

1,012,062.

5 SHEETS--SHEET 1.

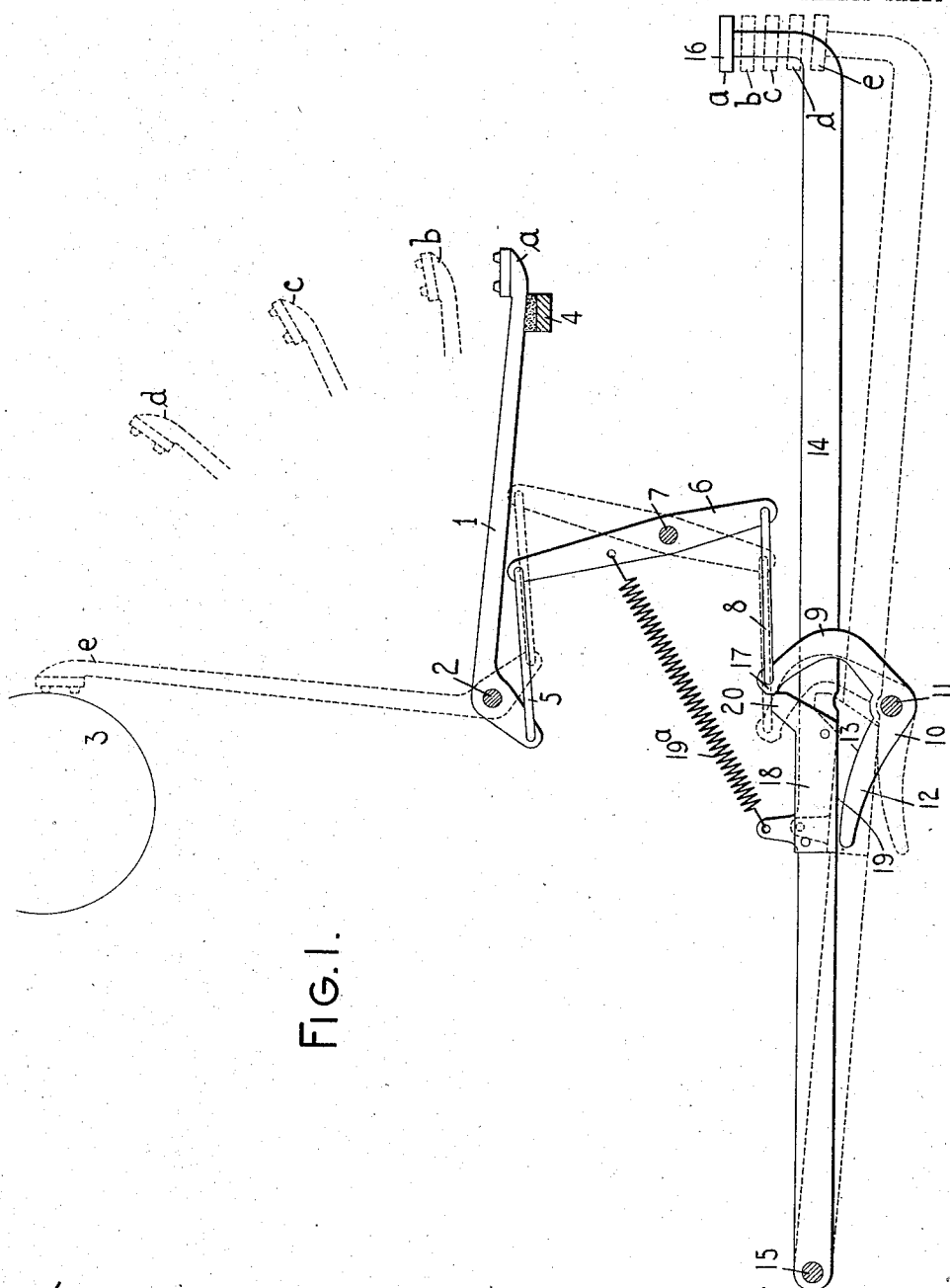


Fig. 1.

J. B. Reeves.
Charles E. Smith.

James S. Daugherty
By Jacob Filbel
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1,012,062.

Patented Dec. 19, 1911.

5 SHEETS-SHEET 2.

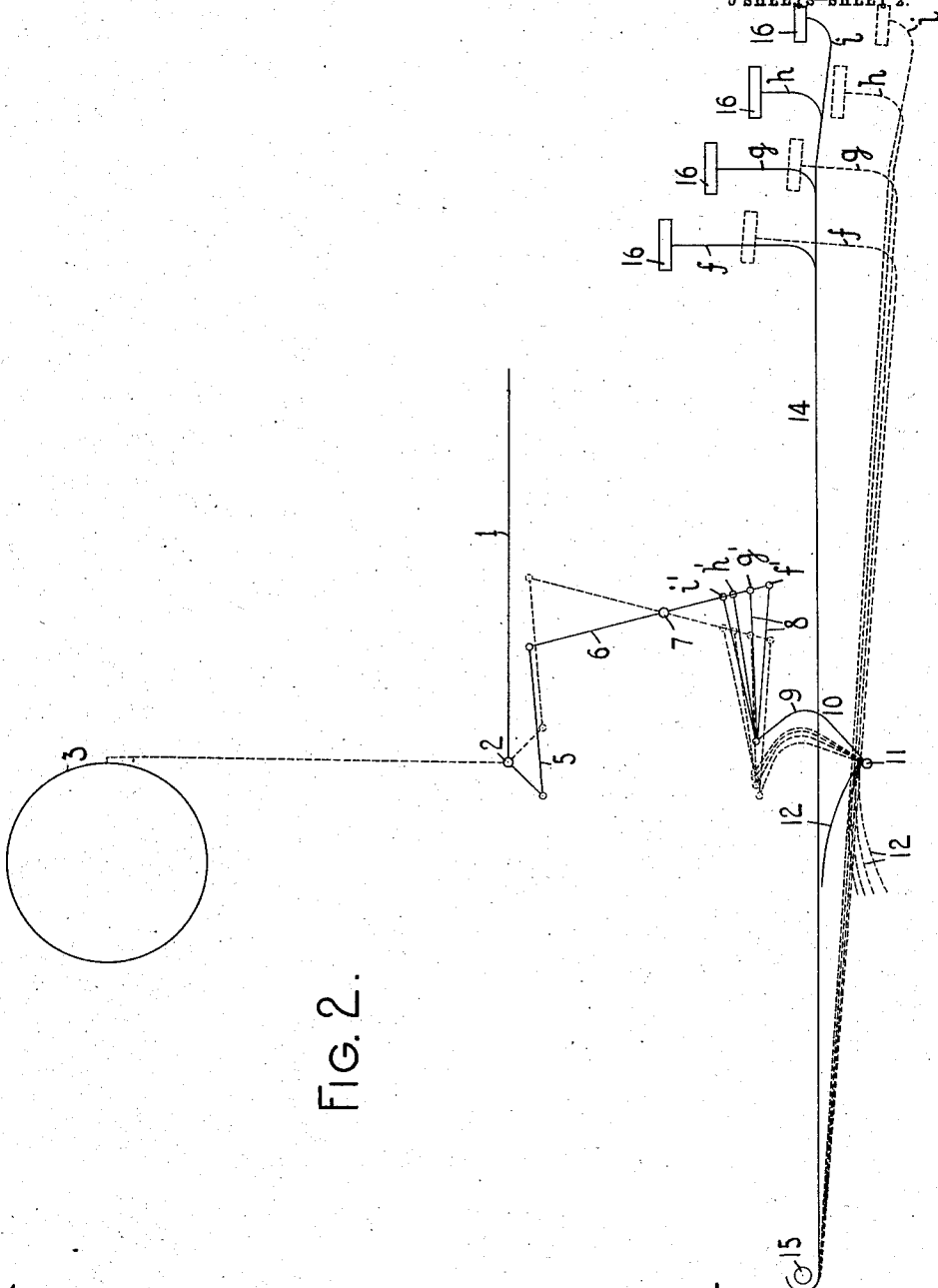


FIG. 2.

WITNESSES:

J. B. Reeves
Wm. Smith

INVENTOR:

James D. Daugherty
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1,012,062.

Patented Dec. 19, 1911.

5 SHEETS—SHEET 3.

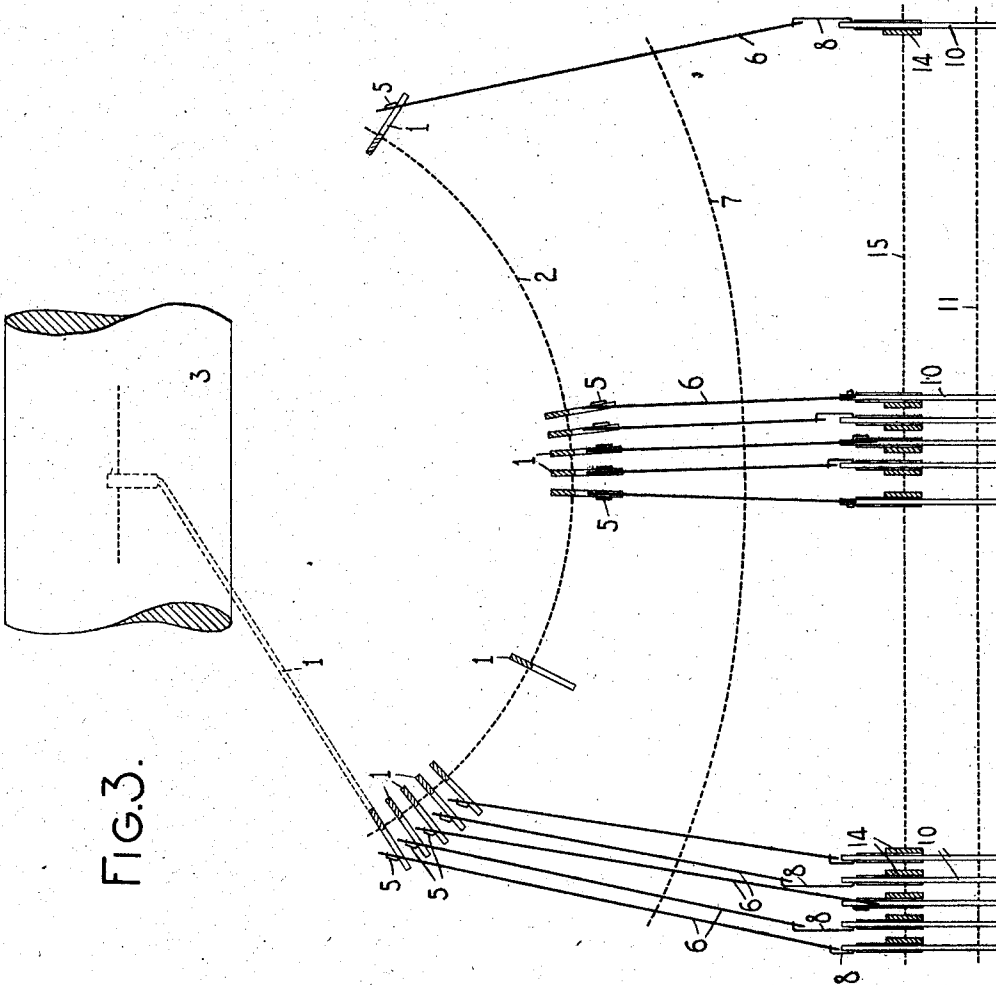


FIG. 3.

WITNESSES:

J. B. Reeves.
 Walter Smith

INVENTOR:

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 By Jacob F. Reed
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1,012,062.

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5 SHEETS—SHEET 4.

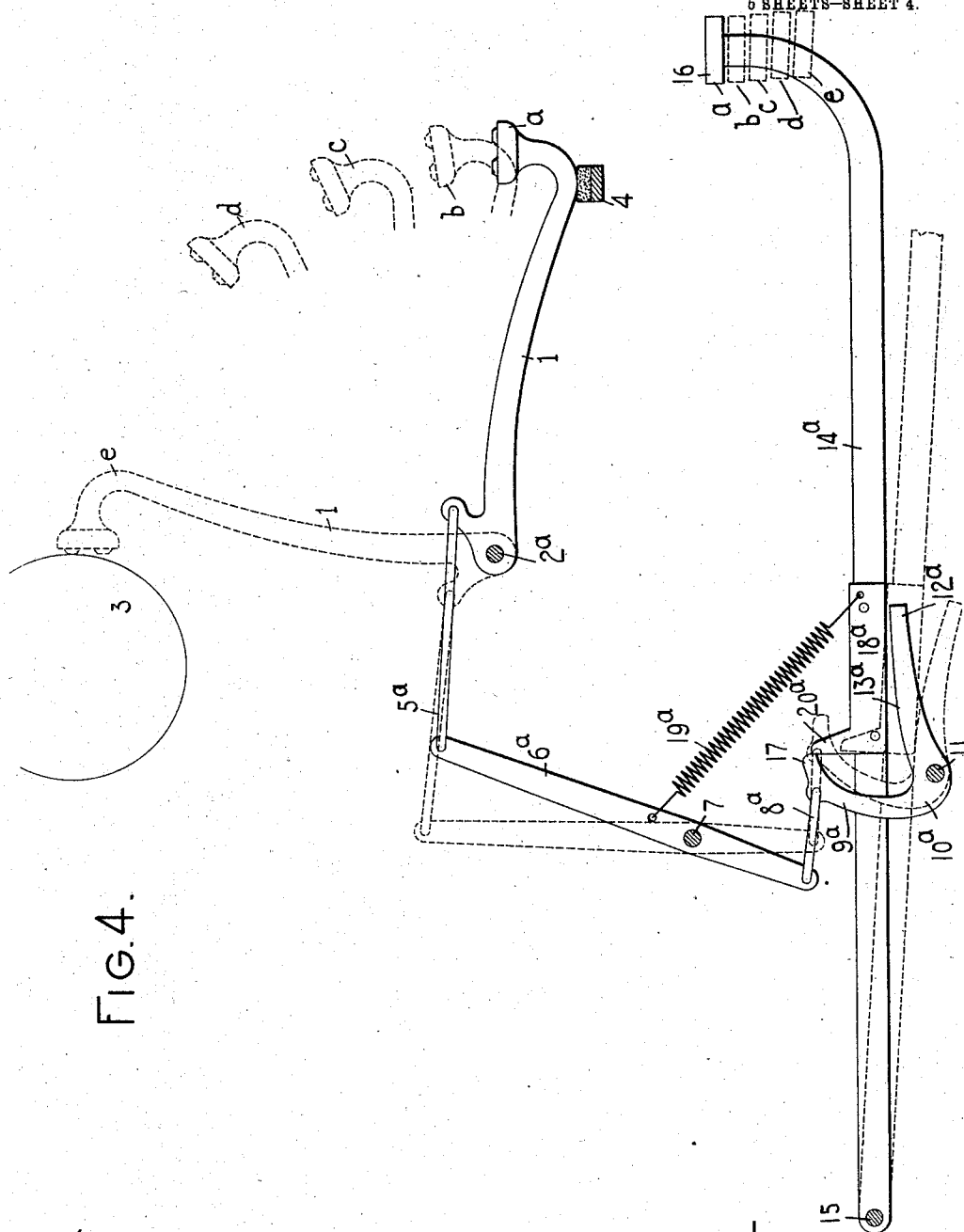


FIG. 4.

WITNESSES:

J. B. Reeves
Charles Smith

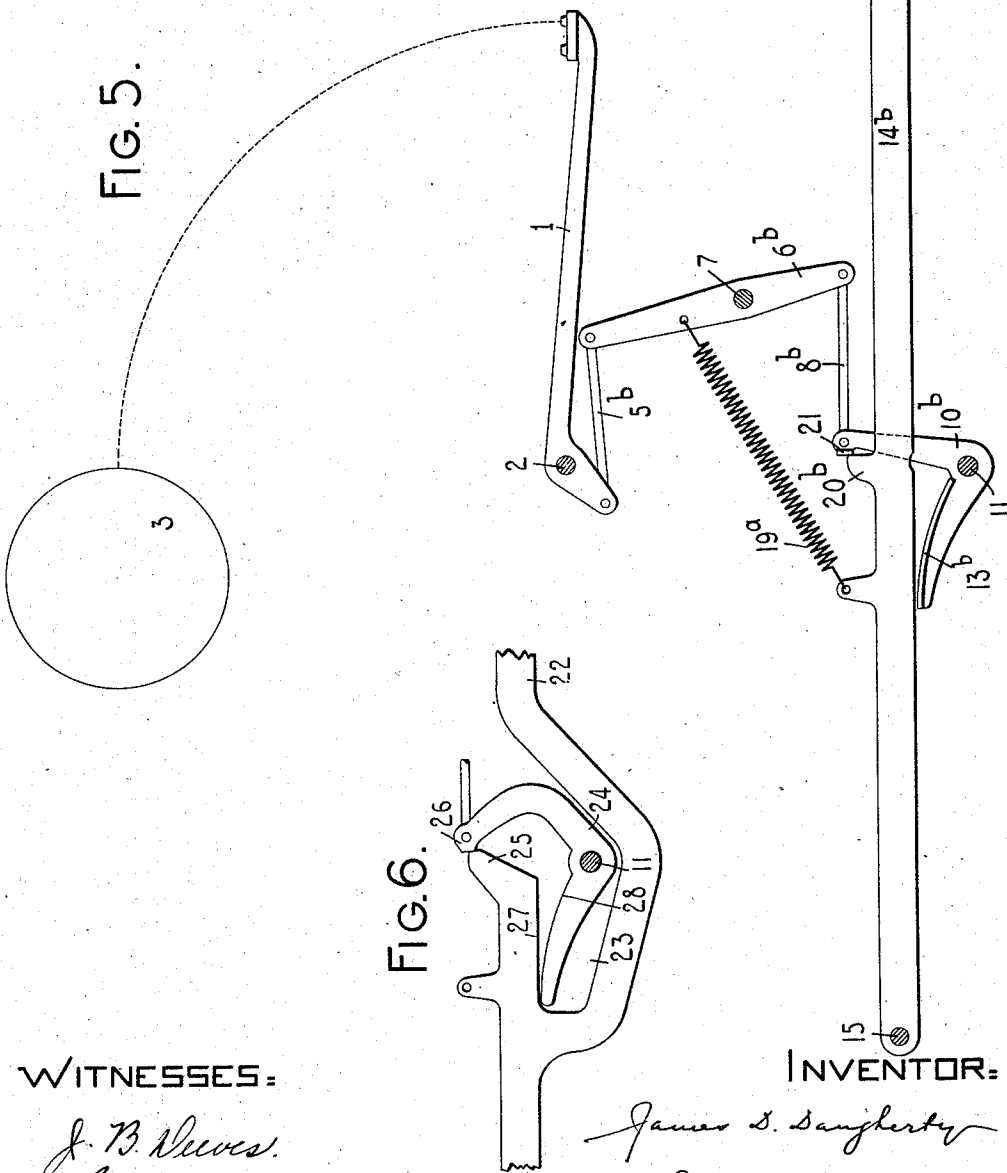
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1,012,062.

Patented Dec. 19, 1911.

5 SHEETS-SHEET 5.



WITNESSES:

J. B. Reeves.
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UNITED STATES PATENT OFFICE.

JAMES D. DAUGHERTY, OF KITTANNING, PENNSYLVANIA, ASSIGNOR TO UNION TYPE-WRITER COMPANY, OF JERSEY CITY, NEW JERSEY, A CORPORATION OF NEW JERSEY.

TYPE-WRITING MACHINE.

1,012,062.

Specification of Letters Patent.

Patented Dec. 19, 1911.

Application filed March 28, 1908. Serial No. 423,948.

To all whom it may concern:

Be it known that I, JAMES D. DAUGHERTY, citizen of the United States, and resident of Kittanning, in the county of Armstrong and State of Pennsylvania, have invented certain new and useful Improvements in Type-Writing Machines, of which the following is a specification.

My invention relates to typewriting machines and more particularly to type actions.

One object of my invention is to provide a simple and efficient front-strike type action.

A further object of my invention is to provide a type action which affords an easy start and in which the type bar receives an accelerated movement as it approaches the printing position.

A still further object of my invention is to provide a structure whereby a uniform leverage, a uniform touch and a uniform extent of dip of the different keys is provided throughout the system.

To the above and other ends which will hereinafter appear, my invention consists in the features of construction, arrangements of parts and combinations of devices to be hereinafter described and particularly pointed out in the appended claims.

In the drawings, wherein like reference characters indicate corresponding parts in the various views, Figure 1 is a diagrammatic side elevation of one form of type action embodying my invention. Fig. 2 is a diagrammatic side view showing a series of four key levers and some of the parts controlled thereby and the disposition of the parts as they appear when different keys are depressed. Fig. 3 is a diagrammatic front elevation with parts in section of a series of type actions. Fig. 4 is a diagrammatic side elevation showing another form of type action embodying my invention. Fig. 5 is a like view of still another form of type action embodying my invention. Fig. 6 is a fragmentary side elevation showing a still further modification of a portion of the type action.

The present invention is in the nature of an improvement on the construction disclosed in my application Serial No. 283,758, filed October 21st, 1905 and the claims herein are intended to be restricted to distinguish

the construction from that disclosed in my said previously filed application.

Referring more particularly to Figs. 1 to 3 inclusive, segmentally arranged upwardly and rearwardly moving type bars 1 are pivoted at 2 and are adapted to strike against the front face of a platen 3, the type bars being supported in their normal positions by a type rest 4. In the construction shown in these figures each type bar is connected to a forwardly extending pull link 5 pivotally connected at its forward end to the upper end of a nearly upright straight sub-lever 6 of the first order. These sub-levers are fulcrumed in an arc on a curved pivot wire 7, situated forward of the type bar pivots, so that the sub-levers are pivoted at gradually higher elevations from the center to the sides of the system as shown in Fig. 3. The upper ends of the sub-levers are arranged forward of the pivots of the type bars and are arranged in a curve at their upper ends which corresponds approximately to the curved pivot wire 2 of the type bars and to the arc in which the type bars are arranged, as will be seen upon reference to Fig. 3. The upper arm of each sub-lever is preferably longer than the lower arm. The lower arm of each sub-lever is connected to the forward end of a rearwardly extending link 8 which is pivotally connected at its rear end to the upwardly extending arm 9 of a bell crank or angular sub-lever 10, pivoted at 11 and provided with a rearwardly extending arm 12 curved at its upper or contact face 13. The fixed pivot 11 for the various angular sub-levers is situated beneath substantially straight key levers 14 and extends in a straight line from side to side of the machine beneath the key levers. The key levers preferably have a parallel arrangement and are pivoted at 15 and are provided with usual finger keys 16. The upwardly extending arms 9 of the angular sub-levers extend between the key levers as shown in Fig. 1 and are each provided with a rearwardly extending portion or abutment 17.

Each key lever has formed thereon or secured to one side thereof by rivets or other means a plate-like piece 18. This plate-like piece is off-set to one side of its key lever and the lower edge 19 thereof is situated

above the arm 12 of the associated angular sub-lever 10 for coöperation with the curved contact face 13 of said angular lever. The plate-like piece 18 has an upwardly extending arm 20 which in the normal positions of the parts is in contact with the abutment 17 on the associated angular sub-lever in order to prevent a rebound of the type bar as will hereinafter more clearly appear.

Contractile springs 19^a are each connected at one end to the upper arm of a sub-lever 6 and at the other end to the associated key lever, or the plate 18 carried thereby, in order to restore the various portions of the type action to their normal positions. This restoring spring for each type action may be relied upon to restore all of the parts to their normal positions or suitable auxiliary restoring springs may be employed. In the normal positions of the parts the contact face 13 of the angular sub-lever is preferably free from contact with the face 19 of the associated key lever. It therefore follows that a slight depression of the key lever against the tension of its spring 19^a may be effected before motion is transmitted to the angular sub-lever and the parts controlled thereby. This movement is sufficient to effect a downward movement of the arm or abutment 20 with the key lever in order to move it to a position where it will no longer lock the upright arm of the associated angular lever against rearward movement. A further depression of the key lever brings the contact face 19 thereof into engagement with the curved contact face 13 on the angular lever, thus vibrating the angular lever from the position shown in full lines to that indicated in dotted lines in Fig. 1 to transmit movement through the associated link 8, sub-lever 6 and link 5 to the type bar. The rolling contact between the key lever and angular sub-lever causes the power to be transmitted to the angular lever nearer to its fulcrum 11 as the key lever descends, thereby producing a gradual acceleration of the type bar in its movement from its normal position to the printing position as indicated in Fig. 1. Thus it will be seen that a depression of the key from the position indicated at *a* to that indicated at *b* in Fig. 1 produces a movement of the type bar from the position shown at *a* to that indicated at *b*, whereas the same extent of key-depression from the position indicated at *b* to that indicated at *c* produces a greater extent of movement of the type bar from the position *b* to that indicated at *c*. A still greater extent of movement of the type bar is effected from the positions *c*, *d*; thus approximately one-half of the complete movement of the type bar takes place, from *d* to *e*, during the last fourth of the depression of the key, from the position indicated at *d* to that shown at *e*. The initial portion of the key depression is effected while the key lever is operatively disconnected from the type action so that it does not have the weight of the parts to carry at the first part of the key stroke and a movement of the key from the position indicated at *a* to the position indicated at *b* is effective to produce a very slight movement of the type bar, so that at the initial portion of the key stroke but little resistance is offered to the key depression and a very light touch at the beginning of the stroke is provided. The resistance is increased and the type bar is accelerated after the parts have acquired momentum and at a time when the resistance offered to the key depression is not so appreciable as at the beginning of the stroke. As the type bar is restored to normal position where it bears against the type rest 4 the abutment 20 will be interposed in the path of the upright arm on the angular sub-lever so that any tendency of the type bar to rebound from the pad or type rest will tend to force the link 5 forward, and the link 8 backward, and this tendency will be resisted by the abutment 20 on the key lever contacting with the upright arm of the angular sub-lever. The force exerted by the tendency of the type bar to rebound is transmitted longitudinally of the key lever against the fixed pivot 15, so that the parts are positively locked to prevent the rebound of the type bar, thus overcoming any liability of adjacent type bars clashing through rebound near the type bar rest or support in the rapid operation of the bars. The lock, however, is automatically released at the first portion of the key depression which is effective to remove the abutment 20 from the path of the arm 9 of the sub-lever or the projection 17 thereon. In practice I have found that the proportions shown of the arms of the upright sub-lever 6 have proved efficient though these proportions may be varied at will. While the sub-levers 6 have, as stated, a general upright disposition, they are slightly radially disposed or fanned as shown in Fig. 3, so as to compensate for the difference in width between the system of key levers and the system of type bars.

In order to compensate for the variation in leverage due to the differences in length of the key levers for the different banks of keys as shown in Fig. 2. I make the lower arms of the upright sub-levers of slightly different proportionate lengths; thus the length of the lower arm of any of the sub-levers 6 depends in a sense upon the length of the key-lever with which the sub-lever is connected, for the system of type-actions is so constructed that each key has a certain dip, which is the same as that of every other key, and each sub-lever 6 moves at its upper end through a certain distance which is the same as that through which

the upper end of every other sub-lever 6 moves, and key-levers f , g , h and i (Fig. 2) of different lengths will impart different angular movements to the angular levers 10 on which they act, and the links 8 attached to these levers 10 will be moved different distances. If a sub-lever 6 is to be connected with an angular lever on which a short key lever f acts, this being one of the key levers to which the keys of the highest bank are attached, the lower end f' of the sub-lever 6 will be at a point to which the link 8, pivoted to the sub-lever at that point, will impart the proper angular movement when the key of the lever f is depressed from its normal to its lowest position. If this sub-lever 6 is to be actuated by a key lever g , h or i then of course the lower end g' , h' or i' of the sub-lever will be nearer to the fulcrum 7 than is the point f' ; and at such a distance from the fulcrum that the link 8, angular lever 10, and the key lever g , h or i which acts on the angular lever, will impart the required angular movement to the sub-lever 6 when the key is depressed to the end of its stroke. Obviously the right length of the lower arm of any sub-lever 6 can be determined mathematically, or otherwise, whichever of the forms, of the four forms of key-levers contained in the machine; the key lever of the type action including that sub-lever may have. By means of the construction described a uniform dip of the various printing keys 16 is effected throughout the system, notwithstanding the fact that different extents of angular movements are transmitted to the angular sub-levers by the key levers of different lengths and a uniform leverage is provided for the type actions throughout the system. The construction of each type action is such that an easy start is provided and little or no side strain is produced upon the type actions, the pull upon the links 5 and 8 being in direct lines fore and aft of the machine. The upper arms of the sub-levers gradually increase in length from the center to the sides of the system in order to bring their upper ends to the proper height with relation to the type bars.

In Figs. 4, 5 and 6 I have shown other forms of type actions in all of which, nevertheless, the advantages hereinbefore pointed out are embodied. In the construction shown in Fig. 4 the sub-levers 6^a are mounted rearwardly of the type bar pivots 2^a and are connected to the type bars by pull links 5^a and are connected to the angular levers 10^a by pull links 8^a. The arms 12^a of the angular levers extend forwardly from their pivots instead of rearwardly therefrom as in the construction shown in Fig. 1 and cooperate with a plate-like contact piece 18^a secured to one side of the associated key lever 14^a. A contact piece or arm 20^a pro-

jects upwardly from the plate-like member 18^a and cooperates with the upright arm 9^a of the associated angular sub-lever 10^a in order to lock the type bar against rebound in its normal position as in the construction previously described. The accelerated action of the type bars is effected in the same manner as previously described and the type bars are locked against rebound in their normal positions. The sub-levers 6^a and links 8^a may be connected at varying points in the lengths of the lower lever arms as previously described, in order to compensate for the variations in the action of key levers of different lengths.

In Fig. 5 the key levers 14^b are each formed substantially straight and are each provided with an upwardly extending arm or abutment 20^b with which an off-set 21 on an angular sub-lever 10^b co-acts. The rearwardly extending arm of each sub-lever is provided with an off-set curved contact shoe 13^b which extends beneath the associated key lever and is adapted to contact therewith so that motion will be transmitted from the angular sub-lever through its connecting link 8^b, sub-levers 6^b and connecting link 5^b to the type bar. The off-set 21 on the angular lever in its normal position cooperates with the projection 20^b on the key lever to prevent the rebound of the type bar. A slight depression of the key lever carries the projection 20^b thereon out of the path of the off-set 21 to release the lock and effect an actuation of the angular levers and the parts controlled thereby. In the construction shown in Figs. 4 and 5 contractile restoring springs 19^a may be employed in the same general manner as described in connection with the construction shown in Fig. 1.

In Fig. 6 I have shown a construction in which the key levers 22 are each recessed at 23 in order that the associated angular lever 24 may be received in the recessed portion of the key lever and may be situated in the same vertical plane as the key lever. An upwardly extending arm 25 on the key lever normally cooperates with the part 26 on the upright arm of the associated angular sub-lever in order to lock the type bar against rebound in the normal position thereof. The face 27 of each key lever is provided for cooperation with a curved contact face 28 on the associated angular sub-lever in order to provide a rolling contact to afford a variation in the leverage when the key lever is depressed and to effect an accelerated movement of the type bar as it approaches the printing position. The angular levers may be connected to the type bars through a system of upright sub-levers and pull links as in the construction shown in Figs. 1 and 5.

It will be seen that the key levers in all

of the constructions shown are levers of the second order, whereas all of the sub-levers 6, 6^a and 6^b are levers of the first order; that the links 8, 8^a and 8^b in the different constructions are horizontally disposed and that the parts are so constructed and arranged that, if desired, the segment carrying the type bars may be shifted to change the case position of the type bars. It will also be seen that the links 8, 8^a and 8^b are pivoted to their respective sub-levers 6, 6^a and 6^b at different distances from the fulcrums of said sub-levers to compensate for the variation in action due to the difference in length of the key levers, and that the angular sub-levers in each construction are all of a uniform size and each of them has an arm that extends in the general direction of the length of its associated key lever. Various changes may be made without departing from the spirit and scope of my invention.

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

1. In a typewriting machine, the combination of a series of type bars; a series of key levers; and means between the type bars and key levers for effecting a gradual acceleration of the type bars in their movements to printing position and for affording a uniform leverage and dip throughout the system, said means comprising angular levers having rolling contact with the key levers, and sub-levers of different lengths operatively connected with said angular levers and type bars.

2. In a typewriting machine, the combination of a series of type bars; a series of key levers; and means between the type bars and key levers for effecting a gradual acceleration of the type bars in their movements to printing position and for affording a uniform leverage and dip throughout the system, said means comprising angular levers pivoted on fixed fulcrums beneath the key levers and having a rolling contact with said key levers, and sub-levers of different lengths pivoted on fixed fulcrums above the key levers and operatively connected with said angular levers and type bars.

3. In a typewriting machine, the combination of a series of type bars; a series of key levers of the second order; and means between the type bars and key levers for effecting a gradual acceleration of the type bars in their movements to printing position and for affording a uniform leverage and dip throughout the system, said means comprising angular levers having rolling contact with said key levers, and sub-levers of the first order and of different lengths operatively connected with said angular levers and type bars.

4. In a typewriting machine, the combination of a series of type bars; a series of

key levers of the second order; and means between the type bars and key levers for effecting a gradual acceleration of the type bars in their movements to printing position and for affording a uniform leverage and dip throughout the system, said means comprising angular levers pivoted on fixed fulcrums beneath the key levers and having rolling contact with said key levers, and sub-levers of the first order and of different lengths pivoted on fixed fulcrums above the key levers and operatively connected with said angular levers and type bars.

5. In a typewriting machine, the combination of a key lever, an angular lever having a rolling contact with said key lever, a type bar, a sub-lever operatively connected with said angular lever and said type bar, and means carried in part by the key lever and in part by said angular lever for locking the type bar against rebound when the parts are in the normal positions.

6. In a typewriting machine, the combination of a key lever, an angular lever pivoted on a fixed fulcrum beneath the key lever and having a rolling contact with said key lever, a type bar, a sub-lever pivoted on a fixed fulcrum above the key lever and operatively connected with said angular lever and said type bar, and means carried in part by the key lever and in part by said angular lever for locking the type bar against rebound when the parts are in the normal positions.

7. In a typewriting machine, the combination of a key lever of the second order, an angular lever having a rolling contact with said key lever, a type bar, a sub-lever of the first order operatively connected with said angular lever and said type bar, and means carried in part by the key lever, and in part by said angular lever for locking the type bar against rebound when the parts are in the normal positions.

8. In a typewriting machine, the combination of a series of type bars; a series of substantially straight key levers; and means between the type bars and key levers for effecting a gradual acceleration of the type bars in their movements to printing position and for affording a uniform leverage and dip throughout the system, said means comprising angular levers having rolling contact with the key levers, and substantially straight sub-levers of different lengths between said angular levers and type bars.

9. In a typewriting machine, the combination of a series of type bars; a series of substantially straight key levers of the second order; and means between the type bars and key levers for effecting gradual acceleration of the type bars in their movements to printing position and for affording a uniform leverage and dip throughout the system, said means comprising angular le-

vers having rolling contact with said key levers, and substantially straight sub-levers of the first order and of different lengths between said angular levers and said type bars.

10. In a typewriting machine, the combination of a series of type bars; a series of substantially straight key levers; and means between the type bars and key levers for effecting a gradual acceleration of the type bars in their movements to printing position and for affording a uniform leverage and dip throughout the system, said means comprising angular levers having rolling contact with said key levers, substantially straight sub-levers of different lengths, links between said angular levers and sub-levers, and links between said sub-levers and type bars.

11. In a typewriting machine, the combination of a series of type bars; a series of key levers; and means between the type bars and key levers for effecting a gradual acceleration of the type bars in their movements to printing position and for affording a uniform leverage and dip throughout the system, said means comprising angular levers having rolling contact with said key levers, sub-levers of different lengths, links between said angular levers and sub-levers, and links between said sub-levers and type bars.

12. In a typewriting machine, the combination of a series of type bars; a series of key levers; and means between the type bars and key levers for effecting a gradual acceleration of the type bars in their movements to printing position and for affording a uniform leverage and dip throughout the system, said means comprising angular levers pivoted on fixed fulcrums beneath the key levers and having rolling contact with said key levers, sub-levers of different lengths pivoted on fixed fulcrums above the key levers, links between the angular levers and sub-levers, and links between said sub-levers and type bars.

13. In a typewriting machine, the combination of a substantially straight key lever, an angular lever having a rolling contact with said key lever, a substantially straight sub-lever, a link between said angular lever and sub-lever, a type bar, a link between said sub-lever and type bar, and means carried in part by the key lever and in part by said angular lever for locking the type bar against rebound when the parts are in the normal positions.

14. In a typewriting machine, the combination of a key lever, an angular lever having a rolling contact with said key lever, a type bar, a sub-lever, a link between said angular lever and sub-lever, a link between the sub-lever and type bar, and means carried in part by the key lever and in part by

said angular lever for locking the type bar against rebound when the parts are in the normal positions.

15. In a typewriting machine, the combination of a series of type bars; a series of key levers; and means between the type bars and key levers for effecting a gradual acceleration of the type bars in their movements to printing position and for affording a uniform leverage and dip throughout the system, said means comprising angular levers pivoted on fixed fulcrums below the key levers, one of each of the companion key levers and angular lever members having an off-set contact face with which the other member has a rolling contact, sub-levers of different lengths operatively connected to said angular levers, and means for operatively connecting said sub-levers with the type bars.

16. In a typewriting machine, the combination of a series of type bars; a series of key levers; and means between the type bars and key levers for effecting a gradual acceleration of the type bars in their movements to printing position and for affording a uniform leverage and dip throughout the system, said means comprising angular levers pivoted on fixed fulcrums below the key levers, one of each set of companion key lever and angular lever members having an off-set contact face with which the other member has a rolling contact, upright sub-levers of the first order and of different lengths pivoted on fixed fulcrums above the key levers and operatively connected to said angular levers; and means for operatively connecting said sub-levers with the type bars.

17. In a typewriting machine, the combination of a series of type bars; a series of key levers; and means between the type bars and key levers for effecting a gradual acceleration of the type bars in their movements to printing position and for affording a uniform leverage and dip throughout the system, said means comprising angular levers pivoted on fixed fulcrums below the key levers, one of each set of companion key lever and angular lever members having an off-set contact face with which the other member has a rolling contact, sub-levers of different lengths, links between said angular levers and sub-levers, and links between said sub-levers and type bars.

18. In a typewriting machine, the combination of a key lever, an angular lever pivoted on a fixed fulcrum below the key lever, one of the key lever and angular lever members having an offset contact face with which the other member has a rolling contact, a sub-lever operatively connected to said angular lever, a type bar operatively connected with said sub-lever, and coöperative means for effecting an engagement be-

tween the angular lever and key lever to prevent a rebound of the type bar from its normal position.

19. In a typewriting machine, the combination of a key lever, an angular lever pivoted on a fixed fulcrum below the key lever, one of the key lever and angular lever members having an offset contact face with which the other member has a rolling contact, an upright sub-lever of the first order pivoted on a fixed fulcrum above the key lever and operatively connected to said angular lever, a type bar operatively connected with said sub-lever, and coöperative means for effecting an engagement between the angular lever and key lever to prevent a rebound of the type bar from its normal position.

20. In a typewriting machine, the combination of a key lever, an angular lever pivoted on a fixed fulcrum below the key lever, one of the key lever and angular lever members having an offset contact face with which the other member has a rolling contact, a sub-lever, a link between said angular lever and sub-lever, a type bar, a link between said sub-lever and type bar, and coöperative means for effecting an engagement between the angular lever and key lever to prevent a rebound of the type bar from its normal position.

21. In a typewriting machine, the combination of a key lever, an angular lever pivoted on a fixed fulcrum beneath the key lever and having an arm that extends substantially horizontally in the same general direction as the key lever and has a rolling contact therewith, said angular lever also having an arm that extends upwardly above the key lever, an abutment on the key lever with which said upwardly extending arm coöperates in the normal positions of the parts, a type bar, and intermediate actuating connections between said type bar and angular lever.

22. In a typewriting machine, the combination of a key lever, an angular lever pivoted on a fixed fulcrum beneath the key lever and having an arm that extends in the same general direction as the key lever and has a rolling contact therewith, said angular lever also having an arm that extends upwardly above the key lever, an abutment on the key lever with which said upwardly extending arm coöperates in the normal positions of the parts, a type bar, and a sub-lever intermediate of and operatively connected with said type bar and angular lever.

23. In a typewriting machine, the combination of a key lever, an angular lever pivoted on a fixed fulcrum beneath the key lever and having an arm that extends in the same general direction as the key lever and has a rolling contact therewith, said angular lever also having an arm that extends upwardly above the key lever, an abutment on

the key lever with which said upwardly extending arm coöperates in the normal positions of the parts, a type bar, an upright sub-lever, a link between said angular lever and sub-lever, and a link between said sub-lever and type bar.

24. In a typewriting machine, the combination of a substantially straight key lever of the second order having an upwardly extending projection, an angular lever having an arm that extends in the same general direction as said key lever and has a rolling contact therewith, said angular lever also having an upwardly extending arm that is adapted to engage the upwardly extending projection on the key lever to prevent rebound of the type bar, a fixed fulcrum beneath the key lever on which said angular lever turns, a type bar, and connections between said angular lever and type bar.

25. In a typewriting machine, the combination of a substantially straight key lever of the second order having an upwardly extending projection, an angular lever having an arm that extends in the same general direction as said key lever and has a rolling contact therewith, said angular lever also having an upwardly extending arm that is adapted to engage the upwardly extending projection on the key lever to prevent rebound of the type bar, a fixed fulcrum beneath the key lever on which said angular lever turns, a type bar, and an intermediate sub-lever operatively connected with said angular lever and type bar.

26. In a typewriting machine, the combination of a substantially straight key lever of the second order having an upwardly extending projection, an angular lever having an arm that extends in the same general direction as said key lever and has a rolling contact therewith, said angular lever also having an upwardly extending arm that is adapted to engage the upwardly extending projection on the key lever to prevent rebound of the type bar, a fixed fulcrum beneath the key lever on which said angular lever turns, a type bar, an upright sub-lever, a link between said sub-lever and angular lever, and a link between said sub-lever and type bar.

27. In a front strike typewriting machine, the combination of a system of upwardly and rearwardly striking type bars arranged in an arc, a system of radiating upright levers, the upper ends of which are arranged in an arc corresponding to the arc in which the type bars are arranged, said levers being pivoted in an arc, and key actuated devices operatively connected to said levers and having a rolling action one on another to give an accelerated movement of the type bars as they approach the printing point, the radiation of the upright levers compensating for the difference in width between

the system of type bars and the system of key actuated devices.

28. In a front strike typewriting machine, the combination of a system of upwardly and rearwardly striking type bars arranged in an arc, a system of radiating upright levers, the upper ends of which are arranged in an arc corresponding to the arc in which the type bars are arranged, said levers being pivoted in an arc, and key actuated devices operatively connected to said levers at different distances from the fulcrums of said levers and having a rolling action one on another to give an accelerated movement of the type bars as they approach the printing point.

29. In a front strike typewriting machine, the combination of a system of upwardly and rearwardly striking type bars arranged in an arc, a system of radiating upright levers, the upper ends of which are arranged in an arc corresponding to the arc in which the type bars are arranged, said levers being pivoted in an arc, and key actuated devices operatively connected to said levers at different distances from the fulcrums of said levers and having a rolling action one on another to give an accelerated movement of the type bars as they approach the printing point, said key actuated devices including key levers of different lengths.

30. In a front strike typewriting machine, the combination of a system of upwardly and rearwardly striking type bars arranged in an arc, a system of radiating upright sub-levers, the upper ends of which are arranged in an arc corresponding to the arc in which the type bars are arranged, said sub-levers being pivoted in an arc, key levers, and angular levers having a rolling contact on said key levers and operatively connected to said sub-levers.

31. In a front strike typewriting machine, the combination of a system of upwardly and rearwardly striking type bars arranged in an arc, a system of radiating upright sub-levers, the upper ends of which are arranged in an arc corresponding to the arc in which the type bars are arranged, said sub-levers being pivoted in an arc, key levers, angular levers having a rolling contact on said key levers, links between said angular levers and sub-levers, and links between said sub-levers and type bars.

32. In a front strike typewriting machine, the combination of a system of upwardly and rearwardly striking type bars arranged in an arc, a system of radiating upright sub-levers, the upper ends of which are arranged in an arc corresponding to the arc in which the type bars are arranged, said sub-levers being pivoted in an arc, and key actuated devices operatively connected to said levers at different distances from the fulcrums of said

levers and having a rolling action one on another to give an accelerated movement of the type bars as they approach the printing point, said key actuated devices comprising key levers of different lengths, and angular levers having rolling contacts on said key levers.

33. In a front strike typewriting machine, the combination of a system of upwardly and rearwardly striking type bars arranged in an arc, a system of radiating upright levers, the upper ends of which are arranged in an arc corresponding to the arc in which the type bars are arranged, said levers being pivoted in an arc, key actuated devices operatively connected to said levers and having a rolling action one on another to give an accelerated movement of the type bars as they approach the printing point, and means for preventing rebound of the type bars from their normal positions.

34. In a front strike typewriting machine, the combination of a system of upwardly and rearwardly striking type bars arranged in an arc, a system of radiating upright levers, the upper ends of which are arranged in an arc corresponding to the arc in which the type bars are arranged, said levers being pivoted in an arc, and key actuated devices operatively connected to said levers at different distances from the fulcrum of said levers and having a rolling action one on another to give an accelerated movement of the type bars as they approach the printing point, said key actuated devices including key levers of different lengths, and means carried in part by said key levers for preventing rebound of the type bars from normal position.

35. In a front strike typewriting machine, the combination of a system of upwardly and rearwardly striking type bars arranged in an arc, a system of radiating upright sub-levers, the upper ends of which are arranged in an arc corresponding to the arc in which the type bars are arranged, said sub-levers being pivoted in an arc, key levers, angular levers having a rolling contact on said key levers, and coöperative engaging means between the angular levers and key levers for preventing rebound of the type bars from normal position.

36. In a front strike typewriting machine, the combination of a system of upwardly and rearwardly striking type bars arranged in an arc, a system of radiating upright sub-levers, the upper ends of which are arranged in an arc corresponding to the arc in which the type bars are arranged, said sub-levers being pivoted in an arc, key levers, angular levers having a rolling contact on said key levers, links between said angular levers and sub-levers, links between said sub-levers and type bars, and coöperative engaging means

between the angular levers and key levers for preventing rebound of the type bars from normal position.

37. In a front strike typewriting machine, the combination of a system of upwardly and rearwardly striking type bars arranged in an arc, a system of radiating upright sub-levers, the upper ends of which are arranged in an arc corresponding to the arc in which the type bars are arranged, said sub-levers being pivoted in an arc, angular levers operatively connected to said sub-levers at different distances from the fulcrums of the latter, key levers of different lengths with which said angular levers have a rolling contact to give an accelerated movement of the type bars as they approach printing position, and engaging projections on said key levers with which said angular levers engage to prevent rebound of the type bars from normal position.

38. In a typewriting machine, the combination of a series of type bars, a series of key levers of different lengths, a series of intermediate pivoted actuating devices between said key levers and type bars, the key levers being connected to said actuating devices at different distances from the pivots thereof depending on the lengths of said key levers to afford a uniform leverage throughout the system, and means whereby an acceleration of each type bar is effected as it moves toward the printing position.

39. In a typewriting machine, the combination of a series of type bars, a series of key levers of different lengths, a series of intermediate sub-levers between said key levers and type bars, the key levers being connected to said sub-levers at different distances from the pivots thereof depending on the lengths of said key levers to afford a uniform leverage throughout the system, and means whereby an acceleration of each type bar is effected as it moves toward the printing position.

40. In a typewriting machine, the combination of a series of type bars, a series of key levers of different lengths, two series of sub-levers between the key levers and type bars, and links between said sub-levers, the points of connection of the links to one set of sub-levers being at different distances from the fulcrums thereof depending on the lengths of the associated key levers to afford a uniform leverage throughout the system and a uniform extent of dip to the keys throughout the system.

41. In a typewriting machine, the combination of a series of type bars, a series of key levers of different lengths, a series of intermediate sub-levers between the type bars and key levers, said sub-levers generally increasing in length from the center to the sides of the system and making connection with their actuating means at different

points in their lengths depending on the length of the associated key lever, and means whereby an acceleration of each type bar is effected as it moves toward the printing position.

42. In a typewriting machine, the combination of a series of type bars, a series of key levers of different lengths, a series of intermediate upright sub-levers between the type bars and key levers, the upper arms of said sub-levers increasing in length from the center to the sides of the system, and links which are connected with said sub-levers at different points in their lengths depending on the length of the associated key lever.

43. In a typewriting machine, the combination of key levers of different lengths; type bars, intermediate connections between the key levers and type bars, said connections including sub-levers, and links connected to the sub-levers at different distances from their fulcrums depending on the lengths of the key levers.

44. In a typewriting machine, the combination of key levers of different lengths; type bars, intermediate connections between the key levers and type bars, said connections including upwardly extending substantially straight sub-levers of different lengths, and means whereby a uniform leverage is provided for the different type actions and a uniform extent of dip of the different keys is provided.

45. In a typewriting machine, the combination of key levers of different lengths, type bars, intermediate connections between the key levers and type bars, said connections including upwardly extending substantially straight sub-levers of different lengths, means whereby a uniform leverage is provided for the different type actions and a uniform extent of dip of the different keys is provided, and means whereby an accelerated movement of each type bar is effected as it moves toward the printing position.

46. In a typewriting machine, the combination of key levers of different lengths, type bars, intermediate connections between the key levers and type bars, said connections including upright sub-levers of the first order and of different lengths, the upper ends of one set of arms of said sub-levers being arranged in an arc which corresponds to the arc in which the type bars are arranged, horizontally disposed links between said sub-levers and type bars, means whereby an acceleration is given to each type bar as it moves toward the printing point, and means whereby a uniform extent of dip is given to the different keys.

47. In a typewriting machine, the combination of a series of type bars, a series of key levers of different lengths, two sets of

sub-levers between said key levers and type bars, and means whereby different extents of angular movements are given to the different sub-levers of one set and a uniform leverage is provided throughout the system.

48. In a typewriting machine, the combination of a series of type bars, a series of key levers of different lengths, two sets of sub-levers between said key levers and type bars, means whereby different extents of angular movements are given to the different sub-levers of one set and a uniform leverage is provided throughout the system, and means whereby each type bar is accelerated as it moves toward the printing point.

49. In a typewriting machine, the combination of a series of key levers, a series of angular levers of a uniform size and each having a rolling contact with the associated key lever, a series of type bars and a series of sub-levers operatively connected with said angular levers and said type bars.

Signed at Kittanning, in the county of Armstrong, and State of Pennsylvania, this 25th day of March A. D. 1908.

JAMES D. DAUGHERTY.

Witnesses:

PAUL MCKENRIED,
J. M. PAINTER.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."