

No. 703,339.

Patented June 24, 1902.

FELBEL & C. GABRIELSON.
TYPE WRITING MACHINE.

(Application filed Aug. 10, 1900.)

(No Model.)

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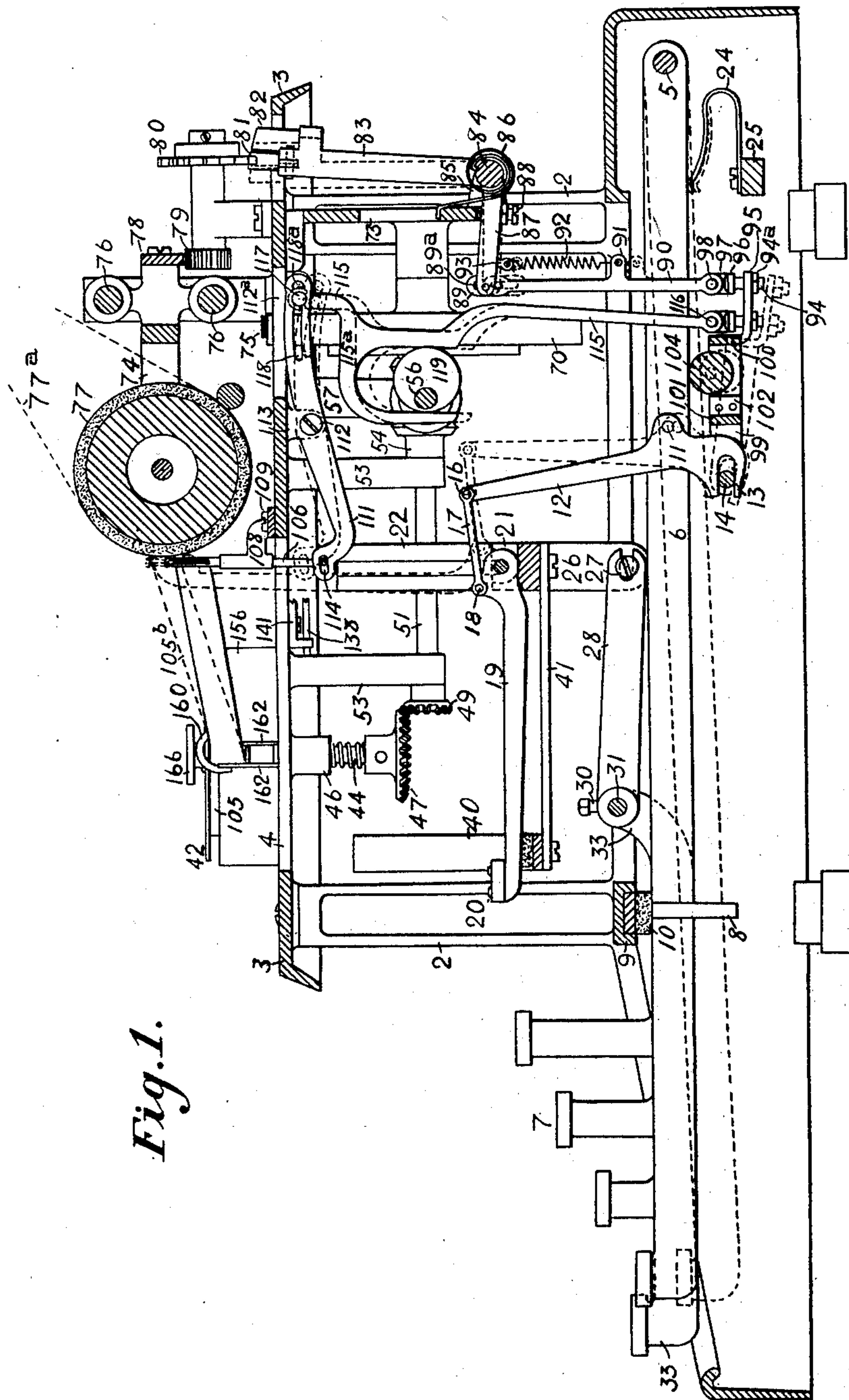


Fig. 1.

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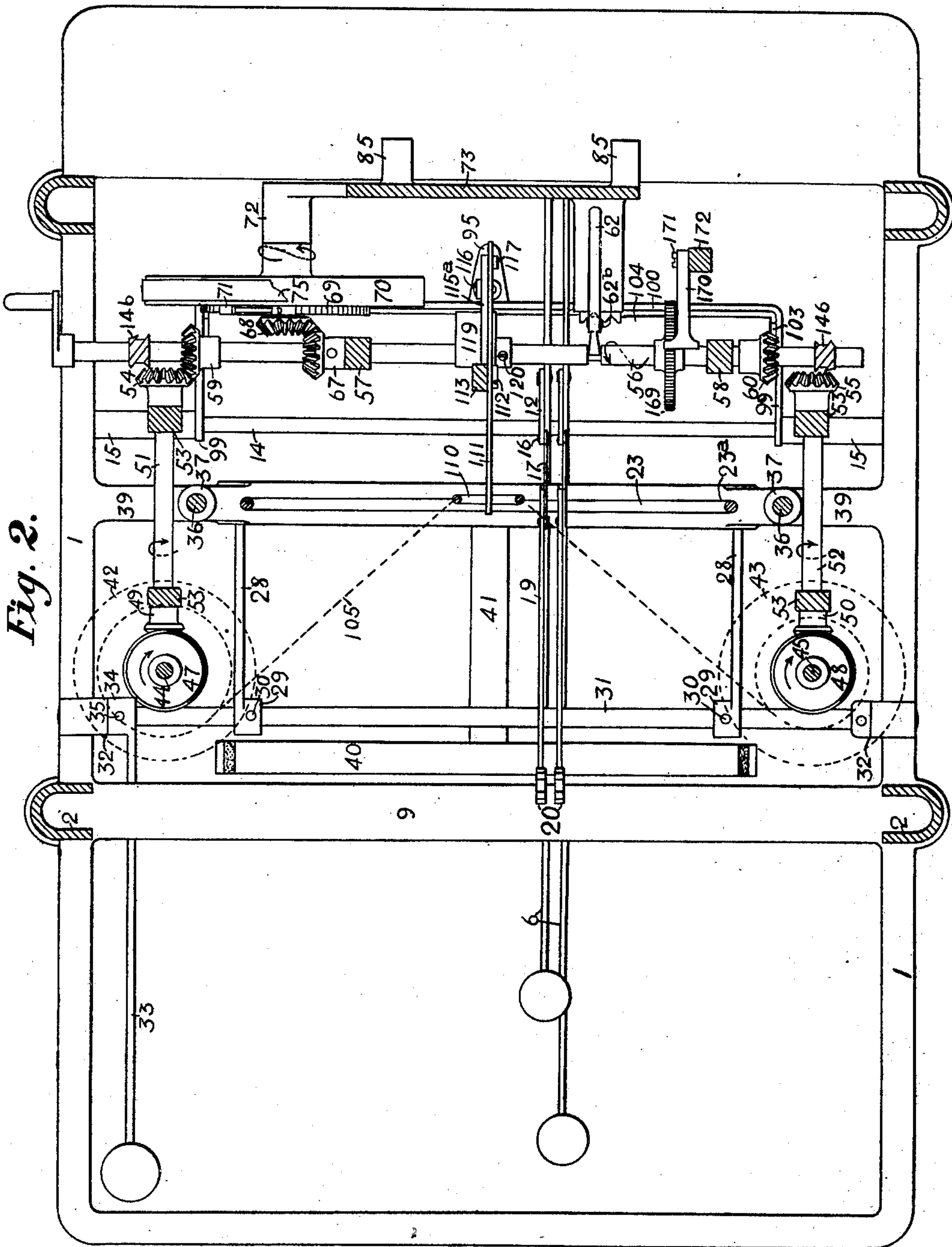
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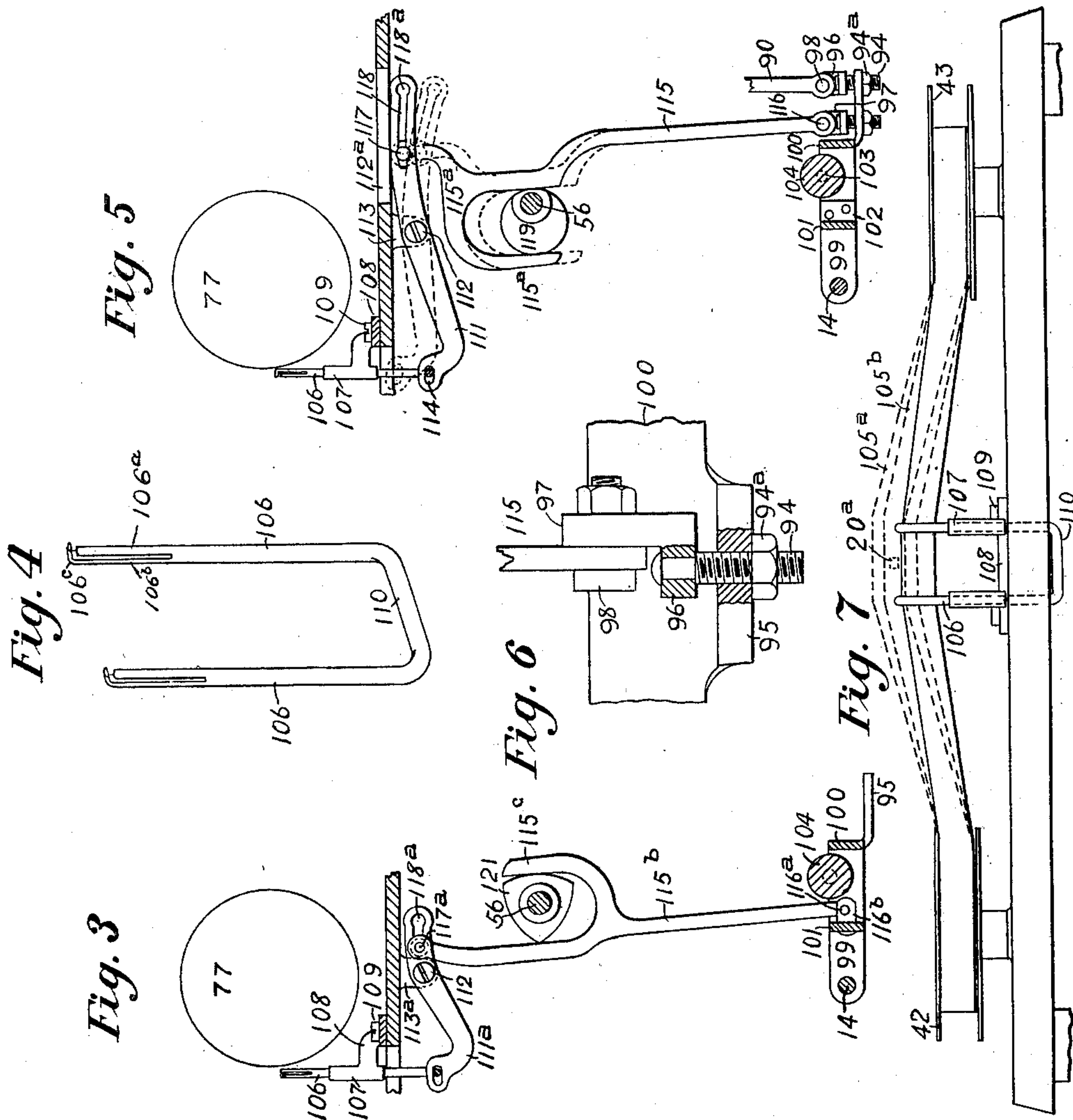
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Fig. 10



Fig. 9



Fig. 11

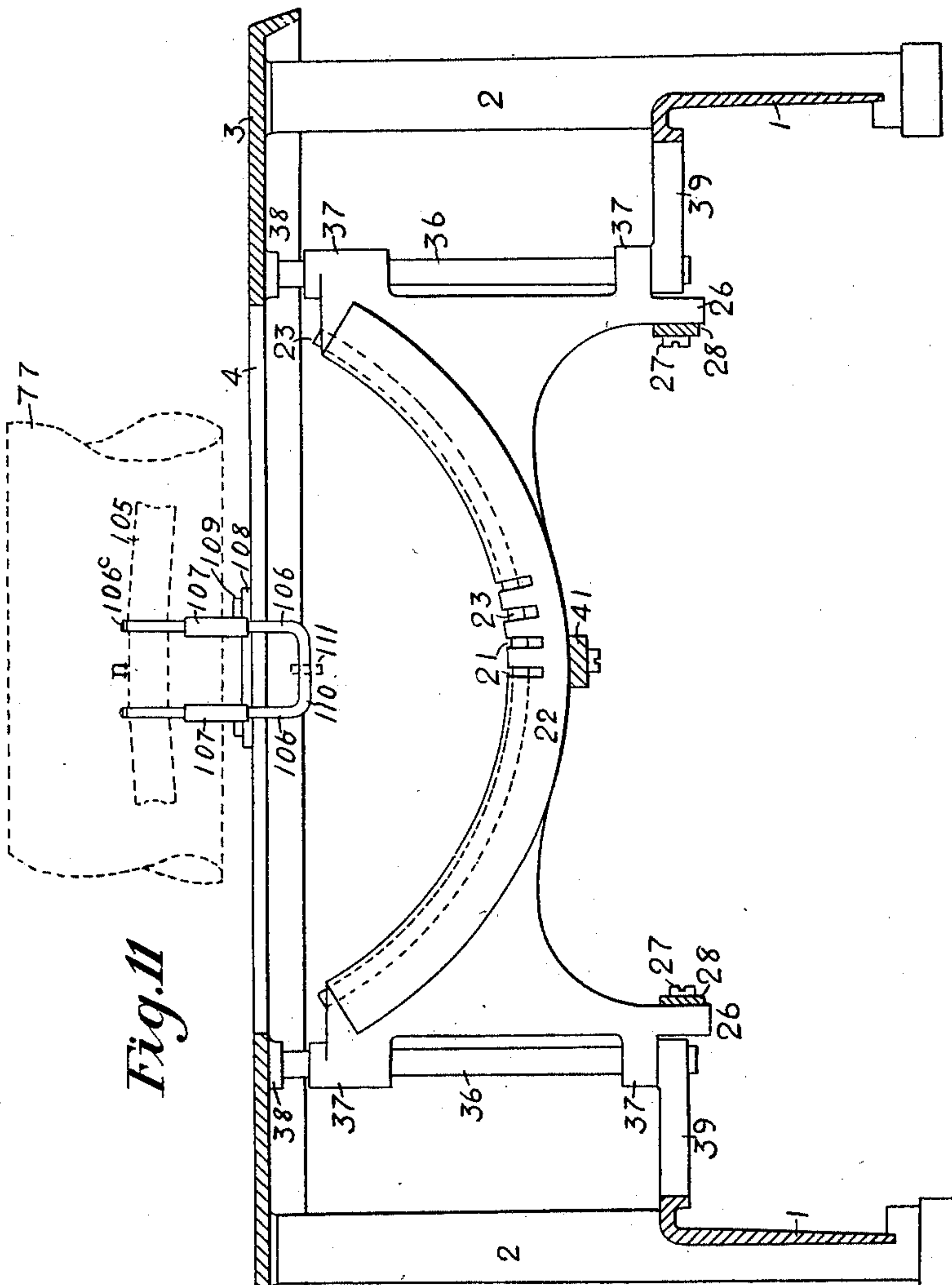
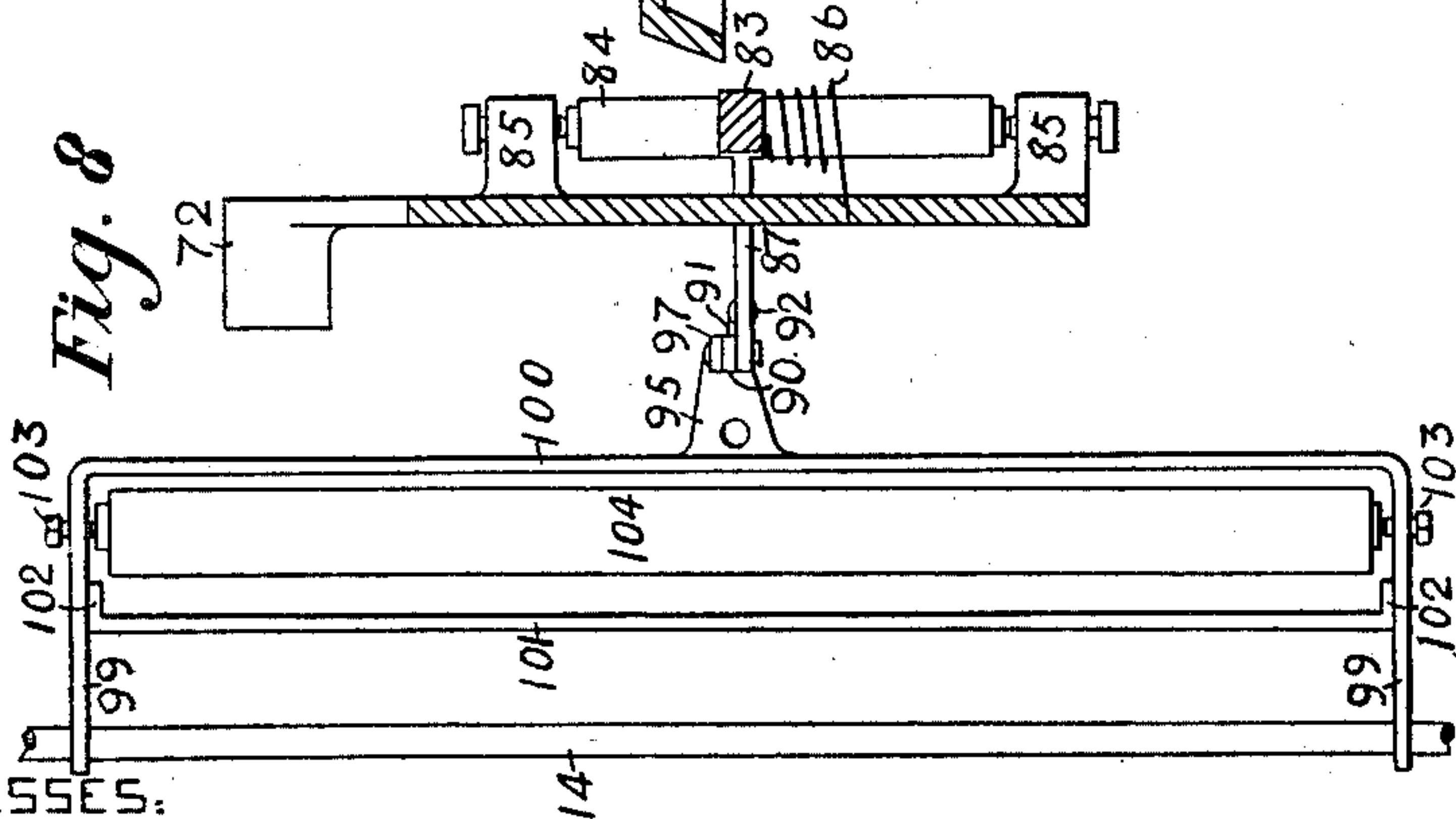


Fig. 8



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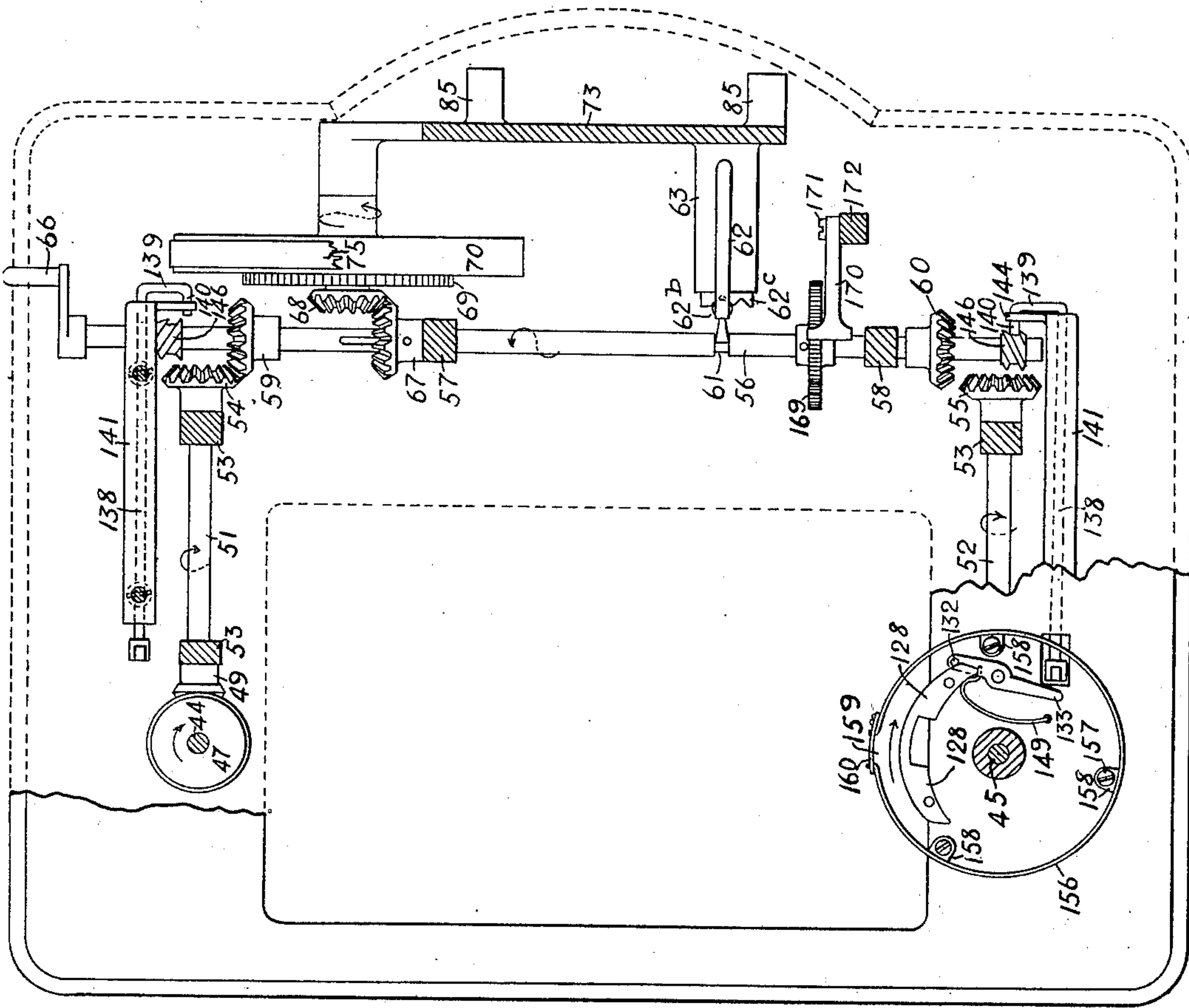


Fig. 12.

Fig. 13.

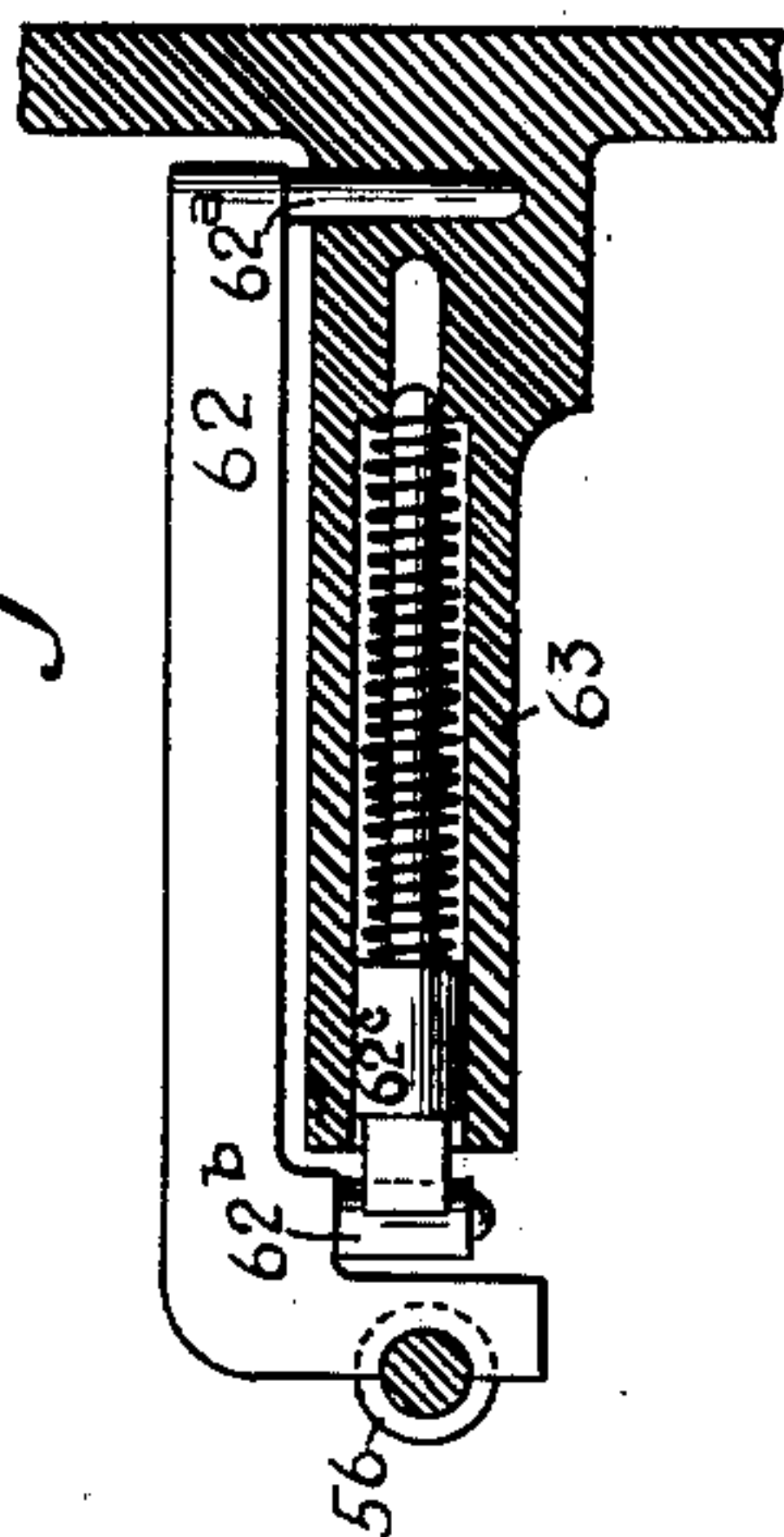
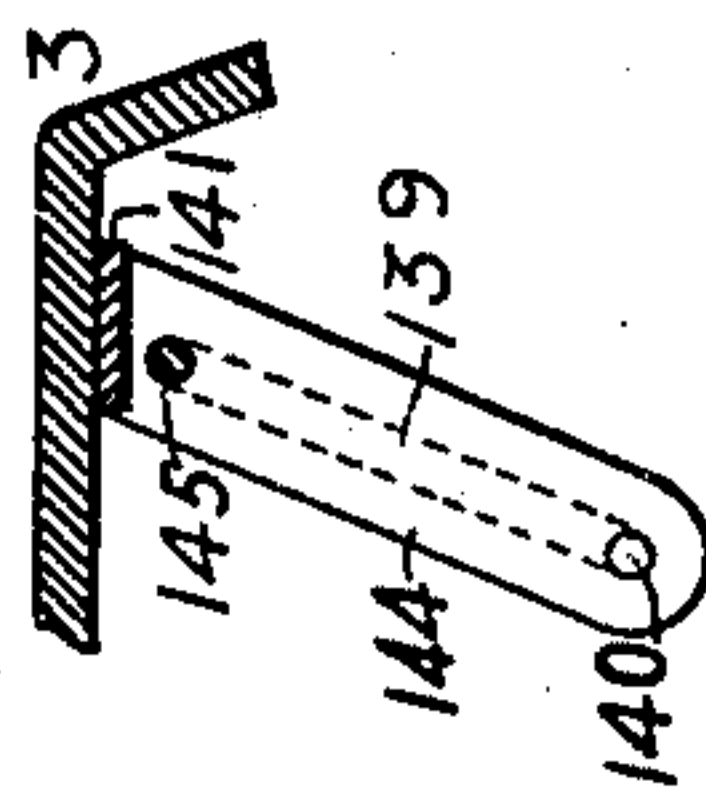


Fig. 14.



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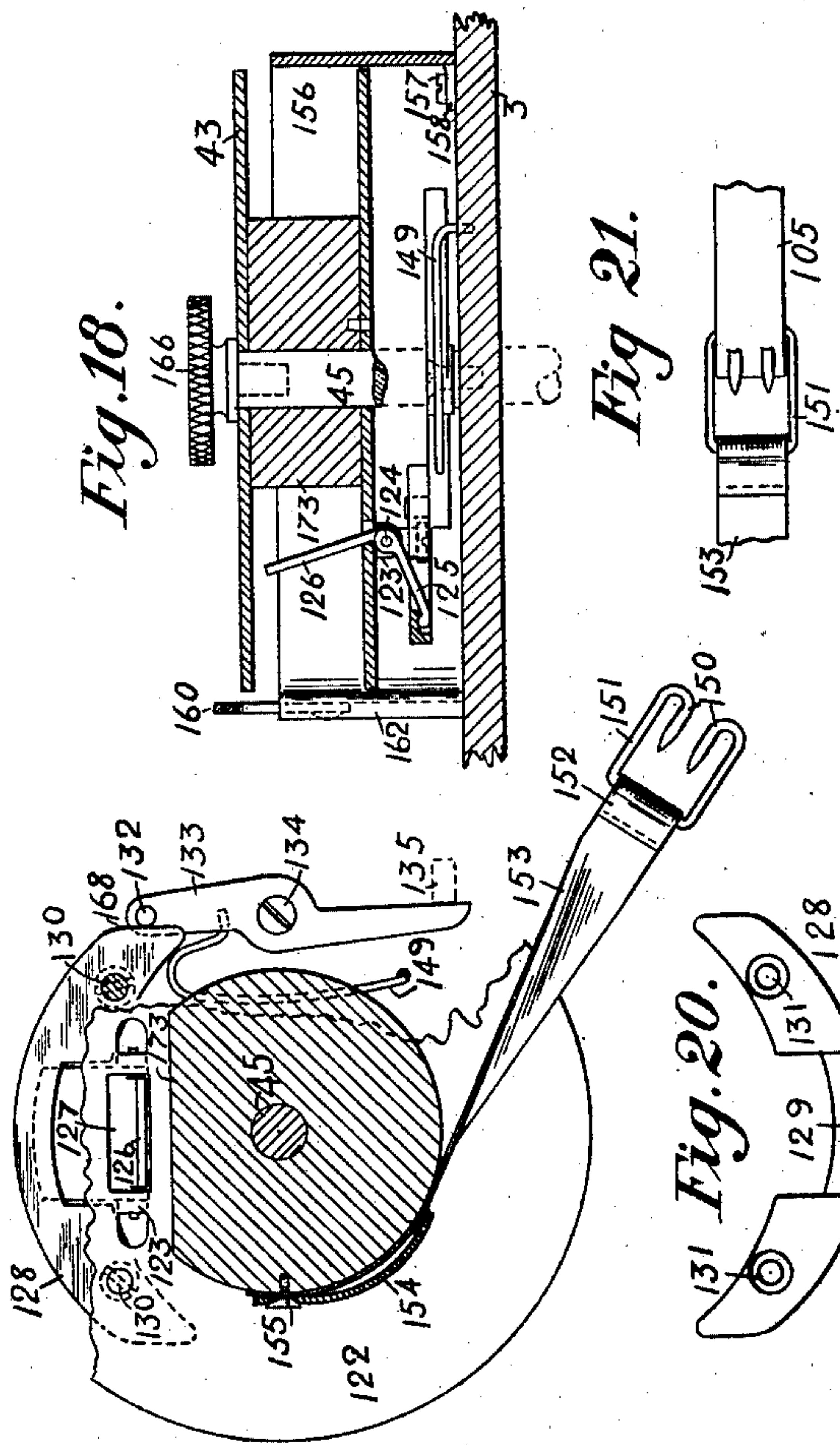
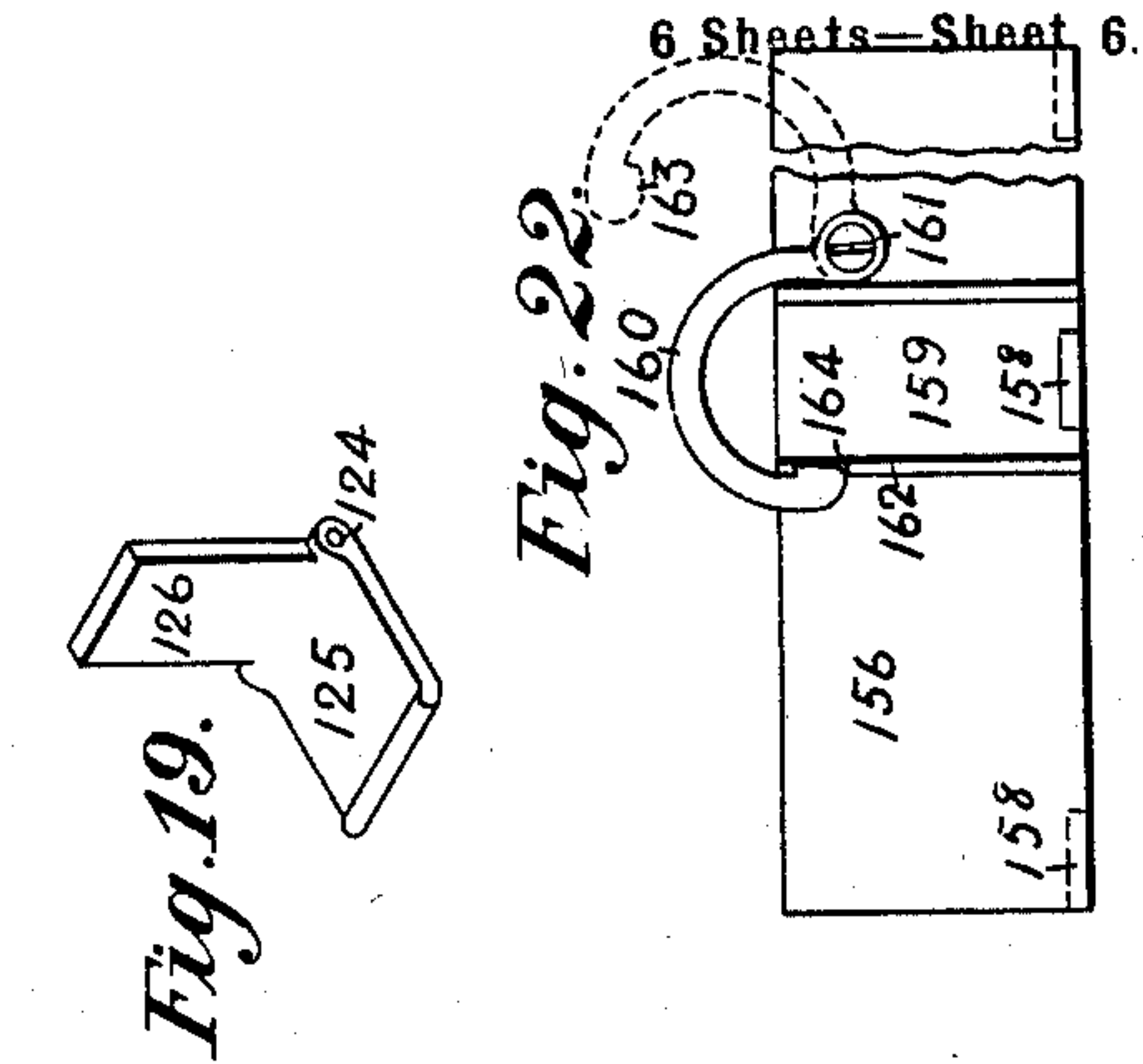
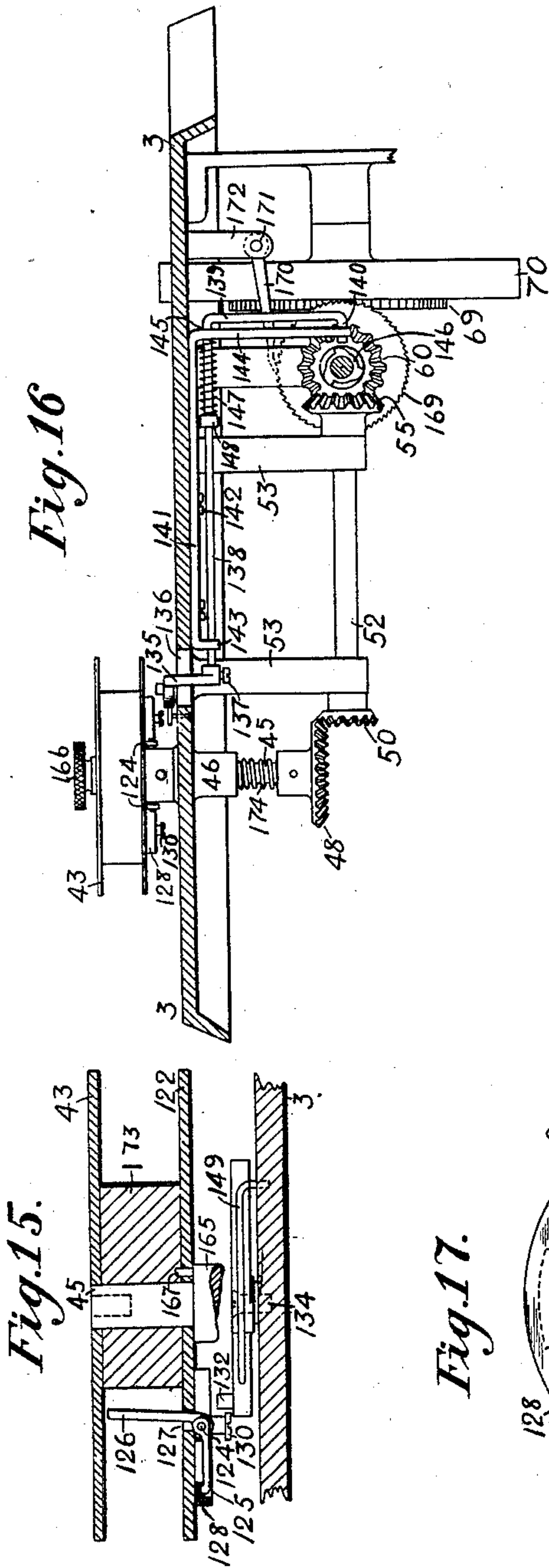
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JACOB FELBEL, OF NEW YORK, N. Y., AND CARL GABRIELSON, OF GREENVILLE, NEW JERSEY; SAID GABRIELSON ASSIGNOR TO SAID FELBEL.

TYPE-WRITING MACHINE.

SPECIFICATION forming part of Letters Patent No. 703,339, dated June 24, 1902.

Application filed August 10, 1900. Serial No. 26,507. (No model.)

To all whom it may concern:

Be it known that we, JACOB FELBEL, a resident of New York city, in the county and State of New York, and CARL GABRIELSON, a resident of Greenville, in the county of Hudson and State of New Jersey, citizens of the United States, have invented certain new and useful Improvements in Type-Writing Machines, of which the following is a specification.

The present invention relates to the ribbon-movements of type-writing machines; and its principal objects are to provide novel and efficient means for automatically reversing the winding movements of the ribbon and also to provide a construction whereby the ribbon-spools and ribbon may be bodily detached from the machine without disconnecting the ribbon from either spool, so that a fresh ribbon or one of different color and a new pair of spools may be substituted and so that the automatic movements of the ribbon may proceed as before.

To these and other ends our invention consists in certain combinations of devices, arrangements of parts, and features of construction, all as will be hereinafter more fully set forth, and particularly pointed out in the appended claims.

In the accompanying drawings, in which our improvements are illustrated as applied to a front-strike writing-machine in connection with mechanism invented by Carl Gabrielson for variably moving the ribbon to cover and uncover the printing-point, as set forth in an application filed by said Gabrielson December 26, 1899, Serial No. 741,622, Figure 1 is a vertical central section from front to rear of a "front-strike" writing-machine embodying our improvements. Fig. 2 is a horizontal section taken just beneath the top plate of Fig. 1, but omitting some parts for the sake of clearness. Fig. 3 is a skeleton sectional elevation showing a modification of the ribbon-throwing devices. Fig. 4 is an enlarged perspective view of the ribbon-carrier. Fig. 5 is a sectional elevation of the ribbon-throwing devices shown at Fig. 1, the parts being positioned, however, to give the ribbon a greater throw. Fig. 6 is an enlarged fragmentary rear view, partly in section, of

adjusting devices shown at Fig. 1 as connected with the universal-bar frame. Fig. 7 is a diagrammatic front view of the top plate, ribbon-spools, ribbon, and ribbon-carrier. Fig. 8 is a plan of the universal-bar frame and showing its connection to the dog-rocker of the escapement mechanism. Fig. 9 is a section of ribbon, showing in dotted lines the wavy path made thereon by the types. Fig. 10 is a similar view showing in dotted lines the path made by the types with the modification illustrated at Fig. 3. Fig. 11 is a front elevation showing the shifting type-segment and its supports and also a portion of the ribbon mechanism and the platen, some of the parts being shown in section. Fig. 12 is a plan view, partly in section, showing portions of the ribbon winding and reversing mechanisms both above and below the top plate. Fig. 13 is an enlarged sectional detail view of a double-acting spring device connected with the transverse ribbon-winding shaft. Fig. 14 is an enlarged sectional detail view of one end of a sliding device forming part of the ribbon-reversing mechanism and also of the bracket in which it is mounted. Fig. 15 is an enlarged sectional elevation of a ribbon-spool and certain of the ribbon-reversing devices, the parts being shown in normal position. Fig. 16 is a view looking at the right-hand edge of the top plate, which is shown in section to afford a full view of the right-hand ribbon winding and reversing mechanism. Fig. 17 is an enlarged sectional plan of the ribbon-spool and connected devices, the lower flange of the spool being partly broken away. Fig. 18 is an enlarged sectional elevation similar to Fig. 15, but showing the reversing devices in working position and also showing the housing for the spool. Fig. 19 is a perspective view of a bell-crank which is mounted on the lower spool-flange and forms part of the reversing mechanism. Fig. 20 is a bottom plan view of a cam-plate which is hung from the under side of the ribbon-spool. Fig. 21 is an elevation of a spool-buckle, showing the end of the ribbon as caught thereon. Fig. 22 is a side elevation of a spool-housing.

In the several drawings like parts are designated by like characters of reference.

The frame of the machine comprises a rec-

tangular base 1, corner-posts 2, and a top plate 3, provided at its front portion with a large opening 4 for the passage of the types. Upon a rod 5 is fulcrumed a series of key-levers 6, provided with keys 7 and guided in a comb 8, depending from a bar 9, having a cushion-stop 10 for the levers. At a point 11 upon each lever is pivoted an upright bell-crank 12, one arm of which is forked at 13 to engage a fulcrum-rod 14, which is common to all of the bell-cranks and is supported in studs 15. To the upper end of each bell-crank 12 is pivoted at 16 the rear end of a link 17, which is connected at 18 to a type-bar 19, having a type-block 20, and guided in a radial slot 21 cut in a segment 22 and mounted upon a pivot-wire 23, which is seated in a curved slot 23^a. The depression of a key-lever causes a rearward movement of the vertical arm of the bell-crank, whereby the type-bar is swung up to print, the parts being returned by a spring 24, secured upon a bar 25.

Each type-block 20 is provided with a lower-case and an upper-case type, the former being arranged at the outer end of the type-block, so as normally to strike the platen. In order to enable the capital types to print, the segment 22 is made shiftable vertically by means of downwardly-extending arms 26, in which are inserted screws 27, engaged by the rear ends of a pair of levers 28, whose forward ends are secured by hubs 29 and set-screws 30 upon a rock-shaft 31, which is journaled at 32 in the base. A shift-key lever 33 is also secured upon said rock-shaft by means of a hub 34 and a set-screw 35. By depressing the shift-key and rocking the shaft the levers 28 are swung upwardly, causing the segment and type-bars to rise, so that when the type-bars are operated the capital letters strike the platen. Upon release of the shift-key the segment drops to normal position. It is guided by rods 36, the segment being provided with ears 37, bored to engage said rods. The movements of the segment are limited by stops 38 and arms 39. A type-basket 40 is secured to the segment by means of a horizontal plate 41.

Ribbon-spools 42 43 are arranged upon the top plate, one at each side of the machine and forwardly of the printing-point and are secured upon the upper ends of a pair of vertical shafts 44 45, journaled in bosses 46. It is not essential that these shafts should be exactly vertical. Carried by the lower ends of the shafts are beveled pinions 47 48, which mesh with smaller pinions 49 50, secured upon the forward ends of parallel horizontal shafts 51 52, the latter being journaled in the lower ends of two pairs of depending arms 53. These shafts are provided at their rear ends with beveled pinions 54 55. Arranged immediately in rear of the last-mentioned pinions is a horizontal transverse rotary driving-shaft 56, journaled in depending arms 57 58 and bearing near its ends beveled pinions 59

60, the former of which is shown at Fig. 2 as in mesh with the left-hand pinion 54, so that on the rotation of the shaft 56 the ribbon is caused to wind upon the left-hand spool. The other pinion 60 on said shaft 56 is shown as out of mesh with the pinion 55, connected with the right-hand spool 43, so that the latter is enabled to run freely in paying out the ribbon. By moving the shaft 56 endwise so as to separate the pinions 54 and 59 and throw into engagement the pinions 55 and 60 the direction of longitudinal movement of the ribbon may be reversed. The shaft 56 is provided with a circumferential groove 61, with which engages a vibratory detent 62, vertically pivoted at 62^a upon a fixed block 63 and having a roller 62^b, adapted to be engaged by notches formed upon the forward end of a horizontal spring-pressed slide 62^c, housed in the block 63, the function of said slide being to complete the endwise throw of the shaft 56 in either direction and also to maintain the shaft in position after such movement, substantially as set forth in Letters Patent granted to G. B. Webb, No. 599,428, February 22, 1898. Said shaft is also provided with the usual crank 66, by which it may be manually rotated when it is desired to wind the ribbon rapidly upon either spool.

Splined upon the shaft 56 and abutting against the left depending arm 57 is still another beveled pinion 67, which is constantly in mesh with a like pinion 68, to which is secured a ratchet-wheel 69, both the ratchet-wheel and the pinion 68 being loosely mounted, as usual, upon a spring-drum structure 70. The latter carries a spring-pressed pawl 71, so that when the drum revolves in one direction the ratchet-wheel and pinion revolve therewith to cause the ribbon to wind and so that when the drum rotates in the opposite direction said ratchet and pinion remain stationary, as common in the Remington machine. The normal rotary movements of the parts are indicated by arrows at Fig. 2.

The spring-drum is pivoted upon a forwardly-extending boss 72, formed upon the lower right-hand portion of a bracket 73, which depends from the under side of the top plate near the rear edge thereof. The drum is connected to a paper-carriage 74, by means of a strap 75, the carriage being indicated as sliding upon parallel rails 76 and as bearing at its forward portion a cylindrical platen 77, upon the front of which the types strike. A sheet of paper is indicated in position upon the platen at 77^a. The usual carriage-rack 78 meshes with a pinion 79, the latter being connected by a horizontal shaft to an escapement-wheel 80. A spring-pressed stepping or feeding dog 81 is arranged normally in engagement with the escapement-wheel, a detent-dog 82 being arranged in rear of and in line with the stepping-dog, as usual. Both dogs are carried upon the upper end of a vertical vibratory arm 83, which is cast integrally with a transverse horizontal rock-shaft 84, the latter be-

ing journaled in ears 85, which project rearwardly from the said vertical plate 73. A returning-spring 86 is provided for the rocker and dogs. The rock-shaft 84 also carries an operating-arm 87, provided with an adjustable stop 88, the latter normally bearing up against the under edge of the bracket 73 by reason of the tension of the spring 86. A pin 89 is secured in said operating-arm and engages a slot 89^a, formed in a vertical link 90, which is provided with an ear 91, in which is hooked the end of a spring 92, whose other end hooks into an eye 93, provided upon the arm 87. The link may be pulled downwardly without moving the dog-rocker until the pin 89 is engaged by the upper end of the slot 89^a. The lower end of the link has an adjustable pivotal connection with a universal-bar frame arranged below the key-levers. This connection embraces a vertical screw 94, which engages a threaded hole in the rear end of a short horizontal arm 95 of the universal-bar frame and an angle-piece which is swiveled upon the upper end of said screw. The angle-piece comprises a horizontal plate or member 96 and a vertical member 97, to the latter of which is pivoted the lower end of the link 90. A nut 94^a locks the screw at any height to which it may be adjusted.

The universal-bar frame above mentioned consists of a pair of horizontal parallel side bars 99, which are pivoted at their forward ends upon the above-mentioned fulcrum-rod 14 and at their rear ends are united by a horizontal bar 100, preferably made in one piece with said side bars. A tie rod or plate 101, whose ends are bent at right angles at 102 and riveted to the side bars, is used to stiffen the structure. A cylindrical universal bar 104 is journaled at 103 in said side bars between the transverse bars 100 and 101 and is normally held up against the under side of the key-levers by the tension of the spring 92.

A ribbon 105 is threaded through a vertically-disposed reciprocary carrier 106, arranged just forward of the platen and in proximity to the printing-center (the latter being indicated by the letter *n* at Fig. 11) and is thereby normally supported at a point just below the line of writing, as shown in dotted lines at said figure and also in full lines at Figs. 1 and 7. This ribbon-carrier is made of wire and bent to form a U-frame whose arms are slit to receive the ribbon, the slit dividing each vertical arm into two fingers, the forward one of which, 106^a, is the shorter. The top of the rear finger 106^b is bent over at 106^c to prevent the escape of the ribbon, but not so as to touch the top of the short finger. The U-frame is guided in a pair of vertical tubular slideways 107, which are formed upon a bracket 108, secured upon the top plate by screws 109, the vertical arms of the carrier passing through said tubular slideways and being thereby prevented from moving in any direction other than vertically. The horizontal member 110 of the U-frame is engaged

by the forward end of a horizontal operating-lever of the first order 111, which is pivoted at 112 in an ear 113, depending from the top plate. Engagement between the operating-lever and the ribbon-carrier is made at the forward end of the lever, which is provided with a slot 114, to accommodate the rectilinear movement of the ribbon-carrier as the lever moves in an arc about the axis 112. The top plate may be cut away at 112^a to form a clearance for the lever.

The rear end of the lever is operated by a vertically-arranged link 115, whose lower end is provided with an adjustable pivotal connection, like that of the link 90, to the same arm 95 of the universal-bar frame, the link 115 being arranged forwardly of the other and its pivotal point being designated by 116. The upper end of the link 115 is provided with a lateral pin or stud 117, which engages a horizontal slot 118, formed in the rear arm of said operating-lever 111, the extreme right-hand end of said slot being enlarged at 118^a to permit the entrance of the head of said stud when the latter is being inserted in the slot. The link is adapted to swing about its pivot 116 to cause the said stud to move to different parts of the slot, so as to engage the lever at different distances from its fulcrum. The slot is cut upon an arc struck from said pivot 116, so that the normal position of the lever 111 is always the same, no matter how the link 115 may have been swung. A downward pull of the link 115 causes a vibration of the lever 111 and an ascent of the device 106 and the ribbon carried thereby. It will be understood that the extent of movement of the lever, carrier, and ribbon can be varied by swinging the link about the pivot 116, inasmuch as the vertical movement of the link is the same at each key depression.

As a means for swinging the link to cause variations in the throw of the ribbon, the former is provided with a bent arm 115^a, which branches forwardly from the link and then downwardly parallel with the body of the link, so as to form an open slot. An eccentric controller 119 is secured by a screw 120 upon the transverse ribbon-winding shaft 56, so as to have a step-by-step movement in a single rotary direction and the front edge of the link and the rear edge of its arm engage said eccentric, said edges being of course parallel and substantially vertical, so that the link has a sliding connection with the eccentric and may move freely up and down at all times. As shown at Fig. 2, the eccentric has a wide working face or periphery, so as to compensate for the movement of the shaft 56 as the latter is shifted endwise, so that the eccentric is never disengaged from the link. During the rotation of the shaft the eccentric 119 is slowly turned, and hence causes the link 115 to swing slowly upon the pivot 116 without, however, affecting the vertical movements of said link, so that as the point of engagement of the link with the lever 111 is

shifted the throw of the lever and of carrier 106 is constantly varied, and hence the working position of the ribbon is also varied.

Inasmuch as the entire type system is moved vertically at the type-shifting operation, it follows that both the upper-case and lower-case characters print in a single line not only upon the platen or the paper thereon, but also upon the ribbon.

As shown by dotted lines at Fig. 1, at the depression of any key-lever 7 its bell-crank 12 is swung rearwardly, and through the link 17 swings the type-bar to the printing-point. The key-lever also forces down the universal bar 104, which through the arm 95 causes the link 115 to descend, pulling down the slotted rear arm of the ribbon-throwing lever 111 and causing the front arm thereof to rise and move the ribbon-carrier and ribbon up, so that the ribbon covers the printing-point. At the same time the link 90 descends, expanding the spring 92 until the upper end of the slot 89 contacts with the pin 89^a upon the forward end of the dog-rocker arm 87, whereupon the continued descent of the link 90 causes the dog-rocker to swing and the upright arm thereof to vibrate forwardly, so that the spring-pressed feeding-dog 81 is, as usual, disengaged from the escapement-wheel 80 and is moved independently past said tooth, the latter being temporarily engaged by the detent-dog 82, no movement of the wheel occurring at this time.

Upon the relief of the finger-key 7 from pressure the key-lever spring 24 returns the key-lever, bell-crank, link, and type-bar to normal position. The spring 86 returns the dog-rocker to normal position and also through the arm 87 and link 90 lifts the universal-bar frame until the adjustable stop 88 upon the arm 87 contacts with the under edge of the bracket 73, whereupon the movement of the dog-rocker ceases. At this time the universal-bar frame has not reached normal position; but its return movement is completed by the spring 92. Both of said springs 86 and 92 also assist in returning the key-lever and type-bar. At the same time the link 115, together with lever 111 and ribbon-carrier 106, return to normal position, the ribbon dropping to a point below the line of writing.

During the return of the dog-rocker the detent-dog 82 is disengaged from the wheel and the stepping-dog 81 is reengaged therewith, and the wheel is thereby permitted to rotate to the extent of one tooth, so that the paper-carriage advances a letter-space under the tension of the spring-drum 70. The movement of the spring-drum is communicated through pawl 71 and ratchet 69 to the pinion 68, and thence through pinion 67, shaft 56, pinions 59 and 54, shaft 51, pinions 49 and 47, and shaft 44 to the spool 42, causing the ribbon to wind slightly thereon and to also pay off from the other spool 43. At the operation of other finger-keys 7 the described movements are repeated, and the ribbon is

still further wound upon spool 42. When the end of the line of writing is reached, the carriage is returned, as usual, for beginning a new line and also for rewinding the spring in the drum 70; but during this return movement there is no motion of any part of the ribbon or type operating mechanism.

As the shaft 56 is caused to rotate in the described manner the eccentric 119 thereon is given a corresponding step-by-step rotary movement, so that link 115 is during its vertical movements gradually swung forwardly from the full-line position indicated at Fig. 1 to that indicated at Fig. 5 and then rearwardly again to the position at Fig. 1, and so on, so that the pin 117 is caused to work in different parts of the slot 118, and hence the ribbon is thrown varying distances from normal position during the winding thereof. When the pin 117 works in the rear portion of the slot 118 in the ribbon-throwing lever, as shown at Fig. 1, the vertical movement of the link 115 causes the ribbon to be thrown to the dotted-line position indicated in Fig. 7 at 105^b, this being the lowest position to which the ribbon is thrown, and the type (indicated by 20^a at said figure) strikes the ribbon at a point close to the upper edge thereof. In the position of the parts illustrated at Fig. 5, where the pin 117 is at its nearest approach to the fulcrum 112 of the ribbon-throwing lever, the movement of said lever is greatest and the ribbon is thrown then to the top position, (indicated at 105^a, Fig. 7,) and the type consequently strikes the ribbon at a point near the lower edge thereof. The normal position of the ribbon is indicated in full lines at said figure. The wavy path followed by the type impressions upon the ribbon is indicated in dotted lines at Fig. 9, said path being independent of the return movements of the carriage and therefore continuous, whether long or short lines are written on the paper. As the ribbon winds back and forth there is an intersection of the curved or sinuous paths made by the types, so that the ribbon is worn with substantial uniformity throughout its available width.

The pinion 49 is made smaller than the pinion 47, so that the vibration or adjustment of the link 115 about the pivot 116 occurs oftener, in proportion to the amount of ribbon wound upon the spool, than would be the case if the said pinions were of equal size.

At Fig. 3 a triangular eccentric or cam 121 is substituted for the plain eccentric 56, and the arm 115^c of the link 115^b branches upwardly. The link is given three vibrations at each rotation of the shaft 56, so that the path followed by the types in the ribbon is made up of a succession of very short waves, as indicated by dotted lines at Fig. 10. The lower end of the link is pivoted at 116^a to a stud 116^b, which projects rearwardly from the stiffening-bar 110 of the universal-bar frame. As the horizontal movement of the pin 117^a is less than in the other drawings, the slot

118^a in the lever 111^a is shortened, as is also the lever itself, and the pivot 112 is moved forward a corresponding distance. The proportions of the parts are such, however, that the ribbon is moved from the same normal position to the same limits, (indicated by dotted lines 105^a and 105^b at Fig. 7.)

The movement of the ribbon-throwing devices, including the universal bar, begins at the initial portion of the key depression; but owing to the pin-and-slot connection of the link 90 to the dog-rocker the latter remains stationary until the key has been partly depressed and is therefore operated during the last part of the key-stroke. Hence the dog-rocker returns to normal position during the initial part of the return stroke of the key, in readiness for immediate operation of a succeeding key. By means of the adjustable connection of the link 90 with the universal-bar arm the feeding mechanism may be so timed as to permit the escapement movement of the carriage to occur at the earliest practicable moment. The adjustable connection of the link 115 with the universal-bar arm enables said link, and hence the ribbon-carrier, to be adjusted vertically so that the upper edge of the ribbon may normally lie at the desired position, just below the line of writing.

To each ribbon-spool is connected mechanism for causing the feed of the ribbon to be automatically reversed when the spool is empty, and as the reversing devices at each spool are substantially alike only those connected with the right-hand spool will be described in detail.

Referring now more particularly to Figs. 12 to 22, the lower flange 122 of the ribbon-spool is provided with a pair of depending ears 123, in which is pivotally supported at 124 an elbow-lever comprising a horizontal arm 125, which extends outwardly from said pivot beneath the spool-flange, and a vertical arm 126, which extends upwardly through a rectangular hole 127, formed in the spool-flange between said ears, said arm standing in proximity to the spool-core and terminating at a point just below the upper spool-flange. A cam-plate 128, arranged beneath the lower spool-flange 122 and provided upon its under side with a recess 129, which overhangs the outer end of the horizontal arm 125 of said bell-crank, is constructed to have a vertical sliding movement upon two shouldered screws 130, which extend downwardly from the spool-flange and engage perforations 131, formed in the cam-plate. The coils of ribbon as they wind upon the spool normally press the vertical arm 126 of the bell-crank toward the spool-core, and through the arm 125 sustain the cam-plate 128 in an inoperative position in contact with the under surface of the spool-flange, as indicated at Figs. 15 and 16; but when the spool is empty and the restraint upon the arm 126 is removed said cam-plate drops and rests upon the heads of the screws

130, as indicated at Fig. 18, the holes 131 being counterbored to admit said screw-heads, as seen at Fig. 20.

A short vertical pin 132 projects upwardly from the inner end of one arm of a horizontal lever 133, which is pivoted upon a vertical screw 134, seated in the top plate 3, the other arm of said lever being normally in engagement with a vertical arm or lug 135, which extends up through a perforation 136 in the top plate and is fixed at its lower end by a screw 137, upon a sliding horizontal rod or wire 138, whose rear end is bent downwardly and inwardly at 139, Fig. 14, the lower end of said downturned portion being again bent at right angles to form a short forwardly-projecting horizontal trip-pin 140. The wire 138 is supported and guided in a bracket 141, which is secured by screws 142 to the under side of the top plate and is bent downwardly at its forward end to form an ear 143, which is perforated to receive the rod 138. Said bracket is also bent downwardly and inwardly at its rear end to form an arm 144, which is perforated at 145 in line with the perforation in the ear 143, to receive the rear end of the rod 138, and is also perforated or slotted at its lower end to guide or support the sliding finger or trip-pin 140.

Upon the right-hand end of the endwise-movable driving-shaft 56 is fixed a worm 146, which when the right-hand spool is delivering stands directly in front of the point of the trip-pin 140. Said pin is given a constant forward tendency by a compression-spring 147, Fig. 16, which bears rearwardly against the fixed arm 144 and forwardly against an adjustable collar 148, secured upon the rod 138. Said rod and pin are kept in their rearward or non-working positions by the lever 133, which for this purpose is provided with a spring 149, one end whereof is fixed in said lever and the other end whereof is inserted in a hole in the top plate, the tension of said spring being relatively superior to that of the spring 147. It will be seen that the inner end of the spring 149 is rigidly secured to the inner arm of the lever 133 and that the outer end thereof works loosely in the hole in the top plate, so that the outer arm of said lever is given a rearward pressure or tendency, and hence normally holds the arm 135 and rod 138 in their rearward positions.

The end of the ribbon is caught upon a buckle having sharpened hooks 150, as indicated at Figs. 17 and 21, said hooks being formed by turning inwardly the pointed ends of a yoke or U formed wire 151, the cross-piece of which is caught in a loop 152, formed on the end of a tab 153. The hooks 150 are parallel with and in the plane of the arms of the yoke, and a space is left between the points of the hooks and the cross-piece of the buckle for the insertion or passage of the end of the ribbon. Thus the device forms a very effective ribbon-fastener, which occupies little room and is not liable to catch ob-

structions and impede the movement of the ribbon. The other end of the tab is caught under a short plate 154, which curves around a part of the spool-core and is secured there-
5 to by a screw 155.

The spool is surrounded by an annular housing 156, secured upon the top plate by screws 157, which engage inwardly-turned ears 158, the purpose of the housing being
10 principally to prevent the coils of ribbon from bulging and slipping down around the lower spool-flange. The ribbon passes out from the spool through an opening or port 159, provided in said housing, a guard 160 being
15 provided at said opening to prevent the ribbon from slipping up around the top flange of the spool. The guard arches over the upper edge of the ribbon and is pivoted at one end at 161 to the housing 156. Its unpivoted
20 end may frictionally engage an outwardly-turned flange 162, provided upon the housing, or may be provided with a projection 163 to engage a hole or depression 164, formed in said flange. The housing being formed of
25 thin metal yields sufficiently to enable the engagement of said projection with said depression.

The spool rests upon a collar or shoulder 165, provided upon the shaft 45, and is detachably secured upon said shaft by a thumb-screw 166, said shoulder 165 being preferably
30 provided with a key 167, which engages a perforation in the lower spool-flange to insure the turning of the spool with the shaft.

When the last coil of ribbon pays off from the spool, the arm 126 is free to yield outwardly by reason of the combined weight of the arm 125 and the cam-plate 128, which latter gravitates to the position indicated at Fig.
40 18. Normally the plate stands at such a height as always to pass over the pin 132 upon the lever 133; but the descent of the plate brings it into the same horizontal plane as said pin, so that during further rotation of the
45 spool the leading edge 168 of the plate engages said pin and causes the lever to vibrate upon its pivot against the tension of its spring 149, as indicated at Fig. 12. This movement of the lever permits the slide 138 to move forwardly under the influence of the spring 147,
50 and the pin 140 engages the worm 146 upon the endwise-movable shaft 68, so that during its further rotation the shaft is wormed or cammed endwise toward the right, vibrating
55 the lever 62, until the roller 62^b, carried thereby, passes over the projecting point of the spring-cam 62^c, whereupon the cam forces the lever to complete both its own vibratory movement and the endwise movement of the shaft,
60 so that the pinion 60 thereon engages the pinion 55 upon the shaft 62.

It will be understood that the endwise worming movement of the shaft is accompanied by further rotative movements of the spools. A
65 sufficient extent of tab or ribbon is provided between the clamping-plate 154 and the pivoted arm 126 to enable the continued unwind-

ing movement of said spool at the reversing operation, during which movement the pin 132 rides along the outer edge of the cam-
70 plate 128, as indicated at Fig. 12, said edge being cut concentrically with the spool-axis to form a dwell portion, whereby the lever 133 is maintained in the inactive position
75 shown at said figure until the endwise shifting of the shaft 56 is effected. It will be noted that said cam-plate is similarly shaped at each end, so that either end thereof may operate, thus permitting the spools to be interchanged.
80

After the described endwise movement of the shaft 56, whereby the worm 146 is moved along out of engagement with the trip-pin 140, further rotation of the shaft 68 causes the shafts 52 and 45 to rotate and the right-
85 hand spool to wind. The first coil of the ribbon passes outside of the arm 126, and when the ribbon tightens it vibrates said arm inwardly or toward normal position, thereby lifting the plate 128. It will be understood
90 that the constant tendency of the plate is to cause said arm to vibrate outwardly, and hence during the intermittent return movements of the paper-carriage there is a liability on the part of said plate, acting through said
95 arm, to draw or belly out the single coil of ribbon, and thereby cause a reverse rotation of the ribbon-spool, together with shafts 45, 52, and 56, immediately after the reversing operation. To prevent this reverse move-
100 ment, we provide upon the shaft 56 a fine-toothed ratchet-wheel 169, which is engaged by a gravity-pawl 170, pivoted at 171 to an arm or ear 172, depending from the under
105 side of the top plate, the working edge or tooth of said pawl being widened, so as to enable it to engage said ratchet-wheel at either of the positions to which the latter is shifted at the
110 endwise movements of the shaft 56. It will also be understood that when the ribbon-vibrator descends from the printing-point—that is, from the dotted-line position to the full-line position shown at Fig. 1—a slack occurs
115 in the portion of the ribbon which extends between the spools, and hence that the ribbon tends to wind loosely upon the spool, and also that the slack permits an outward vibration of the arm 126, allowing the cam-plate 128 to drop. In order to avoid this difficulty and to
120 cause the cam-plate to rise to normal position and remain there, the core of the spool is cut away or slabbed off at 173 in proximity to arm 126, so as to give the coil of the ribbon a better purchase upon said arm, it being under-
125 stood that the more remote from said arm are the points at which the ribbon is supported upon said core the better is the pull or leverage thereof upon the arm. To the same end compression-springs 174 are placed upon the
130 vertical spool-shafts 44 and 45, the lower ends thereof pressing down upon the beveled pinions 47 and 48 and the upper ends thereof pressing up against the fixed bosses 46, so as to cause a frictional opposition to the rotation

of the shafts and spools, and therefore to put a tension upon the ribbon as it coils upon the winding-spool sufficient to enable the ribbon to force the arm 126 inwardly to normal position, lifting the cam-plate 128 and holding it up against the under side of the lower spool-flange, whereby it is disengaged from the pin 132 and enabled thereafter to pass over the latter during the rotation of the spool. Said springs 174 also tend to check any abnormal movement of the empty spool in an unwinding direction immediately after the reversing operation.

As soon as the ribbon is all delivered from the left-hand spool the foregoing operation is substantially repeated, the left-hand pin 140 engaging with the worm or screw 146, provided near the left-hand end of the shaft 68, and worming the latter toward the left to re-engage the pinion 59 with the pinion 54 and cause the ribbon to rewind upon the left-hand spool.

At any time the spools and ribbon may be bodily detached or removed from the machine without disconnecting the ribbon from either spool and another pair of spools containing a fresh or differently-colored ribbon may be substituted bodily—that is, without the necessity of attaching the ribbon end or ends to a spool or spools after the latter have been placed upon their shafts. The portion of the ribbon extending between the spools may be readily connected with the vibrator 110. After such substitution the automatic widthwise, longitudinal, and reverse movements continue as before, regardless of the length of ribbon upon either pair of spools. The elbow-levers and cams are detached, together with the spools, and it will be understood that each of the cams operates by a movement in one direction when its spool is placed upon one of the shafts and by a movement in the other direction when its spool is placed upon the other of said shafts, the cams being double-ended and the spools being interchangeable.

It will be seen that the ribbon-reversing mechanism at each side of the machine comprises a pair or set of tripping members, one member being mounted upon a driver which is common to both ribbon-spools and one member constantly tending to move into engagement with the other, means being provided for preventing such engaging movements until the ribbon is substantially all wound upon one of the spools. Said common driver being in the preferred form of the invention a rotary shaft, the tripping member which is arranged thereon is preferably in the form of a worm and the other tripping member is preferably in the form of a pin, which is constantly pressed toward the worm by spring 147, a second spring 149 being provided to oppose the spring 147 and hold the tripping members apart. Said trip-pin is normally disconnected from the spool; but when either spool becomes discharged of ribbon a con-

nection is automatically effected or an operative relation established between the spool and the trip-pin by reason of the outward movement of the arm 126, and thereupon the opposition of the spring 149 is overcome by the longitudinal tension of the ribbon exerted through the spool, the cam 128, and the lever 133, and thereby the spring-pressed trip pin or member 140 is released and permitted to engage its mate or coacting tripping member 146, thereby causing the shaft to worm endwise out of engagement with the one and into engagement with the other of the spool-gears 54 55 in the described manner, said movements taking place when the arm 126 or equivalent device, movable toward and away from the spool-axis, is released by the coils of ribbon. The reversing mechanism is automatically called into operation by the ribbon-winding mechanism, preferably through or by reason of the longitudinal movements of the ribbon and also preferably through the liberation of the outwardly-tending device 126 by the coils of ribbon. It will also be seen that the invention includes a pair of ribbon-spools having upright or erect axes and arranged one at each side of the type system or printing-point and forwardly of the platen, in combination with automatically-operating means actuated wholly by the spool-winding mechanism for causing the winding movement of the ribbon to be reversed. It will further be noted that a cam is mounted for rotation with each spool and that means are controlled by the ribbon for enabling the cam through its rotation about the spool-axis to operate devices which cause the direction of the ribbon-winding movement to be reversed. The cam is normally maintained or held in an inoperative position, and normally inactive devices extend from said cam to the self-shifting driver 56.

Our improvements may be carried out in many different ways, and we do not, therefore, wish the invention to be considered as limited to the specific details of construction and arrangement herein set forth. Said improvements may be adapted to other than front-strike machines, and portions of the invention may be used without others.

While we have shown a narrow ribbon and prefer to use the same, it will be understood, of course, that a ribbon of greater width may be employed, if desired. While we have shown our invention embodied in a machine in which the types shift in printing upper-case characters, it will of course be understood that the same may be embodied in a machine wherein the platen shifts, as is more commonly the case.

The devices for automatically reversing the winding movement of the ribbon may be adapted to machines of other general design and may be used independently of devices for moving the ribbon widthwise.

What we claim as new, and desire to secure by Letters Patent, is—

1. In a type-writing machine, the combination with a ribbon-winding mechanism, including a pair of spools and a rotary driving-shaft common to both spools, of worms 5 mounted upon said shaft, a cam rotating with each spool, and a normally stationary mechanism arranged between the cam on each spool and said driving-shaft and including a pin to engage its associated worm, said mechanism being adapted to be actuated by said 10 cam only when the latter is released by the ribbon, and to cause an engagement between said pin and said worm, and by the coöperation of said two last-mentioned devices to 15 cause an endwise movement of said shaft and a reversal of the winding movement of the ribbon.

2. In a front-strike writing-machine, the combination of a platen, a pair of ribbon- 20 spools arranged one at each side of the printing-point and forwardly of the platen, vertical shafts for said spools, gears upon said shafts, rearwardly - extending horizontal shafts having gears in mesh with said spool- 25 shaft gears, a transverse horizontal shaft connected by gearing with said rearwardly-extending shafts, and means called into action through the longitudinal movements of the ribbon for moving said transverse horizontal 30 shaft into and out of engagement with said rearwardly-extending shafts.

3. In a front-strike writing-machine, the combination of a platen, a pair of ribbon- 35 spools having upright axes arranged one at each side of the printing-point and forwardly of the platen, an arm mounted to rotate with each spool and having a constant tendency away from the spool-axis and normally held in an inoperative position by the coils of rib- 40 bon, and a cam, pin mechanism, and a worm for causing the direction of longitudinal movement of the ribbon to be automatically reversed.

4. In a front-strike writing-machine, the 45 combination of a platen, a pair of ribbon-spools having upright shafts arranged one at each side of the printing-point and forwardly of the platen, a ribbon-winding mechanism including a driving-shaft common to both 50 spools, shafts extending at each side of the machine forwardly from said common driving-shaft and geared at their forward ends to said upright spool-shafts, and means actuated by the ribbon-winding mechanism for automatically reversing the longitudinal movement 55 of the ribbon, said reversing means including an arm and a cam mounted to rotate with each spool and pin mechanism extending from said cams to said driving-shaft and operating to cause the latter to connect alternately with 60 said spools to wind the same.

5. In a type-writing machine, the combination with a ribbon-winding mechanism, including a pair of spools and a common rotary 65 driver therefor, of a cam mounted for rotation with each spool, normally inactive devices adapted to be connected to said rotary

driver for enabling said driver by means of its rotary movement to effect a reversal of the winding movement of the ribbon, and means 70 controlled by the ribbon for enabling said cams intermittently to operate said inactive devices and cause the latter to coöperate with said rotary driver.

6. In a type-writing machine, the combination with a ribbon-winding mechanism, including a pair of horizontal spools mounted upon vertical shafts, of a vertically-movable cam mounted on the under side of each spool and rotating therewith, but normally held in 80 an inactive position, and constructed to move automatically to an active position when the ribbon is unwound from the spool, and devices operated by said cam through its rotation about the spool-axis for causing the direction of the ribbon-winding movement to 85 be reversed.

7. In a type-writing machine, the combination with a ribbon-winding mechanism, including a pair of spools and a rotary driving- 90 shaft common to both spools and capable of a worming movement, of a cam mounted for rotation with each spool, normally inactive devices extending from said cams to said shaft, and means controlled by the ribbon 95 for enabling said cams to operate said normally inactive devices and cause the latter to coöperate with said shaft and thereby cause the shaft to worm and thereby become disconnected from one spool and connected to 100 the other spool.

8. In a type-writing machine, the combination with a ribbon-winding mechanism, including a pair of spools and an endwise-movable driving-shaft common to both spools, of 105 a cam mounted to rotate with each spool but normally held in an inactive position, and constructed to move automatically to an active position when the ribbon is unwound from the spool, and two sets of connections 110 from said cams to said driving-shaft, each of said sets of connections being constructed to be operated by its cam and to then coact with said shaft to cause endwise movements of said shaft independently of the other of said 115 sets of connections.

9. In a type-writing machine, the combination with a ribbon-winding mechanism, including a pair of spools, of a cam mounted for rotation with each spool, a ribbon-controlled 120 arm rotating with each spool and mounted independently of the cam but connected thereto, and devices operated by said cams through their rotation about the spool-axes for causing the direction of the ribbon-winding movement to be reversed. 125

10. In a type-writing machine, the combination with a ribbon-winding mechanism, including a pair of spools, of a pivoted arm arranged at the spool-core and a cam mounted 130 to rotate with each spool, said arm having a tendency away from the spool-axis but being normally held by the coils of the ribbon in an inoperative position, together with said cam,

the latter being arranged upon the outside of the spool and connected to said arm, and devices operated by said cam, when permitted to move to an active position by reason of the release of said arm from the control of the coils of the ribbon, for reversing the direction of the winding movement.

11. In a type-writing machine, the combination with a ribbon-winding mechanism, including a pair of spools and a self-shifting driving-shaft common to both spools, of a cam mounted to rotate with each spool, an arm independently mounted to rotate with each spool and connected to the cam, said arm and cam being held in inoperative positions by the coils of ribbon, and connections extending from said cams to said shaft and operated by said cams when the latter move to active positions by reason of the release of said arms from the control of the ribbon-coils, for causing said shaft to disconnect itself from the full spool and reconnect itself to the empty spool.

12. In a front-strike type-writing machine, the combination with a platen, of ribbon-winding mechanism, including a pair of spools having upright axes located upon opposite sides of the printing-point and forwardly of the platen, an elbow-lever pivoted upon the flange of each spool and comprising an upright arm arranged at or near the spool-core and a horizontal arm extending beneath the lower spool-flange, a vertically-movable cam carried upon the under side of the spool-flange and normally sustained in an inactive position by the horizontal arm of said elbow-lever, the upright arm of which is forced toward the spool-axis by the coils of the ribbon, and means operated by said cam upon the descent thereof when the elbow-lever is released from the control of said ribbon, for causing the direction of the ribbon-winding movement to be reversed.

13. In a type-writing machine, the combination with a ribbon-winding mechanism, including a pair of spools, of a normally inoperative cam connected to each ribbon-spool and controlled by the ribbon, and devices operated by said cams for causing the direction of the ribbon-winding movement to be reversed, each of said cams being provided with a dwell portion for maintaining said reversing devices in operative position during further rotation of the spool at the reversing operation.

14. In a type-writing machine, the combination with a ribbon-winding mechanism, including a pair of spools, of a cam mounted for rotation with each spool but normally held in an inactive position, and constructed to move automatically to an active position when the ribbon is unwound from the spool, and devices operated by said cam through its rotation about the spool-axis for causing the direction of the ribbon-winding movement to be reversed, each of said cams being provided with a dwell portion for maintaining said re-

versing devices in operative position during further rotation of the spool at the reversing operation.

15. In a type-writing machine, the combination with a ribbon-winding mechanism, including a pair of spools and a driving-shaft connected to both spools, of a cam arranged at each spool, normally inactive devices extending from said cams to said shaft, and means controlled by the ribbon for enabling said cam to operate said normally inactive devices and thereby cause the shaft to become disconnected from one and connected to the other spool, each of said cams being provided with a dwell portion for maintaining said reversing devices in operative position during further rotation of the spool at the reversing operation.

16. In a type-writing machine, the combination with a ribbon-winding mechanism, including a pair of spools, of an arm and a cam mounted to rotate with each spool, said arm having a tendency away from the spool-axis but being normally held by the coils of the ribbon in an inoperative position, together with said cam, and devices operated by said cam, when permitted to move to an active position by reason of the release of said arm from the control of the coils of the ribbon, for reversing the direction of the winding movement, each of said cams being provided with a dwell portion for maintaining said reversing devices in operative position during further rotation of the spool at the reversing operation.

17. In a front-strike type-writing machine, the combination with a platen, of ribbon-winding mechanism including a pair of spools having upright axes located upon opposite sides of the printing-point and forwardly of the platen, an elbow-lever pivoted upon a flange of each spool and comprising both an upright arm arranged at or near the spool-core and a horizontal arm extending beneath said flange, a vertically-movable cam mounted upon the under side of the spool-flange and normally sustained in an inactive position by the horizontal arm of said elbow-lever, the upright arm of which is forced toward the spool-axis by the coils of the ribbon, and means operated by said cam upon the descent thereof when the elbow-lever is released from the control of said ribbon for causing the direction of the ribbon-winding movement to be reversed, each of said cams being provided with a dwell portion for maintaining said reversing devices in operative position during further rotation of the spool at the reversing operation.

18. In a type-writing machine, the combination with a ribbon-winding mechanism, including a pair of spools, of a device mounted to rotate with each spool and to be held in an inactive position by the coils of the ribbon, a cam with which said spool device cooperates, and means controlled by said cam for causing the direction of the ribbon-winding move-

ment to be reversed, the construction and arrangement being such that when said device is liberated from the coils of the ribbon it co-operates with said cam to enable the latter to
 5 cause an operation of said reversing means, and such that said reversing means move at once to an active position and remain there during the continued rotation of the spool in an unwinding direction at the reversing op-
 10 eration.

19. In a type-writing machine, and in an automatic ribbon winding and reversing mechanism, the combination with a pair of spools and a self-shifting driver connected to
 15 both spools, of a ribbon-controlled cam for each spool, and connections from said cams to said driver, the construction and arrangement being such that a cam is automatically called into operation by reason of the longi-
 20 tudinal movement of the ribbon, and through its said connections causes a shifting movement to be effected by said driver, each of said cams being provided with means for en-
 25 abling said connections to remain in their active positions during a continued winding of the ribbon upon the full spool by said driver while the shift is being effected.

20. In a type-writing machine, the combination with a ribbon-winding mechanism, in-
 30 cluding a pair of spools and a common driver for the spools, of a pair of tripping members one of which is mounted upon said driver, and one of which constantly tends to engage the other, a releasable device normally pre-
 35 venting an engagement of said tripping members, and a ribbon-controlled device for forcing said releasable device to a releasing position.

21. In a type-writing machine, the combi-
 40 nation of a pair of ribbon-spools, a self-shifting driver common to both spools and provided with a tripping device, a trip-pin normally tending to engage said tripping device, means normally holding said trip-pin out of
 45 operative position, and means rotating with one of said spools for moving said holding means to a position for permitting said trip-pin to move into engagement with said trip-
 50 ping device.

22. In a type-writing machine, the combination with a pair of ribbon-spools, of a self-shifting driver common to both spools and provided with a tripping device, a trip-pin
 55 normally tending to engage said tripping device, a device on the framework between the spool and the trip-pin and normally holding said trip-pin out of operative position, and means operable through the longitudinal
 60 movements of the ribbon for forcing said holding device to release said trip-pin.

23. In a type-writing machine, the combination with a pair of ribbon-spools, of a self-shifting driver connected to both spools and provided with a tripping device, a trip-pin
 65 normally tending to engage said tripping devices, a device normally holding said trip-pin

out of active position, a device mounted to rotate with each spool and to be held in inoperative position by the coils of ribbon, and means called into action by said spool devices
 70 when released by the ribbon for forcing said pin-holding device to release said pin.

24. In a type-writing machine, the combination with a pair of ribbon-spools, of a driver connected to both spools, a pair of tripping
 75 members one of which is mounted upon said driver, and one of which constantly tends to engage the other, a device normally preventing such engagement, a ribbon-controlled cam connected to a spool and rotating therewith,
 80 and means for enabling said cam to cause an engagement of said tripping members.

25. In a type-writing machine, the combination with a pair of ribbon-spools, of a driver connected to both spools, a pair of tripping
 85 members one of which is mounted upon said driver, and one of which constantly tends to engage the other, a cam mounted so that it may rotate with a spool, and mechanism controlled by the said cam and extending to said
 90 last-mentioned tripping member, and including a device which normally prevents movement of the latter.

26. In a type-writing machine, the combination with a pair of ribbon-spools, of a driver
 95 common to both spools, a pair of tripping members one of which is mounted upon said driver, and one of which constantly tends to engage the other, a cam mounted so that it may rotate with a spool, and a releasing de-
 100 vice controlled by the said cam and extending to said last-mentioned tripping member, said cam being provided with a dwell portion for holding said releasing device in operative
 105 position during the continued winding of the ribbon upon the other spool at the shifting movement of said driver.

27. In a type-writing machine, the combination with a pair of ribbon-spools, of a driver
 110 common to both spools, two sets of tripping members, one member of each set being mounted upon said driver, and one member of each set being mounted on the framework and constantly tending to move into engage-
 115 ment with its mate, devices normally preventing such engaging movements, and means controlled by the ribbon for forcing said devices to releasing position.

28. In a type-writing machine, the combination with a pair of ribbon-spools, of a driver
 120 common to both spools, two sets of tripping members, one member of each set being mounted upon said driver and one member of each set being mounted on the framework and constantly tending to move into engagement
 125 with its mate, a cam associated with each of the last-mentioned tripping members, one cam being connected to one spool and the other cam being connected to the other spool, devices engageable by said cams and nor-
 130 mally holding said tripping members out of engagement, and means called into action by

the longitudinal movements of the ribbon for enabling said cams to force said holding devices to release said tripping members.

29. In a type-writing machine, the combination with a pair of ribbon-spools, of a driving-shaft common to both spools, a pair of worms upon said shaft, a pair of tripping-pins tending normally to engage said worms, devices normally holding said tripping-pins out of engagement with said worms, said holding devices being arranged on the framework and normally disconnected from the spools, and means operating automatically through the longitudinal movements of the ribbon for forcing said holding devices to release said tripping-pins one at a time, whereby said shaft is caused to drive the spools alternately.

30. In a type-writing machine, the combination with a pair of ribbon-spools, of a driving-shaft common to both spools, a pair of worms upon said shaft, a pair of tripping-pins tending normally to engage said worms, devices normally holding said tripping-pins out of engagement with said worms, a cam arranged at each spool, and means called into action through the longitudinal movements of the ribbon for enabling said cams to force said holding devices to release said pins.

31. In a type-writing machine, the combination with a pair of ribbon-spools, of a driving-shaft common to both spools, a pair of worms upon said shaft, a pair of tripping-pins tending normally to engage said worms, a cam arranged at each spool, and an arm mounted to rotate with each spool and to be inclosed by the coils of the ribbon, said arms being constructed to cooperate with the cams when released by the ribbon, to enable the cams to release said tripping-pins.

32. In a type-writing machine, the combination with a pair of ribbon-spools, of a driving-shaft common to both spools, a pair of worms upon said shaft, a pair of tripping-pins tending normally to engage said worms, a cam arranged at each spool, and an arm mounted to rotate with each spool and to be inclosed by the coils of ribbon, said arms being constructed to cooperate with the cams, when released by the ribbon, to enable the cams to release said tripping-pins, and said cams being provided with dwell portions to enable said pins to remain in operative position during the worming movements of said shaft and the accompanying rotation of the spools.

33. In a type-writing machine, the combination with a pair of ribbon-spools, of a driving-shaft connected to both spools, a pair of worms upon said shaft, tripping-pins 140, springs 147, cams 128, connections from said cams to said tripping-pins, and arms 126 connected to said cams 128.

34. In a type-writing machine, the combination with a pair of ribbon-spools, of a driver common to both spools, a pair of tripping members one of which is mounted upon said driver, a spring normally pressing one of said members toward the other, a second spring

for opposing the first spring and normally holding said tripping members apart, and means controlled by said ribbon-winding mechanism for overcoming the opposition of said second spring and thereby releasing said spring-pressed tripping member, so that the latter may engage its mate.

35. In a type-writing machine, the combination with a pair of ribbon-spools, of a driver common to both spools, a pair of tripping members one of which is mounted upon said driver, a spring normally pressing one of said members toward the other, a second spring for opposing the first spring and normally holding said tripping members apart, an arm mounted to rotate with each spool and to be inclosed by the coils of the ribbon, and means called into action when said arm is released by the ribbon, for overcoming the opposition of said second spring and thereby releasing said spring-pressed tripping member so that the latter may engage its mate.

36. In a type-writing machine, the combination with a pair of ribbon-spools, of a driver common to both spools, a pair of tripping members one of which is mounted upon said driver, a spring normally pressing one of said members toward the other, a second spring for opposing the first spring and normally holding said tripping members apart, a cam arranged at each spool, and means called into action by the longitudinal movements of the ribbon for causing said cam, during the unwinding movement of the spool, to overcome the opposition of said second spring and thereby release said spring-pressed member so that the latter may engage its mate.

37. In a type-writing machine, the combination with a pair of ribbon-spools, of a driver common to both spools, a pair of tripping members one of which is mounted upon said driver, a spring normally pressing one of said members toward the other, a second spring for opposing the first spring and normally holding said tripping members apart, a cam arranged at each spool, and means called into action by the longitudinal movements of the ribbon for causing said cam, during the unwinding movement of the spool, to overcome the opposition of said second spring and thereby release said spring-pressed member so that the latter may engage its mate, said cam being provided with a dwell portion, so as to hold said second spring in an inoperative position during the worming action of said shaft and the accompanying spool movement.

38. In a type-writing machine, the combination with a pair of ribbon-spools, of a driver common to both spools, a pair of tripping members one of which is mounted upon said driver, a spring normally pressing one of said members toward the other, a second spring for opposing the first spring and normally holding said tripping members apart, a cam arranged at each spool, and an arm mounted to rotate with each spool and to be inclosed by the coils of the ribbon, said arm being con-

5 constructed to cooperate with the cam when released by the coils of the ribbon, to enable said cam to overcome the opposition of said second spring and thereby release said spring-pressed tripping member, so that the latter may engage its mate.

10 39. In a type-writing machine, the combination with a pair of ribbon-spools, of a driver common to both spools, two sets of tripping members, one member of each set being mounted upon said driver, springs for normally pressing one member toward the other member of each set, springs for opposing said trip-springs and normally holding said tripping members apart, and means controlled by said ribbon-winding mechanism for overcoming the opposition of said opposing springs and thereby releasing said spring-pressed tripping members so that they may engage
20 their mates.

40. In a type-writing machine, the combination with a ribbon-winding mechanism, including a pair of spools, and a driving-shaft, of a worm on said shaft, trip-pin 140, spring
25 147, lever 133 controlling said trip-pin, spring 149, cam 128, and arm 126 controlling said cam.

41. In a type-writing machine, the combination with a ribbon-winding mechanism, including a pair of spools and a driving-shaft
30 common to both spools, of a pair of worms upon said shaft, trip-pins 140, springs 147, levers 133 controlling said trip-pins, springs 149, cams 128, and arms 126 controlling said cams.

35 42. In a type-writing machine, the combination with a ribbon-winding mechanism, including a pair of spools and a driving-shaft common to both spools, of a pair of worms upon said shaft, trip-pins 140, springs 147,
40 levers 133 controlling said trip-pins, springs 149, pins 132, cams 128 mounted upon said spools, and elbow-levers 125, 126, also mounted upon said spools and controlling said cams.

43. In a type-writing machine, the combination with a ribbon-winding mechanism, including a pair of spools and a driving-shaft
45 common to both spools, of a pair of worms upon said shaft, rods 138, springs 147, trip-pins 140, fingers 135, levers 133 controlling said trip-pins, cams 128, and arms 126 controlling said cams.
50

44. In a type-writing machine, the combination with a ribbon-winding mechanism, including a pair of spools and a transverse
55 driving-shaft common to both spools, of a pair of worms upon said shaft, rods 138, arms 139, trip-pins 140, brackets 141, fingers 135, levers 133, springs 149, cams 128, and elbow-levers 125, 126.

60 45. In a front-strike type-writing machine, the combination with a platen, a carriage and a propelling-spring therefor, of ribbon-winding mechanism including a pair of spools arranged one at each side of the printing-point
65 and forwardly of the platen, shafts 44, 45, 51, 52, 56, gears 47, 48, 49, 50, 54, 55, 59, 60,

worms 146, pins 140, levers 133 controlling said trip-pins, cams 128, and elbow-levers 125, 126 controlling said cams.

46. In a front-strike type-writing machine, 70 the combination with a platen, a carriage and a propelling-spring therefor, of ribbon-winding mechanism including a pair of spools arranged one at each side of the printing-point and forwardly of the platen, shafts 44, 45, 51, 52, 56, 75 gears 47, 48, 49, 50, 54, 55, 59, 60, worms 146, pins 140, springs 147, levers 133 controlling said pins, springs 149, cams 128, and elbow-levers 125, 126 controlling said cams.

47. In a type-writing machine, the combination with a ribbon-winding mechanism, including a pair of spools, and a spool-winding mechanism, including a rotary driving-shaft common to both spools, of an independent mechanism extending from each spool to said
80 shaft but normally disconnected from both the spool and the shaft for causing the direction of the ribbon-winding movement to be reversed by the operation of said shaft when said mechanism is connected thereto; and 90 means for causing said mechanism to be connected to said shaft.

48. In a type-writing machine, the combination with a ribbon-winding mechanism including a pair of spools, and a spool-winding
95 mechanism including a rotary driving-shaft common to both spools, of an arm mounted to rotate with each spool and to be inclosed by the coils of ribbon, and an independent mechanism extending from said arm to said
100 shaft but normally disconnected from both said devices, for causing the direction of the ribbon-winding movement to be reversed, said independent mechanism being automatically connected to said arm and to said shaft when
105 the arm is released by the coils of ribbon.

49. In a type-writing machine, the combination with a ribbon-winding mechanism, including a pair of spools, and a spool-winding mechanism including gears connected to said
110 spools and also including an endwise-movable driving-shaft provided with gears which are adapted to mesh with said spool-gears, of means for moving said shaft endwise to disengage one of said gears thereon from one
115 spool-gear and to engage the other of said spool-gears thereon with the other spool-gear, said endwise-moving means including devices mounted upon said spools and constructed to be controlled by the ribbon, and also including
120 devices extending from said spools to said shaft and normally disconnected from said ribbon-controlled devices but adapted to be acted upon by the latter when the spool becomes discharged of ribbon and in turn to act
125 upon said shaft and cause it to move endwise as it revolves.

50. In a type-writing machine, the combination with a ribbon-spool and a driver therefor, of a pair of normally disengaged tripping
130 members, one of which is mounted upon said driver, devices extending from the other of

said tripping members to said spool but normally disconnected from the spool, and means controlled by the ribbon for automatically acting on said devices and thereby causing said tripping members to become engaged to cause a shifting movement of said driver.

51. In a type-writing machine, the combination of a pair of ribbon-spools and a common driver therefor, of two sets of tripping members, one member of each set being mounted upon said driver, devices extending from the other tripping members to said spools but normally disengaged from the spools, and means controlled by the ribbon for automatically acting on said devices in alternation and thereby causing the tripping members of each set to become engaged in alternation and effect a back-and-forth shifting movement of said common driver.

52. In a type-writing machine, the combination with a pair of ribbon-spools and a rotary driving-shaft common to both spools, of a pair of worms upon said shaft, a pair of tripping-pins normally disengaged from said worms, and ribbon-controlled devices normally disconnected from said tripping-pins and mounted to rotate with said spools, the construction and arrangement being such that when either spool is discharged of ribbon the ribbon-controlled device thereon is automatically connected to its associated tripping-pin and the latter is engaged to its associated worm, whereby said shaft is caused to have an endwise movement.

53. In a type-writing machine, the combination with a pair of ribbon-spools of a rotary driving-shaft common to both spools, two worms upon said shaft, trip-pins normally disengaged from said worms, and an arm mounted to rotate with each spool and to be inclosed by the coils of ribbon, each of said arms being normally disconnected from its associated trip-pin, and the construction and arrangement being such that when said arm is released by the coils of ribbon it is automatically connected to said trip-pin and the latter is caused to engage said worm, whereby said shaft is caused to move endwise.

54. In a type-writing machine, the combination with a ribbon-winding mechanism, including a pair of detachable spools, of automatically-operating means for causing the direction of the ribbon-winding movement to be reversed, said reversing means including an elbow-lever pivoted upon each spool and detachable therewith, one arm of said lever extending within the spool and being constructed to be inclosed by the coils of the ribbon, and the other arm thereof extending along the spool-flange, said last-mentioned arm being connected to the reversing devices and being constructed to perform its reversing function when the first-mentioned arm is released by the coils of the ribbon.

55. In a type-writing machine, the combination with a ribbon-winding mechanism, in-

cluding a pair of interchangeable spools detachably mounted upon a pair of shafts, of a ribbon-controlled double cam mounted upon each spool and detachable therewith, and devices actuatable by said cams for causing the direction of the ribbon-winding movement to be reversed, each of said cams being constructed to operate by a movement in one direction when its spool is placed upon one of said shafts, and by a movement in the other direction when its spool is placed upon the other of said shafts.

56. In a type-writing machine, the combination with a ribbon-winding mechanism, including a pair of interchangeable spools detachably mounted upon a pair of shafts, of a ribbon-controlled double cam mounted upon each spool and detachable therewith, and devices actuatable by said cams for causing the direction of the ribbon-winding movement to be reversed, each of said cams being constructed to operate by a movement in one direction when its spool is placed upon one of said shafts, and by a movement in the other direction when its spool is placed upon the other of said shafts, and each cam being provided with a dwell portion between its ends, whereby said reversing devices are maintained in operative positions during the continued rotative movements of the spools.

57. In a type-writing machine, the combination with a ribbon-winding mechanism, including a pair of ribbon-spools carried by upright shafts, a pair of horizontal shafts connected to said vertical shafts, and a driving-shaft for said horizontal shafts, of a pair of worms for said driving-shaft, a pair of devices extending from said worms to said spools and having trip-fingers for engaging said worms, and means arranged at the spools and normally disconnected from said trip-finger devices, for moving the latter so as to enable the trip-fingers to engage the worms.

58. In a type-writing machine, the combination with a ribbon-winding mechanism, including a pair of spools, of a ribbon-controlled cam mounted to rotate with each spool and having a dwell portion concentric to the spool-axis, and devices operated by said cams and held in working position by said dwell portions, for causing the direction of the ribbon-winding movement to be reversed.

59. In a type-writing machine, the combination with a carriage, a propelling-spring therefor, and a ribbon-winding mechanism operated by said carriage-spring and including a pair of spools, of an arm mounted to rotate with each spool and to be inclosed by the coils of the ribbon and having a constant tendency outward or away from the spool-axis, mechanism operated by said arms for causing the direction of the ribbon-winding movement to be reversed, and a pawl-and-ratchet mechanism as 169, 170, arranged between said carriage-spring and said spools, for preventing an unwinding movement of the empty

spools immediately after the reversing operation, by reason of the outward pressure of said arms.

60. In a visible-writing machine, the combination with a platen and a type mechanism, of a ribbon-winding mechanism, including a pair of spools, an arm mounted to rotate with each spool and to be inclosed by the coils of the ribbon thereon and having a constant tendency away from the spool-axis, devices operated by said arms for causing the direction of the ribbon-winding movement to be reversed, means arranged between the spools for moving the ribbon widthwise at each type-stroke to cover and uncover the printing-point, whereby a slack occurs at each type-stroke in the portion of ribbon extending between the spools, and means for frictionally opposing rotation of the spools, whereby after the reversing operation an unwinding movement of the empty spool is checked and the ribbon is rendered taut and enabled to move said arms toward the spool-axes during the initial winding movement of the empty spools and maintain them there.

61. In a type-writing machine, the combination with a platen and a type system, of a pair of ribbon-spools having upright axes arranged forwardly of the platen and one at each side of the type system, housings 156, having ribbon-openings 159, and movable latched guards 160 overlying said openings.

62. In a type-writing machine having a top plate, as 3, the combination with a platen constructed to run over the top plate and a type system arranged forwardly of the platen, of a pair of ribbon-spools mounted upon vertical shafts and arranged above said top plate forwardly of the platen, and one at each side of the type system, and housings 156 secured upon said top plate and having ribbon-openings 159 and releasable movable guards 160 overlying said pins.

63. In combination, a ribbon-spool carrying on its under side a cam which is adapted to move to and from the lower flange of said spool, means for guiding said cam in its said movements, a pivoted arm arranged between the flanges of the spool and adapted to be acted on by the coils of the ribbon, and means connecting said arm with said cam so that when the arm is moved toward the core of the spool by the winding of the ribbon it will raise and hold up said cam, but when the ribbon is unwound and releases said arm it will permit the said cam to fall or drop away from the lower flange of the spool.

64. In combination with a ribbon-spool comprising a core and top and bottom flanges, two arms pivoted below the bottom flange, one arm extending through an opening up and between the flanges of the spool and so as to be acted on by the coils of the ribbon, and the other arm extending horizontally, and a vertically-moving cam arranged exteriorly of and on the under side of said spool and connected to the last-mentioned arm.

65. In combination with a ribbon-spool comprising a core and upper and lower flanges, an elbow-lever pivoted on the under side of said lower flange and having a vertical arm which extends up substantially parallel with the core of the spool and a horizontal arm which extends substantially parallel with the bottom flange of the spool and which is arranged exteriorly of and beneath said flange, a vertically-movable cam connected to said horizontal arm, and means depending from the bottom flange of the spool for guiding the movements of said cam to and from said flange and for limiting its downward movement.

66. In combination with a ribbon-spool comprising a cylindrical core slabbed off or flattened on one side and top and bottom flanges, an elbow-lever having a vertical arm adjacent said slabbed-off or flattened side, said lever being pivoted on the under side of the lower flange and having a horizontally-arranged arm beneath said flange, a cam connected to the last-mentioned arm, and means depending from said flange for guiding said cam in its up-and-down movements relatively to said lower flange.

67. A ribbon-spool carrying on its under side a cam and also carrying a bent lever which is connected to said cam, one arm of said lever being adapted to be acted on by the coils of the ribbon to hold up the other arm and the said cam, and the said lever being adapted to vibrate when the ribbon is unwound and to permit the said cam to descend or drop away from the spool.

68. A ribbon-spool having a bottom flange, a double cam having an intermediate dwell and mounted to move toward and away from said flange, and a ribbon-controlled lever pivoted to said spool and connected with said cam beneath the spool.

69. In combination, a ribbon-spool having a lower flange which is provided with a pair of depending ears in which is pivotally supported an elbow-lever comprising a horizontal arm 125 which extends outwardly from said pivot beneath the spool-flange, and a vertical arm 126 which extends upwardly through a hole formed in the spool-flange, a cam-plate 128 arranged beneath the lower spool-flange and provided upon its under side with a recess 129 which overhangs the outer end of the horizontal arm 125 of the elbow-lever, and shouldered screws or pins 130 extending downwardly from the spool-flange and engaging perforations formed in the cam-plate.

Signed at borough of Manhattan, in the city of New York, in the county of New York and State of New York, this 8th day of August, A. D. 1900.

JACOB FELBEL.
CARL GABRIELSON.

Witnesses:

B. C. STICKNEY,
K. V. DONOVAN.