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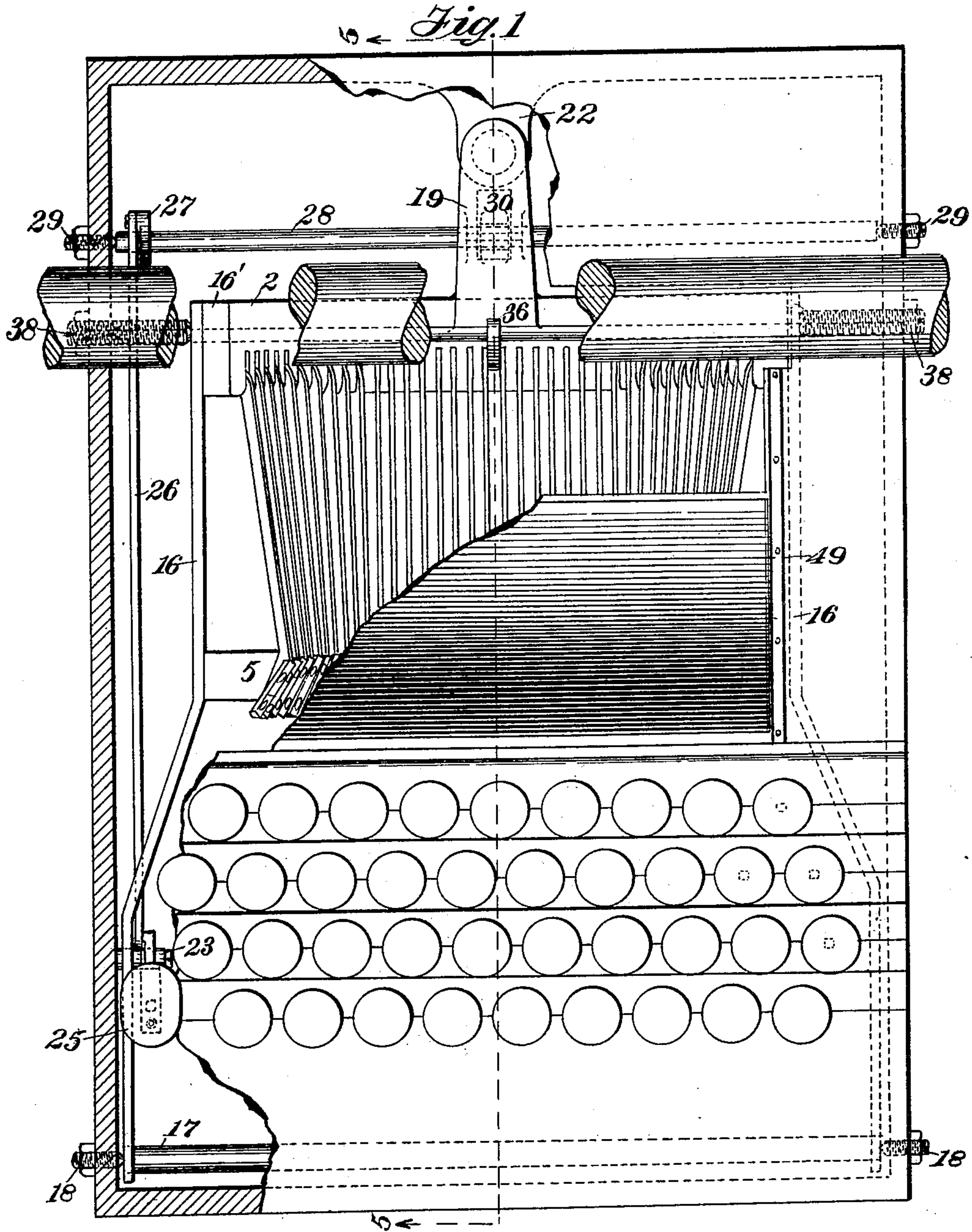
Patented May 20, 1902.

E. B. HESS.
WRITING MACHINE.

(Application filed Apr. 26, 1901.)

(No Model.)

3 Sheets—Sheet 1.



Witnesses
E. A. Buech.
A. M. Perkins.

Edward B. Hess Inventor
By *his Attorneys*
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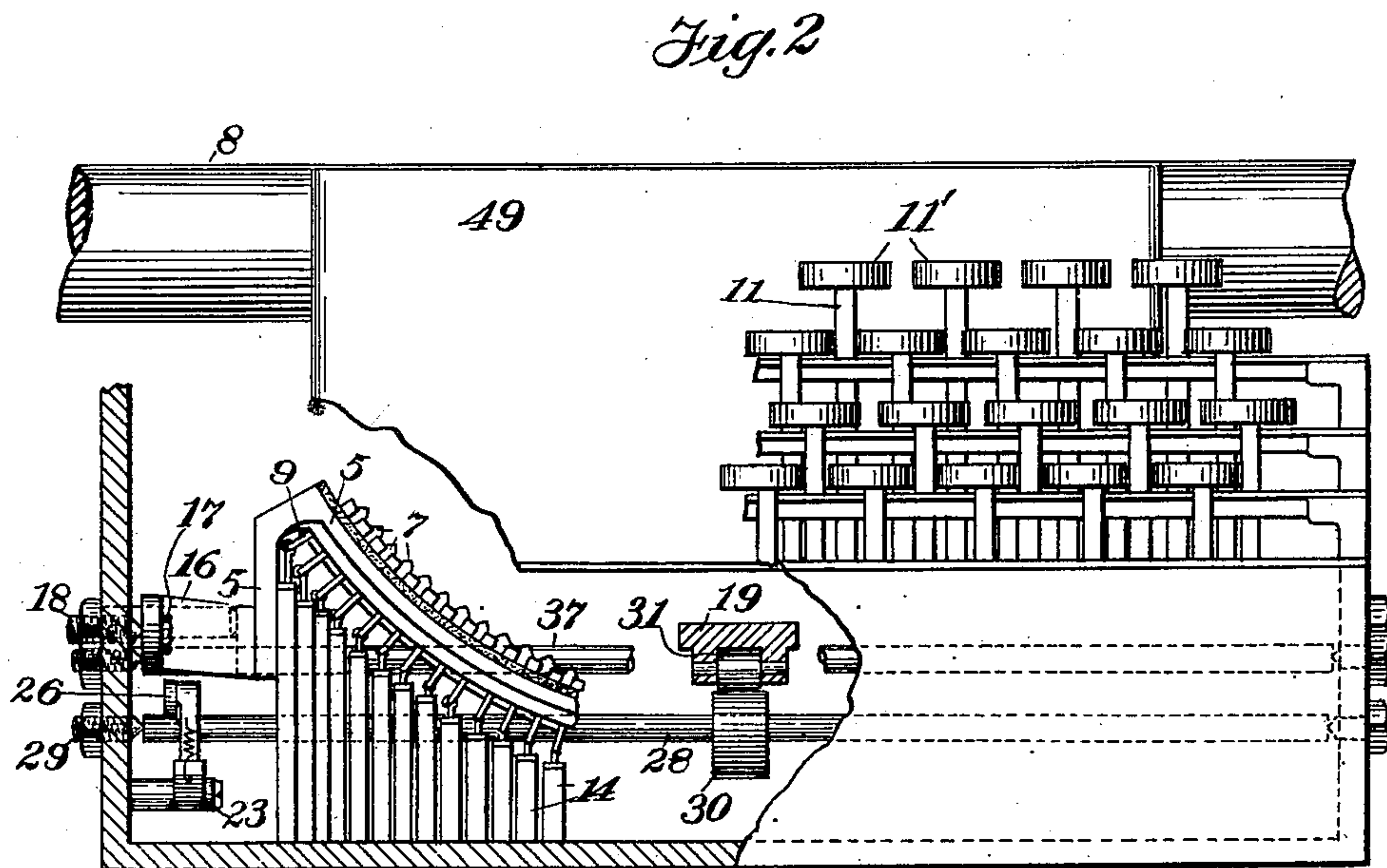
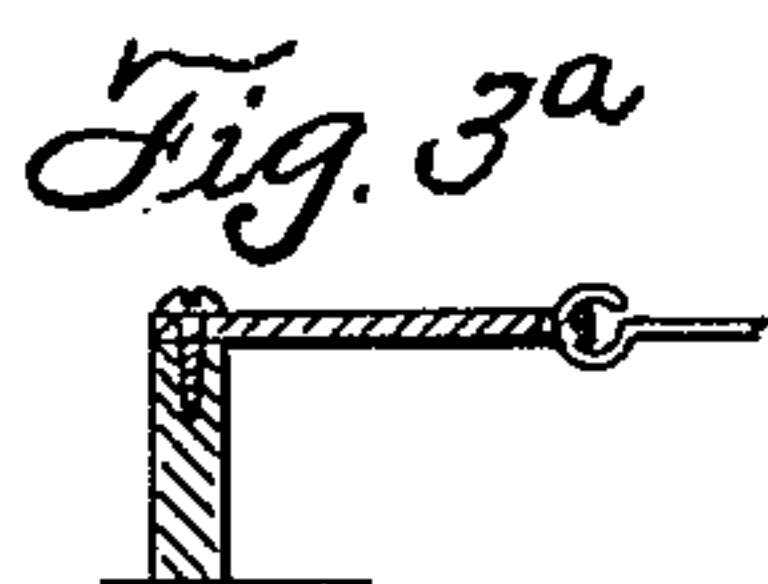
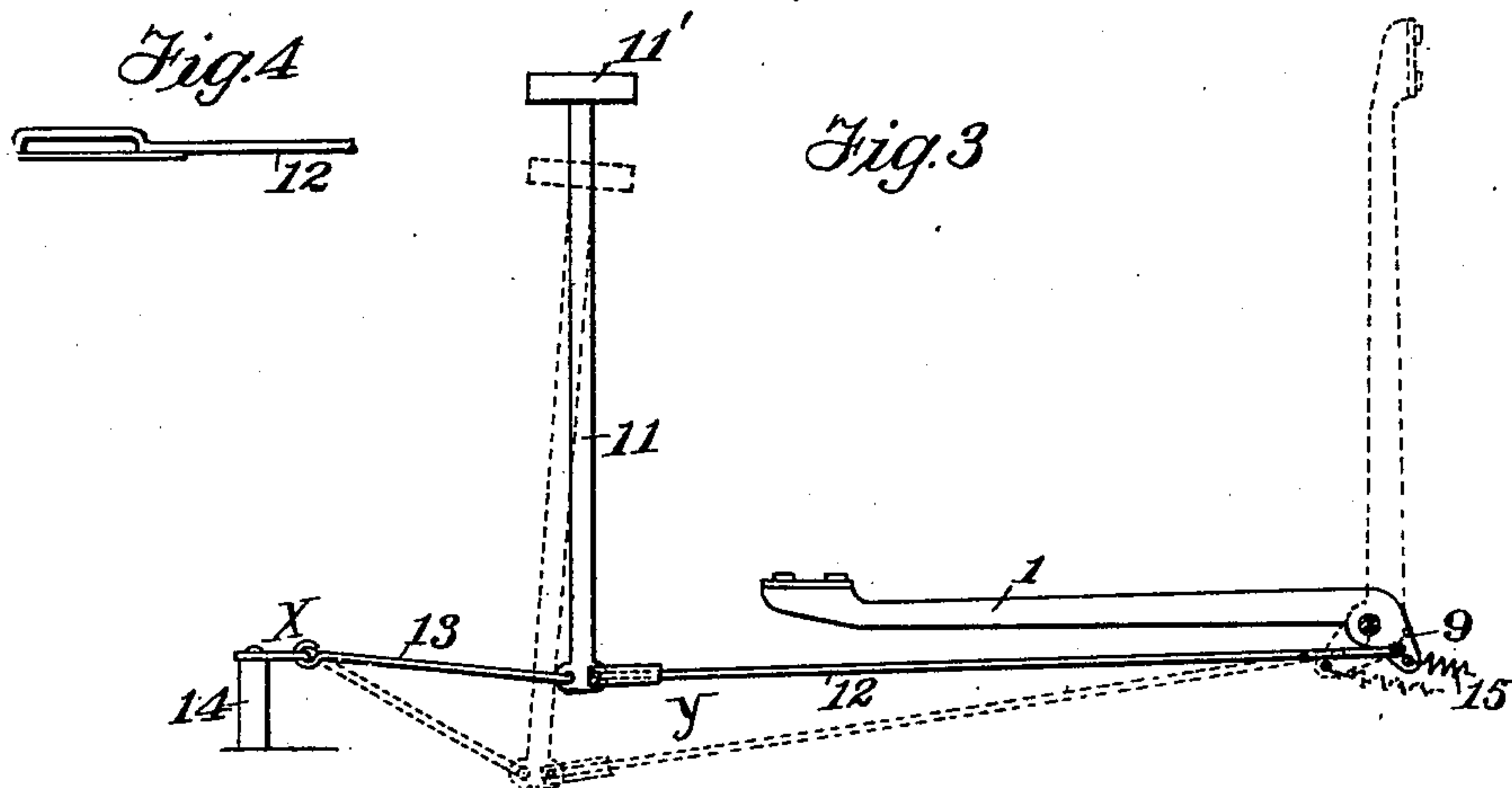
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3 Sheets—Sheet 2.



Witnesses
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3 Sheets—Sheet 3

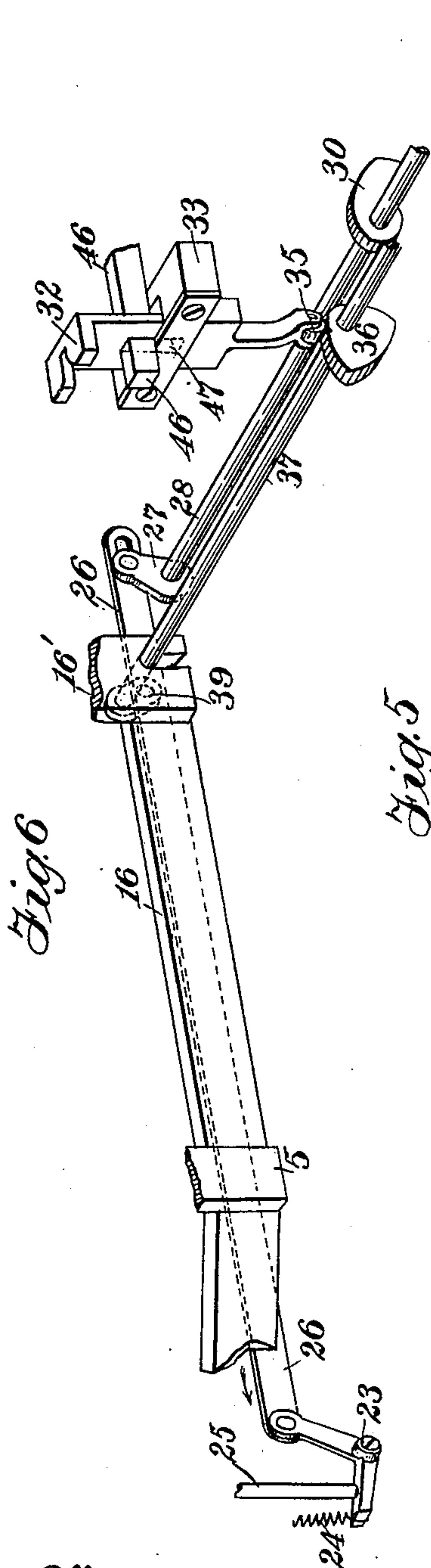
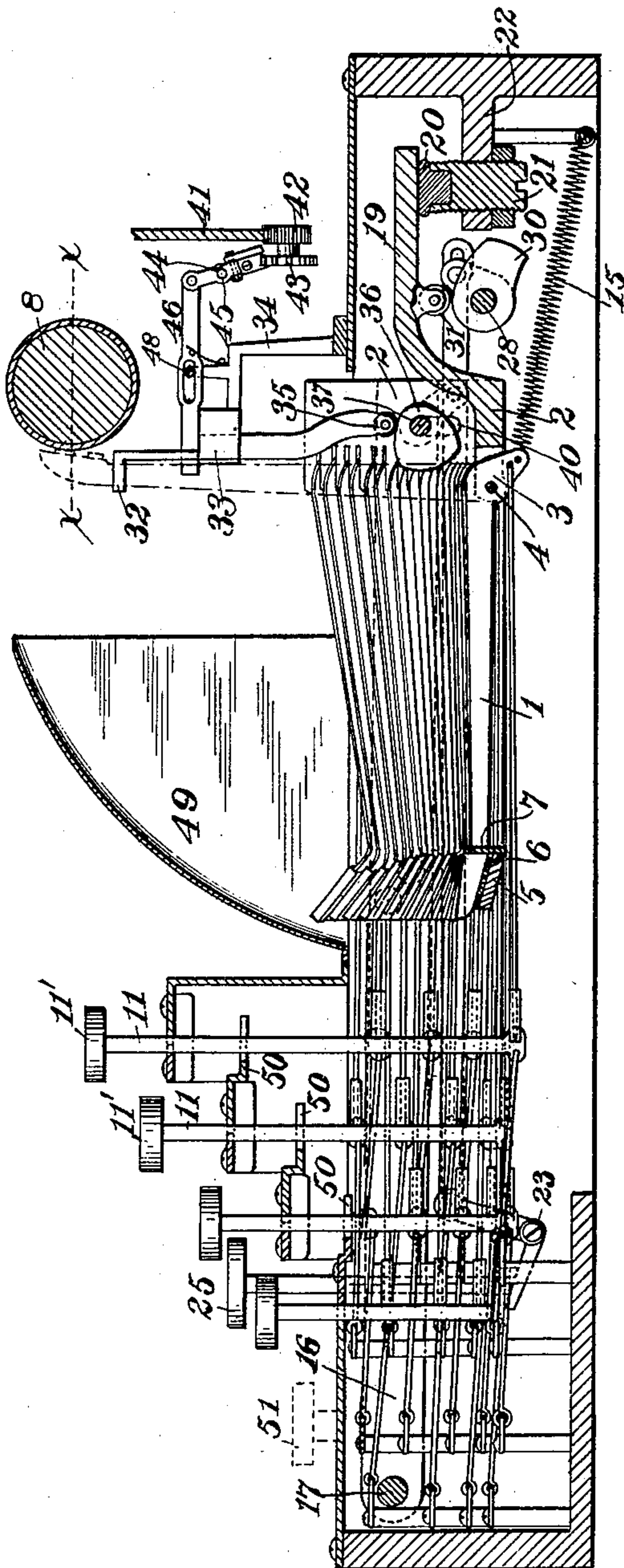


Fig. 6

Fig. 5



Witnesses

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UNITED STATES PATENT OFFICE.

EDWARD B. HESS, OF BROOKLYN, NEW YORK, ASSIGNOR TO MECHANICAL IMPROVEMENTS COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

WRITING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 700,687, dated May 20, 1902.

Application filed April 26, 1901. Serial No. 57,588. (No model.)

To all whom it may concern:

Be it known that I, EDWARD B. HESS, a citizen of the United States, residing in the borough of Brooklyn, city of New York, State of New York, have invented certain new and useful Improvements in Writing-Machines, of which the following is a specification.

This invention relates to improved organizations for actuating type bars or carriers.

10 The invention is shown as applied to a front-stroke machine or one in which the printing-point is substantially in the horizontal plane of the axis of the platen and to a machine in which the type-bar support is shifted.

15 In the accompanying drawings, Figure 1 is a plan view, partly broken away, of so much of a type-writing machine as is necessary or desirable to illustrate the invention; Fig. 2, a front elevation, partly broken away and in which duplication of parts has been avoided for the sake of clearness; Fig. 3, a detached view showing the type-bar movement; Fig. 3^a, a sectional view of the left-hand end of Fig. 3; Fig. 4, a detail of one of the members of the type-bar-actuating devices; Fig. 5, a longitudinal vertical section on the line 5 5 of Fig. 1; Fig. 6, a detail perspective view showing in part devices by which the type-bar guide and the support in which the type-bars are mounted are shifted.

30 The type-bars 1 are respectively pivoted in a support 2, which is segmental in shape and has projecting toward the keyboard a series of teeth 3, between which the type-bars are mounted, and the entire series of type-bars may be pivoted upon a single curved pivot-rod 4, passing through apertures in the teeth 3 and through the bearing-apertures in the type-bars. In the particular construction shown, as will be seen by reference to Fig. 5, the support 2 is so placed that its center line or axis, assuming it to be a segment of a true circle, is horizontal. The type-bars normally extend toward the front of the machine in substantially horizontal positions and rest at their ends upon a segmental support 5, having a yielding or buffer facing 6 and an upright flange 7 at the side toward the pivots of the type-bars, which is slotted to receive the several bars as they return to normal posi-

tion. The platen 8 is shown as mounted substantially over the segmental support 2, but might be, of course, somewhat otherwise disposed, and preferably the center of the printing-point is slightly above the horizontal plane in which the axis of the platen lies and which is indicated by the dotted line $x x$ in Fig. 5 to reduce or avoid foreshortening of the printed character as viewed by the operator, the point of view being considerably above the plane of the platen. Each type-bar has a projection or extension 9 beyond its pivot, extending downwardly and rearwardly. From each such projection a flexing connection extends to a fixed point at or near the front of the machine. When power is applied to this connection intermediate its ends, its flexure exerts a pull on the part 9 that throws the type-bar to the printing-point. A feature of this construction is that the initial movement of a finger-piece acting through any suitable device or mechanism to depress the flexing connection is opposed by a minimum resistance to its actuation, as by the finger of an operator, the type-bar moving relatively slowly as its inertia is overcome and it is put into motion. Continued depression or deflection of the connection imparts an increasing velocity to the type-bar, and correspondingly a gradually-increasing resistance is opposed to the deflection of the connection. These conditions are advantageous, as will be understood by those skilled in the art. The return of the type-bars is effected in the construction shown substantially by the rebound after impact against the platen and by gravity, although I prefer to employ spring reaction to properly seat the bars against their back cushion-stop 5 6 and maintain all parts in normal position. I therefore have shown a spring 15 applied to the projection 9 of each type-bar.

The part 9 of the type-bar is connected by a universal joint to the rear end of a flexing connection Y, the front end of which is connected by a universal joint with a fixed piece or part X of the frame. The connection Y might normally lie in a true horizontal line. It is, however, shown as slightly depressed below such a line. The reason for that pre-

ferred arrangement in the particular construction shown is hereinafter stated. In Fig. 3 the lower end of the finger-key or stem 11 is shown as forming a part of the flexing connection Y; but that is not essential, as the end of the finger-key might be caused merely to operate directly or indirectly upon the connection to deflect it, while not forming a part of it. A link 12 extends from the type-bar projection 9 to the end of the finger-key or stem and a shorter link from the end of the finger-key to the fixed point X. The connection between the ends of the two links is a universal joint or one capable of flexure in all directions. The fixed piece or anchor-point is arrived at in the construction shown by connecting the link 13 with a plate or lateral projection on the vertical end of a post 14 on the bed-plate. When the finger-piece 11' is depressed, the operation before described occurs, the type-bar being thrown to the printing-point, as indicated by the dotted lines in Figs. 3 and 5. 15 is a spring to perform the function hereinbefore mentioned, which is in the construction shown applied to the projection 9 of the type-bar, its other end being suitably connected to a point at the rear of the machine. As appears from the dotted lines on Fig. 3, there will be with this construction a slight deflection of the stem of the finger-key. This, however, will not be noticeable as a serious imperfection in operation. For convenience in assembling the link 13 is formed with a hook-eye which engages an aperture in the plate or lateral projection on the post 14, a similar connection being made between the other end of the link and the end of the key-stem and also between one end of the link 12 and the projection 9 on the type-bar. The opposite end of the link 12 may be formed with a snap-hook (shown in Fig. 4) for making the connection between it and the stem of the finger-piece. These details are of course immaterial.

It will be observed that the flexing connections running from the type-bars are arranged as a whole in a concave or trough-like form and diverge toward the front of the machine; also, that the posts or fixed points to which they are connected are arranged in four sets, each set being in a concave or curved transverse line and the sets being arranged at different distances from the platen. The flexing connections, therefore, are not of uniform length; but their front links or the distances between their fixed points and the points at which power is applied to actuate them are uniform, since the excursions of the type-bars from the position of rest to the printing-point are of uniform extent. This arrangement is for the purpose of adapting the connections to the keyboard, there being four parallel rows of finger-pieces. The various finger-key stems 11 pass loosely through apertures in the stepped plates forming the frame of the keyboard, so as to accommodate themselves to the movement already described,

and the longer stems may also be guided, as shown in Fig. 5, in slots formed in the plates 50.

The type-bar carrier 2 is shown as the rear cross-bar of a rocking frame whose side pieces are marked 16 and of which the back stop-frame 5 is an intermediate cross-bar and the bar or shaft 17 the front cross-bar. The bearings for this frame are the bearing-screws 18, located at or toward the front of the machine, while the rear end of the frame is supported in the normal position by a projection 19, extending rearwardly from the type-bar support 2 and resting upon a cushion block or buffer 20, seated in the end of a screw-bolt 21, that is vertically adjustable in a threaded socket in a projection 22, extending from the back of the frame of the machine. When the rocking frame is shifted vertically, it rocks upon the axis 18 18. The power of the shifting device is preferably applied at or near the rear end of the rocking frame. The long frame having its axis of motion near the front of the machine and the application of power to lift it at or near its rear end enables the shift to be made with a minimum exertion of power, while the movement is smooth and accurate and is characterized by an absence of shock or vibration. A horizontal plane passing through the axis 18 18 is midway, or substantially so, between horizontal planes bounding, respectively, the lowest point of the curve in which the type-bars are pivoted and its upper ends, and therefore the arc in which the type-bar support moves upwardly produces a minimum variation in the relation of the type-bars to the printing-point, and since the radius of motion may be relatively long the variation is one that is not noticeable either in operating the machine or in the printing done by it. The frame may be shifted, of course, in a variety of ways. Many such will occur to the skilled mechanic. That which I have shown is deemed by me to have special advantages and is as follows: At the left side of the machine near the front is pivoted a bell-crank lever 23, one arm of which is substantially horizontal and projects toward the front of the machine, being normally held up by a suitable spring 24. The stem of the shift-key 25 or other actuating device is applied to this arm of the lever. The other arm, which extends upwardly, is pivoted to an endwise-moving rod 26, having a slot in its rear end, in which lies the wrist-pin of a crank 27, fast on a rock-shaft 28, pivoted upon supporting-screws 29 in the sides of the frame. This shaft lies below the part 19 of the vertically-rocking frame and carries a cam 30, working against a roller 31 in a bracket on the under face of the part 19. When the shift-key is depressed, the rod 26 is moved endwise, as shown by the arrow, Fig. 6. During the first part of the movement of the bar the crank 27 is not actuated; but when the wrist-pin of the crank comes against the rear wall of the slot the shaft is

rocked, the cam 30 turned upwardly, and the frame carrying the type-bar support elevated. The movement is graduated and uniform and without shock or jar.

5 In machines of this character it is desirable to employ a guide located adjacent the printing-point on the platen to receive the type-bars and so direct them as to bring the characters thereon accurately to the printing-
10 point. Such a guide 32 is shown in Figs. 1 and 2. It is in the construction shown mounted to slide vertically in a block 33, which may be supported by a bracket 34 or in any other appropriate manner. In the lower end of the
15 guide is a roll 35, resting on a cam 36 on a rock-shaft 37. This shaft is supported by bearing-screws 38 38, extending through the sides of the frame. On one end of the shaft is a crank 39, (shown in dotted lines, Fig. 6,) whose wrist-pin fits in an aperture in the end-
20 wise-movable rod 26. The shaft 37 lies in slots formed in the rear ends of the frame-bars 16 and in the lower ends of the plates 16', attached, respectively, to such frame-
25 bars and above them to the ends of the segmental type-bar support 2 and also extends through slots 40 in that support. When the shift-key 25 is depressed, the rod 26 in the first part of its movement, through the me-
30 dium of the crank 39, rocks the shaft 37, and the cam 36 raises the guide to its proper position. Then the crank 27 is actuated by the rod 26 to elevate the frame carrying the type-bar support. The relation of the guide to
35 the type-bars is therefore the same in either position of the type-bar support, and the work of the two operations described is apportioned to different stages in the depression of the shift-key, thereby causing it to oppose
40 an approximately uniform resistance to depression and reducing such resistance as against what it would be if both of the described operations were performed conjointly during any or all stages of depression of the
45 key.

In Fig. 5, 41 is the carriage rack-bar, 42 the pinion engaging it, 43 the wheel-escapement, and 44 the latch or pawl engaging the escape-
50 ment-wheel. This pawl is pivoted at 45 and its free end is pivotally connected to a rod 46, normally urged toward the front of the machine by a spring, as shown, and passing through a slot 47 in the vertically-movable type-bar guide 32. The bar 46 may also be
55 guided and held by a pin 48, working in a slot therein and mounted between ears or projections on the upper part of the bracket 34. All these parts are to be appropriately mounted to perform their proper functions,
60 and I have deemed it unnecessary to encumber the drawings with detailed illustration. They may be arranged substantially as shown or in any appropriate way. The end of the bar 46 projecting in front of the type-bar
65 guide occupies such position that a type-bar approaching the printing-point on the platen will strike it and move it rearwardly, thereby

actuating the pawl 44 and permitting the escapement-wheel to move one tooth. The parts are so arranged and the movement so
70 timed that an impression from a character on a type-bar is completed and the character moved out of contact with the paper before the platen is permitted to move one step to the left, as is well understood. In this ma-
75 chine the endwise-movable escapement-actuating bar 46 is, in effect, a universal bar. I have merely illustrated the arrangement of universal bar in that way as one form that may be used. Any suitable mechanism, how-
80 ever, for effecting the feed of the carriage in the usual way or in accordance with the usual practice may be adopted in this machine.

I prefer to place a curved hood or shield 49 in front of and so as to inclose as much as
85 possible the type-bars both when at rest and when in action, thereby relieving the eyes of the operator from strain due to viewing their rapid movement.

51 indicates a space key or bar. The spac-
90 ing may be effected by any suitable mechanism. For instance, a bar 1 without a type-carrying head may be mounted in the support 2 and actuated from the space key or bar in the same way the other bars are, or
95 any usual connecting mechanism may be interposed between the space-key and carriage-feed pawl 44. It is apparent that the rocking frame construction is applicable to the shifting of the platen where the type-bar sup-
100 port is stationary or where both such members shift, machines of both the styles indicated being known in the prior art.

Any appropriate construction of carriage and ribbon mechanism may be employed, in-
105 cluding the usual or necessary adjuncts thereto. Such matters form no part of this invention, and as there are many forms of mechanism that may be used it is not deemed essential to illustrate these features.
110

In type-writing machines of the general style herein shown a serious problem is to secure a proper touch of the finger-pieces that operate the type-bars at or near the ends. In the construction herein described the push-
115 pin finger-pieces in the keyboard have a substantially uniform touch, primarily due to the universal-joint connections between the flexing connections and their type-bars, by reason of which the type-bars at the ends of the
120 segments can be thrown to the printing-point without opposing more, or noticeably more, resistance at the finger-pieces than is observable at the finger-piece which operates the type-bar at the middle of the segment. This
125 refinement of touch of the finger-pieces actuating the end bars is assisted by the universal-joint connections between the two links composing a flexing connection, and also, to a less extent, by the universal-joint connec-
130 tion with the frame of the front end of the front link. By providing front links of uniform length, pivoting them in series in transverse lines at different distances from the

platen, a uniform depth of depression of the finger-pieces is obtainable not only in the particular construction shown, wherein finger-pieces and vertical stems or push-pins are employed, but in other styles of construction well known in the art. By arranging the flexing connections in a trough-like formation I can not only maintain them in straight lines from the type-bars to the fixed pieces, or substantially so, but can also arrange them in horizontal lines. These conditions are in my judgment most favorable, particularly where the type-bar segment is made to shift relatively to the platen. If the front ends of the flexing connections were pivoted in a horizontal line or lines, each flexing connection might, it is true, be made to extend in a straight line from its type-bar to its fixed piece at the front; but the several flexing connections would of course not be horizontally disposed or even approximately parallel. If under these conditions the front links were maintained horizontal, then the rear links would necessarily extend in different directions up and down to meet the type-bars at different points in the height of the segment. This arrangement would not possess that feature of the invention which requires, as stated in some of the claims, that the initial movement of a finger-piece should be opposed by the least obtainable resistance. Experience has demonstrated that the arrangement of each flexing connection and the spring of the corresponding type-bar in the same general line or direction affords a favorable condition of operation that constitutes a material improvement in the behavior of the machine. If a flexing connection extends in an absolutely straight line between its type-bar and fixed piece, there would be a slight lost motion due to the looseness of joints, so that the initial movement of the finger-piece, although exceedingly light, would not immediately start the type-bar into motion. For this reason I prefer that the joint or point of flexure should be dropped sufficiently far below a straight line to compensate this lost motion and make every part of the depression of the finger-piece count in the movement of the type-bar.

The subjects-matter of the several claims herein comprise special features of construction which are not disclosed in another application of mine, filed August 27, 1901, Serial No. 73,460, which does, however, show a flexing connection of the general character herein described operated by a key-lever and organized in a front stroke writing-machine. The features referred to may be briefly indicated as follows: The flexing connections are of unequal length and the fixed points to which their front ends are attached are arranged in different transverse lines at different distances from the platen. The means for flexing the connections operate from above. The finger-pieces are arranged in transverse rows over the flexing connections and have

stems by means of which their operation is communicated to the flexing connections. The front links of the several connections are of substantially equal length; but their front ends are connected in transverse lines at different distances from the platen. The substantially straight-line arrangement of the flexing connections, each composed of two links hinged together, is combined with a means acting from above directly upon the hinged joint. These special features of construction not being shown in my said application No. 73,460 cannot be made elements of claims therein. I do not, therefore, waive the right to claim in the said application No. 73,460 such flexing connections in terms other than in the claims herein, nor the right to claim them in terms more generic than herein employed, nor the right to claim such flexing connections in combination with a key-lever and in combination with the elemental parts of a front-stroke writing-machine.

No claim is made herein to the mechanism for shifting the type-bar guide and type-bar support or segment, such subject-matter being shown and claimed in my Patent No. 681,638, dated August 27, 1901, issued upon an application filed as a division of this application.

I claim as my invention—

1. In a writing-machine, the combination of a platen, a segmental type-bar support arranged in a plane below the platen, type-bars pivoted therein and normally lying toward the front of the machine, flexing connections hinged at their rear ends to the type-bars and at their front ends hinged to the frame in lines lying in different transverse vertical planes, the flexing connections being divided into series of unequal lengths and means acting upon the flexing connections intermediate their ends for flexing them to pull the type-bars to the printing-point with an increasing velocity.

2. In a writing-machine, the combination of a platen, a segmental type-bar support arranged in a plane below the platen, type-bars pivoted therein and normally lying toward the front of the machine, flexing connections connected at their rear ends to the type-bars by universal joints and at their front ends hinged to the frame in lines lying in different transverse vertical planes, the flexing connections being divided into series of unequal lengths and means acting upon the flexing connections intermediate their ends for flexing them to pull the type-bars to the printing-point with an increasing velocity.

3. In a writing-machine, the combination of a platen, a segmental type-bar support arranged in a plane below the platen, type-bars pivoted therein and normally lying toward the front of the machine, flexing connections each composed of two links arranged end to end and united by a universal joint and hinged at their rear ends to the type-bars and at their front ends hinged to the frame in lines lying

in different transverse vertical planes, the flexing connections being divided into series of unequal lengths, and means acting upon the flexing connections intermediate their ends for flexing them to pull the type-bars to the printing-point with an increasing velocity.

4. In a writing-machine, the combination of a platen, a segmental type-bar support arranged in a plane below the platen, type-bars pivoted therein and normally lying toward the front of the machine, flexing connections each composed of two links arranged end to end and united by a universal joint and connected at their rear ends to the type-bars by universal joints and at their front ends hinged to the frame in lines lying in different transverse vertical planes, the flexing connections being divided into series of unequal lengths, and means for acting upon the flexing connections intermediate their ends flexing them to pull the type-bars to the printing-point with an increasing velocity.

5. In a writing-machine, the combination of a platen, a segmental type-bar support arranged in a plane below the platen, type-bars pivoted therein and normally lying toward the front of the machine, flexing connections each composed of two links arranged end to end and united by a universal joint and connected at their rear ends to the type-bars by universal joints and connected at their front ends to the frame by universal joints in lines lying in different transverse vertical planes, the flexing connections being divided into series of unequal lengths, and means for flexing them to pull the type-bars to the printing-point with an increasing velocity.

6. In a writing-machine, the combination of a platen, a segmental type-bar support arranged in a plane below the platen, type-bars pivoted therein and normally lying toward the front of the machine, flexing connections hinged at their rear ends to the type-bars and at their front ends hinged to the frame in lines lying in different transverse vertical planes, the flexing connections being divided into series of unequal lengths, finger-pieces arranged in transverse rows above the flexing connections and connections between the finger-pieces and the flexing connections intermediate the ends of the latter to flex them downwardly on the depression of the finger-pieces and thereby pull the type-bars to the printing-point with an increasing velocity.

7. In a writing-machine, the combination of a platen, a segmental type-bar support arranged in a plane below the platen, type-bars pivoted therein and normally lying toward the front of the machine, flexing connections connected at their rear ends to the type-bars by universal joints and at their front ends hinged to the frame in lines lying in different transverse vertical planes, the flexing connections being divided into series of unequal lengths, finger-pieces arranged in transverse rows above the flexing connections and connections between the finger-pieces and the flexing con-

nections intermediate the ends of the latter to flex them downwardly on the depression of the finger-pieces and thereby pull the type-bars to the printing-point with an increasing velocity.

8. In a writing-machine, the combination of a platen, a segmental type-bar support arranged in a plane below the platen, type-bars pivoted therein and normally lying toward the front of the machine, flexing connections each composed of two links arranged end to end and united by a universal joint and hinged at their rear ends to the type-bars and at their front ends hinged to the frame in lines lying in different transverse vertical planes, the flexing connections being divided into series of unequal lengths, finger-pieces arranged in transverse rows above the flexing connections and connections between the finger-pieces and the flexing connections intermediate the ends of the latter to flex them downwardly on the depression of the finger-pieces and thereby pull the type-bars to the printing-point with an increasing velocity.

9. In a writing-machine, the combination of a platen, a segmental type-bar support arranged in a plane below the platen, type-bars pivoted therein and normally lying toward the front of the machine, flexing connections each composed of two links arranged end to end and united by a universal joint and connected at their rear ends to the type-bars by universal joints and at their front ends hinged to the frame in lines lying in different transverse vertical planes, the flexing connections being divided into series of unequal lengths, finger-pieces arranged in transverse rows above the flexing connections and connections between the finger-pieces and the flexing connections intermediate the ends of the latter to flex them downwardly on the depression of the finger-pieces and thereby pull the type-bars to the printing-point with an increasing velocity.

10. In a writing-machine, the combination of a platen, a segmental type-bar support arranged in a plane below the platen, type-bars pivoted therein and normally lying toward the front of the machine, flexing connections each composed of two links arranged end to end and united by a universal joint and connected at their rear ends to the type-bars by universal joints and connected at their front ends to the frame by universal joints in lines lying in different transverse vertical planes, the flexing connections being divided into series of unequal lengths, finger-pieces arranged in transverse rows above the flexing connections and connections between the finger-pieces and the flexing connections intermediate the ends of the latter to flex them downwardly on the depression of the finger-pieces and thereby pull the type-bars to the printing-point with an increasing velocity.

11. In a writing-machine, the combination of a platen, a segmental type-bar support arranged in a plane below the platen, type-bars

pivoted therein and normally lying toward the front of the machine, flexing connections each hinged at its rear end to its type-bar and at its front end to a fixed piece or part of the frame and extending in a substantially straight line from the type-bar to its point of connection on the frame and means acting from above the flexing connections to flex them and pull the type-bars to the printing-point with an increasing velocity, the straight-line arrangement of the flexing connections affording the least resistance obtainable at the commencement of their flexure.

12. In a writing-machine, the combination of a platen, a segmental type-bar support arranged in a plane below the platen, type-bars pivoted therein and normally lying toward the front of the machine, flexing connections each composed of two links united by a universal joint and hinged at its rear end to its type-bar and at its front end to a fixed piece or part of the frame and extending in a substantially straight line from the type-bar to its point of connection on the frame and means acting from above the flexing connections to flex them and pull the type-bars to the printing-point with an increasing velocity, the straight-line arrangement of the flexing connections affording the least resistance obtainable at the commencement of their flexure.

13. In a writing-machine, the combination of a platen, a segmental type-bar support arranged in a plane below the platen, type-bars pivoted therein and normally lying toward the front of the machine, flexing connections each connected by a universal joint at its rear end to its type-bar and composed of two links united by a universal joint and connected at its front end to a fixed piece or part of the frame and extending in a substantially straight line from the type-bar to its point of connection on the frame, and means acting from above the flexing connections to flex them and pull the type-bars to the printing-point with an increasing velocity, the straight-line arrangement of the flexing connections affording the least resistance obtainable at the commencement of their flexure.

14. In a writing-machine, the combination of a platen, a segmental type-bar support arranged in a plane below the platen, type-bars pivoted therein and normally lying toward the front of the machine, flexing connections each connected by a universal joint at its rear end to its type-bar and composed of two links united by a universal joint and connected at its front end to a fixed piece or part of the frame by a universal joint and extending in a substantially straight line from the type-bar to its point of connection on the frame, and means acting from above the flexing connections to flex them and pull the type-bars to the printing-point with an increasing velocity, the straight-line arrangement of the flexing connections affording the least resistance

obtainable at the commencement of their flexure.

15. In a writing-machine, the combination of a platen, a segmental type-bar support arranged in a plane below the platen, type-bars pivoted therein and normally lying toward the front of the machine, flexing connections each composed of two links of unequal length united by a universal joint and hinged at its rear end to its type-bar at its rear end and at its front end to a fixed piece or part of the frame and extending in a substantially straight line from the type-bar to its point of connection on the frame, and means acting from above the flexing connections to flex them and pull the type-bars to the printing-point with an increasing velocity, the straight-line arrangement of the flexing connections affording the least resistance obtainable at the commencement of their flexure.

16. In a writing-machine, the combination of a platen, a segmental type-bar support arranged in a plane below the platen, type-bars pivoted therein and normally lying toward the front of the machine, flexing connections each connected by a universal joint at its rear end to its type-bar and composed of two links of unequal length united by a universal joint and connected at its front end to a fixed piece or part of the frame and extending in a substantially straight line from the type-bar to its point of connection on the frame, and means acting from above the flexing connections to flex them and pull the type-bars to the printing-point with an increasing velocity, the straight-line arrangement of the flexing connections affording the least resistance obtainable at the commencement of their flexure.

17. In a writing-machine, the combination of a platen, a segmental type-bar support arranged in a plane below the platen, type-bars pivoted therein and normally lying toward the front of the machine, flexing connections each connected at its rear end by a universal joint to its type-bar at its rear end and composed of two links of unequal length united by a universal joint and connected at its front end to a fixed piece or part of the frame by a universal joint and extending in a substantially straight line from the type-bar to its point of connection on the frame, and means acting from above the flexing connections to flex them and pull the type-bars to the printing-point with an increasing velocity, the straight-line arrangement of the flexing connections affording the least resistance obtainable at the commencement of their flexure.

18. In a writing-machine, the combination of a platen, a segmental type-bar support arranged in a plane below the platen, type-bars pivoted therein and normally lying toward the front of the machine, flexing connections each hinged at its rear end to its type-bar and at its front end to a fixed piece or part of the frame and extending in a substantially

straight line from the type-bar to its point of connection on the frame, finger-pieces arranged in transverse rows above the flexing connections and connections between the finger-pieces and the flexing connections intermediate the ends of the latter to flex them and pull the type-bars to the printing-point with an increasing velocity.

19. In a writing-machine, the combination of a platen, a segmental type-bar support arranged in a plane below the platen, type-bars pivoted therein and normally lying toward the front of the machine, flexing connections each composed of two links united by a universal joint and hinged at its rear end to its type-bar and at its front end to a fixed piece or part of the frame and extending in a substantially straight line from the type-bar to its point of connection on the frame, finger-pieces arranged in transverse rows above the flexing connections and connections between the finger-pieces and the flexing connections intermediate the ends of the latter to flex them and pull the type-bars to the printing-point with an increasing velocity.

20. In a writing-machine, the combination of a platen, a segmental type-bar support arranged in a plane below the platen, type-bars pivoted therein and normally lying toward the front of the machine, flexing connections each connected by a universal joint at its rear end to its type-bar and composed of two links united by a universal joint and connected at its front end to a fixed piece or part of the frame and extending in a substantially straight line from the type-bar to its point of connection on the frame, finger-pieces arranged in transverse rows above the flexing connections and connections between the finger-pieces and the flexing connections intermediate the ends of the latter to flex them and pull the type-bars to the printing-point with an increasing velocity.

21. In a writing-machine, the combination of a platen, a segmental type-bar support arranged in a plane below the platen, type-bars pivoted therein and normally lying toward the front of the machine, a series of links of substantially equal length pivoted in different transverse lines at or near the front of the machine, a series of links hinged to the rear ends of the first-named links and operatively connected at their rear ends to the type-bars, finger-pieces and devices which, on the depression of the finger-pieces act upon the flexing connections intermediate their ends to flex the corresponding pairs of links and pull the type-bars to the printing-point with an increasing velocity.

22. In a writing-machine, the combination of a platen, a segmental type-bar support arranged in a plane below the platen, type-bars pivoted therein and normally lying toward the front of the machine, a series of links of substantially equal length pivoted in different transverse lines at or near the front of the machine, a series of links hinged to the

rear ends of the first-named links and connected at their rear ends by universal joints to the type-bars, finger-pieces and devices which, on the depression of the finger-pieces, act upon the flexing connections intermediate their ends to flex the corresponding pairs of links and pull the type-bars to the printing-point with an increasing velocity.

23. In a writing-machine, the combination of a platen, a segmental type-bar support arranged in a plane below the platen, type-bars pivoted therein and normally lying toward the front of the machine, a series of links of substantially equal length pivoted in different transverse lines at or near the front of the machine, a series of links connected to the rear ends of the first-named links by universal joints and connected at their rear ends by universal joints directly to the type-bars, finger-pieces and devices which, on the depression of the finger-pieces, act upon the flexing connections intermediate their ends to flex the corresponding pairs of links and pull the type-bars to the printing-point with an increasing velocity.

24. In a writing-machine, the combination of a platen, a segmental type-bar support arranged in a plane below the platen, type-bars pivoted therein and normally lying toward the front of the machine, a series of links of substantially equal length pivoted in different transverse lines at or near the front of the machine, a series of links connected to the rear ends of the first-named links by universal joints and operatively connected at their rear ends to the type-bars, finger-pieces and devices which, on the depression of the finger-pieces, flex downwardly the corresponding pairs of links and pull the type-bars to the printing-point with an increasing velocity.

25. In a writing-machine, the combination of a platen, a segmental type-bar support arranged in a plane below the platen, type-bars pivoted therein and normally lying toward the front of the machine, a series of links of substantially equal length pivoted at their front ends in different transverse lines at or near the front of the machine, a series of links hinged to the rear ends of the first-named links and operatively connected at their rear ends to the type-bars, finger-pieces arranged in transverse rows above the series of connected links and connections between the finger-pieces and the series of front links applied to the latter in rear of their front ends whereby, when the finger-pieces are depressed, the corresponding type-bars are pulled to the printing-point with an increasing velocity.

26. In a writing-machine, the combination of a platen, a segmental type-bar support arranged in a plane below the platen, type-bars pivoted therein and normally lying toward the front of the machine, a series of links of substantially equal length pivoted at their front ends in different transverse lines at or near the front of the machine, a series of links

hinged to the rear ends of the first-named links and connected at their rear ends by universal joints to the type-bars, finger-pieces arranged in transverse rows above the series of connected links and connections between the finger-pieces and the series of front links applied to the latter in rear of their front ends whereby, when the finger-pieces are depressed, the corresponding type-bars are pulled to the printing-point with an increasing velocity.

27. In a writing-machine, the combination of a platen, a segmental type-bar support arranged in a plane below the platen, type-bars pivoted therein and normally lying toward the front of the machine, a series of links of substantially equal length pivoted at their front ends in different transverse lines at or near the front of the machine, a series of links connected to the rear ends of the first-named links by universal joints and connected at their rear ends by universal joints to the type-bars, finger-pieces arranged in transverse rows above the series of connected links and connections between the finger-pieces and the series of front links whereby, when the finger-pieces are depressed, the corresponding front links are pressed downwardly and the corresponding type-bars are pulled to the printing-point with an increasing velocity.

28. In a writing-machine, the combination of a platen, a segmental type-bar support arranged in a plane below the platen, type-bars pivoted therein and normally lying toward the front of the machine, a series of links of substantially equal length pivoted in different transverse lines at or near the front of the machine, a series of links connected to the rear ends of the first-named links by universal joints and operatively connected at their rear ends to the type-bars, finger-pieces arranged in transverse rows above the series of connected links and connections between the finger-pieces and the series of front links whereby, when the finger-pieces are depressed, the corresponding front links are forced downwardly and the corresponding type-bars are pulled to the printing-point with an increasing velocity.

29. In a writing-machine, the combination of a platen, a segmental type-bar support in a plane below the platen, type-bars pivoted therein and normally lying toward the front of the machine, a series of horizontally-disposed links of substantially equal length hinged at their front ends to the frame in several curved transverse lines at different distances from the platen, a second series of links hinged at their front ends to the first-named links and at their rear ends operatively connected with the type-bars, such latter connections lying in a curve corresponding substantially to the curve in which the pivots of the type-bars lie, and means for effecting a flexure of the joints between the respective front and rear links to thereby pull the corresponding type-bars to the printing-point with an increasing velocity.

30. In a writing-machine, the combination of a platen, a segmental type-bar support in a plane below the platen, type-bars pivoted therein and normally lying toward the front of the machine, a series of horizontally-disposed links of substantially equal length hinged at their front ends to the frame in several curved transverse lines at different distances from the platen, a second series of links connected at their front ends by universal joints to the first-named links and at their rear ends operatively connected with the type-bars, such latter connections lying in a curve corresponding substantially to the curve in which the pivots of the type-bars lie, and means for effecting the flexure of the joints between the respective front and rear links to thereby pull the corresponding type-bars to the printing-point with an increasing velocity.

31. In a writing-machine, the combination of a platen, a segmental type-bar support arranged below the plane thereof, type-bars pivoted therein and normally lying toward the front of the machine, flexing connections extending from front to rear of the machine operatively connected at their rear ends with their respective type-bars and each connected at its front end to a fixed part of the frame and each composed of two links united by a hinged joint, finger-pieces arranged in transverse rows in front of the type-bars and over the flexing connections, and operative connections between the finger-pieces and the joints between said links whereby when the finger-pieces are depressed, the type-bars are pulled to the printing-point with an increasing velocity.

32. In a writing-machine, the combination of a platen, a segmental type-bar support arranged in a plane below the platen, type-bars pivoted therein and normally lying toward the front of the machine, flexing connections each composed of two links arranged end to end and united by a universal joint and hinged at their rear ends to the type-bars and at their front ends hinged to the frame in lines lying in different transverse vertical planes, the flexing connections being divided into series of unequal lengths, and means acting directly upon the universal joints between the two links to flex them and pull the type-bars to the printing-point with an increasing velocity.

33. In a writing-machine, the combination of a platen, a segmental type-bar support arranged in a plane below the platen, type-bars pivoted therein and normally lying toward the front of the machine, flexing connections each composed of two links arranged end to end and united by a universal joint and connected at their rear ends to the type-bars by universal joints and at their front ends hinged to the frame in lines lying in different transverse vertical planes, the flexing connections being divided into series of unequal lengths and means acting directly upon the universal

joints between the two links to flex them and pull the type-bars to the printing-point with an increasing velocity.

34. In a writing-machine, the combination of a platen, a segmental type-bar support arranged in a plane below the platen, type-bars pivoted therein and normally lying toward the front of the machine, flexing connections each composed of two links arranged end to end and united by a universal joint and connected at their rear ends to the type-bars by universal joints and connected at their front ends to the frame by universal joints in lines lying in different transverse vertical planes, the flexing connections being divided into series of unequal lengths and means acting directly upon the universal joints between the two links to flex them and pull the type-bars to the printing-point with an increasing velocity.

35. In a writing-machine, the combination of a platen, a segmental type-bar support arranged in a plane below the platen, type-bars pivoted therein and normally lying toward the front of the machine, flexing connections each composed of two links arranged end to end and united by a universal joint and hinged at their rear ends to the type-bars and at their front ends hinged to the frame in lines lying in different transverse vertical planes, the flexing connections being divided into series of unequal lengths, finger-pieces arranged in transverse rows above the universal joints, connections between the finger-pieces and said joints acting to flex them downwardly on the depression of the finger-pieces and thereby pull the type-bars to the printing-point with an increasing velocity.

36. In a writing-machine, the combination of a platen, a segmental type-bar support arranged in a plane below the platen, type-bars pivoted therein and normally lying toward the front of the machine, flexing connections each composed of two links arranged end to end and united by a universal joint and connected at their rear ends to the type-bars by universal joints and at their front ends hinged to the frame in lines lying in different transverse vertical planes, the flexing connections being divided into series of unequal lengths, finger-pieces arranged in transverse rows above the flexing connections and connections between the finger-pieces and the universal joints between the links to flex them downwardly on the depression of the finger-pieces and thereby pull the type-bars to the printing-point with an increasing velocity.

37. In a writing-machine, the combination of a platen, a segmental type-bar support arranged in a plane below the platen, type-bars pivoted therein and normally lying toward the front of the machine, flexing connections each composed of two links arranged end to end and united by a universal joint and connected at their rear ends to the type-bars by universal joints and connected at their front ends to the frame by universal joints in lines lying in different transverse vertical planes,

the flexing connections being divided into series of unequal lengths, finger-pieces arranged in transverse rows above the flexing connections and connections between the finger-pieces and the universal joints between the links to flex them downwardly on the depression of the finger-pieces and thereby pull the type-bars to the printing-point with an increasing velocity.

38. In a writing-machine, the combination of a platen, a segmental type-bar support arranged in a plane below the platen, type-bars pivoted therein and normally lying toward the front of the machine, flexing connections each composed of two links united by a universal joint and hinged at its rear end to its type-bar and at its front end to a fixed piece or part of the frame and extending in a substantially straight line from the type-bar to its point of connection on the frame and means acting from above directly upon the universal joints between the links to flex them and pull the type-bars to the printing-point with an increasing velocity, the straight-line arrangement of the flexing connections affording the least resistance obtainable at the commencement of their flexure.

39. In a writing-machine, the combination of a platen, a segmental type-bar support arranged in a plane below the platen, type-bars pivoted therein and normally lying toward the front of the machine, flexing connections each connected at its rear end by a universal joint to its type-bar and composed of two links united by a universal joint and connected at its front end to a fixed piece or part of the frame and extending in a substantially straight line from the type-bar to its point of connection on the frame and means acting from above directly upon the universal joints between the links to flex them and pull the type-bars to the printing-point with an increasing velocity, the straight-line arrangement of the flexing connections affording the least resistance obtainable at the commencement of their flexure.

40. In a writing-machine, the combination of a platen, a segmental type-bar support arranged in a plane below the platen, type-bars pivoted therein and normally lying toward the front of the machine, flexing connections hinged at their rear ends to the type-bars and at their front ends hinged to the frame in lines lying in different transverse vertical planes, the flexing connections being divided into series of unequal lengths, means acting upon the flexing connections intermediate their ends for flexing them to pull the type-bars to the printing-point with an increasing velocity, and means for at will changing the relation of the platen and type-bar support.

41. In a writing-machine, the combination of a platen, a segmental type-bar support arranged in a plane below the platen, type-bars pivoted therein and normally lying toward the front of the machine, flexing connections each composed of two links arranged end to

end and united by a universal joint and connected at their rear ends to the type-bars by universal joints and connected at their front ends to the frame by universal joints in lines
 5 lying in different transverse vertical planes, the flexing connections being divided into series of unequal lengths, means for flexing them to pull the type-bars to the printing-point with an increasing velocity, and means
 10 for at will changing the relation of the platen.

42. In a writing-machine, the combination of a platen, a segmental type-bar support arranged in a plane below the platen, type-bars pivoted therein and normally lying toward
 15 the front of the machine, flexing connections each hinged at its rear end to its type-bar and at its front end to a fixed piece or part of the frame and extending in a substantially straight line from the type-bar to its point of
 20 connection on the frame, means acting from above the flexing connections to flex them and pull the type-bars to the printing-point with an increasing velocity, the straight-line arrangement of the flexing connections affording the
 25 least resistance obtainable at the commencement of their flexure, and means for at will changing the relation of the platen and type-bar support.

43. In a writing-machine, the combination
 30 of a platen, a segmental type-bar support arranged in a plane below the platen, type-bars pivoted therein and normally lying toward the front of the machine, a series of links of substantially equal length pivoted in different
 35 transverse lines at or near the front of the machine, a series of links hinged to the rear ends of the first-named links and operatively connected at their rear ends to the type-bars, finger-pieces, devices which, on the depres-
 40 sion of the finger-pieces act upon the flexing connections intermediate the ends to flex the corresponding pairs of links and pull the type-bars to the printing-point with an increasing velocity, and means for at will chang-
 45 ing the relation of the platen and type-bar support.

44. In a writing-machine, the combination of a platen, a segmental type-bar support arranged in a plane below the platen, type-bars
 50 pivoted therein and normally lying toward the front of the machine, flexing connections extending from front to rear of machine under the type-bars and connected at their rear ends to the type-bars and each connected at
 55 its front end to a fixed piece or part of the frame, finger-pieces arranged in transverse rows in front of the type-bars and above the flexing connections, and vertically-movable connections between the finger-pieces and
 60 flexing connections, whereby on the depression of a finger-piece the corresponding flexing connection is forced downwardly and the type-bar pulled to the printing-point with an increasing velocity.

65 45. In a writing-machine, the combination of a platen, a segmental type-bar support arranged in a plane below the platen, type-bars

pivoted therein and normally toward the front of the machine, flexing connections, each composed of two links hinged together, 70
 extending from front to rear of the machine under the type-bars and connected at their rear ends to the type-bars and each connected at its front end to a fixed piece or part of the frame, finger-pieces arranged in transverse 75
 rows in front of the type-bars and above the flexing connections, and vertically-movable connections between the finger-pieces and flexing connections, whereby, on the depres- 80
 sion of a finger-piece, the corresponding flexing connection is forced downwardly and the type-bar pulled to the printing-point with an increasing velocity.

46. In a writing-machine, the combination of a vertically-movable finger-piece, a link ly- 85
 ing below it and substantially in a plane at right angles to the line of movement of the finger-piece and having one end connected to a fixed part of the frame, a second link operatively connected to the part to be actuated 90
 and united with the free end of the first-named link by a hinge-joint, and means directly interposed between the finger-piece and the first-named link to depress the latter and thereby cause the second-named link to 95
 approach said fixed part of the frame.

47. In a writing-machine, the combination of a vertically-movable finger-piece, a link ly-
 ing below it and substantially in a plane at right angles to the line of movement of the 100
 finger-piece and having its front end connected to a fixed part of the frame, a second link operatively connected at one end to the part to be actuated and at the other end united
 105 by a hinge-joint, to the rear end of the first-named link, and a device interposed between the finger-piece and the hinge-joint uniting the two links to depress said joint and thereby cause the second-named link to approach
 110 said fixed point.

48. The combination of a pivoted type-bar, its actuating connection consisting of two links united at their adjacent ends by a hinge-joint and arranged substantially end to 115
 end in the same horizontal plane, the rear end of one link being operatively connected with the type-bar and the front end of the other link with a fixed part of the frame, and the links being so disposed that the hinge-joint is in a plane slightly below the plane in which 120
 the two links lie, a push-pin finger-piece arranged above the said actuating connections and a device actuated by the finger-piece to further depress said hinge-joint and thereby throw the type-bar to the printing-point with 125
 a minimum initial resistance and an increasing resistance and velocity.

49. The combination of a platen, a type-bar segment mounted at right angles to the horizontal plane of the machine, type-bars mount- 130
 ed therein, connections for operating the type-bars having their rear ends arranged in an arc corresponding substantially to the curve of the segment and their front ends con-

5 nected in similar transverse arcs, finger-pieces arranged above such connections and means for acting upon said connections intermediate their ends when the finger-pieces are depressed to actuate the type-bars.

10 50. The combination of a platen, a type-bar segment mounted at an angle to the horizontal plane of the machine, type-bars mounted therein, connections of unequal length for operating the type-bars having their rear ends arranged in an arc corresponding substantially to the curve of the segment and their front ends mounted in similar transverse arcs at different distances from the platen, finger-
15 pieces arranged above such connections and means for acting upon said connections intermediate their ends when the finger-pieces are depressed to actuate the type-bars.

20 51. The combination of a platen, a type-bar segment mounted at an angle to the horizontal plane of the machine, type-bars mounted therein, flexing connections of unequal length for operating the type-bars having their rear ends operatively connected directly to the
25 type-bars in a curve corresponding with the curve of the segment and their front ends each connected to a fixed piece or part of the frame and arranged in similar transverse curves, and means for flexing such connections to operate the type-bars, said connections being respectively so arranged that
30 when flexed their rear ends are caused to approach such fixed points.

35 52. The combination of a platen, a type-bar support, type-bars pivotally mounted therein in a curve whose radial plane is at an angle to the horizontal plane of the machine, a series of independent fixed parts or pieces attached to the frame near the front of the machine and arranged in transverse curves at
40 different distances from the platen, flexing type-bar-operating connections of unequal length extending between such fixed pieces and the type-bars, and means for acting on such flexing connections intermediate their
45 ends, to thereby cause their rear ends to approach said fixed points.

50 53. The combination of a platen, a type-bar support, type-bars pivotally mounted therein in a curve whose radial plane is at an angle to the horizontal plane of the machine, a series of fixed parts or pieces arranged in sets in similar segmental curves and at different
55 distances from the platen, flexing connections operatively connected at their rear ends to the type-bars and at their front ends to such fixed pieces and each consisting of jointed links, and means for flexing such connections to actuate the type-bars, said
60 connections being so disposed that when flexed their rear ends approach such fixed pieces.

65 54. The combination of a platen, a type-bar support, type-bars pivotally mounted therein in a curve whose radial plane is at an angle to the horizontal plane of the machine, a series of fixed parts or pieces arranged in sets

in similar segmental curves and at different distances from the platen, flexing type-bar-operating connections operatively connected with the type-bars at their rear ends and at
70 their front ends to such fixed pieces and consisting of jointed links, finger-pieces arranged above said flexing connections, and devices of different lengths interposed between the finger-pieces and said flexing
75 connections intermediate their ends, the connections being so disposed that when flexed their rear ends approach such fixed pieces.

80 55. The combination of a platen, a type-bar support, type-bars pivotally mounted therein in a curve whose radial plane is at an angle to the horizontal plane of the machine, flexing type-bar-operating connections composed of links arranged end to end and united by a hinge-joint and operatively connected at their
85 rear ends to the type-bars and at their front ends to fixed parts of the frame arranged in similar curves transverse to the machine at different distances from the platen, such flexing connections converging from front to
90 rear, a series of finger-pieces arranged over such connections and means controlled by the finger-pieces for flexing the connections, the latter being so disposed that when flexed their rear ends approach their front ends.
95

100 56. The combination of a platen, a segmental type-bar support, arranged below the platen with its concave face upward, type-bars pivotally mounted therein, flexing type-bar-operating connections operatively connected with the type-bars at their rear ends
105 and extending to the front of the machine in divergent lines and in similar concave or trough-like formation and there connected to fixed parts of the frame, finger-pieces arranged above such connections in horizontal
110 lines at different heights, and means on the depression of the finger-pieces operating on such connections intermediate their ends to actuate the type-bars.

115 57. In a writing-machine, the combination of a platen, a segmental type-bar support arranged in a plane below the platen, a type-bar pivoted therein and normally lying toward the front of the machine, a flexing connection operatively connected at its rear end
120 to the type-bar and extending toward the front of the machine and there connected to rock about a fixed part of the frame, a finger-piece arranged in front of the type-bar and over the flexing connection, and a connection between the finger-piece and the flexing connection, intermediate the ends of the latter, whereby it is flexed, on the depression of the
125 finger-piece, to throw the type-bar to the printing-point with an increasing velocity.

In testimony whereof I have hereunto subscribed my name.

EDWARD B. HESS.

Witnesses:

EDWARD C. DAVIDSON,
LILLIE F. BROWNING.