and the bar 86 consequently falls with it until the part or trap 67^a is level with the upper track 67. The trap in its fall strikes the end 102^a of the latch, and thus opens the switch 67^b, so that the parts are then all in the position shown in Fig. 14, the fingers 58 having dropped also and lowered the idle warps, while the healds have raised the other warps on which the thrums have been put and formed the shed for the weft. As soon as the backward movement begins the deliv-

ery-rods drop, leaving the thrums on the warps, and the parts move backward down the tracks or guides 67 67, the bar 86 maintaining its distance from the bar 59, so that all the parts move back into the position shown in Fig. 10, the guide 105 being for the next forward movement shifted to the opposite position, so that the rollers are forced farther in on guides 67, and the parts will travel forward in a different line at the next feeding movement.

It will be understood that the healds separate the warps in the usual way to form a shed, and that between each delivery of the thrums there is a shot of weft put in by a suitable picking mechanism, which forms no part of my present invention, and that the fabric is also beaten up by the reeds 119, Fig. 1.

In place of the arrangement for operating the front clip, which is described in the specification of Letters Patent No. 612,519, I employ the arrangement best shown in Figs. 3, 5, 6, and 6^a. In this the clip 33 is hung on a fixed transverse bar 120 by means of cranks 121, which are pivoted at 121^a, and are connected to them by links 121^b. Only one of these cranks is shown in Figs. 6 and 6^a; but the arrangement is the same at the other end. The upper ends of the cranks 121 are pivoted to a transverse bar 123, one end of which projects outside the frame 12 and is connected loosely to a lever 124, pivoted to one end of a shaft 125, carried in bearings 125^a on the outside of the frame 12. The other end is suitably guided. Also connected to the bar 123 on the other side is the inner end of a crank 126, the outer end of which is notched, as indicated in Fig. 6, and is adapted to be caught by the hooked end of a connecting-rod 127. The crank is pivoted at 126^a to the frame 12. A spring 128 tends to draw the outer end of the lever 126 upward and thus keep the clip raised. The outer end of the lever 126 has a downwardly-projecting extension 126^b, against which the hooked end of rod 127 may rub when it is out of engagement. The other end of shaft 125 carries a hook 129, adapted to engage at intervals with an arm 130 on the shaft 32, which operates the back clip.

The rod 127 is connected to a lever 131, having a roller 132, pivoted on shaft 48, such roller engaging with an eccentric groove or cam of a disk 133, mounted on shaft 22. The up-and-down motion imparted to rod 127 draws down crank 126, the spring attached to the latter assisting it to rise, and it thus reciprocates bar 123 and front clip 33, the bar 123 in turn, through lever 124, rocking shaft 125 and hook 129.

For the purpose of stopping the operation of the clips both from front and back, so that the thrum-yarns are not drawn off when the mat has been finished or it is otherwise desired to throw the thrum feeding and spinning mechanism out of gear, I connect to the rod 127 a rod 131, Figs. 3 and 5, and to the other end of the rod 131 I pivot one end of a

handled lever 132, which can rock on a shaft 133. The rod 127 is connected to rod 131 by means of a pin, which can move in a slot 131^b of rod 131. The rods 131 and 127 are further
 5 connected by a spring 131^a, the effect of which is to draw the rod 127 to the forward end of slot 131^b. The extreme forward end of the rod 131 is notched, and with the notch engages a latch 134, the purpose of which will be here-
 10 after explained. After lifting this latch the handle may be drawn forward and the rods 131 and 127 forced backward, thus disengaging the hooked end of rod 127 from the lever 126, which is thus drawn up by spring 128, so
 15 that the front clip remains raised, while the hook 129 is also held in its forward position, and consequently will prevent the arm 130 on shaft 132 from rising, so that the back clip, which is raised by a spring, (as described
 20 in the specification of Letters Patent No. 612,519 referred to and the operation of which does not form part of the present invention,) is held down. In this way the clips are both prevented from straining against each other
 25 and the feeding is stopped, as the back clip, though it has the yarn gripped with the right length projecting through the tubes, simply moves backward and forward and does not draw off any yarn, and there being no resist-
 30 ance at said back clip the roller 52, though it continues to operate, is unable to draw off any yarn.

For the purpose of measuring the mats as they are made and automatically stopping the
 35 feeding of the thrums I employ the following arrangement: In the front of the machine between the pairs of drawing-off rollers 135 136 137 138 and at one end of same is a slotted rod 140, Fig. 3, which is attached to a slotted rod
 40 141, pivoted to a lug 142 inside one of the frames 12, the two rods being so secured together as by a nut and bolt or otherwise that the rod 140 may be readily removed laterally to be adjusted to the width of the mat being made.
 45 The rod 140 carries a projection 143, which is adapted to be struck by a finger 144, carried by the mat, which is shown in dotted lines 145 in Fig. 3. This finger consists of a piece of metal which is inserted between the
 50 warp-threads at the beginning of each mat. The rod 140 is also adjustably attached to a transverse slotted lever 146, pivoted at 147 to the opposite side of the frame 12 and capable of rocking on said point 147 and being formed
 55 with an extension 146^a, carrying an adjustable balance-weight 148, which tends to keep the opposite end of lever 146 raised. To the part 146^a of lever 146 is pivotally hung a link 149, pivoted to the free end of latch 134, which
 60 is pivoted in turn to lug 150 on the inside of the outer frame 151. It will be seen that as the mat travels down between the rollers 135 to 138 the finger 144 will strike projection 143 and draw down lever 146, lifting the end
 65 146^a and raising the latch 134, with the result that the spring 131^a will draw back the rod 131 and force the hooked end of rod 127

off the lever 126, and the clip will thus be kept raised. The parts are restored by the
 handled lever 132, by which the rod 131 is
 70 moved forward and through the spring 131^a draws forward rod 127, so that the hooked end of rod 127 is drawn against the extension 126^b of the crank 126, and as such rod is al-
 ways reciprocating vertically it will engage
 75 the crank 126 and begin to operate it again. The catch 134 is restored by the weight 148, which also puts the lever 146 back again into the same position for the next mat. The ob-
 80 ject of the slot 131^b in the rod 131 is to allow rod 131 to be drawn forward to engage with the catch irrespective of whether the rod 127, to which it is attached, is at the top or the bottom of its stroke.

It is desirable when a mat is finished and a
 85 division is required between it and the next mat to draw it down quickly, together with the warp-threads which constitute said division, and for this purpose I secure to the lower
 rear drawing-off roller 138 a sleeve 152, Fig. 90
 3, movable with it and surrounding the shaft 133, which merely forms a support for the sleeve and is not attached to the roller. The sleeve 152 carries an arm 153 and spring-
 95 pressed pawl 154, Figs. 4 and 5, which bears against a ratchet-wheel 155, Figs. 3 and 5, se-
 cured on shaft 133. The shaft 133 turns in bearings on frame 151 and terminates in a worm-wheel 156, operated by a worm 157 on
 a shaft 158, suitably supported in bearings
 100 outside the frame 151. At the other end of shaft 158 is a bevel-wheel 159, gearing with a similar wheel 160 on a shaft 161, carried in a bracket 162, projecting at right angles to the
 105 frame. The shaft 161 carries a sprocket-wheel 163. The sleeve 152 carries a sprocket-wheel 164, which is driven, by means of a chain, from a sprocket-wheel 164^a on the shaft
 of the upper front roller 135, so that as the
 110 latter is driven by the drawing through of the mat the roller 137 is also driven. The back rollers 136 138 are also provided with sprocket-
 wheels 164^b 164^c, connected by a chain, and the roller 138 is normally driven by spur-
 115 wheel 207, Fig. 2, on the opposite side to ratchet-wheel 155 through a wheel 208, car-
 ried in a curved slot 209 in a bracket attached to frame 12. The slot corresponds to the cen-
 120 ter of wheel 207. The wheel 208 is driven by a change-wheel 210, carried on a stud 211 in a suitable bracket, Fig. 5, of the frame, and
 such stud extends through inside the frame, Fig. 3, and carries a ratchet-wheel 212, driven
 125 by a pawl 213, hung on an arm 214, pivoted on stud 211. By substituting other wheels for wheel 210 a change in speed is effected.
 Connected to arm 214 is a rod 215, operated
 by an eccentric 216 on shaft 22, the recipro-
 130 cation of the rod 215 giving, through the ratchet and pawl, an intermittent movement to the parts. On the shaft 161 is pivotally
 hung a lever 166, the upper end of which forms a bearing for the spindle 168 of a pul-
 ley 167, the other end of the spindle 168 be-

ing carried on an arm 169, capable of rocking on the shaft 161. The spindle 168 carries a sprocket-wheel 163^a, which is connected by a chain with the wheel 163. The lower end of lever 166 is attached to an adjustable connecting-rod 170, connected to a crank 171, the opposite end of which carries a weight 172. The crank is pivoted on a shaft 174, supported in bearings between the inner and outer frames, Fig. 3, the inner end of such shaft 174 having an arm 173, secured to it, connected to a rod 176, attached to a pivoted foot-lever 177 in the front of the machine.

Supported in the frames 12 and passing also through the right-hand side frame 151 is the driving-shaft 178, carrying fast and loose pulleys 179 180, the former being driven by belt 181. Supported on a stud in a bracket 182, attached to the frame 151, is an idle pulley 183, which is located inside the belt 181. The shaft 178 carries a pinion 184, which drives a spur-wheel 185 on shaft 22, which shaft carries the pinion 21, Fig. 1, which gears with spur-wheel 20 on shaft 19. The upper end of the lever 166 carries a cord 187, which passes over pulleys 188 188 188, hung in brackets on some fixed point, as the ceiling, and in a bracket on frame 151, respectively. The other end of the cord is attached to a counterweighted lever 189, having a cranked end 190 and pivoted at 191 to frame 12. The end of the cranked portion carries a brake-shoe 192, which bears against the rim of a disk 193 on stud 3. The operation is as follows: The roller 138 is driven intermittently, as described, and through the sprocket-wheels (and chains) 164^c and 164^b the upper roller 136 is driven, the friction of the mat passing through, driving in turn roller 135, the sprocket-wheel 164^a of which, through the chain, drives the sprocket-wheel 164 of roller 137. The motion thus transmitted to roller 138 rotates the sleeve 152, the pawl carried by which travels around the ratchet-wheel 155 without operating same. As soon, however, as it is desired to pull off the mat directly and quickly the foot-lever 177 is pressed down, (after stopping the thrum-feeding mechanism,) thus rocking lever 166 on shaft 161, pulling cord 187, raising lever 189, and so removing the brake 192 from disk 193. The brake is otherwise normally on to give the necessary drag to the warps passing between rollers 2 2. The warps are by this means enabled to be drawn through freely. The continued movement of lever 166 brings pulley 167 against belt 181 and presses it against the loose pulley 183, (which acts as a support,) and the pulley 167 is thus driven, and drives, through sprocket-wheels 163^a and 163, shaft 161, which in turn drives, through bevel-gears 160 and 159, shaft 158, which, through worm 157 and worm-wheel 156, drives shaft 133 and ratchet-wheel 155, which thus overtakes the pawl 154 and commences to drive sleeve 152 and roller 138 continuously.

For the purpose of making a mat having good wearing qualities and presenting a well-

finished appearance it is desirable that the outside warps on each side receiving thrums should carry a close series of such thrums, which will not be the case if they only receive a thrum alternately, as would be ordinarily the case. I therefore provide an arrangement (shown in Figs. 26 and 27) by which the outside warps will receive a thrum each time. These two outside warps 1^a 1^a are passed through guides 195 195, each of which, as shown, may consist of two fingers attached to a plate 196, secured to a transverse bar 197, suitably supported in guides 198 198, Figs. 1 and 3, on the inner frame 12 and capable of sliding therein. The fingers are adjustable on the bar by means of holes 199 and corresponding holes in plates 196, through which holes pass suitable bolts. The end of the bar carries a roller or pin 200, engaging in a slot 201 in the bar 107, (see also Fig. 5,) so that the reciprocation of the latter will slide the bar 197 to and fro, its movement therefore corresponding with the rocking of the channel 105, which effects the lateral movement of the thrum-carrying fingers. The beater 119 is carried in the usual manner by the slay, (which it is not necessary to show,) and the numerous reeds which go to make up same are carried in the upper and lower bars 201 202 of same, respectively, by rods 203 204, on which they are threaded, each rod being seated in a groove in the bar, as shown in Figs. 1 and 26, and passing through the ends of the reeds, which are separated by washers 205. In this way by withdrawing the rods one or more of the reeds can be removed and a larger washer 205^a inserted in their place, leaving a wider gap between the reeds for the warps 1^a 1^a to pass through and allowing them room to be reciprocated by the movement of the bar 197, as shown in Fig. 27.

It is desirable to provide a selvage for the mat in addition, and to this end a further warp 1^b 1^b is used at the extreme outside, such warp receiving no thrums, but only being held to the mat by the weft-thread, which bends around same. These threads 1^b 1^b are passed between reeds 119, which are out of a straight line with their healds 8, as shown in Fig. 27, so that room is allowed for the warps 1^a 1^a to be reciprocated. The operation is as follows: Where referring to Fig. 27 and commencing from the left hand it will be seen that the warp 1^a has been moved out of the straight line, and referring for the purpose of explanation to the warps by the letters *a b c d a' b' c' d'* it will be seen that a thrum will be put on the alternate warps *a b d* and so on, and on the other side on the alternate warps *a c'* and so on, the shifting back of the bar bringing the warps 1^a into the position shown in dotted lines, when the thrums will be put on the alternate warps *a c* and so on, and on the alternate warps on the other side *a' b' d'* and so on, the warps 1^a 1^a (*a a'*) always receiving a thrum by reason of their being caused to follow the movement of the thrum-

fingers, which come up from beneath the warps, as previously explained.

In connection with the measuring device it has been found desirable to keep an even strain on the mats as they pass through the drawing-off rollers, as otherwise they may bend or curl, and thus the finger 144 may miss the projection 143 or strike it late, and, further, it is desirable to take away the mats and coil them up as they are made and before they are separated. To this end I employ the arrangement shown in Figs. 28 and 29, in which the arm 214 is connected to and operates a rod 217, having a slot 217^a in its front end, with which engages a pin or stud of a lever 218, pivoted in a frame 219 and carrying at its other end a pawl 220, engaging with a ratchet 221 on the shaft of a roller 222. The roller has lugs 224 at each end, through holes in which passes a rod 223, by means of which the first mat may be attached to the roller 222, the rod being first withdrawn and the mat placed on the roller and the rod replaced. A pawl 225 prevents the roller turning backward. To the end of lever 218 is attached a spring 226, the other end of which is secured to frame 12 of the loom. As the rod 217 is drawn back, the lever 218 by the action of the spring will follow same, the slot 217^a allowing a larger movement to the rod 217 than is necessary for the movement of the lever 218 and pawl 220, which is controlled by the amount of mat it is able to draw off. As this is very small, the forward movement of the pawl is slight. Its backward movement is effected by the forward movement of rod 217 when the end of the slot 217^a engages the pin of lever 218. The mats 7 leave the loom by passing under a roller 186 and pass up to roller 222 around a roller 227 on frame 219.

What I claim is—

1. In a machine for weaving coir-yarn mats and similar fabrics and in combination the warp-heckles, a bar 9 carrying same, the frame, a crank pivoted on each side of same, a link connected to one end of each crank and to the bar 9, respectively, at either end of same, a bar connecting the other ends of the cranks to cause same to move together, a rod connected to one end of the bar 9, and means for raising and lowering said rod whereby the heckles are evenly and positively operated in both directions, substantially as described.

2. In a machine for weaving coir-yarn mats and similar fabrics and in combination, the thrum-plungers, levers carried by same, a bar in which the free ends of the levers are pivotally carried and means for shifting the bar laterally so that the levers are positively operated substantially as described.

3. In a machine for weaving coir-yarn mats and similar fabrics and in combination, the thrum-plungers, levers carried by same, a bar in which the free ends of the levers are pivotally carried, means for carrying the bar and plungers and for raising and lowering same,

and fixed eccentric guides adapted to reciprocate the bar as it passes same and thus rotate all the plungers, substantially as described.

4. In a machine for weaving coir-yarn mats and similar fabrics and in combination, a receptacle for each thrum, means for moving the receptacles forward to the delivery-point, means for holding the thrums open in same during the whole of the forward movement of the receptacles such means moving with the thrum-receptacles, and means for removing the thrums from said receptacles and placing them on the warps, substantially as described.

5. In a machine for weaving coir-yarn mats and similar fabrics and in combination, a finger provided with a receptacle for a thrum, means for holding the thrum open in same, a delivery device located in the finger, a bar for carrying the finger and guides for such bar, means for moving the finger on such guides to the delivery-point and means for holding up the delivery device for placing the thrum on the warp substantially as described.

6. In a machine for weaving coir-yarn mats and similar fabrics and in combination a finger provided with a receptacle for each thrum, a dividing device for each finger adapted to hold the thrums open therein a delivery-rod in each finger on which the thrum is seated means for carrying the fingers, dividing devices, and delivery-rods to the delivery-point and means for holding up the delivery-rods for placing the thrums on the warps substantially as described.

7. In a machine for weaving coir-yarn mats and similar fabrics and in combination, a receptacle for each thrum, a delivery device on which the thrums are adapted to seat, means for carrying the receptacles forward to the delivery-point, means for holding the thrums open in the receptacles during the whole of the forward movement of the latter such means moving with the thrum-receptacles, and means for lowering the receptacles so that the thrums remain on the delivery device, substantially as described.

8. In a machine for weaving coir-yarn mats and similar fabrics and in combination, a finger provided with a receptacle for each thrum, a dividing device for each finger to hold the thrums open therein, a delivery-rod in each finger on which the thrum is seated, a bar carrying the fingers, a bar carrying the dividing devices, guides for such bars, means for carrying the fingers, dividing devices, and delivery-rods to the delivery-point, means for raising the fingers and dividing devices and withdrawing the latter from the fingers, and means for lowering the fingers and dividing devices so that the thrums remain on the delivery devices substantially as described.

9. In a machine for weaving coir-yarn mats and similar fabrics and in combination, the front yarn-feeding clip, a bar, pivoted cranks connecting the bar and clip, means for carrying the bar, a pivoted cranked lever having

one end attached to the bar, means for holding the outer end of the cranked lever normally up, a connecting-rod having a hooked end adapted to engage with the outer end of
5 said lever and means for reciprocating the rod and for throwing it out of engagement with the lever substantially as described.

10 10. In a machine for weaving coir-yarn mats and similar fabrics and in combination, the front yarn-feeding clip, a pivoted cranked lever, connections between same and clip, a spring for operating the lever in one direction, a hooked connecting-rod adapted to engage with the lever, means for reciprocating
15 the rod, a rod and handle for disconnecting the hooked rod and lever and thereby stopping the movement of the clip, and means for causing the hooked rod and lever to again engage substantially as described.

20 11. In a machine for weaving coir-yarn mats and similar fabrics, and in combination, means for reciprocating the front clip and normally holding same up a shaft 125, connected to and operated by same, a hook 129 carried by
25 the shaft, the back clip and an arm 130 carried and moved by same and with which the hook is adapted to engage to hold same down when the front clip is stopped substantially as described.

30 12. In a machine for weaving coir-yarn mats and similar fabrics and in combination, the yarn-feeding clip, means for reciprocating and normally holding same up, a finger carried by the mat, and means connected with
35 the clip and adapted to be set so as to throw the clip out of operation when struck by the finger substantially as described.

40 13. In a machine for weaving coir-yarn mats and similar fabrics and in combination the yarn-feeding clip, means for reciprocating and normally holding same up, a rod 131 connected thereto, means for moving the rod to throw the clip out of operation, a latch for holding the rod normally in position, a finger
45 carried by the mat, a rod 140, an adjustable projection carried by same adapted to be struck by the finger when the mat is sufficiently long, means for adjustably supporting the rod and connections between said rod
50 in the latch whereby same may be raised and rod 131 released substantially as described.

14. In a machine for weaving coir-yarn mats and similar fabrics the combination with the warp-rollers a drag device for same, the mat-
55 drawing-off rollers, means for intermittently driving same and a driving-belt, of means for carrying a loose pulley, means whereby same may be moved to bring the pulley into contact with the driving-belt, means driven
60 by the pulley and connected with the mat-drawing-off rolls for driving same continuously, and means connected to the pulley and the drag device so that when the pulley is driven to drive the mat-drawing-off rolls continuously the drag device is removed from the
65 warp-rollers substantially as described.

15. In a machine for weaving coir-yarn mats and similar fabrics and in combination with the driving-belt, a loose pulley, means for rocking same and bringing it against the belt,
70 a shaft 158, means for driving same from the pulley, the mat-drawing-off rolls, a ratchet-wheel 155 carried by one of same, and means for driving the ratchet-wheel from shaft 158 so that said wheel is driven continuously when
75 the pulley is being driven by the belt substantially as described.

16. In a machine for weaving coir-yarn mats and similar fabrics and in combination, a mat-drawing-off roll, means for driving same inter-
80 mittently, a pawl carried by said roll, a shaft 133, means for supporting same, a ratchet for the pawl carried by the shaft, a shaft 158, means for supporting same, connections between the two shafts whereby the former may
85 be driven, a driving-belt, a pulley 167 adapted to be brought into contact with the same, and means operated by said pulley and connected with the shaft 158 whereby said shaft 158 is caused to drive the shaft 133 and through
90 ratchet 155 and pawl to drive the roll continuously, substantially as described.

17. In a machine for weaving coir-yarn mats and similar fabrics, the combination with a
95 thrum-feeding device, of guides 195, 195 adapted to receive the outside thrum-warps, a bar 197 for carrying same, means for reciprocating said bar to move said outside thrum-warps so that they are always in line to receive a thrum from the thrum-feeding device, means
100 for adjusting the guides on the bar, and means for moving the thrum-feeding device, substantially as described.

18. In a machine for weaving coir-yarn mats and similar fabrics the combination with a
105 thrum-feeding device and means for operating same, of guides adapted to receive the outside thrum-warps, and means for reciprocating the guides and thrum-feeding device in unison substantially as described. 110

19. In a machine for weaving coir-yarn mats and similar fabrics and in combination with the thrum-receptacles, the beater, the reeds, means for removably carrying same in the
115 beater so that one or more may be removed to afford a larger space between some of the reeds, a bar, guides for the outside thrum-warps carried thereby, which warps are adapted to pass between the large space provided between the reeds, and means for reciprocating
120 the bar so that the outside thrum-warps are shifted laterally to follow the thrum-receptacles and receive a close series of same, substantially as described.

In testimony whereof I have hereunto set
125 my hand in the presence of two subscribing witnesses.

KENNEDY WALKER.

Witnesses:

WALTER GOODACRE,
WALTER I. SKERTEN.