C. B. YAW.

TYPE WRITING MACHINE.

APPLICATION FILED JULY 16, 1909.

1,034,554.

Patented Aug. 6, 1912.

3 SHEETS—SHEET 1.

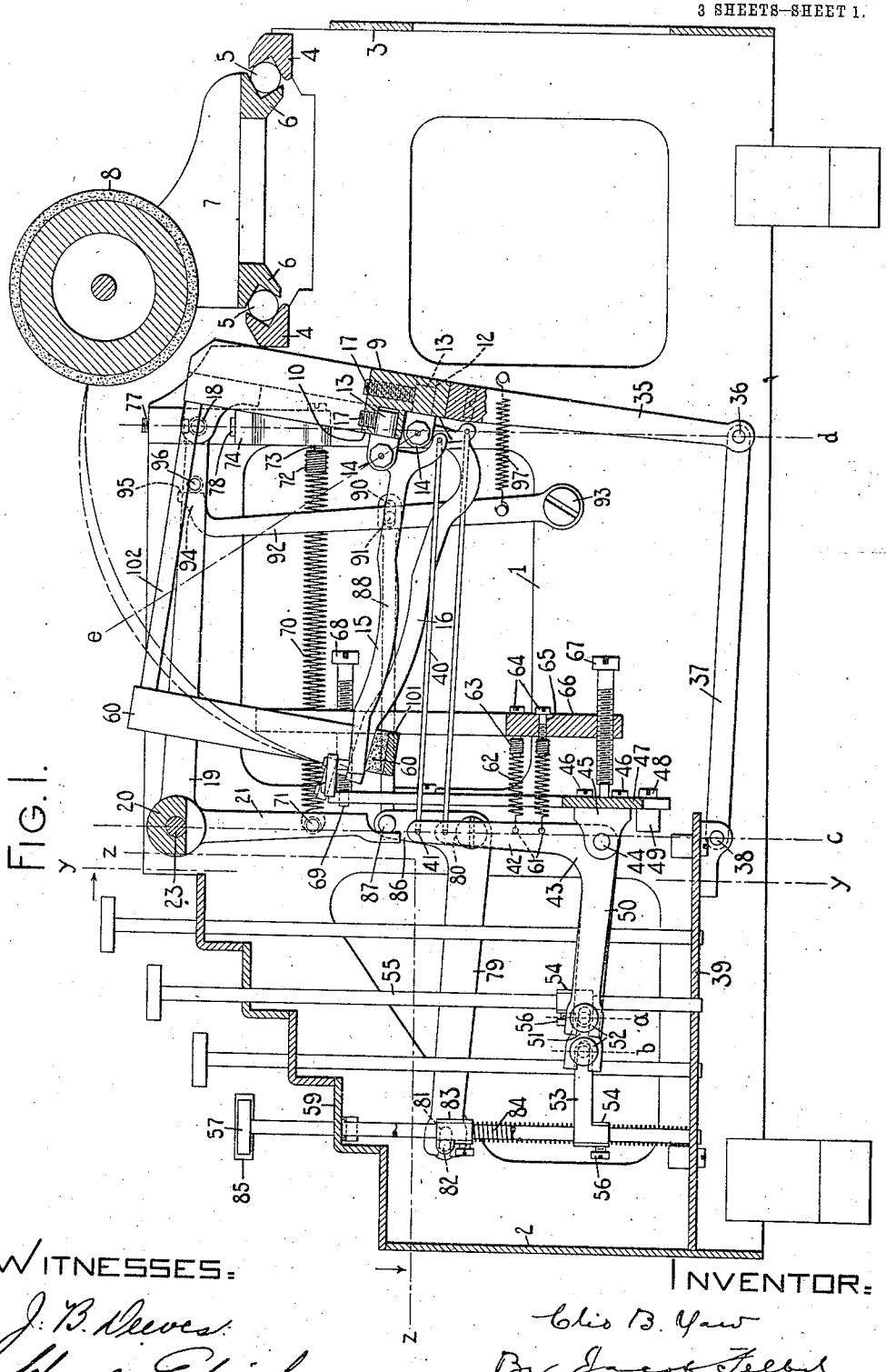

FIG. 1.

WITNESSES:

J. B. Reeves.

Wm. E. Smith

INVENTOR:

Chas B. Yaw

By Jacob Feeb

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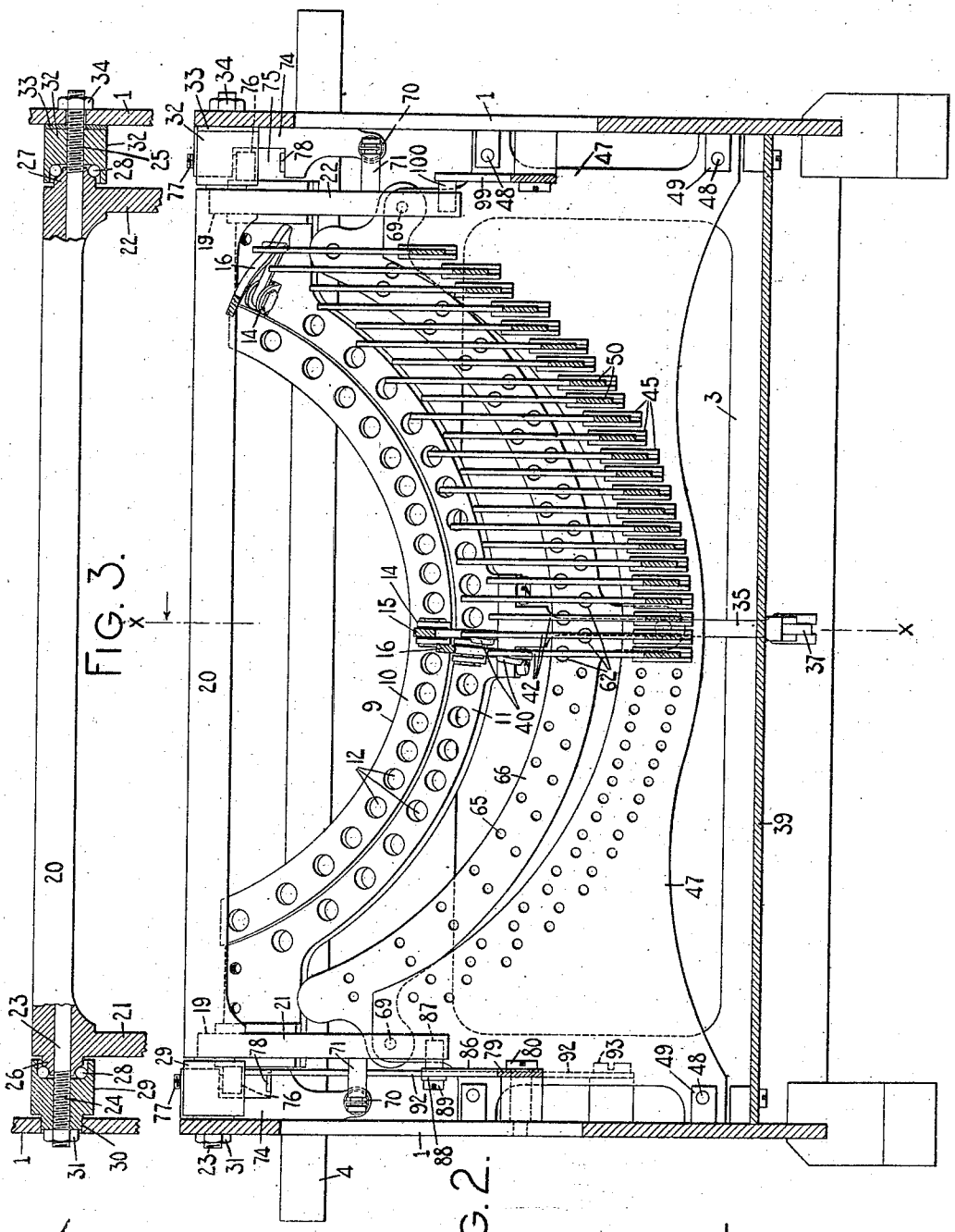

FIG. 2.

FIG. 3.

WITNESSES:

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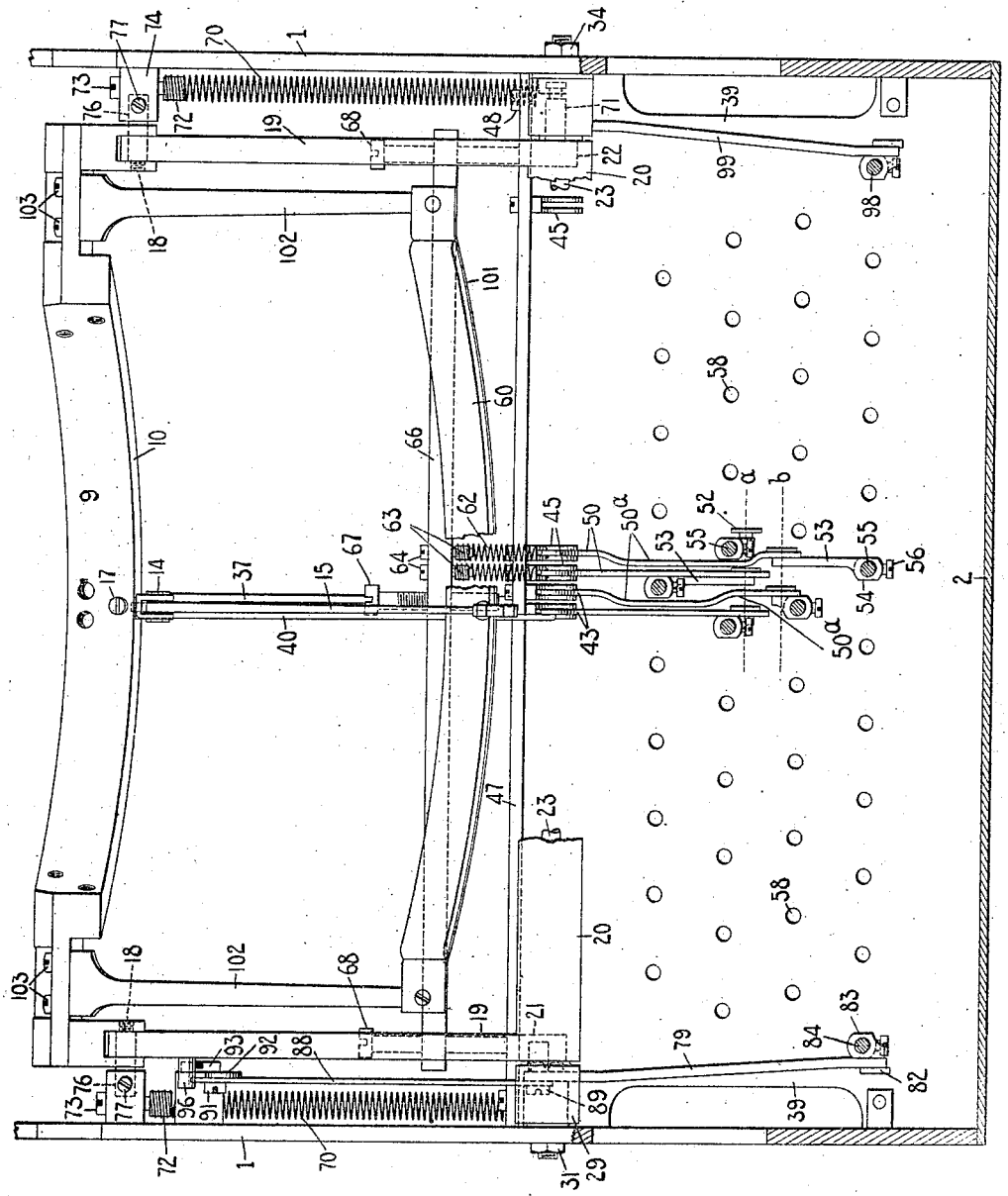

FIG. 4.

WITNESSES:

J. B. Reeves

Charles E. Smith

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By Jacob Fabel

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UNITED STATES PATENT OFFICE.

CLIO B. YAW, OF ARLINGTON, NEW JERSEY, ASSIGNOR, BY MESNE ASSIGNMENTS, TO UNION TYPEWRITER COMPANY, OF JERSEY CITY, NEW JERSEY, A CORPORATION OF NEW JERSEY.

TYPE-WRITING MACHINE.

1,034,554. Specification of Letters Patent. Patented Aug. 6, 1912.

Application filed July 16, 1909. Serial No. 507,919.

To all whom it may concern:

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

My invention relates to typewriting machines and more particularly to type actions and to means whereby the type bars may be shifted to change the case positions thereof.

One object of my invention is to provide an efficient and comparatively simple mechanism of the character described and at the same time to provide type actions which have an easy touch and a uniform leverage and in which a uniform extent of dip of the keys is provided throughout the key-board.

A further object of my invention is to provide means whereby the touch of the keys at one part or another of the key-board may be simultaneously altered, or the touch of the keys may be individually altered, or the touch of the keys in the entire key-board may be altered by means universal to all of the actions as may be desired.

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 set forth in the following specification and particularly pointed out in the appended claims.

In the accompanying drawings wherein like reference characters indicate corresponding parts in the different views, Figure 1 is a vertical central fore and aft sectional view of one form of typewriting machine embodying my invention, the section being taken on the line *x*—*x* of Fig. 2, and looking in the direction of the arrow at said line. Fig. 2 is a transverse sectional view of the same, taken on the line *y*—*y* of Fig. 1 and looking in the direction of the arrow at said line. Fig. 3 is a fragmentary detail front view, partly in section, of a portion of the case shifting mechanism. Fig. 4 is a fragmentary horizontal sectional view of the machine taken on the line *z*—*z* of Fig. 1.

I have shown my invention embodied in the present instance in a front-strike typewriting machine, in which the type bars receive shifting movements to change the case positions thereof. It should be understood, however, that from certain aspects of my invention the features thereof may be embodied in other styles of machines and from certain aspects of my invention it is not essential that the type bars be shifted to change the case positions thereof.

Heretofore great difficulty has been encountered in providing an efficient front-strike type action in which type bars received case shifting movements and the type bars were actuated by a forward pull from devices situated forward of the type bar segment. By my present construction I have overcome certain of the difficulties heretofore presented.

The frame of the machine comprises side plates 1, and front and rear cross plates 2 and 3 respectively which unite the side plates. Fixed grooved guide rails 4 receive anti-friction balls or rollers 5 which likewise cooperate with oppositely disposed grooved guide rails 6 of a carriage 7. The carriage supports a cylindrical platen 8 and is adapted to travel from side to side of the machine in the usual manner. A type bar segment 9 has two concentric stepped faces 10 and 11 apertured at 12 for the reception of stems 13 of type bar hangers 14. The two sets of type bar hangers are arranged in two concentric series and the hangers in the two series are staggered relatively to each other. From an inspection of Fig. 1 it will be seen that there are two sets of type bars 15 and 16 connected respectively with the upper and lower set of type bar hangers. The type bars of the two series alternate and the pivots thereof have what is known as the 45° angle arrangement, as indicated by the dotted line *e* in Fig. 1, whereby the two sets of type bars, although they are of different lengths extend the same distance forwardly in the machine. The type bar hangers are secured in place by set screws 17 received in tapped openings in the segment and extending transversely to the lengths of the stems of the hangers. The type bar segment 9 is pivoted at 18 to rearwardly extending parallel arms or links 19 secured at their forward ends to a rock shaft 20. The rock shaft 20 likewise has depending arms or projections 21 and 22 at opposite sides of

the machine. The parallel links or arms 19, the arms 21 and the portion 20 are preferably cast in one piece to form a case shift frame although they may be otherwise connected together. From an inspection of Fig. 3 it will be seen that the part 20 is hollow throughout its length and receives a shaft 23 which extends loosely therethrough and which is threaded at its ends as indicated at 24 and 25. The part 20 is also formed at its ends with bearings 26 and 27 for cooperation with anti-friction bearing balls or rollers 28. The bearing balls at the left-hand side of the machine are received in a companion cup or bearing 29 threaded onto the end 24 of the shaft 23. The cupped bearing member is provided at its outer end with a cylindrical reduced portion 30 which is received and bears loosely in a corresponding opening in the left-hand side plate 1 of the frame. A nut 31 is received on the left-hand threaded end of the shaft 23 to lock the bearing portion 29 in the position to which it may be adjusted along the shaft. At the right-hand end of the shaft 23 is a cup or bearing 32 which coöperates with and forms a bearing for the anti-friction balls at the right-hand end of the member 20. The bearing 32 is threaded onto the shaft at 25 and a washer 33 is received between the outer end of the bearing and the right-hand side plate 1 of the machine. The right-hand end of the shaft 23 extends through an opening in the right-hand side plate 1 and receives a nut 34 on the threaded end 25 of the shaft. By this arrangement the bearing 32 may be adjusted and held firmly against the right-hand side plate, the side plate being clamped on one side by the bearing member 32 and on the opposite side by the nut 34. The bearing 29 at the opposite end of the shaft may then be adjusted to take up any lost motion in the bearings, the member 29 being held in the position to which it is adjusted by the nut 31. The shaft 23 and bearing members 29 and 32 are thus held firmly against rotation and are secured to the frame of the machine, whereas the frame comprising the hollow rock shaft 20, arms 19, 21 and 22 may turn on the bearing balls 28 to afford an easy case shifting movement of the segment. A centrally disposed depending arm 35 is secured to the type bar segment and is pivoted at its lower end, as at 36, to a forwardly extending link 37. The forward end of this link is pivoted at 38 to a bracket secured to a horizontal guide plate 39. The link 37 is parallel with the arms 19 and is the same length as said arms so that the type bar segment is in effect mounted on substantially horizontally disposed parallel links for case shifting movement, the forward ends of said links or arms being anchored, whereas the rear ends thereof are pivotally connected to the type bar segment. The set of shorter type bars has its comparatively long crank arms connected to a segmental series of substantially horizontally disposed parallel pull links 40 which extend forwardly from the type bars and are connected at their forward ends, as at 41, to upright arms 42 of a set of angular levers 43 disposed in vertical parallel planes which extend fore and aft of the machine. These angular levers are segmentally arranged and are pivoted at 44 to hangers 45 secured by screws 46 to a segment 47 fixed by screws 48 to inwardly projecting lugs 49 on the side plates of the machine. The angular levers have forwardly extending arms 50 bifurcated or slotted at their forward ends, as at 51, for the reception of headed pins 52 which project laterally from arms or blocks 53 carried by and rigidly connected to key stems 55, so that each key stem and block are in effect one part and the key stems and angular levers are in this sense directly connected as distinguished from a connection between the parts effected through intermediate actuating links or levers. From an inspection of Fig. 4 it will be seen that the arms 53 vary in length for purposes which will hereinafter more clearly appear.

Each arm is formed as part of a sleeve 54 which surrounds a vertically disposed key stem 55 and is secured thereto by a set screw 56. By these means the sleeves 54 may be adjusted on their key stems in an arc-like arrangement corresponding to the arc-like arrangement of the horizontally disposed arms of the angular levers with which they connect. The longer set of type bars has its comparatively short crank arms operatively connected to the key stems in a like manner, the only difference being that the pull links 40 for the longer set of type bars are arranged concentrically with the links of the shorter type bars, but in an arc of greater radius and the pull links 40 for the longer set of type bars are connected to the angular levers at points nearer the fulcrums of said levers than are the links for the shorter set of type bars, as will be understood from an inspection of Fig. 1. As each upright arm 42 for the longest set of type bars is made shorter than the upright arms for the shorter set of type bars, the angular levers connected with the longer set of type bars have their horizontally disposed arms 50 extended forwardly farther from their fulcrums than the corresponding set of arms 50 of the angular levers for the shorter type bars. This is in order to provide a staggered arrangement of various parts of the different actions and to compensate for the variation in the length of the crank arms on the two sets of type bars. The construction is such as to provide a uniform leverage and a uniform dip of the keys through-

out the system, it being understood that the angular levers 43 for the longer set of type bars are all of the same size, whereas the angular levers for the shorter set of type bars are likewise all of one size and all of the angular levers are arranged with their pivots at progressively greater elevations from the center to the sides of the system in order that the upper ends of the upright arms of said levers may be positioned in arc-like arrangement corresponding to the arc-like arrangement of the pull links with which they have to coöperate.

In the present instance I have shown four banks of printing keys 57, each provided with a key stem 55 guided at its lower end in an opening 58 in the guide plate 39, and each guided at its upper end in an opening in a guide plate 59. From an inspection of Fig. 4 it will be seen that the arms 53 of the two forward banks of keys extend rearwardly from their key stems for connection with the horizontally disposed arms 50 of the angular levers, whereas the arms connected with the keys in the two rear banks extend forwardly from their key stems for connection with the horizontal arms 50 of the angular levers, so that the connection of all of the key stems with their angular levers is on the lines *a* and *b* in Fig. 4. This construction provides a staggered arrangement of the connections between the key stems and the arms 50 and also assists in providing a uniform dip and leverage of the different actions and in compensating for certain of the variations that exist between the actions of the two sets. It will also be understood that by connecting the angular levers with the key stems in the manner described an adjustment of the parts of each individual action may be readily effected. Thus, when a type bar is properly seated on its supporting pad 60, the set screw 56 of the associated type action may be loosened and the key positioned to its proper level in the key-board. The screw 56 may then be tightened and the parts are all properly adjusted, no further adjustment of the parts being necessary. Moreover, it will be understood that the weight of each key stem takes up any lost motion that may exist between the key and the point of connection 41 between the angular lever and its associated pull link.

From an inspection of Fig. 4 it will be seen that where necessary the horizontally disposed arms 50 of the angular levers are provided with lateral clearance bends, as indicated at 50ª to enable the key stems to pass freely between the horizontal lever arms and to afford clearance between the different parts.

From an inspection of Fig. 1 and from a comparison of the lines *c* and *d* it will be seen that the parallel pull links 40 are all substantially the same length as the parallel shift links 19 and 37 and are parallel therewith, and that the forward ends of the shift links where they connect at 41 with the angular levers, are in the same vertical transverse plane as the anchored ends of the shift links 19 and 37 as indicated by the line *c*; whereas the rear ends of the pull links 40 are in substantially the same vertical transverse plane as the rear pivoted ends of the shift links 19 and 37, as indicated by the line *d*. By this arrangement a shifting movement of the segment may be effected without altering the parallelism maintained between the pull links 40 and the shift links 19 and 37. In short, this parallelism is maintained whether the type bar segment be in the upper or in the lower case position. In the shifting movement of the segment the rear ends of the pull links 40 shift with the segment, the links turning on their pivotal points of connection 41 with the angular levers while the angular levers and the key stems, which are carried by a fixed portion of the machine, remain at rest.

Each angular lever is connected at 61 with a contractile restoring spring 62, the opposite end of the spring having its convolutes threaded onto an exteriorly and interiorly threaded nut 63. A headed screw 64 passes loosely through an opening 65 in a segmental adjusting member or plate 66. By turning the screw 64 it will be threaded into or out of the associated nut 63, thus increasing or decreasing the tension exerted by the restoring spring 62, thereby giving an individual adjustment for each type action to vary its touch. The screws 64 are arranged in two concentric segmental series the arcs of which have radii of different lengths and the points of connection 61 between the restoring springs and the upright arms of the angular levers are at different distances from the fulcrums 44 of said levers. Moreover, the screws and springs are staggered as indicated in Fig. 2. This disposition of the springs and their adjusting screws provides ample room for the restoring springs so that the requisite number of springs for a full complement of type actions may be provided in the comparatively small arc in which they should be mounted without unduly crowding the springs and their adjusting means and without any liability of the springs conflicting one with another. Furthermore, the springs are mounted so as to exert their force on the levers in accordance with the variations in the length of the upright arms thereof. It is sometimes desirable to provide a harder or a lighter touch at one part or another of the keyboard, depending upon the operator. Thus, in some cases an operator has a heavier stroke with the right-hand than with the left and it is desirable to provide a

slightly harder touch at the right-hand side of the key-board than at the left. In order to provide a construction by which the keys at different portions of the key-board may be given a harder or lighter touch without adjusting each type action individually or the restoring springs therefor, I have provided a construction by which the ends stated may be readily accomplished. Thus, the segmental adjusting member or plate 66 is tapped to receive a centrally disposed screw 67 and two terminal screws 68. The two screws 68 are arranged near the upper ends of the segment, whereas the screw 67 is arranged at the central portion thereof, as indicated in Figs. 1 and 2. The screws 68 are each reduced at its forward end as indicated at 69 and is loosely received in an opening in the fixed segmental plate 47, the shoulder formed by the reduced portion bearing against the rear face of the plate 47. The centrally disposed screw 67 bears at its forward end against the rear flat face of the plate 47, thus forming a three point bearing for the plate 66. In this manner the segmental adjusting plate 66 is supported in place by the fixed segment 47, the pressure of the springs 62 maintaining the screws in contact with the fixed segment. By adjusting a screw 68 at one side of the machine the segmental adjusting plate or member 66 is moved at one end accordingly nearer to or farther from the fixed segment 47, thereby varying the pressure of the springs 62 at the end of the adjusting member 66 which has been adjusted. The variation in the adjustment of the springs 62 is greatest at or near the point of adjustment of the plate 66 and gradually diminishes as the opposite end or side of the plate is reached, where the springs will not be affected or appreciably affected by the adjustment of the opposite end of the adjusting plate. If, on the other hand, it is desired to vary the tension of the springs for those keys which are at the center of the key-board without affecting, or appreciably affecting, the springs for the keys at the sides of the key-board, an adjustment of the screw 67 may be effected. Then again, if it is desired to effect a universal adjustment in the pressure of all the springs to a like degree so that a variation in the touch to a like degree may be effected throughout the key-board, then it is merely necessary to adjust all three of the screws 67 and 68 in a like manner, thus effecting a universal adjustment of the restoring springs throughout the system to a like degree. It will be seen, therefore, that I have provided means whereby the tension of the springs 62 may be individually adjusted to vary the touch, or whereby an increase or decrease in the pressure of a plurality of the springs may be simultaneously effected without affecting the others, in order to provide for a variation in the touch at different parts of the key-board, or whereby the restoring springs for the entire system of type actions may be adjusted by universal means to a like degree, so that the touch of the keys throughout the system may be varied alike.

From certain aspects of my invention any suitable means may be employed for effecting a case shifting movement of the segment. However, I preferably provide means whereby the type bar segment is normally maintained in the elevated position and is shifted downwardly for upper case writing. Thus, contractile springs 70 are each secured at one end to a laterally projecting pin 71 on a depending arm 21 or 22 or the shiftable frame. The opposite end of each spring has its convolutes threaded on exterior threads of a nut 72 which nut is likewise interiorly threaded for coöperation with a headed screw 73 which passes freely through an opening in an inwardly extending projection or lug 74 on a side plate 1 of the frame. These lugs are each recessed as at 75 to receive the prolongation 76 of a pivot 18 which connects the rear ends of the arms 19 to the type bar segment. The upper end of each lug 74 is tapped to receive a screw stop 77, the lower end of which extends into the recess 75 in the associated lug and coöperates with a pin 76 to limit the shifting movement of the segment in one direction. Each pin 76 also coöperates with a stop 78 to limit the shifting movement of the segment in an opposite direction. The springs 70 thus exert a pressure to maintain the segment in the elevated position shown in Fig. 1 with the projecting ends 76 of the pivots 18 in contact with the screw stops 77.

In order to shift the segment downwardly from the lower to the upper case position and to lock it in such shifted position when desired I have provided an angular lever 79 pivoted to the left-hand side plate 1 of the frame on a shouldered pivot screw 80. The forward end of the lever 79 is bifurcated at 81 to receive a laterally projecting pin 82 on a collar 83 which is fixed to a stem 84 of a temporary shift key 85. An upwardly extending arm 86 of the lever 79 is provided with a laterally projecting pin 87 which coöperates with the depending arm 21 of the case shifting frame. A rearwardly extending link 88 is pivoted on a shouldered screw at 89 to the upright arm of the angular shift lever 79 and extends rearwardly therefrom and is slotted at its rear end as indicated at 90. This slot receives a laterally projecting pin 91 which projects from an upright locking lever 92 pivoted on a shouldered pivot screw 93 to the left-hand side plate 1 of the frame. The

upper end of the locking lever is provided with a hook-like portion 94 which has a flat face 95 that bears against a pin 96 on the left-hand shift link or arm 19 when the segment is in the normal position shown in Fig. 1. When, however, the type bar segment is shifted to the lowermost position the hook-like end of the locking lever is, under certain conditions which will hereinafter appear, moved by a spring 97 over the pin 96 and locks the segment in its lowermost shifted position. The shift key 85 is situated at the left-hand side of the keyboard and is in the nature of a temporary shift key employed when it is desired to shift the segment to write one or more upper case characters, the segment being restored to normal position when pressure on the key 85 is released. When the shift key 85 is depressed it is effective to move the arm 21 forwardly, thus moving the segment from the elevated position to the lower position to change the case position of the type bars. During this depression of the key 85 the link 88 receives a forward movement. It will be observed from Fig. 1 that the pin 91 is at the forward end of the slot 90 in the link so that during the case shifting movement, effected by the depression of a key 85, a lost motion will be effected between the link 88 and the locking lever 92. At the completion of the case shifting movement effected by a depression of the key 85, the rear end of the slot 90 will be brought into coöperation with the pin 91 so as to prevent the locking lever from moving rearwardly to bring its hook-like portion 94 over the pin 96, thus retaining the locking lever out of locking position so that at this time the segment is not locked and is free to return to normal position when pressure is released on the shift key 85. Thus, as pressure on the shift key 85 is released the segment will be moved upwardly by the springs 70 and the locking lever will be retained in its unlocked position until such time as the pin 96 is moved into coöperation with the flat face 95 of the locking lever which prevents a rearward movement of the locking lever under the pressure of the spring 97. I have also provided at the right-hand side of the keyboard a permanent shift key or locking shift key connected to a key stem 98 connected to a shift lever 99 in the same manner that the key stem 84 of the temporary shift key is connected to its shift lever. Moreover, the shift lever 99 is constructed and mounted in the same manner as the shift lever 79 but there is no connection with a link and lever corresponding to the link 88 and the locking lever 92. The permanent shift lever 99 is merely provided with a laterally projecting pin 100 which coöperates with the depending shift arm 22 of the shift frame and is effective, on the depression of the right-hand permanent shift key, to move the arm 22 forwardly, thereby effecting a downward shift of the type bar segment. At this time the arm 21 will move forwardly, being rigidly connected with the arm 22, without affecting the shift key 85 and the parts connected therewith at the opposite side of the machine. The lever 79 and link 88 being in the normal position shown in Fig. 1 when the right-hand or permanent shift key is depressed, enables the pin 91 to move to the right in the slot 90 as the parts are shown in Fig. 1, so that the locking lever is released and at this time is free to move rearwardly and hook over the pin 96 and thus retain indefinitely the segment in its shifted position. Should the operator desire to release the segment from its shifted position it is merely necessary to depress the temporary shift key 85 and the temporary shift key is effective to move the locking lever 92 back to the unlocking position as soon as the pin 91 is seated in the rear end of the slot 90 of the link 88 and to disengage the locking lever 92 from the pin 90, thus enabling the segment to be restored to its normal position.

The pad 60 on which the free ends of the type bars are supported receives its support from a segmental strip 101 connected at its ends to forwardly extending bracket arms 102 secured by screws 103 to the type bar segment so that the type rest will be shifted with the type bar segment in its case shifting movements.

It will be observed that so far as either of the two series of type bars, connecting rods, bell cranks and key stems is concerned, the construction embodies type bars that are arranged in a segmental series; a series of forwardly extending pull links and bell cranks that are likewise segmentally arranged; that the bell cranks have their pivots or fulcra all arranged in substantially the same transverse vertical plane and comprise a series of upwardly extending lever arms and a series of forwardly extending lever arms; that the forwardly extending lever arms are of the same length and terminate at a single plane transversely of the machine about centrally of the keyboard; that there are a plurality of transverse rows or banks of key stems which have a vertically sliding movement; that there are a plurality of couplings or connecting arms extending different distances from different rows or banks of key stems; and that such couplings or connections are attached to said lever arms in substantially a single vertical plane across the machine and parallel with the rows of key stems and at equal distances from the fulcra of said lever arms so that the keys in different transverse rows have

substantially the same leverage on all of said series of type bars, whereby there is a uniform or substantially uniform leverage throughout the series. From certain aspects of my invention it is immaterial whether the parts referred to above are arranged in a single series, or in a double series as herein shown.

Various changes may be made without departing from the spirit of my invention.

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

1. In a front-strike typewriting machine, the combination of a series of segmentally arranged upwardly and rearwardly striking type bars, a series of type bar actuating links connected directly with and extending forwardly from said type bars, a series of angular levers having upright arms connected with said links and also having forwardly extending arms projecting to the keyboard of the machine, a series of key stems directly connected with the forwardly extending arms of the angular levers, and parallel shift links or arms which are substantially parallel with the actuating links and on which the series of type bars are shifted and by which they are guided in their shifting movements, the actuating links and shift links being substantially coextensive in length.

2. In a front-strike typewriting machine, the combination of a shiftable type bar segment, a series of segmentally arranged upwardly and rearwardly striking type bars mounted on said segment, a series of type bar actuating links extending forwardly from said type bars, a series of segmentally arranged angular levers having upright arms connected with said links and also having forwardly extending arms, a series of key stems separate from but directly connected with the forwardly extending arms of the angular levers at different elevations, and parallel shift links or arms which are substantially parallel with the actuating links and on which the type bar segment is shifted and by which it is guided.

3. In a front-strike typewriting machine, the combination of a series of segmentally arranged upwardly and rearwardly striking type bars, a series of type bar actuating links directly connected with and extending forwardly from said type bars, a series of angular levers having upright arms connected with said links and also having forwardly extending arms, a series of key stems distinct from said angular levers, means coöperative with each of said key stems at the upper and lower end portions thereof for guiding it, and adjustable means for directly connecting said key stems with the forward arms of said angular levers.

4. In a front-strike typewriting machine, the combination of a series of segmentally arranged upwardly and rearwardly striking type bars, a series of type bar actuating links extending forwardly therefrom, a series of angular levers having upright arms connected with said links and also having forwardly extending arms, a series of key stems, and a series of connecting devices each rigidly and adjustably connected to a key stem and connecting directly with a forwardly extending arm of one of said angular levers.

5. In a front-strike typewriting machine, the combination of a series of segmentally arranged upwardly and rearwardly striking type bars, a series of type bar actuating links extending forwardly therefrom, a series of angular levers having upright arms connected with said links and also having forwardly extending arms, a series of key stems, a series of blocks each adjustably secured to a key stem, and pin and slot connections between said blocks and the forwardly extending arms of said angular levers.

6. In a front-strike typewriting machine, the combination of a series of segmentally arranged upwardly and rearwardly striking type bars, a series of type bar actuating links extending forwardly therefrom, a series of angular levers having upright arms connected with said links and also having forwardly extending arms, a series of key stems, a series of blocks, set screws for connecting the blocks to said key stems and for affording a relative up and down adjustment between each key stem and the block connected therewith, and a pin carried by each of said blocks and received in a slot in the forwardly extending arm of one of said angular levers.

7. In a front-strike typewriting machine, the combination of a shiftable type bar segment, a series of segmentally arranged upwardly and rearwardly striking type bars carried by said segment, a series of type bar actuating links connected directly with and extending forward from said type bars, a series of angular type bar actuating levers carried by a fixed portion of the machine and connected to the forward ends of said actuating links, a series of key stems distinct from said angular levers, and adjustable devices each directly connecting a key stem with one of said angular levers.

8. In a front-strike typewriting machine, the combination of a shiftable type bar segment, a series of segmentally arranged upwardly and rearwardly striking type bars carried by said segment, a series of type bar actuating links extending forward from said type bars, a series of angular type bar actuating levers carried by a fixed portion of the machine and connected to the forward ends of said actuating links, a series of key stems, a series of blocks each adjustably and rigidly connected to a key stem, a pin and

slot connection between each of said blocks and one of said angular levers, parallel shift links substantially parallel with said actuating links and on which said segment is shifted, and key actuated means for shifting said segment.

9. In a front-strike typewriting machine, the combination of a shiftable type bar segment, a series of segmentally arranged upwardly and rearwardly striking type bars carried by said segment, a series of type bar actuating links extending forward from said type bars, a series of angular type bar actuating levers carried by a fixed portion of the machine and having upright arms connected to the forward ends of said actuating links and also having forwardly extending arms, a series of key stems, a series of blocks, set screws for connecting the blocks to said key stems and for affording a relative up and down adjustment between each key stem and the block connected therewith, a pin carried by each block and received in a slot in a forwardly extending arm of one of said angular levers, parallel shift links substantially parallel with said actuating links and on which said segment is shifted, and key actuated means for shifting said segment.

10. In a typewriting machine, the combination of a type bar, an actuating lever therefor, a key stem carrying a key, a connecting device for rigidly and adjustably connecting said key stem with said type bar actuating lever, and means for affording a vertical adjustment of said key stem relatively to the type bar actuating lever and relatively to the said connecting device, whereby the key stem with the key head carried thereby may be vertically adjusted.

11. In a typewriting machine, the combination of a type bar, an actuating device therefor, a key stem, a block adjustably secured to said key stem, and a pin and slot connection between said block and type bar actuating device.

12. In a typewriting machine, the combination of a type bar, an actuating device therefor, a key stem, a block, a set screw for connecting said block and key stem and for affording a relative up and down adjustment between the key stem and block, and a pin carried by said block and received in a slot in said type bar actuating device.

13. In a front-strike typewriting machine, the combination of a series of segmentally arranged upwardly and rearwardly striking type bars, a series of actuating links that extend forwardly from said type bars, a series of angular levers pivoted on fixed fulcrums, upper and lower perforated guide plates, key stems that work in the perforations in said guide plates, and adjustable means by which the key stems are adjustably and directly connected to said angular levers.

14. In a front-strike typewriting machine, the combination of a series of segmentally arranged upwardly and rearwardly striking type bars, a series of actuating links that extend forwardly from said type bars, a series of angular levers of a substantially uniform size and mounted at gradually higher elevations from the center to the sides of the machine, upper and lower perforated guide plates, and key stems that work in the perforations in said guide plates and which are directly connected to said angular levers.

15. In a front-strike typewriting machine, the combination of a series of segmentally arranged upwardly and rearwardly striking type bars, a series of actuating links that extend forwardly from said type bars, a series of angular levers of a substantially uniform size, upper and lower perforated guide plates, key stems that work in the perforations in said guide plates and which are separate from but are directly connected to said angular levers by pin and slot connections.

16. In a front-strike typewriting machine, the combination of a series of segmentally arranged upwardly and rearwardly striking type bars, a shiftable segment on which said type bars are mounted, a series of actuating links that extend forwardly from said type bars, a series of angular levers mounted on a fixed portion of the machine, upper and lower perforated fixed guide plates, key stems that work in the perforations in said guide plates and which are directly connected to said angular levers, and parallel shift links or arms on which said segment is mounted, said arms being substantially parallel and coextensive in length with said actuating links and maintaining such substantial parallelism in both the upper and lower case positions of the segment.

17. In a front-strike typewriting machine, the combination of type bars pivoted in two concentric arcs one forward of and having a shorter radius than the other, two sets of links which extend forwardly from said type bars, the said links being arranged in two concentric arcs, one of which arcs has a shorter radius than the other, two sets of angular levers pivoted in an arc the upright arms of which levers terminate in arcs corresponding to the arrangement of said links and which arms are connected to said links, and key stems directly connected to forwardly extending arms on said angular levers.

18. In a front-strike typewriting machine, the combination of a shiftable segment, type bars carried by said segment and pivoted in two concentric arcs one forward of and having a shorter radius than the other, two sets of actuating links which

extend forwardly from said type bars, the said links being arranged in two concentric arcs, one of which arcs has a shorter radius than the other, two sets of segmentally arranged angular levers pivoted on a fixed part of the machine and the upright arms of which levers terminate in arcs corresponding to the arrangement of said links and which arms are connected to said links, key stems directly connected to said angular levers, and parallel shift arms or links on which said segment is shifted, said links being substantially parallel with said actuating links when the segment is in both the upper and lower case positions.

19. In a front-strike typewriting machine, the combination of a series of angular levers having forwardly projecting arms and upwardly projecting arms, a series of key stems which are connected to said forwardly projecting arms and certain of which key stems work between the said forwardly projecting arms, a series of upwardly and rearwardly striking type bars, and a series of actuating links between said upwardly projecting arms and the type bars.

20. In a typewriting machine, the combination of a series of angular levers having forwardly projecting arms with clearance bends therein and upwardly projecting arms, a series of key stems which are connected to said forwardly projecting arms and certain of which key stems work between the said forwardly projecting arms, upper and lower perforated guide plates in which said key stems work in the perforations therein, a series of type bars, and a series of actuating links between said upwardly projecting arms and the type bars.

21. In a typewriting machine, the combination of a series of angular levers having forwardly projecting arms and upwardly projecting arms, a series of key stems which are connected to said forwardly projecting arms and certain of which key stems work between the said forwardly projecting arms, a series of type bars, a series of actuating links between said upwardly projecting arms and the type bars, a shiftable segment which carries said type bars, and parallel shift links or arms which are substantially parallel with said actuating links when the segment is in either the upper or lower case position.

22. In a front-strike typewriting machine, the combination of a series of angular levers pivoted to a fixed portion of the machine and having forwardly projecting arms and upwardly projecting arms, a series of key stems which are connected directly to said forwardly projecting arms and certain of which key stems work between the said forwardly projecting arms, a series of upwardly and rearwardly striking type bars, a series of actuating links between said upwardly projecting arms and the type bars, a shiftable segment which carries said type bars, parallel shift links or arms which are substantially parallel with said actuating links when the segment is in either the upper or lower case position, and means for shifting said segment.

23. In a front-strike typewriting machine, the combination of a series of angular levers pivoted to a fixed portion of the machine and having forwardly projecting arms with clearance bends therein and upwardly projecting arms, a series of key stems which are connected directly to said forwardly projecting arms and certain of which key stems work between the said forwardly projecting arms, upper and lower perforated guide plates in which said key stems work in the perforations therein, a series of upwardly and rearwardly striking type bars, a series of actuating links between said upwardly projecting arms and the type bars, a shiftable segment which carries said type bars, parallel shift links or arms which are substantially parallel with said actuating links when the segment is in either the upper or lower case position, and means for shifting said segment.

24. In a typewriting machine, the combination of a series of type bars, a series of segmentally arranged angular levers, the two sets of the arms of which are proportionately the same size throughout the series, one arm of each of the angular levers extending to the keyboard of the machine, links directly connecting said type bars and angular levers, and key stems separate from but connected directly to said angular levers.

25. In a front-strike typewriting machine, the combination of a series of upwardly and rearwardly striking type bars, a series of angular levers which vibrate in vertical parallel planes that extend fore and aft of the machine, the two sets of the arms of said angular levers being of proportionately the same size throughout the series, actuating links which extend fore and aft of the machine between said type bars and angular levers, key stems separate from but connected directly to said angular levers, a shiftable segment which carries said type bars, and shift links or arms on which said segment is mounted, said shift links being substantially co-extensive in length with said actuating links and substantially parallel with said actuating links when the segment is in either the upper or lower case position.

26. In a typewriting machine, the combination of a series of type actions; restoring springs therefor; and means for simultaneously increasing or decreasing the pressure of some of said springs without affecting the others, said means comprising a plate or frame to which said restoring springs are

connected, and a three-point adjustment for said plate or frame.

27. In a front-strike typewriting machine, the combination of a series of type actions including upwardly and rearwardly striking type bars; restoring springs for said type actions; and means for simultaneously increasing or decreasing the pressure of some of said springs without affecting the others, said means including a substantially vertically disposed segmental plate to which said restoring springs are connected, and individually adjustable means coöperative with said segmental plate for affording a swinging adjustment of the plate at different portions thereof.

28. In a typewriting machine, the combination of a series of type actions; restoring springs therefor; and means for simultaneously increasing or decreasing the pressure of some of said springs without affecting the others, said means including a plate or frame to which said springs are connected, and individual means for effecting a swinging adjustment of said plate around different axes which are at angles to each other.

29. In a typewriting machine, the combination of a series of type actions, restoring springs therefor, a plate or frame to which said springs are connected, and means for adjusting the center of the plate or frame independently of the ends to effect a variation in the pressure of those springs which are connected at and near the center of the plate or frame without affecting the springs connected to the end portions of the plate or frame.

30. In a typewriting machine, the combination of a series of type actions, restoring springs therefor, a plate or frame to which said springs are connected, and individual means for adjusting either end of the plate or frame independently of the other or for adjusting the plate or frame at the center thereof independently of the ends as may be desired, whereby the springs connected with the plate or frame at either end or at the center may be adjusted independently of the others or whereby all of the springs may be adjusted to a like extent.

31. In a typewriting machine, the combination of a series of type actions, restoring springs therefor, a plate or frame to which said springs are connected, individual means for adjusting either end of the plate or frame independently of the other or for adjusting the plate or frame at the center thereof independently of the ends as may be desired, whereby the springs connected with the plate or frame at either end or at the center may be adjusted independently of the others or whereby all of the springs may be adjusted to a like extent, and individual adjusting means for effecting an individual variation in the pressure exerted by said springs.

32. In a typewriting machine, the combination of a series of type actions, a series of restoring springs each connected at one end to a member of the associated type action, a segmental plate or frame adapted to receive a bodily movement and to which the opposite end of each spring is connected, and three individually adjustable screws by which said plate or frame is supported and adjusted, one of said screws being located near each end of the segmental plate or frame and one near the middle thereof.

33. In a typewriting machine, the combination of a series of type actions, a series of restoring springs each connected at one end to a member of the associated type action, a segmental plate or frame adapted to receive a bodily movement and to which the opposite end of said screw is connected, and three individually adjustable screws by which said plate or frame is supported and adjusted, one of said screws being located near each end of the segmental plate or frame and one near the middle thereof, said screws being threaded into the said segmental plate or frame and bearing at their free ends against a fixed part of the machine and resisting the pressure of said springs.

34. In a typewriting machine, the combination of a platen, type bars, and means for effecting a relative case shifting movement between said type bars and platen, said case shifting means comprising a shift frame, a fixed shaft that extends through said shift frame, roller bearings on said shaft, roller bearings on the shift frame, and antifriction rollers between said bearings for supporting said shift frame.

35. In a typewriting machine, the combination of a platen, type bars, and means for effecting a relative case shifting movement between said type bars and platen, said case shifting means comprising a shift frame, a shaft detachably fixed to the frame of the machine, roller bearings adjustable on said shaft, roller bearings on the shift frame, and anti-friction rollers between said bearings for supporting said shift frame.

36. In a typewriting machine, the combination of a platen, type bars, and means for effecting a relative case shifting movement between said type bars and platen, said case shifting means comprising a shift frame mounted on ball bearings and having rearwardly extending parallel arms fixed thereto and connected to the part to be shifted, a link of a length corresponding substantially to the length of and parallel with said arms and connected to the part to be shifted, and key actuated means for shifting the part to be shifted on said arms and link and for turning said shift frame.

37. In a typewriting machine, the com-

bination of a platen, type bars, and means for effecting a relative case shifting movement between said type bars and platen, said case shifting means comprising a shaft, means for detachably and fixedly connecting said shaft to the frame of the machine, a case shift frame having an opening therethrough for the free passage therethrough of said shaft, ball bearings between said shaft and said shift frame, means for adjusting said ball bearings, a connection between said shift frame and the part to be shifted, and key actuated means for shifting said frame.

38. In a typewriting machine, the combination of a platen, type bars, and means for effecting a relative case shifting movement between said type bars and platen, said case shifting means comprising a shift frame pivoted to the frame of the machine and having arms directly connected with the part to be shifted and also having actuating arms at opposite sides of the machine, angular shift levers coöperative directly with said actuating arms, a locking lever, a spring which tends to force the locking lever into engagement with said shift frame, and a lost motion connection between one of said angular shift levers and said locking lever, whereby on the actuation of one of said shift levers the locking lever will be held out of operation and on the actuation of the other of said levers the locking lever is rendered effective.

39. In a typewriting machine, the combination of a platen, type bars, and means for effecting a relative case shifting movement between said type bars and platen, said case shifting means comprising a shift frame pivoted to the frame of the machine and having arms directly connected with the part to be shifted and also having actuating arms at opposite sides of the machine, angular shift levers coöperative directly with said actuating arms, a locking lever, a spring which tends to force the locking lever into engagement with said shift frame, a link pivoted to one of said angular shift levers and having a pin and slot connection with said locking lever, and separate keys at opposite sides of the key-board for actuating said angular levers, whereby on the actuation of one of said shift levers the locking lever will be held out of operation and on the actuation of the other of said levers the locking lever is rendered effective.

40. In a front strike typewriting machine, the combination with a platen, of a series of segmentally arranged type bars, a series of forwardly extending pull links of substantially the same length and connected at their rear ends to said type bars, a series of segmentally arranged bell cranks having their pivots or fulcra all arranged in substantially the same vertical plane, and having a series of upwardly extending and a series of forwardly extending arms, the forward ends of the pull links being connected to the upwardly extending arms, a series of vertically movable stem keys, and means thereon for directly coupling said stem keys to the free ends of the forwardly extending arms of the said bell cranks.

41. In a front strike typewriting machine, the combination of a series of upwardly and rearwardly striking type bars; a series of key stems arranged in different banks; and intermediate actuating connections between said key stems and type bars, said connections comprising a series of angular levers having their pivots arranged in a single transverse plane and having one set of the arms thereof extending to the key-board of the machine, said angular levers being separate from but connected to the key stems, and means by which direct connection is effected between the key stems and angular levers in a single plane across the machine.

42. In a front strike typewriting machine, the combination of a series of upwardly and rearwardly striking type bars; a series of key stems arranged in different banks; and intermediate actuating connections between said key stems and type bars, said connections comprising a series of segmentally arranged angular levers having their pivots arranged in a single transverse plane and having one set of the arms thereof extending to the keyboard of the machine, said angular levers being separate from but connected to the key stems, and arms extending varying distances fore and aft of the machine from said stems and by which direct connection may be effected between the key stems and angular levers.

43. In a front strike typewriting machine, the combination of a series of upwardly and rearwardly striking type bars; a series of key stems arranged in different banks; and intermediate actuating connections between said key stems and type bars, said connections comprising two series of angular levers each series having their pivots arranged in a single transverse plane and having one set of the arms thereof extending to the keyboard of the machine, said angular levers being separate from but connected to the key stems, and means by which direct connection is effected between certain of the key stems in different banks and angular levers of each series in a single plane across the machine so that the points of connection between the two series of angular levers and the key stems are in two parallel planes across the machine.

44. In a typewriting machine, the combination with a series of type bars, a series of forwardly projecting lever arms connected to said type bars, a plurality of

transverse rows of stem keys, and connections extending respectively from said key stems to the terminal ends of said lever arms; whereby the different keys of the different transverse rows have substantially the same leverage on their respective type bars.

45. In a typewriting machine, the combination of a series of type bars, a series of lever arms projecting forwardly to the same extent and operatively connected to said type bars, a plurality of transverse rows of stem keys, and a series of couplings or connections extending from said stem keys to the terminal ends of the lever arms and there connected in a row substantially parallel with said rows of stem keys, whereby equal leverage is obtained for all of said lever arms and type bars.

46. In a typewriting machine, the combination of a series of type bars, a series of forwardly projecting lever arms of equal length and terminating substantially in a single plane transversely of the keyboard, a plurality of transverse parallel rows of sliding key stems, and a plurality of couplings of different lengths extending from said key stems to the terminal ends of said lever arms and connected thereto at substantially equal distances from the fulcra of said lever arms; whereby though the transverse rows of key stems are arranged at different distances from the fulcra of said levers they are all connected at substantially the same distance from the said fulcra thus providing for equal leverage in different rows or banks of keys.

47. In a typewriting machine, the combination of a series of type bars, a series of bell crank levers having upwardly extending and forwardly extending arms, a series of links connecting the type bars with the upwardly extending arms, a plurality of transverse rows of stem keys, and a plurality of couplings connecting said stem keys with said forwardly extending arms at substantially the same distance from the fulcra of said levers.

Signed at the borough of Manhattan, city of New York, in the county of New York and State of New York this 15th day of July A. D. 1909.

CLIO B. YAW.

Witnesses:
CHARLES E. SMITH,
J. B. DEEVES.