

No. 668,713.

Patented Feb. 26, 1901.

C. GABRIELSON.
TYPE WRITING MACHINE.

(Application filed Aug. 16, 1900.)

(No Model.)

5 Sheets—Sheet 1.

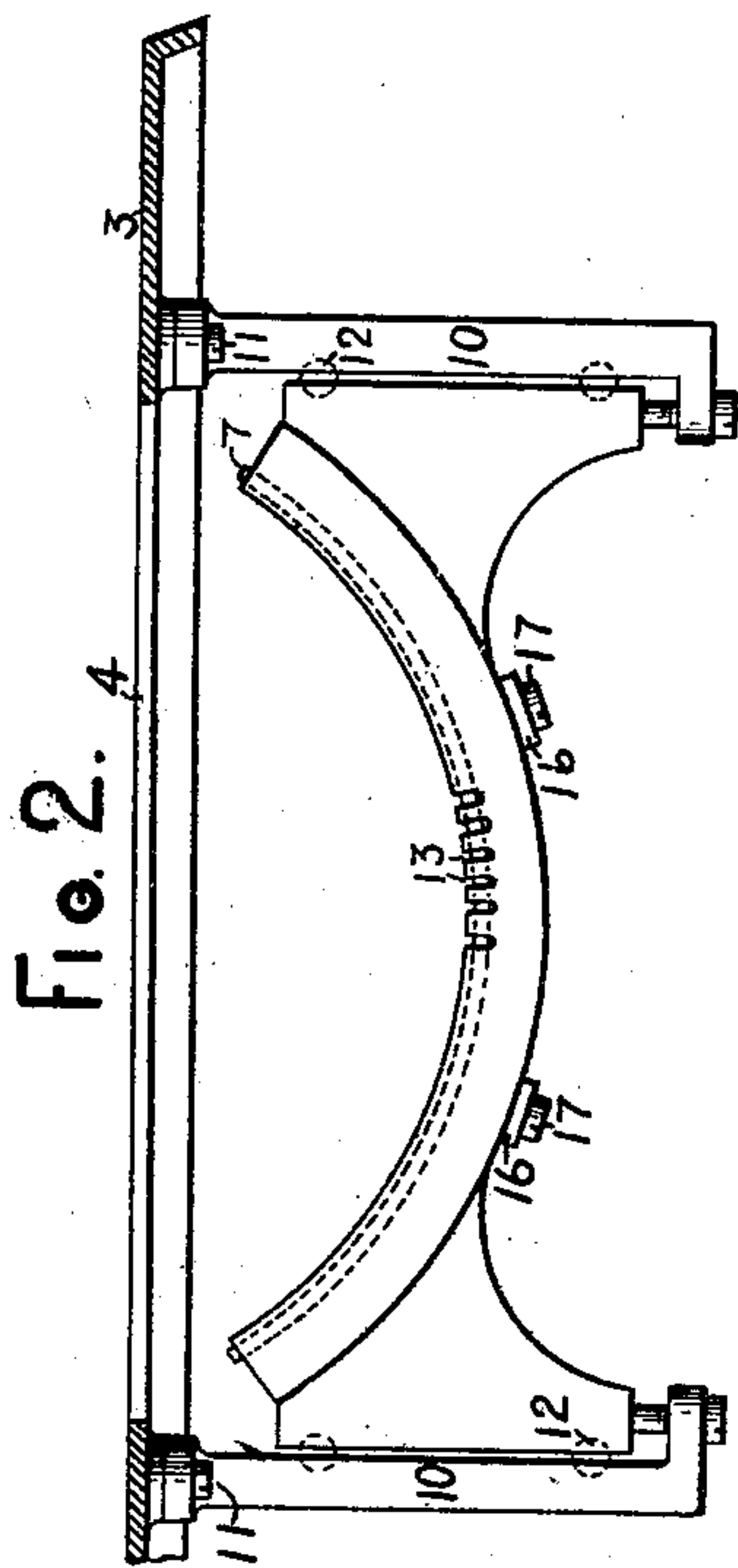
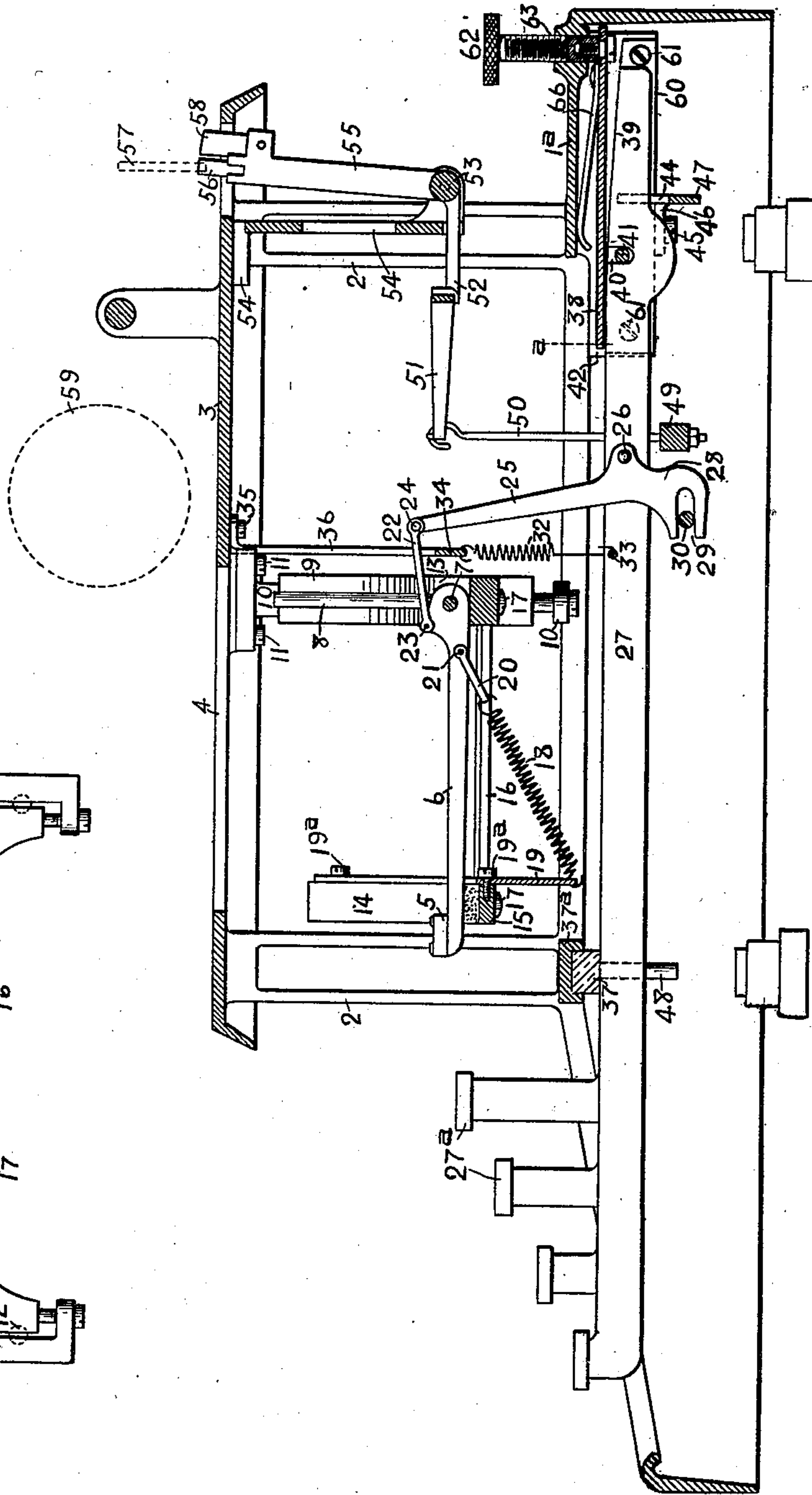


Fig. 1.



WITNESSES:
Henry C. Dudgeon
E. M. Wells.

INVENTOR=
Carl Gabrielson
by Jacob Feltel
HIS ATTORNEY

No. 668,713.

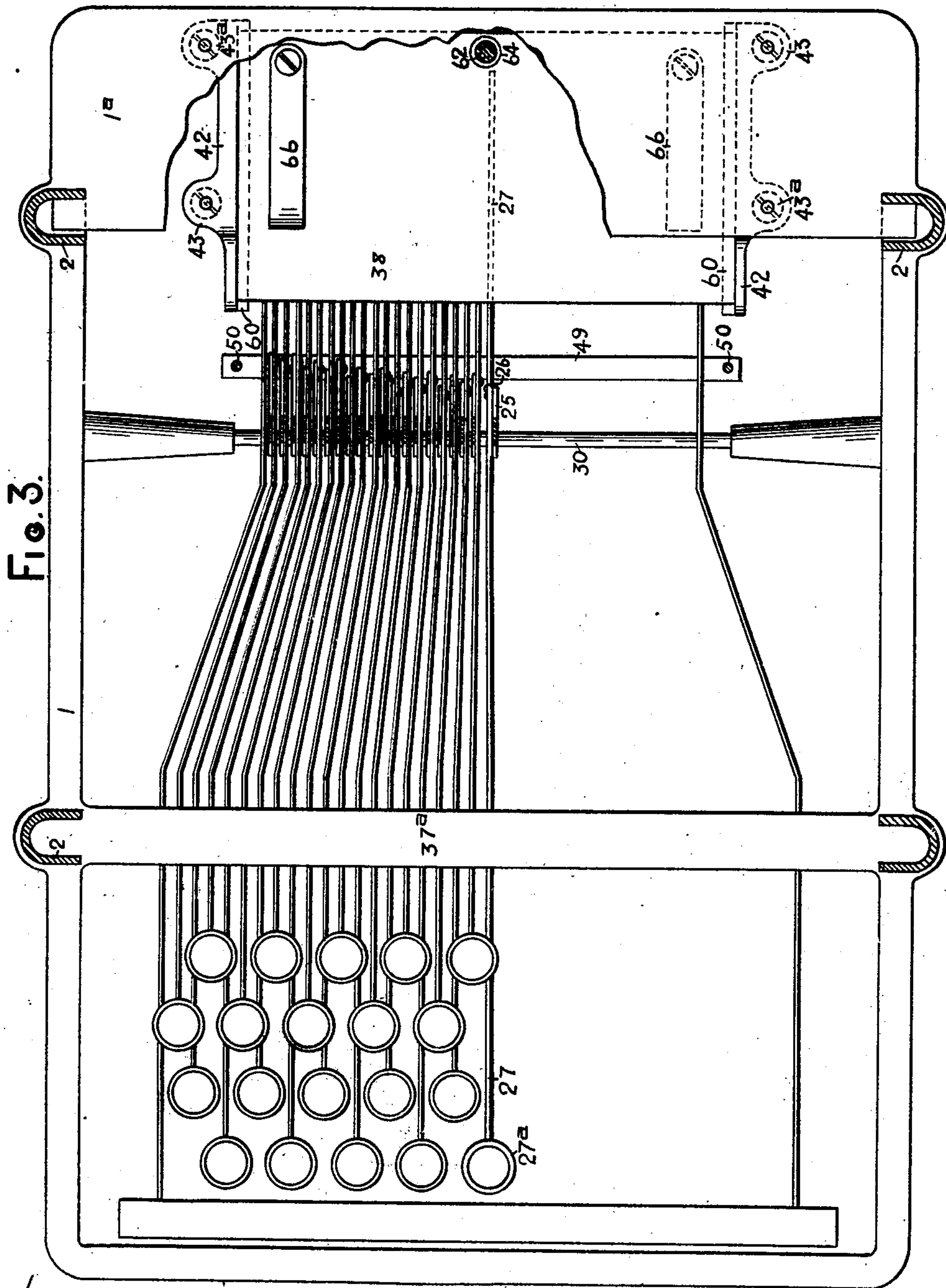
Patented Feb. 26, 1901.

C. GABRIELSON.
TYPE WRITING MACHINE.

(Application filed Aug. 16, 1900.)

(No Model.)

5 Sheets—Sheet 2.



C. GABRIELSON.
TYPE WRITING MACHINE.

(Application filed Aug. 16, 1900.)

(No Model.)

5 Sheets—Sheet 3.

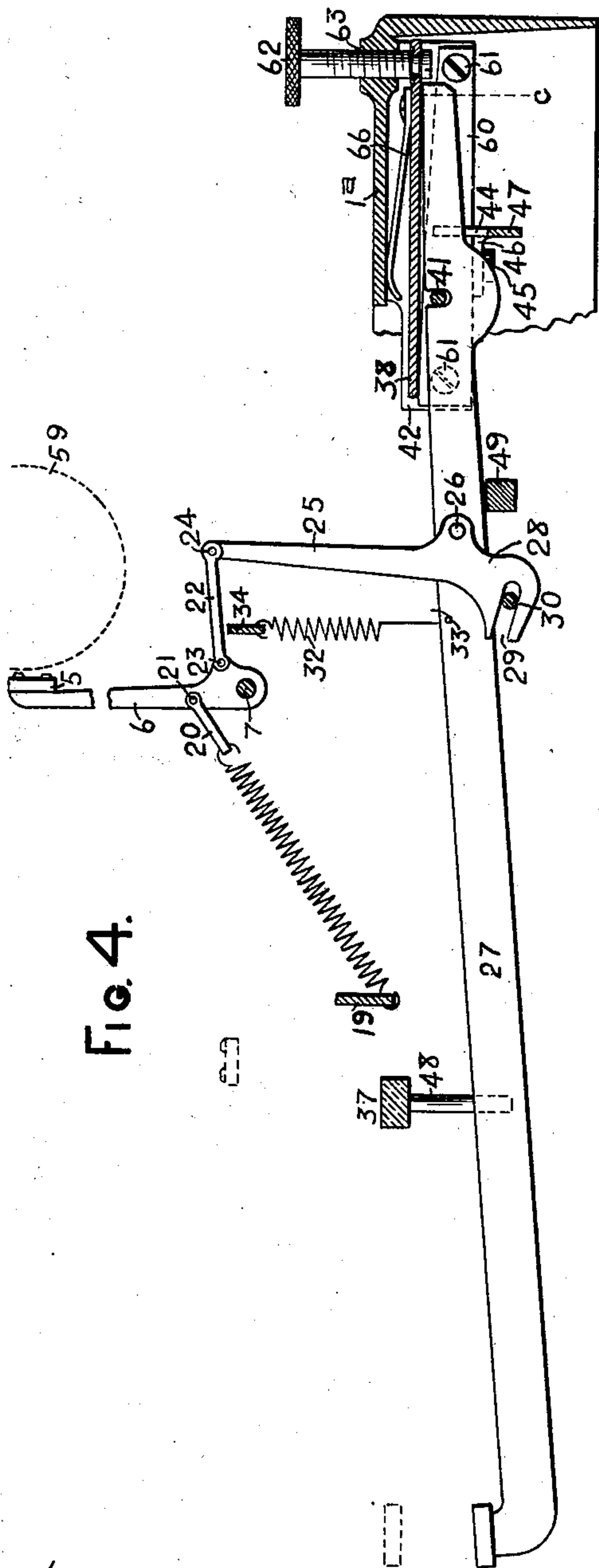


Fig. 4.

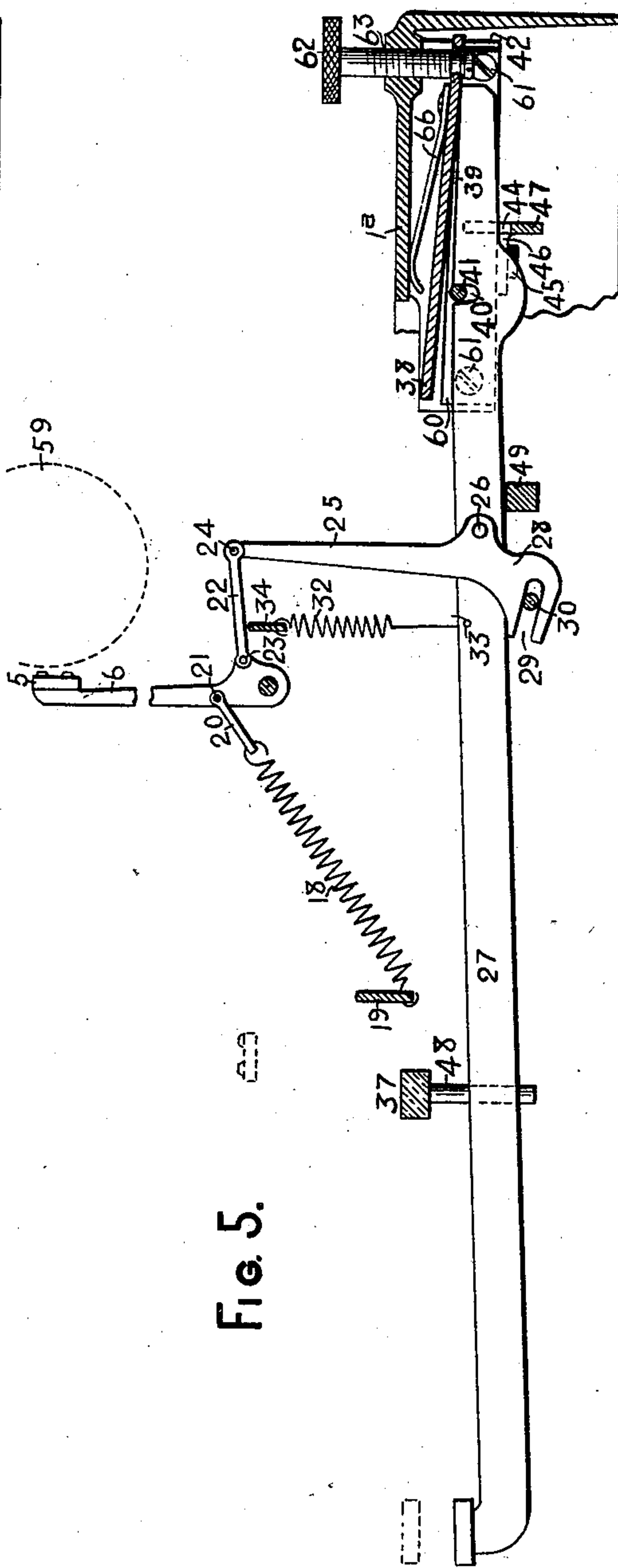


Fig. 5.

WITNESSES:

Henry C. Dudgeon
E. W. Wells

INVENTOR.

Carl Gabrielson
by Jacob Falbel
HIS ATTORNEY

C. GABRIELSON.
TYPE WRITING MACHINE.

(Application filed Aug. 18, 1900.)

(No Model.)

5 Sheets—Sheet 4.

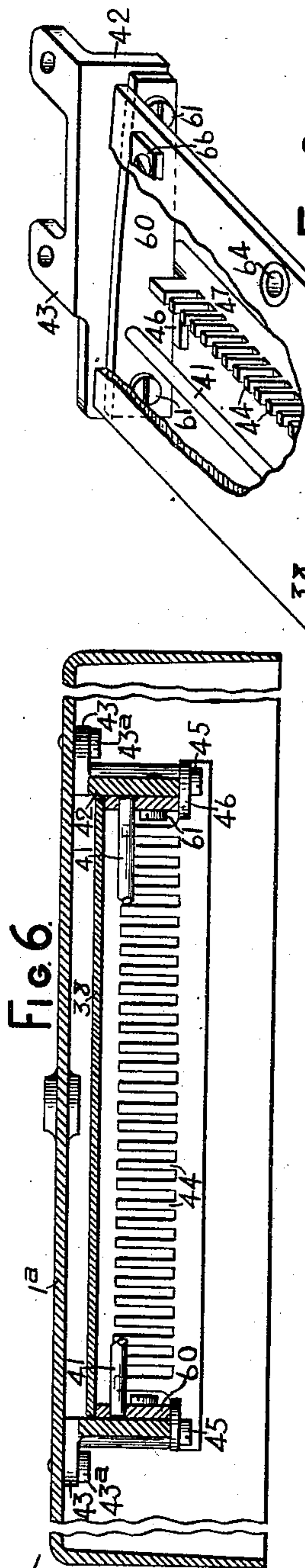


Fig. 6.

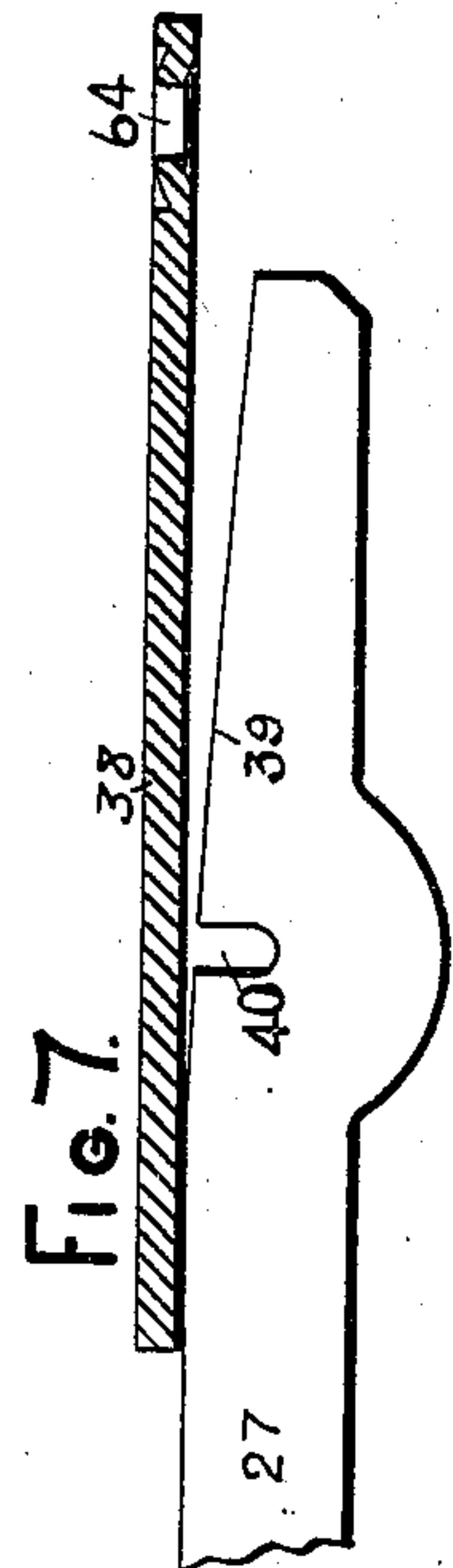


Fig. 7.

Fig. 8.

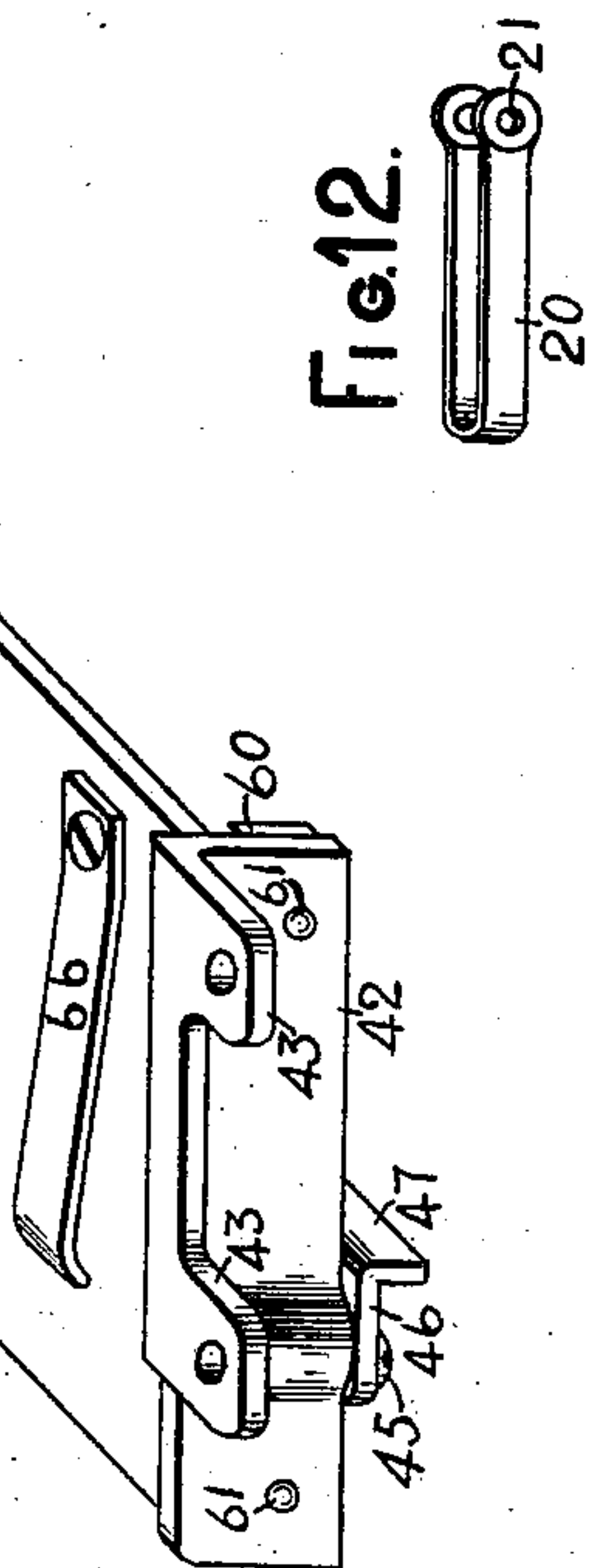


Fig. 9.

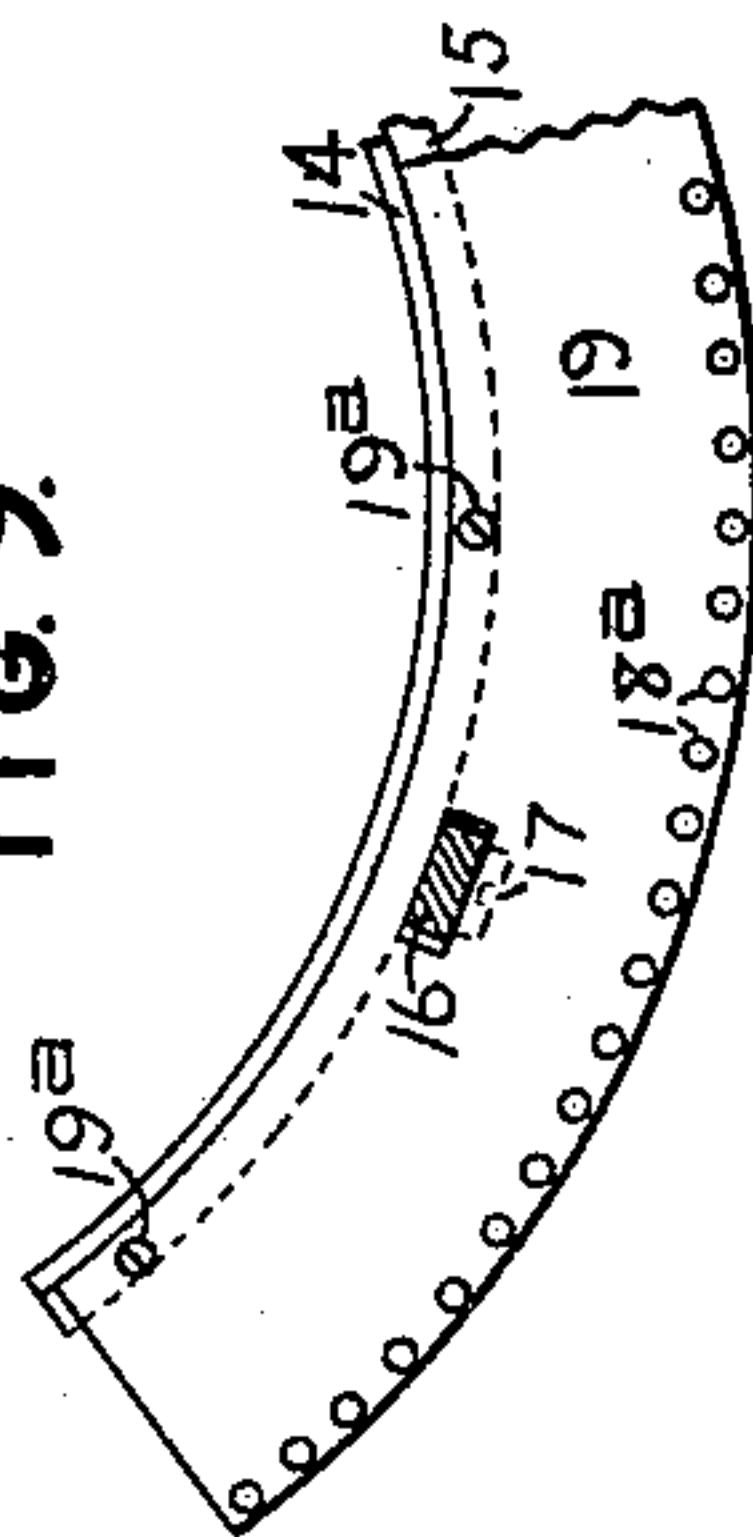


Fig. 10.

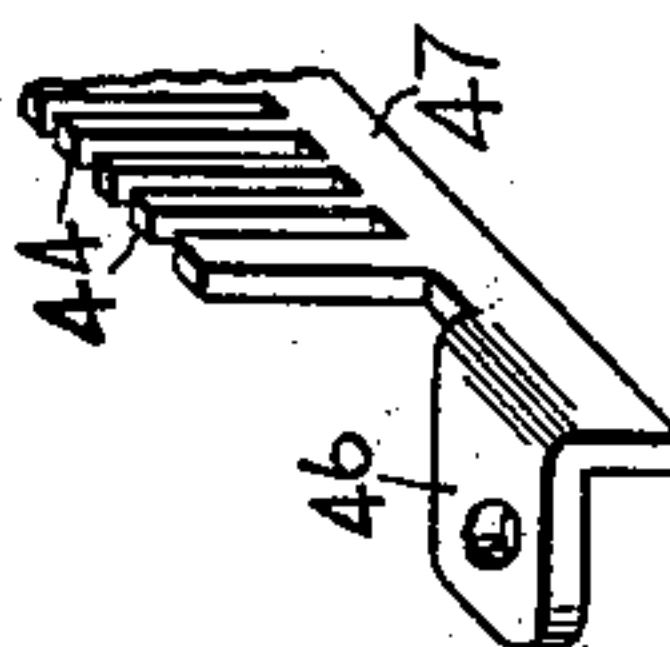


Fig. 11.

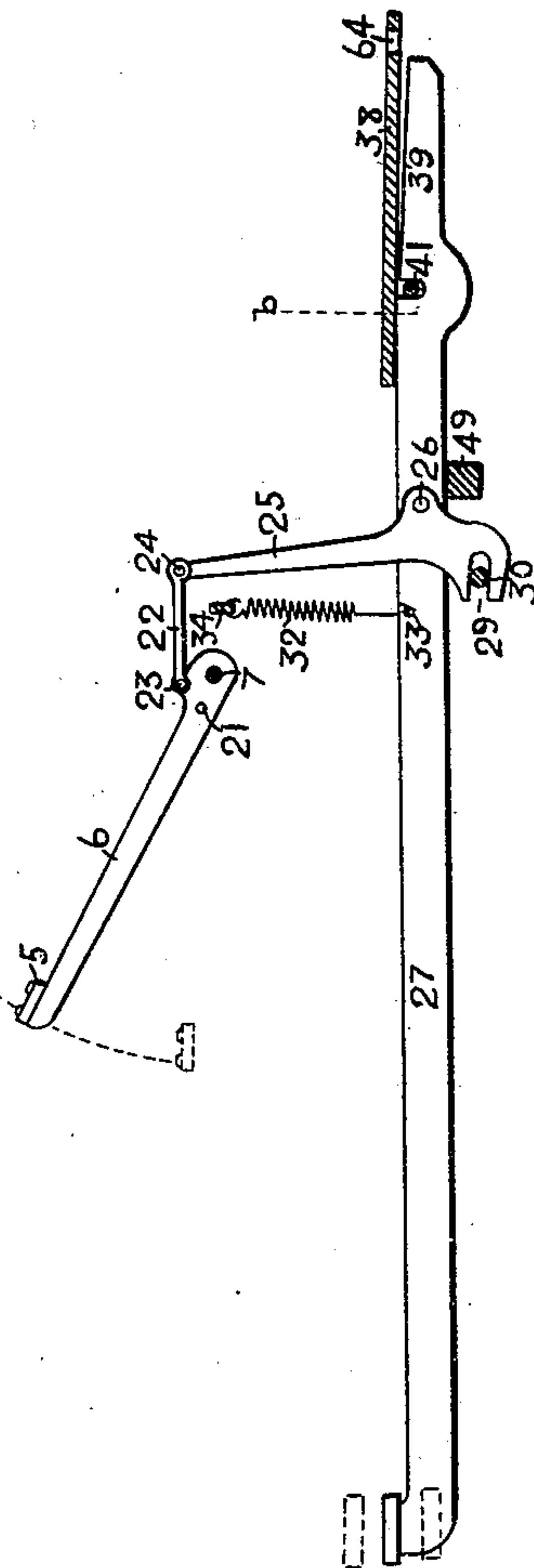
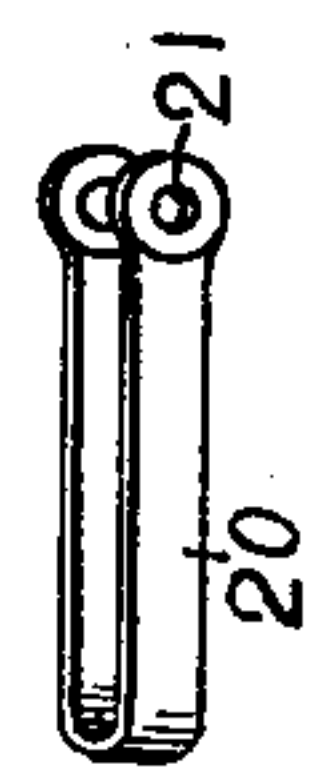


Fig. 12.



WITNESSES.

Henry C. Dudgeon
E. W. Wells.

INVENTOR.

Carl Gabrielson
by Jacob Felbel
HIS ATTORNEY

No. 668,713.

C. GABRIELSON.
TYPE WRITING MACHINE.
(Application filed Aug. 16, 1900.)

Patented Feb. 26, 1901.

5 Sheets—Sheet 5.

(No Model.)

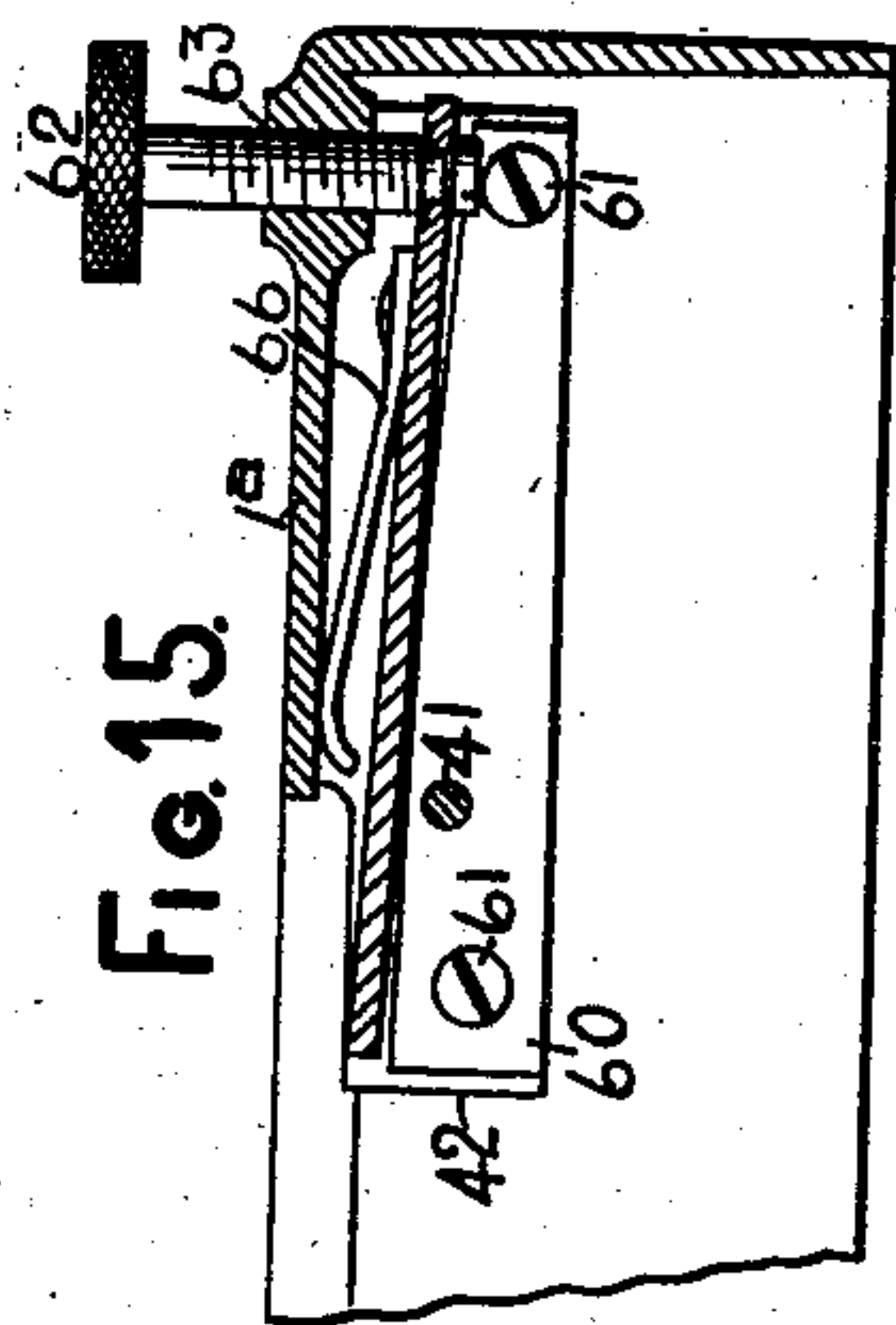


Fig. 15.

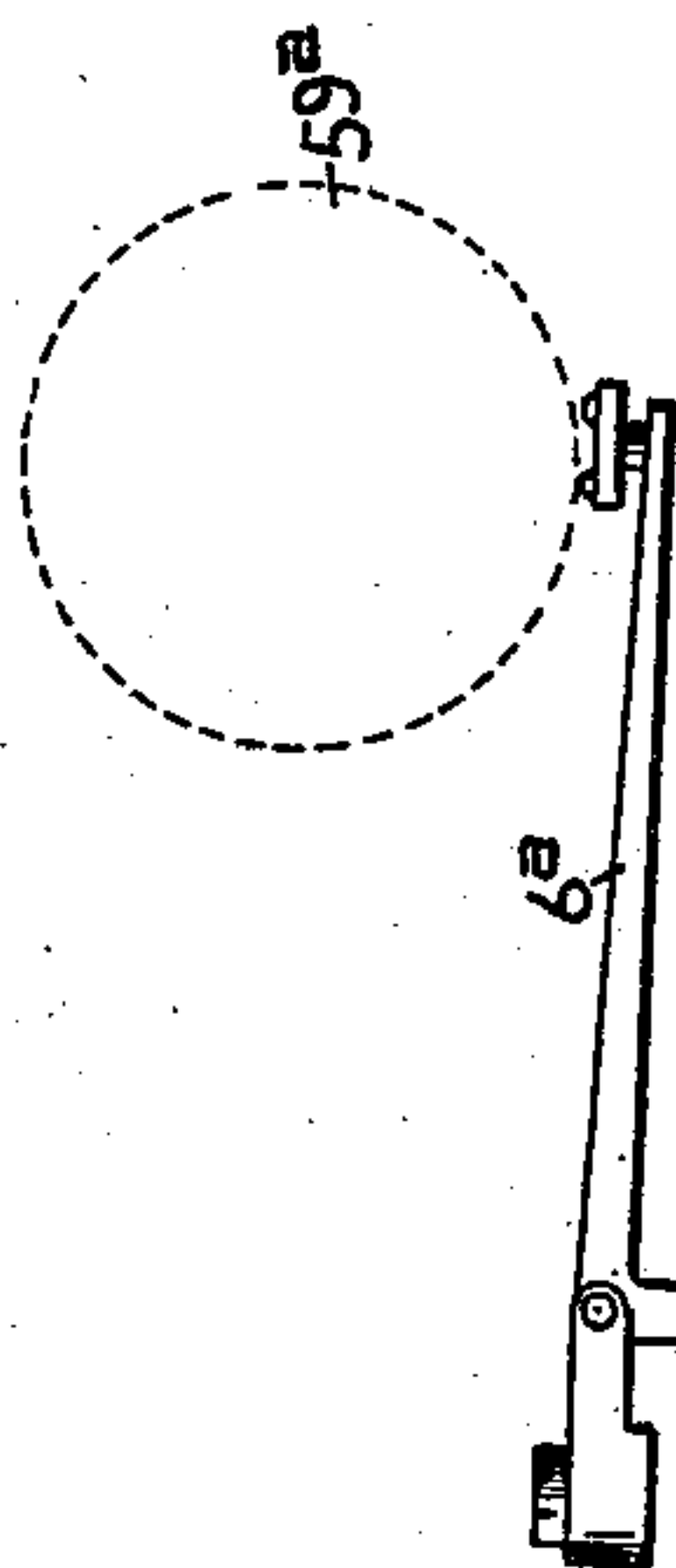


Fig. 14.

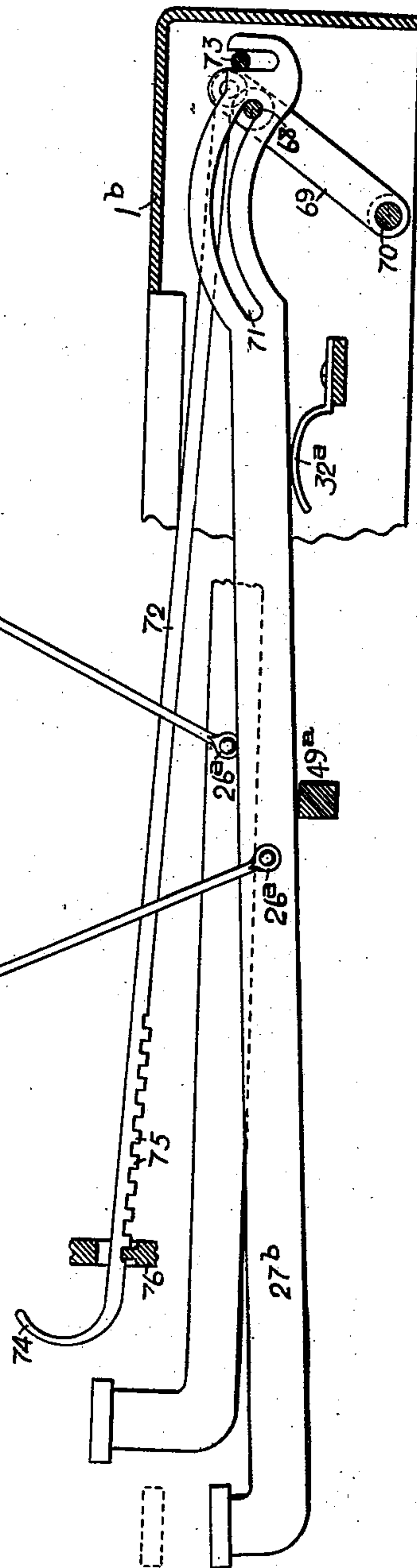


Fig. 13.

WITNESSES
Henry C. Dudgeon
E. M. Wells

INVENTOR.
Carl Gabrielson
By Jacob Feltel
HIS ATTORNEY

UNITED STATES PATENT OFFICE.

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

TYPE-WRITING MACHINE.

SPECIFICATION forming part of Letters Patent No. 668,713, dated February 26, 1901.

Application filed August 16, 1900. Serial No. 27,102. (No model.)

To all whom it may concern:

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

My invention relates to the type-operating mechanism of type-writing machines. Heretofore the resistance offered by the fingers to the touch of the operator has been increased or diminished by changing the tension of the dog-rocker or universal-bar spring, which is common to all the key-levers, or by changing the tension of the individual springs provided for the key-levers, or by adjusting both the dog-rocker spring and the individual springs until the "touch" of the keys suits the individual operator. Some operators prefer a very light resistance to the finger-stroke, while others prefer the contrary. If the tension of the dog-rocker spring be made very great, the key-levers and other parts are liable to bend in operation, as they are necessarily of light construction, and hence the action of the spacing-dogs is affected injuriously, so that after keying up the tension it is generally found necessary to also readjust the connections between the keys and the spacing-dogs in order to insure a complete movement of the latter at each key-stroke. This last-mentioned adjustment must in most cases be performed by a skilled mechanic, so that it is not usually within the power of the operator to alter the key tension, except within very narrow limits, without getting the machine out of order, so far as he is concerned.

One of the principal objects of my invention is to enable the operator to alter the key-resistance or touch from very light to very heavy or any intermediate point by a simple adjustment and without necessitating readjustment of the connections between the keys and the escapement-dogs, so that whether the key-touch is light or heavy the movement of the escapement devices is uniform, and hence the services of a skilled adjuster are not needed. Although I accomplish this change in the key-touch without the adjustment of either the usual dog-rocker spring or

any other key-returning spring, still I prefer to retain said dog-rocker spring and the usual adjusting devices therefor, so that it may be keyed up to enable the mechanism to respond promptly to the touch of the fingers upon the keys; but after being once adjusted to this point it will not need to be thereafter adjusted to any great extent by the operator, as said spring will exert the same returning force and cause the same prompt response of the mechanism through all the changes which may be made in the key resistance by the hereinafter-described improvements. Again, some operators prefer the lightest possible key-touch, and so long as this is obtained do not object to a key dip or stroke of, say, three-fourths of an inch, while other operators, having a heavier touch, desire considerable key resistance and would be enabled to operate faster if the dip or stroke of the key were shallow—say one-half or even three-eighths of an inch—as in that case the key would be released, and hence all the parts operated thereby would return to normal position in much less time than would be the case with a deep key-stroke. In other words, some operators are enabled to do better with a light key-touch and deep stroke, while other operators, not having nimble fingers and being therefore unable to release the keys so promptly, do better with a shallow touch and greater key resistance. Obviously a machine constructed especially for one class of operators would be unsuited for the other class, and heretofore it has been the practice to adapt the same machine to suit all classes of operators by having a medium dip of the keys and by depending upon adjustments of the dog-rocker spring for altering the touch to suit the needs of the operator in each case.

My invention has for another of its principal objects the provision of means whereby the dip or depth of stroke of the finger-keys may be altered at will by the operator, so that an operator desiring a light touch and not objecting to a deep stroke may by a simple adjustment effect this result, while another operator subsequently using the same machine and desiring a shallow key-stroke and a great key resistance may by a reverse adjustment instantly change the machine to

meet his own requirements. Machines provided with such adjustment will be suited for both classes of operators, as well as for those who prefer a medium key-stroke and medium resistance to the finger-touch.

To these and other ends my invention consists, primarily, in the combination, with a series of keys and a series of types connected thereto, of means whereby the purchase or leverage of the keys upon the types may be adjusted so that the type-bars may be operated by long easy key-strokes or short hard key-strokes as desired, it being understood that the resistance to the key-touch is increased in proportion to the decrease of the purchase of the key upon the type-bar and to the consequent decrease in the depth of the key-stroke.

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

As shown in the accompanying drawings, I have adapted my own improvements to certain improvements set forth and claimed in an application filed by Burnham C. Stickney, January 12, 1900, Serial No. 1,190, said adaptation or combination being such as to preserve the advantages of the improvements set forth in said application, while enabling the operator to change the depth of stroke and resistance to touch at will. In other words, the present machine is constructed to give the operator the benefit of the very soft touch afforded by the improvements set forth in said application, or a shallow hard touch, or any intermediate touch, according to the desire of the operator. In said application a cushioning effect is described as being effected by automatically decreasing the leverage of the key upon the type-bar during the key-stroke, and although in my preferred construction means for adjusting the leverage of the keys upon the types are combined with means for automatically decreasing the leverage during the key-stroke, whereby said cushioning effect is secured, still my invention, broadly considered, is not limited to any particular means for producing either effect and, if desired, my stroke-adjusting devices may be used in machines in which the leverage is not automatically changed during the key-stroke.

In the accompanying drawings, Figure 1 is a longitudinal sectional elevation of a "front-strike" type-writing machine embodying my improvements. Fig. 2 is a rear elevation of a shiftable type-segment. Fig. 3 is a sectional plan view of the machine shown at Fig. 1. In these and other figures certain parts are omitted for the sake of clearness. Fig. 4 is a skeleton view similar to Fig. 1, but showing the parts at the printing position. In both Figs. 1 and 4 the key-lever fulcrum-plate is shown in a horizontal position. Fig. 5 is a view similar to Fig. 4, but showing said ful-

crum-plate as adjusted or tipped to the other extreme of its movement. Fig. 6 is a front sectional elevation of the key-lever fulcrum-plate, the supports therefor, the rear key-lever guide-comb, and other parts. Fig. 7 is a fragmentary enlarged view of the rear end of a key-lever, showing the curvature of the extended thread thereon, and also showing its relation to the fulcrum-plate. Fig. 8 is a perspective top view of the fulcrum-plate and its supports and springs and of the rear key-lever guide-comb. Fig. 9 is a fragmentary elevation of the type-basket and a perforated plate attached thereto. Fig. 10 is a perspective view of one end of the rear key-lever guide-comb, showing the formation of the ear thereon. Fig. 11 is a view of a type action similar to that shown at Figs. 1 and 4, but showing the position of the parts when the key is half-way depressed. At this view also the fulcrum-plate is in a horizontal position. Fig. 12 is a perspective view of a yoke for attachment to a type-bar. Fig. 13 is a rear elevation of the dog-rocker, showing the dog-rocker spring and the usual adjustment therefor. Fig. 14 is a diagrammatic side elevation showing certain of my improvements as applied to a machine of the "under-strike" class, one type-bar being shown in printing and the other type-bar in normal position. Fig. 15 is a fragmentary sectional elevation showing the fulcrum-plate as tipped to a position between the two positions shown, respectively, at Figs. 4 and 5.

Throughout the several views the same part will be found designated by the same reference characters.

The framework consists of a rectangular base 1, corner-posts 2 rising therefrom, and a top plate 3, secured upon the posts and having at its forward portion a large opening 4 for the passage of the types in their movement to the platen. Each type-block 5 is provided with an upper and lower case type suitably secured upon the free forward end of a type-carrier 6. The type carriers or bars are arranged in front of the platen and are pivoted at their rear ends upon a common fulcrum-rod 7, which is bowed or arc-shaped and seated in a curved slot 8, formed in a shiftable segment 9, the latter being guided in its vertical shift movements between vertical guides 10, depending from the under side of the top plate, to which they are secured by screws 11, bearing-balls 12 being interposed between the segment-casting and the guides 10, and both the guides and the segment being provided with suitable ballways. The segment is also provided with radial slots 13, one for each type-bar. The type ends of the bars rest normally upon a segmental pad 14, having a metallic support 15, the latter being secured to the forward ends of arms 16, which are fastened to the segment 9 by screws 17. Each type-bar is returned from working position to normal position and there retained by a draw-spring 18, which hooks at its forward end into a per-

foration 18^a, formed near the lower edge of a segmental plate 19, and at its rear end into a sheet-metal yoke or strap 20, which straddles the type-bar and is pivoted thereto at a point 21, near the pivot 7 thereof. The plate 19 is secured to the support 15 by screws 19^a. The segment 9 and its attachments constitute a shiftable supporting-frame for the type-bars.

A short horizontal draw bar or link 22 is pivoted at its forward end 23 to the type-bar and at its rear end 24 to the upper end of a vertical arm 25 of a bell crank or lever. When the segment 9 is shifted, the forward ends of links 22 move up or down with the type-bars. The bell-crank is pivoted to a horizontally-extending unpivoted lever 27 of the second order at a point 26 between the ends of the latter. A key 27^a is borne by the forward end of each lever 27, the keys being arranged in straight rows transversely of the machine. The levers extend rearwardly from the keyboard beneath the type-bars and paper-carriage. The other arm 28 of the bell-lever or sublever extends downwardly and forwardly from the pivot 26, and at its lower end is forked at 29, so as to straddle a cylindrical fulcrum rod or bar 30, which extends horizontally across the machine beneath the key-levers and is suitably secured at 31 to the side walls of the base. The type-bars lie horizontally at different heights, the arms 25 of the bell-crank levers being of corresponding lengths.

At a point just forward of the bell-lever each key-lever is provided with a lifting-spring, as 32, the lower end of which hooks into a hole 33 in a key-lever, and the upper end of which hooks into a perforation formed in a horizontal transverse bar 34, having upwardly-extending arms 36, which are secured by means of screws 35 to the under side of the top plate. This spring causes the forward end of the key-lever to bear up normally against a pad 37, arranged upon the under side of a transverse bar 37^a, and its rear portion to bear up against the under side of a fixed transverse horizontal fulcrum-plate 38, arranged over the rear ends of the key-levers and under the horizontal rear plate 1^a of the base. The rear end portion of each key-lever is extended or prolonged, and the upper edge of the extension is curved at 39 to form a tread or rocker, which creeps or rolls along the under plane surface of the fulcrum-plate when the forward end of the key-lever is depressed, thus automatically changing the leverage or purchase of the key upon the type-bar. It will be observed that the fulcrum is correspondingly extended or elongated, or, in other words, the plate 38 may be considered as made up of a series of elongated fulcrums, one for each key-lever, the elongation being of course in a direction parallel with the length of the key-lever. About midway of the rocker or "tread" portion each key-lever is provided at its upper edge with a notch or opening 40, whereby it engages a fixed horizontal transverse bar or

projection 41, whereby endwise movement of the lever is prevented. Said bar 41 is preferably of cylindrical form, and its ends are supported in perforations formed in a pair of vertical plates or brackets 42, between which the rear ends of the key-levers are confined, said brackets having outwardly-turned ears 43, which are placed up against the under side of the horizontal overhanging portion 1^a of the base and secured thereto by screws 43^a. A comb or series of guiding-teeth 44 is provided upon a transverse fixed bar 47, the latter extending transversely just beneath the lower edges of the key-levers, so as to permit a limited vertical movement of the latter, while preventing accidental disengagement of the notches 40 from the bar 41. The bar 47 is supported by means of screws 45, which pass through perforated ears 46, extending forwardly from the bar, and engage threaded holes extending upwardly into the brackets 42. As usual, the key-levers at their forward portions are guided by a comb 48, secured to the bar 37^a.

The letter-spacing movements of the spring-propelled carriage may be effected in any suitable way, as by a transverse universal bar 49, depending by means of rods 50 from arms 51, secured to a rocking-frame 52, pivoted at 53 to a bracket 54, secured to the under side of the top plate 3. The said rocking frame also includes a vertical arm 55, at the upper end of which is carried both a pivoted feeding or stepping dog 56, which is normally in engagement with a carriage-rack 57, and a fixed detent-dog 58, in line with said dog 56. A cylindrical platen is indicated at 59. The platen and paper-carriage, which are not fully illustrated, may be of any usual or suitable construction.

In operation the key-lever is depressed, carrying down the pivot 26 of the bell-crank lever and causing the arm 25 of the latter to swing rearwardly, so that by means of link 22 the type-bar is swung up to strike the platen. During this operation the universal bar 49 is carried down, the rocker-arm 55 is swung forwardly, and the dog 56 disengaged from the rack 57, the fixed dog 58 becoming engaged therewith. Upon release of the key from pressure the springs 18 and 32 cause the type-bar, key-lever, and sublever to return to normal position, and the usual dog-rocker spring 55^a, Fig. 13, causes a return of the dog-rocker to normal position, permitting the carriage to advance one tooth in the usual manner, under the tension of the carriage-spring. (Not shown.)

Preferably no part of the lever-tread 39 is straight, so that it normally bears up against the plate 38 at only a single point, (indicated by the letter *a* at Fig. 1.) This point is not far from the load-point 26 of the key-lever, and hence it will be observed that the movement of the type 5 is at the beginning comparatively slow. In other words, the type is given an easy start, and hence the resistance

offered by the finger-key to the touch of the operator at the early part of the stroke is minimized. The key-lever works with a varying fulcrum, or, in other words, as the key-lever vibrates the tread 39 rolls or shifts along the extended fulcrum 38, and consequently the fulcrum-point constantly recedes from the load-point 26. As the type-bar gathers headway the leverage or purchase of the key upon the type-bar constantly decreases, causing an acceleration of the speed of the type-bar as it approaches the platen, so that the type strikes a powerful blow. Owing to said decrease in leverage the resistance offered by the key to the operator's touch constantly increases from beginning to end of the key-stroke. Toward the latter end of the stroke the rear portion of the tread 39 is in working contact with the fulcrum-surface, and the leverage is so much changed and hence the resistance offered by the type-bar is so much increased as to gradually absorb the momentum of the hand, so that the final shock at the termination of the key-stroke is minimized.

The tread or working edge 39 of the key-lever may, if desired, be cut upon an arc of a circle; but the best results are obtained by conforming the tread to a curve having a changing radius, the forward portion of the curve having the shorter and the rear portion of the curve having the longer radii, whereby as the key is depressed the fulcrum-point changes slowly at first, so that when the key has been depressed half-way, as illustrated at Fig. 11, the fulcrum-point has receded only a short distance, as indicated at *b* at said figure, and the type-bar has moved only one-third or less of the distance from normal position to the platen. The remaining two-thirds or more of the type-bar movement is effected by the last half of the key-stroke, inasmuch as the recession of the fulcrum-point from the load-point is more rapid during the latter half of the key-stroke. At the time of the impression of the type the rear extreme of the key-lever tread is bearing upon the fulcrum-plate at the point *c*, as shown at Fig. 4. If the curve 39 should be cut upon an arc of a circle, the fulcrum-point would change too soon, so that the desired cushioning effect at the beginning of the key-stroke is not fully obtained; but by the use of the described irregular curve the movement of the type is for the first third of its stroke rendered very gradual and the jar to the finger is avoided, while at the same time the subsequent quick change of the fulcrum-point gives an ample cushioning effect for absorbing the momentum of the hand and minimizing or forestalling the jar to the finger which occurs by reason of the impact of the type. The depth of the key-depression is not excessive, however, since the comparatively slow movement of the type at the beginning of the key-stroke is compensated by

the comparatively rapid movement of the type during the remainder of the stroke.

It will thus be seen that there have been combined with a system or series of type-bars and a series of operating-keys a series of leverage-changing connections between said keys and said type-bars, each of said connections being constructed to diminish the leverage or purchase of its key upon its type-bar slowly during the first part of the key-stroke, so that the first portion of the impulse communicated from the key to the type-bar occurs when the leverage is greatest and so that thereafter the leverage diminishes at first slowly, then more rapidly, until the point of least leverage is gained, at which point the last portion of the impulse is communicated from the key to the type-bar. It will also be observed at Fig. 11 that upon the release of the depressed key the type-bar completes two-thirds of its return motion by the time that its key has completed only one-half of its return motion—that is to say, assuming that the return movement of the finger-key is uniform the return of the type-bar is much more prompt than usual heretofore, and hence the succeeding type-bar may be operated sooner, thus permitting more rapid manipulation of the machine.

Owing to the described change in leverage the spring 18, working through the link 22 and the bell-crank lever 25, exerts more tension upon the key at the beginning of the return stroke of the latter than at the finish thereof, so that the touch upon the keys is rendered very elastic. However, this spring may be omitted, if desired, and the spring 32 made correspondingly stronger. The spring 32 has a like effect to spring 18 in securing an elastic touch, for the same reason as does also the dog-rocker spring 55^a, Fig. 13, which is provided with the usual adjusting mechanism 55^b.

It will be understood that it is not essential that the type-operating lever be of the second order or that it be provided directly with a key or that it be in the form of a straight horizontal lever.

In carrying out my present invention I provide means at the key-lever fulcrums for adjusting the leverage of the keys upon the type-bars, and thereby altering the dip of the keys, and although I prefer this arrangement, still it is not essential in all forms of my invention, as provision may be made elsewhere for such adjustment. Preferably I mount the fulcrum-plate 38, above described, in such a manner that it may be adjusted or tipped to different angles from normal horizontal position, as illustrated at Figs. 5 and 15. This rocking movement of the fulcrum-plate is effected without disturbing the key-levers, since said plate rests at its side edges upon short parallel bars 60, which extend horizontally along the inner sides of the plates or brackets 42, to which they are fastened by

screws 61, the upper or working edges of these bars having exactly the same curve as the treads or fulcrum portions of the key-levers. In other words, the upper edges of said bars 60 coincide or are in line with the upper edges of the extended ends of the key-levers, so that said plate may be tipped or rocked upon said bars without causing a movement of any key-lever.

For effecting an adjustment of the fulcrum-plate I provide a thumb-screw, which engages a vertical threaded hole 63, formed in the overhang 1^a at the rear of the base, and at its lower end engages the edge of a hole 64, formed near the rear edge of the fulcrum-plate and about midway of its length. A small-shouldered screw 65 is passed upwardly through said hole 64 and engages a threaded vertical hole formed in the lower end of the thumb-screw. It will be seen that both the end of the thumb-screw and the head of the shouldered screw are larger than the perforation in the fulcrum-plate, so that the latter is controlled by the thumb-screw and compelled to follow it in its vertical movements. The plate is held down upon the bars 60 by springs 66, secured at their rear ends to the upper side of the plate and near the right and left hand ends thereof and extending forwardly and upwardly and bearing up against the under side of the overhang 1^a, the springs being, however, preferably only of sufficient length to reach to points about midway between the front and rear edges of the fulcrum-plate. These springs are strong enough to hold the plate down firmly upon the bars 61, while at the same time the plate may be readily adjusted or tipped to any degree within the limits of its movement by turning the thumb-screw 62, said springs always cooperating therewith to hold the plate firmly in its adjusted position, so that it may not yield to the upward pressure of the key-levers. When the thumb-screw 62 has been adjusted to bring the fulcrum-plate to the horizontal position shown at Fig. 4, the key stroke or dip is the deepest and the touch is the lightest, which adjustment will be preferred by operators whose fingers, while lacking strength, are nimble in their movements. When said screw has been adjusted downwardly to bring the plate to the position shown at Fig. 5, the key-dip is shallowest and the touch or key resistance greatest, this adjustment being preferred by those having strong fingers and heavy touch. The difference in the depth of the key-strokes is considerable, as will be perceived by comparing the distances between the dotted elevated key positions and full-line depressed positions at said figures. At Fig. 15 the fulcrum-plate is shown as lying in a medium position, so that the key-stroke is not so long or easy as at Fig. 4 nor so short and hard as at Fig. 5. It will be understood that very fine adjustments of the plate may be effected to suit the requirements of individual operators or of the same operator at

different times or when doing different kinds of work. The adjustment may be readily effected by the operator without liability of getting the machine out of order.

It will be understood that at Fig. 15 there is a rolling or creeping movement of the key-lever along the plate at the printing operation, although the extent of such creeping movement is not so great as at Fig. 4, and hence the stroke is not so well cushioned as at the last-mentioned figure. It will also be noted that at Fig. 5 the cushioning effect is very slight, since the very tip of the lever bears upon the fulcrum-plate throughout nearly the entire key-stroke. It will be seen, however, that considerable adjustment of the plate 38 may be effected without eliminating or affecting to a great extent the cushioning effect of the curved key-lever tread, and I do not consider the invention as limited to constructions in which the adjustment of the key-dip affects the automatic leverage-changing action at the printing stroke of the key, since the dip-adjusting device may be arranged at one part and the key-cushioning device at another part of the connection between the key and the type, as at Fig. 14.

The movements of the type-bar, link 22, and bell-lever 25 are the same in all cases, regardless of the adjustment of the key-dip—that is to say, the up-and-down movement of the pivot 26 is uniform and the dip of the key varies according as the plate 38 is adjusted to vary the working point or points of the lever. During the changes in the adjustment it is desirable that the movement of the universal bar 49 and of the feed devices controlled thereby shall be uniform in extent, and hence I construct said universal bar to be operated by parts whose movements are not affected by said adjustments, preferably by arranging said bar at a point nearly or directly under the pivots 26, Figs. 3 and 4, so that the variations in the lever movements will not appreciably vary the escapement movements.

The usual adjustment for the dog-rocker spring (illustrated at Fig. 13) is preferably retained, so that the tension of said spring may be adjusted to secure prompt return movements of the rocker and also of the key mechanism and so that when desired the touch of the keys may be weakened or strengthened without changing the dip thereof. By variously adjusting both the dog-rocker spring and the fulcrum-plate a very great variety of touches may be obtained at the keyboard.

Referring now to Fig. 14, the key-levers 27^b of the second order are connected at 26^a by rods 67 to understrike type-bars 6^a and are hung at their rear ends upon a transverse cylindrical horizontal fulcrum-rod 68, whose ends are rigidly secured in the upper portions of upright rocker-arms 69. Said rocker-arms are arranged one at each side of the machine, so as to confine the key-levers, and at their lower ends are fixed upon a rock-shaft 70,

whose ends are journaled in the side walls 1^b of the base of the machine. Each key-lever is provided with a longitudinal arched slot 71, which is concentric to the axis 70 whenever the key-lever is in normal position. The frame comprising the arms 69 and parallel rods 68 70 may be rocked forwardly to move the rod 68 in the slots 71, and thereby bring the fulcrum-point of all the key-levers nearer to their load-points, thereby increasing the leverage or purchase of all of the keys upon the type-bars. This rocking movement of the frame may be conveniently effected by a link 72, pivoted at 73 to the upper end of one of the arms 69 and extending forwardly to the keyboard, whereby it may be provided with a handle 74, as well as a series of teeth 75, to engage a fixed part 76 and hold the rocking frame in any desired position. Springs 32^a return the key-levers to normal position after the type impressions are made, and a universal bar 49^a is placed beneath the levers in proximity to the points of attachment of the links 67. By a comparison of the two positions of the parts shown at this view it will be noted that the purchase of the key upon the type-bar is greatest at the beginning of the stroke and gradually decreases until the end of the stroke, as usual in this class of machines, the difference in the leverage being due to the different angular positions assumed by the short arms of the type-bars relatively to the links 67 during the printing stroke.

It will be seen that in each of the constructions herein illustrated by moving a single finger-piece the relation of all the keys to all of the type-bars is so adjusted as to vary the dip of all of the keys simultaneously, and hence to increase or diminish their resistance to the key touch, as the case may be, such change in the resistance being secured independently of the spring mechanism, which provides for the return of the type-bars, keys, and carriage-feed parts to normal position and whereby the resistance of the finger-keys may also be adjusted when desired. The adjustment of the dip of the keys is preferably effected independently of the connections which extend from the key-levers to the type-bars.

Numerous other changes may be made in construction and arrangement without departing from the spirit of my invention. Portions of my improvements may be used without others and may be applied to machines of other general design and operation than those herein illustrated.

Certain of the features of construction shown herein are the invention of Jacob Felbel, and certain others are the invention of the aforementioned B. C. Stickney; but

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 keys and a series of type-bars connected thereto of means for varying at will the purchase or leverage of the keys

upon the type-bars, so that each type-bar may be operated with a variable key-leverage, so as to alter the touch of the key.

2. In a type-writing machine, the combination with a series of keys and a series of type-bars connected thereto of means for varying at will the purchase or leverage of all the keys upon all the type-bars simultaneously, so that each type-bar may be operated with a variable key-leverage, so as to alter the touch of the key.

3. In a type-writing machine, the combination with a series of type-bars and means for operating them, including a set of keys, of means for varying at will the purchase of the keys upon the type-bars in such a manner as to vary the depth of the key-strokes, so that each type-bar may be operated with a variable key-leverage and a variable depth of key-stroke.

4. In a type-writing machine, the combination with a system of types and independently-movable keys, of means for variably limiting the dip of all the keys simultaneously, the construction and arrangement being such that all of said types are operable by said keys at all limitations of the dip of the keys.

5. In a type-writing machine, the combination with a series of type-bars, of means, including a series of key-operated levers, for operating said type-bars, and means for varying at will the purchase of said levers upon said type-bars, so that each type-bar may be operated with a variable purchase of its lever, so as to alter the touch of the key.

6. In a type-writing machine, the combination with a type and a key operatively connected thereto, of means for adjusting the purchase or leverage of said key upon said type, so that said type may be operated by said key with a variable touch or key resistance.

7. In a type-writing machine, the combination of a series of type-bars, a series of key-bearing levers, a series of connections extending from said levers to said type-bars, and means for varying at will the purchase of said levers upon said type-bars independently of said connections, so that each type-bar may be operated with a variable purchase of its key-lever and thus the touch thereof altered.

8. In a type-writing machine, the combination with a type and a key, of means for variably limiting the dip of the key at will, said type being operable by said key at all limitations in the dip of the latter.

9. In a type-writing machine, the combination of a series of type-bars, a series of key-levers, a series of intermediate levers connected to both said key-levers and said type-bars, and means for varying at will the purchase of at least one series of said levers upon said type-bars, so that each type-bar may be operated with a variable key purchase and thus the touch of the key altered.

10. In a type-writing machine, the combination of a series of type-bars, a series of le-

vers connected thereto, and means for adjusting the bearing points or fulcrums of said levers so as to alter their purchase upon said type-bars, and enable each type-bar to be operated by its lever with a variable purchase.

11. In a front-strike writing-machine, the combination of a platen, a series of type-bars arranged forwardly thereof, a series of key-levers, a series of bell-levers directly engaging said key-levers and connected by links to said type-bars, and means for adjusting the bearing-points or fulcrums of said key-levers so as to alter their purchase upon said type-bars, and enable each type-bar to be operated by its key-lever with a variable purchase.

12. In a type-writing machine, the combination of a series of type-bars, a series of type-bar-operating levers, and an adjustable fulcrum bar or plate common to said levers, whereby the purchase of all of said levers upon said type-bars may be altered, said levers maintaining engagement with said fulcrum bar or plate at all adjustments thereof.

13. In a type-writing machine, the combination of a series of type-bars, a series of type-bar-operating levers, a movable fulcrum-bar common to said levers, and means, including a finger-piece, for effecting an adjustment of said fulcrum-bar, whereby the purchase of all of said levers upon said type-bars may be altered, said levers maintaining engagement with said fulcrum-bar at all adjustments thereof.

14. In a type-writing machine, the combination of a series of type-bars, a series of levers of the second order bearing keys at their forward ends, connections from said levers to said type-bars, a transverse fulcrum-bar arranged at the rear portions of said levers, and means for moving said fulcrum-bar so as to cause different portions of said levers to bear thereon, without changing the order of said levers.

15. In a type-writing machine, the combination of a series of type-bars, a series of levers having keys at their forward ends and connected to the type-bars, a transverse fulcrum-bar arranged over the rear ends of the levers, means for causing said levers to bear up against said fulcrum-bar, and means for adjusting said fulcrum-bar and maintaining its contact with said levers, whereby the leverage is altered.

16. In a type-writing machine, the combination of a platen, a series of type-bars arranged forwardly thereof, a series of levers extending beneath the type-bars and platen and having keys at their forward ends, a series of intermediate bell-levers connected to both the type-bars and the key-levers, a transverse fulcrum-bar arranged over the rear ends of the key-levers, means for causing said key-levers to bear up against said fulcrum-bar, and means for adjusting said fulcrum-bar so as to vary the fulcrums of said levers upon said bar.

17. In a type-writing machine, the combi-

nation of a series of type-bars, a series of levers connected thereto, means for adjusting the bearing-points or fulcrums of said levers so as to alter their purchase upon said type-bars and enable each type-bar to be operated with a changeable leverage, and means for preventing endwise displacement of said levers.

18. In a type-writing machine, the combination of a series of type-bars, a series of notched levers connected thereto, means for adjusting the bearing-points or fulcrums of said levers so as to alter their purchase upon said type-bars and enable each type-bar to be operated with a changeable leverage, and a relatively-fixed transverse bar engaging the notches in the levers so as to prevent endwise displacement of the latter.

19. In a type-writing machine, the combination of a type, a key so connected thereto that the purchase of the key upon the type decreases automatically during the printing stroke of the key, and means for adjusting the purchase of the key upon the type, so that the dip of the key is altered.

20. In a type-writing machine, the combination of a series of type-bars, a series of keys so connected thereto that the purchase of each key upon its type-bar decreases automatically during the stroke of the key, and means for adjusting the purchase of the keys upon the type-bars, so that the dip of the keys is altered.

21. In a type-writing machine, the combination of a type-bar, a lever connected thereto, means for automatically changing a working point of at least one of said parts so as to decrease the purchase of said lever upon said type-bar during the printing stroke of said lever, a key for said lever, and means for adjusting the relation of the key to the type-bar so as to alter the purchase of the key upon the type-bar and thereby change the dip of the key.

22. In a type-writing machine, the combination of a type-bar, a lever, a device connecting said lever to said type-bar, at least one of said three elements being constructed to have a leverage-changing rolling movement, so as to decrease the purchase of said lever upon said type-bar during the printing stroke of said lever, a key connected to said lever, and means for adjusting the relation of the key to the type-bar so as to alter the purchase of the key upon the type-bar and thereby change the dip of the key.

23. In a type-writing machine, the combination with a type-carrier of an operating-lever therefor, means for causing a working point of said lever to shift during the operation of the lever to move the type-carrier from normal position to the printing-point, so that the purchase of said lever upon said type-carrier decreases during its printing stroke, and means for adjusting the relationship of said lever to said type-carrier in such a manner as to alter the purchase of said lever upon

said type-bar and thereby change the extent of the lever stroke.

24. In a type-writing machine, the combination with a type-carrier of an operating-lever therefor, a fulcrum-surface along which said lever is adapted to roll, so that the purchase of said lever upon said type-carrier diminishes during the operation of the lever, and means for adjusting said fulcrum-surface.

25. In a type-writing machine, the combination with a type-carrier of an operating-lever therefor having a curved tread, a fixed straight fulcrum-surface along which said lever is adapted to roll, so that the purchase of said lever upon said type-carrier diminishes during the operation of the lever, and means for adjusting said fulcrum-surface.

26. In a type-writing machine, the combination of a type-carrier, a lever, connecting devices extending from said type-carrier to said lever at a point between its ends, operating means at one end of said lever, and an adjustable fulcrum-surface along which the other end of the lever has a leverage-changing rolling movement.

27. In a type-writing machine, the combination of a type-carrier, a lever provided at one end with a key, an adjustable fulcrum-surface arranged over the other end of the lever and along which the upper edge of the lever has a leverage-changing rolling movement, and connecting devices extending from a point between the ends of said lever to said type-carrier.

28. In a type-writing machine, the combination with a series of type-bars of a series of operating-levers therefor and an adjustable fulcrum-plate along which all of said levers have leverage-changing rolling movements.

29. In a type-writing machine, the combination with a series of type-bars of a series of operating-levers therefor each having a curved tread, and an adjustable fulcrum-plate having a plane surface along which all of said levers have leverage-changing rolling movements.

30. In a type-writing machine, the combination of a type-carrier, a key-lever, a sub-lever connected to said key-lever and also to said type-carrier, means for causing one of said key-lever and sublever elements to work with a varying fulcrum, so that the purchase of the key upon the type-carrier decreases during the printing stroke of the key, and means arranged at said fulcrum for adjusting the leverage of the key upon the type-bar and thereby changing the dip of the key.

31. In a type-writing machine, the combination of a series of type-bars, a series of levers of the second order provided at their forward ends with keys, a sublever pivoted upon each of said key-levers and provided with a connection to the corresponding type-bar, means for causing one of said key-lever and sublever elements to work with a varying fulcrum, so that the purchase of the key upon

the type-bar decreases during the printing stroke, and means arranged at said fulcrum for adjusting the leverage of the key upon the type-bar and thereby changing the dip of the key.

32. In a type-writing machine, the combination of a series of type-bars, a series of levers, each provided with a key at its forward end, an adjustable fulcrum-plate arranged over the rear ends of said levers and along the under surface of which said levers have leverage-changing rolling movements, and a sublever pivoted to each of said levers and connected to the corresponding type-bar.

33. In a type-writing machine, the combination with a type-carrier of an operating-lever therefor, an adjustable fulcrum-plate along which said lever has a leverage-changing rolling movement such that the purchase of said lever upon said type-carrier diminishes during the operation of the lever, and means for preventing endwise displacement of the lever.

34. In a type-writing machine, the combination with a series of type-bars and a series of operating-keys of a series of leverage-changing connections between said keys and said type-bars, each of said connections being constructed to diminish the leverage of its key upon its type-bar slowly during the first part of the key-stroke, and rapidly during the remainder of the key-stroke, so that the first portion of the impulse communicated from the key to the type-bar occurs when the leverage is greatest, and so that thereafter the leverage diminishes at first slowly, then more rapidly, until the point of least leverage is gained, at which point the last portion of the impulse is communicated from the key to the type-bar, and means for adjusting the leverage of the keys upon the type-bars and thereby altering the dip of the keys.

35. In a type-writing machine, the combination with a type-carrier of an operating-lever therefor, means for causing the fulcrum-point of said lever to shift slowly during the first part of the operation of the lever, and rapidly during the latter part of the operation of the lever to move the type-carrier from normal position to the printing-point, so that the purchase of said lever upon said type-carrier diminishes slowly during the first portion of the stroke and rapidly during the remainder of the stroke, and means arranged at said fulcrum for adjusting the purchase of said lever upon said type-bar so as to change the extent of stroke of said lever.

36. In a type-writing machine, the combination with a type-carrier, of an unpivoted key-lever connected thereto and having a free elongated fulcrum end, and an elongated adjustable fulcrum for said free end of the key-lever.

37. In a front-strike type-writing machine, the combination of a series of type-bars pivoted at their rear ends, a horizontally-arranged link pivoted to each type-bar, a bell-

crank lever to which the other end of said link is pivoted, an unpivoted horizontally-arranged key-lever to which said bell-crank lever is pivoted, an adjustable fulcrum-plate arranged transversely over the rear ends of said key-levers and along the under surface of which said key-levers are adapted to roll, and a common fulcrum-rod for said bell-crank levers.

38. In a type-writing machine, the combination with a series of type-bar-operating levers having elongated treads of a fulcrum-plate, supports for the ends of said plate, and means for adjusting said plate upon said supports.

39. In a type-writing machine, the combination with a series of type-bar-operating levers having curved elongated treads of a fulcrum-plate, supports for the ends of said plate, said supports being formed to coincide with the treads of said levers, and means for tipping said plate upon said supports.

40. In a type-writing machine, the combination with a series of type-bar-operating levers having elongated treads of fulcrum-plate 38, support 60, and spring device 66.

41. In a type-writing machine, the combination with a series of type-bar-operating levers having elongated treads of fulcrum-plate 38, supporting-bars 60 for the ends of said plate, and springs 66 arranged one at or near each end of the plate, for holding said plate against said bars 60.

42. In a type-writing machine, the combination with a series of type-operating levers having elongated treads of plate 38, supports 60, and thumb-screw 62.

43. In a type-writing machine, the combination with a series of type-operating levers having elongated treads of plate 38, supports 60, springs 66, and thumb-screw 62.

44. In a type-writing machine, the combination of a series of types, a series of keys, leverage-changing connections between said type-bars and said keys, whereby the leverage of the keys upon the types decreases automatically during the printing strokes of the keys, adjustable spring mechanism for regulating the tension upon the keys, and means for adjusting the leverage of the keys upon the types and thereby changing the dip of the keys.

45. In a type-writing machine, the combination of a type, a key, and means, including an adjustable screw, for altering the dip of the key at will, said type being operable by said key at all variations in the dip of the latter which may be caused by the adjustment of said screw.

46. In a type-writing machine, the combination of a series of types, a series of operating-levers, each of said levers being constructed to bear at successive points during its operation, a common fulcrum bar or plate for said levers, and means for adjusting said fulcrum bar or plate so as to vary at will the extent of the lever strokes, the types being operable by said levers at all variations in the adjustment of said fulcrum bar or plate.

47. In a type-writing machine, the combination with a series of types of a series of operating-levers, each of said levers being constructed to bear at successive points during its operation, an adjustable fulcrum bar or plate common to said levers, and an adjusting-screw for said bar or plate.

48. In a type-writing machine, the combination of a series of types, a series of operating-levers, each of said levers being constructed to bear at successive points during its operation, an adjustable fulcrum bar or plate common to said levers, a spring for said bar or plate, and an adjusting-screw for said bar or plate.

49. In a type-writing machine, the combination of a key-controlled type-bar, and means for adjusting the leverage of the key upon the type-bar so that the same type-bar may be operated by the same key with a varying touch or key resistance.

50. In a type-writing machine, a type-bar adapted to be operated by a key-lever under varying conditions of leverage, and means for adjusting the leverage of said key-lever upon said type-bar.

Signed at the borough of Manhattan, city of New York, in the county of New York and State of New York, this 15th day of August, A. D. 1900.

CARL GABRIELSON.

Witnesses:

E. M. WELLS,
WM. E. COOK.