July 12, 1938. R. G. THOMPSON 2,123,756

TYPEWRITING MACHINE

Filed Feb. 20, 1937 4 Sheets-Sheet 1

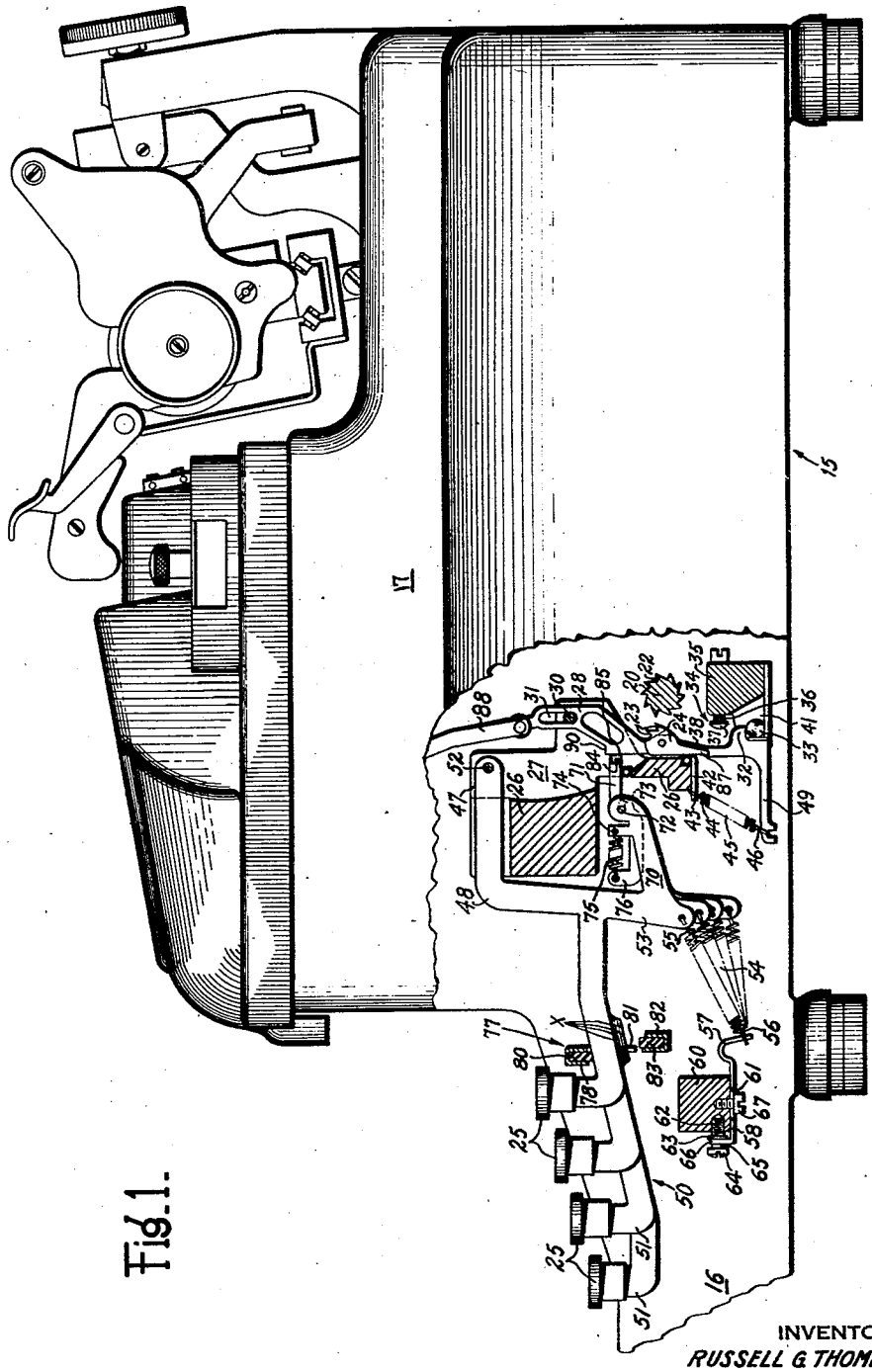

Fig.1.

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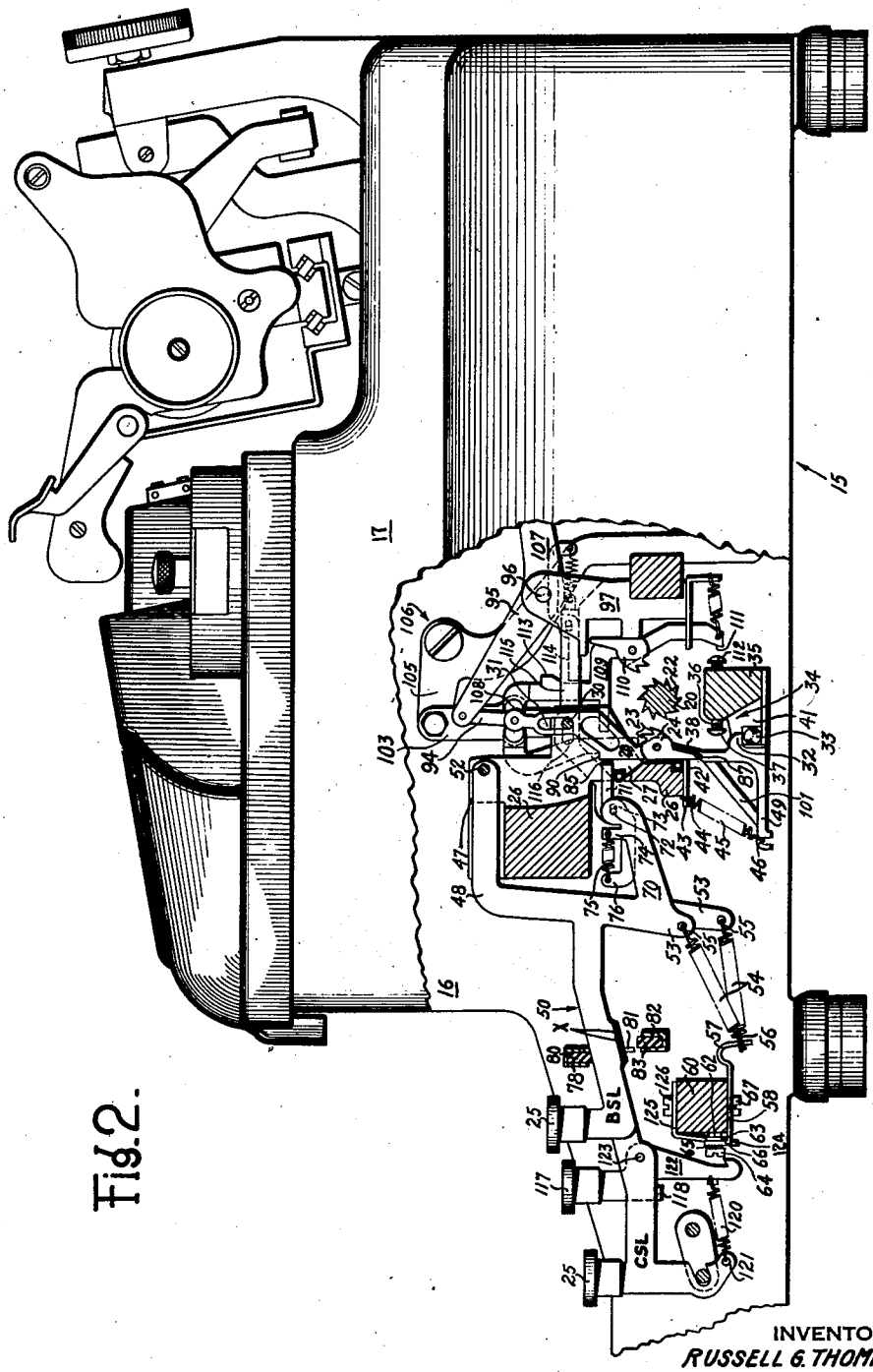

Fig.2.

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TYPEWRITING MACHINE

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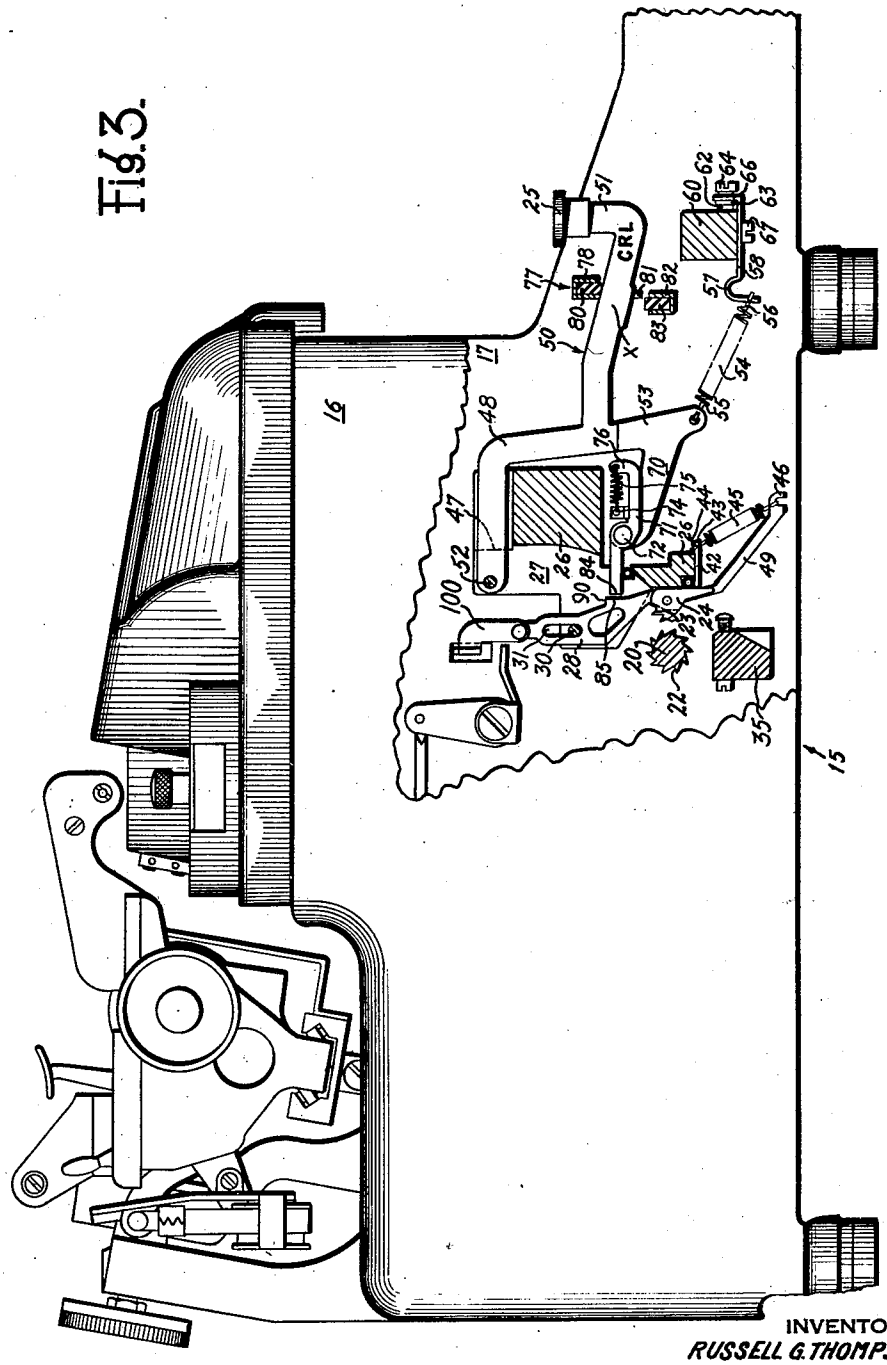
Fig. 3.



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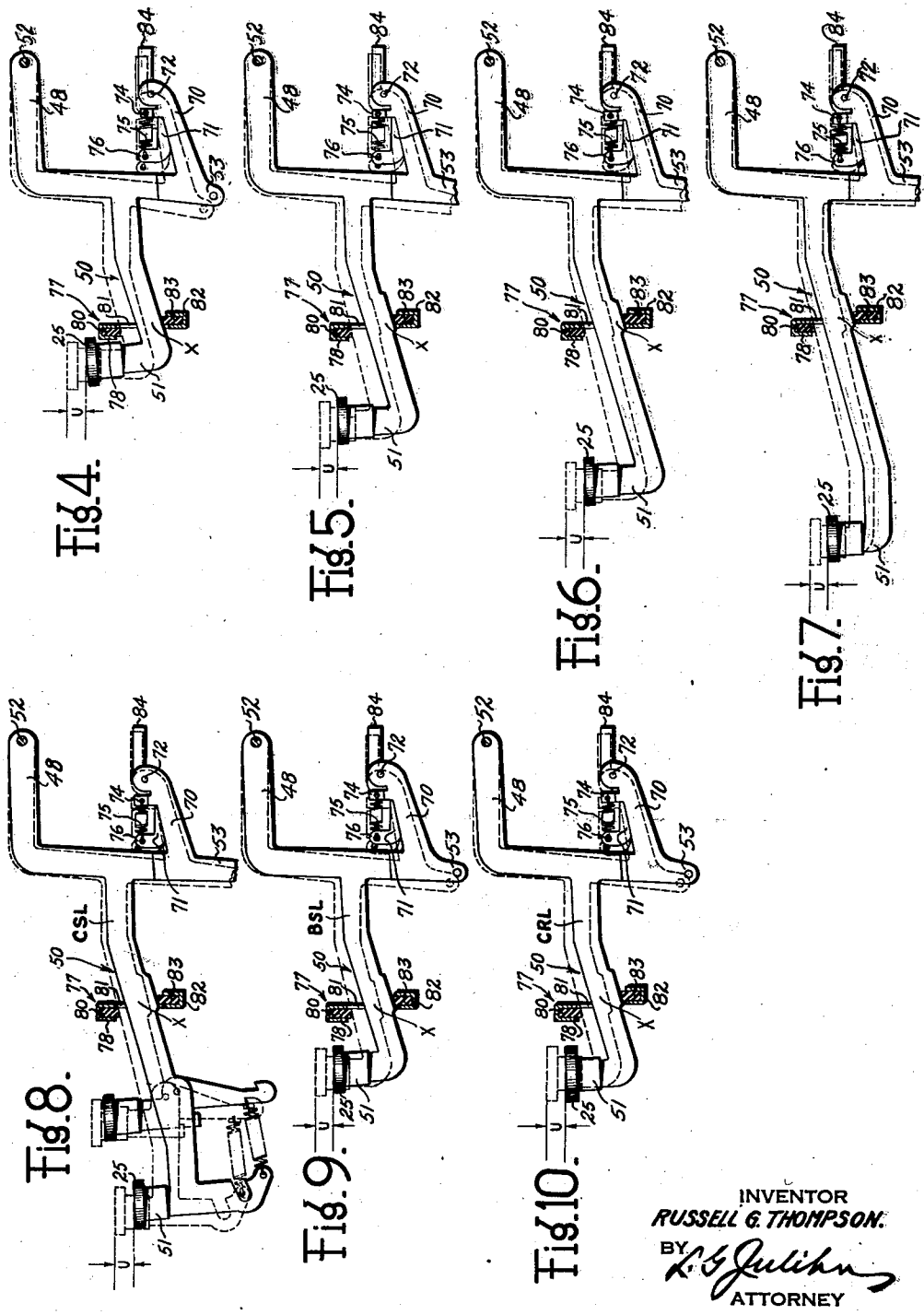
July 12, 1938. R. G. THOMPSON 2,123,756

TYPEWRITING MACHINE

Filed Feb. 20, 1937 4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE

2,123,756

TYPEWRITING MACHINE

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Application February 20, 1937, Serial No. 126,905

7 Claims. (Cl. 197—17)

This invention relates to typewriting machines and with regard to certain more specific features thereof to the key lever construction of power-driven typewriters.

The touch or action of power-driven typewriters is different from that of the conventional manually operated machines and as the art has developed to increase the speed of operation of power-driven typewriters this difference has been emphasized. According to present day construction a very light touch of a key, and pressure over a comparatively short range of movement, is all that is required to set the desired agency into operation, and under these conditions it is desirable that the same pressures and lengths of key depressions be effective for the operation of all of the various power-driven agencies on the machine. It should not be necessary for the operator to have to adjust or adapt the touch as type actuating or selecting keys in different banks are struck. Similarly when the case shift, back-spacer or carriage-return keys are operated there should be no necessity for compensation or adjustment in the operator's touch. If key movements are of different lengths, or opposed by varying tensions or loads, the rhythm of operation is destroyed and inferior work may result.

It is an object of the present invention to provide a simple and inexpensive mechanism by which all the power-driven agencies of a typewriter may be operated by keys the depressions of which are uniform in character both as to length of stroke and initial tension, while at the same time securing uniformly reliable operation of all the power driven parts.

It is another object of the invention to provide an inexpensive construction by which all the key lever movements are suitably cushioned in both directions of movement in order that the operation of the keys shall be rendered extremely quiet.

It is a further object of the invention to provide for the use of uniform return springs for all the key levers, thus eliminating the expense of organizing the keyboard with a plurality of springs of different sizes or strengths, and further providing for quick and convenient adjustment of the "touch" of the keys by simple manipulation which uniformly affects all of the keys.

In the accompanying drawings wherein is shown one of various possible embodiments of the invention:

Fig. 1 is a view in side elevation of a power-driven typewriter with a part of the side frame broken away to show clearly how the present invention is applied to the selecting keys for the types.

Fig. 2 is a view similar to Fig. 1 showing the present invention in its adaptation to the case-shifting and back-spacing keys.

Fig. 3 is a view taken from the opposite side of the machine with parts broken away to show how the invention is adapted to the carriage-return key.

Figs. 4, 5, 6, and 7 are diagrammatic views illustrating the construction and operation of the type selecting key levers and associated mechanism for the keys in each of the four banks of the machine.

Fig. 8 is a diagrammatic view showing the construction and operation of the case-shift key lever and associated mechanism.

Fig. 9 is a diagrammatic view showing the construction and operation of the back-spacing key lever and associated mechanism, and

Fig. 10 is a diagrammatic view showing the construction and operation of the key lever and associated mechanism for effecting the carriage return function.

Referring now more in detail to the drawings, the frame of a power-driven typewriter is indicated at 15 and journaled between side walls 16 and 17 of the frame is a continuously rotating power-drive member 20 which in the preferred form of the invention shown in the drawings is a toothed shaft or rod driven by suitable gearing from an electric motor mounted on the machine. The teeth 22 of the drive member are of ratchet type and are adapted to pick up teeth 23 of pivoted pawls 24 when these pawls are caused to be engaged by the operation of keys 25, and move the pawls and their mountings a short distance substantially tangential to the direction of rotation of the drive shaft 20.

A transversely arranged supporting member 26, sometimes referred to as the "backbone" of the machine, extends between the side walls 16 and 17 and serves as a mounting for actuating devices to be hereinafter described. Spaced vertical slots 27 are cut through the rear of the backbone, and actuators 28 for the various type bars, back-spacer mechanism and carriage-return device are positioned respectively in these slots for vertical movement therein, guided by a pin or rod 30 which extends the full length of the backbone through vertical slots 31 in each of the actuator members 28. To the upper part of these actuator members are pivotally secured the connections to the various operating agen-

cies. Below the guiding pin 30 each actuator carries the pivoted pawl 24 and at the bottom of each actuator member having to do with any of the type actions there is a lug 32 adapted to enter between balls 33 of a crowding lock to prevent effective operation of other keys until there has been a disengagement of the pawl 24 from the driving member by a throw-off device 34. The balls of the crowding lock are contained in a cross member 35 secured at its ends to the opposite side walls of the frame and this cross member also carries screws 36 having heads 37 which constitute the throw-off device by reason of engagement with cams 38 on the actuator members. This cross member is also comb slotted as indicated at 41 to receive and guide the lugs 32 of the actuator members 28.

A plate 42 is secured to the under side of the backbone and has a forward flange extension 43 adapted to receive the ends 44 of returning springs 45 the opposite ends 46 of said springs being secured to a forwardly extending arm 49 at the bottom of the actuator member.

An upper section of the backbone is comb slotted at 47 in a direction from front to rear of the machine and in these comb slots are positioned arms 48 of key levers 50, each of which has a bend down in front of the backbone, and then forwardly and obliquely downward until it terminates in an upstanding stem portion 51 in one or another of four different rows or banks at the front of the machine. Each stem portion is capped with a key 25 and thus it will be seen that the keys for the levers in different rows of banks are spaced at different distances from a pivot pin or rod 52 which locates the arms of all the levers within the slots of the backbone.

Each of the key levers has a downwardly extending arm 53 which in the preferred form of the invention shown in the drawings is of a different length depending on which row or bank contains the key of the particular lever. Coiled springs 54 of uniform size and strength each have one end 55 connected to the depending arm 53 of each lever 50 and the other end 56 of each spring is connected to a hook 57 of a retaining or anchor plate 58 adjustably secured on the under side of a cross bar 60 which has its ends fixed in the side walls of the machine, the adjustment being possible by slots 61 in the anchor plate permitting fore-and-aft movement of said plate by an adjusting screw 62 threaded into the bar 60 and having a collar 63 spaced from the head 64 of said screw, and a shank 65 of the screw between the head and collar, being located in a recess of an upturned flange 66 of the anchor plate. Thus by loosening screws 67 at opposite sides of the machine the adjusting screw 62 may be manipulated to set up or withdraw the anchor plate and when the desired position is found the securing screws 67 are set up fast against the bottom of the plate.

The key levers also have arms 70 rearwardly extended from the downward extension 53. These arms terminate in a shoulder in the backbone and each arm 70 has pivoted thereon a dog 71 by means of a pivot pin 72 positioned in a short slot 73. Lugs 74 on each of the rearwardly extending arms 70 are connected by coil springs 75 to the forward ends 76 of the dogs 71 for a purpose which hereinafter will more clearly appear.

As shown in Figs. 1 to 3 of the drawings, the key levers are normally swung by springs 54 around the pivot pin 52 until the upper edges of their forwardly inclined arms seat against an upper stop member 77 which comprises a metal channel 78 extending between the side walls of the machine and containing a seating strip 80 of vulcanized rubber, fibre, leather or other suitable cushioning material. One side of the channel 78 extends downwardly and is comb slotted as indicated at 81 to guide the levers.

A channel member 82 extends between the side walls of the machine some distance below the key levers and contains a similar seating strip 83.

Referring now more particularly to Figs. 4 to 10 of the drawings, the key levers are there indicated by dotted lines in their normally seated position against the upper stop 77. The actuated position of the key levers is shown in full lines and it will be noted by comparison of the distances U between the top surface of each key in its normal position and the top surface of the same key in its depressed or actuated position that these distances are in all cases substantially equal and that, therefore, the movement of each key lever from one stop to the other results in a uniform movement of the key of each lever. In the preferred form of the invention shown in the drawings this is done by giving additional width at X to the key levers which have their keys at greater distances from the pivot point 52 and this width is increased, as shown clearly in Figs. 4, 5, 6, and 7 as the distance between the key and the pivot is increased. Thus the key levers are shaped to have more or less travel between the upper and lower stops and the amount of this travel is predetermined by a uniform or standard amount of dip of the keys in the different rows or banks. To compensate for the differences in the angle of swing of the key levers as units, to the end of obtaining a uniform initial tension even though one key lever swings a greater or less distance than another, the returning springs 54 are connected from anchor points which are in transverse alignment to varying points on the depending arms 53 of the levers. It will be noted that the downwardly extending arms of the key levers considered with the bodies of these levers provide, in effect, bell-cranks, the long arms of which, to wit, those carrying the keys, are of progressively increasing length from the pivot point 52 to the respective keys 25 of the different banks. To compensate for the varying leverage provided by these long arms of the bell cranks the short arms which include the depending arms 53 are proportionately progressively increased in length to the point where the uniform returning springs 54 are respectively connected. Thus, while employing uniform return springs the initial tension to be overcome in depressing key levers in the various rows or banks is substantially equalized.

Inasmuch as the means of obtaining uniform key dip of the keys in different rows comprises in the preferred form shown a greater width of key lever as such levers extend forwardly into the different rows, it will be obvious that the angle of movement of the levers in different rows varies and consequently the pivot points 72 for the dogs 71 are advanced varying distances according to which row the particular key lever happens to have its key. It is desirable to have all of the pawls respectively on each side of the drive member 20 rest in a common vertical plane and to advance them uniformly to a position of engagement with the driving member. Therefore, to compensate for the variations in movement of

the pivot pins 72, varying lengths of dogs 71 are employed. Thus for each key lever having its key in the rear or upper bank of the keyboard and which has the largest angle of movement, a shorter length of dog is employed, the shortening taking place between the pivot pin 72 and the end 84 of the dog 71 which contacts with an edge 85 of the actuator 28 of which there is one for each pawl 24. The dogs for the levers in this particular bank may have their ends some distance from the edges of the actuators with which they are intended to engage and move to bring the pawl teeth into engagement with the teeth of the driving member. This is shown clearly in Fig. 1 of the drawings and other longer dogs are shown some of which have their ends 84 normally nearly in engagement with the edges of the actuators. As the varying angle of movement of the key levers is so compensated a substantially uniform movement of the actuators is accomplished by the depression of any key lever.

In Fig. 1 of the drawings the four rows of key levers which are used to couple the driving member to the various type actions are indicated. As any one of the keys there shown is depressed its key lever rocks around the pivot point 52 urging the pivot pin 72 rearwardly to carry the end of dog 71 into engagement with its adjacent actuator, whereupon the lower tooth of the pawl engages a tooth of the driving member and introduces the upper or second tooth of the pawl exactly into engagement with a succeeding tooth of the driving member. The pawl is free to rotate on the actuator except that a tail 87 of the pawl bears against an edge of the plate 42 on the under surface of the backbone which prevents further rotation of the pawl and thereafter the pawl and its actuator mounting must move downwardly, pulling down a link 88 which is connected to a type action, not shown, but preferably of the well-known "Noiseless" construction used in Underwood typewriters or some suitable modification thereof or other suitable type action. As the actuator is thrown or pulled downwardly by the engagement just described the cam face 38 on the edge of the actuator 28 engages with the head 37 of the adjustable throw-off screw 36 and the pawl is thrown out of engagement. The actuator is now free to be returned by its spring 45 to its normal position where it may be again moved by the key lever for re-engagement. During this return movement a shoulder 90 of the actuator will be intercepted by the end of the dog 71 in the event that the operator has not removed her finger from the key or the lever has not fully returned. Under this condition the dog may pivot on its pin 72 and the end of the dog will be carried upwardly by the returning actuator. When the pressure on the key is removed allowing its return spring 54 to return the lever the spring 75, having one end connected to a lug 74 on the lever arm 70 and its other end connected to the forward end of the dog, resets the dog in horizontal position for a second engagement of the pawl and the driving member. It will be apparent, therefore, that when a key is once depressed control of the type action has been lost, but only one operation of the type can be effected until the key is permitted to return towards its upper stop and is again actuated. The pivot pin and slot connection 72—73 serves to prevent shocks of engagement from being transmitted to the finger of the operator.

In Fig. 2 of the drawings a back-space lever is identified by the letters BSL and its operation and the operation of its co-operative actuator and pawl are similar in all respects to the mechanism just described in connection with Fig. 1. A link 94 connects the actuator 28 to a bell crank lever 95 pivoted at 96 to a bracket 97 fixed on the frame, and this lever in turn connects with back spacing mechanism of any suitable character.

In Fig. 3 a carriage-return lever CRL and its associated actuator mechanism are the same as employed for the type action key levers and the back space key lever. A link 100 extends from the top of the actuator and connects with suitable carriage return mechanism.

In Fig. 2 identified by the letters CSL is a case-shift lever which has its key well toward the front of the keyboard at a considerable distance from the pivot pin or fulcrum 52. It therefore has a longer depending arm 53 or at least the connection of its returning spring is made at a lower position on the arm. This key lever is provided with the same type of dog as those heretofore described and when moved it actuates a similar actuator member and engages its pawl with the driving member. The actuator has the usual return spring 45 but for the case shifting operation it is not necessary to employ a lug on the actuator, therefore, the lower part of the actuator is shaped with a diagonal arm 101 having a lug similar to 46 which anchors the lower end of the return spring 45. When engagement is made by the depression of the key 25 of the case shift lever its related pawl is engaged with the driving member and the actuator is moved downwardly. In this case the actuator, instead of being pivotally mounted on the pin 30 is pivotally mounted upon a trunk actuator member 103 which in turn is pivotally and slidably mounted upon the pin 30 as by the slot corresponding to slots 31 of the actuators 28. This second or trunk actuator is connected to a short arm 105 of a bell crank lever 106 which has a long arm 107 connected to suitable linkage for moving the carriage to upper case position. On the trunk actuator 103 there is pivoted at 108 another pawl-carrying actuator 109 having a pawl 110 for engagement with the opposite side of the driving member. Thus when the key lever is depressed the pawl at the front side of the driving member is engaged and the actuator mechanism is moved downwardly and thrown off in the usual way by the head of the adjustable screw 36. Means not shown are provided for toggle-locking the carriage in the upper case position so that as long as the case-shift lever is held depressed the actuator will be held down and not returned by its spring as in the case of the other mechanisms heretofore described. When the actuator mechanism is down a cam face 111 of the rear actuator bar 109 lies below a throw-off screw head 112 at the rear of the cross bar 35 and the teeth of the pawl 110 of the rear actuator are in position to be engaged by a forward swing of the actuator as the key 25 of the case-shift lever is allowed to return from its depressed position. The rear actuator 109 has a lug 113 on its rear edge which, when the actuator is in its down position, rests opposite the end of a dog 114 similar in construction to the dog 71 which operates upon the forward actuator. This rear dog is pivoted on a rearwardly extending arm 115 carried by the pivot stud 72 as an extension of the rearwardly extending arm 70 of the case-shift key lever. The arm 115 is penetrated by the pin 30

through a slot 116, the construction being such that when the key lever is depressed, not only is the forward dog engaged with the forward actuator to connect the forward pawl with the driving member, but the rearwardly extending arm is moved a corresponding distance rearwardly, carrying the pivoted dog 114 rearwardly to allow the lug 113 to pass down in front of its forward end. It will be seen, therefore, that as the case-shift key lever is allowed to return under the action of its return spring, the rearwardly positioned dog 114 will move the rear actuator 109 to carry the rear pawl into engagement with the rear side of the driving member. This gives a reverse or upward movement to the entire actuator mechanism, returning the forward actuator member and at the same time moving the short arm of the bell crank lever 106 upwardly, thereby breaking the toggle of the shift mechanism to upper case and establishing another toggle with the carriage in its lower case position, all as more particularly described in my co-pending application Serial No. 126,904, filed February 20, 1937.

A lock-down key for the case-shift lever is indicated at 117 having a laterally extending lug 118 which is held normally against the under side of the case-shift lever by a spring 120 having one end anchored at 121 to the lever and the other end connecting with a depending hook 122 integral with the lock-down key and pivoted at 123 on the case-shift lever. When the lever has been depressed pressure on the lock-down key will swing it about the pivot 123 and engage the hook under the edge 124 of an angle member 125 secured to the cross bar 60 by screws 126. Relief of pressure on the case-shift lever impinges the hook on the angle member and holds the case shift lever against full return. Subsequent slight pressure on the key 25 of the case-shift lever slightly depresses the lever and allows spring 120 to withdraw the hook, thus providing for the return of the lever and actuation of the bell crank lever as heretofore described.

The particular form of back-spacer, carriage-return mechanism, case-shift mechanism and type action is not controlling in the present invention which is directed to the key lever mechanism and the various actuators which are caused to engage with a power-driven element by movement of keys on the key levers. It will be apparent from the foregoing description taken in connection with the accompanying drawings that a large number of the different power operations of the machine are controlled by pivoted key levers the keys of which are arranged in different rows and varying distances from a common pivot, and that in each instance of key operation, either for the setting in action of the type bars or the movements of the carriage, the range of movement of the keys is substantially uniform and the initial tension or primary resistance of each key is also substantially uniform. Thus by comparative light and short movements of the keys any of the described mechanisms may be set in operation without in any case requiring the operator to exert greater or lesser pressures or employ longer or shorter strokes. This makes for increased speed of operation of the entire machine and greatly relieves the operator of both physical and mental fatigue. It is of particular importance in power-driven typewriters of the kind shown herein because the load of each key lever is light and substantially uniform. The specific form of the invention shown and described herein is extremely inexpensive by reason of the fact that all the compensations are made by the stamping of thin metal parts in various sizes and the employment of continuous strips of cushioning material for the upper and lower stops for the key levers and the employment of one standard size and strength of spring throughout for returning the key levers to their upper stop positions.

What is claimed is:—

1. In a power-driven typewriter, a plurality of pivoted key levers having their forward ends in rows at different distances from their pivot points, means comprising stops at opposite sides of the levers for limiting the range of pivotal movement of said levers, means coacting with said stops to restrict the permissible range of pivotal movement of the levers having their ends in one row to less than that of levers having their ends in another row, said means predetermining a uniform range of movement of the lever ends in different rows, spring means normally urging the lever ends upwardly, and dogs arranged to be actuated respectively by each lever for moving parts into engagement with a power-driven member, said dogs being of different lengths to compensate for the variable movements of the levers between the stops, to insure advance of the dogs to a common plane.

2. In a power-driven typewriter having a rotary driving member and actuators adapted for transient engagement with the driving member; the combination of letter-key levers, a carriage-return-key lever, a case-shift key lever, some of which levers are of variable lengths, with stops for positively limiting the range of movement of said levers, means, including said stops, compensating for the variable lengths of said levers and variably limiting their movements to obtain uniform range of movement of the keys, and means on said levers for engaging said actuators respectively, the last said means being of different dimensions on different lengths of levers, to compensate for the variable operating movements of said levers.

3. In a power-driven typewriter, a multiplicity of letter and numeral key levers arranged with their actuating keys in different banks, a carriage-return lever, a case-shift lever, stops on opposite sides of said levers defining their ranges of movement, means, including said stops, for limiting the movements of certain of said levers to less than the movement of certain others to obtain uniform ranges of movements of the respective keys, and means, comprising dogs of variable lengths, for compensating for the lesser movements of certain of said levers.

4. In a power-driven typewriter, a plurality of pivoted key levers respectively for the selection of various types to be actuated, said key levers having keys arranged in different rows, stops on opposite sides of said key levers for defining the range of movement of said levers, means, including said stops, for variably limiting the range of movement of levers having keys in different rows to the standard of a uniform range of movement of the keys, members adapted to be moved by said levers, and means of variable dimensions on key levers of different lengths respectivly to compensate for the variable movements of the levers and cause uniform movement of said members by the various key levers.

5. In a power-driven typewriter, key levers pivoted in alignment for connecting various actuating devices to the driving means, said levers

having actuating keys at various distances from the pivot, stop bars on opposite sides of said levers between the keys and the pivot, certain of said levers being of different widths between the stops to provide uniformity of movement of the actuating keys which are at different distances from the pivot, and pivoted dogs on the levers certain of which are longer than others.

6. In a power-driven typewriter, key levers pivoted in alignment for connecting various actuating devices to the driving means, said levers having actuating keys at various distances from the pivot, stop bars on opposite sides of said levers between the keys and the pivot, certain of said levers being of different widths between the stops to provide uniformity of movement of the actuating keys which are at different distances from the pivot, pivoted dogs on the levers certain of which are longer than others, an anchor, a multiplicity of coiled springs having their ends connected to said anchor, and connecting means on said levers for the opposite ends of said springs, said connecting means being differently located on those levers which have their actuating keys at different distances from the pivot to provide substantially uniform initial tension of the different springs.

7. In a power-driven typewriter, a set of pivoted key levers for actuating parts to couple the various operating mechanisms to the power drive, said set comprising different lengths of key-carrying arms with keys at different distances from the pivot point and different lengths of spring connecting arms, stop means for limiting the range of movement of said levers to different amounts predetermined to a standard of a uniform range of movement of the keys, uniform springs each having one end anchored in a line, and the other end connected to the spring connecting arms and pivoted dogs of different lengths on said levers adapted to be moved to a common plane by the extreme movement of any of said levers.

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