

No. 646,224.

Patented Mar. 27, 1900.

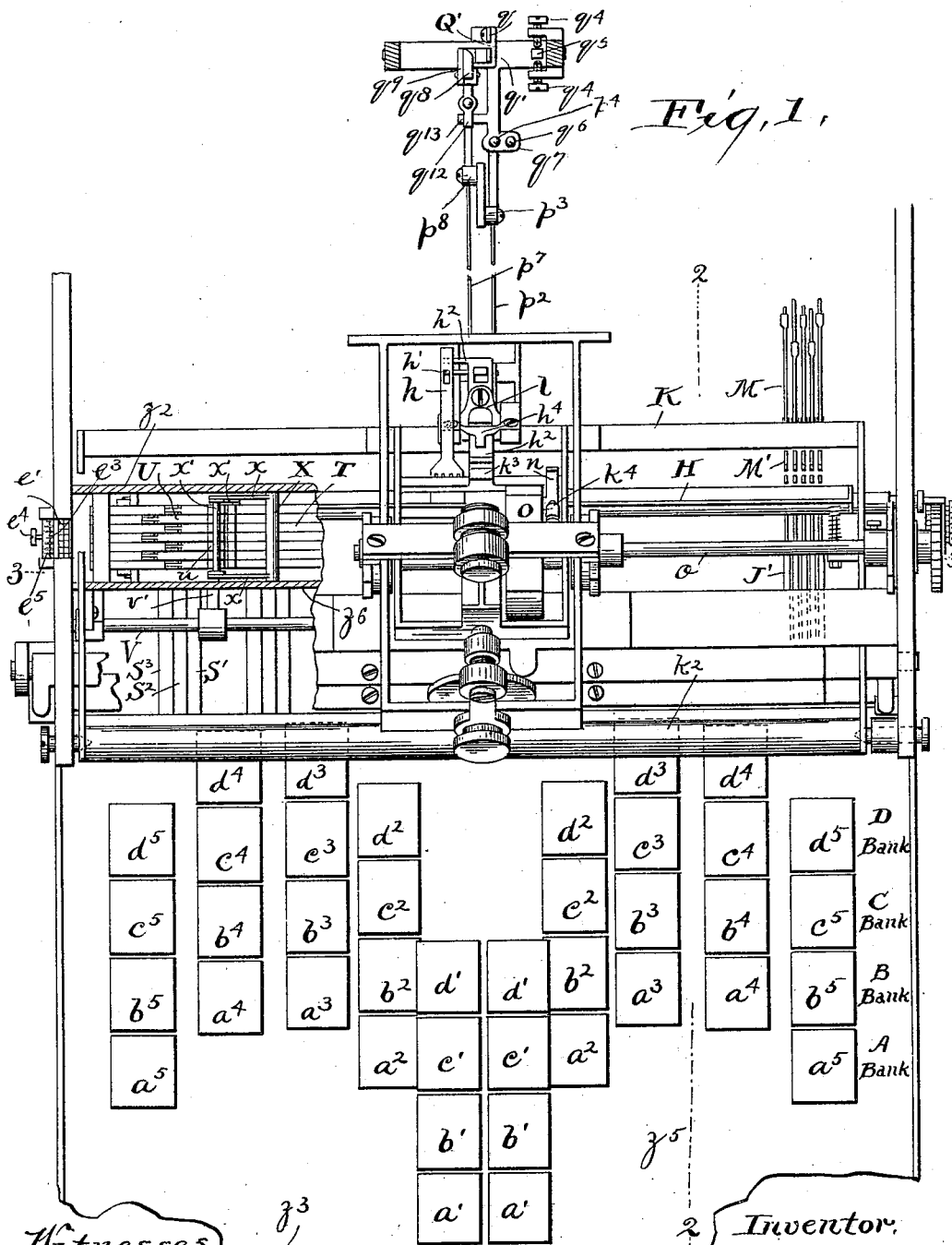
E. B. KIRBY.

KEYBOARD MECHANISM FOR TYPE WRITERS.

(Application filed Aug. 9, 1899.)

(No Model.)

4 Sheets—Sheet 1.



Witnesses.

E. B. Gilchrist
Philip E. Knowlton

Inventor.

Edmund B. Kirby,
By his Attorneys,
Thurston & Bates.

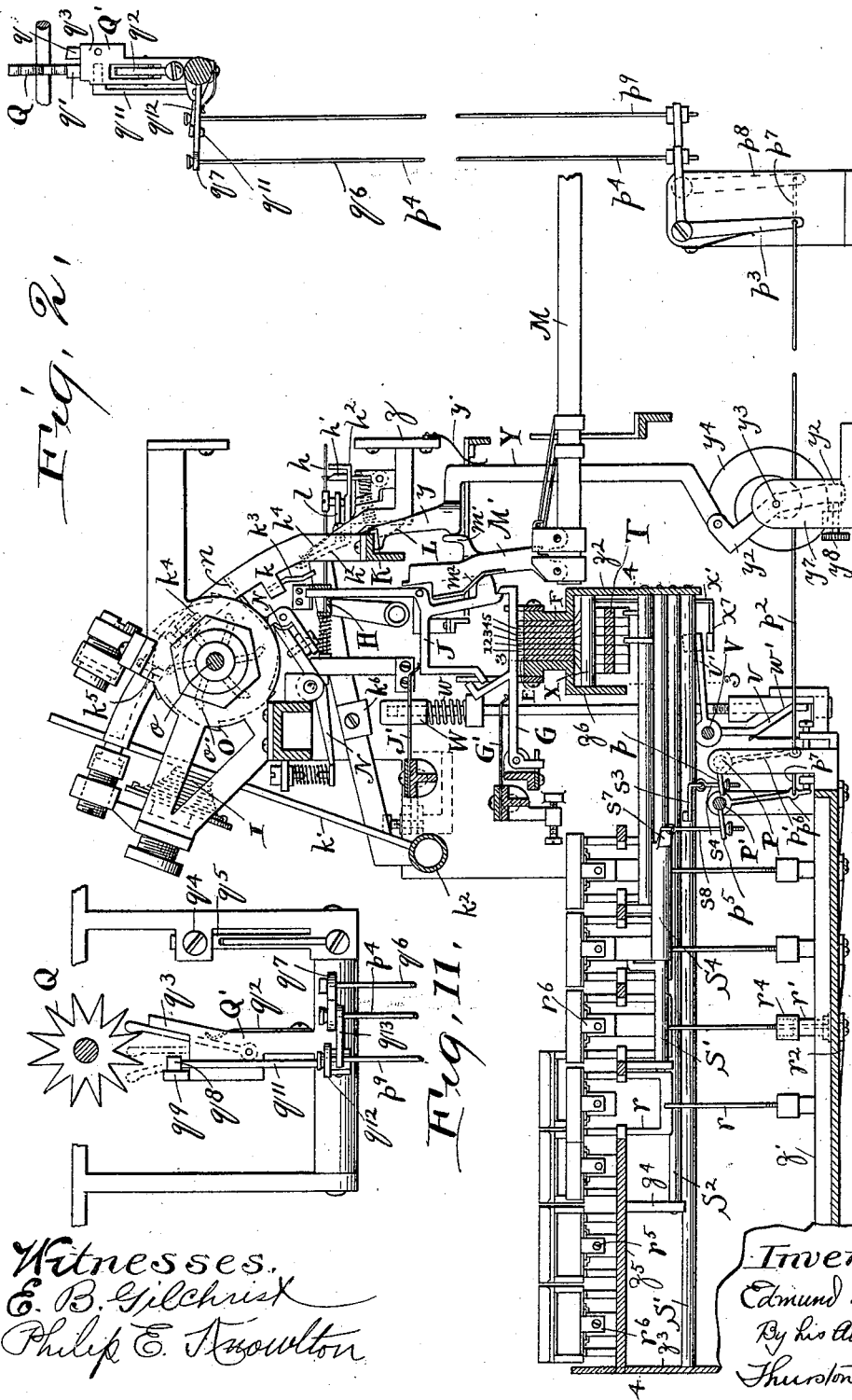
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4 Sheets—Sheet 2.



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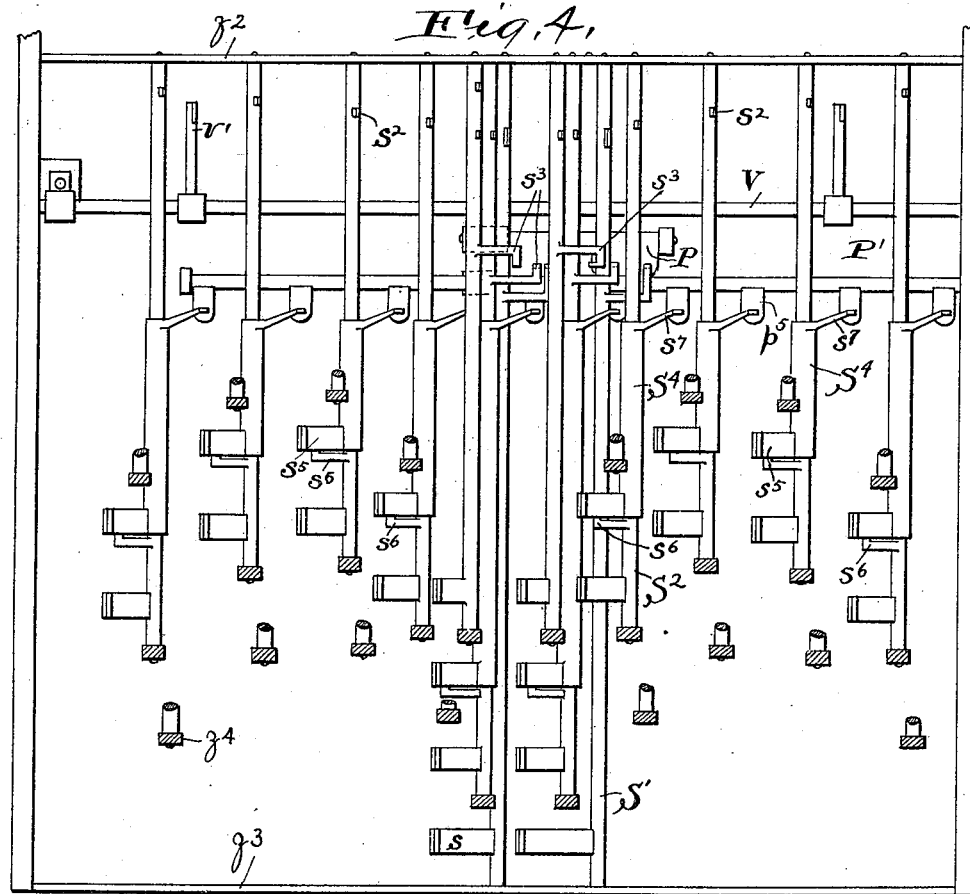
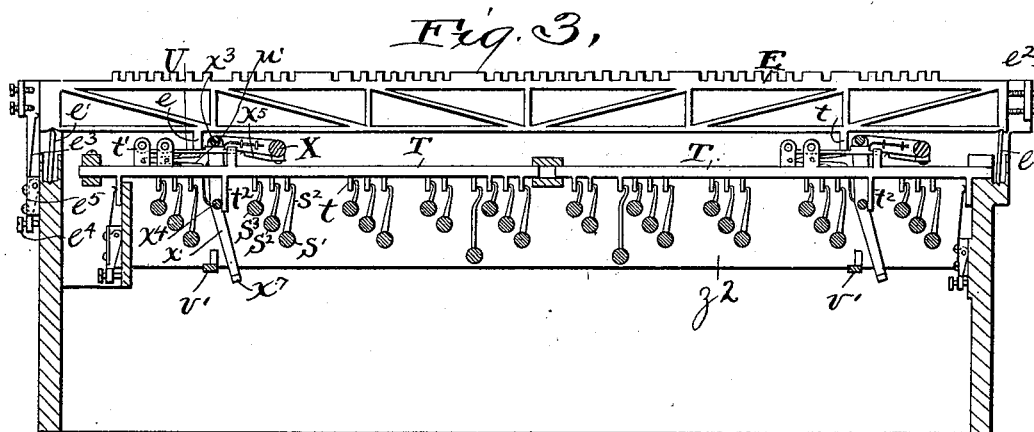
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4 Sheets—Sheet 3.



Witnesses.
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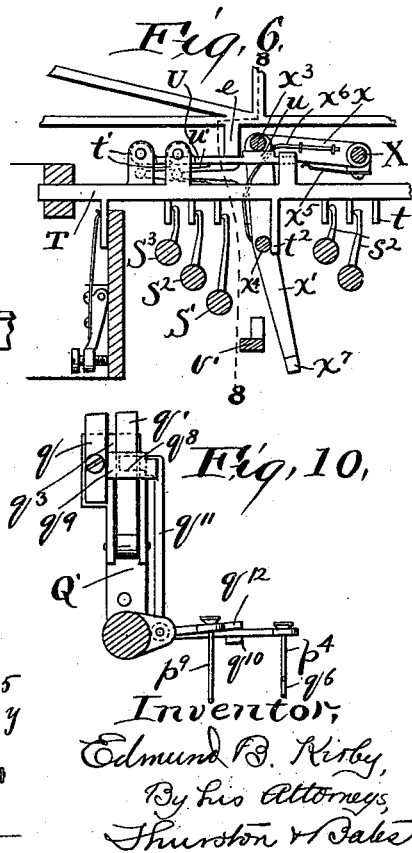
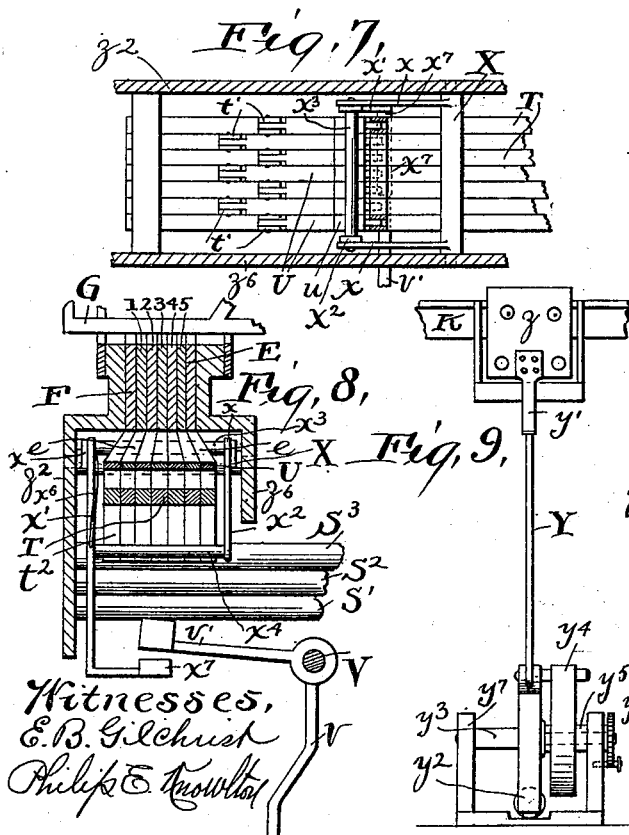
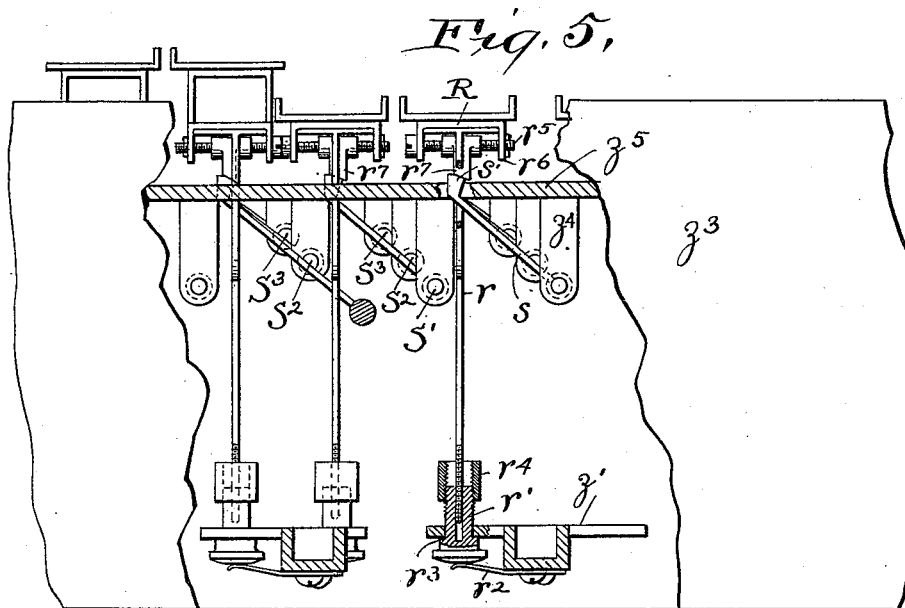
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KEYBOARD MECHANISM FOR TYPE WRITERS.

(Application filed Aug. 9, 1899.)

(No Model.)

4 Sheets—Sheet 4.



UNITED STATES PATENT OFFICE.

EDMUND B. KIRBY, OF DENVER, COLORADO.

KEYBOARD MECHANISM FOR TYPE-WRITERS.

SPECIFICATION forming part of Letters Patent No. 646,224, dated March 27, 1900.

Application filed August 9, 1899. Serial No. 726,632. (No model.)

To all whom it may concern:

Be it known that I, EDMUND B. KIRBY, a citizen of the United States, residing at Denver, in the county of Arapahoe and State of Colorado, have invented a certain new and useful Improvement in Keyboard Mechanism for Type-Writers and Analogous Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

My invention relates to certain improvements in the keyboard mechanism for typewriters and analogous machines which is described in my prior patents, Nos. 597,775 and 597,776, of January 25, 1898.

The objects of the present invention are to increase the speed and ease of operation of the machine and to generally enhance its efficiency.

The invention may be best summarized as consisting in the construction and combinations of parts hereinafter described, and definitely set out in the claims.

In the drawings, Figure 1 is a plan of keyboard mechanism embodying my invention. Fig. 2 is a sectional side elevation of said mechanism on the line 2 2 of Fig. 1 looking from the right. Fig. 3 is a vertical transverse section on the line 3 3 of Figs. 1 and 2 looking to the rear. Fig. 4 is a horizontal section just above the rock-shafts, being on the line 4 4 of Fig. 2. Fig. 5 is an end elevation, partly sectional, looking from the front of the machine, the end plate being partly broken away. Figs. 6, 7, and 8 illustrate, on an enlarged scale, the connection between the ratchet-bars and combination-bars shown in Figs. 1, 2, and 3, Fig. 6 being a side elevation, Fig. 7 a plan just below the combination-bars, and Fig. 8 a vertical section on the line 8 8 of Fig. 6 looking toward the right. Fig. 9 is a rear elevation of the stroke-equalizing mechanism shown in Fig. 2. Figs. 10 and 11 are views of the escapement mechanism for the typewriter carriage, the former being a sectional side elevation of the oscillating frame and the latter a face view of the mechanism.

The same letters and numerals of reference designate the same part in each figure.

Briefly, the machine includes a series of keys adapted to be actuated successively or simultaneously in various combinations, a

series of notched combination-bars adapted to be shifted by the keys; a series of letter-bars, one for each key-lever of the type-writer; and mechanism actuated by the letter-bar to operate such corresponding key-levers. The depression of a specific combination of keys brings the notches of the combination-bars into alinement beneath a certain letter-bar, which, dropping into these notches, causes the striking of the corresponding character by the type-writer.

Referring to the parts by letters and numerals, E, 1, 2, 3, 4, 5, and F represent seven longitudinally-movable notched combination-bars. These combination-bars are adapted to be moved longitudinally one unit when the finger-keys are depressed in a manner to be hereinafter explained. The present invention is concerned largely in this intermediate mechanism. For ease of comprehension, however, I will first describe the operation of the mechanism by which the properly-placed combination-bars actuate the movement of the type-writer key-levers. For a detailed description of this mechanism reference is hereby made to my said prior patent, No. 597,776.

It is to be understood that M represents the key-levers of any type-writer with which my mechanism is used, and M' represents push-rods which are pivoted to said levers for transmitting motion from a striking-bar K, which is adapted to be depressed onto the upper end of whatever push-rod is beneath it.

Extending across the combination-bars and above them are a series of pivoted letter-bars G, which normally rest upon one or more stubs between the notches in the combination-bars under the influence of the spring G'. When the depression of the finger-keys to produce a given character moves the combination-bars so that beneath the letter-bar corresponding to that character is a continuous row of notches, the spring G' forces that letter-bar downward, and this downward movement acts as a trigger to release the mechanism which moves the push-bars beneath the striking-bars and releases the power mechanism. When a letter-bar G drops into the aligned notches in the combination-bars, it releases a three-legged lever J, which, moving downward under the influence

of the spring J' , shoves a push-bar M' beneath the striking-bar K and at the same time draws forward the trigger-bar H , which, through a rod h , draws forward the latch h' and releases the lever h^2 . The forward arm of this lever h^2 moves forward under the influence of a spring h^4 , and this moves rearward from beneath the striking-bar a pawl L , which has an arm l , through which extends an adjusting-screw bearing on the arm h^2 . The striking-bar is thus released, and the spring I , acting on a plate k' , (which is part of a rigid frame k , which carries the striking-bar K and is pivoted at k^2), forces the frame and striking-bar downward, and the latter, engaging with the push-rod, depresses the key-lever M . During this movement the cam-bar k^3 engages with the arm h^2 , bringing its cooperating parts back to position. The cam m^2 on the front of the push-bar forces the lever J forward, and its front end raises the letter-bar out of the notches, and as the striking-frame reaches its lowest position the stop k^4 thereon engages with the arm n of the pivoted pawl N and moves the pawl to release the notched detent-wheel O . The shaft o , with which this detent-wheel is rigid, has a constant tendency to revolve in the left-hand direction, and being now released one of the wiper-arms o' , which it carries, engages with the projection k^5 on the frame and elevates the frame to its original position. Thereupon the pawl N engages with the next notch of the detent-wheel and stops the wiper-wheel, and the pawl L springs beneath the striking-bar and locks it in elevated position.

When the mechanism described is used in connection with a type-writer having a shift-key for capital letters or other purposes, a new condition is presented in that more force is required to move the shift-key and type-key than is required when the type-key alone is struck, and therefore if the striking-bar always descended with the same force the stroke would be either too strong in ordinary cases or too weak when the shift-key was struck. To provide for this condition, the force of the spring I , which actuates the striking-bar, is increased to the amount required when the shift-key is used, and a movable buffer is supplied which ordinarily counteracts the excessive force of the spring but is moved out of the way when the shift-key is struck. The buffer is shown in Figs. 2 and 9, wherein Y represents the buffer-bar, located in the middle line of the machine and having its upper end y forked and extending under the striking-bar K . The lower end of the buffer-bar is pivoted to a rocker-arm y^2 , carried by a rock-shaft y^3 , journaled in the standard y' . A spiral spring y^4 surrounds the rock-shaft (being secured to an adjustably-locked sleeve y^5 thereon) and is connected with the arm y^2 . This spring in tending to unwind presses the buffer-bar upward, the upward movement being limited by the lower end of the arm y^2 impinging against the set-screw y^6 , carried by

the standard. The spring y' , secured to a frame-plate z of the machine, bears against the buffer-bar and tends to keep the upper end thereof under the striking-bar. There are two push-rods M' , which are connected to the shift-levers (similar to the levers M) of the type-writer, and these push-rods have on their rear sides toes m' , which bear against the buffer-bar and when brought into action force the buffer-bar from under the striking-bar, and the latter comes down with the full force of the spring I . With the latter levers, however, there is no toe on the push-rod, and the latter moves into position beneath the striking-bar without engaging the buffer-bar, and therefore the buffer-bar normally remains in engagement with the striking-bar and counteracts the excessive force of the spring I .

The preceding explanation has been deemed necessary to elucidate the operation of the complete machine shown in the drawings. I will now return to the description of the parts of the machine with which the present invention is particularly concerned.

In the machine shown there are two keyboards, one for each hand, the corresponding keys producing exactly the same effect and the two keyboards being intended to be operated alternately in order to rest the hands. Each keyboard consists of four banks of keys, which I call the "A bank," "B bank," "C bank," and "D bank," respectively, the different keys being designated a' , a^2 , b' , b^2 , &c. The A bank is adapted to be used for capital letters, the B bank for lower-case letters and common points, the C bank for lower-case letters and common points when followed by a space, and the D bank for figures and less usual characters.

Referring more particularly to Fig. 5, on the under side of each key is a flanged plate R , and depending from this plate is the forked stem r . This stem is screw-threaded at its lower end into a plug r' , which is supported by a spring r^2 and has a shoulder r^3 , engaging the under side of a frame-plate z' , thus forming a limit to the upward movement under the influence of the spring r^2 . A downward limit is provided by the nut r^4 screwing onto the plug r' .

The rock-shafts S' , S^2 , and S^3 (there being one for each key except those of the C bank) are journaled at their rear ends in a stationary frame-plate z^2 and at their forward ends in the front plate z^3 or in webs z^4 , depending from the top plate z^5 . Near their forward ends these rock-shafts have rocker-arms s , on the free ends of which are the beveled heads s' . Adjustably carried on the under side of the key by being threaded on the screw r^5 , screwing into flanges r^6 of the plate R , is the beveled block r^7 . When the key is elevated, this block engages with the beveled head s' ; but as the key is depressed the rocker-arm s is swung downward and the head s' slides laterally from under the block r^7 , whereupon the key descends idly simply against the force

of the spring r^2 . This provides a very easy and trigger-like touch, the key being depressed until it has done its work and the spring r^2 receiving the thrust thereafter.

5 On the rear ends of the rock-shafts are a series of arms s^2 , which engage with depending lugs t on what I call the "ratchet-bars" T. There are two of these ratchet-bars (placed end to end and each operating exactly alike—one for the right keyboard and one for the left) for each of the combination-bars. There are seven of these combination-bars, those numbered 1 2 3 4 5 being adapted to be moved by the five keys of the B bank, 15 these same bars and also the bar lettered E being adapted to be moved by the keys of the A bank and the numbered bars and the bar lettered F being moved by the keys of the D bank, the C bank moving the same bars as 20 the B bank, as hereinafter explained.

I provide the ratchet-bars separate from the combination-bars with a pawl connection between them, so that a combination-bar may be moved to its position by the depression of 25 the finger-keys, but may be immediately released therefrom as soon as it has done its work without waiting for the finger-keys to assume their normal position. This allows one hand to start the depression of the keys 30 while the other is returning from having completed such depression, and thus a very rapid operation of the keyboard is possible.

Pivoted to each of the ratchet-bars by means of lugs t' , rising from its upper side, is the 35 pawl U, pressed upward by the spring u' . This pawl has on its upper surface a lug u , which is adapted to engage with a lug e , depending from one of the combination-bars, as E. The depression of a key moves the ratchet- 40 bar to the left, as shown in Figs. 3 and 6, and thus the lug u , engaging with the lug e on the combination-bar, moves it to the left, and this brings into alinement notches on the combination-bar beneath some letter-bar G, which 45 drops into these notches, and thereupon the key-lever of the type-writer is operated, as heretofore explained. When the striking-frame k descends in this operation, a bar k^6 , carried thereby, strikes on the head of a rod 50 W, which is normally held elevated by the spring w . When this rod is thus depressed, the inclined foot w' thereon forces the rock-lever v , which engages therewith, toward the front of the machine, and this rocks the rock-shaft V and moves downward a pair of rear- 55 wardly-projecting arms v' , rigid with the rock-shaft. Journaled in the frame-bars z^6 and z^2 near each side of the machine and above the ratchet-bars are the rock-shafts X, each of which has rigid arms x , carrying the freely-depending frame consisting of the arms x' and x^2 and the rods x^3 and x^4 . The spring x^5 tends to keep these parts elevated, and the spring x^6 tends to move the swinging frame to the 60 right, with the rod x^1 against a lug t^2 , depending from each ratchet-bar. Now when a

ratchet-bar is moved to the left by the depression of a finger-key the lug t^2 moves this swinging frame also to the left and a forwardly-projecting end x^7 of the arm x' comes 70 beneath the rock-arm v' , and when the striking-frame descends this arm v' also descends, as heretofore explained, and, engaging the projection x^7 , draws down the rod x^3 onto all of the pawls U, and thus releases the combination-bars and allows them to spring back 75 into their normal position irrespective of the position of the finger-keys.

The combination-bars are made in the trussed form shown in Fig. 3, to thus lighten 80 them and reduce their inertia, and to reduce friction they are supported on the struts e' . They are adjustably limited in their movement by the screws e^2 and are forced to the left by the comb-spring e^3 —i. e., a bar with 85 projecting individual spring-teeth, after the manner of a comb—carried by the pivoted block e^5 , which is adjusted by the set-screw e^4 .

When a letter is printed by the type-writer, its own mechanism actuates the carriage-es- 90 capement one space. The thumb-keys of any bank $a' b' c' d'$ are also adapted to cause this escapement, but without bringing the combination-bars into such position that a letter-bar G falls. Thus projecting from the rock- 95 shafts which these thumb-keys operate are arms s^3 , which when elevated by the depression of these keys draw up the rods s^4 . This movement through the bell-crank P, having the arms p and p' , draws forward the rod p^2 , 100 which extends to the rear of the type-writer and through the bell-crank p^3 and the rod p^4 operates the escapement, as hereinafter more fully explained.

The C bank of keys is intended to be used 105 for striking lower-case letters at the end of a word and causing a space following such letters. This renders unnecessary a separate stroke for the space and greatly increases the speed. This result is accomplished by caus- 110 ing the keys of the C bank to operate the rock-shafts S^2 of the B bank and at the same time cause a double escapement of the type-writer carriage instead of the usual single escapement. 115

The mechanism provided for the above purpose is as follows: Loosely surrounding the rock-shafts S^2 are a series of sleeves S^4 , carrying at their forward ends arms s^5 , having the 120 usual heads at their free ends and adapted to be engaged and depressed by the blocks beneath the C keys in the same manner as the arms s are depressed. When a key of the C bank is depressed, however, the arm s^5 engages with a lug s^6 , projecting from the rock- 125 shaft S^2 of the B bank, and thus shifts the combination-bar the same as when the B keys are depressed. Projecting from the other end of the sleeve S^4 is an arm s^7 , from which depends a rod s^8 , which when drawn upward 130 rocks the shaft P' through an arm p^5 . This swings forward the arm p^6 , which draws for-

ward the rod p^7 , which through the bell-crank p^8 draws down the rod p^9 , leading to the escapement.

The escapement may be of any form. The drawings show a common form, being a notched wheel Q, which may be connected by a suitable pinion and rack with the carriage. A suitably-journalled rocking frame Q' carries a rigid pawl q and a movable one q' , and a light spring q^2 gives the movable pawl a tendency in the opposite direction to that in which the tension on the carriage moves it by means of the notched wheel. The movable pawl is normally in engagement. The tension on the carriage holds the pawl against the wall q^3 of the frame Q', as shown in full lines in Fig. 11. The frame Q' is pivoted and is capable of a slight movement forward and backward axially to the wheel Q, this movement being limited by the set-screws q^4 , which confine the rigid arm q^5 , extending upward from the body of the frame Q'. As the typewriter strikes a letter a pull is given to the rod q^6 (leading from the arm q^5 , rigid with the frame Q', to the key-levers) and this tips the frame Q' forward sufficiently to bring the stationary pawl q into engagement with the wheel Q and brings the movable pawl forward out of such engagement. Thereupon the spring q^2 forces the pawl forward against the stop-block q^8 , which lies against the bar q^9 of the frame, and when the frame returns the movable pawl is between the next two teeth, as shown in the vertical dotted position in Fig. 11, and the tension of the carriage being stronger than the spring q^2 the carriage advances one step. The same operation of the escapement takes place when the depression of a thumb-key draws downward the rod p^4 , the latter acting through the arm q^7 and the frame Q'.

The stop-block q^8 , against which the movable pawl q' normally impinges, is on a pivoted bell-crank q^{11} , the forward arm q^{12} of which stands normally above the bar q^{13} , extending laterally from the arm q^7 . The rod p^9 , actuated by the keys of the C bank, extends through the arm q^{12} , and thus when a key of that bank is depressed the first operation at the escapement is to withdraw the block q^8 out of the path of the movable pawl q' . Then the arm q^{12} engages with the projection q^{13} and tips forward the frame, allowing the movable pawl to escape from the wheel, whereupon it springs over into the position shown by dotted lines at the extreme left in Fig. 11, and when the frame returns the pawl comes into the second notch in the wheel and allows it to move two spaces.

Having described my invention, I claim—

1. In a keyboard mechanism, in combination, finger-keys, mechanism adapted to be mediately actuated thereby, and intermediate means connecting said mechanism with the keys but adapted to cease such engagement therewith before the depression of the keys is completed, substantially as described.

2. In a keyboard mechanism, finger-keys, and rock-shafts, combined with intermediate mechanism connecting the two which allows the key during part of its depression to actuate the rock-shaft and thereafter allows it to be freed therefrom, substantially as described.

3. In combination, a finger-key, a spring tending to elevate the same, mechanism which the key is adapted to actuate, said mechanism being adapted to be engaged when the key is actuated but adapted to move out of such engagement before the key reaches its limit of movement and thus leave the spring sustaining the thrust on the keys, substantially as described.

4. The combination of a finger-key, a stem depending therefrom, a spring tending to elevate said stem, a rock-shaft, an arm extending therefrom and adapted to be engaged when the key is depressed, a continued depression of the key releasing such engagement before the depression is completed, substantially as described.

5. The combination of a finger-key, a spring tending to elevate the same, an adjustable block carried by the key, a rock-shaft, an arm extending therefrom and adapted to engage said block and also adapted to pass out of such engagement before the actuation of the key is completed, substantially as described.

6. In combination, a finger-key, a forked stem depending therefrom, adjustable stops limiting the up-and-down movement of said stem, a spring tending to elevate said stem, an adjustable block carried by said key between the forks of the stem, an arm engaging with said block adapted to pass out of engagement therewith when the key is sufficiently depressed, substantially as described.

7. In a keyboard mechanism, in combination, a finger-key, a stem depending therefrom, a plug r' screwing onto the end of said stem and extending through a frame-plate z' and having a shoulder adapted to engage with said plate and limit the movement of the stem in one direction, and a nut screwing onto said plug and adapted to engage with said frame-plate and limit the movement of the stem in the other direction, substantially as described.

8. In a keyboard mechanism, in combination, a series of combination-bars, a series of ratchet-bars carrying pawls adapted to engage with the combination-bars, a series of finger-keys, and suitable connections between them and the ratchet-bars whereby an actuation of the finger-keys moves the ratchet-bars, substantially as described.

9. A series of combination-bars, a series of ratchet-bars, individual pawls carried by the ratchet-bars adapted to engage the combination-bars, a keyboard, connection between the same and the ratchet-bars whereby the actuation of the keys moves the ratchet-bars, and means for releasing all the pawls simultaneously, substantially as described.

10. The combination of a system of notched

combination-bars, a pair of systems of ratchet-bars, pawls carried by the ratchet-bars adapted to connect the ratchet-bars and combination-bars, two keyboards, each operating its corresponding set of ratchet-bars, and means for releasing the pawls from the combination-bars independently of the finger-keys, substantially as described.

11. The combination of a pair of keyboards, a double system of ratchet-bars, one system corresponding to each keyboard, a single system of combination-bars adapted to be shifted by either of said systems of ratchet-bars, mechanism for delivering movement to some certain lever of a system according to the position of the combination-bars, and mechanism actuated by said delivery mechanism for releasing the connection between the ratchet-bars and combination-bars, substantially as described.

12. The combination of a series of combination-bars, a series of ratchet-bars beneath them, a series of pawls carried by the ratchet-bars and adapted to engage with the combination-bars, a series of keys, connecting mechanism between the keys and the ratchet-bars, a rod extending across the pawls, and mechanism for depressing the same to move the pawls out of engagement with the combination-bars, substantially as described.

13. The combination of a series of combination-bars, a striking-frame, suitable connection between the combination-bars and the striking-frame whereby when rightly placed these bars release said frame, a series of finger-keys, a connection between them and the combination-bars whereby they move those bars, and mechanism actuated by the striking-frame to disengage the connection between the combination-bars and the finger-keys, substantially as described.

14. In a keyboard mechanism, in combination, two sets of keys, a common system of movable members adapted to be actuated by either set, an escapement mechanism, and means connecting the keys with the escapement mechanism, one set of keys giving the escapement a greater actuation than the other, substantially as described.

15. The combination of two sets of keys, two sets of rocking members, one set of keys operating one set of rocking members and the other set of keys operating both sets of rocking members, one of said sets of rocking members governing the actuation of a system of type-writer levers and the other independently governing an escapement mechanism, substantially as described.

16. The combination of a set of keys, a set of rock-shafts actuated thereby, a second set of keys, a set of sleeves surrounding the rock-shafts, a connection between said second set of keys and the sleeves, and a loose connection between the sleeves and rock-shafts,

whereby the depression of one set of keys turns the rock-shafts and the other set turns both sleeves and rock-shafts, said sleeves and rock-shafts operating one to actuate the type-writer and the other to actuate the type-writer and the carriage-escapement independently, substantially as described.

17. In an escapement mechanism, in combination, an oscillating frame, a rigid and a movable pawl carried thereby, a notched member with which said pawls may alternately engage, a spring tending to move the movable pawl, means for limiting the amplitude of oscillation of the frame, means for varying the throw of the movable pawl without changing said amplitude of oscillation, two sets of keys each adapted to oscillate the frame substantially the same amount but one to change the throw of the movable pawl, substantially as described.

18. In an escapement mechanism, a stationary and a movable pawl, a member adapted to alternately engage therewith, and a spring tending to move said movable pawl, in combination with a member limiting such movement, and mechanism for moving such member away from the pawl and thus increasing the throw of the latter, substantially as described.

19. In an escapement mechanism, in combination, an oscillating frame, a rigid and a movable pawl carried thereby, a notched member with which said pawls may alternately engage, a spring tending to move the movable pawl, a block limiting such movement, a lever carrying said block, and a loose connection between said lever and frame whereby an actuation of the lever first withdraws the block from the path of the pawl and then oscillates the frame, substantially as described.

20. The combination with a series of movable members of a comb-spring having individual prongs bearing on said members, a pivoted block to which said spring is attached, and a screw for adjusting said block, substantially as described.

21. In a keyboard mechanism, a series of trussed bars adapted to reciprocate longitudinally combined with individual struts supporting said bars, substantially as described.

22. The combination of two sets of keys, common character-indicating mechanism adapted to be operated by either set, and means whereby one set indicates the character itself and the other set the same character plus a space.

In testimony whereof I hereunto affix my signature in the presence of two witnesses.

EDMUND B. KIRBY.

Witnesses:

J. O. A. CARPER,
E. H. BANCROFT.