

No. 668,730.

Patented Feb. 26, 1901.

J. FELBEL.

TYPE WRITING MACHINE.

(No Model.)

(Application filed June 19, 1900.)

5 Sheets—Sheet 1.

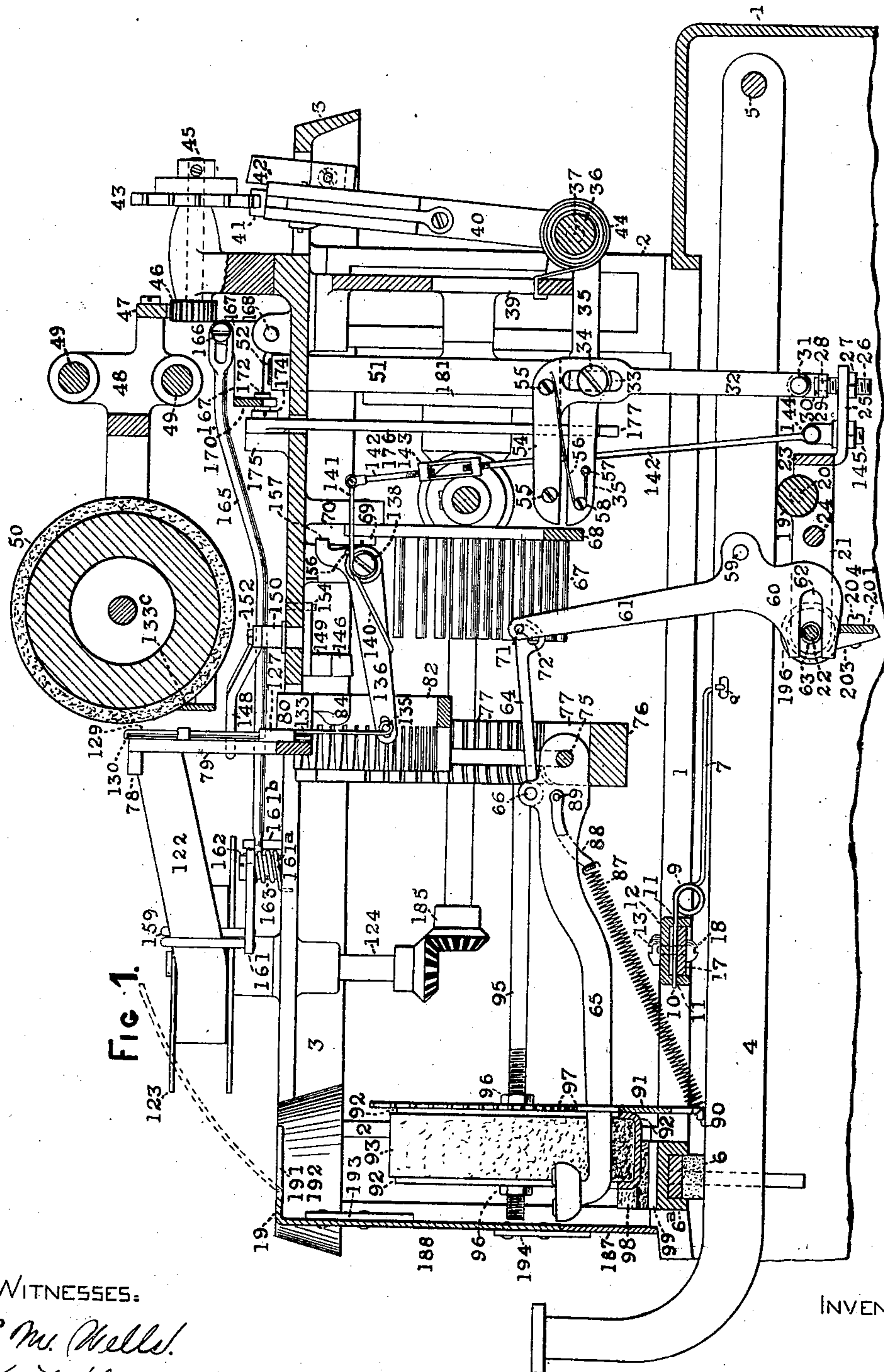


Fig. 1.

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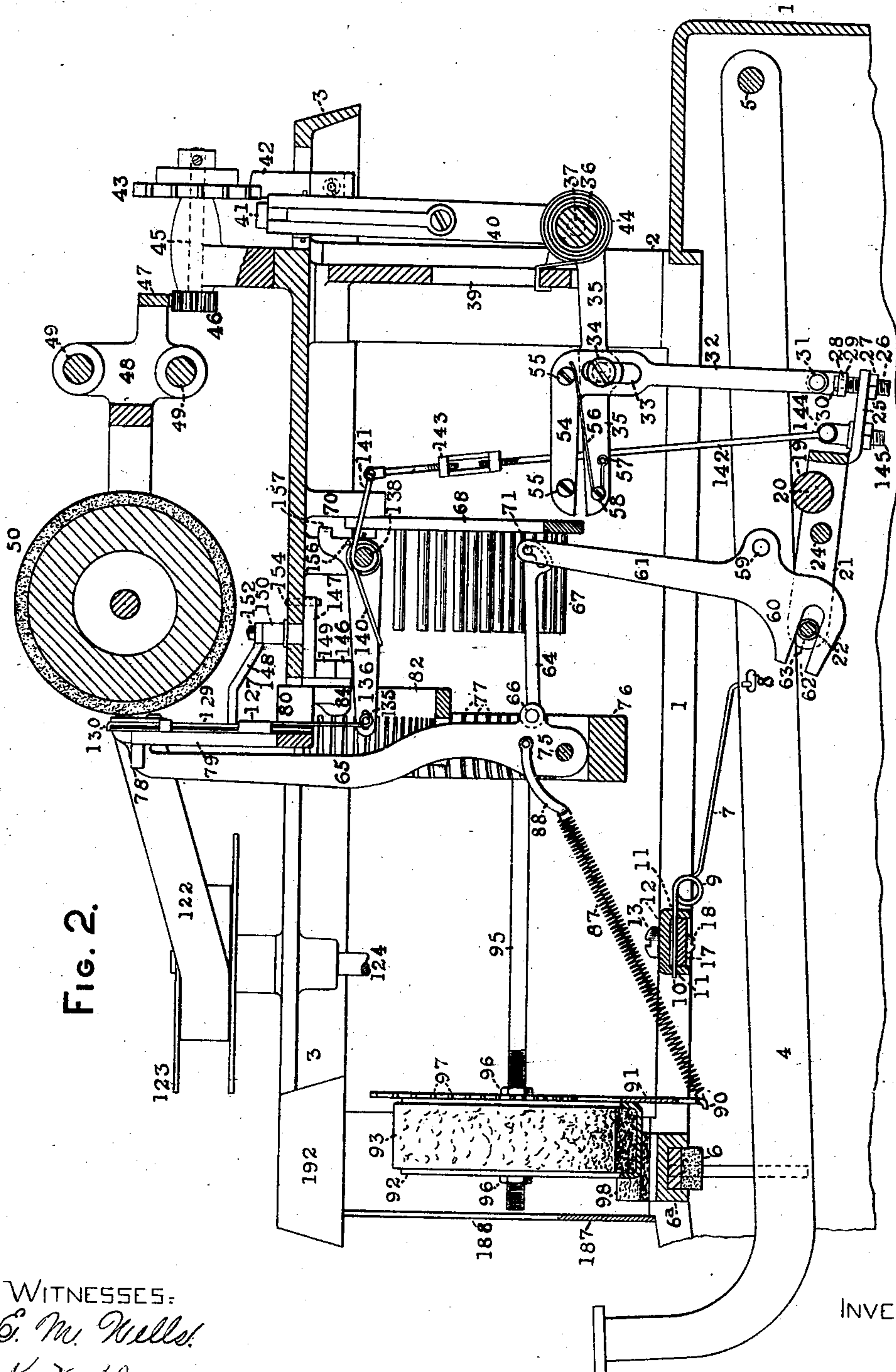


FIG. 2.

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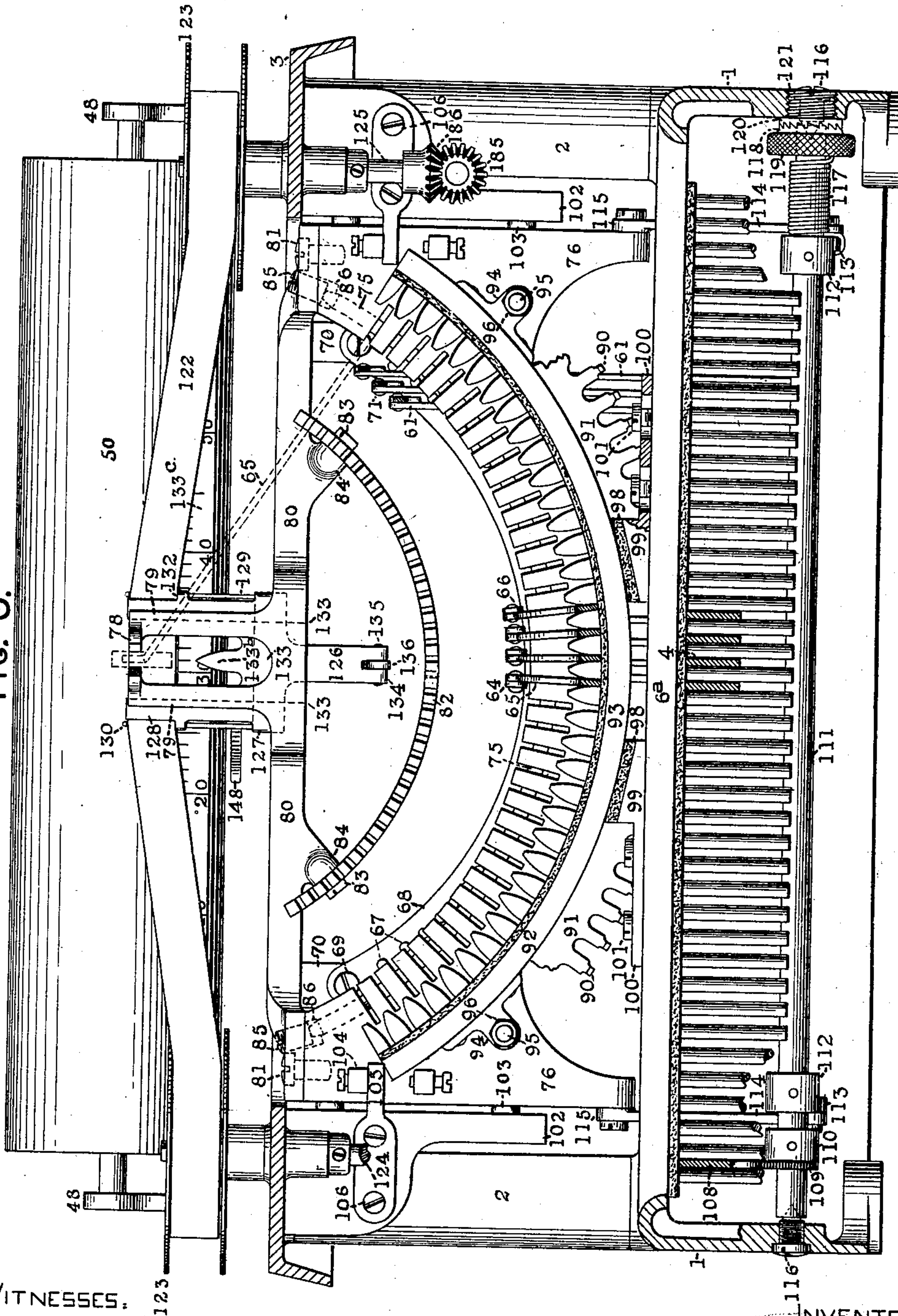
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FIG. 3.



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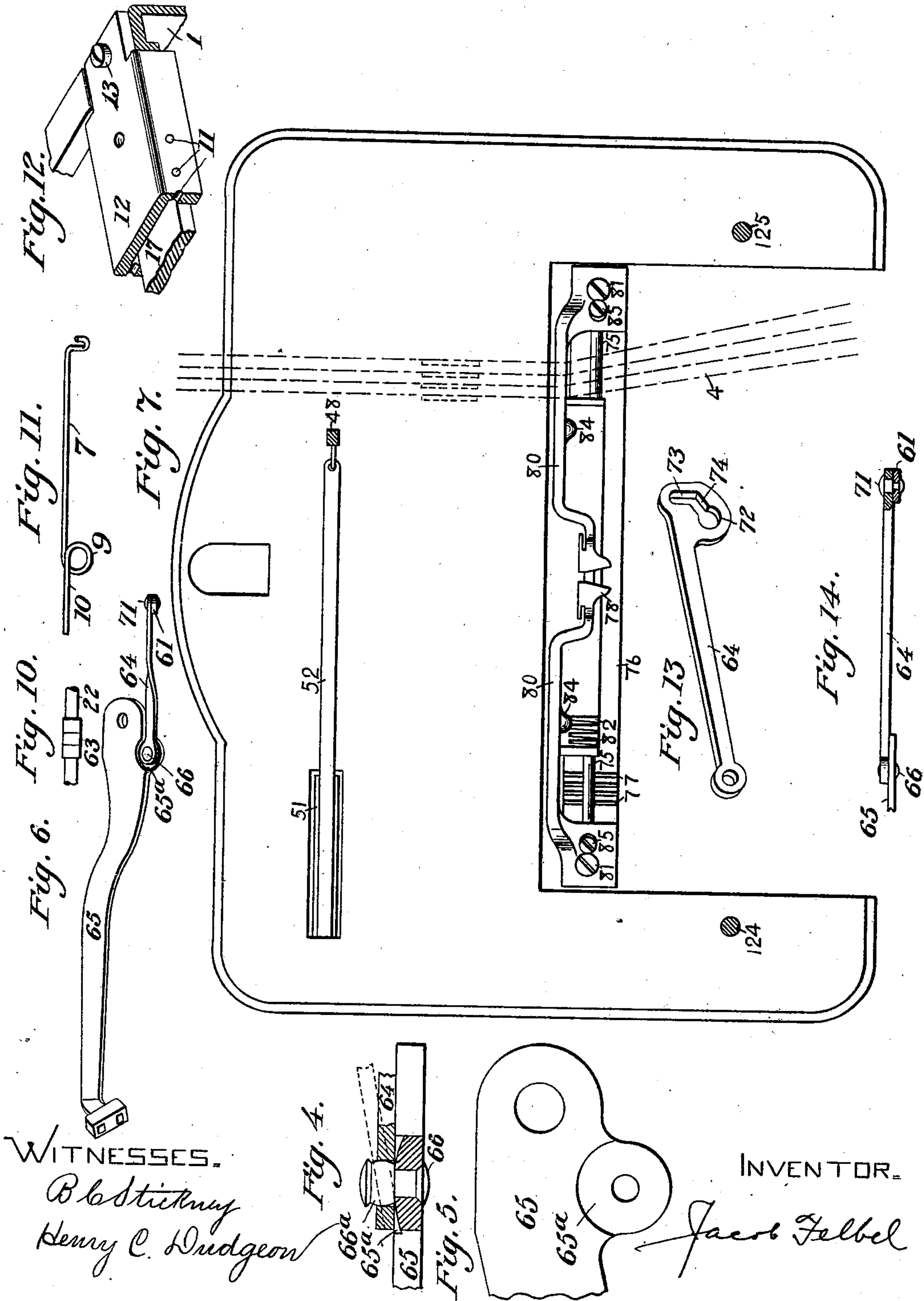
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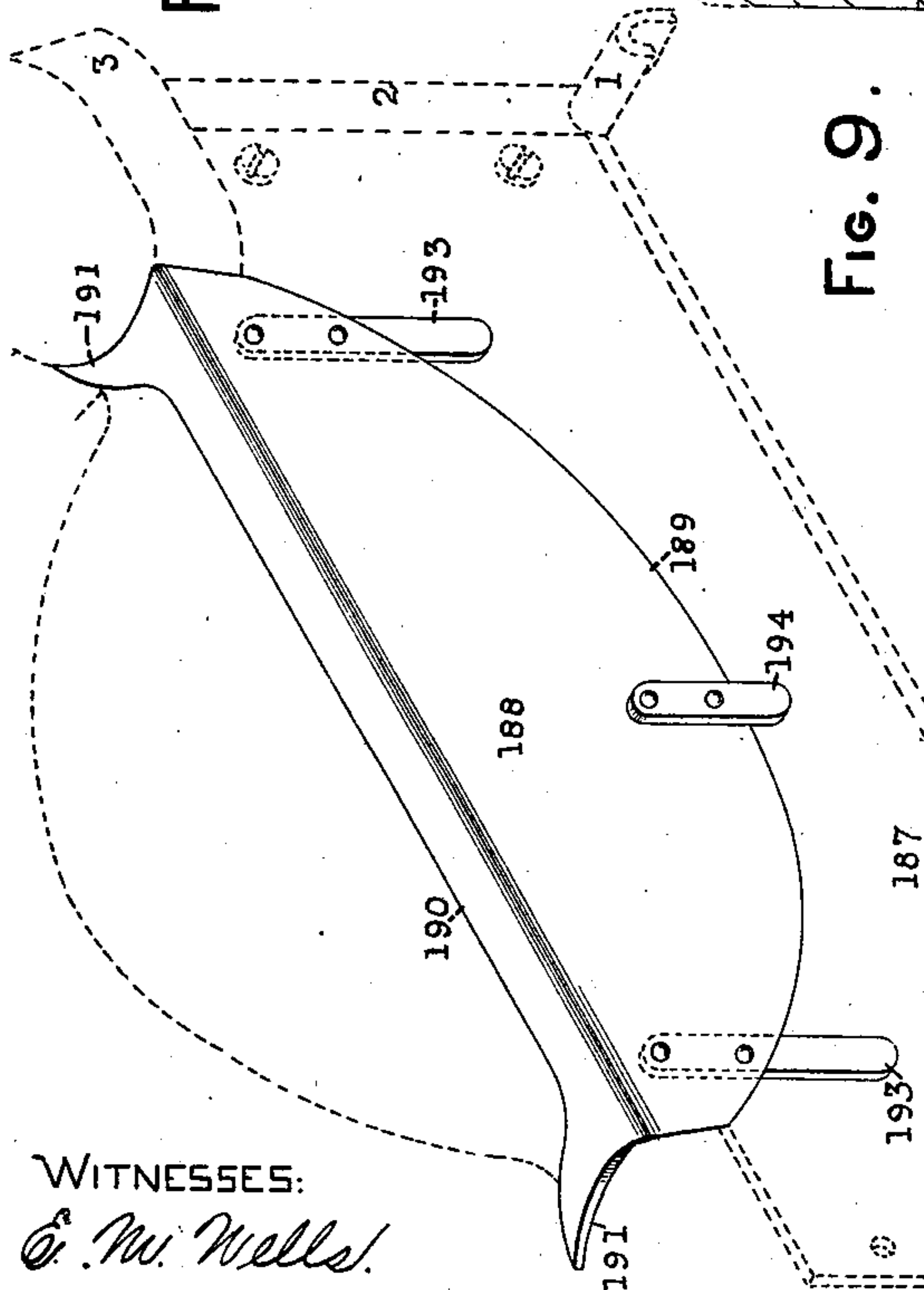
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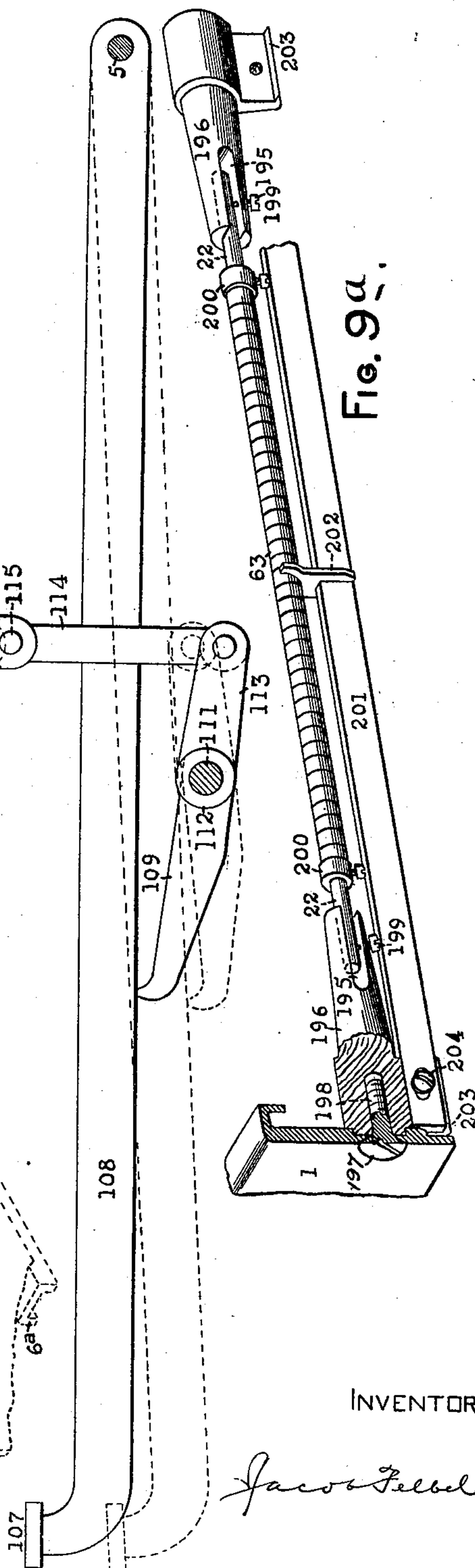
**5 Sheets—Sheet 5.**



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# UNITED STATES PATENT OFFICE.

JACOB FELBEL, OF NEW YORK, N. Y.

## TYPE-WRITING MACHINE.

SPECIFICATION forming part of Letters Patent No. 668,730, dated February 26, 1901.

Application filed June 19, 1900. Serial No. 20,797. (No model.)

*To all whom it may concern:*

Be it known that I, JACOB FELBEL, a citizen of the United States, and a resident of the borough of Manhattan, in the city of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Type-Writing Machines, of which the following is a specification.

The present invention relates more particularly to front-strike type-writing machines; and its objects are to provide improved spring mechanism for the type key-levers and an improved detachable link connection to the type-bars; to improve the type-bar and link-joint; to adjust the type-bar springs both independently and collectively; to provide means for guiding the bell-cranks, means for guiding the type-bar in its printing stroke, and also means for guiding the type-bars upon the return stroke, so that the type ends of the bars will not strike one another when approaching the type-basket; to deaden the sound of the types as they fall back into the basket; to provide a detachable front shield upon the framework of the type-writer; to mount the type-guide upon the shifting type-bar segment; to maintain the type-bar fulcrum-wire firmly in its seat and to provide means for adjusting it endwise to vary the type-bar bearing portions thereof; to provide improved means for mounting and adjusting the spring which partly sustains the weight of the shifting segment, and also to improve the mode of hanging and supporting the fulcrum-bar for the type-bar-operating levers.

Other objects and certain advantages will appear hereinafter.

My invention consists in certain features of construction, combinations of devices, and arrangements of parts, all as will be more fully hereinafter described, and particularly set forth in the concluding claims.

In the accompanying drawings, Figure 1 is a longitudinal central vertical section of a front-strike type-writing machine of the kind made the subject-matter of my pending application, Serial No. 719,419, filed June 5, 1899, and showing my present improvements. Fig. 2 is a similar view (some of the parts being omitted, however) showing the type-key depressed and the parts connected thereto in working position. Fig. 3 is a front elevation

of the machine, partly in section. Fig. 4 is an enlarged horizontal section of the hub end of a type-bar, showing the manner of loosely pivoting a link thereto. Fig. 5 is an enlarged elevation of the type-bar hub shown at Fig. 4. Fig. 6 is a plan showing one extreme type-bar of the series and a twisted link connecting it to the upper end of an operating-lever. Fig. 7 is a plan view showing a type-bar segment, a spanner-bar, type-bar guide, &c. Fig. 8 is a perspective view of a detachable front plate or shield. Fig. 9 is a view of the key-lever mechanism for operating the type-bar segment and its connected parts. Fig. 9<sup>a</sup> is a perspective view of the fulcrum-rod for the bell-levers and means for sustaining the same. Fig. 10 is a fragmentary view of a fulcrum-rod and the antifriction-collars placed thereon. Fig. 11 is a perspective view of a key-lever spring. Fig. 12 is a fragmentary perspective view of one end of a bracket for the key-lever springs. Fig. 13 is a perspective view of a detachable type-bar link; and Fig. 14 is a plan view of the same, showing its method of connection to the type-bar and to the operating-lever.

The frame of the machine comprises a rectangular open base 1, corner-posts 2, rising therefrom, and a top plate 3, supported upon the posts. Horizontal key-levers 4 are pivoted at their rear ends to a transverse rod 5, arranged in the rear portion of the base, and are caused to bear up against a pad 6, arranged over the forward or key ends of the levers by means of springs 7. The pad 6 is secured upon the under side of a fixed transverse horizontal bar 6<sup>a</sup>. Each of the springs 7 is arranged horizontally over its key-lever and at its rear end has a downwardly-extending hook portion which engages a slot 8, formed in the key-lever. At its forward end the spring is coiled at 9 and is provided with an extension 10, which passes forwardly through perforations 11, formed in the downwardly-projecting ledges of a channel-bar 12, which is removably secured upon the upper side of the flanged walls of the base by screws 13, which pass downwardly through holes 14 in the ends of the bar and into the metal of the base. The series of springs may be firmly secured in place by means of a smaller binding-plate 17, which is secured by



screws 18 to the channel-bar. The springs may be secured in place upon the bar 12 before the latter is placed in the machine, and the rear end of each spring may thereupon be readily connected to its key-lever. The slot 8 permits a sliding movement of the spring's hook upon the lever when the latter is swung about its pivot. The springs take up but little room, which is a feature of importance in this class of machines.

A transverse universal bar or roller 19 is arranged beneath the key-levers and journaled at 20 upon side arms 21, which are pivoted at their forward ends upon a transverse horizontal bar 22, fixed or supported upon the side walls of the base. Said side arms at their rear ends are rigidly united by a bar 23, the latter and the side arms taken together forming a bail. The arms are also united by a transverse tie-rod 24, which stiffens the structure. At a point about midway between the side arms said bar 23 is formed with a lip or ear 25, which extends rearwardly and is provided with a threaded hole, with which engages a vertical screw 26, which may be firmly secured in any adjusted position by a nut 27. At its upper end the screw is reduced at 28 to form a neck, which pivotally engages the horizontal member of a small angle-piece 29, said screw being formed with a head 30 to maintain the angle-piece in permanent engagement. To the vertical member of the angle-piece 29 is pivoted at 31 the lower end of a vertical link 32. The purpose of the screw 26 and the angle-piece swiveled thereto is to enable a vertical adjustment of the link 32. At its upper end the link is provided with a vertical slot 33, which works upon a shouldered screw 34, the latter projecting laterally from an arm 35, which extends forwardly from a shaft 36, the latter being pivoted at 37 to ears 38, extending rearwardly from a vertical plate or bracket 39, which is secured to the under side of the top plate. An arm 40 rises from the shaft 36 and carries at its upper end a stepping-dog 41 and a detent-dog 42, of which the former is normally in engagement with an escapement-wheel 43. A returning-spring 44 is coiled about the shaft 36. The escapement-wheel 43 is carried by the rear end of a shaft 45, which at its forward end is provided with a pinion 46, arranged in mesh with a rack 47, the latter being suitably connected to a paper-carriage 48, which may slide upon rails 49 and which carries a platen 50. A spring-drum 51 is connected to the carriage by a strap 52 and propels the carriage in letter-spaced direction. The link 32 is provided with an extension, which is attached by screws 55 to an overhanging arm 54, formed on the upper end of the link, the said extension being hidden by the arm 54 in Figs. 1 and 2. The spring 44 lifts the universal-bar frame, and its motion thereafter is continued by a light spring 56, one end of which is secured at 57 and 58 to the arm 35 and the other end of

which bears against the under side of the head of one of the screws 55, so that the universal bar 19 is caused to bear up against the under side of the key-levers.

Pivoted at 59 to each key-lever, at a point between the ends thereof and just forwardly of the universal bar, is a bell-crank lever, comprising an arm 60, extending downwardly and forwardly, and an arm 61, extending upwardly. The lower end of the arm 60 is forked at 62 to embrace the rod 22, antifric-tion washers or collars 63 being placed along said rod. The upper end of each bell-crank is connected by a horizontal link 64 to a type-bar 65, the link extending over the hub of the type-bar and the pivotal point of connection to the type-bar being indicated at 66. The bell-cranks are arranged closely together, so that each arm 61 may be directly behind its connected type-bar. Forwardly of the bell-cranks the key-levers are fanned out, as explained in my said application and as illustrated diagrammatically herein in dotted lines at Fig. 10. In order to prevent collision between adjoining bell-cranks and connections, the upper ends of the series of bell-cranks are provided with a curved guide-comb—that is, they are guided between round pins or teeth 67, which project horizontally forward from a curved or segmental plate 68, the upper ends or horns of which are secured by screws 69 to lugs 70, depending from the top plate. The guiding-pins, which are constantly in engagement with the bell-crank levers, also serve to prevent sidewise tipping or twisting of the key-levers or binding of the latter in their guides.

To enable the type-bar and bell-crank to be readily disconnected, the rear end of the link 64 is formed with a peculiar closed slot, which engages a headed stud 71, projecting laterally from the upper end of the bell-crank, Figs. 23 and 24. The round lower portion of the slot 72 is large enough to enable the link to slip over the head of the stud 71, and said enlarged portion is connected to the vertical portion 73 of the slot by an oblique portion 74, so that disengagement cannot be effected accidentally by vertical vibration of the link, as such vibration is prevented by contact between the stud 71 and the lower face 74 of the oblique part of the slot. By lifting the type-bar and at the same time lifting the rear end of the link the head of the stud 71 may be brought opposite the opening 72 and the link then forced one side to effect disconnection. This feature is of much importance in this class of machines, in which it is usual to solder or rivet the type directly upon the type-bar, and in which it is therefore necessary when renewing the type to furnish the same permanently secured in place upon the type-bar, so that it becomes necessary to remove the old type-bar and substitute the new one instead of changing the types upon the same bar. By means of this invention the old type-bar is readily separated from the bell-crank



and removed from the machine and the new bar is readily reconnected. It will also be noted that the key-levers and bell-cranks may be assembled in position in the machine independently of the type-bars, that the type-bars may be independently assembled and placed in the machine, and that the links may then be easily connected to the bell-cranks. It will be noted that the slot is constructed to sustain thrust or pull in both directions longitudinally of the link. As recited in my said application, the links are twisted, as shown herein at Fig. 6, so that while the rear end of the link remains parallel with its bell-crank the forward end thereof is parallel with its type-bar, thus enabling the type-bars and links and bell-cranks to be assembled in a small compass and to work without interference. The link-joints should be very free to permit the necessary movements of the bell-cranks and type-bars. At Fig. 4 is illustrated a mode of loosely pivoting the link to the type-bar. The perforation in the forward end of the link 64 engages a crowned, convex, or spherical shoulder 66<sup>a</sup>, formed on the stud 66, so that the link has great freedom of lateral movement, while it always fits the shoulder closely. The type-bar is recessed at 65<sup>a</sup> to permit an inward lateral movement of the forward end of the link 64, as indicated by dotted lines at Fig. 4. It will be understood that the upper end of the bell-crank 61 moves in a curved line, and hence causes a vibration of the link 64 about the pivot 66, and the loose or universal joint just described is intended to permit such vibration of the links at the sides of the system where the pivots 66 and 71 are at an angle to each other without causing the parts to cramp.

The type-bars are pivoted concentrically at their rear ends upon a curved rod 75, which is secured in the bottom of a slot cut in the inner periphery of a segment 76. The latter is also provided with a series of radial slots 77, one for each type-bar. When a type-bar is swung upwardly and rearwardly about the pivot 75, the type enters between the prongs 78 of a center guide, which prongs are arranged in front of the platform and are formed upon the upper ends of a pair of upright arms 79, carried by a bar 80 and preferably formed integrally therewith. Said bar 80 is horizontally arranged and spans the segment 76 and forms a chord to the arc thereof and is secured at its ends by screws 81 to the upper ends of the segment. There is a space between the type-bar segment and the type-guide spanner-bar which enables the front ends of the type-bar-operating links to come forward between said segment and said spanner-bar and be connected to the crank-arms of the type-bars, which arms project upwardly from the type-bar hubs and so as to enable the links to be so connected thereto as that they may pull rearwardly on the down or printing stroke of the keys. The said space between the segment and the spanner-bar

also affords ready access to the links from the front of the machine for the purpose of attaching and detaching said links and enabling the removal and insertion of type-bars. In fitting the type-bars very loosely in the slots 77, so as to enable them to move freely, there is liability that they may vibrate sidewise and that the types may knock against the flaring openings of the center guide 78, and thus not only cause the machine to operate noisily, but also unduly wear the guide and batter the type. To avoid this difficulty, I provide an ancillary guiding means for the purpose of insuring the types passing truly into the guide 78. Said ancillary means consists of a comb 82, curved concentrically with the type-segment 76, arranged above the type-bar hubs and below the center guide and secured by screws 83 to lugs 84, formed upon the transverse guide-supporting bar 80. The forwardly-projecting teeth of the comb are pointed or beveled to facilitate the entrance of the type-bars, and it will be understood that the latter fit somewhat loosely between the said teeth, so that the radial movement of the type-bars is not hindered. The advance edge of a type-bar enters a slot in the comb 82 while the type is yet some distance from the center guide 78, so that any error in the movement of the type-bar is corrected by the time the type engages the center guide. This improvement is of special value in connection with those type-bars which are arranged at the sides of the segment and which are especially liable to sag and swing out of their true paths. As the portion of the type-bar which engages the comb 82 is moving at a comparatively slow speed the type-bar is guided gradually into its true path, avoiding injurious collision of the type, which is moving at a high speed, with the flaring opening of the center guide.

In order to insure the vertical alinement of the type impressions, the curved pivot-rod 75, which is threaded through the hubs of all the type-bars, is pressed firmly downwardly and outwardly in its seat in the segment. This pressure is preferably secured by means of screws 85, which engage threaded diagonal holes formed in the ends of the transverse bar 80 and bear down upon the tips of said curved rod 75. By turning the screws 85 inwardly said rod is forced to conform to its seat and to remain properly seated. Therefore in the rapid swinging of the type-bars they are unable to lift the wire from its seat and cause the impression to be made above the line of print; or, in other words, by this construction the type-bars are prevented from moving endwise on account of springing or partial unseating of the fulcrum-wire. Should wear occur upon the pivot-rod after long use of the machine, either of the screws 85 may be turned outwardly, and the other of said screws may then be turned inwardly, so as to move the rod along bodily and bring new portions thereof into engagement with



the pivot holes or bearings in the several type-bars, thereby taking up the wear. Suitable clearances 86 are formed in the segment 76 for the screws 85. The ends of the pivot-rod 5 75 are pointed, so that it may be more readily threaded through the type-bars when the latter are placed in position in the segment. The return of the type-bar to normal position is effected partially by the spring 7 and 10 partially by a diagonally-arranged draw-spring 87, the rear end of which is caught in the end of a loop 88, that straddles the rear end of the type-bar, to which it is pivoted at 89. The forward end of the spring is caught 15 over one of a series of hooks 90, formed upon the lower edge of a vertical segmental-shaped plate 91, and secured to the rear edge of a type-bar rest 92, having a pad 93. The rest or basket is secured by means of brackets 20 94, attached to the under side thereof, upon the forward ends of horizontal rods 95, which at their rear ends are rigidly attached to the segment 76 and at their forward ends are threaded to receive nuts 96, one placed upon 25 each side of the type-basket, whereby the latter is rendered adjustable along said rods for the purpose of altering the tension of all the springs 87 together. Any one of said springs may be also adjusted independently 30 by bending its hooked arm 90 backward or forward, as required.

The types lie closely together in the basket, and in order to prevent them from striking one another when returning thereto I provide 35 a series of beveled teeth 97 upon the upper edge of the spring-carrying plate 91, whereby the type end of the bar is guided backwardly to its proper position. It will be seen that by the use of the comb 82 for guiding the 40 type ends of the bars into the guide 78 and of the comb 97 for insuring the proper positioning of the types in the basket it is possible to give the hub ends of the type-bars a very free bearing in the slots 77 without danger of collision of the type with the flaring 45 horns of the center guide, which would result in injury to the type, and also without danger of injuring adjoining types upon returning to normal position. In order further 50 to diminish the sound made by the type-bars in falling back into the suspended basket, the latter is partly supported by or arranged in contact with pads 98, which are supported beneath the type-basket upon sloping or 55 wedge-shaped blocks 99. The latter are provided with slotted extensions 100, which are engaged by screws 101, which pass into the cross-bar 6<sup>a</sup>, the slots permitting endwise adjustment of the blocks or brackets, so that the 60 desired contact may be secured between the pads and the under side of the type-basket.

Each type-bar is provided with two types, the outer one of which is a lower-case type and normally strikes the platen. In order to 65 enable the inner or capital type to make an impression, the type-segment is made shiftable vertically, as set forth in said applica-

tion, the entire system of type-bars, guides, basket, and springs 87 being moved up and 70 down bodily and the links 64 vibrating simultaneously about the pivots 71 to accommodate such movement. The sides of the segment 76 are straight and vertical, Fig. 3, and 75 arranged in juxtaposition to guiding-brackets 102, which may depend from the under side of the top plate. The segment is guided in a vertical motion by bearing-balls 103, which work in suitable grooves formed in the 80 adjoining edges of the segment and brackets. The movement of the segment is limited in either direction by means of screws which engage lugs 104, projecting forwardly from 85 the segment, and a coacting stop-arm 105, which is secured by screws 106 to the forward side or face of the pendent brackets 102. As the center type-guide shifts vertically it lies in proximity to the platen at each of its shift positions.

The segment is shifted by means of a key 107, Figs. 3 and 9, arranged upon the forward 90 end of a lever 108, which is arranged at the left-hand side of the key-lever system and pivoted at its rear end upon the fulcrum-rod 5. This lever operates an arm 109, arranged 95 therebeneath and secured by a hub 110 upon a transverse horizontal rock-shaft 111. To the latter is secured, by collars 112, a pair of rock-arms 113, which extend rearwardly from said shaft and at their rear ends are connected by vertical links 114 to the lower side por- 100 tions of the segment-casting at 115.

The rock-shaft 111 is supported at its ends upon pointed pivot-screws 116, of which the 105 left-hand one engages a threaded hole formed in the side wall of the base 1. A spring 117 is curled around the shaft at its right-hand end, one end of the spring catching under the rock-arm 113 and the other end thereof engaging a crown-ratchet 118, which is mounted 110 loosely upon the end of the shaft 111 and provided with a finger-wheel 119. A coacting crown-ratchet 120 is screwed against the inner vertical face of the side wall of the base at 121. The purpose of spring 117, which has 115 a constant tendency to lift the segment, is to partially counterbalance the weight of the latter, the type-bars, &c., and assist the key 108 in lifting the same, and the tension of the spring is made adjustable, so that as much 120 as possible of the weight can be sustained without rendering the return movement of the segment too sluggish. The right-hand pivot-screw 116 engages a threaded hole 125 formed axially in the screw-shank of the fixed crown-ratchet 120.

A ribbon 122 is wound upon spools 123, one 125 placed at either side of the type-bar system forwardly of the platen and over the top plate 3, the left-hand spool being carried by the upper end of a vertical shaft 124 and the right- 130 hand spool by the upper end of a similar shaft 125. The ribbon extends from the spools backwardly and upwardly to a ribbon-vibrator which is made of sheet metal and com-



prises a vertical T-shaped operating-arm 126, the cross-arms of the T being folded back upon themselves at 127 and being provided with upwardly-extending sliding portions 128. The lower end of an upright ribbon-guiding wire 129 is caught in the fold 127, and its upper end is hooked over at 130 to prevent escape of the ribbon, which is threaded through the opening or eye 131, formed by the coöperation of said wire with the adjoining vertical plate 128. The latter is also provided with a lateral fold or hook 132, which sustains said wire. The ribbon is inserted downwardly between the hook 130 and the upper end of the plate 128 and rests upon the hooks 132. Vertical grooves 133 are provided in the portions 79 and 80 and are engaged by the plates or slides 128, whereby the ribbon-vibrator is enabled to move freely in a vertical direction, but is prevented from sidewise movement. The grooves 133 are formed by a plate 133<sup>a</sup>, whose side edges overlap the cut-away rear faces of the uprights 79, to which said plate is fixed. Formed integrally with the plate is an index 133<sup>b</sup>, which coöperates with a platen-scale 133<sup>c</sup>.

At its lower end the arm 126 is formed with eyes 134 for the reception of a horizontal cross-pin 135, with which engages the forward slotted end of a vertical vibrating lever 136, the said arm 126 being forked at 137 to embrace said lever. The latter is pivoted at its rear end upon a shoulder-screw 138, which engages an ear 139, depending from the under side of the top plate. A spring 140, whose forward end is caught under the lever 136, is coiled one or more times about the shoulder of the screw 138 and then extends rearwardly to form an operating-arm 141, the rear end of which is pivotally connected to the upper end of a two-part link 142. The parts of the link are connected by a turnbuckle 143, and its lower end is pivoted at 144 to a stud 145, secured upon the upper side of the rearwardly-projecting ear 25 of the universal-bar frame, so that upon the depression of said frame the link and the arm 141 are drawn downwardly and the lever 136 is swung upwardly, together with the ribbon-vibrator and ribbon, whose normal position is just below the printing-point. A stop 146 for the lever 136 is carried on a plate 147, that is pivoted to the top plate and provided with a handle 148. The plate carries a second stop 149, arranged at a higher elevation than stop 146. A pivot 150 is threaded to receive a jam-nut 152. A stop-pin 154 coöperates with the plate 147 to limit the movements of the latter. 156 is a stop-pin over the spring-arm 141 to limit the upward movement of the latter. 157 is an offset to prevent the lever from being pressed too far.

It will be understood that the ribbon-vibrator does not shift together with the segment and the type-guide structure and that both lower-case and capital types strike upon the same line upon the ribbon. Owing to the sliding engagement 133 the type-guiding de-

vices are enabled to shift vertically without interference by or with the ribbon-vibrator. The ribbon is threaded between vertical pins 159 and has at each end an obstruction of a size to prevent its passage between said pins, which latter are fixed in a lever 161, pivoted at 162 upon a boss 163, rising from the top plate, and the outer end of said lever is pivoted at the forward end of a horizontal link 165, which at its rear end engages a screw 166 on an ear 167<sup>a</sup> of an arm 167, said arm being pivoted at 168. A cross-bar 170 unites said arm 167 with a similar arm at the other side of the machine, said arms and said bar 170 forming together a bail. About midway between its ends the bail is provided with a slot or opening, through which projects a horizontal pin 172, which extends rearwardly from the free end of an arm which is pivoted by a screw 174 on a lug 175 on the top plate. To said arm is united a pendent arm 176, the lower end of which is hooked at 177, so that by a swinging movement about the axis 174 it may engage the under side of the arm 35 of the dog-rocker and intercept the latter in its vibratory movements.

I provide upon the frame in front of the type-bars a vertical shield 187, whose lower edge is straight and about on a level with the top of the transverse bar 6<sup>a</sup> and whose upper edge is curved concentrically with the system of type-bars, and also I provide a detachable supplemental shield 188, whose lower edge is preferably curved at 189 to match the upper edge of the plate 187 and whose upper portion is bent over rearwardly at 190 to form a ledge, the latter being prolonged at each end and curved to form horns 191, which match a correspondingly-curved portion 192 of the top plate. Upon the rear side of the plate 188, near its ends, are secured downwardly-extending fingers 193, which engage the rear side of the shield 187, and upon the front face of the said plate 188 is provided a third downwardly-extending finger 194, which engages the front side of the shield 187. By means of the fingers the said plate 188 is held firmly in position; but it may be lifted off whenever it is desired to inspect or clean the types and may then be readily replaced. The shield 188 relieves the operator from the annoyance caused by the dancing of the types as they rise and fall in rapid writing. If desired, the inwardly-extending portion 190 of the supplemental shield 188 may be extended rearwardly as far as desired, so as to hide from view as much as possible the moving type-bars. I have indicated this extension of the shield by dotted lines at Figs. 1 and 8. Of course said extension should be so shaped and arranged at such an elevation as not to interfere with the swinging movements of the type-bars.

Referring now to Figs. 1 and 9<sup>a</sup>, the ends of the fulcrum-rod 22 are caught in slots or depressions 195, formed in the free ends of a pair of inwardly-projecting horizontal studs or supports 196, which are each secured to



the base by screws 197, which pass through the base and engage threaded holes 198, formed in the outer ends of the studs. The rod 22 is held in the slots 195 by screws 199.

5 The collars 63 are loosely held in place on the rod by fixed collars 200. In order to prevent vibration of the rod under the stress of the key-lever action, a fixed bar 201 is placed beneath the rod and parallel therewith, and  
10 from its middle portion a strut 202 extends upwardly to support the rod. The bar 201 rests in hooks 203, which depend from the studs 196, and is secured thereto by screws 204. Bar 201 may be slotted at its ends to  
15 provide for lengthwise adjustment thereof, so as to enable the strut 202, which is preferably fixed, to be brought to the exact position under the rod 22, and thereby not interfere with any of the bell-cranks forming part  
20 of the type-bar system.

In operation when a key-lever 4 is depressed the universal bar 19 and its supporting-frame are forced downwardly about the axis 22, pulling down the link 32 and extension 53  
25 thereon. The forward point of the latter first contacts with the arm 35, as at Fig. 5, and during the continuance of the downward movement the lower edge of the extension 53 rolls or creeps along the upper edge of the  
30 arm 35 as the latter rocks about the pivot 37 until at the completion of the key-stroke the rear end of the extension 53 is in contact with the arm 35, as at Fig. 2, at which time the purchase or leverage of the finger-key and  
35 universal bar upon the dog-rocker is the least. During the movement of the arm or lever 35 the upright arm 40 of the dog-rocker swings forwardly to disengage the dog 41 from and engage the detent 42 with the escapement-  
40 wheel 43, the dog 41 then stepping forward to a position opposite the next notch in the wheel in the usual way. By the said downward movement of the key-lever the upper end of the bell-crank 61 pivoted thereon is  
45 caused to swing rearwardly, being guided in the comb 67, and through the link 64 swings the type-bar up to the printing-point to make the impression. The type-bar enters one of the notches of the guide-comb 82, so that the type  
50 is properly directed into the center guide 78.

During the downward movement of the universal bar the link 142 is also pulled down and through the yielding arm 141 vibrates the lever 136 about its axis 138, thereby rais-  
55 ing the ribbon-carrying frame, the guiding edges 128 of which slide in the grooves 133, provided upon the parts 79 and 80. The ribbon-frame and lever 136 are arrested by either of the stops 146 or 149, according to the ad-  
60 justment thereof effected by the lever 148. In case the stop 146 is in active position the ribbon-frame and ribbon are arrested when the upper portion of the ribbon covers the printing-point, or if the stop 149 is in active  
65 position the frame and ribbon are permitted to move upwardly until the lower portion of

the latter covers the printing-point, in which case the contact between the lever 136 and the stop 149 may occur at about the time the type makes its impression; but in the former  
70 case the contact between the lever and the lower stop 146 occurs during the downward stroke of the key and before the completion of the movement of the universal bar and link 142, and the spring-arm 141 yields to  
75 permit the completion of the movements of said link and universal bar.

Upon the relief of the finger-key from pressure the return of the parts to normal position is effected by springs 7, 87, 44, and 56.  
80 As the key-lever rises the bell-crank 61 and link 64 move forwardly and the type-bar drops, the latter entering a notch in the comb 97 when approaching the basket and being thereby guided to its proper position. The  
85 universal bar and its frame return upwardly to normal position, together with the link 142. The lever 136 and the ribbon-vibrating frame and ribbon drop to normal position, leaving the type impression exposed, and the yield-  
90 ing arm 141 comes to a bearing against the stop-pin 156. The purchase of the spring 44 on the universal bar is greatest at the beginning of the return stroke, thus insuring a prompt return movement of the parts, and gradu-  
95 ally diminishes as the extension 53 creeps along the upper edge of the arm 35. The upper side of the latter comes to rest against the under side of the bracket 39, and there-  
100 upon the spring 56 operates to complete the return of the link 32 and universal-bar frame to normal position. At the rearward movement of the upright arm 40 of the dog-rocker the detent 42 releases the escapement-wheel  
105 43, thereby permitting the latter to advance one step or until it is arrested by the feeding-dog 41 in a well-known manner. The movement of the escapement-wheel is effected by the carriage-rack 47, pinion 46, and shaft 45, the movement of the carriage being caused  
110 by the spring-drum 51 through the strap 52, as usual.

When it is desired to print an upper-case character, the key 107 is depressed to vibrate the lever 108 downwardly and to cause the  
115 lower edge thereof to act upon the lever or arm 109, so as to rock the latter downwardly. The arm 109 rocks the shaft 111, thereby lifting the arms 113 and through the links 114 shifting the segment 76 upwardly, to-  
120 gether with the comb 82, bar 80, type-guide 78, type-bars 65, the type-basket, and the springs 87, so that the lower or inner type upon the bar is enabled to print. The spring 117 materially assists the key in lifting  
125 the segment and its connections, thereby contributing to the lightness or ease of the key touch. During the shifting movement of the type-bars the links 64 vibrate about the pivots 71, the universal joint between the  
130 forward end of the link and the type-bar permitting the free vibration of the links at the



sides of the system. Upon the relief of the shift-key 107 from pressure gravity returns the segment and connections to normal position against the tension of the spring 117.

5 By means of the described adjusting devices the tension of this spring may be regulated so as to secure as light a touch upon the key as is consistent with a prompt return of the parts to normal position.

10 By the use of the term "front-strike writing-machine" in the subjoined claims I mean to include "visible-writing" machines, in which the impressions are made on the front side of the platen, and do not wish to be limited to a machine in which the types strike exactly upon the foremost portion of the platen or upon a horizontal line passing through the axis of the platen.

20 The claims for the improvements shown and described relating to carriage-escapement devices have been divided out of this application and are now made the subject-matter of my application filed September 11, 1900, Serial No. 29,656, and the claims for the improvements relating to the ribbon mechanism have also been divided out of this case and are now made the subject-matter of my application filed September 15, 1900, Serial No. 30,101.

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

1. In a type-writing machine, the combination with a series of horizontal key-levers, of a series of horizontal springs arranged over the levers, each spring being provided at one end with a hook to engage its lever, a transverse fixed bar provided with perforations through which the other ends of said springs pass, and a binding-plate for securing all of said springs upon said bar.

2. In a type-writing machine, the combination with a series of horizontal key-levers, of a series of horizontal springs arranged thereover, each spring being provided at one end with means for engaging its lever, a transverse horizontal channel-bar fixed in the machine, and a series of perforations provided in said bar, the other ends of the springs being constructed to pass through said perforations, and means for holding said ends in said perforations.

3. In a front-strike type-writing machine, the combination with a platen, a series of type-bars, and a series of horizontally-extending key-levers arranged below the type-bars, of a series of upright levers pivoted at their lower ends and operated by said key-levers, a comb for guiding said upright levers at their upper ends, and links connecting said upright levers to said type-bars.

4. In a front-strike type-writing machine, the combination with a platen, of a series of type-bars, a series of key-levers extending rearwardly below the type-bars, a series of upright levers pivoted to the key-levers, means for causing said upright levers to vi-

brate during the depression of the key-levers, a comb for guiding the upper ends of said upright levers, and links connecting said upright levers to the type-bars.

5. In a front-strike type-writing machine, the combination with a platen, of a series of horizontal type-bars concentrically arranged in front of said platen, a series of key-levers extending rearwardly beneath said type-bars, a series of upwardly-extending bell-cranks pivoted to said key-levers, said bell-cranks being of varying lengths corresponding to the different heights at which their connected type-bars lie, a curved comb for guiding the upper ends of said bell-cranks, and links connecting said bell-cranks to said type-bars, said links extending over the hubs of the type-bars, and said bell-cranks being arranged behind the type-bars.

6. In a type-writing machine, the combination with a horizontal type-bar and an upright operating-lever, of a horizontal link connecting the two and provided at one end with a closed slot whereby it may be disconnected, said slot being so constructed as to sustain thrust or pull in both directions longitudinally of said link.

7. In a type-writing machine, the combination with a type-bar and an operating-lever, of a horizontal link connecting the two and provided at one end with a closed slot whereby it may be disconnected, said slot being so constructed as to sustain thrust or pull in both directions longitudinally of said link, and being also so constructed and arranged that its weight maintains the working end of the slot in engagement.

8. In a type-writing machine, the combination with a horizontal type-bar and a horizontal operating-link therefor, of an upright operating-lever to which said link is connected by a slot, said upright lever being provided with a lateral headed pin with which the upper end of said slot normally engages, so as to sustain thrust or pull in either direction endwise of said link, and said slot having below said lateral pin an obliquely-extending portion, which terminates at its lower end in an enlarged portion, through which the head of said pin may be caused to pass.

9. In a type-writing machine, the combination of a series of type-bars, a series of levers constructed to vibrate in different planes from the type-bars, and a series of detachable links, each detachably engaging at one end one of said levers and engaging at its other end a shoulder formed upon a stud riveted in the type-bar.

10. In a front-strike type-writing machine, the combination with a series of horizontal type-bars, of a series of upright levers which vibrate in different planes from the type-bars and a series of links directly connecting the levers to the type-bars, each link being pivoted to each lever so as to vibrate in the same plane therewith and being connected to its



type-bar by a universal joint, whereby said link may vibrate in a different plane from said type-bar.

11. In a front-strike type-writing machine, the combination of a series of type-bars, a series of key-levers extending below the type-bars, a series of upright levers connected to the key-levers and arranged in rear of the type-bars, and twisted links pivoted at their rear ends to said upright levers and connected at their forward ends to the type-bars by universal joints.

12. In a front-strike type-writing machine, the combination of a series of type-bars, a series of key-levers extending below the type-bars, a series of upright levers connected to the key-levers and arranged in rear of the type-bars, and twisted detachable links pivoted at their rear ends to said upright levers and connected at their forward ends to the type-bars by universal joints.

13. In a front-strike type-writing machine, the combination with a platen and a series of type-bars, of a segment upon which said type-bars are pivotally supported, a bar spanning said segment and attached at its ends to the ends of the segment, type-bar-operating links arranged between the segment and the spanning bar, and a center type-guide secured upon said bar in front of the platen.

14. In a front-strike type-writing machine, the combination with a platen and a series of type-bars, of a segment upon which said type-bars are pivotally supported, a bar spanning said segment and attached at its ends to the ends of the segment, type-bar-operating links arranged between the segment and the spanning bar, and a center type-guide formed integrally with said bar and extending to a point in front of the platen.

15. In a front-strike type-writing machine, the combination with a platen and a series of type-bars, of a shifting segment upon which said type-bars are pivotally supported, a bar spanning said segment and attached at its ends to the ends of the segment, a pair of uprights carried centrally by said bar, shifting links for operating the type-bar arranged between said segment and said spanning bar, connections from said links to the key-levers, and cooperating type-guiding devices carried by the upper ends of said uprights.

16. In a front-strike type-writing machine, the combination with a platen and a series of type-bars, of a shifting segment upon which said type-bars are pivotally supported, a bar spanning said segment and attached at its ends to the ends of the segment, shifting links for operating said type-bars and arranged between said segment and said spanning bar, bell-cranks, key-levers, a pair of uprights carried centrally by said bar, and cooperating type-guiding devices carried by the upper ends of said uprights, said uprights being formed integrally with said bar.

17. In a front-strike type-writing machine, the combination with a series of type-bars, of

a shifting segment upon which they are pivotally supported, a bar spanning said segment and secured at its ends thereto, shifting links connected to said type-bars and arranged between said segment and said spanning bar, key-levers, connections from said key-levers to said links, a center guide carried by said bar, and a curved guiding-comb also carried by said bar and arranged between the type-bar hubs and said center guide.

18. In a type-writing machine, the combination with a series of type-bars, of a curved wire upon which said type-bars are pivoted, a segment provided with a curved slot or groove in which said wire is seated, and means bearing against the ends of said wire for forcing the latter against its seat in said groove.

19. In a type-writing machine, the combination with a series of type-bars, of a curved wire upon which said type-bars are pivoted, a segment provided with a curved slot or groove in which said wire is seated, and screws bearing against the ends of said wire for forcing the latter against its seat in said groove.

20. In a type-writing machine, the combination with a series of type-bars, of a curved wire upon which said type-bars are pivoted, a segment provided with a curved slot or groove in which said wire is seated, and diagonally-arranged opposing screws bearing against the ends of said wire for forcing the latter against its seat in said groove.

21. In a front-strike type-writing machine, the combination with a series of type-bars pivoted at their rear ends, of a series of springs connected at their rear ends to the type-bars and at their forward ends to an adjustable device, whereby the tension of all of said springs may be regulated.

22. In a front-strike type-writing machine, the combination with a series of type-bars, of a segment upon which said type-bars are pivotally supported at their rear ends, horizontal rods attached at their rear ends to the segment, a device carried adjustably upon the forward ends of said rods, and a series of springs connected at their rear ends to the type-bars and at their forward ends to said adjustable device, whereby the tension of all of the springs may be regulated.

23. In a front-strike type-writing machine, the combination with a series of type-bars, of a segment to which said type-bars are pivoted at their rear ends, a pair of horizontal rods extending forwardly from said segment and threaded at their front ends, a type-basket, a pair of brackets secured to said type-basket and engaging said rods, nuts engaging the threaded portions of said rods for holding the type-basket at any adjusted position thereon, and a series of springs connected at their rear ends to the type-bars and at their forward ends to said type-basket.

24. In a front-strike type-writing machine, the combination with a series of type-bars pivoted at their rear ends, of a series of springs connected at their rear ends to the type-bars



and attached at their forward ends to a series of fingers, each of which may be independently adjusted.

25. In a front-strike type-writing machine, the combination with a series of type-bars pivoted at their rear ends, of a series of springs connected at their rear ends to the type-bars and attached at their forward ends to a series of flexible fingers each of which may be independently adjusted, said fingers being formed upon the lower edge of an adjustable vertical plate, whereby all of said springs may be adjusted simultaneously.

26. In a front-strike type-writing machine, the combination with a series of type-bars pivoted at their rear ends, of a type-basket, a vertically - arranged plate secured to the basket, a series of notches formed upon the upper edge of said plate for guiding the types to their positions in the basket, and a series of springs connected at their rear ends to the type-bars and at their forward ends to the lower portion of said vertical plate.

27. In a front-strike type-writing machine, the combination with a series of type-bars pivoted at their rear ends, of a center guide arranged in proximity to the printing-point, a guide-comb arranged between the type-bar hubs and said center guide, a type-basket, and a comb for guiding the returning type-bars to their positions in said basket.

28. In a front-strike type-writing machine, the combination with a series of horizontal type-bars, of a basket carrying a pad, and a sound-muffling pad arranged below the basket and bearing thereagainst.

29. In a front-strike type-writing machine, the combination with a series of type-bars, of a curved type-basket carrying a pad, means for supporting said basket, and a pair of wedge-shaped pad devices supported below said basket and adjustable toward and away from each other to effect a contact between said pads and the basket.

30. In a front-strike type-writing machine, the combination with a curved type-bar basket and its supporting means, of a pair of wedge-shaped blocks provided with pads adapted to coact with the under surface of said basket, extensions upon said blocks provided with slots, screws engaging said slots, and a cross-bar.

31. In a front-strike type-writing machine, the combination with a series of shifting type-bars, of a series of upright levers which vibrate in different planes from the type-bars, and a series of links directly connecting the levers to the type-bars, each link being pivoted to each lever so as to vibrate in the same plane therewith and being connected to its type-bar by a universal joint, whereby said link may vibrate in a different plane from said type-bar.

32. In a front-strike type-writing machine, the combination of a series of shifting type-bars each provided with a plurality of types, a series of key-levers extending below the

type-bars, a series of upright levers connected to the key-levers and arranged in rear of the type-bars, and twisted links pivoted at their rear ends to said upright levers and connected at their forward ends to the type-bars by universal joints.

33. In a front-strike type-writing machine, the combination with a platen, of a series of shifting type-bars each provided with a plurality of types, and a center type-guide arranged in proximity to the platen and constructed to shift simultaneously with the type-bars.

34. In a front-strike type-writing machine, the combination with a platen and a series of type-bars each provided with a plurality of types, of a shifting segment upon which said type-bars are pivotally supported, and a center type-guide carried by said segment and shifting therewith.

35. In a front-strike type-writing machine, the combination with a cylindrical platen and a series of type-bars each provided with a plurality of types, of a shifting segment upon which said type-bars are pivoted, and a type-guide rigidly secured upon said segment, the construction and arrangement being such that the type-guide in each of its shifted positions lies close to the periphery of the platen.

36. In a front-strike type-writing machine, the combination with a platen and a series of type-bars each provided with a plurality of types, of a shifting segment upon which said type-bars are pivoted, a bar spanning said segment and attached at its ends to the ends of the segment, and a center type-guide secured upon said bar in front of the platen.

37. In a front-strike type-writing machine, the combination with a platen and a series of type-bars each provided with a plurality of types, of a shifting segment upon which said type-bars are pivoted, a bar spanning said segment and attached at its ends to the ends of the segment, and a center type-guide formed integrally with said bar and extending to a point in front of the platen.

38. In a front-strike type-writing machine, the combination with a platen and a series of type-bars each provided with a plurality of types, of a shifting segment upon which said type-bars are pivoted, a bar spanning said segment and attached at its ends to the ends of the segment, a pair of uprights carried centrally by said bar, and cooperating type-guiding devices carried by the upper ends of said uprights.

39. In a front-strike type-writing machine, the combination with a platen and a series of type-bars each provided with a plurality of types, of a shifting segment upon which said type-bars are pivoted, a bar spanning said segment and attached at its ends to the ends of the segment, a pair of uprights carried centrally by said bar, and cooperating type-guiding devices carried by the upper ends of said uprights, said uprights being formed integrally with said bar.



40. In a front-strike type-writing machine, the combination with a series of type-bars, of a shifting segment upon which said type-bars are pivotally supported at their rear ends, horizontal rods attached at their rear ends to the segment, a device carried adjustably upon the forward ends of said rods, and a series of springs connected at their rear ends to the type-bars and at their forward ends to said adjustable device, whereby the tension of all of the springs may be regulated.

41. In a front-strike type-writing machine, the combination with a series of shifting type-bars, of a curved shifting type-basket carrying a pad, means for supporting said basket, and a pair of wedge-shaped pad devices supported below said basket and adjustable toward and away from each other to effect a contact between said pads and the basket.

42. In a type-writing machine, the combination with a platen and a series of type-bars each provided with a plurality of types, of a shifting mechanism, including a transverse shaft, a spring coiled around said shaft and connected thereto at one end, a crown-ratchet mounted loosely upon said shaft and connected to the other end of said spring, a co-acting crown-ratchet provided with a threaded portion whereby it is screwed into the framework, a pivot-screw passing axially through said stationary crown-ratchet and supporting one end of said shaft, and a co-acting pivot-screw engaging the framework and supporting the other end of said shaft.

43. In a front-strike type-writing machine, the combination with a platen, a series of

type-bars, and an upwardly-shifting segment upon which the latter are pivoted, of a transverse shaft connected to said segment, a spring coiled around said shaft and connected thereto at one end, a crown-ratchet mounted loosely upon said shaft and connected to the other end of said spring, a co-acting crown-ratchet provided with a threaded portion whereby it is screwed into the framework, a pivot-screw passing through said stationary crown-ratchet and supporting one end of said shaft, and a co-acting pivot-screw engaging the framework and supporting the other end of said shaft.

44. In a front-strike type-writing machine, the combination of a series of type-bars, pivoted at their rear ends, a curved type-rest, plate 187, and plate 188 detachably supported above said plate 187.

45. In a front-strike type-writing machine, the combination of a series of horizontal type-bars, a curved type-rest, plate 187 whose upper edge is curved, and a detachable plate 188 arranged thereabove and curved to correspond, its upper edge being bent over rearwardly to form a ledge, and fingers 193 and 194 fixed upon said upper plate.

Signed at the borough of Manhattan, in the city of New York, in the county of New York and State of New York, this 18th day of June, A. D. 1900.

JACOB FELBEL.

Witnesses:

K. V. DONOVAN,  
FLORENCE KEELING.