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W. BENSON

TYPEWRITING MACHINE

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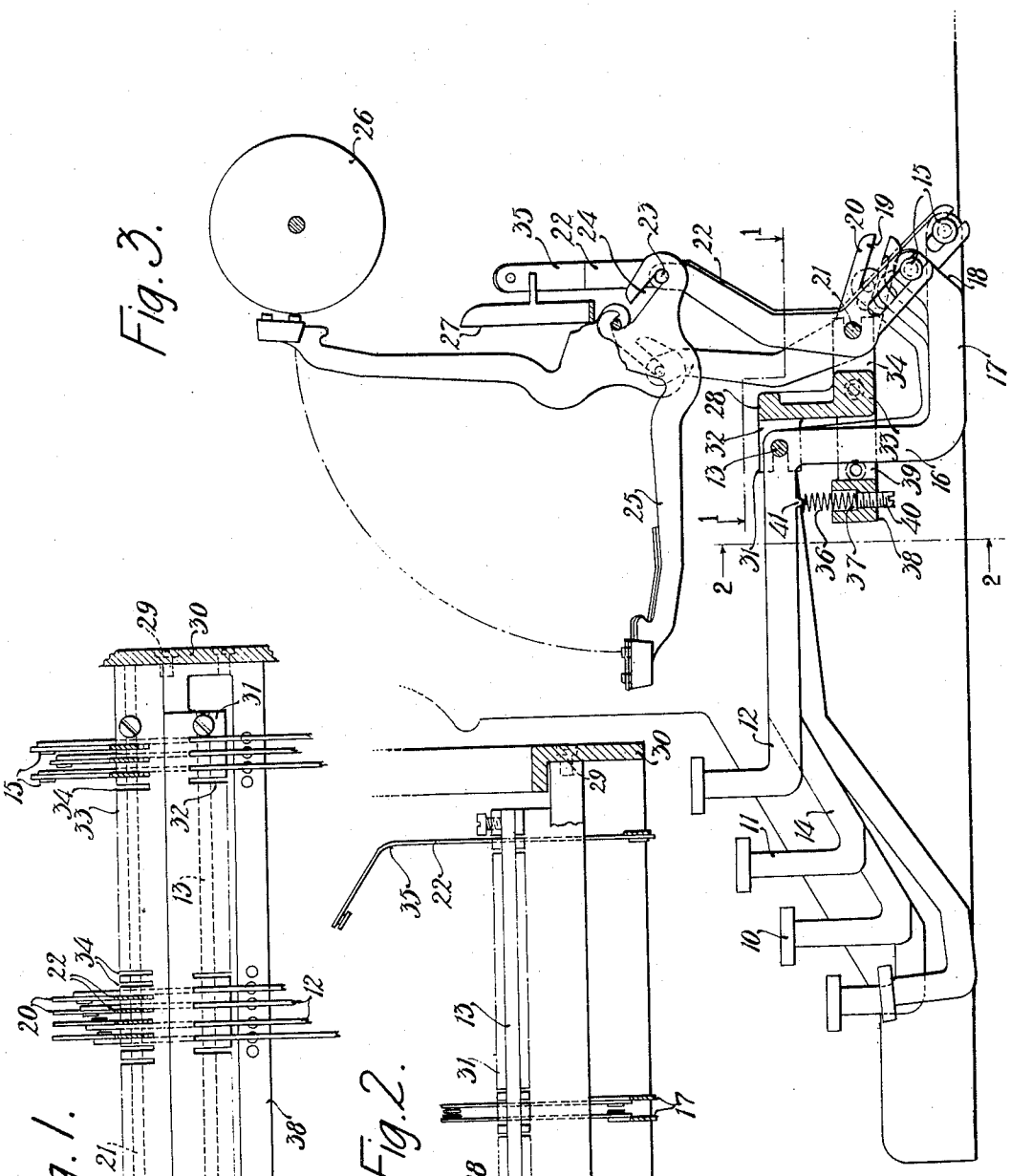

Fig. 3.

Fig. 1.

Fig. 2.

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UNITED STATES PATENT OFFICE.

WILLIAM BENSON, OF BROOKLYN, NEW YORK, ASSIGNOR, BY MESNE ASSIGNMENTS, TO UNDERWOOD TYPEWRITER COMPANY, OF NEW YORK, N. Y., A CORPORATION OF DELAWARE.

TYPEWRITING MACHINE.

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To all whom it may concern:

Be it known that I, WILLIAM BENSON, a citizen of the United States, residing in Brooklyn Borough, in the county of Kings, city and State of New York, have invented certain new and useful Improvements in Typewriting Machines, of which the following is a specification.

This invention relates to the type-actions of a front-strike typewriting machine, and its object is to provide an improved connection between the key and type-bar, with a view to securing compactness and ease of assembling and disassembling, while making only a relatively simple change in the machine.

Another object of the invention is to improve the springs for returning the key-levers, and the means for adjusting the tension of the springs.

The present improvements are shown in connection with the type-bar system of an Underwood standard typewriting machine, and in carrying out the present improvements each type-bar is operated by means of a key-lever and a single part intervening between the key-lever and the type-bar, so that the well-known advantages of the Underwood three-part type-action are preserved, while economy of manufacture and saving of room are gained.

According to the present invention, each key-lever is an elbow-lever, the fulcrum being at its bend, which occurs between the ends of the lever, the key being connected to the forward end of the lever, while the rear end of the lever is directly engaged to a sub-lever, the latter being in the form of an elbow-lever, having a radially-slotted arm extending down and to the rear from its pivot to engage an operating pin that is provided upon said key-lever, while the other arm of the sub-lever extends upwardly and is provided with a pin to engage a slot in the end of a type-bar. The upwardly-extending arms of the sub-levers may correspond generally with similar arms, as at present manufactured in the Underwood machine, so that the principal changes that are made in the machine, according to the present invention, reside in extending the short arms of the sub-levers downwardly and rearwardly from their pivots, and in pivoting the key-levers between their ends and providing improved connections from the key-levers to the sub-levers.

The axis of the rear arm of each novel key-lever extends downwardly and rearwardly from the key-lever fulcrum at a steep inclination to a point below and in rear of the fulcrum of the novel sub-lever, which is substantially below and to the rear of the key-lever fulcrum. The key-lever fulcrum, sub-lever fulcrum and operating pin (on the key-lever) are nearly in line when the parts are in their normal positions, with the sub-lever fulcrum between the two pivotal points of the key-lever.

Both the key-levers and the sub-levers may be fulcrumed upon two straight parallel transverse rods arranged upon a single transverse bar forming a common bracket, one rod for each set of levers, said bracket or bar having one set of guide-slots for the key-levers and another set for the sub-levers. The bracket or transverse bar may also carry a bar having sockets for springs to return the type-actions, screws being provided for convenient adjustment of individual springs.

Other features and advantages will hereinafter appear.

In the accompanying drawings,

Figure 1 is a sectional plan taken at about the line 1—1 of Figure 3 to illustrate the transverse bar or bracket upon which the key-levers and sub-levers are fulcrumed, this view showing the sub-levers in section.

Figure 2 is a sectional front elevation taken at about the line 2—2 of Figure 3, showing the key-levers in section and also showing the upwardly-extending portions of the sub-levers as longer at the sides of the machine and convergent for the usual purpose, namely, to conform to the curvature system of type-bar arms.

Figure 3 is a sectional side elevation showing the improved type-actions, one key being shown depressed and its corresponding type-bar in printing position.

The keys 10 and the key-stems 11 are provided upon the forward ends of the arms 12 which extend back to a straight transverse fulcrum-rod 13. The portions of the key-levers for the three front banks of keys may be inclined downwardly at the keyboard as at 14 to give clearance. The portion 12 of the key-lever may be about level with the fulcrum-rod 13. The operating pin 15 of

each key-lever is at a point substantially below and substantially in the rear of the key-lever fulcrum-rod 13, said operating pin being fixed upon the rear end of an L shaped arm 16, 17, the member 16 being pendent from the fulcrum 13 and the member 17 extending rearwardly from the lower end of the member 16, so that the axis of the arm 16, 17 extends downwardly and rearwardly from the fulcrum 13 at a steep inclination. Each member 17 lies preferably in a lower position than the operating pin 15, being connected thereto by a short rearward oblique riser 18. The shaping of the rear arm of the key-lever in this manner affords clearance for the various other portions of the mechanism.

The operating pins 15 work in radial slots 19 formed in arms 20 of type-actuating bell-cranks or sub-levers whose elbow portions are pivoted upon a fulcrum-rod 21 and whose upright portions 22 have pins 23 to engage slots 24 in type-bars 25 to swing them to the platen 26 and to operate a universal bar 27 for the purpose usual in an Underwood typewriter. The pivot 21 of each bell-crank is substantially below and to the rear of the fulcrum-pivot 13 of the corresponding type-bar, and is at a point between and substantially in alignment with the pivots 13 and 15. Both the key-levers and the sub-levers have their pivots intermediate their length and may thus be regarded as levers of the first order. All of the levers may be carried upon a bracket in the form of a single transverse frame-bar 28 supported by screws 29 upon the sides 30 of the machine, and located between the parallel fulcrum-rods 13 and 21, which it supports. Said bar is provided with a forwardly-extending portion 31, vertically slotted as at 32 to receive and guide the key-levers, and also having a rearwardly-extending portion 33, vertically slotted as at 34, to receive and guide the sub-levers.

It will be seen that the key-levers are directly and positively engaged to the sub-levers, the latter being similarly engaged to the type-bars, so that a durable and reliable connection is established between the keys and the types. It will also be seen that the upper arms of the bell-cranks of the sub-levers may be of substantial length which is a desideratum, being for this purpose sunken, or pivoted at a much lower point than the key-lever pivots, preferably below the level of the first bank of keys, as shown in Figure 3, so that substantial portions of the upstanding arms 22 vibrate forwardly and rearwardly below the level of the key-lever pivots, permitting closeness of the key-levers to the type-bars. The key-levers are pivoted at a high level, being pivoted at about the same level as the second bank of keys, substantially midway between the uppermost position of the top bank of keys and the lowermost position of the bottom bank of keys, thus avoiding undue forward swing of the upper keys, or backward swing of the lower keys, while being depressed. At the same time, the key-lever fulcrum-rod is at a point relatively close to the sub-lever fulcrum-rod, so that space is economized; at the same time, with the foregoing advantages, there is gained the advantage of the three points 13, 21, and 15 approximately in line, such line being oblique or diagonal, the points 21 and 15 being below and to the rear of 13, and 15 being below and to the rear of 21. The arms 20 of the sub-levers are relatively short, and terminate, together with the arms 17 of the key-levers, beneath the platen 26, thus leaving a substantial portion of the base of the machine free for the accommodation of other mechanisms. The length of the arms 20 is proportionate to the height of the arms 22, which increase from the center outwardly toward the sides of the machine (see Figure 2). The varying lengths of the short arms 20 necessitate risers 18 of varying lengths, the arm 20 of the outermost sub-lever 22 being so long as to require no riser at all (see Figure 3). Since the keys 10 of the several banks of keys are at varying distances from the fulcrum 13, and since all of the keys are adapted to be depressed equal distances, the key-levers 12 of the forward banks of keys will be swung through a smaller angle than the key-levers of the rear banks of keys. It is therefore necessary to vary the distance between fulcrum 13 and pivot 15 for the various banks of keys, as shown in Figure 3. The upright arms 22 of the sub-levers may be bent as at 35 to converge towards the type-bars in the manner usual in the Underwood typewriting machine.

The type-bars 25 are pivoted in the arc of a circle below the printing point on the front of the platen 26, the type-bearing arms of these type-bars being all of the same length, and their short operating arms, having therein the slots 24, are also of the same length, these type-bars being of the usual construction. In view of the fact, as above noted, that the length of the upright arms 22 of the sub-levers is less at the middle and greater at the sides of the machine it is evident that the sub-levers having the shorter upright arms will need to be rocked through a greater angle than those having the longer upright arms. Also, in view of the fact, above noted, that the longer forward arms 12 of the key-levers of the lower banks of keys swing through a smaller angle than the shorter forward arms 12 of the upper banks of keys, it will be evident that the rocking motion communicated to the sub-levers from the key-levers having the longer forward arms will need to be multi-

plied correspondingly more. Therefore, it will be seen that the greatest multiplication of movement will be required in the case of long key-levers which are connected to short sub-levers, and that, conversely, the least multiplication of movement is required for short key-levers which are connected to long sub-levers. In the embodiment of the invention illustrated in the drawings, the compensation of movement between the keys 10 and the type-bars 25 is accomplished by varying the point of pivotal connection 15 relatively to both the fulcrum 21 of the sub-levers and to the fulcrum 13 of the key-levers. If the pivot 15 is brought nearer to the fulcrum 15, it will at the same time be brought nearer to the fulcrum 21, and the effect is to shorten both the short lever-arm 16, 17 of the key-lever and the short lever-arm 20 of the sub-lever, but, in view of the fact that the lever-arm 20 will be shortened in greater proportion than the lever-arm 16, 17, the result will be to increase the angular movement of the sub-lever. Conversely, locating the pivot-point 15 at a greater distance from the fulcra 13 and 21 lengthens both the lever-arm 20 and the lever-arm 16, 17, but, as the lever-arm 20 will be lengthened in greater proportion than the lever-arm 16, 17, less angular movement will be communicated to the sub-lever. Therefore, by reason of the varying proportional lengths of the pivotally-connected lever-arms 20 and 16, 17, all of the type-bars 25 may be swung through the same arc to writing position by equal depression of the keys 10, irrespective of the varying lengths of the key-lever arms 12 or of the upstanding arms 22 of the sub-levers.

The type-actions may be returned by means of compression springs 36 in the form of helices inserted in sockets 37 in a transverse bar 38 carried upon forwardly-extending arms 39 of the main bar 28; and spring-adjusting screws 40 may be threaded up into the sockets, each spring bearing directly up against its key-lever which may be provided with a returning spur 41 adapted to seat in the top of the spring.

It is to be noted that the present invention provides a type-action which is both exceedingly compact and highly effective.

In those claims where no specific conformation is recited, it is understood that the forward arm of the key-lever means the length of a straight line that would join the fulcrum 13 to the center of the key 10, and that the rear arm of the key-lever means the length of a straight line that would join said fulcrum 13 to the load point 15. The term bent lever where used in the claims, means a lever having its arms bent at an angle, with the fulcrum (13 or 21) at the angle. The key-levers are bent, each having a forwardly-extending arm (meaning a straight line) joining its fulcrum 13 to the key 10, and each also having a downwardly and rearwardly extending arm joining fulcrum 13 to load point 15, said arms constituting a bent lever, and 13 being at the bend.

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

Having thus described my invention, I claim:

1. In a typewriting machine, the combination with a system of front-strike type-bars pivoted below the printing point, of a system of banks of pivoted key-levers immediately below the type-bar system and having their fulcra arranged in transverse horizontal alignment, each key-lever having a long arm extending forwardly from its fulcrum, and having a short arm which extends downwardly and rearwardly from the fulcrum, sub-levers having their fulcra arranged in transverse horizontal alignment along a line substantially below and in rear of and close to and parallel with the line of fulcra of the key-levers, each sub-lever having a long arm extending upwardly from its fulcrum and pivotally engaging the corresponding type-bar, and each sub-lever having a short oblique arm extending downwardly and rearwardly from its fulcrum and pivotally connected to the end of the short arm of the corresponding key-lever at a point substantially below and to the rear of the key-lever fulcrum, all of said oblique arms being about midway between vertical and horizontal, a frame-bar extending transversely of the machine between the line of fulcra of the key-levers and the line of fulcra of the sub-levers and upon which both the key-levers and the sub-levers are fulcrumed, and key-lever returning springs supported upon said bars.

2. A front-strike typewriting machine comprising a platen, a system of type-bars pivoted in an arc below the platen and extending forwardly from their pivots, a system of pivoted sub-levers in the form of bent levers having upstanding arms extending to the type-bars, and also having arms extending downwardly and rearwardly from their pivots, a system of pivoted bent levers having keys and extending below the type-bars close thereto, and having arms extending downwardly and rearwardly from their pivots, the first-mentioned downwardly-extending arms occupying positions about midway between the horizontal and vertical, and connected by pin-and-slot connections at their rear ends; the sub-levers being arranged immediately in rear of the pivots of the key-levers and sunken so that substantial portions thereof vibrate forwardly and rearwardly below the level of the key-lever pivots, to permit said proximity of the type-

bars to the key-levers; each key-lever comprising a portion extending about vertically down from its pivot and a portion extending about horizontally back to the sub-lever, and a fulcrum bar upon which both systems of levers are mounted, said fulcrum bar lying between said sub-levers and said vertical portions of said key-levers, and said horizontal portions extending rearwardly beneath said fulcrum bar.

3. A front-strike typewriting machine comprising a platen, a system of type-bars pivoted in an arc below the platen and extending forwardly from their pivots, a system of pivoted sub-levers in the form of bent levers having upstanding arms extending to the type-bars, and also having arms extending downwardly and rearwardly from their pivots, a system of pivoted bent levers having keys and extending below the type-bars close thereto, and having arms extending downwardly and rearwardly from their pivots, the first-mentioned downwardly-extending arms occupying positions about midway between the horizontal and vertical, and connected by pin-and-slot connections at their rear ends; the sub-levers being arranged immediately in rear of the pivots of the key-levers and sunken so that substantial portions thereof vibrate forwardly and rearwardly below the level of the key-lever pivots, to permit said proximity of the type-bars to the key-levers; each key-lever comprising a portion extending about vertically down from its pivot and a portion extending about horizontally back to the sub-lever, and a fulcrum bar upon which both systems of levers are mounted, said fulcrum bar lying between said sub-levers and said vertical portions of said key-levers, and said horizontal portions extending rearwardly beneath said fulcrum bar, said fulcrum bar forming a portion of a frame-bar, and said frame-bar having springs individual to the key-levers and extending up from the frame-bar to the key-levers forwardly of their pivots.

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Witnesses:
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