Dec. 6, 1927. 1,651,739

B. C. STICKNEY

TYPEWRITING MACHINE

Filed June 16, 1922 5 Sheets-Sheet 1

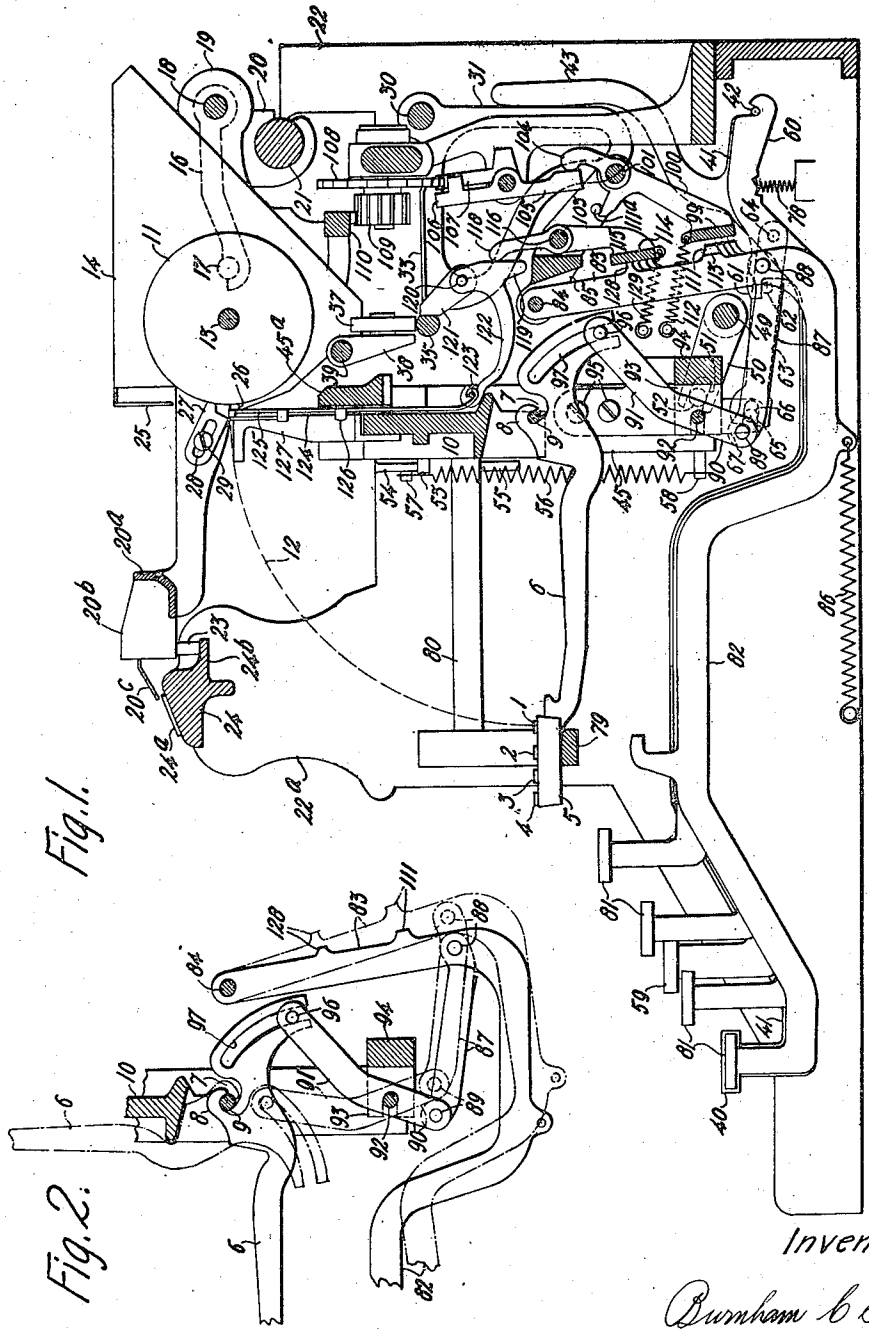


Fig. 1.

Fig. 2.

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Burnham & Stickney

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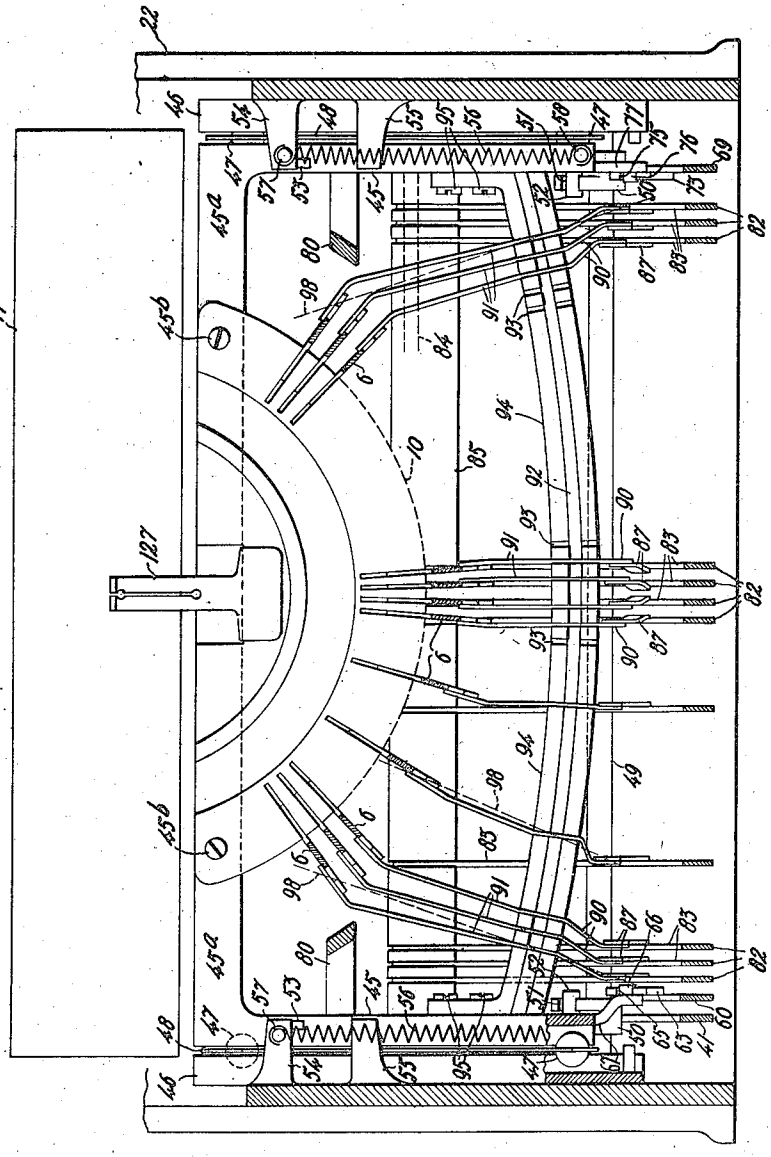


Fig. 3.

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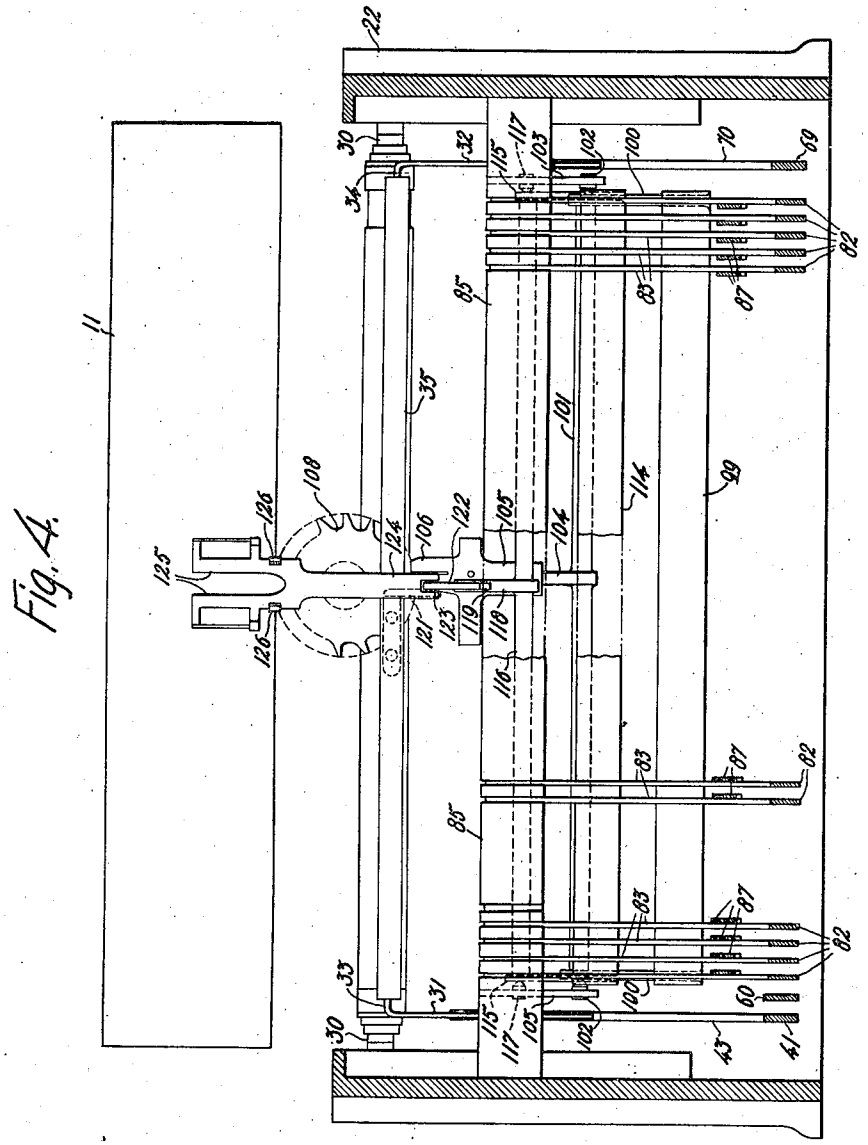


Fig. 4.

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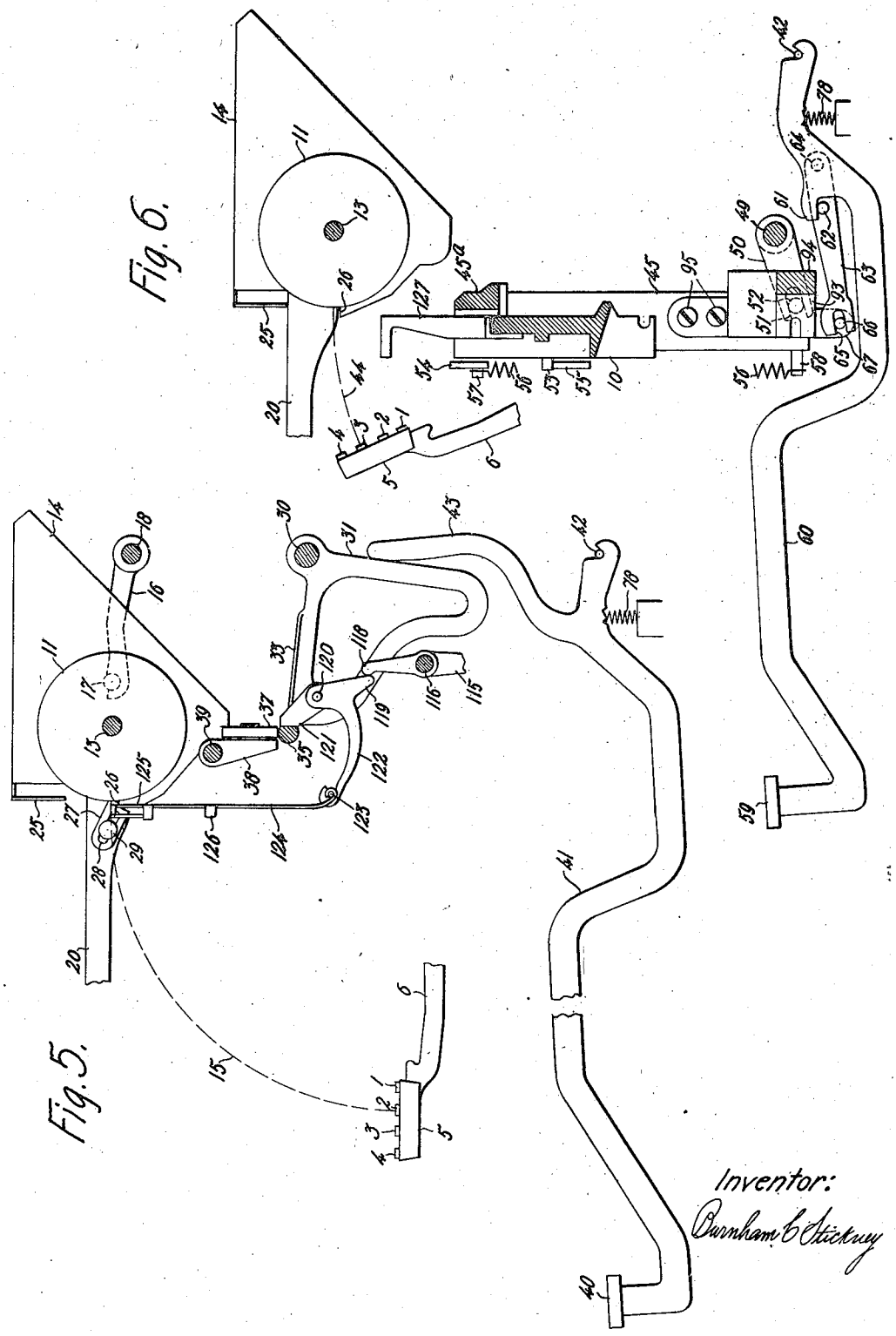


Fig. 6.

Fig. 5.

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TYPEWRITING MACHINE

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Fig. 8

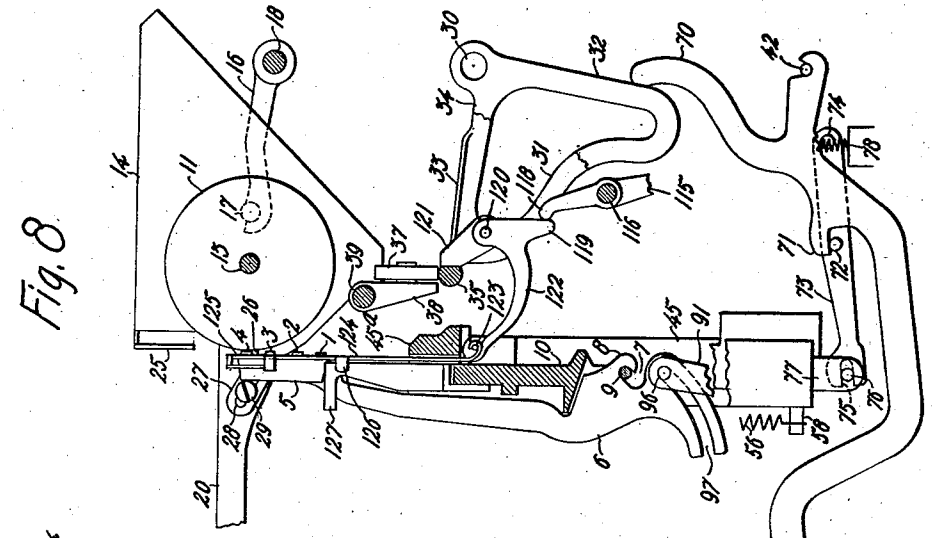
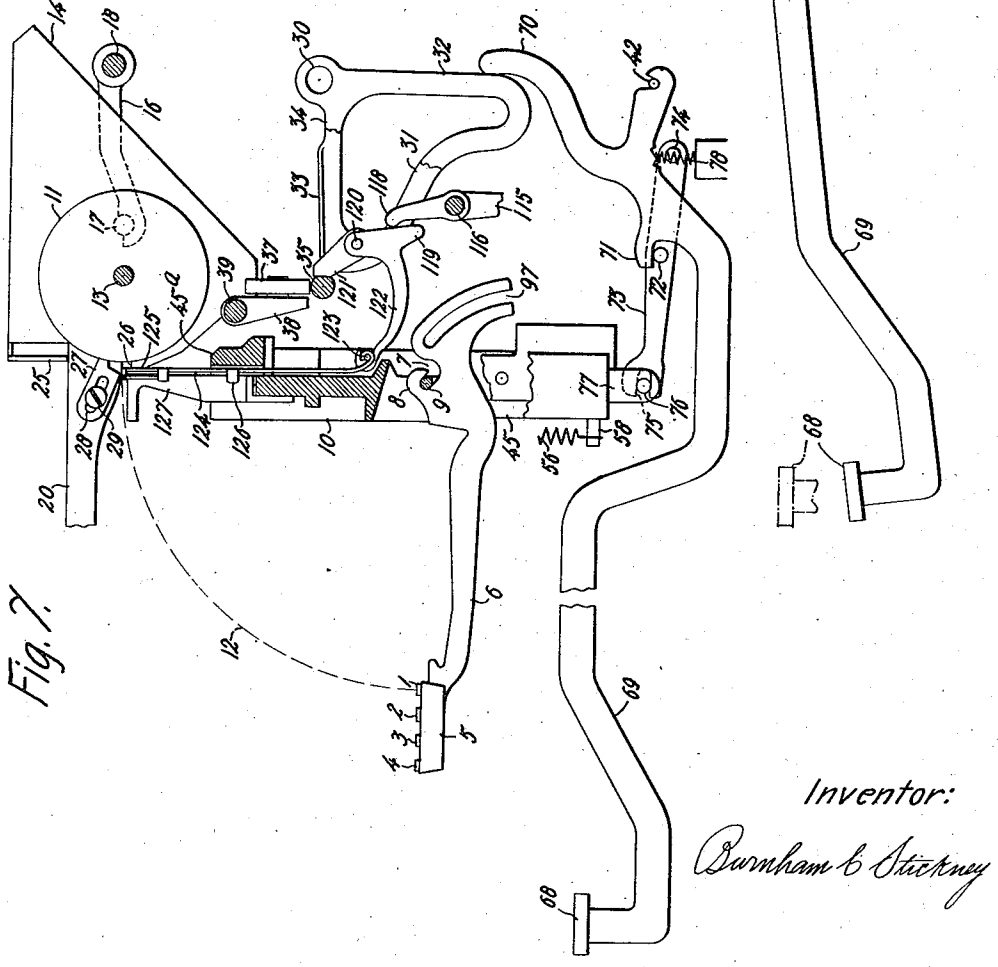


Fig. 7.



Inventor:

Burnham & Stickney

Patented Dec. 6, 1927. 1,651,739

UNITED STATES PATENT OFFICE.

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TYPEWRITING MACHINE.

Application filed June 16, 1922. Serial No. 568,691.

This invention relates to typewriting machines of that class having a plurality of case-shifts to provide for typing selectively by means of three or more types on type-bars striking at the front of the platen, and there is disclosed herein a four-type typewriting machine having three independently-operable shift-keys for shifting the platen and the type-bars from their normal printing positions, for one of the types, to three different case-shift positions for the three remaining types. As is well known in the art, four-type machines have a variety of uses. One use is for typing languages which have such a large number of letters in their alphabets as to prohibit their being typed by the usual single-shift typewriting machines, such as the Underwood and other front-strike type-bar machines, owing to the number of type-bars being less than the number of letters in the alphabet. Another use is to enable the typing of languages in which the same letters of the alphabet have different forms, according to the position which the letter may occupy in a word, or for other reasons. Another important use, in a machine for writing English or other languages, is to provide for the accommodation of a large number of arbitrary signs or symbols which are commonly employed in technical and commercial work.

An object of the invention is to produce a four-type typewriting machine, of simple, highly effective and inexpensive construction, and, more particularly, along the general lines of, and embodying the advantages of, the usual Underwood standard typewriting machine.

According to the present invention, the platen and the type-bar-segment are independently shiftable by means of three independently-operable shift-keys, one of which shifts the platen without shifting the segment, another of which shifts the segment without shifting the platen, and the third of which concomitantly shifts both the platen and the segment. More particularly, the platen and the type-bar-segment are each shiftable between fixed stops and have the same case-shift movement, whether shifted independently or concomitantly; one of the case-shift movements being through a single case-shift space or distance, and the other case-shift movement through two case-shift spaces or distances.

Another feature of the invention resides in the type-action providing for the case-shift movement of the type-bar-segment and having other advantages. A feature of the invention embodied in the type-action relates to means for imparting continually accelerated movement to the type-bars at the depression of the keys.

Other features of the invention relate to means for operating the carriage-feeding escapement mechanism and the vibrating ribbon-guide, while providing for the case-shift movement of the type-bar-segment. Another feature relates to means by which silent keys may be provided wherever desired.

Other features and advantages will hereinafter appear.

In the accompanying drawings,

Figure 1 is a substantially central front-to-rear vertical section of a typewriting machine embodying the present invention, and showing the platen and the type-bar-segment in their normal positions for typing with the first or lowermost type of the series of four types on each type-bar.

Figure 2 is a similar view, showing the type-action as segregated from the other parts appearing in Figure 1.

Figure 3 is a transverse, vertical section, partly diagrammatic and with parts omitted, the section being taken for the most part at the front of the type-bar-segment and rearwardly of the types and keyboard.

Figure 4 is a similar view, taken at the rear of the type-bar-segment, but with the platen and ribbon guide appearing in front elevation.

Figure 5 is a side elevation, with parts in section and parts omitted, showing the platen shifted up to bring into use the second type in the series by means of one of the shift-keys.

Figure 6 is a similar view, showing the type-bar-segment as shifted down from normal position through two-case-shift spaces to bring into use the third type in the series by means of another of the shift-keys.

Figure 7 is a similar view, showing the means, including a third shift-key, for con-

comitantly shifting both the platen and the type-bar-segment, but showing them in their normal or unshifted positions, similarly to Figure 1.

Figure 8 is a view of what appears in Figure 7, with the platen shifted up and the type-bar-segment shifted down to bring into use the fourth or final type in the series, and also showing one of the type-bars at the printing position.

The typewriting machine embodying the present invention, illustrated in the accompanying drawings, is generally of the construction of the standard Underwood typewriting machine, only such alterations and modifications being made as are required for the embodiment therein of the present invention.

The four types 1, 2, 3 and 4 are arranged in a series longitudinally along an extended type-head or block 5 carried upon the free end of an upwardly and rearwardly swingable type-bar 6, there being about as many of these type-bars 6 as are commonly employed in a single-shift English typewriting machine, such as the standard Underwood machine. Each type-bar 6 is provided with a curved slot 7 forming a hook 8 by means of which it is pivoted upon an arcuate wire or rod 9 carried by a type-bar segment 10, which is provided with usual slots for guiding the type-bars. Normally, without the use of a shift-key, the lowermost type 1 prints upon the front of a platen 11, as indicated in Figure 1 and 7 by the broken arcuate line 12, the remaining types being brought into use by means of independently operable shift-keys. The usual rotatable platen 11 is journaled by means of its axle 13 in a usual up-and-down shiftable platen-frame 14. The platen-frame 14 is shiftable upwardly from the normal printing position of the platen 11 through a single case-shift space or distance to a case-shift printing position of the platen corresponding to the second type 2 of the series, as indicated in Figure 5 by the broken arcuate line 15. In this case-shift movement, the platen-frame is guided by means of arms 16 engaging studs or gudgeons 17 on the ends of the platen-frame 14, these guide-arms 16 being fixed upon and extending forwardly from a rock-shaft 18 journaled in ears 19 formed upon a traveling carriage 20, as is usual in the Underwood machine. The carriage 20 may travel upon a rear rail 21 mounted upon the main frame 22 of the machine.

The carriage 20 comprises a front bar portion 20^a elevated above the remainder of the carriage so as to clear the extended type-bars. The front bar portion 20^a carries a housing 20^b, from the front of which there projects an index or pointer 20^c. A roller 23 is journaled in and projects below the housing 20^b at the front of the front bar portion 20^a. The framework 22 of the machine is provided at the front with upper extensions 22^a, at each side thereof. The upper ends or tops of the frame extensions 22^a are firmly connected together by means of a tie-bar 24 which, on its upper side at the front thereof, is provided with a scale 24^a to co-operate with the pointer 20^c, and at its rear the tie-bar 24 has a depressed shelf portion 24^b forming a front rail upon which the carriage-roller 23 runs. The front tie-bar 24 is at the front of and somewhat lower than the front carriage-bar 20^a, but the tie-bar 24, including the front rail portion 24^b thereof, is elevated sufficiently to clear the extended type-bars. However, both the front carriage-bar 20^a and the front tie-bar 24 are below the line of vision, so that the typing is visible while it is being written.

The platen-frame 14 is positively stopped at the normal printing position of the platen 11 by means of end portions 25 on the platen-frame, which abut against the top of the carriage 20 at the ends thereof, thereby to limit the downward movement of the platen when it is returned from its case-shift to its normal position, as shown in Figures 1 and 7. The upward case-shift movement of the platen-frame 14 is positively limited to a single space or step by means of shoulders 26 formed upon the ends of the platen-frame to abut against stops 27 which, by means of slots 28 therein and screws 29, are rigidly but adjustably secured upon the carriage 20 at the ends thereof to arrest the upward movement of the platen-frame at the printing position of the platen 11 for the second type 2 in the series, as shown in Figure 5.

For shifting the platen upwardly, a shift-rail frame is provided, comprising a rock-shaft 30 journaled at its ends in the rear and upper part of the general frame 22, and carrying similar left and right side plates having, respectively, similar portions 31 and 32 extending downwardly from the rock-shaft 30 and also having, respectively, similar portions 33 and 34 extending forwardly from the rock-shaft 30 and carrying a shift-rail 35 upon which runs a roller 37 journaled upon a bracket 38 depending from a transverse rod 39 forming part of the shiftable platen-frame 14.

A shift-key 40, located in the keyboard at the extreme left thereof, is carried by the forward end of a shift-lever 41 pivoted at 42 upon the rear and lower part of the main frame 22. At its rear end, the shift-lever 41 has an upstanding arm 43 to press forward upon the downwardly-extending portion 31 of the left-hand side plate of the shift-rail frame, so that, when the shift-key 40 is depressed, the shift-rail frame will be rocked for shifting the platen upwardly from its normal printing position for the type 1, as shown in Figure 1, to its case-shift position

for printing by means of the type 2, as shown in Figure 5. The case-shifting mechanism for the platen, just described, and the operation thereof are substantially the same as in the usual Underwood machine, and may include the lock device (not shown) which is usually provided in said machine for the platen-shift-key 40. It will be noted that the above-described case-shifting mechanism for the platen will permit the case-shifting of the platen independently of the shift-key 40, while the latter remains at rest.

In order to print by means of the third type 3 in the series, means, now to be described, including an independently-operable shift-key, are provided to shift the type-bar segment 10 downwardly through two case-shift spaces or steps from the normal position thereof, shown in Figures 1 and 7, to the case-shift position thereof shown in Figure 6, while the platen 11 remains at its normal position, so that typing may then be normally effected by the third type 3 in the series, as is indicated by the short broken arcuate line 44 in Figure 6, in which the type-block 5 is shown as partly raised to the printing position. The set of third types may include alphabetical letters where the number of letters exceeds the number of type-bars.

The type-bar segment 10 forms a part of an up-and-down shiftable frame, having at its sides legs or uprights 45 connected together at the top by a cross-bar 45^a to which the segment 10 may be secured by means of screws 45^b (Figure 3). The legs 45 are guided for up-and-down movement by means of vertical bars 46 secured to the sides of the framework 22 of the machine and forming guideways. Each of the segment-frame legs 45 is guided upon its guide-bar 46 by means of a pair of balls 47, maintained in spaced relation by means of a ball-carrier 48 and traveling in a groove formed in the leg 45 and in a corresponding groove formed in the guide-bar 46, as is shown in Figure 3. Pins projecting from the lower ends of the legs 45 (Figure 3) limit the downward movement of the ball-carrier 48.

Additional guiding means are provided for the vertically shifting segment-frame in order to prevent any tendency of the frame to twist laterally or skew, and consequently to bind upon the guide-balls 47. For this purpose a rocking frame is provided, comprising a rock-shaft 49 extending transversely of the machine at the rear of the lower part of the segment-frame and journaled at its ends in the sides of the main framework 22, arms 50 being fixed upon the rock-shaft 49 at the ends thereof and extending forwardly and normally slightly upwardly therefrom, and having a pivotal connection with the lower ends of the segment-frame legs 45 by means of slots 51 in the forward ends of the arms 50, which receive inwardly-projecting pins or studs 52 upon the lower ends of the legs 45. It will be observed that the rocking frame, comprising the rock-shaft 49 and the forwardly-extending arms 50, will compel the opposite sides or ends of the segment-frame to move evenly up and down to an equal extent in its case-shifting operation.

Each leg 45 of the shiftable segment-frame carries a forwardly-projecting stop-lug 53, which, in the upper or normal position of the segment 10, abuts against an upper stop 54 projecting inwardly from the side of the framework 22, as shown in Figures 1 and 3. In the lowered or case-shift position of the segment-frame and type-bar segment 10 carried thereby, each stop-lug 53 will abut against a lower stop 55, suitably spaced below the upper stop 54, and similarly projecting inward from the sides of the machine framework 22, to limit the downward case-shift movement of the segment-frame, as shown in Figure 6. The shiftable segment-frame is lifted to its normal position by means of a pair of sufficiently strong springs 56, each of which is anchored at its upper end to the corresponding upper stop 54 by means of a pin 57, and is connected at its lower end to the lower end of the adjacent segment-frame leg 45 by means of a pin 58, as shown in Figures 1 and 3.

To shift the segment-frame, including the type-bar segment 10, from its upper or normal position, determined by the upper stops 54, downwardly to its case-shift position, determined by the lower stops 55, an independently-operable shift-key 59, or second shift-key, is carried by the forward end of a shift-lever 60 located at the left side of the machine and next inward from the first shift-lever 41, and at its rear end is pivoted at 42 in the same manner as the first shift-lever 41. At a proper distance forward from its pivot point 42, the shift-lever 60 is provided at its upper side with a forwardly-projecting toe 61, which engages a projecting pin or stud 62 carried by a substantially horizontal intermediate lever 63 of the third order. At its rear end, the intermediate lever 63 is pivoted at 64 upon the framework of the machine, and, at its forward end, is provided with a slot 65 to engage a stud or pin 66 projecting inwardly from the lower end of a lug 67, which projects from the lower end of the left-hand segment-frame leg 45. When the second shift-key 59 is depressed, the shift-lever 60, through the intermediate lever 63, will shift the segment-frame downwardly from its normal position, shown in Figures 1 and 7, to its case-shift position, shown in Figure 6, thereby to cause the third type 3 in the series to print at the front of the platen 11, if the platen 11 remains at rest at its normal print-

ing position. But if key 40 is depressed at this time, the fourth type will print. It will be noted that sufficient space is provided below the shift-lever toe 61 to permit the segment-frame to be case-shifted independently of the shift-lever 60, while the latter remains at rest. Also, it is to be noted that any tendency of the segment-frame to skew or bind upon its guiding-balls 47, by reason of the downward pull of the shift-lever 60 and intermediate lever 63 at the left side of the segment-frame, will be counteracted by the rocking frame comprising the rock-shaft 49 and guide-arms 50.

A single shift-key device may be employed in order to print by means of the fourth type 4 in the series, the platen 11 and the segment 10 being shiftable concomitantly from their normal positions (for printing by means of the first type 1) to the same case-shift positions to which they are shiftable individually by means of their respective shift-keys 40 and 59, as hereinbefore described. For this purpose, a third independently-operable shift-key 68, located at the right of the keyboard, is carried by the forward end of a third shift-lever 69 pivoted at 42 in the same manner as the shift-levers 41 and 60. At its rear end, the shift-lever 69 has an upstanding arm 70 to press forward upon the rear edge of the downwardly-extending portion 32 of the right-hand side plate of the shift-rail frame, as shown in Figures 7 and 8. Forwardly from its pivot point 42 the shift-lever 69 is provided at its upper side with a forwardly-projecting toe 71, which engages over a laterally-projecting stud 72 carried by a substantially horizontal intermediate lever 73 of the third order. At its rear end, this lever 73 is fulcrumed at 74 on the framework of the machine and at its forward end is provided with a slot 75, which engages a pin or stud 76 projecting inwardly from the lower end of a lug 77, which projects from the lower end of the right-hand segment-frame leg 45, as shown in Figures 3, 7 and 8.

Because of the double work which the third shift-key 68 has to do in concomitantly shifting both the platen-frame and the segment-frame, this latter shift-key is preferably given a greater throw or dip than the other two shift-keys, so that the amount of force required to depress the third shift-key 68 will be about the same as that required for each of the other shift-keys 40 and 59. For this purpose, the platen-shifting upstanding arm 70 on the third shift-lever 69 is made, to the required extent, shorter than the platen-shifting upstanding arm 43 of the first shift-lever 41. And likewise, for similar reasons, the segment-shifting intermediate lever 73 for the third shift-lever 69 is longer and has its fulcrum point 74 located farther to the rear, so that the lever-arm formed between its fulcrum pivot 74 and its operating pin 72 is substantially twice the length of the corresponding lever-arm of the segment-shifting intermediate lever 63, which is operated by the second shift-lever 60. When the third shift-key 68 is depressed from the normal position, shown in Figure 7 and indicated in broken lines in Figure 8, to the actuated position, shown in full lines in Figure 8, the shift-rail frame will be rocked by the upstanding arm 70 to lift the platen-frame 14 for case-shifting the platen, and concomitantly the intermediate lever 73 will pull the type-bar segment 10 downwardly against the tension of the lifting springs 56, for case-shifting the type-bars 6.

As the platen-frame 14 is case-shifted by means of the third shift-lever 69, it is brought to a positive stop at its case-shift position by reason of its stop shoulders 26 abutting against stops 27, the same as when the platen is case-shifted by means of the first shift-lever 41, as hereinbefore described; and, similarly, when the segment-frame, including the type-bar segment 10, is case-shifted by means of the third shift-lever 69, the segment-frame is brought to a positive stop by reason of its stop-lugs 53 abutting against the stops 55, the same as when the segment-frame is case-shifted by means of the second shift-lever 60, as hereinbefore described. It is to be noted, in this connection, that the third shift-lever 69 shifts the platen 11 upwardly through one case-shift space and concomitantly shifts the type-bar segment 10 downwardly through two case-shift spaces, thereby effecting a relative case-shift movement of the platen 11 and type-bars 6 through a total of the three case-shift spaces from their normal printing positions for the first type 1 to relative printing positions to bring into use the fourth type 4, as will be clear by an inspection of Figures 7 and 8. Any tendency of the segment-frame to twist or skew and, therefore, to bind upon its guiding-balls 47, by reason of the third-shift-lever 69 through its intermediate lever 73 exerting its case-shift pull at the right side only of the segment-frame, will be counteracted and prevented by the rocking frame comprising the rock-shaft 49 and its guiding arms 50. By reason of the fact that the upstanding operating arms 43 and 70 of the respective first and third shift-levers 41 and 69 engage only at the rear of the downwardly-extending end-plate portions 31 and 32 of the shift-rail frame, it will be evident that either of the shift-keys 40 or 68 may be operated while the other remains at rest. Similarly, by reason of the fact that similar clearance space is provided below each of the actuating pins 66 and 76 carried by the respective segment-shifting intermediate levers 63 and 73, it will be evident that

either the second shift-key 59 or the third shift-key 68 may be depressed while the other remains at rest. The three shift-levers 41, 60 and 69 are returned to normal positions by means of similar springs 78. An arcuate rest 79 for the type-blocks 5 is carried by arms 80, which project rigidly forwardly from the legs 45 of the segment-frame.

The improved type-action forming a feature of the present invention provides for the up-and-down case-shift movement of the type-bar segment 10, and has other advantages. Type-keys 81, arranged in banks as usual, are carried by the forward ends of key-levers 82, which, at their rear ends, have downwardly and slightly rearwardly extending portions 83, fulcrumed at their upper ends upon a common pivot rod 84 carried by a slotted frame-bar 85 extending transversely of the machine and forming a part of the stationary framework thereof. The key-lever pivots 84 are at the rear of the type-bar pivots 9, are shown as directly beneath the platen 11, and are at a level above all the type-keys 81 in the keyboard, so that all of the key-levers 82 may be of sufficient length that the dip of the type-keys 81 will be nearly straight downward and only slightly forward, at the same time providing space in the machine at the rear of the downwardly-extending key-lever portions 83 for the accommodation of other mechanism, yet to be described.

When a type-key 81 is depressed in the typing operation, the key-lever portion 83 which extends downwardly from its fulcrum or pivot point 84, will move rearwardly.

All of the key-levers 82 are parallel, and the system of key-levers extends laterally of the machine at each side thereof beyond the system of type-bars 6, as shown in Figure 3. Retractile springs 86 normally draw forward the downwardly-extending key-lever portions 83 and lift the type-keys 81. Substantially horizontal operating links 87 are pivoted at their rear ends at 88 to the downwardly-extending portions 83 of the key-levers, and at their forward ends the links 87 are pivoted at 89 to the lower arms 90 of sub-levers of the first order, having rearwardly and upwardly extending upstanding arms 91. The sub-levers are fulcrumed upon a slightly downwardly-bowed or curved rod 92, substantially directly beneath the arcuate pivot wire 9 for the type-bars, so that the type-bar pivots and sub-lever pivots are substantially in the same vertical transverse plane. The sub-levers are guided in slots 93 formed in the forward side of, and at right angles to, a curved cross-bar 94 which carries the sub-lever pivot rod 92, and which forms a part of the shiftable segment-frame, the ends of the cross-bar 94 being shown as rigidly connected by means of screws 95 to the lower parts of the legs 45 of the segment-frame, Figures 1 and 3. When the segment-frame is shifted, as hereinbefore described, the sub-levers will partake of this shifting movement. The pivot pins 89 at the forward ends of the operating links 87 will also move downwardly to swing these links about their rear pivot point 88 on the key-lever portions 83, without thereby affecting the operation of the sub-levers from the key-levers by means of the links 87, the type-bar pivots 9 and the sub-lever pivots 92 having a fixed relation to each other.

The upper end of the upstanding arm 91 of each sub-lever carries an actuating pin 96 to be swung in an arc upwardly and forwardly, the type-bar 6 having an arcuate slot 97 in which the pin 96 works. The slot 97 is bowed rearwardly and upwardly, and extends upwardly and rearwardly from the actuating pin 96 to a point at the rear of, and substantially at the same level or in the same horizontal plane as, the type-bar pivot 9, when the several parts of the type-action are in their normal positions of rest, as shown in Figure 1, and as shown in full lines in Figure 2. When a type-key 81 is depressed, the actuating pin 96 will be brought into alignment between the type-bar pivot 9 and the sub-lever pivot 92, and therefore substantially into the vertical plane in which the type-bar and sub-lever fulcrum pivots are located, substantially at the printing position of the type-bar 6, as indicated in broken lines in Figure 2, and as shown in Figure 8. The type-bar 6 will therefore be continually gradually and evenly accelerated as it moves to the printing point on the platen, thereby giving both a light key-touch and a strong printing impact of the types against the platen.

The terms "horizontal plane" and "vertical plane," as applied to the type-bars and sub-levers, are used relatively, for convenience of description, and are not to be considered as limiting.

The sub-levers, as is usual, are made longer at the sides of the machine and converge inwardly from the key-levers towards the type-bars. According to the present invention, the sub-levers converge inwardly from the forward ends of the actuating links 87 along general lines to the actuating pins 96 of the sub-levers. Also the three pivots of each sub-lever, namely, the pivot 89 at the lower end thereof, its fulcrum pivot 92 and its upper end pivot 96, are all arranged in an inclined plane extending transversely of the axes of these pivots, so as thereby to avoid undesired twisting of the sub-lever upon its fulcrum pivot 92. The arrangement of the three pivot points of the sub-levers are shown in Figure 3, and there indicated by means of

the three laterally inclined broken lines 98, each drawn through the three pivot points of a sub-lever.

According to the present invention, the usual Underwood escapement mechanism is operated by the downwardly-extending portions 83 of the key-levers, and the means for doing so will now be described. A universal bar 99 extends transversely of the machine at the rear of and in the path of the rearwardly-movable downwardly-extending key-lever portions 83, to be moved rearwardly thereby at the depression of the type-keys 81. At its ends the universal bar 99 is carried by a pair of upwardly and rearwardly extending arms 100, forming therewith a bail or swinging frame. The upper ends of the bail-arms 100 are fixed upon the ends of a rock-shaft 101 pivoted at its ends by pivot studs 102, Figure 4, to the ends of rearwardly and downwardly extending stationary arms 103 carried by the frame-bar 85 upon which the key-levers 82 are pivoted, so that the arms 103 form a part of the framework of the machine. The universal bar 99, its arms 100 and the rock-shaft 101, taken together, form a rocking universal frame. Approximately at its middle, the rock-shaft 101 has fixed thereon an upwardly-projecting lever-arm 104, engageable at the rear of a downwardly-extending arm 105 of a dog-rocker pivoted on the machine frame and provided with rigid and loose dogs 106 and 107, which in turn are engageable with an escapement wheel 108 connected to a pinion 109 engaged by a rack 110 connected with the carriage 20. The parts of the escapement mechanism, from the dog-rocker to the rack 110, may be of substantially the usual Underwood construction. A usual spring-barrel, not shown, may be provided to impel the carriage 20 in its letter-feeding direction of movement.

The downwardly-extending portions 83 of the key-levers are provided with rearwardly-projecting lugs 111 to engage and operate the universal bar 99 when the type-keys 81 are depressed. The operating lugs 111 are not normally in contact with the universal bar 99, but are arranged so as to leave an open space and provide lost motion between their ends and the universal bar 99, in order that the escapement mechanism will be operated only during the final portion of, or near the end of, the key-lever stroke, to obtain thereby prompt letter-feeding of the carriage 20 immediately upon release of any type-key 81.

The actuating lugs 111 are located at different heights on the depending portions 83 of different key-levers, so as to move the universal bar 99 rearwardly substantially equal distances for the key-levers of different lengths, and thereby impart a substantially uniform throw to the dog-rocker for the different key-levers. In view of the fact that the upper lugs 111 are nearer to the universal-bar rock-shaft 101 to a greater proportional extent than they are to the pivotal points 84 of the key-levers, and that the lower lugs 111 are farther from the rock-shaft 101 to a greater proportional extent than they are distant from the key-lever pivot points 84, the more elevated lugs 111 will be upon the shorter key-levers, or upon the key-levers having type-keys in the upper banks of keys, while the lower lugs 111 will be carried by the longer key-levers, of which the type-keys are in the lower banks. The universal bar 99 may be returned to normal position against a stop 111^a by means of a spring 112.

According to the present invention, silent keys, for printing accents or the like, may be provided wherever desired, merely by omitting or removing the lugs 111 from any selected key-levers, as is shown in Figure 1 at 113.

According to the present invention, means, now to be described, are provided to be operated by the depending portions 83 of the key-levers for operating a ribbon-vibrator, independently of the above-described means provided for operating the escapement mechanism. A second universal bar 114 extends transversely of the machine above the first universal bar 99 at the rear of and in the path of the rearwardly-movable downwardly-extending key-lever portions 83, to be moved rearwardly thereby at the depression of the type-keys 81. At its ends, the second universal bar 114 is carried by upwardly-extending bail-arms 115 forming therewith a swinging frame. The upper ends of the bail-arms 115 are fixed upon the ends of a rock-shaft 116 pivoted at its ends by means of pivot-studs 117 upon the stationary frame-arms 103 just at the rear of the transverse frame-bar 85, so that the universal bar 114, bail-arms 115 and rock-shaft 116 together form a rocking universal frame. Fixed upn the rock-shaft 116 substantially at the middle thereof is an upwardly-projecting lever-arm 118, the upper end of which engages the rear face of a downwardly-extending lever-arm 119 forming a part of a bell-crank-lever pivoted at 120 upon a depending bracket 121 fixed upon the shift-rail 35. The bell-crank-lever has a forwardly-extending arm 122 pivotally connected at 123 to the lower end of a ribbon-guide or ribbon-vibrator 124, which has at its upper end portions 125 for guiding the usual ribbon, not shown, the vibrator 124 being shifted to cover and uncover the printing point on the platen at the strokes of the type-keys 81. The vibrating ribbon-guide 124 is guided between the rear face of the segment 10 and the front face of the upper bar 45^a of the segment-frame, and is further

guided by means of guide-lugs 126 on the ribbon-guide, which engage at the sides of the usual type-guide 127, which is mounted upon the segment 10.

When the platen 11 is case-shifted from its normal position, shown in Figures 1, 5 and 7, the ribbon-guide-vibrating bell-crank lever, being carried by the shift-rail 35, partakes of the shifting movement of the platen, and the downwardly-extending lever-arm 119 of this bell-crank-lever is moved upwardly along the upper end of the upstanding rocking arm 118, as shown in Figures 5 and 8. The actuating arm 118 is thereby enabled to actuate the bell-crank-lever to vibrate the ribbon-guide 124 at either the normal or the case-shift position of the platen 11. The slight change in effective length of the bell-crank lever-arm 119, caused by the sliding movement of this lever-arm along the end of the rocking upstanding actuating arm 118 at the case-shift movement of the platen, is of no particular consequence. It will only cause the types to print at a slightly different place on the ribbon, which latter is of sufficient width so that the types will not miss the ribbon, and, if the ribbon bears only a single color, it may be of the usual width.

In carrying out the present invention, the downwardly-extending portions 83 of the key-levers are provided with rearwardly-projecting lugs 128 to engage and operate the ribbon-vibrating universal bar 114 when the type-keys 81 are depressed in the typing operation. As it is desirable that the type-keys 81 shall all have a uniform dip or stroke, the actuating lugs 128 are located at different distances below the key-lever fulcrum pivots 84, to compensate for the different lengths of the key-levers for the type-keys in the upper and lower banks. In view of the fact that the higher actuating lugs 128 are nearer to the universal-bar rock-shaft 116 than they are to the key-lever pivots 84, and that the lower actuating lugs 128 are correspondingly farther from the universal-bar rock-shaft 116 than they are from the type-bar pivots 84, the upper or higher actuating lugs 128 belong to the shorter key-levers, the type-keys of which are in the upper banks of keys, while the lower actuating lugs 128 belong to the longer key-levers having type-keys in the lower banks of keys. The arrangement of these actuating lugs 128 at different heights provides for the different key-levers, different effective lengths of the co-operating lever portions 83 of the key-levers and of the depending arms 115 of the universal bar 114, in view of the fact that the universal-bar rock-shaft 116 is located at a lower level than the key-lever pivots 84. By this arrangement, rearward movement through substantially uniform distances will be imparted to the ribbon-vibrating universal bar 114 by each of the key-levers 82 irrespective of the difference in length of the key-levers, thereby imparting a substantially uniform ribbon-vibrating throw to the ribbon-guide 124. After each actuation, the ribbon-vibrating universal bar 114 will be returned to its normal position by means of a spring 129.

As the ribbon-vibrator and the escapement mechanism are operated independently by means of their separate universal bars 114 and 99, respectively, the provision of silent keys, as above described, will not interfere with the ribbon-vibrating operation. Also the downward case-shift movement of the type-bar segment will not interfere with the operation of the vibrating ribbon-guide 124, for, when the segment 10 is case-shifted, the segment 10, the segment-frame bar 45[a] and the type-guide 127 merely slide downward relatively to the ribbon-guide 124, as shown in Figure 8.

The mounting of the bracket 121, upon which the ribbon-vibrating bell-crank-lever is pivotally carried, upon the shift-rail 35 causes the ribbon-guide 124 to partake of the case-shift movement of the platen 11, while the sliding engagement of the upstanding actuating arm 118 with the depending bell-crank-lever arm 119 causes the ribbon-guide 124 to be vibrated to cause the ribbon to cover and uncover the printing point on the platen in both the normal and case-shift printing positions of the platen.

Variations may be resorted to within the scope of the invention, and partions of the improvements may be used without others.

Having thus described my invention, I claim:

1. In a front-strike typewriting machine, in combination, a platen mounted for case-shift movement, a set of type-bars mounted for case-shift movement and each having four types thereon, means for concomitantly shifting the platen and the set of type-bars, means for independently shifting the platen, and means for independently shifting the set of type-bars.

2. In a front-strike typewriting machine, in combination, a platen mounted for case-shift movement, a set of type-bars mounted for case-shift movement and each having four types thereon, means for independently shifting the platen from normal position to a case-shift position, means for independently shifting the set of type-bars from normal position to a case-shift position, one of said case-shift movements being through twice the distance of the other, and means for concomitantly shifting both the platen and the set of type-bars from their normal positions to the same case-shift positions to which they are shiftable independently.

3. In a front-strike typewriting machine,

in combination, a platen mounted for case-shift movement, a set of type-bars mounted for case-shift movement and each having four types thereon, means for independently shifting the platen from normal position to a case-shift position, means for independently shifting the set of type-bars from normal position to a case-shift position, one of said case-shift movements being through twice the distance of the other, means for concomitantly shifting both the platen and the set of type-bars from their normal positions to the same case-shift positions to which they are shiftable independently, fixed stops to limit the case-shift and return movements of the platen, and fixed stops to limit the case-shift and return movements of the set of type-bars.

4. In a front-strike typewriting machine, in combination, a platen mounted for case-shift movement, a set of extended type-bars mounted for case-shift movement and each having four types arranged thereon in a row or series longitudinally thereof, the platen and the set of type-bars having normal relative printing positions corresponding to one of the end types in the series, means for independently shifting the platen from its normal position to a printing position for an intermediate type in the series, means for independently shifting the set of type-bars from its normal position to a printing position for the other intermediate type in the series, and means for concomitantly shifting both the platen and the set of type-bars in opposite directions from their normal positions to printing positions for the final type in the series.

5. In a front-strike typewriting machine, in combination, a platen mounted for case-shift movement, a set of extended type-bars mounted for case-shift movement and each having four types arranged thereon in a row or series longitudinally thereof, the platen and the set of type-bars having normal relative printing positions corresponding to one of the end types in the series, means for independently shifting the platen from its normal position to a printing position for an intermediate type in the series, means for independently shifting the set of type-bars from its normal position to a printing position for the other intermediate type in the series, means for concomitantly shifting both the platen and the set of type-bars in opposite directions from their normal positions to printing positions for the final type in the series, fixed stops to limit the case-shift and return movements of the platen, and fixed stops to limit the case-shift and return movements of the set of type-bars.

6. In a front-strike typewriting machine, in combination, a shiftable platen, a set of type-bars each having four types thereon, a shiftable segment-frame on which the type-bars are pivoted, a shift-key at the keyboard independently operable for shifting the platen alone, a second shift-key at the keyboard independently operable for shifting the segment-frame alone, and a third shift-key at the keyboard independently operable for concomitantly shifting the platen and the segment-frame.

7. In a front-strike typewriting machine, in combination, a shiftable platen, a set of type-bars each having four types thereon, a shiftable segment-frame on which the type-bars are pivoted, a shift-key at the keyboard for independently shifting the platen from normal position to a case-shift position, another shift-key at the keyboard for independently shifting the segment-frame from normal position to a case-shift position, and a third shift-key at the keyboard or concomitantly shifting both the platen and the segment-frame from their normal positions to the same case-shift positions to which they are shiftable independently.

8. In a front-strike typewriting machine, in combination, a shiftable platen, a set of type-bars each having four types thereon, a shiftable segment-frame on which the type-bars are pivoted, a shift-key at the keyboard for independently shifting the platen from normal position to a case-shift position, another shift-key at the keyboard for independently shifting the segment-frame from normal position to a case-shift position, and a third shift-key at the keyboard for concomitantly shifting both the platen and the segment-frame from their normal positions to the same case-shift positions to which they are shiftable independently, the case-shift movements of the segment-frame being through twice the distance of the case-shift movements of the platen.

9. In a front-strike typewriting machine, in combination, a shiftable platen, a set of type-bars each having four types thereon, a shiftable segment-frame on which the type-bars are pivoted, a shift-key at the keyboard for independently shifting the platen from normal position to a case-shift position, another shift-key at the keyboard for independently shifting the segment-frame from normal position to a case-shift position, a third shift-key at the keyboard for concomitantly shifting both the platen and the segment-frame from their normal positions to the same case-shift positions to which they are shiftable independently, one of said case-shift movements being through twice the distance of the other, fixed stops to limit the case-shift and return movements of the platen, and fixed stops to limit the case-shift and return movements of the segment-frame.

10. In a front-strike typewriting machine, in combination, a shiftable platen, a set of extended type-bars each having four types

arranged thereon in a row or series longitudinally thereof, a shiftable segment-frame on which the type-bars are pivoted to shift therewith, the platen and the set of type-bars having normal relative printing positions corresponding to one of the end types in the series, a shift-key at the keyboard for independently shifting the platen from its normal position to a printing position for the next adjacent type in the series, another shift-key at the keyboard for independently shifting the segment-frame from its normal position to a printing position for the third consecutive type in the series, and a third shift-key at the keyboard for concomitatntly shifting the platen and the segment-frame in opposite directions from their normal positions to printing positions for the final type in the series, each of said shift-keys being independently operable while the remaining shift-keys remain at rest.

11. In a front-strike typewriting machine, in combination, a shiftable platen, a set of extended type-bars each having four types arranged thereon in a row or series longitudinally thereof, a shiftable segment-frame on which the type-bars are pivoted to shift therewith, the platen and the set of type-bars having normal relative printing positions corresponding to one of the end types in the series, a shift-key at the keyboard for independently shifting the platen from its normal position to a printing position for the next adjacent type in the series, another shift-key at the keyboard for independently shifting the segment-frame from its normal position to a printing position for the third consecutive type in the series, a third shift-key at the keyboard for concomitantly shifting the platen and the segment-frame in opposite directions from their normal positions to printing positions for the final type in the series, each of said shift-keys being independently operable while the remaining shift-keys remain at rest, fixed stops to limit the case-shift and return movements of the platen, and fixed stops to limit the case-shift and return movements of the segment-frame.

12. In a front-strike typewriting machine, in combination, a platen, a platen-frame mounted for up-and-down case-shift movement, a type-bar segment mounted for up-and-down case-shift movement, a set of type-bars pivoted on the segment to shift therewith, the case-shift movements of the platen-frame and the segment being in opposite directions, and one of said case-shift movements being through a single case-shift space or distance and the other case-shift movement being through two case-shift spaces or distances, fixed stops to limit the case-shift and return movements of the platen-frame, fixed stops to limit the case-shift and return movements of the segment, a shift-key for shifting the platen-frame without shifting the segment, a second shift-key for shifting the segment without shifting the platen-frame, and a third shift-key for concomitantly shifting the platen-frame and the segment, each type-bar having four types thereon to correspond respectively with the four relative printing positions of the platen and the type-bars.

13. In a front-strike typewriting machine, in combination, a platen, a platen-frame mounted for up-and-down case-shift movement, a type-bar segment mounted for up-and-down case-shift movement, a set of type-bars pivoted on the segment to shift therewith, the case-shift movements of the platen-frame and the segment being in opposite directions, the case-shift movement of the platen-frame being through a single case-shift space or distance and the case-shift movement of the segment being through two case-shift spaces or distances, fixed stops to limit the case-shift and return movements of the platen-frame, fixed stops to limit the case-shift and return movements of the segment, a shift-key for shifting the platen-frame without shifting the segment, a second shift-key for shifting the segment without shifting the platen-frame, and a third shift-key for concomitantly shifting the platen-frame and the segment, each type-bar having four types thereon to correspond respectively with the four relative printing positions of the platen and the type-bars.

14. In a front-strike typewriting machine, in combination, a platen, a platen-frame shiftable upwardly from normal position through single case-shift space, a type-bar segment shiftable downwardly from normal position through two case-shift spaces, type-bars pivoted on the segment to shift therewith, the platen-frame and the segment being shiftable in opposite directions, fixed stops to limit the case-shift and return movements of the platen-frame, fixed stops to limit the case-shift and return movements of the segment, means for automatically lifting the segment from case-shift position to normal position, a shift-key for shifting the platen-frame from its normal position to its case-shift position without shifting the segment, a second shift-key for shifting the segment from its normal position to its case-shift position without shifting the platen-frame, and a third shift-key for concomitantly shifting the platen-frame and the segment from their normal positions to their case-shift positions, each type-bar having four types thereon to correspond respectively with the four relative printing positions of the platen and the type-bars.

15. In a front-strike typewriting machine,

in combination, a platen-frame mounted for up-and-down case-shift movement, a type-bar-segment mounted for up-and-down case-shift movement, the case-shift movements of the platen-frame and of the segment being in opposite directions, and one of said case-shift movements being through a single case-shift space or distance and the other case-shift movement being through two case-shift spaces or distances, fixed stops to limit the case-shift and return movements of the platen-frame, fixed stops to limit the case-shift and return movements of the segment, a shift-key to shift the platen-frame from its normal position to its case-shift position without shiftng the segment, and a second shift-key to shift the segment from its normal position to its case-shift position without shifting the platen-frame.

16. In a front-strike typewriting machine, in combination, a platen-frame mounted for up-and-down case-shift movement, a type-bar-segment mounted for up-and-down case-shift movement, the case-shift movements of the platen-frame and of the segment being in opposite directions, and the case-shift movement of the platen-frame being through a single case-shift space or distance and the case-shift movement of the segment being through two case-shift spaces or distances, fixed stops to limit the case-shift and return movements of the platen-frame, fixed stops to limit the case-shift and return movements of the segment, a shift-key to shift the platen-frame from its normal position to its case-shift position without shifting the segment, and a second shift-key to shift the segment from its normal position to its case-shift position without shifting the platen-frame.

17. In a front-strike typewriting machine, in combination, a platen-frame shiftable upwardly from normal position through a single case-shift space, a type-bar-segment shiftable downwardly from normal position through two case-shift spaces, the platen-frame and the segment being shiftable in opposite directions, fixed stops to limit the case-shift and return movements of the platen-frame, fixed stops to limit the case-shift and return movements of the segment, a shift-key to shift the platen-frame from its normal to its case-shift position without shifting the segment, and a second shift-key to shift the segment from its normal position to its case-shift without shifting the platen-frame.

18. In a front-strike typewriting machine having a platen and a set of type-bars, the combination of means for concomitantly shifting the platen and the type-bars in opposite directions, and means for independently shifting the platen.

19. In a front-strike typewriting machine, in combination, a shiftable platen, a set of type-bars, a shiftable segment-frame on which the type-bars are pivoted to shift therewith, a shift-key at the keyboard for concomitantly shifting the platen and the segment-frame in opposite directions from normal printing positions into case-shift positions, another shift-key at the keyboard for independently shifting the platen from its normal position into the same case-shift position to which it is shiftable concomitantly with the segment-frame, fixed stops to limit the case-shift and return movements of the platen, and fixed stops to limit the case-shift and return movements of the segment-frame.

20. In a front-strike typewriting machine having a platen and a set of type-bars, the combination of means for concomitantly shifting the platen and the type-bars in opposite directions, and means for independently shifting the type-bars.

21. In a front-strike typewriting machine, in combination, a shiftable platen, a set of type-bars, a shiftable segment-frame on which the type-bars are pivoted to shift therewith, a shift-key at the keyboard for concomitantly shifting the platen and the segment-frame in opposite directions from normal printing positions into case-shift positions, another shift-key at the keyboard for independently shifting the segment-frame into the same case-shift position to which it is shiftable concomitantly with the platen, fixed stops to limit the case-shift and return movements of the platen, and fixed stops to limit the case-shift and return movements of the segment-frame

22. In a front-strike typewriting machine having a platen and a set of pivoted type-bars, the combination of sub-levers for operating the type-bars, means for shifting the type-bars and the sub-levers up and down as a unit. links connected to the sub-levers and extending rearwardly therefrom, and key-levers pivoted on the stationary framework of the machine at the rear of the type-bar pivots and having portions extending downwardly from their pivots to move rearwardly when the keys are depressed and pivotally connected to the rear ends of said links, so that said links may swing on the key-levers at the shifting of the type-bars and sub-levers and whereby the key-levers may be of sufficient length to permit substantially vertical movement of the keys.

23. In a front-strike typewriting machine, in combination, a platen, a type-bar segment or frame mounted for up-and-down case-shift movement, a set of type-bars pivoted on said frame to shift therewith, a set of sub-levers connected to the type-bars and also pivoted on said frame to shift therewith, links connected to the sub-levers and extending rearwardly therefrom, and key-levers pivoted on the stationary framework of the machine at the rear of the type-bar

pivots and having portions extending downwardly from their pivots to move rearwardly at the depression of the keys, said downwardly-extending portions being pivotally connected to the rear ends of said links, so that said links may swing on the key-levers to accommodate the case-shift movement of said shiftable frame.

24. In a front-strike typewriting machine, in combination, a platen, a segment-frame shiftable up and down, a set of type-bars pivoted on the segment-frame to shift therewith, sub-levers pivoted on the segment-frame below the type-bar pivots to shift with the segment-frame and having upstanding arms, pin-and-slot connections between said upstanding arms and the type-bars, key-levers pivoted on the stationary framework of the machine at the rear of the type-bar pivots and directly beneath the platen, the key-levers having portions extending downwardly from their pivots at the rear of the sub-levers, and substantially horizontal links pivotally connecting the downwardly-extending portions of the key-levers to the sub-levers below their pivots.

25. In a front-strike typewriting machine, in combination, a platen, a segment-frame shiftable up and down, a set of type-bars pivoted on the segment-frame to shift therewith, sub-levers pivoted on the segment-frame below the type-bar pivots to shift with the segment-frame and having forwardly movable upstanding arms, actuating pins for the type-bars carried by the upper ends of said upstanding arms, the type-bars having slots therein for said pins, each of said slots extending upwardly and forwardly from its corresponding pin to a point at the rear of the type-bar pivot, the arrangement being such that said actuating pin will be brought into alignment between the type-bar pivot and the sub-lever pivot substantially at the printing position of the type-bar, whereby continual acceleration will be imparted to the type-bar throughout its movement to the printing point on the platen, key-levers pivoted on the stationary framework of the machine at the rear of the type-bar pivots, the key-levers having rearwardly movable portions extending downwardly from their pivots at the rear of the sub-levers, and substantially horizontal links pivoted to the downwardly-extending key-lever portions and pivoted to the sub-levers below their pivots.

26. In a front-strike typewriting machine, in combination, a platen, a segment-frame shiftable up and down, type-bars pivoted on the segment-frame to shift therewith, sub-levers pivoted below the type-bar pivots on the segment-frame to shift therewith and having rearwardly-inclined upwardly and forwardly movable upstanding arms, the type-bar pivots and the sub-lever pivots being substantially in the same transverse vertical plane, actuating pins for the type-bars carried by the upper ends of said upstanding arms to be swung thereby upwardly and forwardly, the type-bars having slots therein for said pins, each of said slots extending from its corresponding pin upwardly and forwardly to a point at the rear of and substantially in the same horizontal plane as the type-bar pivot, the arrangement being such that the actuating pin will be brought into said vertical plane substantially at the printing position of the type-bar, whereby continually accelerated movement will be imparted to the type-bar throughout its movement to the printing point on the platen, key-levers pivoted on the stationary framework of the machine at the rear of the type-bar pivots and at a level above the keys in the keyboard, said key-levers having rearwardly movable portions extending downwardly at the rear of the sub-levers, and substantially horizontal links pivotally connecting the sub-levers below their pivots to said downwardly-extending portions of the key-levers.

27. In a front-strike typewriting machine, in combination, a platen, a segment-frame shiftable up and down, type-bars pivoted on the segment-frame to shift therewith, sub-levers pivoted below the type-bar pivots on the segment-frame to shift therewith and having rearwardly-inclined, upwardly and forwardly movable upstanding arms, the type-bar pivots and the sub-lever pivots being substantially in the same transverse vertical plane, actuating pins for the type-bars carried by the upper ends of said upstanding arms to be swung thereby upwardly and forwardly, the type-bars having slots therein for said pins, each of said slots extending upwardly and forwardly on a rearwardly and upwardly bowed curve from its corresponding pin to a point at the rear of and substantially at the same level as the type-bar pivot, the arrangement being such that the actuating pin will be brought into said vertical plane substantially at the printing position of the type-bar, whereby the type-bar will be continually accelerated as it moves to the printing point on the platen, key-levers pivoted on the stationary framework of the machine at the rear of the type-bar pivots, the key-levers having rearwardly movable portions extending downwardly from their pivots at the rear of the sub-levers, and substantially horizontal links pivotally connecting the sub-levers below their pivots to said downwardly-extending portions of the key-levers.

28. In a front-strike typewriting machine, the combination of a platen, a pivoted type-bar, a sub-lever pivoted below the type-bar pivot and having a forwardly movable upstanding arm, the type-bar pivot and the

sub-lever pivot having a fixed relation relatively to each other, an actuating pin for the type-bar carried by the end of said upstanding arm, the type-bar having a slot therein for said pin, said slot extending upwardly and forwardly from the pin to a point at the rear of the type-bar pivot, the arrangement being such that the actuating pin will be brought into alignment between the type-bar pivot and the sub-lever pivot substantially at the printing position of the type-bar, so that the type-bar will be continually accelerated in its movement to the printing point on the platen, and a key-lever connected to the sub-lever to operate the latter.

29. In a front-strike typewriting machine, the combination of a platen, a pivoted type-bar, a sub-lever pivoted below the type-bar pivot and having a forwardly movable upstanding arm, the type-bar pivot and the sub-lever pivot having a fixed relation relatively to each other, an actuating pin for the type-bar carried by the end of said upstanding arm, the type-bar having a slot therein for said pin, said slot extending upwardly and forwardly on a rearwardly and upwardly bowed curve from said pin to a point at the rear of the type-bar pivot, the arrangement being such that the actuating pin will be brought into alignment between the type-bar pivot and the sub-lever pivot substantially at the printing position of the type-bar, so that the type-bar will be continually accelerated in its movement to the printing point on the platen, and a key-lever connected to the sub-lever to operate the latter.

30. In a front-strike typewriting machine, the combination of a platen, a pivoted type-bar, a sub-lever pivoted below the type-bar pivot and having a rearwardly-inclined upwardly and forwardly movable upstanding arm, the type-bar pivot and the sub-lever pivot being substantially in the same transverse vertical plane, an actuating pin for the type-bar carried by the upper end of said upstanding arm to be swung thereby upwardly and forwardly, the type-bar having a slot therein for said pin, said slot extending upwardly and forwardly on a rearwardly and upwardly bowed curve from said pin to a point at the rear of and substantially in the same horizontal plane as the type-bar pivot, the arrangement being such that the actuating pin will be brought into said vertical plane substantially at the printing position of the type-bar, whereby a continual acceleration will be imparted to the type-bar throughout its movement to the printing point on the platen, and a key-lever connected to the sub-lever to operate the latter.

31. In a front-strike typewriting machine having a platen, a letter-feeding carriage therefor, escapement mechanism for the carriage, a set of pivoted type-bars and sub-levers for operating the type-bars, the combination of key-levers connected to operate the sub-levers, said key-levers being pivoted on the stationary framework of the machine at the rear of the type-bar pivots and having portions extending downwardly from their pivots to move rearwardly when the keys are depressed, and a rearwardly movable universal bar for operating the escapement mechanism extending transversely of the machine at the rear of and in the paths of said downwardly-extending portions of the key-levers.

32. In a front-strike typewriting machine having a platen, a letter-feeding carriage therefor, escapement mechanism for the carriage, a set of pivoted type-bars and sub-levers for operating the type-bars, the combination of key-levers connected to operate the sub-levers, said key-levers being pivoted on the stationary framework of the machine at the rear of the type-bar pivots and having portions extending downwardly from their pivots to move rearwardly when the keys are depressed, and a rearwardly movable universal bar for operating the escapement mechanism extending transversely of the machine at the rear of and in the paths of said downwardly-extending portions of the key-levers, said downwardly-extending portions of the key-levers having rearwardly-projecting lugs thereon to operate the universal bar, said lugs being omitted from any desired key-levers in order thereby to produce silent keys.

33. In a front-strike typewriting machine having a platen, a letter-feeding carriage therefor, escapement mechanism for the carriage, a set of pivoted type-bars and sub-levers for operating the type-bars, the combination of key-levers connected to operate the sub-levers, said key-levers being pivoted on the stationary framework of the machine at the rear of the type-bar pivots and having portions extending downwardly from their pivots to move rearwardly when the keys are depressed, a rearwardly movable universal bar for operating the escapement mechanism extending transversely of the machine at the rear of and in the paths of said downwardly-extending portions of the key-levers, a vibrating ribbon-guide, and a second rearwardly movable universal bar to vibrate the ribbon-guide extending transversely of the machine at the rear of said downwardly-extending portions of the key-levers in the paths thereof to be operated thereby when any key is depressed in the typing operation.

34. In a front-strike typewriting machine having a platen, a letter-feeding carriage therefor, escapement mechanism for the carriage, a set of pivoted type-bars and sub-levers for operating the type-bars, the combination of key-levers connected to operate the sub-levers, said key-levers being pivoted

on the stationary framework of the machine at the rear of the type-bar pivots and having portions extending downwardly from their pivots to move rearwardly when the keys are depressed, a rearwardly movable universal bar for operating the escapement mechanism extending transversely of the machine at the rear of and in the paths of said downwardly-extending portions of the key-levers, said downwardly-extending portions of the levers having rearwardly-projecting lugs thereon to operate the universal bar, said lugs being omitted from any desired key-levers in order thereby to produce silent keys, a vibrating ribbon-guide, and a second rearwardly movable universal bar to vibrate the ribbon-guide extending transversely of the machine at the rear of said downwardly-extending portions of the key-levers in the paths thereof to be operated thereby when any key is depressed in the typing operation.

35. In a front-strike typewriting machine having a shiftable platen, a traveling carriage therefor, letter-feeding escapement mechanism for the carriage, a ribbon-vibrator shiftable with the platen, a set of pivoted type-bars and sub-levers to operate the type-bars, the combination of key-levers connected to the sub-levers to operate the latter pivoted on the stationary framework of the machine at the rear of the type-bar pivots, said key-levers having rearwardly movable portions extending downwardly from their pivots, a rearwardly movable universal bar for operating the escapement mechanism extending transversely at the rear of and in the paths of said downwardly-extending portions of the key-levers to be operated thereby, a second rearwardly movable universal bar extending transversely at the rear of and in the paths of said downwardly-extending portions of the key-levers to be operated thereby, and means carried by the second universal bar for operating the ribbon-vibrator in any case-shift position of the platen.

36. In a front-strike typewriting machine having a shiftable platen, a ribbon-vibrator shiftable with the platen, type-bars and sub-levers to operate the type-bars, the combination of key-levers connected to operate the sub-levers and pivoted on the stationary framework of the machine at the rear of the type-bar pivots, said key-levers having rearwardly movable portions extending downwardly from their pivots, a rearwardly movable universal bar extending transversely at the rear of and in the paths of said downwardly-extending key-lever portions to be operated thereby, and means carried by said universal bar to operate the ribbon-vibrator in the different case-shift positions of the platen.

37. In a front-strike typewriting machine having a platen, a letter-feeding carriage therefor, escapement mechanism for the carriage, a set of pivoted type-bars and sub-levers for operating the type-bars, the combination of key-levers connected to operate the sub-levers, said key-levers being pivoted on the stationary framework of the machine at the rear of the type-bar pivots and having portions extending downwardly from their pivots to move rearwardly when the keys are depressed, and a rearwardly movable universal bar for operating the escapement mechanism extending transversely of the machine at the rear of and in the paths of said downwardly-extending portions of the key-levers, lost motion being provided between said downwardly-extending portions of the key-levers and the universal bar so as to operate the escapement mechanism only during the final portion of the key-lever stroke.

38. In a front-strike typewriting machine having a platen, a letter-feeding carriage therefor, escapement mechanism for the carriage, a set of pivoted type-bars and sub-levers for operating the type-bars, the combination of key-levers connected to operate the sub-levers, said key-levers being pivoted on the stationary framework of the machine at the rear of the type-bar pivots and having portions extending downwardly from their pivots to move rearwardly when the keys are depressed, a rearwardly movable universal bar for operating the escapement mechanism extending transversely of the machine at the rear of and in the paths of said downwardly-extending portions of the key-levers, a vibrating ribbon-guide, and a second rearwardly movable universal bar to vibrate the ribbon-guide extending transversely of the machine at the rear of said downwardly-extending portions of the key-levers in the paths thereof to be operated thereby when any key is depressed in the typing operation, lost motion being provided between said downwardly-extending portions of the key-levers and the universal bar for operating the escapement mechanism, so that the escapement mechanism will be operated near the end of the stroke of the respective key-levers.

39. In a front-strike typewriting machine, in combination, a platen, a traveling carriage for the platen, a letter-feeding escapement mechanism for the carriage, an up-and-down shiftable type-bar segment or frame, type-bars pivoted on said frame to shift therewith, a set of sub-levers connected to the type-bars and also pivoted on said frame to shift therewith, links connected to the sub-levers and extending rearwardly therefrom, key-levers pivoted on the stationary framework of the machine at the rear of the type-bar pivots and having portions extending downwardly from their pivots to move rearwardly at the depression

of the keys, said downwardly-extending portions being pivotally connected to the rear ends of said links, so that said links provide for the case-shift movement of said frame, and a rearwardly movable universal bar for operating the escapement mechanism extending transversely at the rear of and in the paths of said downwardly-extending portions of the key-levers to be operated thereby at the depression of the keys.

40. In a front-strike typewriting machine, in combination, a platen, a traveling carriage for the platen, a letter-feeding escapement mechanism for the carriage, an up-and-down shiftable type-bar segment or frame, type-bars pivoted on said frame to shift therewith, a set of sub-levers connected to the type-bars and also pivoted on said frame to shift therewith, links connected to the sub-levers and extending rearwardly therefrom, key-levers pivoted on the stationary framework of the machine at the rear of the type-bar pivots and having portions extending downwardly from their pivots to move rearwardly at the depression of the keys, said downwardly-extending portions being pivotally connected to the rear ends of said links, so that said links provide for the case-shift movement of said frame, a rearwardly movable universal bar for operating the escapement mechanism extending transversely at the rear of and in the paths of said downwardly-extending portions of the key-levers to be operated thereby at the depression of the keys, said downwardly-extending portions of the key-levers having rearwardly-projecting lugs to operate the universal bar, lost motion being provided between said lugs and the universal bar, so that the escapement mechanism will be operated near the end of the strokes of the key-levers, said lugs being omitted wherever desired to produce silent keys, a ribbon-vibrator, and a second universal bar for operating the ribbon-vibrator extending transversely of the machine at the rear of and in the paths of said downwardly-extending portions of the key-levers to be operated thereby at the depression of the keys.

41. In a front-strike typewriting machine, in combination, a platen, a traveling carriage for the platen, a letter-feeding escapement mechanism for the carriage, an up-and-down shiftable type-bar segment or frame, type-bars pivoted on said frame to shift therewith, a set of sub-levers connected to the type-bars and also pivoted on said frame to shift therewith, links connected to the sub-levers and extending rearwardly therefrom, key-levers pivoted on the stationary framework of the machine at the rear of the type-bar pivots and having portions extending downwardly from their pivots to move rearwardly at the depression of the keys, said downwardly-extending portions being pivotally connected to the rear ends of said links, so that said links provide for the case-shift movement of said frame, a rearwardly movable universal bar for operating the escapement mechanism extending transversely at the rear of and in the paths of said downwardly-extending portions of the key-levers to be operated thereby at the depression of the keys, a ribbon-vibrator, and above said universal bar another universal bar for operating the ribbon-vibrator extending transversely of the machine at the rear of and in the paths of said downwardly-extending portions of the key-levers to be operated thereby at the depression of the keys.

42. In a front-strike typewriting machine, in combination, a platen, a traveling carriage upon which the platen is shiftable up and down, a letter-feeding escapement mechanism for the carriage, a ribbon-vibrator, means for shifting the ribbon-vibrator with the platen, a type-bar segment or frame shiftable up and down, a set of type-bars pivoted on said frame to shift therewith, a set of sub-levers connected to the type-bars and also pivoted on said frame to shift therewith, key-levers pivoted on the stationary framework of the machine at the rear of the type-bar pivots and having portions extending downwardly from their pivots to move rearwardly at the depression of the keys, links connecting said levers to said downwardly-extending portions to swing on the latter at the case-shift movement of said frame, a rearwardly movable universal bar extending transversely of the machine at the rear of and in the paths of said downwardly-extending portions of the key-levers to be operated thereby at the depression of the keys for operating the escapement mechanism, above said universal bar a second universal bar extending transversely of the machine at the rear of and in the paths of said downwardly-extending portions of the key-levers to be operated thereby at the depression of the keys, and means operated by the second universal bar to operate the ribbon-vibrator in the different printing positions of the shiftable platen.

43. In a front-strike typewriting machine, in combination, a platen, a carriage therefor, letter-feeding escapement mechanism for the carriage including a dog-rocker having a downwardly-extending arm, a set of pivoted type-bars, sub-levers for operating the type-bars, key-levers connected to operate the sub-levers pivoted on the stationary framework of the machine at the rear of the type-bar pivots and having portions extending downwardly from their pivots to move rearwardly when the keys are depressed, a universal bar extending transversely of the

machine at the rear of and in the paths of said downwardly-extending portions of the key-levers to be moved rearwardly thereby at the depression of the keys, said universal bar having upwardly-extending arms to form a swinging frame, a rock-shaft mounted on the framework of the machine and to which the upper ends of said arms are fixed, and an upwardly-projecting arm carried by the rock-shaft engageable with the downwardly-extending arm of the dog-rocker at the rear thereof for operating the dog-rocker at the depression of the keys.

44. In a front-strike typewriting machine, in combination, a platen, a carriage therefor, letter-feeding escapement mechanism for the carriage including a dog-rocker having a downwardly-extending arm, a set of pivoted type-bars, sub-levers for operating the type-bars, key-levers connected to operate the sub-levers pivoted on the stationary framework of the machine at the rear of the type-bar pivots and having portions extending downwardly from their pivots to move rearwardly when the keys are depressed, a universal bar extending transversely of the machine at the rear of and in the paths of said downwardly-extending portions of the key-levers to be moved rearwardly thereby at the depression of the keys, said universal bar having upwardly-extending arms to form a swinging frame, a rock-shaft mounted on the framework of the machine and to which the upper ends of said arms are fixed, an upwardly-projecting arm carried by the rock-shaft engageable with the downwardly-extending arm of the dog-rocker at the rear thereof for operating the dog-rocker at the depression of the keys, a vibrating ribbon-guide, a bell-crank lever having a forwardly-extending arm connected to the ribbon-guide and having a downwardly-extending arm portion, above said universal bar a second universal bar extending transversely of the machine at the rear of and in the paths of said downwardly-extending portions of the key-levers to be moved rearwardly thereby at the depression of the keys, said second universal bar having upwardly-extending arms forming a swinging frame, a rock-shaft mounted on the framework of the machine and upon which the upper ends of said latter arms are fixed, and an upwardly-projecting arm carried by the latter rock-shaft engageable with the downwardly-extending arm of the bell-crank lever to vibrate the ribbon-guide at the depression of the keys.

45. In a front-strike typewriting machine, in combination, a platen, a platen-frame, a traveling carriage upon which the platen-frame is shiftable up and down, letter-feeding escapement mechanism for the carriage including a dog-rocker having a downwardly-extending arm, a shift-rail frame mounted upon the framework of the machine to shift the platen-frame, a set of pivoted type-bars, sub-levers for operating the type-bars, key-levers to operate the sub-levers and pivoted on the framework of the machine at the rear of the type-bar pivots and having portions extending downwardly from their pivots to move rearwardly at the depression of the keys, a rocking universal frame pivoted on the framework of the machine and provided below its pivots with a universal bar extending transversely of the machine at the rear of and in the paths of said downwardly-extending portions of the key-levers to be moved rearwardly thereby at the depression of the keys, a vibrating ribbon-guide, a bell-crank lever pivoted on the shift-rail frame and having a forwardly-extending arm connected to the ribbon-guide and having an arm portion extending downwardly from its pivot, an upstanding lever-arm carried by the rocking universal frame engageable with said downwardly-extending arm portion of the bell-crank lever at the rear thereof to vibrate the ribbon-guide at the depression of the keys.

46. In a front-strike typewriting machine, in combination, a platen, a platen-frame, a traveling carriage upon which the platen-frame is shiftable up and down, letter-feeding escapement mechanism for the carriage including a dog-rocker having a downwardly-extending arm, a shift-rail frame mounted upon the framework of the machine to shift the platen-frame, a set of pivoted type-bars, sub-levers for operating the type-bars, key-levers to operate the sub-levers and pivoted on the framework of the machine at the rear of the type-bar pivots and having portions extending downwardly from their pivots to move rearwardly at the depression of the keys, a ribbon-vibrating rocking universal frame pivoted on the framework of the machine and provided below its pivots with a universal bar extending transversely of the machine at the rear of and in the paths of said downwardly-extending portions of the key-levers to be moved rearwardly thereby at the depression of the keys, a vibrating ribbon-guide, a bell-crank lever pivoted on the shift-rail frame and having a forwardly-extending arm connected to the ribbon-guide and having an arm portion extending downwardly from its pivot, an upstanding lever-arm carried by the rocking universal frame engageable with said downwardly-extending arm portion of the bell-crank lever at the rear thereof to vibrate the ribbon-guide at the depression of the keys, an escapement-mechanism-operating rocking universal frame pivoted on the framework of the machine and provided below its pivots with a universal bar extending transversely of the machine at the rear of and in the paths of said downwardly-extending key-lever portions below

the ribbon-vibrating universal bar to be moved rearwardly at the depression of the keys, and an upstanding lever-arm carried by the escapement-mechanism-operating universal frame engageable with the downwardly-extending arm of the dog-rocker at the rear thereof to operate the dog-rocker at the depression of the keys.

47. In a front-strike typewriting machine having a platen, a segment, and a system of type-bars pivoted on the segment, the combination of a system of key-levers extending laterally beyond the system of type-bars, and operating connections between the key-levers and the type-bars including sub-levers converging from the key-levers to the type-bars, each of said sub-levers having a fulcrum-pivot point and two connecting pivot points arranged in an inclined plane transverse to the axes of said pivot points, to avoid twisting strain upon the sub-levers and to prevent binding of the sub-levers upon their pivots or distortion of the sub-levers.

48. In a front-strike typewriting machine having a platen, a segment, and a system of type-bars pivoted on the segment, the combination of a system of key-levers extending laterally beyond the system of type-bars, and operating connections between the key-levers and the type-bars including upstanding sub-levers converging from the key-levers toward the type-bars, each of said sub-levers having a fulcrum pivot between its ends, a pivot at its upper end connected to a type-bar and a pivot at its lower end connected to a key-lever, the three sub-lever pivots being arranged in a plane extending transversely of their axes so as to avoid twisting strain upon the fulcrum pivot of the sub-lever.

49. In a front-strike typewriting machine having a platen, a segment, and a system of type-bars pivoted on the segment, the combination of a system of key-levers pivoted on the framework of the machine at the rear of the type-bar pivots, the key-levers being parallel throughout their length and the system of key-levers extending laterally at each side beyond the system of type-bars, and operating connections between the key-levers and the type-bars including upstanding sub-levers converging from the key-levers toward the type-bars, each of said sub-levers having a fulcrum pivot between its ends, a pivot at its upper end connected to a type-bar and a pivot at its lower end connected to a key-lever, the three sub-lever pivots being arranged in a plane extending transversely of the axes of the pivots for avoiding twisting strain upon the sub-lever at its fulcrum pivot.

50. In a front-strike typewriting machine, in combination, a platen, an up-and-down shiftable segment, forming a frame, a system of type-bars pivoted on the segment to shift therewith, a system of key-levers parallel throughout their length pivoted on the framework of the machine at the rear of the type-bar pivots and having portions extending downwardly below their pivots, forwardly-extending links pivoted at their rear ends to said downwardly-extending portions of the key-levers, the system of key-levers and links extending laterally at each side beyond the system of type-bars, and upstanding sub-levers of the first order fulcrumed upon said frame to shift therewith, said sub-levers having pivots at their lower ends connected to the forward ends of said links and having pivots at their upper ends connected to the type-bars, said sub-levers converging from said links toward the type-bars, the three pivots of each sub-lever being arranged in a plane extending transversely of the axes of the pivots for avoiding twisting strain of the sub-lever upon its fulcrum pivot.

51. A front-strike typewriting machine having, in combination, a platen, a shiftable type-bar segment, a rocking segment-guiding frame extending transversely of the machine and journaled at its ends in the framework of the machine, said rocking guiding frame being pivotally connected to opposite end portions of the segment to prevent skewing of the segment at its shifting movement, and means independent of said rocking guiding frame for shifting the segment.

52. A front-strike typewriting machine having, in combination, a platen, an up-and-down shiftable frame including a type-bar segment, vertical guideways in the framework of the machine for guiding said shiftable frame at its ends, a rock-shaft extending transversely at the rear of said shiftable frame and journaled in the framework of the machine, rock-arms carried by and extending forwardly from the rock-shaft and having a pivotal connection to opposite end portions of said shiftable frame to prevent binding of said shiftable frame in said guideways, and a shift-key connected to said shiftable frame independently of said rock-shaft and rock-arms.

53. In a front-strike typewriting machine, in combination, a platen, type-bars, key-levers connected to operate the type-bars and having rearwardly movable portions extending downwardly from their fulcrum pivots, a vibrating ribbon-guide for the platen, and means to vibrate the ribbon-guide, including a rocking universal frame pivoted at the rear of and below the type-bar pivots and having downwardly-extending portions provided with a rearwardly movable universal bar extending transversely of the machine at the rear of and in the paths of said downwardly-extending key-lever portions, said downwardly-extending portions of the key-

levers having rearwardly-projecting lugs thereon to operate the universal bar, said lugs being located at different distances from the key-lever pivots corresponding to the different lengths of the key-levers, thereby to vary the relative effective lengths of the lever-arms formed by the rocking universal frame and the co-operating lever-arms formed by the downwardly-extending key-lever portions above said lugs, whereby the type-keys of the different key-levers may have a uniform dip, and, when depressed, will impart substantially uniform vibrations to the ribbon-guide irrespective of the difference in length of the key-levers.

54. A typewriting machine comprising a platen carriage, front-strike type-bars each extended to carry four types, and a type-bar segment in which said type-bars are pivoted, the type-bar segment and platen being relatively shiftable for typing with any one of said types, the carriage comprising a frame having a front bar portion which is elevated to clear the extended type-bars, a roller journaled upon said front bar portion of the carriage, and a machine frame comprising an upper front bar elevated to clear the extended type bars, said upper front bar of the machine frame having a front scale thereon and at its rear having a shelf forming a front rail upon which said roller runs, said front bar portion of the carriage and said upper front bar of the machine frame both being below the line of vision.

55. In a front-strike typewriting machine, the combination with a platen, of a type-bar swingable in an inclined plane to strike the platen at the printing point, a key-lever pivoted at the rear of the machine to swing in a vertical plane, and a sub-lever pivotally connected at its ends to said type-bar and key-lever, respectively, said sub-lever having a flat central portion pivoted to swing in its own plane and having its ends, for such pivotal connection with the type-bar and key-lever, bent to opposite sides of the flat central portion to obviate twisting stress on the sub-lever.

56. In a front-strike typewriting machine, the combination with a platen, of a type-bar swingable in an inclined plane to strike the platen at the printing point, a key-lever pivoted at the rear of the machine to swing in a vertical plane, and a bent sub-lever pivotally connected at its ends to said type-bar and key-lever, respectively, and pivoted to swing in the plane of its arms, the ends of said arms being bent, for such pivotal connection with the type-bar and key-lever, to opposite sides of said plane to obviate twisting stress on the sub-lever.

57. In a typewriting machine, in combination, a case-shift key and a case-shift lever extending rearwardly and pivoted at its rear end, said lever being offset upwardly in the front portion thereof and downwardly in the rear portion, and having adjacent its rear end an upright arm to effect a platen-shift, and a finger projecting forwardly over the rear end of the downward offset for effecting a case-shift movement of the type-bars.

58. In a typewriting machine, in combination, a case-shift key, a case-shift lever extending rearwardly and pivoted at its rear end, said lever being offset upwardly in the front portion thereof and downwardly in the rear portion, and having adjacent its rear end an upright arm to effect a platen-shift, a finger projecting forwardly over the rear end of the downward offset for effecting a case-shift movement of the type-bars, and a case-shift key-lever similar to the first but without the upright arm.

59. In a typewriting machine, in combination, a case-shift key, a case-shift lever extending rearwardly and pivoted at its rear end, said lever being offset upwardly in the front portion thereof and downwardly in the rear portion, and having adjacent its rear end an upright arm to effect a platen-shift, and a finger projecting forwardly over the rear end of the downward offset for effecting a case-shift movement of the type-bars, and a case-shift key-lever similar to the first but without the forwardly-extending finger.

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