

No. 626,354.

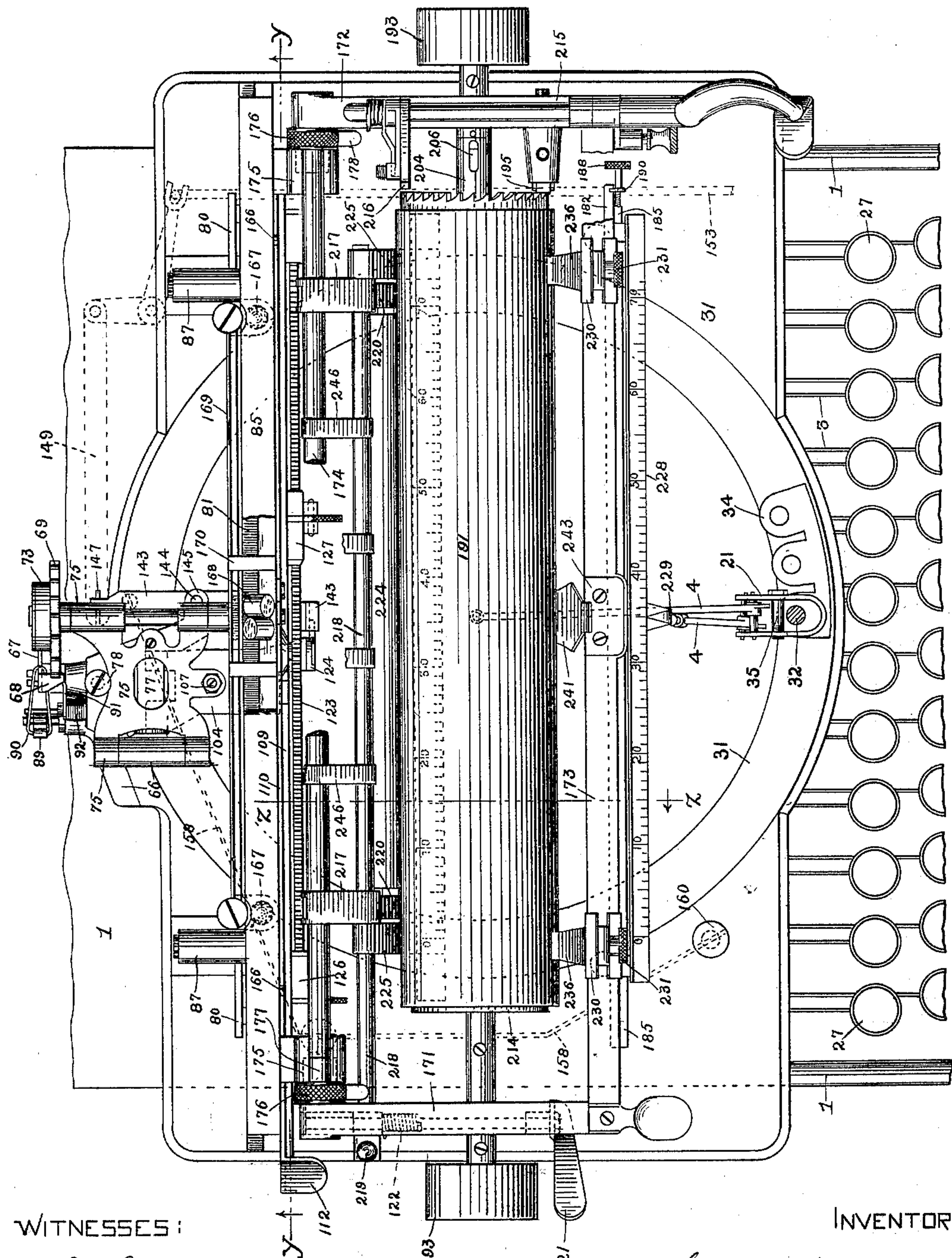
Patented June 6, 1899.

C. D. WALLACE.
TYPE WRITING MACHINE.

(Application filed Feb. 3, 1898.)

(No Model.)

12 Sheets—Sheet 1.



WITNESSES:

H. H. Steele.

E. M. Wells.

Fig. 1.

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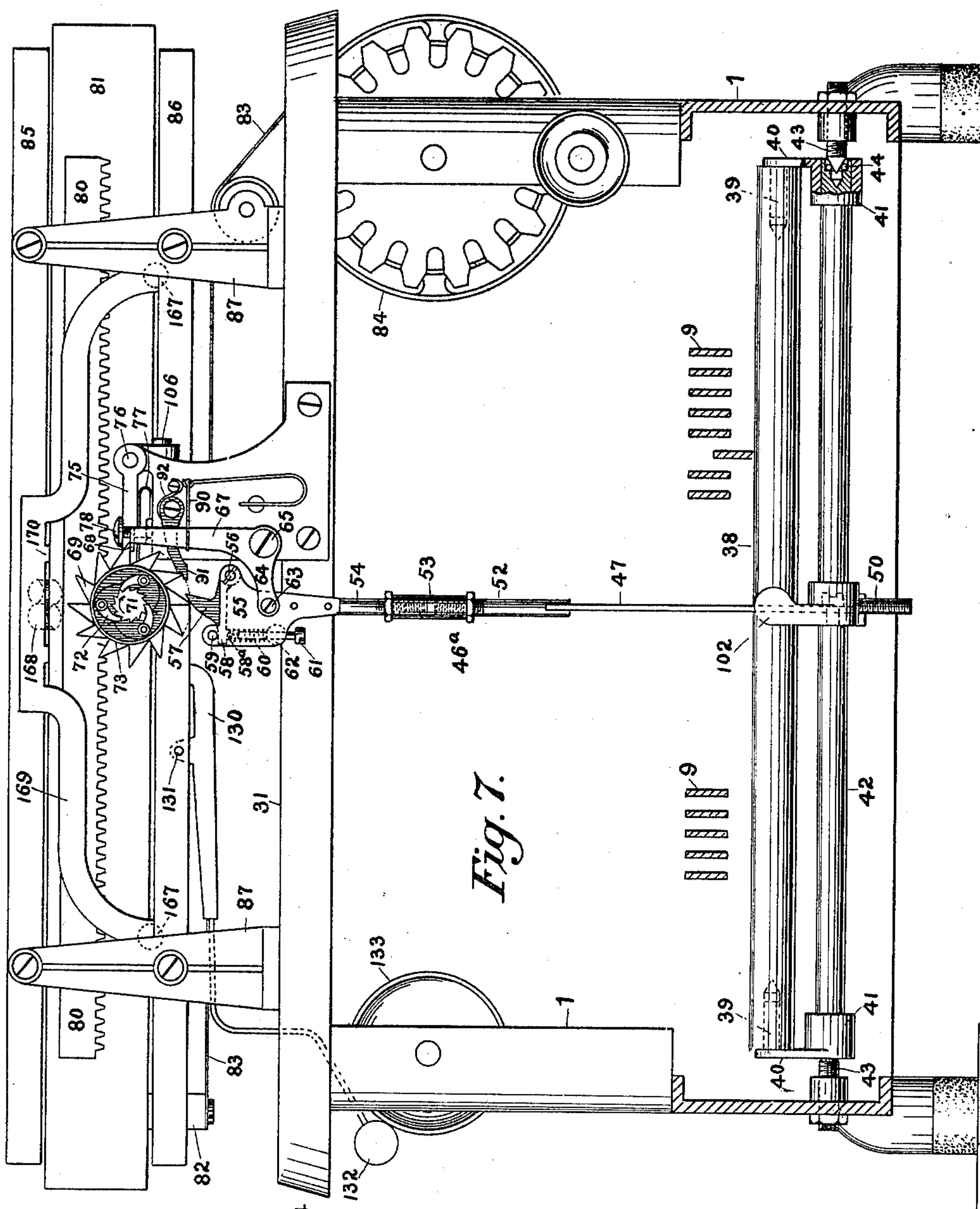


Fig. 1.

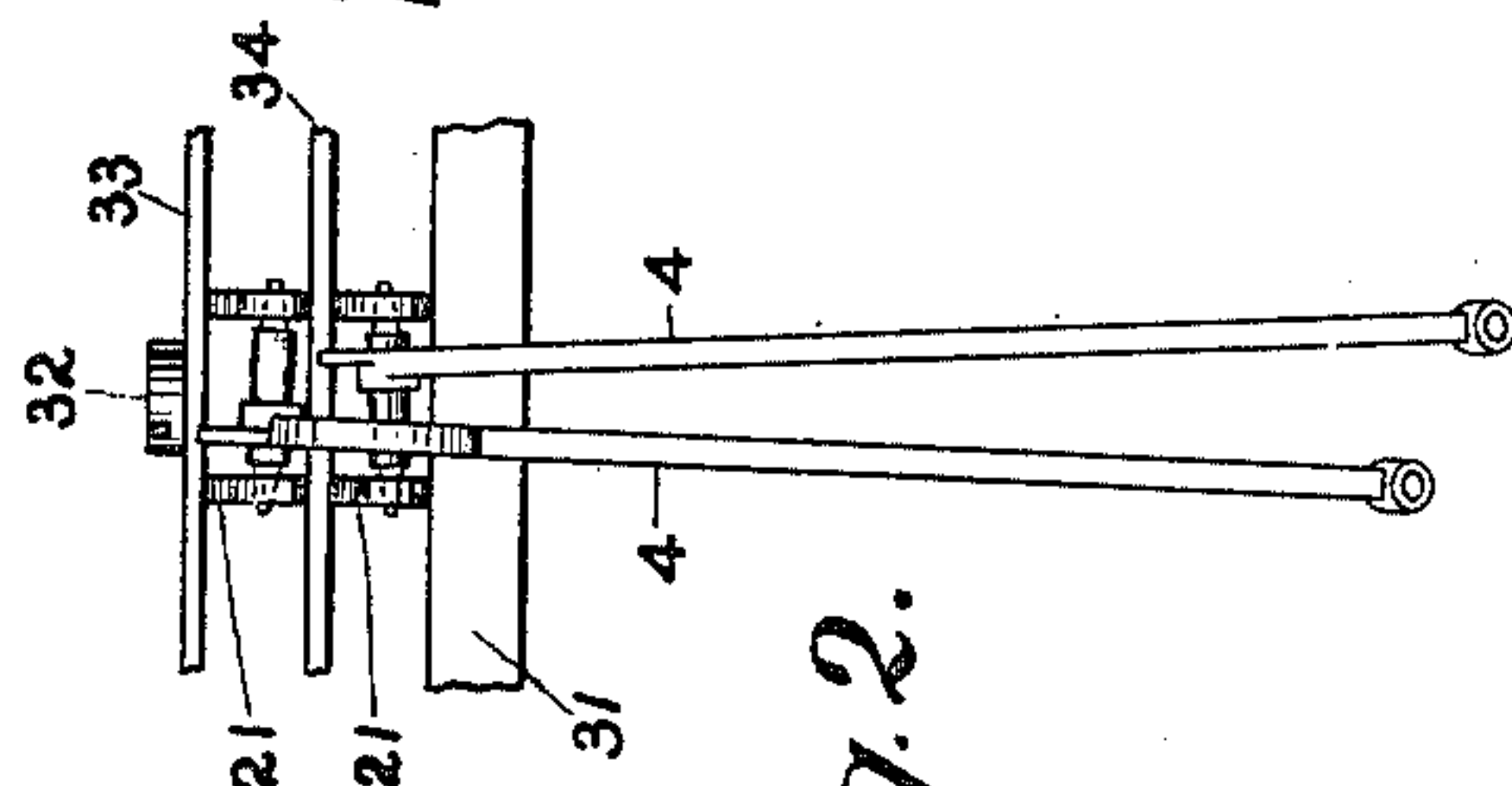


Fig. 2.

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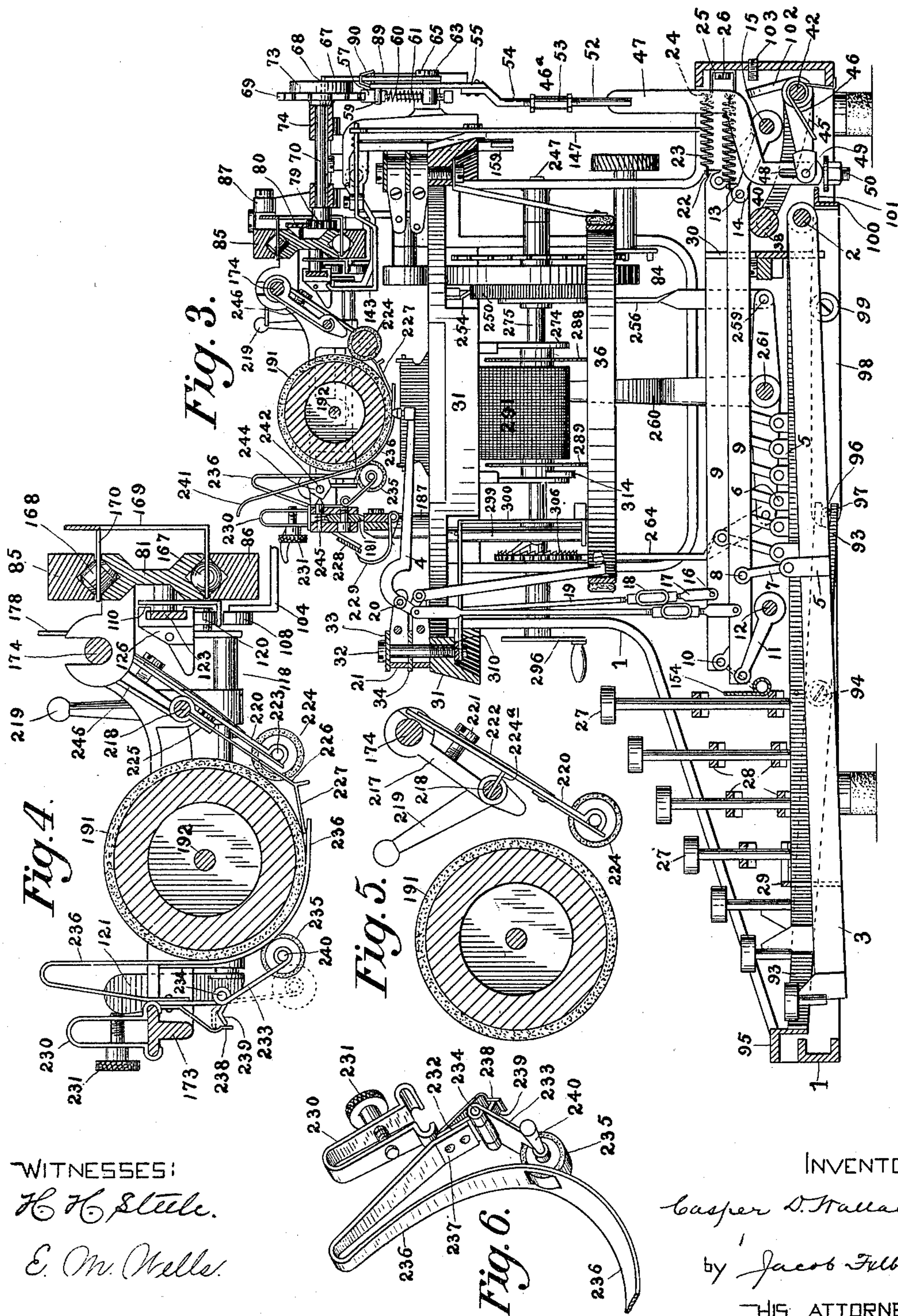
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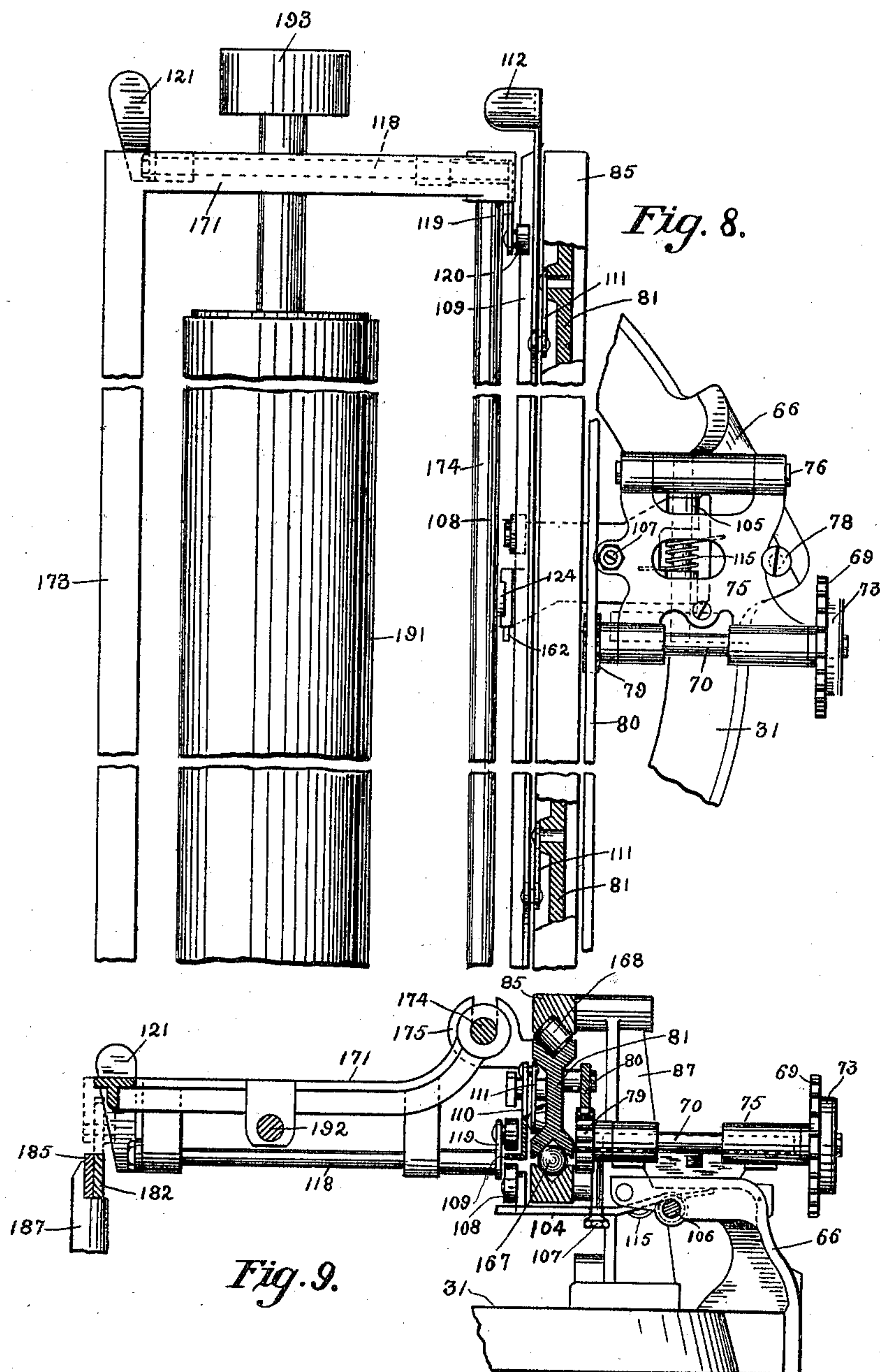
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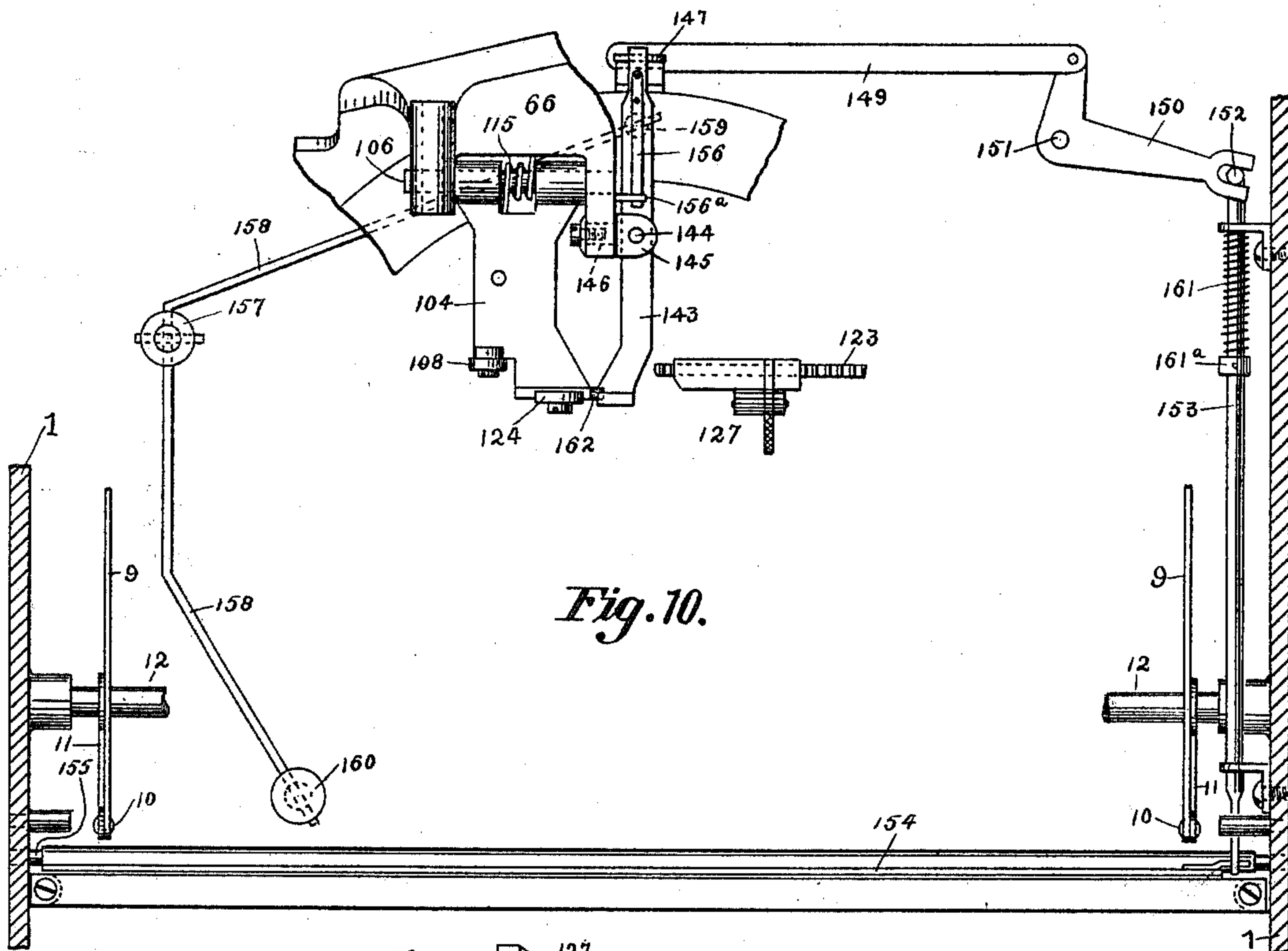


Fig. 10.

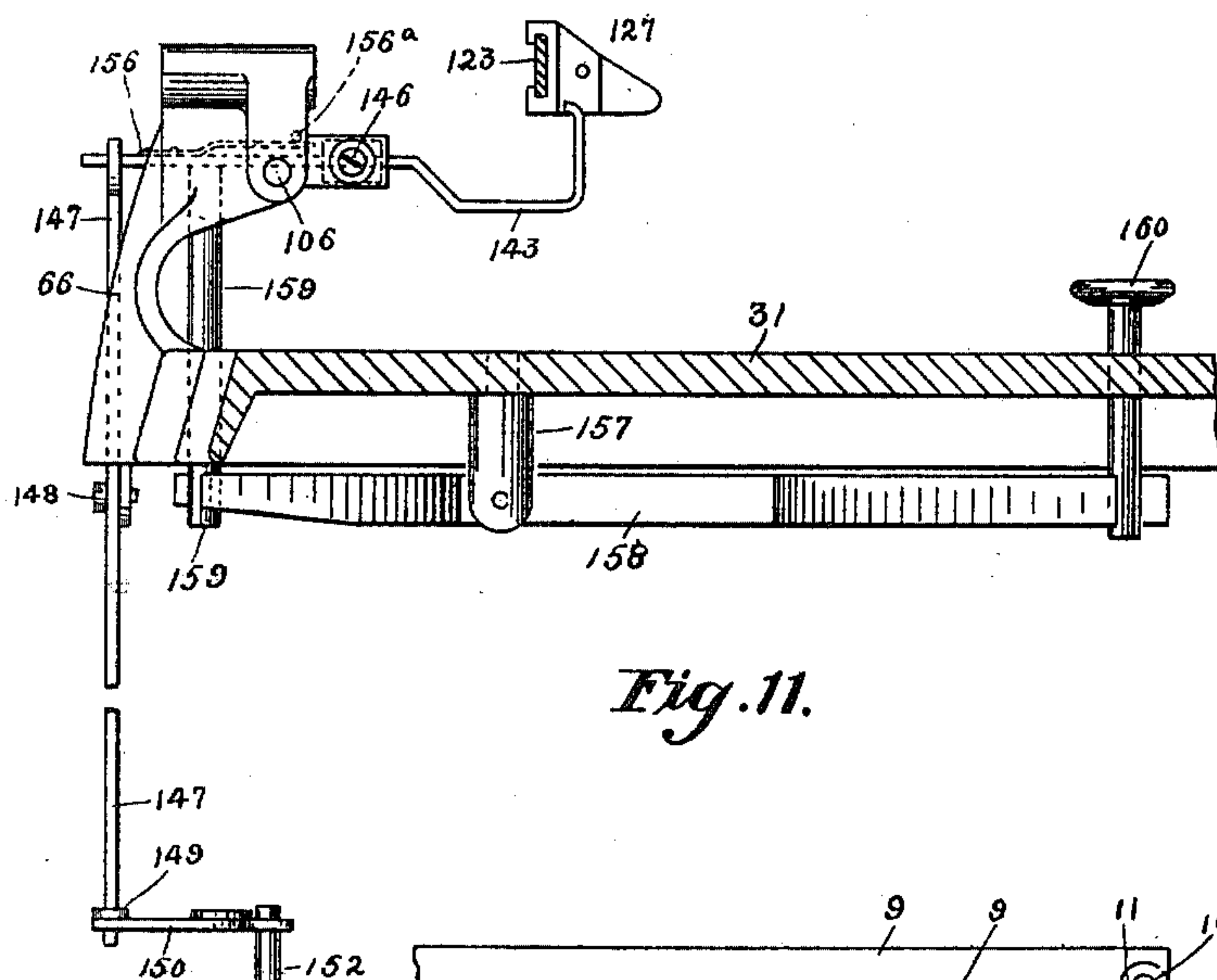


Fig. 11.

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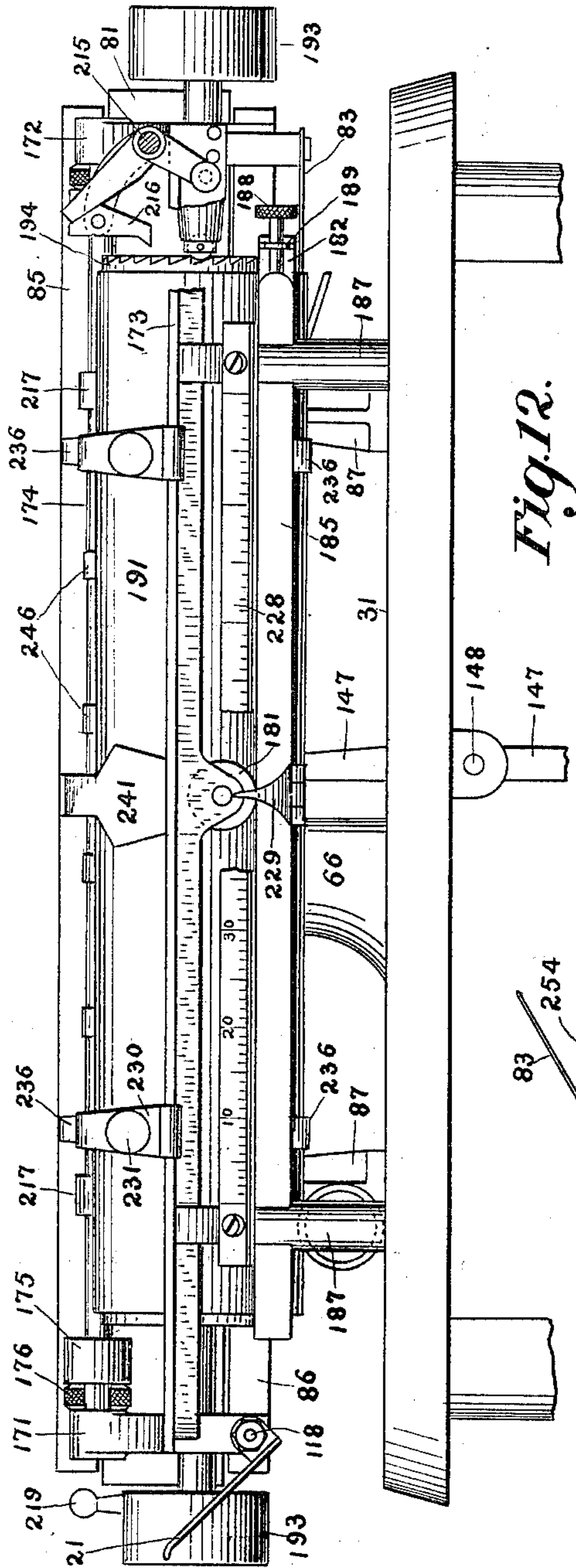


Fig. 12.

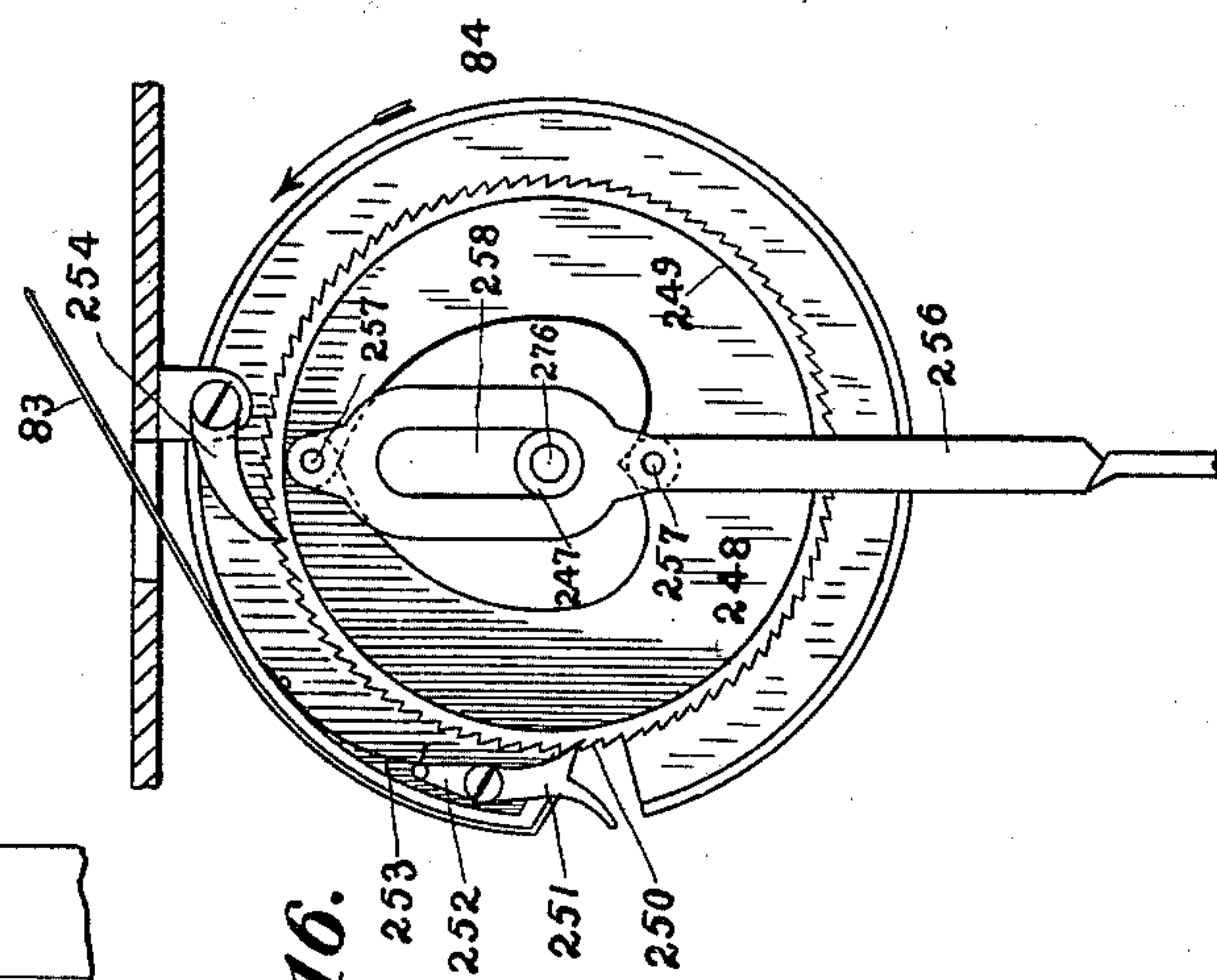


Fig. 16.

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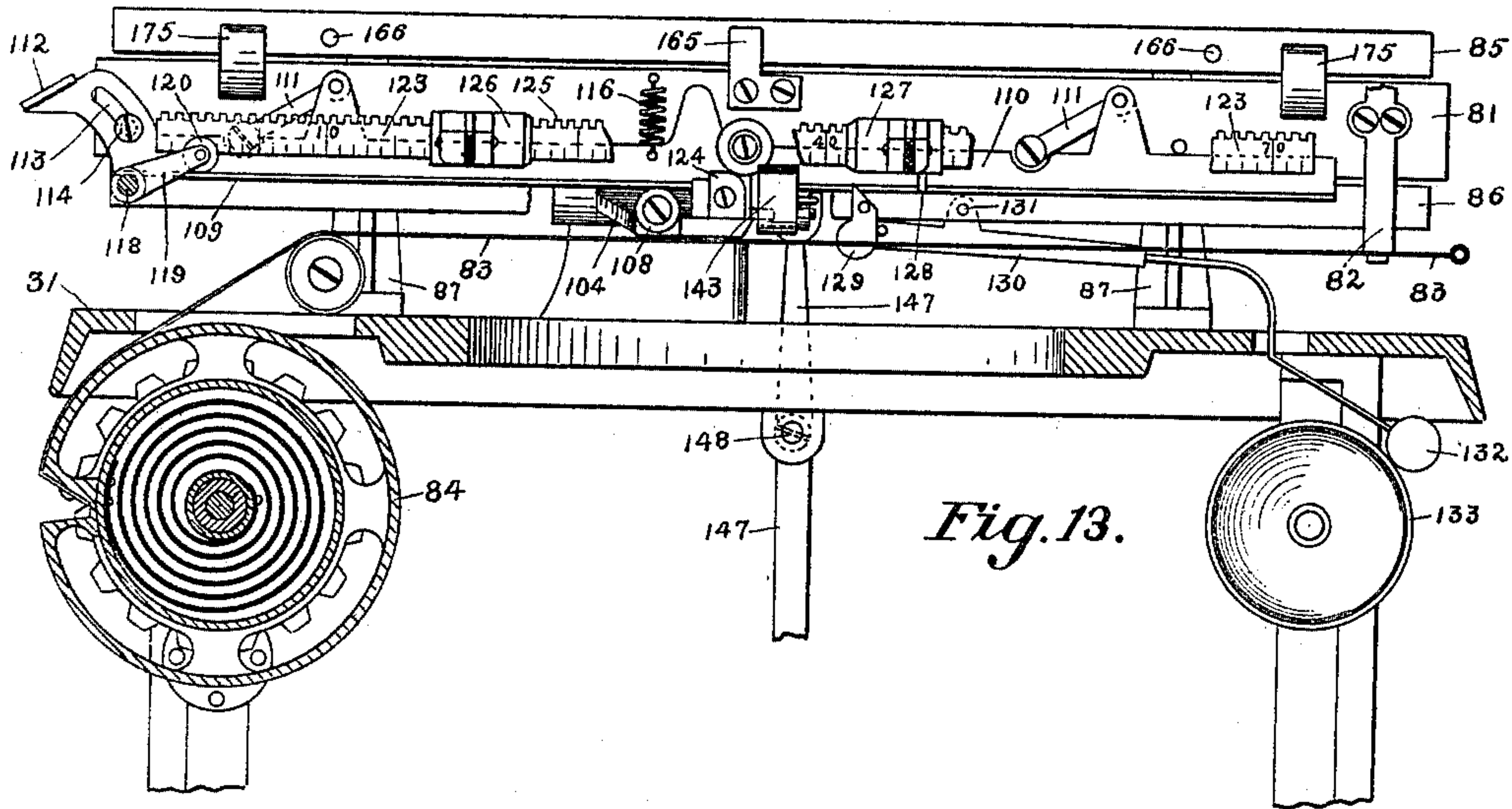


Fig. 13.

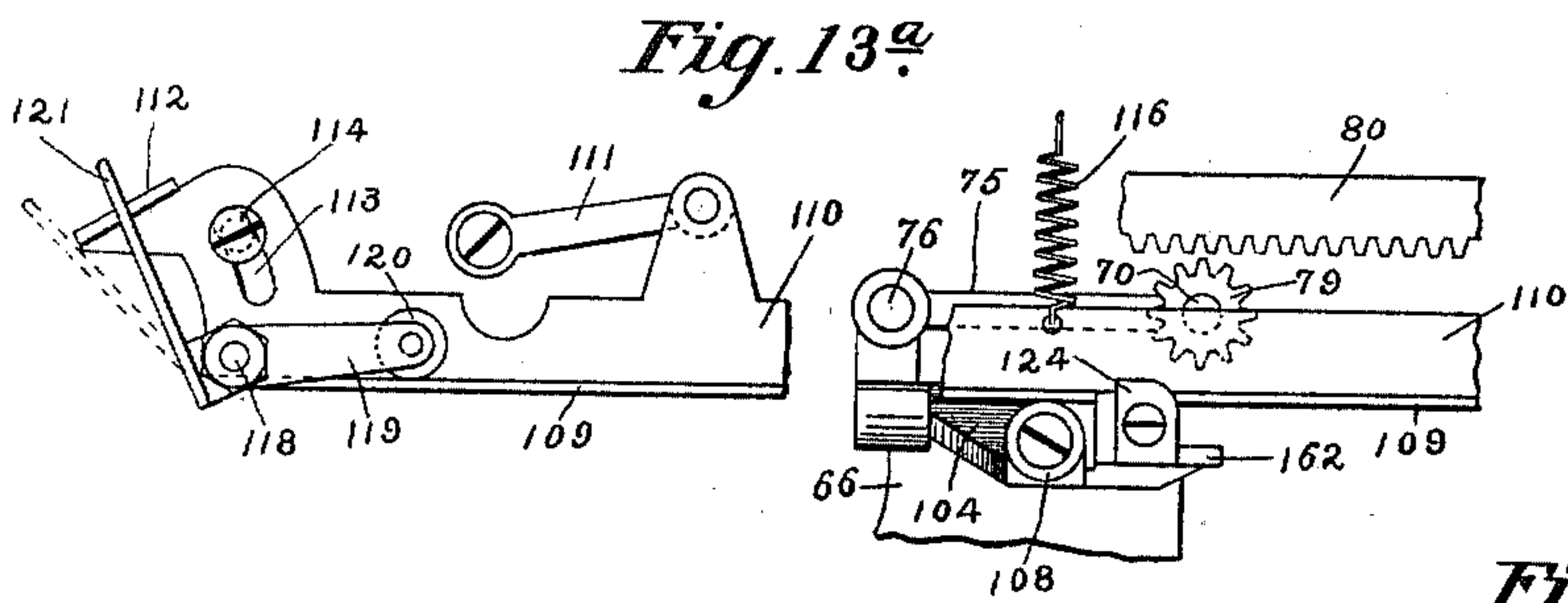


Fig. 13^a

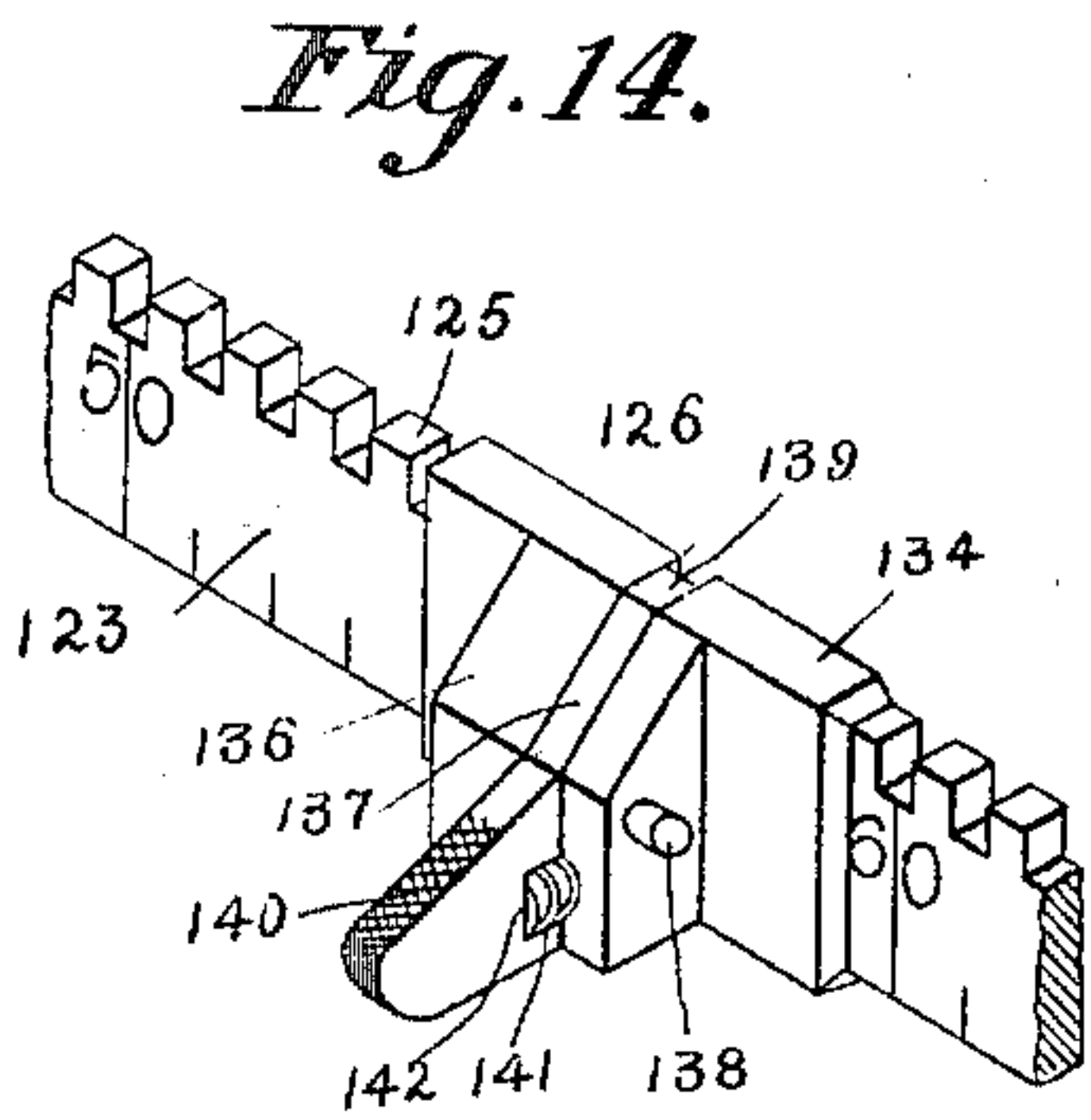


Fig. 14.

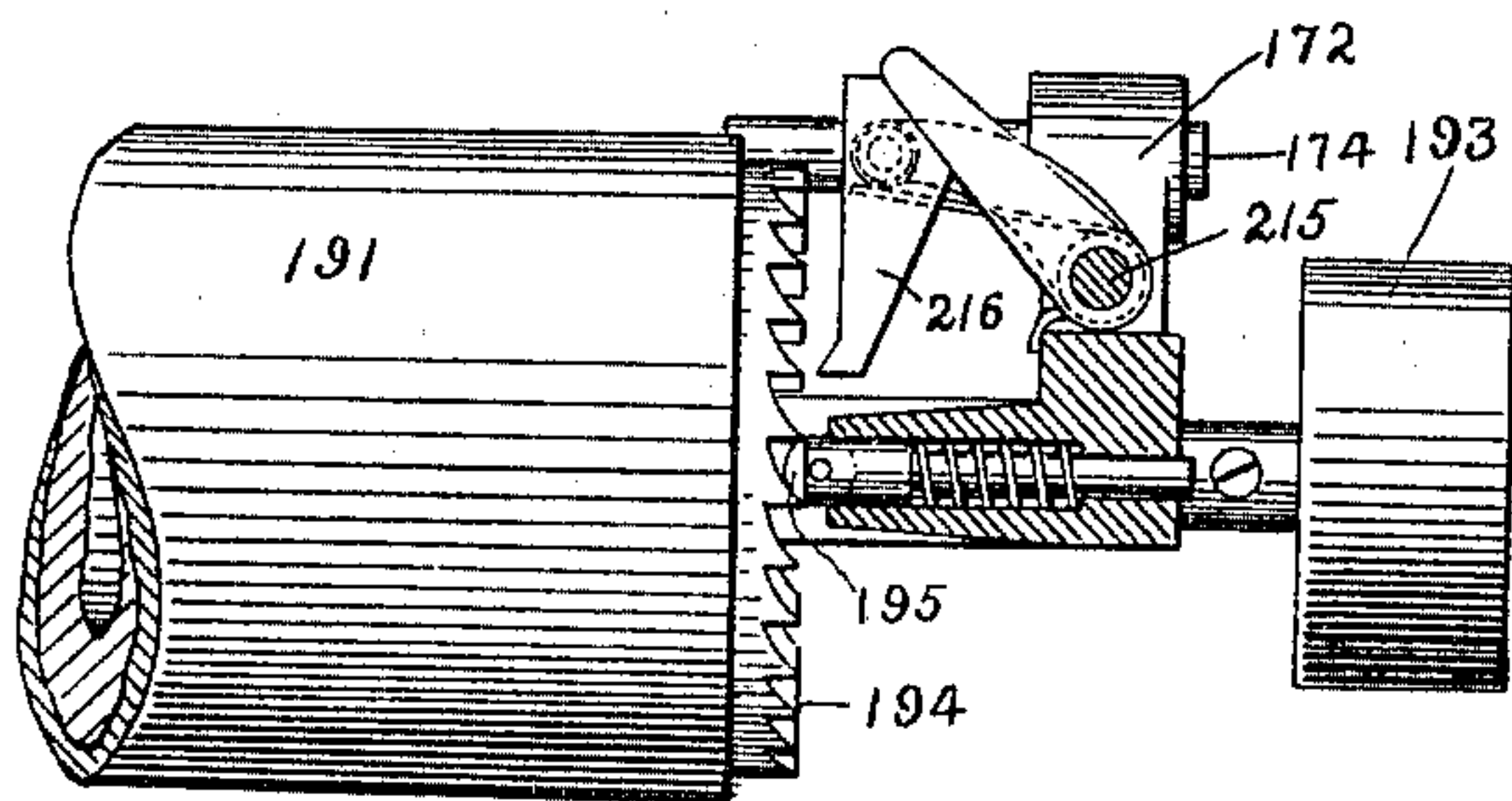


Fig. 12^a

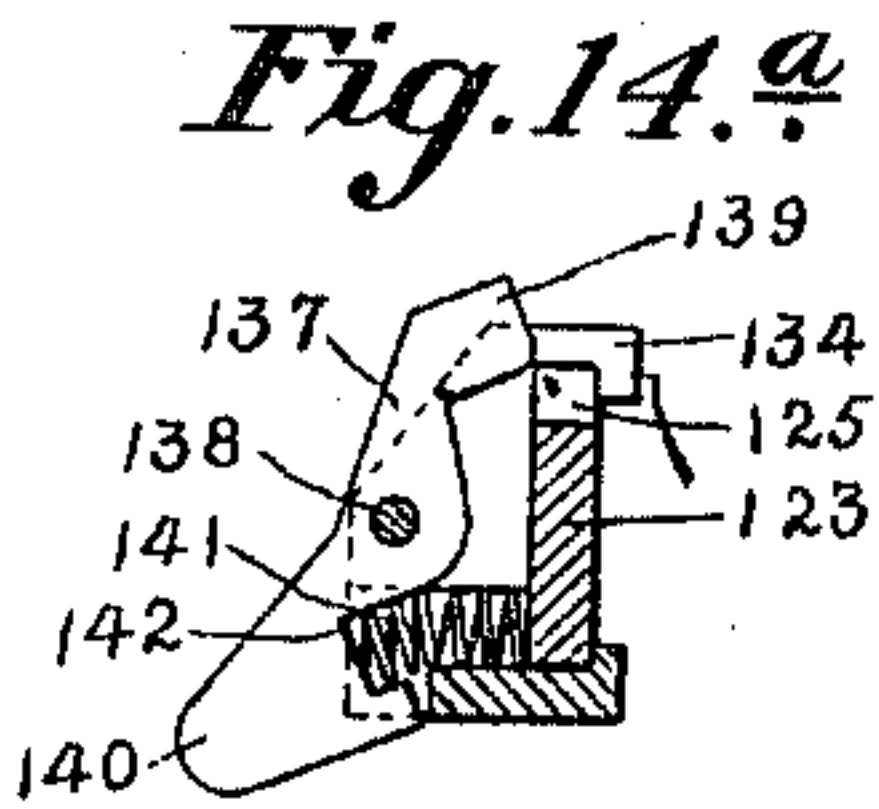


Fig. 14.^a

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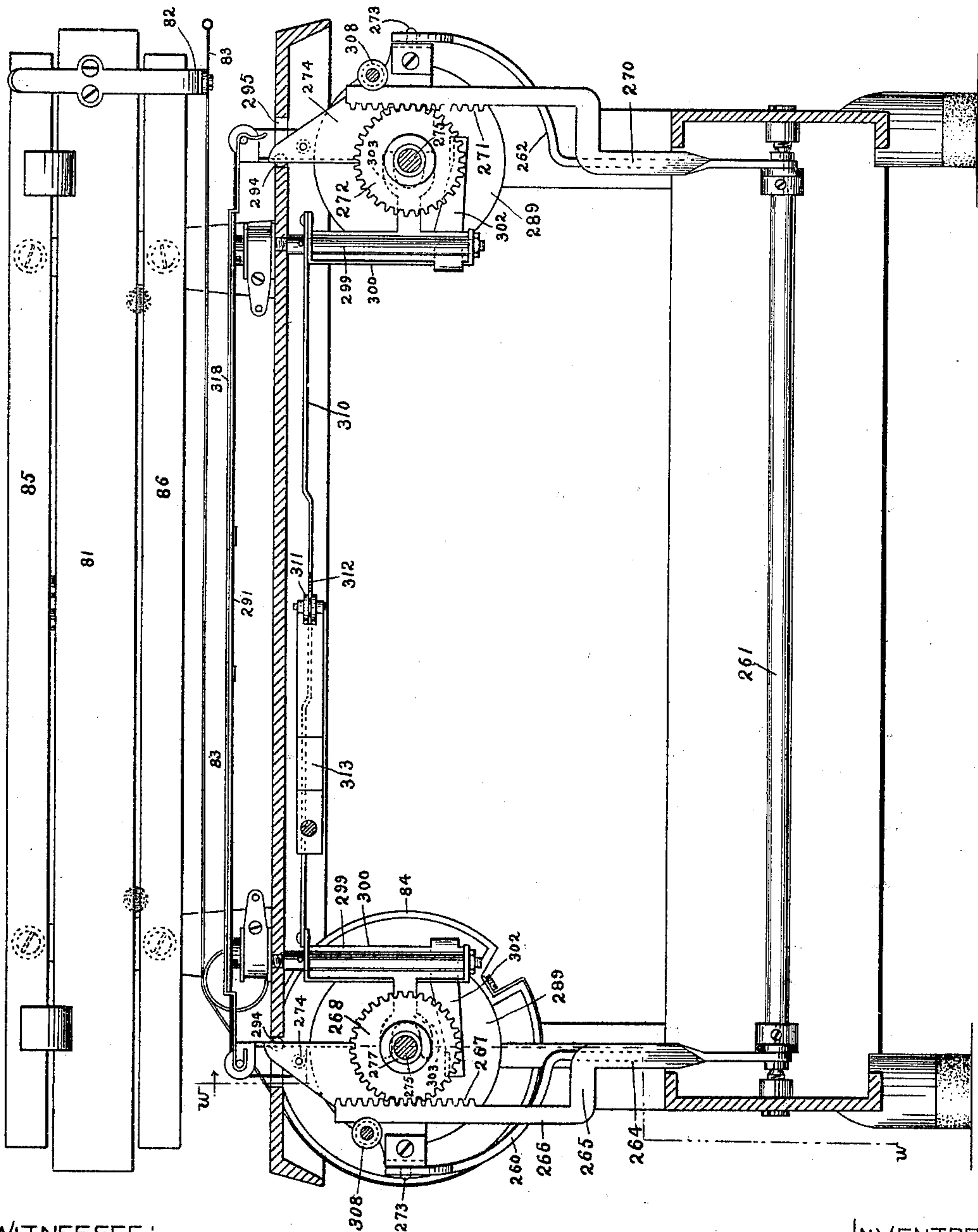
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Fig. 15.

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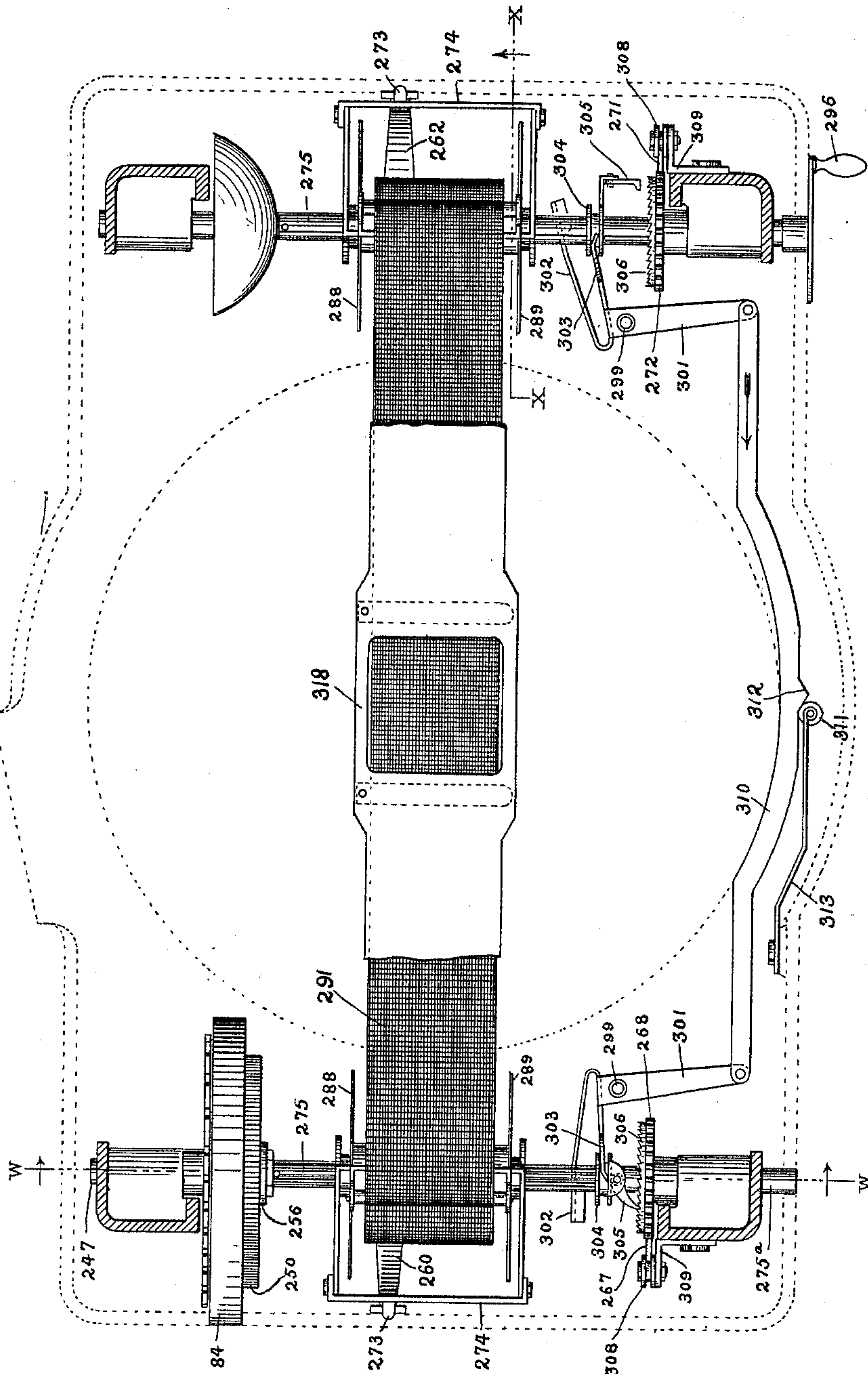
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Fig. 17.

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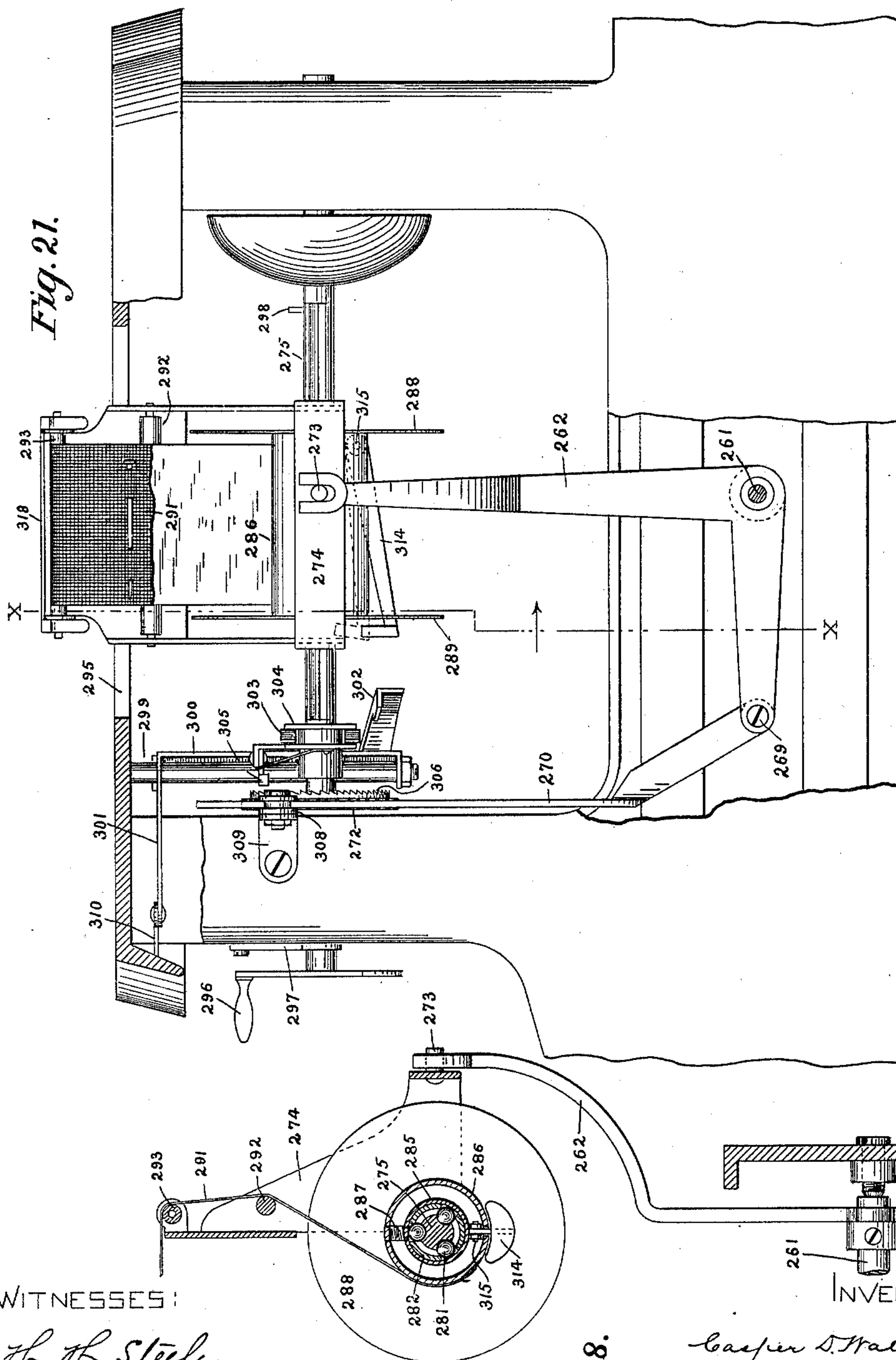
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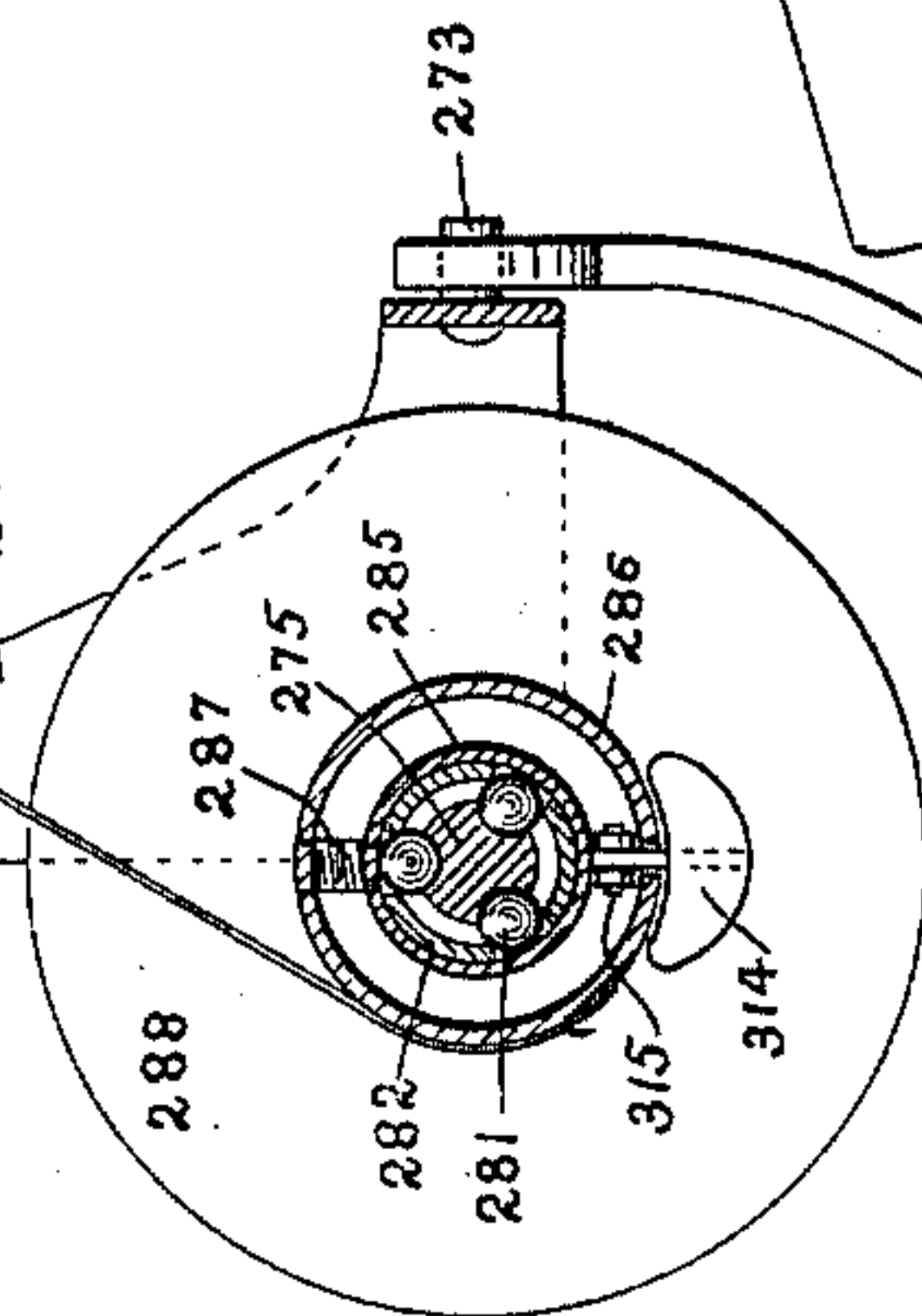
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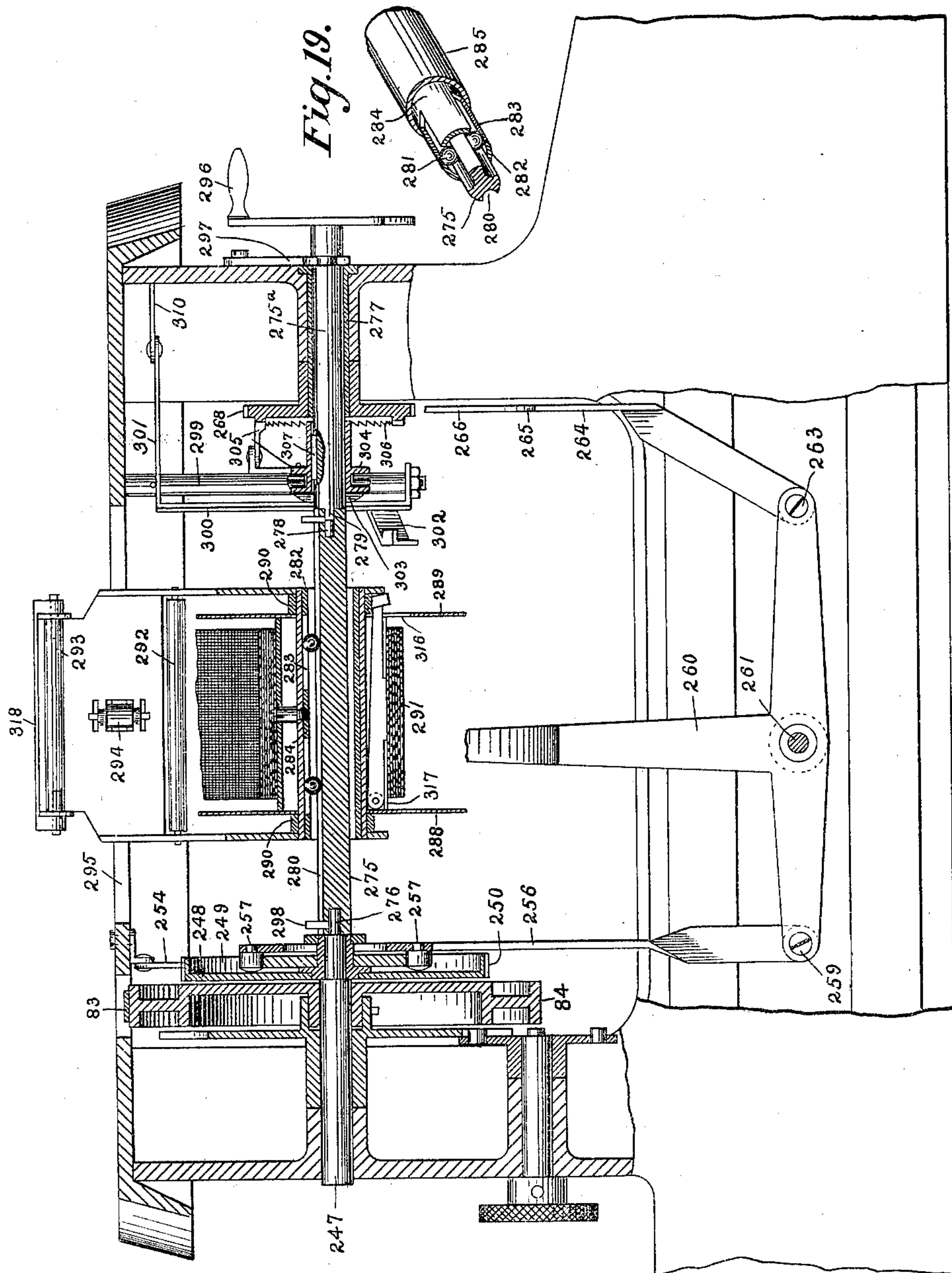
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Fig. 20.

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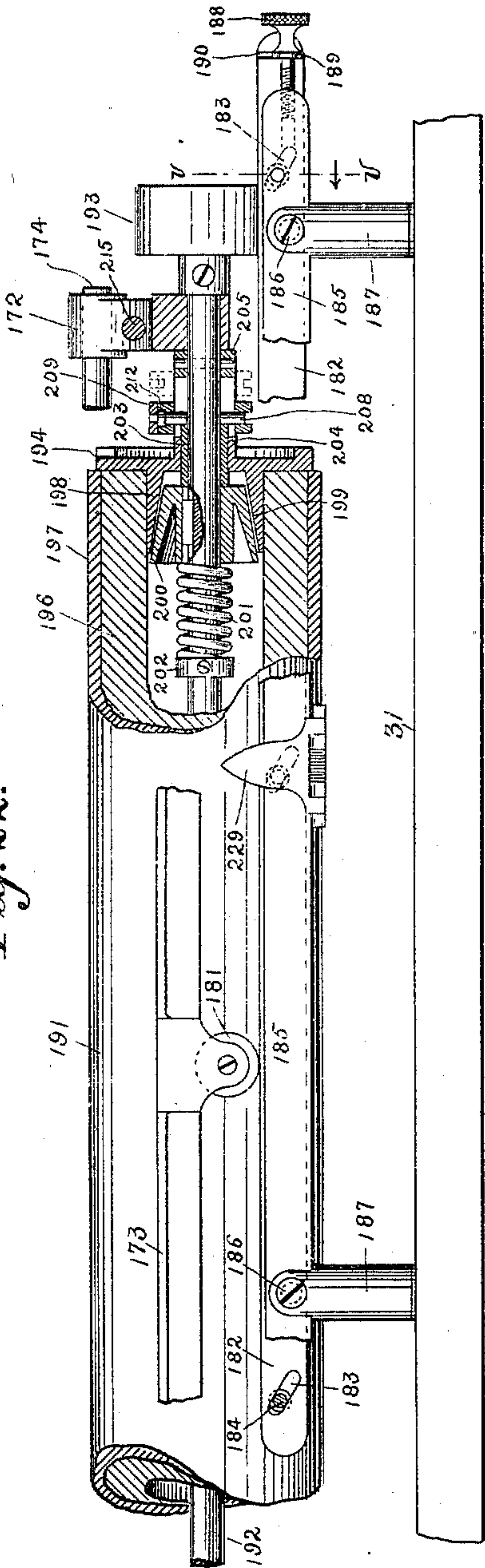
C. D. WALLACE.
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(No Model.)

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Fig. 22.



WITNESSES:

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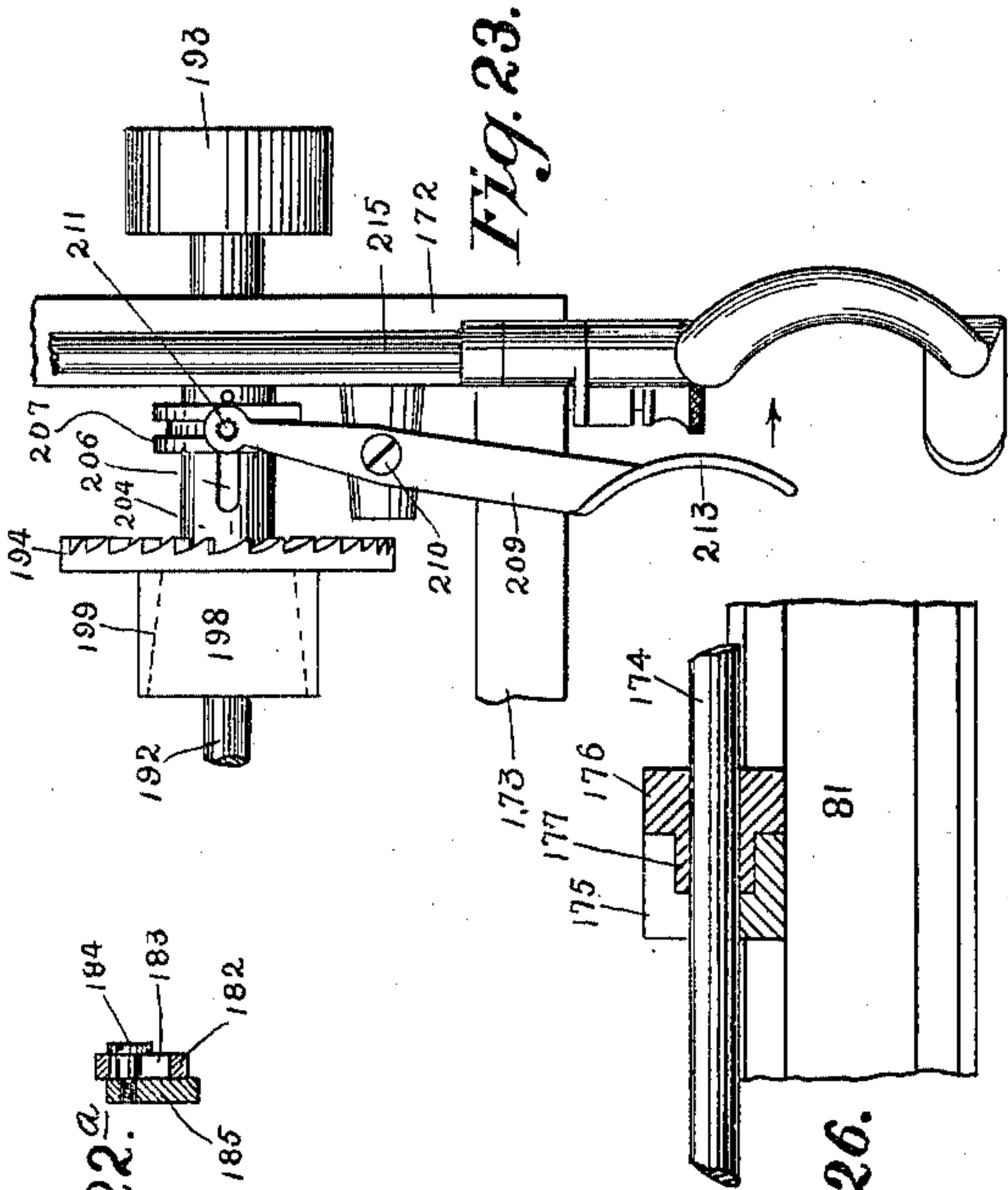


Fig. 22.

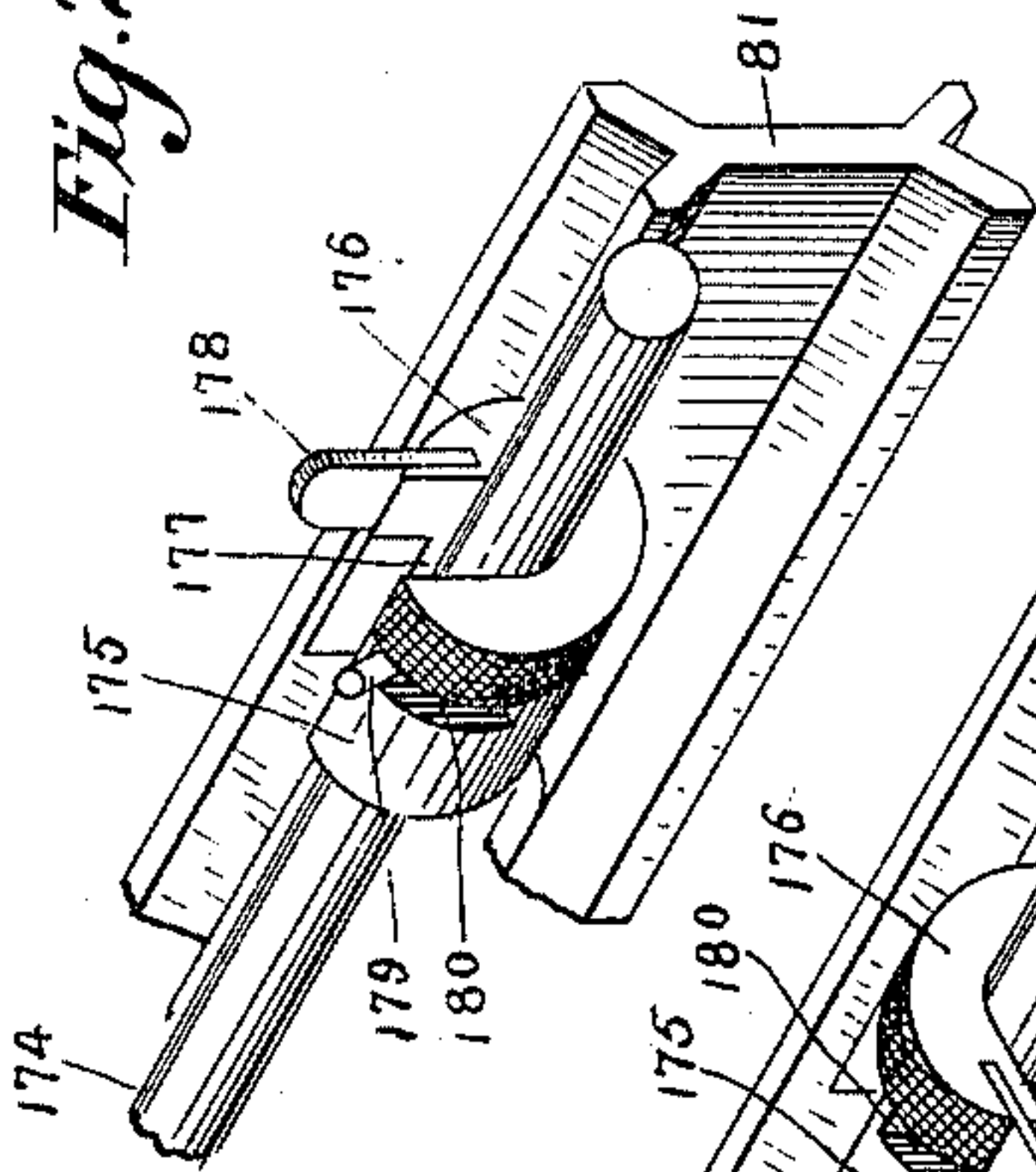


Fig. 24.

Fig. 25.

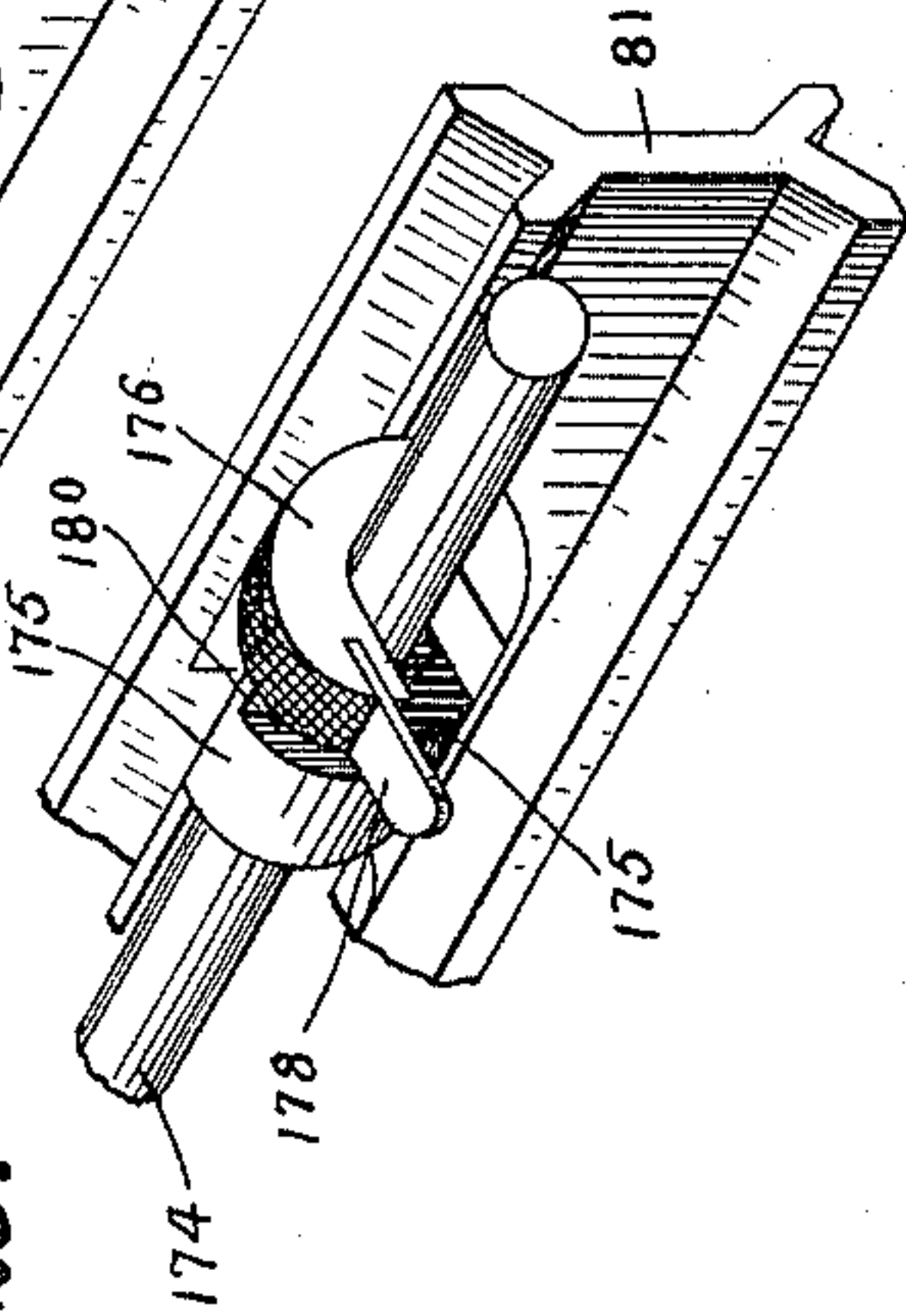


Fig. 26.

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UNITED STATES PATENT OFFICE.

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TYPE-WRITING MACHINE.

SPECIFICATION forming part of Letters Patent No. 626,354, dated June 6, 1899.

Application filed February 3, 1898. Serial No. 668,933. (No model.)

To all whom it may concern:

Be it known that I, CASPER D. WALLACE, a citizen of the United States, and a resident of Bridgeport, in the county of Fairfield and State of Connecticut, have invented certain new and useful Improvements in Type-Writing Machines, of which the following is a specification.

My improvements in type-writing machines relate to the type-bar action, the escapement mechanism, the line-locking mechanism or means for preventing the printing of one character upon another at the end of a predetermined line, the mode of connecting the platen-carrier to the carriage, means for varying the height of the platen for manifolding-work, means for releasing the platen, so as to rotate it independently of its ratchet-wheel, the ribbon mechanism, and other features which will be hereinafter referred to; and my objects are to improve the construction and operation of these portions of a type-writing machine.

To these ends my improvements consist in the various features of construction and combinations of devices hereinafter more fully described, and particularly pointed out in the appended claims.

In the accompanying drawings, Figure 1 is a partial plan view of the machine with certain parts broken away to show other parts below. Fig. 2 is a detail front elevation illustrating the mode of pivoting and mounting the type-bars. Fig. 3 is a vertical longitudinal section through the center of the machine, some of the parts being broken away or disconnected. Fig. 4 is a vertical cross-section taken at the line *z z* of Fig. 1. Fig. 5 is a side view, certain parts being shown in section, to show more particularly the mode of hanging and releasing the rear feed or pressure roll. Fig. 6 is a perspective view of one of the paper-guides and its means of attachment. Fig. 7 is a rear view of the machine, showing the escapement mechanism and its connection with the universal bar, the carriage-mounting, and a portion of the bell mechanism, &c. Fig. 8 is a plan view of the carriage and the escapement mechanism, various parts being broken away and others omitted for the sake of clearness. Fig. 9 is an end view, partly in

section, of the same. Fig. 10 is a plan view, various parts being removed for the purpose of showing more particularly the line locking and releasing devices. Fig. 11 is a side elevation thereof, partly in section and with the top plate added. Fig. 12 is a front view of the machine above the top plate. Fig. 12^a is an enlarged front view of the right-hand end of the platen, showing the end bar of the platen-carrier broken away to expose the detent. Fig. 13 is a vertical cross-section through the line *y y* of Fig. 1, some of the parts being broken away for the sake of clearness. Fig. 13^a is a detail view, the release-blade being broken away, illustrating the operation of throwing the pinion out of engagement with the carriage-rack. Fig. 14 is a perspective view of the margin-stop devices. Fig. 14^a is a vertical section through the margin-stop of Fig. 14 and showing the locking-lever disengaged from the rack. Fig. 15 is a vertical section showing more particularly the ribbon mechanism in front elevation. Fig. 16 is a front view of part of the ribbon-driving mechanism. Fig. 17 is a plan view of the ribbon mechanism. Fig. 18 is a vertical cross-section taken at the line *x x* of Fig. 17 to show more particularly the ribbon-spool mounting. Fig. 19 is an enlarged perspective sectional view of a portion of the ribbon-spool shaft and illustrating the construction of the ball-bearing devices connected therewith. Fig. 20 is an enlarged vertical section on the line *w w* of Fig. 15 with the base of the side frame partly broken away. Fig. 21 is a side view of the ribbon mechanism from the right-hand side, the frame being partly broken away. Fig. 22 is a front view showing in central vertical section means for releasing the platen from the line-spacing devices, so that the platen may be turned freely and independently in either direction and showing also means for raising the platen when it may be desired to do manifold work or write upon a number of sheets of paper at one time. Fig. 22^a is a vertical section on the line *v v* of Fig. 22. Fig. 23 is a plan view of a part of the platen-release and also a part of the line-spacing mechanism. Fig. 24 is a detail perspective view to show the mode of attachment and detach-

ment of the platen-carrier frame from the truck or main carriage, the locking-collar which holds the platen-frame normally in non-detachable condition being turned back to permit of detachment. Fig. 25 is a view similar to Fig. 24, but showing the locking-collar in normal position and the platen-frame as locked against detachment. Fig. 26 is a longitudinal vertical central section of the parts in the condition shown at Fig. 25.

In the various views the same part will be found designated by the same numeral of reference.

1 designates the general framework of the machine. At the base of the machine and near the rear end thereof is a rod 2, which extends across from one side frame to the other and is secured therein. Upon this rod is pivotally mounted the entire set of key-levers 3 used in the machine, the said key-levers occupying vertical planes alongside of and close to one another and there being one key-lever for each type-bar 4. The key-lever and its associated type-bar are not directly connected together by means of a rod or link, as usual heretofore, but in the following manner, namely: Secured to each key-lever is a strap or loop 5, to the upper end of which is pivoted at 6 the lower end of a short link 7, whose upper end is pivoted at 8 to a horizontally-arranged bar 9, which is pivotally connected at its forward end at 10 to the forward end of an obliquely-arranged short link 11, pivoted at its rear and lower end on a rod 12, which extends across the machine and serves as a pivotal support for the entire series of forward links, and the rear end of said bar 9 is pivoted at 13 to the forward end of a rear obliquely-arranged link 14, whose opposite end and lower end is pivotally mounted on a cross-rod 15, which likewise serves as a pivotal support for the entire series of rear links. Pivotally secured at 16, at a suitable point on the length of the bar 9, is a strap or loop 17, to which, through an adjusting turnbuckle 18, is connected the lower end of a type-bar-actuating rod 19, whose upper end is pivotally connected to the short arm of the type-bar 4, which is pivoted at 20 in a U-shaped hanger or clip 21. The rear end of each bar 9 is cut to form a hook 22 to receive one end of a coiled spring 23, whose opposite end is attached to a hook 24, projecting forwardly from a plate 25, attached by a screw 26 to the rear end of the frame or casting. The said spring serves to return the entire type movement from key-lever to type-bar to its normal position. When a key-lever is depressed, it turns about its fulcrum-rod 2, and through the link 7 the bar 9 is drawn down, the links 11 and 14 swinging downwardly, as illustrated at Fig. 3, and maintaining the bar 9 always in a horizontal position. The pulling down of the bar 9 effects also a downward movement of the connecting-rod 19, and thus causes an upward-swinging movement of the type-bar about its pivot 20, the type striking the

paper on the platen in this movement in the usual way. During the downward movement of the bar 9 it also has a slight forward movement, which operates to stretch the spring 23 and impart to it sufficient tension to restore the parts to their first positions when the pressure on the key-lever is released. The drawing down of the bar 9 also effects the carriage-escapement mechanism, as will hereinafter be more fully explained. The key-levers 3 in normal position all lie in substantially the same horizontal plane, and when the draw-bars 9 are in normal position they stand in vertical planes side by side across the machine, with each bar practically in line over its associated key-lever, and when at rest in their normal positions the tops of all of said bars 9 lie in substantially the same horizontal plane.

While the bars 9 are all of equal length, the key-levers vary in length, owing to the fact that their key heads or stems 27 are arranged in seven transverse rows or banks, as shown more particularly at Fig. 3, the key-levers of the foremost row being longest and those of the rearmost row shortest. The finger-piece 27 is connected to the extremity of its key-lever. Preferably the finger-pieces or key-stems of the last or rearmost four rows pass loosely through guide-bars 28.

Extending across the key-bars is a reed bar or comb 29, separating the levers laterally and guiding them in their vibratory movements, and for the purpose of separating and guiding the draw-bars 9 there is likewise provided a transverse comb or reed bar 30, which may extend down far enough to likewise separate and guide the rear ends of the key-levers, as shown at Fig. 3.

By combining the draw-bars with the key-levers through the intermediate links 7 the connecting-rods 19 may be strung or hung in substantially vertical positions, thus reducing to the minimum the wear of the type-bar journals. The key-levers for the entire series of banks may have practically the same amount of dip or depression, and the leverage for all of the key-levers and type-bars may be substantially alike, thus conducing to perfection of touch and action. The actuating-rods 19 are connected to the draw-bars at different points of their lengths, according to the positions of the actuating-rods relatively to the circle in which they are arranged, and the links 7 are connected to the draw-bars at different points, according to the lengths of the key-levers with which they are also connected. The key-levers which extend out to the foremost and lowest transverse row or bank are connected to the foremost transverse series of links 7, and the key-levers which extend out to the rearmost bank or row are connected to the rearmost series of links 7, there being seven transverse rows of links as well as seven transverse rows of key stems or buttons.

The type-bar brackets or hangers 21 are

supported upon the top plate or type-ring 31, and for the purpose of reducing the size of the top plate or type-ring to the smallest possible dimensions its brackets or hangers are arranged in pairs and mounted one directly over the other, yet the brackets or hangers of each pair of bars are entirely separate and independent of each other, and hence each hanger may be independently moved both radially and laterally in order to adjust the type-bar, so that its type will strike exactly at the printing-center. Each pair of hangers is securely fastened upon the top plate or type-ring by means of a single screw 32 only, the threaded end of the screw passing into a tapped hole in the top plate and the head of the screw bearing upon a segmental washer 33, laid upon the upper edge of the topmost hanger. In practice this washer is made long enough to overlie three pairs of hangers; but for each pair of hangers there is a separate screw 32. Between the hangers of each pair is another segmental washer 34, which likewise is preferably made long enough to include three pairs of hangers, and this washer, like the washer 33, is perforated for the passage of the screws. This mode of mounting the type-bar hangers is not only extremely simple and effective, but it enables either hanger of a pair to be adjusted without disturbance of its fellow. For example, if it be desired to adjust the upper hanger of the pair shown in Fig. 3 it is simply necessary to loosen the screw and move the hanger to the desired position without giving concern about the disturbance of the hanger below, for this will remain precisely where it is on account of the clamping effect thereupon of the washer 34, which is still held firmly in position by the other two screws of the remaining two pairs of hangers (not shown) in the group or series of three referred to, and similarly during the adjustment of the topmost hanger, as described, the uppermost washer 33 will for the same reason remain undisturbed. When the said hanger has thus been properly adjusted the screw may be retightened to hold it in its new position, and, again, if, for example, it should be desired to adjust the lowermost hanger after loosening the screw, this may be readily accomplished with affecting the uppermost hanger, which remains tightly clamped between the two washers by means of the two other screws of the series. By making the superposed hangers separate or as individuals not only is it easier to make the adjustments which are required from time to time, but the type-bars may be pivotally mounted in the hangers in the first instance before assemblage in the machine much more conveniently and readily. Each hanger is, as shown at Fig. 1, preferably made in U form in plan view, and the inwardly-projecting arms thereof are preferably provided with an adjusting-screw 35 for holding said arms in parallelism and for adjusting their free ends relatively to the type-bar pivot

or journal, and which is preferably formed conical at each end and seated in a like depression in each arm of the hanger.

Owing to the mounting of the hangers one over the other in couples, provision must be made for preventing the two type-bars thus associated from coming in contact when hanging against the type-rest 36 and from clashing when moving to or from the platen in their printing and returning movements. This is accomplished by attaching the eyes or hubs of the type-bars to their respective journals or pivots in different vertical planes—in the example shown at Fig. 1 the hub of the uppermost type-bar being attached to the right of the center of its journal and that of the lower type-bar to the left of the center of its journal; but owing to this arrangement of the type-bar hubs in different vertical planes some means must be provided to enable them to strike at the same printing-center, and this is accomplished by mounting the pivots or journals in slightly-oblique positions relatively to a vertical plane passing midway between each pair of pivots, as illustrated in Fig. 1, and, as illustrated at Fig. 2, the upper pivot or journal is inclined downwardly from the left-hand side and the lower journal or pivot upwardly from the left-hand side, or, in other words, the pivots are arranged at a slight angle to the horizontal plane, passing midway between each pair of pivots, whereby the type ends of the pair of associated type-bars are caused to be separated or held farther apart when said type-bars are at rest. By thus mounting the pivots and the type-bars not only may the type-bars be made of the same length and be vibrated to strike at the same printing point or center, but also by the peculiar arrangement of the pivots the free or type ends of the bars are maintained at an increased distance apart, and thus there is no liability of the bars clashing in moving to and from the paper or of touching each other while at rest in the basket or support 36. The pivot of the upper type-bar is preferably set slightly farther back than the pivot of the lower type-bar, and for this reason the upper type-bar is cut away or formed with a loop 37, which embraces the lower pivot when the upper type-bar is down in normal position, thus permitting both the upper and lower type-bars to rest side by side against the ring or basket 36.

The type actions, which comprise the series of type-bars, the series of connecting-rods, the series of draw-bars, the series of key-levers, and the series of intermediate links, connect with the carriage-escapement mechanism and will now be described in detail. Located between the series of key-levers and the series of draw-bars and preferably close to the under sides of the latter is a roller 38, which is supported at its ends by pivots 39, Fig. 7, projecting laterally from inwardly-extending arms 40, one at each side of the machine and each formed integral with or attached to a

collar 41, which is secured to a rock-shaft 42, supported at its ends by conical pivots 43, projecting inwardly from the side frames, the ends of the shaft 42 being preferably provided with ball-bearings 44, as indicated at the right-hand side of Fig. 7. The roller 38 corresponds in function to the universal bar of other machines and will be designated as such hereinafter. About the middle of the rock-shaft 42 is secured by a collar an arm 45, which is provided with a spring 46 and which projects forwardly to engage with the lower end of an escapement-rod, designated in its entirety by the numeral 46^a, but which is preferably composed of several sections. The lower section 47 is made from a piece of sheet metal and is formed with a slot 48 at its lower end to receive a pin 49 at the free end of the arm 45. Below the slot 48 the section 47 of the rod is provided with a screw 50, upon which is mounted a flanged nut 51, with which coöperates the spacing-bar, to be presently referred to. Above the slot 48 the section 47 is bent or shaped to extend rearwardly and then upwardly, and at its uppermost end said section is attached to a threaded rod or section 52, which by means of a turnbuckle or threaded sleeve 53 is connected to the lower threaded end of another rod 54, which at its upper end is securely riveted to a plate 55, the turnbuckle and oppositely-threaded rods providing the means for adjusting the length of the escapement-rod as a whole.

To the upper end of the plate 55, at the right-hand edge or corner thereof, (viewed from the back of the machine,) is pivoted at 56 the escapement or feeding dog 57, which dog has a square or straight face and curved or rounded back, and formed integral with the dog is a lateral extension 58, projecting leftward and adapted to contact with a pin 59, fixed above the same in the upper left-hand corner of the plate 55. On the under side of the lateral extension 58 is a short downwardly-projecting lug 58^a to receive the upper end of a small coiled spring 60, whose lower end is fitted over an upwardly-projecting screw 61, which has a bearing in a forwardly-extending lug 62 on the plate 55. (See Figs. 3 and 7.)

Pivoted at 63, about centrally of the plate 55, is the shorter arm 64 of a bent lever, which is pivoted at 65 upon a bracket or stand 66, secured to the top plate, the longer arm 67 of said bent lever extending vertically upward and provided at its free end with a forwardly-bent portion or finger 68, which constitutes the holding-dog of the escapement mechanism. The feeding-dog 57 and the holding-dog 68 both coöperate with a toothed escapement-wheel 69, which is sleeved or mounted loosely on a driving-shaft 70, which at its rear end is formed or provided with a ratchet-wheel 71, with which engage three spring-pressed pawls 72, pivoted in a circular box or casing 73, formed integral with the toothed escapement-wheel 69 and on the rear side thereof.

By this construction the escapement-wheel is caused always to turn with the shaft when the said shaft turns in the direction of the arrow at Fig. 7, (and which is the direction in which said shaft turns when the carriage is moved from right to left in the writing operation;) but when said shaft turns in the opposite direction the pawls 72 bob or slide idly over the teeth of the ratchet-wheel and the toothed escapement-wheel remains at rest, or, in other words, during the retraction of the carriage for the beginning of a new line of print while the shaft rotates the escapement-wheel remains stationary.

The engaging point or part of the feeding-dog 57 is at all times at one side of the line joining its center of motion or axis 56 with the center of motion of the escape-wheel 69, and the parts 55, 56, 57, 58, and 59 are so disposed relatively to the said escape-wheel 69 as will secure that the arc described by the point of the dog 57 when actuated by the spring 60 will slightly intersect the circle described by the points of the teeth of the ratchet-wheel 69. From this construction and arrangement it results that the dog 57 when it is disengaged from one tooth of the wheel 69 by a downward movement of the bar 46^a is immediately thrown by the spring 60, so as to bring its point within the circle described by the points of the teeth of the ratchet-wheel 69, thus insuring that the next tooth of said wheel shall engage with the said dog 57. It is further observed that in the construction shown and described the dog 57 when actuated by its spring 60 moves in a direction the reverse of the direction of motion of the wheel 69 and that its pivot 56 is arranged in a vertical plane to one side of the vertical plane of the axis of the wheel 69.

The shaft is mounted in suitable bearings 74 at the free edge of a plate or bracket 75, which is pivoted at 76 to the upper portion of the aforesaid stand or bracket 66. (See Figs. 7, 8, 9, and 10.)

Beneath the swinging bracket or stand 75 is arranged a flat spring 77, which tends normally to keep the said plate in an elevated position and with its rear edge against the head of the stop-screw 78.

On the forward end of the shaft 70 is a small pinion 79, which normally runs in gear or mesh with a straight toothed rack 80, secured to a bar-like carriage 81, adapted to run on ball and roller bearings, and to said bar or carriage 81 is attached through a downwardly-projecting stud 82 one end of the driving cord, strap, or chain 83, the other end of which is attached to the usual spring-drum 84, by which the carriage is propelled from right to left in the usual manner.

In the construction shown fixed guide rails or bearings 85 and 86 for the bar or carriage 81 are supported one over the other in up-rights 87, secured upon the top plate. (See Figs. 7, 8, 9, and 13.) The platen-carrier is attached to this bar or carriage and will be re-

ferred to after a description of the mode of operation of the escapement mechanism.

When a character-key lever is depressed and its associated draw-bar 9 goes downward and forward, it operates upon the universal bar 38 and its arms 40, and the descent of these devices causes an oscillation of the rock-shaft 42 and a depression of the arm 45, whose pin preferably lies normally at the lower end of the slot 48 of the escapement-rod, and in consequence the said rod is caused to descend instantly with the arm 45. The pulling down of the escapement-rod serves to disengage the pivoted dog 57 from the escapement-wheel 69 and to engage the holding-dog with said wheel, the holding-dog vibrating into the path of rotation of said wheel, so as to arrest the same previous to the disengagement of the feed-dog. At this time the type prints, but there is no feed of the carriage. When the feeding-dog is thus disengaged from the escapement-wheel, its spring 60 causes it to turn on the pivot 56 and to vibrate or step a short distance upwardly and toward the right and into the position shown at Fig. 7, where it is in place to catch the next tooth of the escapement-wheel as soon as the latter is released and to limit the same to a one-tooth rotative movement. The downwardly-projecting lug 58^a on the bottom of the feeding-dog contacts on the return movement of the latter with the top of the screw 61, thus positively arresting the escapement-wheel step by step as it is released from the holding-dog. The holding-dog being connected to the plate 55 through the bent lever and the feeding-dog being also connected to the said plate, they are in consequence moved in unison, and so that when the holding-dog goes into engagement the feeding-dog goes down out of engagement, and so that when the holding-dog vibrates out of engagement the feeding-dog moves upwardly into engagement. At Fig. 7 one of the draw-bars is shown down in working position and the escapement mechanism in the condition in which it exists when the finger-key is held down and the type is against the paper on the platen. When the pressure on the key-lever is released, the draw-bar ascends and leaves the escapement mechanism as a whole to be restored to normal position under the influence of the spring 46 and which may be assisted by a separate spring 89, attached to the bracket 66 and connected to the long arm 67 of the bent lever by a loop or yoke 90. In the restoration of the escapement mechanism to normal position the escapement-wheel rotates a distance of one tooth-space, as before described, by means of the spring driving drum 84 through the strap, carriage, rack, and pinion and shaft, and thus the carriage is fed or spaced step-by-step letter-space distances as it travels from right to left. In order to avoid any possibility of the escapement-wheel rotating backwardly by friction during the retraction of the carriage, a small pivoted spring-pressed and notched

arm 91 is provided, which, as seen at Fig. 7, acts as a positive stop to any reverse rotation of said escapement-wheel; but the said arm does not in any wise prevent the forward or proper rotation of said escapement-wheel, the point of each tooth of the escapement-wheel striking on the upper edge of the said arm and depressing it as it passes by the free end of the same, the spring 92 of said arm acting to immediately restore it to its normal position after such depression.

In connection with the escapement mechanism is employed a space-key for effecting the requisite spacing between words, &c. This space-key is shown at Fig. 3, and comprises two lever-frames connected together and extending from the front edge of the machine back to the escapement-rod. The foremost lever-frame consists of two arms 93, one pivoted at each side of the machine, as indicated at 94, and the front ends of these arms are connected together by a space-key 95, which extends transversely across the keyboard. The rear ends of the lever-arms 93 are bifurcated, as at 96, to receive pins 97 on the forward ends of the arms 98 of the rear-most lever-frame, which arms 98 are pivoted, each at 99, to one of the side frames of the machine and are connected at their rearmost ends by a cross-bar 100, which has a ledge or flange 101, that overlies the flange or head of the nut 51 at the lower end of the escapement-rod, the entire construction being such that when the space-key 95 is depressed the flange 101 is also depressed and, striking upon the flange of the nut 51, causes the escapement-rod to descend and the escapement mechanism to operate in the same manner as if the type-action operated it; but in operating the escapement mechanism through the medium of the space-key the arm 45 remains at rest, and hence the escapement mechanism is restored to normal position by the spring 89 alone, while separate springs (not shown) under the spacing-frames are provided to restore these frames to their normal positions.

The slot 48 in the escapement-rod 46^a permits said rod to move downward a limited distance without also carrying downward the arm 45, whose pin stands normally at the bottom of said slot and remains stationary when the space-key is actuated to pull down the escapement-rod.

On the rock-shaft 42, and preferably made integral with the arm 45, is an arm 102, which is adapted to strike against a screw-stop 103 for the purpose of limiting the upward movement of the escapement-rod. The position of this screw determines or regulates the extent of the engagement of both dogs with the escapement-wheel.

The purpose of mounting the escapement-shaft in the swinging or vibratory plate will now appear in connection with the following description of the mechanism for releasing the carriage from the escapement mechanism to permit of the carriage being moved rapidly

in either direction independently of the said escapement mechanism.

104 is a plate or arm which is pivoted under the plate 75 and at right angles to the pivots of the latter. The rear end of the arm 104 is forked to provide two journals 105 for the pivot-pin 106 of said plate, the pin passing through the eyes or journals 105 and resting at its ends in bearings in the casting or bracket 66 below the plane of the pivot 76 of the swinging bracket 75. The arm 104 extends forwardly from its pivot and at about midway of its length is connected to the swinging plate 75 by means of a rod or bolt 107, and at the foremost end of said arm is an anti-friction-roll 108, with which is adapted to engage the horizontal flange or lip 109 at the bottom edge of a vertically-arranged release rod or blade 110, which is pivotally supported from above at two points in its length by means of obliquely-arranged links 111, the lower ends of said links being pivoted to the bar or carriage 81 and their upper ends to ears formed on said release-bar. The left-hand end of said release-bar is formed with a finger-piece 112 and is also preferably furnished with an inclined guiding-slot 113, surrounding a fixed screw 114 on the carriage 81. When the said release-bar is pressed inwardly or toward the right, it simultaneously swings downwardly, and the flange or lip 109, bearing upon the anti-friction-roll 108, causes the arm 104 to swing down about its pivot 106 against the stress of a returning-spring 115, surrounding the pivot 106, and in this movement of the said arm the swinging plate 75 is caused also to descend by reason of the connecting-rod 107, and thus the shaft is vibrated downwardly and its pinion carried out of engagement with the feed-rack 80, thereby releasing the carriage from its connection with the spacing mechanism and enabling it either to travel swiftly toward the left under the force of the carriage-driving spring or else to be pushed toward the right regardless of the escapement mechanism, as may be desired. When the pressure upon the release key or bar is removed, the spring 115 operates to restore the pinion into mesh with the feed-rack and also to bring the arm 104 back to its first position. The release-bar is returned to its first position by means of a separate spring 116. (See Fig. 13.) It will be understood, of course, that when the escapement-shaft is thus swung downwardly to release the carriage the holding-dog stands back out of engagement with the escapement-wheel, and hence affords no obstruction to the downward movement of the shaft and its wheel, and inasmuch as the pivoted dog stands in engagement with a tooth of said wheel at near its point or tip the said pivoted dog likewise permits of the requisite amount of downward movement of the escapement-wheel to effect the disengagement of the rack and pinion.

While the escapement mechanism may be disengaged from the main carriage or that car-

rying the feed-rack by direct manipulation of the release-bar 110, it may also be released by a supplemental key acting through said release-bar and which key is mounted upon the platen frame or carrier 117, which is hinged or pivotally connected to the main carriage in a manner to be presently described.

In bearings on the left-hand end bar of the platen-carrier is mounted a rock-shaft 118, which at its rearmost end is provided with a crank-arm 119, bearing an anti-friction-roller 120, which is adapted to contact with the flange or lip 109 on the release-bar, and at the foremost end of said rock-shaft is a finger piece or key 121, by which the rock-shaft may be conveniently oscillated and the crank-arm roller caused to depress the release-bar and by such depression effect the swinging down of the escapement-pinion out of engagement with the feed-rack in substantially the manner hereinbefore described with reference to the separation of the parts by direct action upon the release-bar. The rock-shaft may have a separate returning-spring 122, if desired. (See Fig. 1.) When the platen-carrier is down in working position, the disengagement between the rack and pinion may be more conveniently effected by manipulating the supplemental or rock-shaft key; but when the platen-carrier is in an upturned or non-working position, where the work may be inspected and corrected, the crank-arm is out of operative relation to the release-bar, and hence if at this time it be desired to throw off the escapement mechanism this may only be accomplished by direct action upon the release-bar, as at first explained.

The means for defining the amount of travel of the carriage in both directions or what is designated as the "margin-stop" and the "line-stop," the bell mechanism, and the means for locking the printing and escapement mechanism against action when the carriage has arrived at a predetermined point in the course of its travel leftward, will now be described.

On the front side of the carriage or bar 81 is mounted a bar 123, which is preferably graduated or marked on its front face and for substantially its whole length to correspond with the letter-spacing or amount of step-by-step travel of the carriage, and in connection with said graduated bar or scale is employed a stop-block 124, which may be used as a pointer or indicator and which is preferably secured to the front end of the vibratory arm 104 and serves in connection with the said scale-bar to enable the operator to conveniently adjust the carriages for the purpose of making corrections, &c.

The upper edge of the bar 123 is toothed, as at 125, forming between said teeth a series of notches or depressions equal in number and in distance apart to the graduations on the scale. Upon this bar is fitted to slide a margin-stop 126, which limits the returning movement of the carriage, and hence defines

the width of the left-hand margin on the sheet being written. Also mounted to slide on said bar is a line-stop 127, which determines the amount of carriage travel toward the left.

5 These stop devices are practically of the same construction, although the line-stop performs a function in the locking of the printing and escapement mechanisms, as will presently appear, and for the purpose of sounding an alarm
10 just before the end of the carriage travel the said line-stop is provided with a pin 128, which is adapted to strike a pivoted bell-trip 129 at the free end of a lever 130, pivoted at 131 and provided at its right-hand end with a bell-
15 hammer 132, which is adapted to strike against a gong 133, fixed on the framework. The bell mechanism is of the ordinary character and need not therefore be further described.

20 Referring now to the detail construction of the stop devices, Figs. 3, 11, 13, and 14, 134 is a three-sided slide with upper and lower rear flanges or lips forming a rectangular box-like structure with a rear slot from end to end, so
25 that while the slide or stop is properly supported upon said bar it may pass by the several studs or washers 135, Fig. 3, intervening between the carriage and the scale-bar, and which are provided for the purpose of main-
30 taining the latter far enough away from the carriage to enable the employment and convenient manipulation or adjustment of said stop devices. The box or slide portion 134 is formed at its front side with an ear or lug
35 136, Fig. 14, which is cut through or slotted vertically to receive the body portion of a lever 137, and which is supported upon a transverse pivot 138, passing through the ear portions and through a hole in the lever.
40 The inner and upper end of the lever is provided with a finger 139, which is adapted to engage with the notches in the upper edge of the scale-bar, and thus securely hold the device in any position to which it may be ad-
45 justed. The forward end of said lever is formed with a finger-piece 140, which when depressed causes an oscillation of said lever and a removal of the finger 139 from the notch with which it is engaged, and thus leaves the
50 device free to be moved to a new position. In a housing formed in the lug 136 is placed a small spiral spring 141, whose front end is seated in a notch 142 in said lever, and the force of said spring acts on the said lever on
55 that side of its pivot opposite the side on which is located the said finger, so that said spring tends always to keep said finger in engagement with its selected notch. When it may be desired to readjust the stop devices,
60 it is simply necessary to press down upon the finger-piece 140, thus pressing the spring and raising the finger 139 from its notch, and then by a sidewise force upon the lever push or pull the slide along the bar 123 to the de-
65 sired position for resetting, whereupon the finger will automatically engage the notch upon releasement of the lever. This device

has been found in practice to be exceedingly simple in construction and most convenient of manipulation.

70 While the left-hand stop 126 (shown in Fig. 13) normally contacts with the device 124, which serves as a stop, as well as a pointer, as before explained, and thus normally de-
75 fines the extent of retraction of the carriage and the width of left-hand margin on the paper, nevertheless the construction is such that if it be desired to write within the mar-
80 gin the stop 126 may be caused to pass over the stop 124 for this purpose, and this may be accomplished by means of the release-bar or release-key, which when actuated causes
85 the stop 124 to descend, whereby the stop 126 and the carriage may be pushed farther toward the right and beyond the relatively- fixed stop 124. The writing may then be done
90 within the margin, the carriage moving the while step by step toward the left, and the construction is such that when the stop 126 reaches the stop 124 in this movement it is
95 not arrested thereby, but passes it, thus permitting the continuous or uninterrupted writing of the entire line. The stop 126 is adapted to pass by the stop 124 automatically when
100 moving from right to left by reason of the fact that the stop 126 has a slight bevel or curve on its left-hand lower edge, and the stop-block 124 has a similar formation on its upper right-hand edge, and when these edges
105 engage they operate to depress the arm carrying the stop 124, and then the under side of the stop 126 thereafter keeps the said arm depressed until the stop 126 has fully passed
110 by the stop 124, whereupon it automatically rises to its normal position, where it will serve to arrest the stop 126 and the carriage when
115 they are again retracted or moved back toward the right.

The stop 127, which defines the step-by-step travel of the carriage toward the left, coöper-
120 ates with a lever 143, (see Figs. 10 and 11,) which forms a part of the means for locking the printing mechanism when the carriage has arrived at a predetermined point in the line and which locking means prevents the print-
125 ing of one character over or upon another after the carriage has come to a halt. The said lever 143 is supported by a vertical pivot 144 on a small bracket 145, which itself is supported by a horizontal pivot 146 on the bracket
130 or stand 66. The front end of said lever 143 is bent upwardly to terminate in the path of travel of the line-stop 127 and so as to be influenced thereby when the carriage moves toward the left and is at or near the end of its
135 predetermined travel. The rear end of said lever enters the upper forked end of a vertically-arranged lever 147, having a horizontal pivot 148 and connected at its lower end to a horizontally-arranged link 149, which at its
140 right-hand end is pivotally attached to one arm of a bell-crank 150, pivoted vertically at 151 on the frame of the machine. The longer arm of said bell-crank is forked and connected

to the upright arm 152 of a slide-rod 153, supported in suitable bearings in the framework, and whose forward end is connected to a locking blade or bar 154, which extends across the machine and is mounted upon a pivot-rod 155, whose ends are supported in bearings in the side frames. A coiled spring 161, surrounding the slide-rod 153 and held between the fixed collar 161^a and the rear bearing of the slide, operates to cause the blade 154 to be held upright; but when through the action of the line-stop 127 the lever 143 is vibrated, and through the levers 147 149 and the bell-crank 150 the rod 153 is slid endwise, the blade or bar 154 is pulled to the dotted-line position shown at Fig. 11, where, it will be observed, its free upper edge stands under the series of horizontally-arranged draw-bars 9, and it will be understood that when the locking-blade 154 is in this dotted-line position it is impossible for any of the key-levers to be operated, and hence for the escapement mechanism to be acted upon or the type-bars to ascend far enough to effect printing, for these operations can only be produced through the descending action of the draw-bar. When the locking-blade is in its normal position, (represented in full lines at Fig. 11,) the draw-bars may be successfully pulled down, as represented by one of the bars thereat, and hence there is no interference by said locking-blade with the proper manipulation of the printing mechanism and escapement mechanism.

The following means are provided to release the locking devices, so that one or more letters may be added to the line after the carriage has once come to a stop and the printing and escapement mechanisms have once been locked, as explained: Pivoted at 157 in a lug depending from the top plate is a lever 158, to whose rear arm is connected a vertically-arranged sliding pin 159 and to whose front arm is attached a finger-key 160, which projects above the top plate and slides therein. The upper end of the pin 159 terminates at the under side of the rear arm of the lever 143 and is adapted to rock said lever about the pivot 146 of the bracket 145 when the finger-key 160 is depressed, thereby causing the forward arm of the lever 143 to descend below the path of travel of the line-stop 127, thus permitting the carriage to advance farther, and at the same time, owing to the removal of the side pressure of the line-stop 127 against the lever 143, the said lever, under the influence of a returning-spring 161, flies back to its normal position in a vertical plane, and at the same time spring 161 causes a movement of the slide-rod 153 and the levers 150, 149, and 147 in the opposite direction, and this movement of the slide-rod causes the blade 154, with which it is connected, to swing back to its upright position out of the way of the draw-bars. Thus at one depression of the key 160 the locking mechanism is released and the arm 143, which acts normally in conjunction with the stop 127 to arrest the car-

riage, is moved down away out of the path of the stop 127, so that the latter may pass over the arm in the further movement of the carriage, during which additional letters may be printed upon the line.

The actuating-lever 143 rises to its normal position in a horizontal plane when released from the influence of the stop 127 by means of the retracting-spring 156, riveted on its top and bearing at its free end against a pin 156^a on the bracket 66. By reason of a pin 162, extending from arm 104 to lever 143, the hinged arm 104 and the lever 143 are connected together, so that when the arm is depressed against the tension of its spring 115 the lever 143 is also depressed against the tension of its spring, and hence when these parts are released the said springs operate to restore or vibrate the lever 143 and the arm 104 upwardly simultaneously to their normal positions, the arm 104 swinging about its horizontal pivot 106 and the lever about its horizontal pivot 146; but the pin allows of the depression of lever 143 alone without affecting the arm 104, which latter is depressed as the stop 127 moves toward the left by the action of the stop 127 on the cammed or rounded upper edge of stop 124. On the return movement of the carriage, owing to a beveled or rounded lower edge on the right-hand side of the ear 136 of the stop 127, both the arm 104 and the lever 143 are depressed automatically, so that the stop 127 may pass by the same.

It will be understood that when the margin-stop 126 has been moved over on the right-hand side of the lever 143 and the stop 124 for the purpose of writing within the margin the said stop 126 passes automatically over both the said devices without arresting the leftward travel of the carriage, there being a beveled or rounded lower corner on the left-hand side of the ear of the stop 126, which acts first on the lever 143 to depress it and then on the stop 124 to depress it, and when the stop 126 has fully passed by the stop 124 the lever 143 and the arm 104 automatically return to their first positions and the stop 124 is brought to a normal position to arrest the return movement of the carriage the next time when the contact-stop 126 thereon is moved to the right with the carriage.

When writing is done beyond either the margin-stop or the line-stop, the carriage is limited in its travel by means of a lug 165, adapted to contact with either of two fixed stop-pins 166 on the guide-rail 85. (See Fig. 13.) These devices may be said to constitute permanent stops for the carriage. They also prevent the carriage from detachment from its ways or rails both when the belt or strap 83 is attached and when it is removed. Of course if it be desired to detach the carriage this may be accomplished by removing the lug 165 or the pins 166.

The bar or carriage 81 has a V-shaped groove on its upper edge and also a V-shaped groove on its lower edge, and the guide-rails 85 and

86 have V-shaped grooves facing those in the carriage. Between the lower pair of grooves are arranged two antifriction-balls 167, and in the space between the upper pair of grooves are two loose antifriction-rolls 168, one arranged crosswise of the other. For the purpose of holding the set of balls and the set of rolls in proper working relation and to prevent their escape from the grooves or ways there is provided a vertical holder 169, which is formed with perforated horizontal ears at its lower end to embrace the two antifriction-balls and with a horizontal frame 170, which surrounds the pair of antifriction-rolls. (See Figs. 1, 3, and 7.)

The platen frame or carrier, with its various appurtenances, will now be described.

The platen-carrier consists of a rectangular frame composed of two end bars 171 and 172, a front bar 173, and a back bar or rod 174, which at its ends is hinged or pivotally connected to the carriage-bar 81, the latter being provided near each end with an open hook 175, the throat of which preferably extends or opens upwardly, and owing to the construction of these hooks the platen-carriage may be attached and detached with facility; but for the purpose of preventing accidental detachment of the platen-carrier there is provided at each hook, preferably, a locking contrivance, which consists of a head or collar-like device 176, provided with an integral inwardly-extending flange or wing 177, which is circular in form and fits a circular seat or depression in the hook 175. The head or collar and the circular wing or extension are slotted vertically or radially to register with the slot or throat of the hook, so that the back rod 174 of the platen-carrier may be inserted and removed from the said hook-bearing. The wing sets flush with the bore of the fixed hook and the axes of both hooks are in alinement. When the hinge-rod is in place, its longitudinal axis coincides with the common axis of the fixed and movable hooks. Owing to the above construction and arrangement the rod has a bearing in both hooks, and when the concentric movable hook is turned to locking position the rod is not disturbed, nor can it move from its position axially of the said hooks. The wing and the collar simply rotate about the rod, maintaining their bearing thereon, while at the same time the rod continues to keep its bearing in the bore of the fixed hook. The collar is provided with a small finger-piece 178, by which it and its integral wing seated within the hook may be conveniently rotated, and when the said device is turned forward a portion of the said collar and of the said wing are brought over the back rod of the platen-carrier, and hence effect a closure of the bearing and prevent any accidental detachment of the platen-carrier. Preferably the collar is provided with a pin 179, which travels in a slot or cut-away 180 at the side of the hook, and the ends of said slot or cut-away form

stops for said pin to limit the rotative movement of the locking device.

The front bar of the platen-carrier is provided centrally with an antifriction-roller 181, which travels upon an adjustably-supported track 182, formed at each end and in the center with an oblique slot 183, through which slot passes supporting and guiding screws 184, whose threaded ends engage tapped holes in a fixed bar or rail 185, secured by screws 186 to posts 187, rising from the top plate 31. By this construction the track may be adjusted vertically, so as to bring its upper edge upon which the wheel travels in different vertical planes, according to the nature of the work in hand. As is well known, if the types all strike in proper alinement when a single sheet of paper is on the platen they will not strike in alinement when a large number of sheets of paper are on the platen, as in manifolding work, the enlargement of the platen, so to speak, by the additional thicknesses of paper depressing or lowering the normal printing-center to a point which cannot be reached by all of the type-bars, and hence some of the type-bars will print on either side of a vertical plane passing through the depressed or lowered printing-center, and in consequence the types will be irregularly impressed or staggered upon the paper. The object, therefore, of the vertically-adjustable track is to provide some means for raising the platen proportionately to the increase of diameter thereof by the application of a number of sheets of paper to be manifolded, so as to maintain the printing-center or the exact point at which all of the type-bars will converge or meet practically coincident with or in the horizontal plane of the lowermost or outside sheet of the pile of paper on the platen, and thereby preserve the alinement of the printing for this class of work. When it may be desired to print upon single sheets of paper, the track is lowered, so as to bring the under side of the platen or the sheet of paper thereon in a horizontal plane of convergence of the type-bars.

For the purpose of conveniently adjusting the height of the track there is a screw 188, which enters a threaded hole in the fixed bar 185, and which screw is provided with a cylindrical collar 189, which engages with a vertical slot or groove 190 at the right-hand end of the adjustable rail 182, whereby when the milled head or finger piece or button of the screw is turned the adjustable rail is moved endwise and at the same time, in consequence of the presence of the inclined slots and the guiding-screws, the said rail is also caused to ascend or descend, according to the direction in which the screw 188 is turned. A suitable scale or indicator may be provided to assist in determining the elevation of the rail for a given number of sheets of paper.

The platen 191 is supported by a shaft or axle 192 in the end bars of the platen frame

or carrier and is of the usual construction, excepting for the releasing mechanism now to be described. The platen is provided with a line-spacing mechanism, which will presently be referred to and by which the platen may be turned or rotated step by step as the various lines are printed on the under side of the platen. This line-spacing mechanism permits the platen to be turned independently in either direction by means of knobs or wheels 193 on the platen-axle; but these rotative movements of the platen are limited to given distances or spaces, owing to the presence on the platen of the line-spacing ratchet-wheel 194 and its spring-actuated holdfast or dog 195. On account of this construction it is not possible to turn the platen through variable distances or arcs so that writing may be done on the lines of ruled paper which do not happen to correspond with the distance apart of the teeth of the ratchet-wheel and so that writing may be done upon partially-printed blanks where irregular spaces are to be filled in with the type-writer. For the purpose of providing means whereby these classes of work may be done devices are employed by which the platen proper may be turned separately free or independently of its ratchet-head 194 through arcs or distances either very minute or very large, as may be desired, and to bring any desired line of space on the paper to be printed to the striking-center of the types. The platen comprises a hollow wooden core 196 and a rubber sheath or cover 197, and at the right-hand end of the platen is loosely connected the line-space ratchet-wheel 194, which has an inwardly-projecting hub 198 and is cylindrical on the outside and forms a support and bearing for the right-hand end of the hollow core 196. The interior of said hub is made tapering or conical, as shown at 199, to match the tapering surface of a cone 200, which is splined or feathered upon the shaft 192, so that it may move longitudinally of said shaft slightly and yet rotate with the same. Bearing against the inner end of said cone is a coiled spring 201, which surrounds said shaft and is sustained at its opposite end against a collar or abutment 202. The tendency of said spring is to drive the cone toward the right and into frictional engagement with the tapering interior of the hub 198. Surrounding the shaft on the right-hand side of the cone is a short sleeve 203, and upon said sleeve is mounted a hub or bearing 204, formed integral with the ratchet-wheel and extending outwardly toward the right against an abutting collar 205, which is pinned to the shaft between the end of the hub or bearing and the end bar of the platen-frame. The said hub or bearing 204 is slotted longitudinally on diametrically opposite sides, as at 206, and upon the same is mounted a flanged collar 207, provided on diametrically opposite sides with fixed pins 208, which enter the slots 206 in the hub or bearing.

209 is a lever pivoted vertically at 210 on a stand extending upwardly from the end bar of the platen-carrier, and at the inner or rear end of said lever is attached a pin 211, that has a depending head or shoulder 212, which is accommodated in the groove formed between the flanges of the collar 207, and the said lever at its forward end is fashioned into a finger-piece 213. When said lever is pressed rearward or in the direction of the arrow at Fig. 23, the shouldered or headed pin 211 moves inwardly and causes the collar 207 to slide upon the hub or bearing 204, and the pins 208 on the said collar, acting against the end of the short sleeve 203, cause the said sleeve to push the cone 200 inwardly against its spring and to break the frictional contact thereof with the hub of the ratchet-wheel, and when this has been done the shaft may be turned independently of said ratchet-wheel. The opposite or left-hand end of the shaft is rigidly attached to a head 214, which in turn is firmly secured to the platen-core, and hence when the shaft is turned while the cone is held out of engagement with the hub the said platen is caused to thereby turn independently upon the cylindrical portion of the hub, and this rotative movement of the platen may be effected to any desired degree or extent, since at this time, it will be observed, it is entirely free of the line-spacing mechanism and its ratchet-wheel. When the pressure upon the lever 209 is released, the spring 201 causes the cone to return into frictional engagement with the ratchet-wheel and the sleeve 203, collar 207, and actuating-lever 209 all to return to their normal positions, in which the platen and the ratchet-wheel are adapted to turn together in unison either by means of the line-space lever or by means of the hand-wheels on the platen-shaft.

The line-spacing mechanism is of ordinary construction and may be briefly described as consisting of a rock-shaft or lever 215, having a handle at its forward end and a spring-actuated driving-pawl 216 at its rear end, adapted when the rock-shaft is turned to engage with the teeth on the side of the ratchet-wheel, and thereby turn the platen step by step regular distances, the driving-pawl going out of engagement when the line-spacing lever or rock-shaft is released, but the platen being held against accidental rotation by means of the spring-pressed holdfast or plunger 195, as usual. On the back rod 174 of the platen-carrier is firmly secured opposite near each end of the platen a depending hanger 217, and at the lower end of these hangers is mounted a rod 218, which also takes a bearing in the left-hand end bar of the platen-frame, and at its extremity said end bar is provided with a crank or handpiece 219, by which said rod may be rocked slightly for a purpose which will presently appear. Behind each hanger 217 is a thin flexible arm or hanger 220, which is connected to said hanger 217 by means of a screw 221, which

supports said arm, and the latter is caused to bear against the lower or free end of the hanger 217 and against the back rod 174 of the platen-carrier by means of a bowed or curved plate-spring 222, supported upon said screw 221 and by which it is caused to press against said arm 220 at the points mentioned. At the lowermost or free end of said arm 220 are hooks to receive the journals 223 of the rear feed-roll 224, which extends for nearly the whole length of the platen and is normally pressed up against the same or against any intervening paper by means of the pressure-springs 222. The rod 218 is provided at points opposite the flexible arm 220 with pins or blades 224^a for the purpose of moving said arms rearwardly when the said rod is rocked by means of its crank-handle 219, and thus forcing the feed-roll 224 away from the platen, as indicated at Fig. 5, and thereby facilitating the introduction and removal of the sheets of paper. Upon release of the crank-handle the spring 222 of course restores these parts to their normal positions. The desired pressure of the springs may be readily obtained by adjusting the screw 221.

On the outer side of each hanger 217 and loosely supported upon the rocking rod 218 is a clip 225, to which is attached the upper end of an arm 226, whose lower end is formed integral with or attached to a sheet-metal scale-bar 227, graduated to correspond with the scale on the margin stop-bar and also to correspond with the front scale 228, for which is a hinged pointer 229 on the supporting-bar 185. The scale 228 shows the progress and position of the platen-carriage when it is down and the scale 227 its position when the platen-carrier is turned up.

On the front bar of the platen-carrier are two paper-guides, each constructed and supported like the other and shown more clearly in Figs. 1, 4, and 6. The front bar of the platen-carrier is T-shaped in cross-section, and onto this bar is secured a U-shaped sheet-metal clip 230, which firmly grips the said bar by means of clamping-screws 231. The said clip is provided with an integral downwardly-extending portion 232, which at its free end is bent around into the form of an eye, and through this eye and through coinciding eyes in a small roll-hanger 233 is passed a hinge-pin 234. At the lower end of the hinged roll-hanger is a small feed-roll 235, which projects through an opening in a curved paper-guide 236, whose shank or supporting portion 237 is riveted to the downwardly-projecting portion 232 of the clip. On the front side of said downwardly-projecting portion 232 is attached one end of a spring 238, whose lower end bears against a tongue 239 on the hinged roller-bracket 233, and the said spring operates to hold said feed-roller 235 pressed against the platen or against the paper thereon when it may be desired to have said roller operate; but when it may be desired to throw the roller into disuse its hinged frame or holder is swung

forwardly to the dotted-line position shown at Fig. 4, and then the tongue 239 engages with a notch or bend in the spring 238, and the roll-holder is thereby locked out of operative relation to the platen. The roll-holder may be conveniently thrown into and out of working position by means of a small handle 240, which may form an extension of the pivot of the roll.

Fixedly mounted at about the middle of the front bar of the platen-frame is an additional guide 241 for the central portion of the sheet of paper, which guide is pivoted at 242 in a small bracket 243, screwed upon said front bar. The pivot 242 passes through a block 244, riveted on the back of the guide, and the said block is formed with two beveled faces, which are acted upon by a spring-pressed pin 245, which is adapted to hold said guide in either of the two positions to which it may be adjusted, the pin being mounted to slide transversely in the front rod of the frame, which at this locality is widened and slotted vertically and supports at its lower portion the wheel 181. (See Fig. 3.) When the guide 241 is in the position shown in Fig. 3, its lower end presses the paper against the platen and so prevents puckering or the like and keeps the paper smooth at its central portion. By pressing the upper end of guide 241 backward until the spring-pressed pin 245 passes the point of the block 244 the lower end of guide 241 is moved and held away from the platen and catches the heads of sheets as they are inserted in the machine and directs or guides them up in front of the platen.

For the purpose of guiding the paper properly in between the platen and the feed-roller 224 there are a number of strips of metal 246, attached each at one end to the platen-carrier back bar 174 and at its other lower end to the rock-shaft 218. (See Figs. 1 and 3.) In addition to this guiding means the platen-carrier in practice is provided with the usual paper-table. (Not shown.)

The ribbon mechanism will now be described, reference being had more particularly to Figs. 3 and 15 to 21, inclusive.

Means are provided for moving the ribbon step by step in the direction of its length from one spool to another, also for moving it step by step in the direction of its width, and also for automatically reversing the longitudinal travel of the ribbon at or near the end of the unwinding of either spool.

247 is a fixed shaft or axis upon which the carriage spring-drum 84 rotates, and the forward end of this axis is reduced in diameter to receive the hub of a vertically-arranged disk or wheel 248, having a circular flange 249, whose periphery is formed with a series of fine teeth 250, with which engages a driving-pawl 251, pivoted upon the face of the spring-drum and provided with a handpiece 252 and a holding-spring 253, the spring operating normally to keep the pawl in engagement with the ratchet-teeth, so as to drive the wheel with and during the rotation of the

spring-drum in the direction of the arrow at Fig. 16, the drum turning in this direction during the travel of the carriage from right to left in the printing of a line. During the retraction of the carriage and the rotation of the drum in the opposite direction the pawl 251 slides idly over the teeth of the wheel 248, and hence the wheel remains stationary at this time, a pivoted gravity-pawl 254 extending from the framework and engaging with said wheel to positively prevent it from turning backward at this time under any excessive friction. The pawl 251 may be thrown out of engagement with the ratchet-wheel by swinging the finger-piece 252 toward said wheel, and the free end of the spring is hook-shaped, so as to catch a small lateral pin on the finger-piece and hold the pawl out of such engagement. When this is effected, the ratchet-wheel remains always at rest, and since it controls the entire ribbon-moving mechanism the latter is rendered inoperative, although the machine may be otherwise operated, which is sometimes desired—namely, when it may be desired to use the machine for what is known as “mimeograph-work,” wherein the ribbon is entirely dispensed with. In other machines it is necessary to remove the ribbon from the machine when this class of work is to be performed; but in the present machine it is only essential to throw the pawl 251 out of relation with the ratchet-wheel and then to move the ribbon out of the field of action of the type-bars.

Fast on the hub of the ratchet-wheel 248 or otherwise secured thereto is a heart-shaped cam 255, which operates a connecting rod or strap 256, provided with two pins 257, having small antifriction-rolls, which embrace the cam on diametrically opposite sides of its center of rotation, the rod or strap being formed with a longitudinal slot 258, embracing the hub of the ratchet-wheel, so that the strap may be reciprocated vertically by the said cam and pins. The lower end of the strap is pivoted at 259 to the extremity of the rear arm of an inverted-T-shaped lever 260, secured upon a rock-shaft 261, extending across the machine, and to the opposite or right-hand end of said rock-shaft is secured a bent lever 262. To the extremity of the forward arm of the lever 260 is pivoted at 263 the lower end of a connecting-rod 264, which is formed with a quarter-twist within its length and with a lateral outward bend 265 and with an upwardly-extending portion 266, that is provided with teeth to constitute a rack 267 to engage with a pinion or toothed wheel 268, to be presently referred to again.

The shorter or substantially horizontal arm of the bent lever 262 is likewise pivotally connected at 269 to the lower end of a similar rod 270, arranged at the right-hand side of the machine, and likewise provided with a vertical toothed rack 271 to engage with a similar pinion or toothed wheel 272.

The upright or vertical arm of the T-shaped

lever 260 is forked at its upper end to embrace a pin 273 on a ribbon-spool frame or carrier 274, and the opposite vertical arm 262 is likewise forked at its upper end to embrace a similar pin 273 on a like ribbon-spool frame or carrier 274 on the right-hand side of the machine and in a manner such that both said ribbon-spool frames are connected together and caused to move in unison, and within or surrounded or embraced by each ribbon-spool frame, so as to be carried thereby, is a ribbon-spool. Since each ribbon-spool is constructed and mounted alike, a description of one will suffice for both.

Referring now more particularly to the left-hand side of the machine and especially to Fig. 20, where the parts are shown in section, 275 is a ribbon-spool shaft, which is preferably made in two parts to facilitate construction and assemblage. The inner or rear end of the shaft as a whole is formed with a depression, into which projects a pin 276 on the inner end of the axis 247 of the spring-drum and ratchet-wheel, the said pin serving as a journal for this end of the shaft. The outermost end of the two-part shaft is supported and turns in a bushing or bearing 277, fitted in a socket formed in the framework. This portion 275^a of the shaft is plain or cylindrical for substantially its whole length, and at its inner end is provided with a small pin 278, which enters a depression at the outer end of the main section of the shaft and serves to hold the two sections centrally together or in alignment, and the inner end of the section 275^a is formed with a tongue 279, which enters a groove at the extremity of the main section of the shaft, so that by the said tongue-and-grooved connection both sections of the shaft are adapted to turn together. The main or inner section of the shaft is formed longitudinally with three grooves 280, in each of which grooves is arranged a pair of antifriction-balls 281. Surrounding the said several pairs of antifriction-balls is a sleeve 282, which is slotted longitudinally in three lines, as at 283, coincident with the grooves in the shaft, so that the several pairs of antifriction-balls protrude through said slots, as shown at Figs. 18 and 20, and are thereby guided and maintained in proper position relatively to the said shaft, and at the same time the shaft is so connected to the sleeve as that when the shaft is turned the sleeve turns with it through the medium of the several sets of balls. At about the middle of the sleeve 282 is a circular band 284, formed by the uncut portion of the sleeve, and surrounding this band and like bands at the ends of the sleeve is a second but plain sleeve or tube 285, which bridges over or covers the slots formed in the interior tube, or, in other words, the tube 285 completely surrounds or incases the slotted tube 282 and is secured thereto and to the tubular core 286 of the ribbon-spool by means of screws 287, these several devices being so attached together as that when the inner tube

is turned through the medium of the balls the outer tube and the ribbon-spool are turned in unison therewith. The ribbon-spool comprises, in addition to the said hollow core, 5 flanges or heads 288 and 289, between which heads and the sides of the ribbon-spool frame 274 are located washers 290. The ribbon-spool frame 274 is mounted or supported on the ends of the outer tube 285, which project 10 beyond the heads of the ribbon-spool, and hence said frame, as well as the ribbon-spool, is maintained out of contact with the ribbon-spool shaft. The complete suspension of the ribbon-spool and the ribbon-spool carrier on 15 ball-bearings reduces the friction to the minimum, and the mechanism as a whole is in consequence extremely light-running.

The ribbon 291 is attached to one of the ribbon-spools, from which it is passed over an 20 antifriction-roller 292, mounted in the ribbon-frame, thence over another similar roller 293 at the top of said frame, thence across the type-ring, and down over similar rollers at the other side of the machine, where the opposite end of the ribbon is then attached to the 25 ribbon-spool thereat.

Each ribbon spool or frame is preferably provided with a vertically-disposed antifriction-roll 294, which travels against the inner 30 edge of a slot 295 in the top plate, so as to reduce the friction of the ribbon-spool frame as much as possible in its transverse movements, this reduction of the friction, however, taking place more particularly at 35 the ribbon-spool shaft, where the ball-bearings are arranged.

The shaft-section 275^a is preferably provided with a handle 296, by which the shaft and the spool may be turned by hand, if desired, so as to wind the ribbon rapidly from 40 one spool to another and to facilitate the exchange of ribbons. Just back of the crank-handle 296 is a pivoted hook 297, which may engage a shouldered neck on the outer end 45 of the shaft-section 275^a, so as to keep said section normally in engagement with the main grooved section of the shaft; but when it may be desired to separate these parts the hook may be swung aside and the section 50 275^a withdrawn from its bearings, thus freeing the grooved section of the shaft and permitting it to be removed from the machine and the spool to be detached therefrom. Preferably at each end of each groove in the shaft 55 is a pin 298, which prevents accidental separation of the shaft and the spool in assembling and disassembling the parts, and hence prevents the escape and loss of the several pairs of antifriction-balls, which might otherwise ensue in careless handling of the parts. 60

Turning now to the rack and pinion 267 268 and rack and pinion 271 272, the pinions are mounted loosely on the bushing 277 and are both adapted to be turned constantly during the up-and-down movements of their respective racks. These rotative movements 65 of the pinion communicate rotary movement

to their ribbon-spool shafts by the means now to be described. The said means being identically alike at each side of the machine, a description of one will suffice for both. 70

299 is a long pin depending from the top plate, upon which is pivotally mounted a lever-like frame comprising a vertical member 300, a forwardly-projecting arm 301 at the 75 upper end thereof and a laterally-projecting arm 302 at the lower end thereof and terminating in a direction practically at right angles to the ribbon-spool shaft. (See Fig. 17.) Also projecting laterally from the arm 300 of 80 said frame is a fork 303, which engages with a flanged collar or sleeve 304, mounted on the grooved section of the ribbon-spool shaft. Pivoted in an ear on said collar is a pawl 305, projecting in the direction of a set of ratchet- 85 teeth 306, formed on the inner side or face of the pinion, and when said pawl is in engagement with said set of ratchet-teeth or crown ratchet-wheel the shaft upon which said pawl is mounted is caused to rotate. The said pawl- 90 carrying collar is connected to said shaft by means of a slot-and-feather or tongue-and-grooved construction in a manner such that while the shaft and collar are obliged to turn 95 always together the collar may, nevertheless, be slid lengthwise on said shaft for the purpose of effecting the engagement and disengagement of this pawl, as will presently more fully appear, the feather or tongue 307, Fig. 20, being preferably driven into the shaft and 100 a slight protruding portion thereof engaging a groove formed longitudinally in the collar.

The teeth of the ratchet-wheel 306 are so cut or shaped in the machine, as shown, as that 105 when the rack moves upwardly and turns its pinion, and hence the ratchet-wheel, the pawl in engagement therewith will be carried around thereby, and the pawl being on the collar and the collar being splined to the shaft the shaft will therefore also turn and cause its 110 ribbon-spool to turn with these parts, and at this time the ribbon will be wound upon its spool, the opposite spool at this moment being out of engagement with its driving mechanism and rotating freely to pay off the ribbon 115 therefrom; but the form or construction of the ratchet-teeth is such that when the rack descends the ratchet-wheel slides idly over the pawl, which remains at rest, and hence at this time there is no rotative movement of 120 either the shaft or the ribbon-spool. As the rack is in constant mesh with its pinion and the pinion and ratchet-wheel are formed integral or connected together the said pinion and ratchet-wheel are caused to turn first in 125 one direction and then in the other as the rack reciprocates, the mesh between the rack and pinion being maintained constantly by means of a guide-roll 308, mounted on a small bracket 309, attached to the framework. 130

Owing to the fact that when the rack descends there is no rotative movement of the shaft and spool, the ribbon in consequence is not at this time wound upon either spool; but

the ribbon does not remain stationary during this downward movement of the rack-bar, for at this time the rocker-arms 260 and 262 are vibrating and causing the ribbon-carriers, ribbon-spools, and ribbon to move transversely or laterally toward the front of the machine, and hence a new portion or field of the ribbon is thus always brought over the impression-point and the surface of the ribbon is being utilized in a line substantially at right angles to the edges of the ribbon. Inasmuch as the rocker-arms 260 and 262 are always vibrating during the downward travel or travel from right to left of the carriage at all stages of operation of the keys, the ribbon is consequently always moving at such times in the direction of its width; but when the ribbon is moving backwardly the surface thereof is being used in lines oblique to the edges of the ribbon, owing to the fact that during such backward movement of the ribbon the rack is ascending, and hence at the same time the ribbon-spool is being rotated and the ribbon therefore moving in the direction of its length, as well as in the direction of its width. Thus it will be understood that the ribbon-surface is used alternately in transverse and oblique lines and a fresh surface is always brought to the printing-point. It may be remarked here that owing to the mode of connection between the spring-drum and the ratchet-wheel 250 there is no movement of the said ratchet-wheel or its cam, and hence none of the cross-wise ribbon-moving mechanism during the retractive movements of the paper-carriage or return movements of the latter toward the right as for the beginning of a new line, and hence the ribbon remains absolutely stationary at this time, thus providing for its use in continuous lines without substantial interruption or waste of surface.

The pawls which are acted upon by the ratchet-wheels 306 are connected together in such a manner that when one pawl is in engagement with its associated ratchet-wheel the other pawl is out of engagement with its wheel, and thus alternate engagement and disengagement of the said pawls and ratchet-wheels may be effected either by hand or by the automatic means to be presently described.

The pawls are connected together by means of a switch-rod or shifter 310, which extends across the machine and is pivotally connected at its ends to the forwardly-extending arms 301, the arrangement being such that when either of the laterally-projecting arms 302 is moving toward its associated ratchet-wheel and through the fork and collar its pawl is moved into engagement with said wheel the associated arm 301 is vibrated inwardly and causes the shifter-rod to slide endwise and move the opposite arm 301 outwardly, and thereby cause a vibration of the lever-frame, of which it is a part, and a movement of its associated pawl rearward or away from its associated ratchet-wheel to correspond with the movement of the lateral arm 302, thus

putting one ribbon-spool into gear for winding up the ribbon and the other one out of gear for paying off the ribbon. For the purpose of holding the shifting-bar or switch 310 and the pawls in and out of engagement, as desired, there is a spring-mounted roller 311, which engages with a double-acting cam or incline 312 on said bar, and which construction also tends to complete the shifting action, it being only necessary to move the point of the double incline slightly past the center of the roll, whereupon the spring-arm 313, carrying said roll, will effect the remainder of the movement. While this shifting in and out of the pawls may be effected by hand, means are nevertheless provided for performing this operation automatically. The said means are shown best at Figs. 20 and 21, whereat 314 is a lever or arm pivoted at 315 within the core or hollow axle of the ribbon-spool, and one head 289 of said spool is slotted at 316 for the protrusion of the free end of said lever, and the core of said spool is also slotted lengthwise, as at 317, to permit the said lever to drop or fall when the spool has become empty, the lever being held up normally within the core or body of the spool by the wrapping or folds of the ribbon; but when the ribbon has been entirely unwound and the lever has come around to the under side of the shaft it will fall by gravity and its protruding end will then come in line with the laterally-extending arm 302 and will strike against said arm as soon as the ribbon-carrier moves the arm 314 far enough forward for this purpose. When the arm 302 is thus struck, the lever or bell-crank frame, of which the arm 302 forms a part, will be vibrated and its associated collar will be carried forward by its fork and the pawl mounted thereon will be caused to engage its ratchet-wheel, and simultaneously through the arms 301 and shifter-bar 310 and the lever-frame at the other side of the machine the other pawl will be automatically disengaged from its ratchet-wheel, and the longitudinal travel of the ribbon will thus be reversed. As long as the pivoted arm or lever 314 is held up by the folds or coils of the ribbon its free operating end is held above the plane of the arm 302, and hence is incapable of actuating said arm 302 during the back-and-forth movements of the ribbon-spool carrier.

The ribbon may be further guided and supported by a ribbon-plate 318, extending across the top plate and supported at its ends upon the axes of the rollers 293, the said ribbon-plate being preferably hinged at its left-hand end and hooked at its right-hand end, so that it may be conveniently swung up, with the ribbon, to enable the types to be cleaned and for purposes of repair, &c.

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

1. In a type-writing machine, the combination of a key-lever, a draw-bar arranged thereover, a link connecting said key-lever and

said draw-bar, a pair of obliquely-arranged links pivotally mounted above said key-lever and supporting at their free ends the said draw-bar, a type-bar, and a connecting-rod 5 between said type-bar and said draw-bar.

2. In a type-writing machine, the combination of a key-lever pivoted at the rear of the machine and extending to the front, a draw-bar arranged thereover, a link connected at 10 one end to said draw-bar between its ends and connected at its other end to said key-lever between its ends, a pair of obliquely-arranged links for supporting said draw-bar, a connecting-rod and a type-bar.

15 3. In a type-writing machine, the combination of a series of key-levers of different lengths and all having a common axis of vibration at the rear of the machine, a series of draw-bars of uniform length arranged over 20 the series of key-levers, a series of links 7 connecting said draw-bars and key-levers substantially as shown and described, and a series of obliquely-arranged links 11 having a common pivot or fulcrum bar 12 for sup- 25 porting the front ends of said draw-bars, a series of obliquely-arranged links 14 having a common pivot or fulcrum bar 15 for supporting the rear ends of said draw-bars, a series of connecting-rods attached at varying 30 points to the said series of draw-bars, and a series of circularly-arranged type-bars.

4. In a type-writing machine, the combination of a series of key-levers, a series of draw-bars mounted thereover and pivotally sup- 35 ported upon obliquely-arranged links, connections between said draw-bars and said key-levers, a series of type-bars connected to said draw-bars, a universal bar arranged transversely under the series of draw-bars so 40 as to be directly actuated thereby and provided with arms attached to a transverse rock-shaft, an escapement mechanism, a vertically-arranged escapement-rod, and an arm extending from said transverse rock-shaft to 45 said escapement-rod.

5. In a type-writing machine and in a type-movement substantially as described, the combination with the draw-bars, of a universal bar arranged thereunder and connected 50 to a transverse rock-shaft, an arm extending from said rock-shaft, an upright escapement-rod connected to said arm, an escapement mechanism, an arm 102 on said rock-shaft, and an adjustable stop for determining the 55 upward movement of said escapement-rod and the extent of engagement of the escapement-dogs.

6. In a type-writing machine, the combination of an escapement mechanism, a vertically-arranged escapement-rod having a head 60 or flange at its lower end, a transverse rock-shaft, a rocker-arm extending forwardly therefrom and connected to a vertical slot at the lower end of said escapement-rod, a universal bar attached by arms to said transverse rock- 65 shaft, draw-bars acting on said universal bar, key-levers connected to said draw-bars, con-

necting-rods, and type-bars, and a spacing device comprising two independently-pivoted lever-frames, the rearmost frame having a 70 lip for engaging said head or flange on the escapement-rod, the construction being such that the escapement-rod may be actuated either through the universal bar when the character-key levers are depressed or inde- 75 pendently when the space-key is depressed.

7. In a type-writing machine and in an escapement mechanism, the combination with an escapement-wheel, of a movable dog so 80 mounted and arranged that when released from one tooth of the wheel it immediately takes a position in the path of the next tooth of the wheel.

8. In a type-writing machine and in an escapement mechanism, the combination with 85 an escapement-wheel, of a dog pivoted to move in the arc of a circle and so arranged that when released from one tooth of the wheel it immediately takes a position in the path of the next tooth of the wheel, and a 90 holding-dog to hold said wheel when the movable dog is released.

9. In a type-writing machine, the combination in an escapement mechanism, of an escapement-wheel, a vertically-operating es- 95 capement-rod carrying at its upper end a pivoted dog which normally engages said wheel and arrests its rotation, a back-stop for said dog while it is in engagement with the escapement-wheel, a spring to throw said dog 100 forward when pulled down out of engagement with said escapement-wheel for moving the point of said dog into a position where it will engage with the next tooth of said escapement-wheel, a front stop for limiting the for- 105 ward throw of said dog, a holding-dog for engaging said escapement-wheel when the first-mentioned feeding-dog is pulled down, a bell-crank or bent lever pivoted on the framework and carrying said holding-dog and having 110 one of its arms pivotally connected to the said escapement-rod.

10. In a type-writing machine and in an escapement mechanism, the combination of a power-driven carriage, a rack, a reciprocary 115 rod or bar, and a spring-pressed dog pivotally connected to said rod or bar and normally engaged with said rack, but when disengaged therefrom adapted to move under the action of its spring, in an arc intersecting 120 the path described by the points of the teeth of said rack and directly into a position in the path of the next tooth of the rack for engaging the same.

11. In a type-writing machine, the combination with an escape-wheel, of a pair of piv- 125 otally-mounted dogs one of which has an approximately vertical movement while in engagement with the escape-wheel but so pivoted as to move toward the other dog when released 130 and get into the path of rotation of the next tooth of the escape-wheel.

12. In a type-writing machine, the combination with an escape-wheel, of a spring-

mounted stepping-dog having an approximately vertical movement while in engagement and mounted in a vertically-reciprocatory support or holder which is attached to
5 and gives motion to the detaining-dog of the escapement, which latter is independently pivoted and moves in an arc of a circle approximately at right angles to the movement of the first member.

10 13. In a type-writing machine, the combination with an escape-wheel, a pivotally-mounted holding-dog and a pivotally-mounted feeding-dog arranged to move in unison but one toward the center and the other away
15 from the center of the escape-wheel, and the pivot of the feeding-dog being so arranged relatively to the axis of the escape-wheel that when the feeding-dog is disengaged from the escape-wheel its point takes a position at once
20 in the path of the next tooth of the escape-wheel while at the same time the holding-dog moves to a position to check the rotation of said wheel.

14. In a type-writing machine, the combination with the escapement-wheel, of a bell-crank or bent lever pivoted on the framework and carrying on one arm a holding-dog,
25 and an escapement-rod connected to the other arm of said bell-crank or bent lever and carrying a feeding-dog.
30

15. In a type-writing machine, the combination with the escapement-wheel, of a bell-crank pivoted on the framework, a holding-dog carried by one arm thereof, an escape-
35 ment-rod connected to the other arm of said bell-crank, a feeding-dog pivoted upon said escapement-rod and having a lateral extension 58 and a projection 58^a, the pin 59 and also the stop 61 on said rod and the interven-
40 ing spring 60.

16. In a type-writing machine, the combination with the escapement-wheel, of a bell-crank pivoted to the frame and carrying on one arm a holding-dog, an escapement-rod
45 connected to the other arm of said bell-crank and carrying a feeding-dog, the spring 89 and the link 90 connected to the holding-dog arm of said bell-crank.

17. In a type-writing machine, the combination in an escapement mechanism, with an escapement-wheel connected to a pinion-shaft by a pawl-and-ratchet mechanism so as to
50 turn always in one direction, of the spring-pressed arm 91 pivoted on the framework of the machine and arranged to engage with the points of the teeth of the escapement-wheel so as positively to prevent any reverse rota-
55 tive movement of said escapement-wheel.

18. In a type-writing machine, a series of independent and separable type-bar hangers arranged in pairs one directly above the other,
60 a pivot mounted in each hanger, and a type-bar arranged on one side of the middle portion of one pivot, and a type-bar arranged on the opposite side of the middle portion of the
65 other pivot.

19. In a type-writing machine, a series of

independent type-bar hangers arranged in pairs one above and in direct alinement with the other, each pair separated by a removable
70 washer, and each hanger having a pivoted type-bar; one type-bar supported by one hanger being arranged at one side of the middle portion of its pivot and the other type-
75 bar on the other hanger being arranged on the opposite side of the middle portion of its pivot.

20. In a type-writing machine, a series of independent type-bar hangers arranged in pairs one above the other each pair held by
80 the same screw and each hanger having a pivoted type-bar.

21. In a type-writing machine, a pair of independent hangers mounted one over the other with an intervening washer and also
85 with a washer upon the topmost hanger, a single screw passing through said hangers and washers and clamping the same upon the top plate, each hanger having at its inner end a pivoted type-bar.
90

22. In a type-writing machine, a plurality of pairs of adjacent hangers, elongated washers extending over the series and resting upon the lower hangers of each pair, a second washer extending over the series and
95 resting upon the upper hanger of each pair, a single screw for each pair of hangers and washers and engaging the top plate or support, the inner end of each hanger being provided with a pivoted type-bar.
100

23. In a type-writing machine, a pair of independent type-bar hangers, one hanger arranged above the other, type-bars pivotally mounted in the hangers with their pivots in different vertical planes and at an angle to
105 each other and the pivots of said type-bars being also inclined or oblique relatively to a horizontal plane.

24. In a type-writing machine, a pair of hangers, one hanger arranged above the other,
110 a pivot at the inner end of each hanger arranged at an angle to a horizontal plane, the pivot of the upper hanger being arranged farther back than the pivot of the lower hanger and the vertical planes of the pivots
115 being at angles to each other, a type-bar attached to each pivot and in a different vertical plane, and the upper type-bar having a bend to embrace the pivot of the lower type-bar.
120

25. In a type-writing machine, the combination of a carriage having a feed-rack, a swinging bracket having a pivot arranged at right angles to said rack, a shaft parallel with the said pivot carried by the free end of said
125 bracket, a pinion on the inner end of said shaft to engage with said rack, an escapement-wheel at the outer end of said shaft to cooperate with the escapement-dogs, a release-key, and connections therefrom to the
130 said bracket whereby the said shaft is carried bodily downward, substantially at right angles to the rack, to effect a disengagement between said rack and its pinion.

26. In a type-writing machine, the combination of a carriage having a feed-rack, a swinging bracket having a pivot arranged at right angles to said feed-rack and carrying at its free end a shaft parallel with said pivot, a pinion on one end of said shaft to engage the said rack, and an escapement-wheel on the other end of said shaft to cooperate with the escapement-dogs, a swinging arm whose pivot is arranged at right angles to that of the said bracket, a connection between said arm and said bracket, and a release-key mechanism acting first upon said arm through the said connection and then upon said bracket.

27. In a type-writing machine, the combination of a carriage having a feed-rack, a swinging bracket whose pivot is arranged at right angles to said feed-rack, a shaft mounted to rotate in the free end of said bracket, a pinion on one end of said shaft and an escapement-wheel on the other end, an arm whose pivot is arranged at right angles to said shaft and to the pivot of said bracket, a connection between said arm and said bracket, and a release-bar supported upon the carriage and adapted to depress said arm and bracket.

28. In a type-writing machine, the combination of a carriage having a feed-rack, a swinging bracket whose pivot is arranged at right angles to said feed-rack, a shaft mounted to rotate in the free end of said bracket, a pinion on one end of said shaft and an escapement-wheel on the other end, an arm whose pivot is arranged at right angles to said shaft and to the pivot of said bracket, a connection between said arm and said bracket, a release-bar hung by obliquely-arranged links to the said carriage and provided with guiding means, and a finger-piece.

29. In a type-writing machine, the combination of a carriage having a feed-rack, a swinging bracket whose pivot is arranged at right angles to said feed-rack, a shaft mounted to rotate in the free end of said bracket, a pinion on one end of said shaft and an escapement-wheel on the other end, an arm whose pivot is arranged at right angles to said shaft and to the pivot of said bracket, a connection between said arm and said bracket, a release-bar hung on said carriage and having a flange, and a release-key having a crank-arm for acting upon said flange to depress the bar, the arm and the swinging bracket.

30. In a type-writing machine, the combination of a carriage having a feed-rack, a swinging bracket whose pivot is arranged at right angles to said feed-rack, a shaft mounted to rotate in the free end of said bracket, a pinion on one end of said shaft and an escapement-wheel on the other end, an arm whose pivot is arranged at right angles to said shaft and to the pivot of said bracket, a connection between said arm and said bracket, a release-bar hung by obliquely-arranged links in said carriage and having a horizontal flange, a rock-shaft mounted in the platen-carrier and having at one end a finger-key and at its op-

posite end a crank-arm adapted to act upon said flange.

31. In a type-writing machine, the combination with a carriage, a feed-rack, a pinion and an escapement mechanism, of means for separating said rack and pinion comprising a release-bar having a horizontal flange and mounted so as to be depressed, and a rock-shaft mounted in a hinged platen-carrier and having at one end a key and at the other end a crank-arm adapted to act on the flange of the release-bar when the platen-carrier is in its normal or working position.

32. In a type-writing machine, the combination of the pivoted arm 104 on the framework carrying the stop-block 124, a release-key therefor, the toothed bar 123 on the carriage, the margin-stop 126 adjustably mounted on said toothed bar and having the projecting ear 136 constructed at its right-hand side to strike against the block 124 and arrest the carriage on its return movement and also constructed on its left-hand side at its lower edge with a rounded or inclined portion adapted to force down the said block when after depression of the said block by means of the release-key said margin-stop has been caused to step over the said block for the purpose of enabling writing to be done within the margin.

33. In a type-writing machine, the combination with the toothed bar 123 on the carriage, of a margin-stop comprising the rectangular box-like structure formed at its front side with an ear 136 having a vertical slot and a lever 137 pivoted in said slot and provided at its inner end with a finger 139 and at its outer end with a finger-piece 140 and the said ear having also a housing for accommodating an internal spring 141.

34. In a type-writing machine and in a line-locking mechanism, the combination of key-levers, draw-bars arranged thereover, links connecting said levers and said bars, obliquely-arranged links supporting said draw-bars, type-bars connected with said draw-bars, a locking plate or blade for preventing movement of said draw-bars, and means for holding said blade in the path of movement of said draw-bars when the carriage has arrived at a predetermined point in the line.

35. In a type-writing machine and in a line-locking mechanism, the combination of key-levers, draw-bars arranged thereover, links connecting said levers and said bars, obliquely-arranged links for supporting said draw-bars, type-bars connected with said draw-bars, a locking blade or plate, mechanism for holding said blade against the said draw-bars so as to block their movement, and a device on the carriage for actuating said mechanism when the carriage has arrived at a predetermined point in the line.

36. In a type-writing machine and in a line-locking mechanism, the combination of a carriage, a contact device thereon as 127, a lever 143 in the path of said stop having a vertical

pivot, a lever 147, a link 149, a bell-crank 150, a spring-actuated sliding rod 153, a locking-blade 154 and the type-bar mechanism.

37. In a type-writing machine, the combination in a line-locking mechanism, of a carriage having a contact, a lever pivoted horizontally and vertically, the draw-bars of the type-bar mechanism, the locking-blade, connections between said blade and said lever, and a release-key connected to said lever for vibrating it about its horizontal pivot when it may be desired to release the type-bar mechanism and carriage for additional printing.

38. In a type-writing machine and in a line-locking mechanism, the combination of a carriage, a contact thereon, the lever 143 having a vertical pivot and a horizontal pivot, the lever 147, the link 149, the bell-crank 150, the sliding rod 153, the locking-blade, the draw-bars of the type-movement, and the release-key, the whole operating substantially as described.

39. In a type-writing machine and in a line-locking mechanism, the combination of a carriage, an actuating-stop or contact thereon, a lever as 143 having a vertical pivot and a horizontal pivot, the type-movements, a locking-blade therefor connected to said lever, a release-key, and a pin extending from said release-key to said lever 143 and vibrating the same out of the path of the actuating-stop to unlock the line and permit further printing thereon.

40. In a type-writing machine, the combination in a line-locking mechanism, of the type-movements, the locking-blade, the lever 143, having a vertical pivot and a horizontal pivot, and connected to said locking-blade, the arm 104 having the stop 124 and pin 162, the carriage having a stop as 127, and a release-key.

41. In a type-writing machine, the combination of a carriage having open or slotted fixed hooks and open or slotted movable hooks, a platen-carrier frame having a hinge-bar adapted to be seated in the slots of both the fixed hooks and the movable hooks and to be locked therein by rotative movement of the movable hooks.

42. In a type-writing machine, the combination of a carriage having fixed, open or slotted hooks and movable open or slotted hooks supported axially of or concentric with the fixed hooks, and a platen-carrier having its hinge-rod supported in said hooks and adapted to be locked therein against detachment therefrom by a rotative movement of said movable hooks.

43. In a type-writing machine, the combination of a carriage having fixed, open or slotted hooks and movable, open or slotted hooks, a platen-carrier having a hinge-rod seated in both the fixed and the movable hooks and adapted to be attached to and detached from said hooks when their slots are arranged in alinement and adapted to be locked against detachment, when the slots in

the movable hooks are turned out of alinement with those in the fixed hooks.

44. In a type-writing machine, the combination of a carriage having one or more fixed slotted hooks or bearings and one or more laterally-arranged movable slotted hooks or bearings, and a platen-carrier having a hinge-bar adapted to said hooks; the longitudinal axes of the several hooks and the hinge-bar being coincident and the hinge-bar having a bearing in both the slotted and fixed hooks.

45. In a type-writing machine, the combination of a carriage having one or more fixed slotted hooks and one or more movable slotted hooks having their bearings in the fixed slotted hooks, but having its axis or their axes coincident with the axis or axes of the bearing or bearings of the fixed slotted hook or hooks and a platen-carrier having a hinge-bar which has a bearing in both the slotted and fixed hooks.

46. In a type-writing machine, the combination of a carriage having one or more fixed slotted hooks formed with a circular depression and having one or more movable slotted hooks formed with a circular wing, and a platen-carrier having a hinge-bar adapted to said hooks.

47. In a type-writing machine, the combination of a carriage having one or more fixed slotted hooks and one or more movable slotted hooks having their bearings therein, the fixed hooks having end slots and the movable hooks pins, and a platen-carrier having a hinge-bar adapted to said hooks.

48. In a type-writing machine, the combination of a carriage having a fixed slotted hook and a movable slotted hook, the axes of the said two hooks being in the same horizontal plane, a platen-carrier having a hinge-bar adapted to bear in both said hooks, and means for limiting the rotative movement of the movable hook.

49. In a type-writing machine, the combination with the platen-carrier, of a front rail comprising a fixed section and a vertically-movable section for varying the height of the platen.

50. In a type-writing machine, the combination with the platen-carrier, of a front rail comprising a fixed section and a vertically-movable section, and a screw engaging the fixed section and having a collar which works in a slot in the movable section.

51. In a type-writing machine, the combination with the platen-carrier, of a vertically-adjustable front carriage-rail, a support therefor, and means for raising and lowering said rail consisting of pins and slots and an actuating-screw.

52. In a type-writing machine, the combination of a fixed rail, a vertically-movable rail connected thereto by oblique slots and pins and a screw engaging both rails and adapted to raise and lower the movable rail.

53. In a type-writing machine, the combination of a fixed rail, a movable rail connected

thereto by inclined slots and pins, a screw entering a tapped hole in the fixed rail and having a collar which engages a vertical slot in the movable rail.

5 54. In a type-writing machine, the combination of a platen having a line-space ratchet-wheel and mechanism for rotating the same, the ratchet-wheel being loosely connected to the platen and the said ratchet-wheel having
10 a hub which is cylindrical on the outside and tapering on the inside, a platen-shaft rigidly connected to the platen at the opposite end, a cone on said shaft and a spring for pressing said cone normally in contact with said con-
15 ical hub whereby the platen and its ratchet-wheel and the shaft are all caused to turn together normally when the line-spacing mechanism is operated and means for separating the contact between said cone and said hub
20 for releasing the ratchet-wheel and enabling the platen to be turned independently thereof and of its actuating mechanism.

55. In a type-writing machine, the combination of a platen having a hollow core, a
25 ratchet-wheel loosely connected thereto and having a hub upon which said core is mounted, the said hub being tapered interiorly, means for driving said ratchet-wheel, a shaft passing through said core and rigidly con-
30 nected to the platen at one end, a cone on said shaft, a spring for normally holding said cone in frictional contact with the hub of the ratchet-wheel, a sleeve on said shaft, and a lever acting on said sleeve to move the cone
35 endwise on said shaft and thus release the ratchet-wheel from the platen whereby the shaft and the platen may be turned independently of said ratchet-wheel.

56. In a type-writing machine, the combination of a platen having a hollow core, a
40 ratchet-wheel having a hub that enters said core at one end, a shaft which passes through said ratchet-wheel and core and is rigidly connected at its opposite end to said platen, a
45 cone slidably mounted on said shaft for engaging the tapering interior of said hub, a spring for effecting such engagement, a sleeve on said shaft, a slotted hub or bearing projecting outwardly from said ratchet-wheel
50 and surrounding said sleeve, a flanged collar surrounding said hub or bearing and provided with means to engage said sleeve, and an actuating-lever connected to said flanged collar.

57. In a type-writing machine, the combination of a platen having a hollow core, a
55 ratchet-wheel loosely connected to one end thereof and having an inwardly-projecting hub that is tapered interiorly, the shaft, the cone movable endwise only thereon for frictionally engaging said hub, and a lever for moving said cone and breaking such engagement whereby the platen may be turned in-
60 dependently of its ratchet-wheel.

58. In a type-writing machine, the combination of a ribbon, a pair of ribbon-spools, a
65 pair of ribbon-spool shafts a pair of pinions, a pair of reciprocating racks, a ratchet-wheel

connected to each pinion, and a pawl connected to each shaft.

59. In a type-writing machine, the combination of a ribbon, a pair of ribbon-spools, a
70 pair of ribbon-spool shafts, a pinion, a ratchet-wheel and a pawl for each shaft, a rack co-operating with each pinion, a rock-shaft, levers thereon for reciprocating said racks, a
75 spring-drum, and means connected to said drum and to said rock-shaft for reciprocating said racks.

60. In a type-writing machine, the combination of a ribbon, a pair of ribbon-spools, a
80 pair of ribbon-spool shafts, a pinion, a ratchet-wheel and a pawl for each shaft, a rack for rotating each pinion, a rock-shaft, levers or arms secured thereto and connected to said rack, a spring-drum, a cam, a connecting-rod
85 actuated thereby, and an arm on said rock-shaft attached to said connecting-rod.

61. In a type-writing machine, the combination of a ribbon, a ribbon-spool, a ribbon-
90 spool shaft, a pawl connected thereto to rotate therewith, a ratchet-wheel to engage said pawl and turn said shaft when the said ratchet-wheel rotates in one direction, but to slip idly over the said pawl without rotating the shaft
95 when it turns in the opposite direction, and means for turning said ratchet-wheel first in one direction and then in the opposite direction.

62. In a type-writing machine, the combination of a ribbon, a ribbon-spool, a ribbon-
100 spool shaft, a pawl connected thereto to rotate therewith, a ratchet-wheel to engage said pawl and turn said shaft when the said ratchet-wheel rotates in one direction, but to slip idly over the said pawl without rotating the shaft
105 when it turns in the opposite direction, a pinion connected to said ratchet-wheel, and a reciprocating rack always in engagement with said pinion and operating to turn it first in one direction and then in the reverse direc-
110 tion.

63. In a type-writing machine, the combination of a ribbon, a ribbon-spool, a ribbon-
115 spool shaft, a pawl connected thereto to rotate therewith, a ratchet-wheel to engage said pawl and turn said shaft when the said ratchet-wheel rotates in one direction, but to slip idly over the said pawl without rotating the shaft
120 when it turns in the opposite direction, a pinion connected to said ratchet-wheel, a reciprocating rack, means for keeping said rack always in engagement with said pinion, and means for reciprocating said rack.

64. In a type-writing machine, the combination of a ribbon, a ribbon-spool, a ribbon-
125 spool shaft, a pawl connected thereto to rotate therewith, a ratchet-wheel to engage said pawl and turn said shaft when the said ratchet-wheel rotates in one direction, but to slip idly over the said pawl without rotating the shaft
130 when it turns in the opposite direction, a pinion connected to said ratchet-wheel, a reciprocating rack means for keeping said rack always in engagement with said pinion, a le-

ver connected to said rack, a connecting-rod attached to said lever, a cam for operating said connecting-rod, and means for rotating said cam connected to the carriage-driving drum.

65. In a type-writing machine, the combination of a ribbon, a ribbon-spool, a ribbon-spool shaft, a pawl connected to said shaft, a ratchet-wheel for engaging said pawl and turning said shaft, means for rotating said ratchet-wheel first in one direction and then in the opposite direction, and means for disengaging said pawl and ratchet-wheel.

66. In a type-writing machine, the combination of a ribbon, a pair of ribbon-spools, a pair of ribbon-spool shafts, a pawl connected to each ribbon-spool shaft to turn the same, a ratchet-wheel for each pawl, means for connecting said pawls together so that when one pawl is in engagement with its ratchet-wheel the other pawl is out of engagement with its ratchet-wheel, a pinion connected with each ratchet-wheel, a pair of connected racks operating to rotate said pinions and ratchet-wheels first in one direction and then in the opposite direction.

67. In a type-writing machine, the combination of a ribbon, a pair of ribbon-spools, a pair of ribbon-spool shafts, each carrying a rotatory pawl, a ratchet-wheel adapted to engage and drive each pawl, means for rotating said ratchet-wheels, a lever-frame connected to each pawl for engaging it with and disengaging it from its associated ratchet-wheel, and a connecting-bar attached to each lever-frame whereby when one pawl is put into engagement with its associated ratchet-wheel the other pawl is put out of engagement with its associated ratchet-wheel.

68. In a type-writing machine, the combination of a ribbon, a pair of ribbon-spools, a pair of ribbon-spool shafts, a pawl connected to each ribbon-spool shaft, a ratchet-wheel for driving each pawl, a rack and pinion for driving each ratchet-wheel, means for connecting said racks together and to the spring-drum, a lever-frame connected to each pawl for moving it into and out of engagement with its ratchet-wheel, and means for connecting together said lever-frames whereby when one pawl is put into engagement the other is put out of engagement.

69. In a type-writing machine, the combination of a ribbon, a pair of ribbon-spools, a pair of ribbon-spool shafts, a collar splined on each shaft and carrying a pawl, a ratchet-wheel for engaging each pawl, a rack and pinion for driving the same, and a switch mechanism connected to said collars for alternately engaging said pawls with their ratchet-wheels.

70. In a type-writing machine, the combination of a ribbon, a pair of ribbon-spools, a pair of ribbon-spool shafts, a collar splined on each shaft and carrying a pawl, a ratchet-wheel for engaging each pawl, a rack and pinion for driving the same, and a switch mechanism

comprising the two vertically-pivoted lever-frames 300 having forks connected to said collars, the connecting-bar 310, the cam 312, and the spring-arm 315.

71. In a type-writing machine, the combination of a ribbon, a pair of ribbon-spools, a pair of ribbon-spool shafts, means for moving the ribbon-spools endwise, a device arranged within each spool and held in normally by the coils of the ribbon, means for rotating the spools, a switch mechanism independent of and for controlling the spool-rotating means and adapted to be actuated automatically by either of the devices within the spools when either of the spools becomes empty and its associated device is permitted to move outwardly and into the plane of the switch mechanism.

72. In a type-writing machine, the combination of a ribbon, a pair of ribbon-spools, each containing an arm or lever held in normally by the coils of the ribbon but adapted to move outwardly when the spool becomes empty, a pair of ribbon-spool shafts means for moving the spools endwise on their shafts, means for rotating said shafts, a switch mechanism independent of and for controlling the rotating means and adapted to be actuated alternately by the arms or levers in the spools when said arms are released by the ribbon and are carried over into contact with said switch mechanism by the endwise movements of the spool, whereby the direction of rotation of the spools is automatically reversed and the longitudinal movement of the ribbon is likewise reversed.

73. In a type-writing machine, the combination of a ribbon, a pair of ribbon-spools each containing an arm or lever held in normally by the coils of the ribbon and adapted to move outwardly when the spool becomes empty, means for rotating the spool, a switch mechanism independent of and for controlling the spool-rotating means and comprising a pair of connected lever-frames having each an arm, and means for moving the spools endwise, whereby when either of the levers or arms within the spools is released and is carried over into contact with either of the arms on the connected switch-frames, said frames are actuated and the spool-rotating means is reversed and the ribbon caused to travel longitudinally in the reverse or opposite direction.

74. In a type-writing machine, the combination of a ribbon, a pair of ribbon-spools, a pair of ribbon-spool shafts, a pair of ribbon-spool carriers, a pair of connected levers operated from the spring-drum for moving the ribbon carriers and spools endwise, an arm or lever 314 in each spool, means for rotating the spools, and a pair of connected lever-frames having each an arm 302 adapted to be acted upon by its associated arm or lever 314, and said lever-frames operating to connect and disconnect the means for rotating the spools.

75. In a type-writing machine, the combination of a ribbon, a pair of ribbon-spools, a pair of ribbon-spool shafts, a pair of ribbon-spool carriers, a pair of connected levers actuated from the spring-drum for moving said ribbon carriers and spools endwise, a lever 314 in each ribbon-spool, a pawl on each ribbon-spool shaft, a ratchet-wheel for driving each pawl, a rack and pinion for rotating each ratchet-wheel, and a pair of connected lever-frames for moving said pawls in opposite directions, and having each an arm 302 to cooperate with its associated lever 314.

76. In a type-writing machine, the combination of a ribbon, a pair of ribbon-spools, a pair of ribbon-spool shafts, a pair of ribbon-spool carriers, a pair of connected levers actuated by a spring-drum for moving said carriers and ribbon-spools endwise, a pawl-and-ratchet mechanism for driving each shaft, and a rack-and-pinion mechanism for driving the pawl-and-ratchet mechanism and connected to the levers which move the spools and carriers endwise.

77. In a type-writing machine, the combination of a ribbon, a pair of ribbon-spools, a pair of ribbon-spool shafts, a pair of ribbon-spool carriers, a pair of connected levers actuated by a spring-drum for moving said carriers and ribbon-spools endwise, a pawl-and-ratchet mechanism for driving each shaft, and a rack-and-pinion mechanism for driving the pawl-and-ratchet mechanism and connected to the levers which move the spools and carriers endwise, a switch mechanism, and a lever in each ribbon-spool controlled by the folds of the ribbon for actuating said switch mechanism.

78. In a type-writing machine, the combination of a ribbon, a pair of ribbon-spools, a pair of ribbon-spool shafts, a pair of ribbon-spool carriers, a rock-shaft 261, a pair of levers connected thereto and to the ribbon-spool carriers, a spring-drum, a cam connected thereto, a rod actuated by said cam and connected to said rock-shaft, a pair of racks also connected to said rock-shaft, a pair of pinions adapted to be rotated by said racks, a ratchet-wheel connected to each pinion, a pawl on each ribbon-spool shaft adapted to be driven by its ratchet-wheel when turned in one direction but to remain unaffected when said ratchet-wheel turns in the opposite direction, a pair of attached lever-frames connected to said pawls, and a lever in each ribbon-spool adapted to strike said lever-frame and shift the pawls when either spool becomes empty, whereby the ribbon is adapted to move back and forth widthwise and also move longitudinally from one spool to another and to be automatically reversed as to its longitudinal travel when either spool becomes empty.

79. In a type-writing machine and in a ribbon mechanism, the combination of a ribbon-spool shaft having a plurality of longitudinal ball-bearing grooves, balls arranged in said

grooves, a sleeve having a plurality of slots to correspond with the grooves in the shaft and surrounding said balls so that the balls protrude through the slots in the sleeves, and a ribbon-spool connected to said sleeve so as to be wholly suspended on the ball-bearings.

80. In a type-writing machine and in a ribbon mechanism, the combination of a ribbon-spool shaft having a longitudinal groove containing one or more antifriction-balls a slotted sleeve surrounding said shaft, a second sleeve surrounding the slotted sleeve, and means for fastening together the ribbon-spool and the said sleeves.

81. In a type-writing machine, the combination of a ribbon-spool shaft having a longitudinal groove containing one or more antifriction-balls therein, a slotted sleeve surrounding said shaft, a second plain sleeve surrounding the slotted sleeve, and a screw connecting together the tubular core of the ribbon-spool and the said sleeves.

82. In a type-writing machine, the combination of a ribbon-spool shaft having a longitudinal groove, one or more antifriction-balls therein, the slotted sleeve 282 having the central band 284 and end bands, the plain sleeve 285, the ribbon-spool having the tubular core 286 and the connecting-screw 287.

83. In a type-writing machine, the combination of a ribbon-spool shaft having a plurality of longitudinal grooves each having a plurality of antifriction-balls surrounded by a slotted sleeve, a second exteriorly-arranged plain sleeve, and means for connecting the said two sleeves and the ribbon-spool.

84. In a type-writing machine, the combination of a ribbon, a ribbon-spool shaft, a ribbon-spool connected to said shaft by antifriction ball-bearings, means for rotating said shaft, and means connected to said shaft-rotating means and independently of the spool for moving the spool endwise and acting simultaneously therewith so that a rotation of the shaft will cause a rotation of the spool through the ball-bearings, the ball-bearings also serving to permit the said spool to move endwise on its shaft while it is at the same time rotating therewith.

85. In a type-writing machine, the combination of a ribbon, a ribbon-spool shaft having a plurality of longitudinal grooves, a plurality of antifriction-balls in said grooves, a sleeve surrounding said shaft and having a plurality of slots through which the said balls protrude, a tube surrounding said slotted sleeve and balls, a ribbon-spool connected to said tube, and a ribbon-spool carrier mounted on said tube.

Signed at Bridgeport, in the county of Fairfield and State of Connecticut, this 1st day of February, A. D. 1898.

CASPER D. WALLACE.

Witnesses:

GEORGE HUGO,

CHARLOTTE A. MONE.