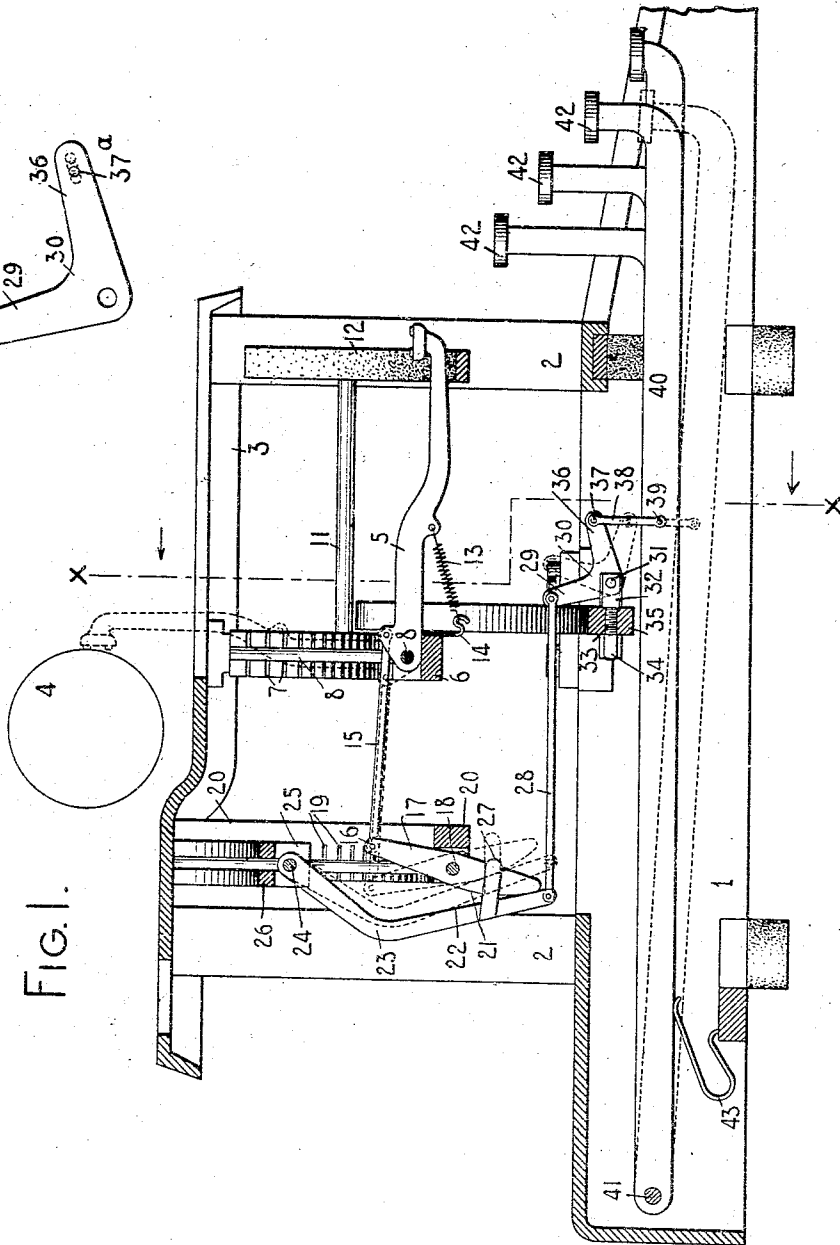
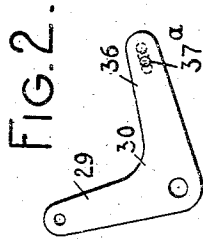


J. FELBEL.
TYPE WRITING MACHINE.
APPLICATION FILED JULY 13, 1911.

1,055,027.

Patented Mar. 4, 1913.

6 SHEETS—SHEET 1.



WITNESSES:

E. M. Wells
Wm. E. Smith

INVENTOR:

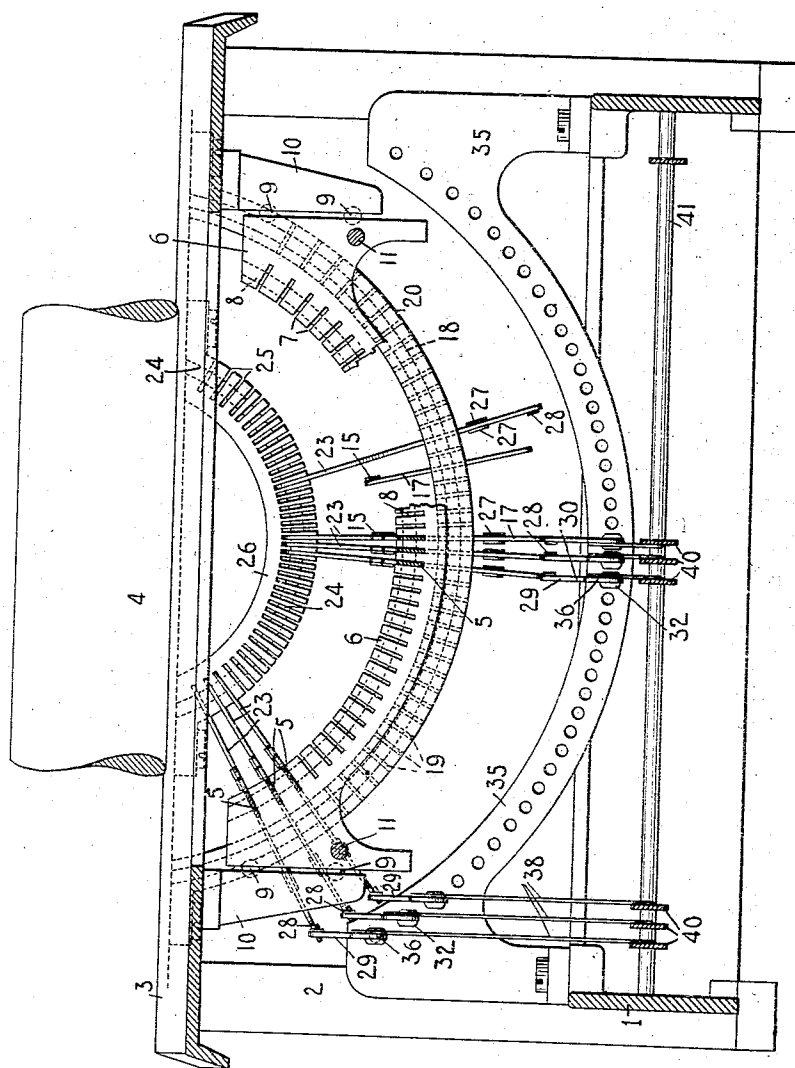
Jacob Felbel

1,055,027.

J. FELBEL.
TYPE WRITING MACHINE.
APPLICATION FILED JULY 13, 1911.

Patented Mar. 4, 1913.
6 SHEETS—SHEET 2.

FIG. 3.



WITNESSES:

E. M. Wells.

Charles Smith

INVENTOR:

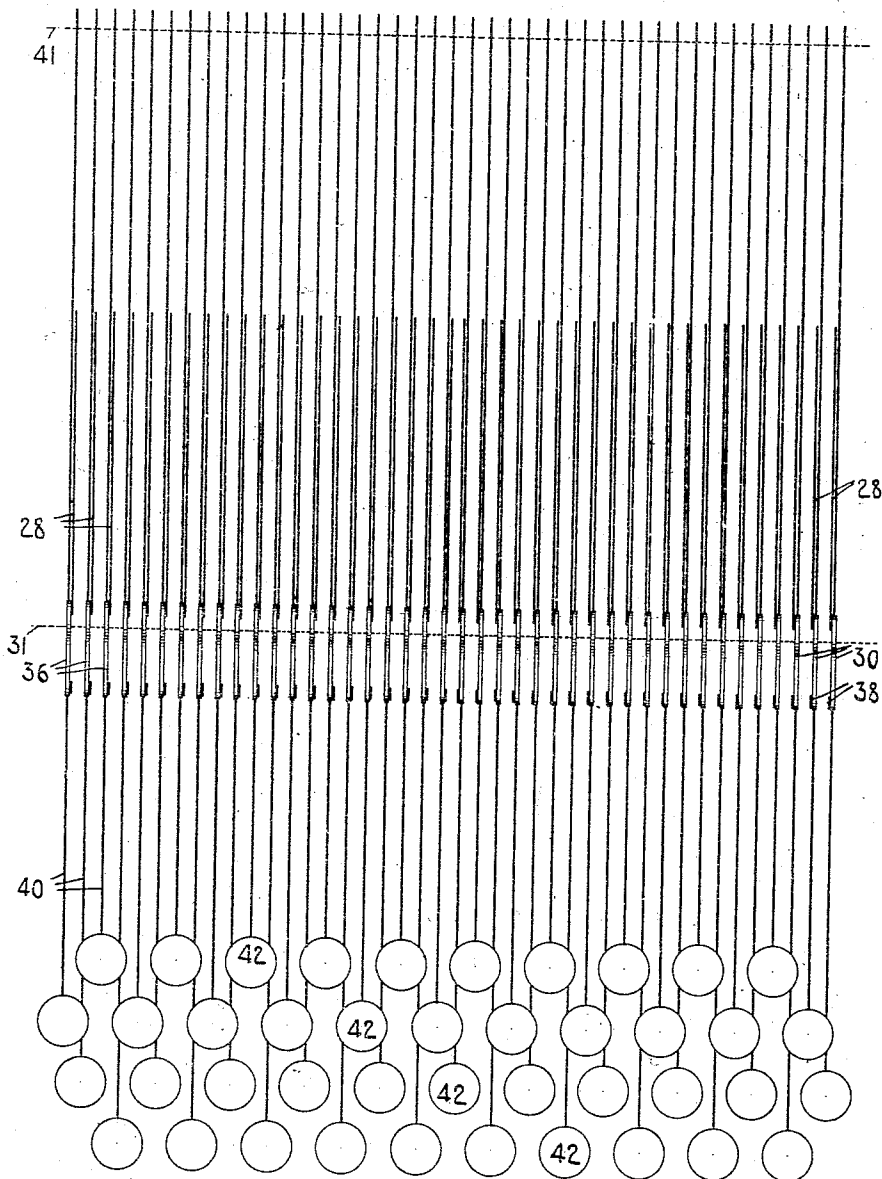
James Felbel

1,055,027.

J. FELBEL.
TYPE WRITING MACHINE.
APPLICATION FILED JULY 13, 1911.

Patented Mar. 4, 1913.
6 SHEETS—SHEET 3.

FIG. 4.



WITNESSES:

E. M. Wells
Charles E. Smith

INVENTOR:

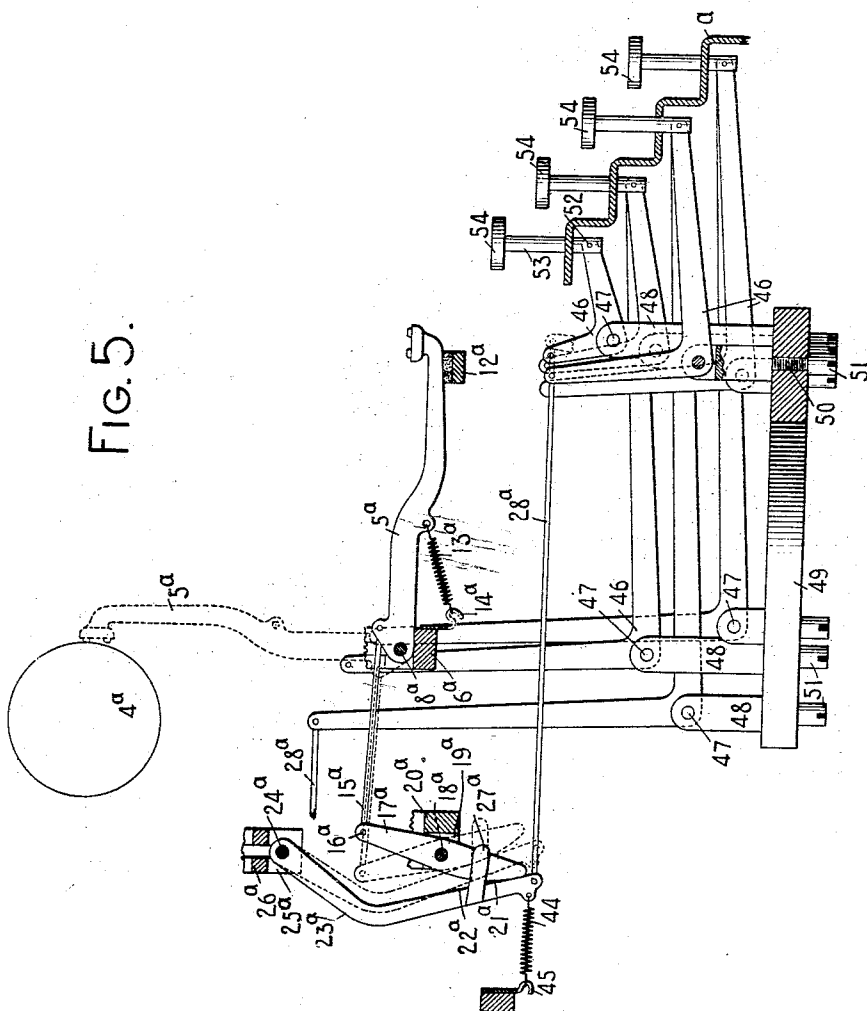
James Felbel

1,055,027.

J. FELBEL.
TYPE WRITING MACHINE.
APPLICATION FILED JULY 13, 1911.

Patented Mar. 4, 1913.
6 SHEETS—SHEET 4.

FIG. 5.



WITNESSES:

E. M. Wells.

Charles E. Smith

INVENTOR:

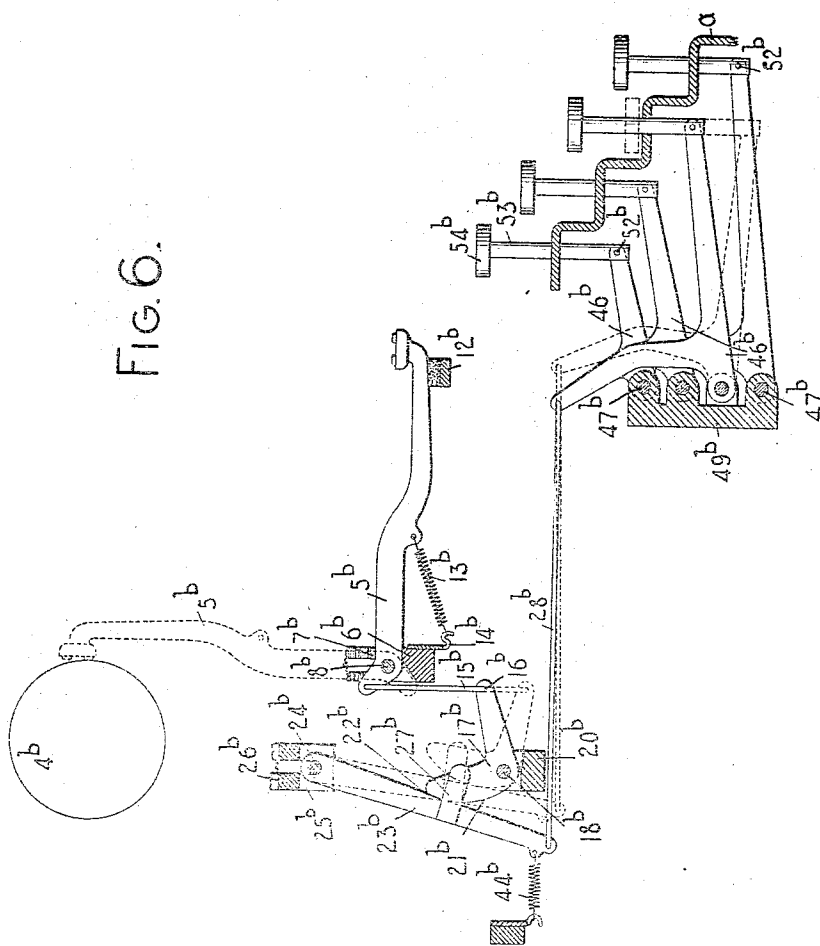
Jacob Felbel

1,055,027.

J. FELBEL.
TYPE WRITING MACHINE.
APPLICATION FILED JULY 13, 1911.

Patented Mar. 4, 1913.
6 SHEETS—SHEET 5.

FIG. 6.



WITNESSES:

E. M. Wells.
Charles E. Smith

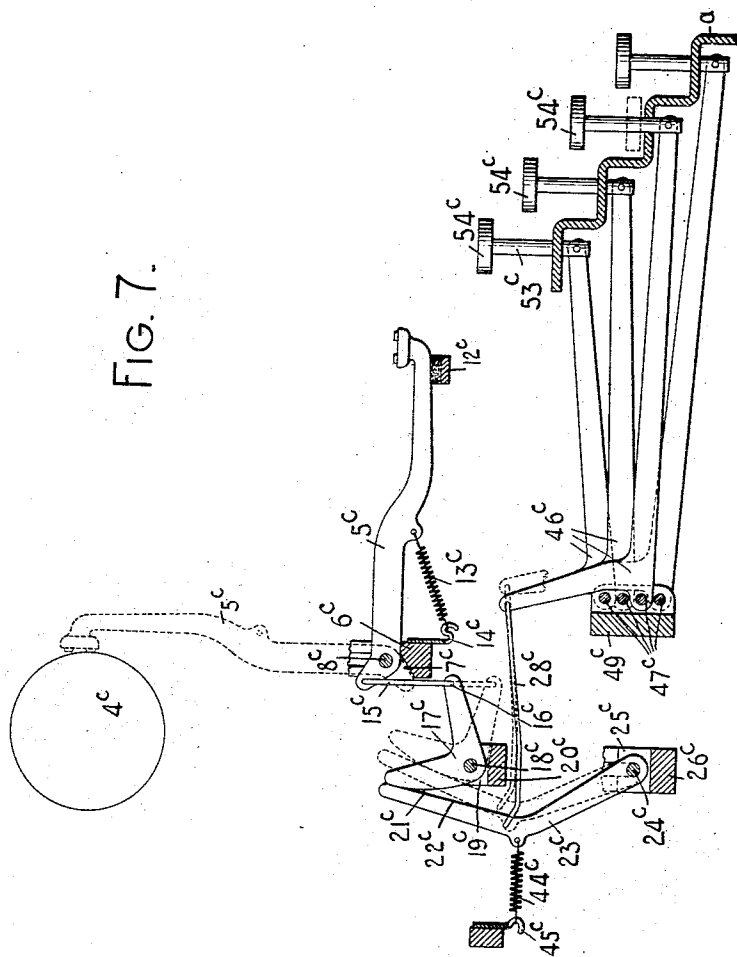
INVENTOR:

Jacob Felbel

1,055,027.

J. FELBEL.
TYPE WRITING MACHINE.
APPLICATION FILED JULY 13, 1911.

Patented Mar. 4, 1913.
6 SHEETS-SHEET 6.



WITNESSES:

E. M. Wells

Wm. E. Smith

INVENTOR:

Joseph Felbel

UNITED STATES PATENT OFFICE.

JACOB FELBEL, OF NEW YORK, N. Y., ASSIGNOR, BY MESNE ASSIGNMENTS, TO UNION TYPEWRITER COMPANY, OF JERSEY CITY, NEW JERSEY, A CORPORATION OF NEW JERSEY.

TYPE-WRITING MACHINE.

1,055,027.

Specification of Letters Patent.

Patented Mar. 4, 1913.

Application filed July 13, 1911. Serial No. 638,248.

To all whom it may concern:

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

My invention relates to typewriting machines and more particularly to type actions.

The main object of my invention, generally stated, is to provide an efficient construction in which a gradual acceleration in the movement of the type bar is effected as it approaches the printing position, thereby providing a type action which affords an easy start and a light touch at the initial part of the key depression.

A further object of the invention is to provide a type action of the character referred to above in which there is a uniform leverage and a uniform dip of the keys throughout the system.

A still further object of the invention is to provide an efficient construction in which there is an elimination of all, or substantially all, side strain or pull in each action throughout the system.

Another object of the invention is to so construct and arrange the parts that the type bars may receive a case shifting movement.

To the above and other ends which will hereinafter appear, my invention consists in the features of construction, arrangements of parts and combinations of devices to be hereinafter described and particularly pointed out in the appended claims.

In the accompanying drawings wherein like reference characters indicate corresponding parts in the various views, Figure 1 is a fragmentary vertical, fore and aft, sectional view showing a sufficient number of parts of a typewriting machine to illustrate one form or embodiment of my invention. Fig. 2 is an enlarged detail side view of one of the angular actuating levers employed in the type action shown in Fig. 1. Fig. 3 is a vertical, transverse sectional view of the construction shown in Fig. 1, the section being taken on the line $x-x$ of Fig. 1 and looking in the direction of the arrow at said line. Fig. 4 is a diagrammatic plan view showing a portion of the system of

type actions. Fig. 5 is a fragmentary, vertical, fore and aft sectional view showing a modified form of construction embodying my invention. Fig. 6 is a like view of a still further modified form of construction. Fig. 7 is a like view but showing still another modification.

In the drawings I have shown only so much of a typewriting machine as is necessary to arrive at an understanding of the invention.

In each of the constructions shown in the accompanying drawings the invention is illustrated embodied in a front-strike machine to which the invention is more particularly directed.

Referring first more particularly to Figs. 1 to 4, inclusive, the frame of the machine comprises a base 1, corner posts 2 and a top plate 3. A platen 4, diagrammatically illustrated, is supported in a suitable carriage (not shown) for movement across the top plate from side to side of the machine. A series of type bars 5 are pivoted in an arc in any suitable manner on an upright type bar segment 6, to swing upwardly and rearwardly to the printing point. In the present instance I have shown the type bar segment slotted at 7 to receive the type bars 5 which turn on a pivot wire 8, the type bars normally resting in an arc or segmental arrangement corresponding to the pivot wire 8. The type bar segment 6 is shown in the present instance as a vertically movable segment guided in its vertical movement by anti-friction balls or rollers 9 which are received in ways in the sides of the segment and in corresponding ways in the depending guides 10 secured to the top plate of the machine. Supporting rods 11 project forwardly from the type bar segment and support a type rest 12 at the forward ends thereof; the type rest supporting the free ends of the type bars in the usual manner. It will thus be understood that the segment in the present instance is mounted for vertical case shifting movement relatively to the platen, although from certain aspects of the invention it is immaterial how the relative case shifting movement between the type bars and the platen is effected; i. e., whether it be by shifting the type bars or the platen. Each type bar is connected to a contractile returning spring 13 which in turn is connected to a hook 14 carried by

the segment 6. A rearwardly extending pull link 15 is pivoted to the heel of the type bar and extends rearwardly therefrom where pivotal connection is made at 16 to a sub-lever 17 of the first order; said lever being pivoted on a curved pivot wire 18 and received and working in a slot 19 in a fixed vertical segment 20. The various sub-levers 17 are radially disposed and are of uniform size, as indicated in Fig. 3; the upper ends of the sub-levers being arranged in an arc which corresponds substantially to the arc in which the type bars are pivoted. The rear edge of each sub-lever 17, below the pivot 18 thereof, is preferably curved to form a curved contact face or edge 21 for cooperation with the contact face or edge 22 on a companion sub-lever 23 of the second order. This companion sub-lever is mounted at its upper end on a curved pivot wire 24 and works in a radial slot 25 of a fixed upright segment 26. Each sub-lever 23 is preferably of some such shape as that illustrated in Fig. 1, in order that each sub-lever 23 may in the normal positions of the parts engage the companion sub-lever 17 near the lower end thereof. During the depression of a key a rolling contact will be effected between the companion sub-levers to bring the point of engagement between them nearer the pivot of the sub-lever 17 as the depression of the key continues and as is indicated in dotted lines in Fig. 1. The sub-levers 23 are radially arranged to correspond to the radial arrangement of the sub-levers 17, so that the two series of sub-levers will be presented edge to edge for cooperation. Preferably each sub-lever 23 is provided with forwardly projecting guide fingers 27 on each side thereof for cooperation with the companion sub-lever 17 to prevent relative lateral deflection of the sub-levers and maintain them at all times in cooperative relation. The lower end of each sub-lever 23 is pivoted to a forwardly projecting pull link 28, connected at its forward end to the upright arm 29 of an angular sub-lever 30. Each angular sub-lever is pivoted at 31 to a hanger 32 connected by a threaded stem 33 and a nut 34 to an upright segment 35. The forwardly projecting arm 36 of each angular sub-lever is pivoted at 37 to a depending pull link 38 which in turn is pivoted at 39 to a key lever 40 of the second order; the various key levers being pivoted on a pivot rod 41. Each key lever carries a finger key 42, and a returning spring 43 cooperates with each key lever to return it and the parts connected therewith to normal position. From an inspection of Fig. 3 it will be observed that the angular sub-levers 30 are all of a uniform size and are disposed in parallel vertical planes extending fore and aft of the machine in a segmental arrangement, and that the links 38 are of gradually increasing lengths from the center to the sides of the system to compensate for the segmental arrangement of the angular sub-levers. It will also be observed from an inspection of Fig. 3 that each link 28 extends in a straight line fore and aft of the machine directly back from the upright arm 29 of its angular sub-lever to the lower end of the companion sub-lever 23. It follows therefore that at the depression of a key a direct fore and aft pull is effected from each angular sub-lever to its companion sub-lever 23. Moreover, the arrangement is such that the sub-levers 17 and 23 for each type bar extend from the type bar to a point directly above the associated key lever, so that movement is transmitted from the key lever to the associated bell crank in a direct fore and aft vertical plane and this movement is transmitted to the associated link 28 in the same plane to the lower end of the companion sub-lever 23. Compensation is made therefore for the difference between the width of the system of type bars and the system of key levers and all lateral or side strain is avoided. The sub-levers 30 being of uniform size and having their pivotal centers arranged in an arc in the manner described, and the sub-levers 17 being of a uniform size and pivoted in an arc in the manner shown, as well as the sub-levers 23, which are likewise all of a uniform size, the construction is such that a uniform dip of the keys and a uniform leverage is afforded throughout the system, except for the variation in the lengths of the key levers for the different banks of keys. In order to compensate for this variation in the length of the key levers, a slight variation is made in the point of connection 37 between the angular sub-levers 30 and the links 38. This is illustrated diagrammatically in Fig. 2 from which it will be seen that the different angular sub-levers are apertured at 37* at four different points and at four different distances from the fulcrum 31 of the sub-levers in order to compensate for the different lengths of the key levers 40 and thus afford a uniform leverage and dip throughout the system.

In Fig. 5 I have shown a modified form of construction embodying my invention. In this view the same reference numerals will be employed to designate parts which correspond to those shown in the preceding views; the exponent α , however, being added to each of the reference numerals in the modified form of the construction. It will be understood that the type bars, the pull links connected therewith, the sub-levers to which the pull links are connected and the cooperating sub-levers are all arranged and constructed in substantially the same manner as in the construction previously described. In the modified form of the con-

struction, however, contractile restoring springs 44 are connected at their forward ends to the sub-levers 23^a and at their rear ends to hooks 45 secured to a fixed part of the machine. Forwardly extending links 28^a are connected at their rear ends to the sub-levers 23^a and at their forward ends to angular levers 46 pivoted at 47 to upstanding studs 48 detachably secured to a fixed plate 49 by threaded shanks 50 and nuts 51. It will be observed that the pivots 47 of the various angular levers 46 are arranged at different heights and at different points fore and aft of the machine. Inasmuch as the lower ends of the sub-levers 23^a are arranged in an arc as in the previously described construction, the upright arms of the different angular levers 46 are of varying lengths so that those angular levers 46 which connect with the type bars at the sides of the system have upstanding arms which reach to a height where direct fore and aft connection can be made through the associated pull link 28^a with the sub-lever 23^a of the companion type bar. Although the upright arms of the different angular levers 46 vary in length a uniform leverage and extent of key depression is nevertheless afforded. This is effected by maintaining the ratio between the two arms of the angular levers 46 whatever be the size of the lever. Thus, those levers which have the longest upright lever arm likewise have the longest forwardly projecting lever arm, and the ratio between the two lever arms of the largest lever 46 and the smallest lever 46 is the same. The levers 46 are key carrying levers, each having its forwardly extending arm projecting to the keyboard of the machine where pivotal connection is made at 52 with a key stem 53 carrying a finger key or head 54. The various key stems are guided in guide openings in a plate *a*. It will be understood therefore that in this modified form of construction, like that previously described, a uniform extent of dip of the keys and a uniform leverage is provided throughout the system and that a gradual acceleration in the movement of each type bar is effected as it approaches the printing position. For the purpose of the present invention it may be assumed that the type bar segment 6^a is mounted for vertical case shifting movement; the links 15^a at such times turning on the pivotal connections of said links with the sub-levers 17^a. If desired, however, the platen may receive a case shifting movement relatively to the type bars.

In Fig. 6 I have illustrated a still further modified form of the construction in which the parts corresponding to those included in the previously described constructions will be designated by the same reference numerals with the addition thereto of

the exponent *b*. In this modified form of type action the segmentally arranged type bars 5^b strike upwardly and rearwardly against the front face of a platen 4^b. Each type bar is connected to a depending pull link 15^b which in turn is pivotally connected to a forwardly directed arm of a sub-lever 17^b pivoted at 18^b. All of the sub-levers 17^b are of a uniform size and are segmentally and radially arranged like the levers 17 and 17^a of the previously described constructions. Each sub-lever 17^b has an upright arm provided with a rear curved contact face 21^b which co-acts with a companion sub-lever 23^b of the second order. All of the sub-levers 23^b are of a uniform size and are segmentally and radially arranged as in the previously described constructions. A returning spring 44^b is connected to each of the sub-levers 23^b to return it and the parts connected therewith to normal position. A forwardly extending link 28^b is connected at its rear end to the lower end of each sub-lever 23^b and at its forward end to an upright arm of an angular lever 46^b. These angular levers are pivoted at 47^b at various heights and the levers themselves have upwardly extending arms that project to varying heights in order to compensate for the segmental arrangement of the pull links 28^b and to effect a direct fore and aft pull on such links at the sides, as well as at the center of the system. Like the construction shown in Fig. 5 the sub-levers 46^b have forwardly extending arms which are connected to key stems 53^b provided with finger keys 54^b. Like the corresponding levers shown in Fig. 5 these angular levers have their forwardly and their upwardly projecting arms of the same ratio throughout the system so that an angular lever with a long, upright arm has a correspondingly long forwardly projecting arm and the ratio between the arms of the smallest angular lever and the arms of the largest angular lever is the same. In this construction like those previously described an accelerated movement of the type bar is effected in its approach to the printing position and an easy start of each type action is afforded. Moreover, the construction is such as to provide a uniform dip of the keys and a uniform leverage throughout the system.

In Fig. 7 I have shown still another modified form of type action embodying my invention. In this figure parts corresponding to those embodied in the constructions previously described will be designated by the same reference numeral with the addition thereto of the exponent *c*. The segmentally arranged upwardly and rearwardly striking type bars 5^c strike against the front face of a platen 4^c. Each type bar is connected to a depending link 15^c which in turn is connected at its lower end to an angular sub-

lever 17°. Each sub-lever 17° is pivoted at 18° in a vertically disposed segment 20° and is provided with an upwardly extending arm having a rear curved contact face 21° for coöperation with a companion sub-lever 23° of the third order, pivoted at its lower end as at 24° in a vertically disposed segment 26°. The sub-levers 17° are pivoted in a vertically disposed arc and are arranged in downwardly and outwardly radiating planes, all of the sub-levers 17° being of a uniform size. The sub-levers 23° are arranged in a like manner and are all of a uniform size. Each sub-lever 23° is connected to a returning spring 44° so that said sub-lever and the parts connected therewith will be returned to normal position. A forwardly extending link 28° is connected to each sub-lever 23° at one end and is connected at its opposite end to an upright arm of an angular key carrying lever 46°, which key carrying levers are constructed and arranged in the same general manner as in the previously described construction shown in Fig. 6.

If it be assumed that the type bar segments 6^b and 6^c in Figs. 6 and 7 respectively are to receive a vertical case shift movement, as in the construction shown in Figs. 1 to 4, it will be necessary to effect a corresponding movement of the co-acting sub-levers and the parts by which they are carried. In this event the rear ends of the links 28^b or 28^c would receive a movement around the forward pivotal connection of said links with the angular key levers 46^b and 46^c if the segments 6^b, 6^c, 20^b, 20^c, 26^b, 26^c are shifted vertically. However, the platen in these constructions like those previously described may be shifted relatively to the type bars if desired. The depending links 15^b, 15^c are radially arranged to correspond with the radial arrangements of the type bars and the sub-levers and the bell cranks 17^b and 17^c.

In each of the constructions shown two series of co-acting sub-levers are arranged in rear of the type bars, the sub-levers having rolling or variable contact between them to afford variable leverage and an acceleration in the movement of the type bars in their approach to the printing position. In each of the constructions shown the sub-levers of each series are of a uniform size and are pivoted in an arc and are radially arranged. In each construction a pull link is operatively connected to the finger key and is interposed between the finger key and one of the coöperative sub-levers, whereas in each instance the other sub-lever is connected by an associated pull link to the type bar. Moreover, in each construction a uniform leverage and dip of the keys is provided throughout the system.

From the foregoing description and from

an inspection of the different modifications of my invention it will be understood that various changes may be made without departing from the spirit and scope of the invention.

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

1. In a typewriting machine, the combination of a series of pivoted type bars; a series of finger keys; and intermediate actuating connections between the finger keys and type bars for swinging the type bars on their pivots to the printing position, said connections comprising two series of coöperative sub-levers having variable contact between them, the pivotal centers of the sub-levers of each series being arranged in an arc.

2. In a typewriting machine, the combination of a series of pivoted type bars; a series of finger keys; and intermediate actuating connections between the finger keys and type bars for swinging the type bars on their pivots to the printing position, said connections comprising two series of coöperative sub-levers having variable contact between them, the pivotal centers of the sub-levers of each series being arranged in an arc, links intermediate one series of said sub-levers and the type bars, and links intermediate the other series of said sub-levers and the finger keys.

3. In a typewriting machine, the combination of a series of pivoted type bars; a series of finger keys; and intermediate actuating connections between the finger keys and type bars for swinging the type bars on their pivots to the printing position, said connections comprising two series of coöperative sub-levers having variable contact between them, the pivotal centers of the sub-levers of each series being arranged in an arc, the sub-levers of one series being fulcrumed intermediate their ends, and the sub-levers of the other series being fulcrumed each at one end.

4. In a typewriting machine, the combination of a series of pivoted type bars; a series of finger keys; and intermediate actuating connections between the finger keys and type bars for swinging the type bars on their pivots to the printing position, said connections comprising two series of coöperative sub-levers having variable contact between them, the pivotal centers of the sub-levers of each series being arranged in an arc, and the sub-levers of each series being of uniform length.

5. In a typewriting machine, the combination of a series of pivoted type bars; a series of finger keys; and intermediate actuating connections between the finger keys and type bars for swinging the type bars on their pivots to the printing position, said connections comprising two series of coöperative

erative sub-levers having variable contact between them, the pivotal centers of the sub-levers of each series being arranged in an arc, and the sub-levers of each series being of uniform length, links intermediate one series of said sub-levers and the type bars, and links intermediate the other series of said sub-levers and the finger keys.

6. In a front strike typewriting machine, the combination of a series of type bars pivoted in an arc to swing upwardly and rearwardly to the printing point; finger keys; and intermediate actuating connections between the finger keys and type bars, said connections comprising two series of radially disposed cooperative sub-levers having variable contact between them.

7. In a front strike typewriting machine, the combination of a series of type bars pivoted in an arc to swing upwardly and rearwardly to the printing point; finger keys; and intermediate actuating connections between the finger keys and type bars, said connections comprising two series of radially disposed cooperative sub-levers having variable contact between them, the sub-levers of each series being of a uniform size, operative connections between the sub-levers of one series and the type bars, and operative connections between the sub-levers of the other series and the finger keys.

8. In a front strike typewriting machine, the combination of a series of type bars pivoted in an arc to swing upwardly and rearwardly to the printing point; finger keys; and intermediate actuating connections between the finger keys and type bars, said connections comprising two series of radially disposed cooperative sub-levers having variable contact between them, the pivotal centers of the sub-levers of each series being arranged in an arc.

9. In a front strike typewriting machine, the combination of a series of type bars pivoted in an arc to swing upwardly and rearwardly to the printing point; finger keys; and intermediate actuating connections between the finger keys and type bars, said connections comprising two series of cooperative sub-levers having variable contact between them, the sub-levers of each series being pivoted in an arc and the sub-levers of one series being sub-levers of the first order and the sub-levers of the other series being each fulcrumed at one end.

10. In a front strike typewriting machine, the combination of a series of type bars pivoted in an arc to swing upwardly and rearwardly to the printing point; finger keys; and intermediate actuating connections between the finger keys and type bars, said connections comprising two series of cooperative sub-levers having variable contact between them, the sub-levers of one series being sub-levers of the first order and

the sub-levers of the other series being each fulcrumed at one end, the sub-levers of each series being of uniform size.

11. In a front-strike typewriting machine, the combination of a series of type bars pivoted in an arc to swing upwardly and rearwardly to the printing point; finger keys; and intermediate actuating connections between the finger keys and type bars, said connections comprising two series of cooperative sub-levers arranged in downwardly and outwardly radiating planes and pivoted in arcs, said sub-levers having variable contact between them, the sub-levers of each series being of uniform size, and the sub-levers of one series being sub-levers of the first order and the sub-levers of the other series being each fulcrumed at one end.

12. In a front strike typewriting machine, the combination of a series of type bars pivoted in an arc to swing upwardly and rearwardly to the printing point; finger keys; and intermediate actuating connections between the finger keys and type bars, said connections comprising two series of radially disposed cooperative sub-levers having variable contact between them, the sub-levers of each series being of uniform size, and the sub-levers of one series being sub-levers of the first order and the sub-levers of the other series being each fulcrumed at one end, and the pivotal centers of the sub-levers of each series being arranged in an arc.

13. In a front strike typewriting machine, the combination of a series of type bars pivoted in an arc to swing upwardly and rearwardly to the printing point; finger keys; and intermediate actuating connections between the finger keys and type bars, said connections comprising two series of segmentally arranged radially disposed cooperative sub-levers having variable contact between them, the sub-levers of each series being of uniform size, and the sub-levers of one series being sub-levers of the first order and the sub-levers of the other series being each fulcrumed at one end, and the pivotal centers of the sub-levers of each series being arranged in an arc, links intermediate one series of the sub-levers and the type bars, and links intermediate the other series of sub-levers and the key levers.

14. In a front strike typewriting machine, the combination of a series of type bars pivoted in an arc to swing upwardly and rearwardly to the printing point; finger keys; and intermediate actuating connections between the finger keys and type bars, said connections comprising two series of radially disposed cooperative sub-levers having variable contact between them and arranged in the rear of the type bars, substantially horizontally disposed links extending from one series of sub-levers to the type

bars, and operative connections between the sub-levers of the other series and the finger keys.

15. In a front strike typewriting machine, the combination of a series of type bars pivoted in an arc to swing upwardly and rearwardly to the printing point; finger keys; and intermediate actuating connections between the finger keys and type bars, said connections comprising two series of coöperative sub-levers having variable contact between them and arranged in the rear of the type bars, the pivotal centers of the sub-levers of each series being arranged in an arc, substantially horizontally disposed links extending from one series of sub-levers to the type bars, and operative connections between the sub-levers of the other series and the finger keys.
16. In a front strike typewriting machine, the combination of a series of type bars pivoted in an arc to swing upwardly and rearwardly to the printing point; finger keys; and intermediate actuating connections between the finger keys and type bars, said connections comprising two series of coöperative sub-levers arranged in downwardly and outwardly radiating planes, said sub-levers having variable contact between them and arranged in the rear of the type bars, the upper ends of the sub-levers of one of said series being arranged in an arc which corresponds substantially to the arc in which the type bars are pivoted, a series of substantially horizontally disposed links intermediate said ends of the sub-levers which are arranged in an arc and said type bars, and operative connections between the other series of sub-levers and the finger keys.
17. In a front strike typewriting machine, the combination of a series of type bars pivoted in an arc to swing upwardly and rearwardly to the printing point; finger keys; and intermediate actuating connections between the finger keys and type bars, said connections comprising two series of coöperative sub-levers arranged in downwardly and outwardly radiating planes, said sub-levers having variable contact between them and arranged in the rear of the type bars, the sub-levers of each series being of uniform size and the upper ends of the sub-levers of one of said series being arranged in an arc which corresponds substantially to the arc in which the type bars are pivoted, a series of substantially horizontally disposed links intermediate said ends of the sub-levers which are arranged in an arc and said type bars, and operative connections between the other series of sub-levers and the finger keys.
18. In a front strike typewriting machine, the combination of a series of type bars pivoted in an arc to swing upwardly and rearwardly to the printing point and mounted

for case shifting movement; finger keys; and intermediate actuating connections between said finger keys and type bars, said connections comprising a series of sub-levers of the first order, and a second series of sub-levers each fulcrumed at one end and coöperative with and having a variable contact on a sub-lever of the first mentioned series.

19. In a front strike typewriting machine, the combination of a series of type bars pivoted in an arc to swing upwardly and rearwardly to the printing point and mounted for case shifting movement; finger keys; and intermediate actuating connections between said finger keys and type bars, said connections comprising a series of sub-levers of the first order, a second series of sub-levers each fulcrumed at one end and coöperative with and having a variable contact on a sub-lever of the first mentioned series, the sub-levers of both series being arranged in the rear of the type bars and the sub-levers of each series being of uniform size.

20. In a front strike typewriting machine, the combination of a series of type bars pivoted in an arc to swing upwardly and rearwardly to the printing point and mounted for case shifting movement; finger keys; and intermediate actuating connections between said finger keys and type bars, said connections comprising a series of radially arranged sub-levers of the first order, a second series of radially arranged sub-levers each fulcrumed at one end and coöperative with and having a variable contact on a sub-lever of the first mentioned series, the sub-levers of both series being arranged in the rear of the type bars.

21. In a front strike typewriting machine, the combination of a series of type bars pivoted in an arc to swing upwardly and rearwardly to the printing point and mounted for case shifting movement; finger keys; and intermediate actuating connections between said finger keys and type bars, said connections comprising a series of radially arranged sub-levers of the first order, a second series of radially arranged sub-levers each fulcrumed at one end and coöperative with and having a variable contact on the sub-levers of the first mentioned series, the sub-levers of both series being arranged in the rear of the type bars and the sub-levers of each series having their fulcrums arranged in an arc.

22. In a front strike typewriting machine, the combination of a series of type bars pivoted in an arc to swing upwardly and rearwardly to the printing point and mounted for case shifting movement; finger keys; and intermediate actuating connections between said finger keys and type bars, said connections comprising a series of sub-levers of the first order situated in the rear of

the type bars and arranged in downwardly and outwardly radiating planes and having their upper ends arranged in an arc which corresponds substantially to the arc in which the type bars are pivoted, said sub-levers being of a uniform size, and a second series of radially arranged sub-levers each fulcrumed at one end and situated in the rear of the type bars and cooperative with one of said first mentioned sub-levers by a variable contact therewith, said second series of sub-levers likewise being of uniform size.

23. In a front strike typewriting machine, the combination of a series of type bars pivoted in an arc to swing upwardly and rearwardly to the printing point and mounted for case shifting movement; finger keys; and intermediate actuating connections between said finger keys and type bars, said connections comprising a series of sub-levers of the first order situated in the rear of the type bars and arranged in downwardly and outwardly radiating planes and having their upper ends arranged in an arc which corresponds substantially to the arc in which the type bars are pivoted, said sub-levers being of a uniform size, substantially horizontally disposed links extending from the upper ends of said sub-levers to the type bars, a second series of radially arranged sub-levers each fulcrumed at one end and situated in the rear of the type bars and cooperative with one of said first mentioned sub-levers by a variable contact therewith, said sub-levers of the second series likewise being of uniform size, the pivotal centers of the sub-levers of both series being arranged in an arc, and links intermediate the finger keys and the sub-levers of the second series.

24. In a front strike typewriting machine, the combination of a series of type bars pivoted in an arc to swing upwardly and rearwardly to the printing point; key levers; and intermediate actuating connections between said type bars and key levers, said connections comprising two series of cooperative sub-levers having a variable contact between them, said sub-levers being arranged in the rear of the type bars, a third series of sub-levers which are angular in form, operative connections between the key levers and angular sub-levers and between

one of the series of first mentioned sub-levers and type bars.

25. In a front strike typewriting machine, the combination of a series of type bars pivoted in an arc to swing upwardly and rearwardly to the printing point; key levers; and intermediate actuating connections between said type bars and key levers; said connections comprising two series of cooperative sub-levers having a variable contact between them, said sub-levers being arranged in the rear of the type bars, a third series of sub-levers which are angular in form, links intermediate the key levers and angular sub-levers, links between the angular sub-levers and one of the first mentioned series of sub-levers, and links between the other series of first mentioned sub-levers and the type bars.

26. In a front strike typewriting machine, the combination of a series of type bars pivoted in an arc to swing upwardly and rearwardly to the printing point, a series of finger keys, and intermediate actuating connections between the finger keys and type bars, said connections for each type bar comprising two sub-levers arranged edge to edge and having a rocking action one on the other, the construction and arrangement of the parts being such that a uniform leverage is afforded throughout the system and such that the type bars are gradually accelerated in their swinging movement from normal to printing position.

27. In a typewriting machine, the combination of a series of pivoted type bars; a series of finger keys; and intermediate actuating connections between the finger keys and type bars for swinging the type bars on their pivots to the printing position, said connections comprising two series of sub-levers radially arranged in upright arcs, the levers of one series working edge to edge with the levers of the other series.

Signed at the borough of Manhattan, city of New York, in the county of New York and State of New York this 12th day of July A. D. 1911.

JACOB FELBEL.

Witnesses:

E. M. WELLS,

CHARLES E. SMITH.