

Nov. 27, 1934.

H. A. AVERY

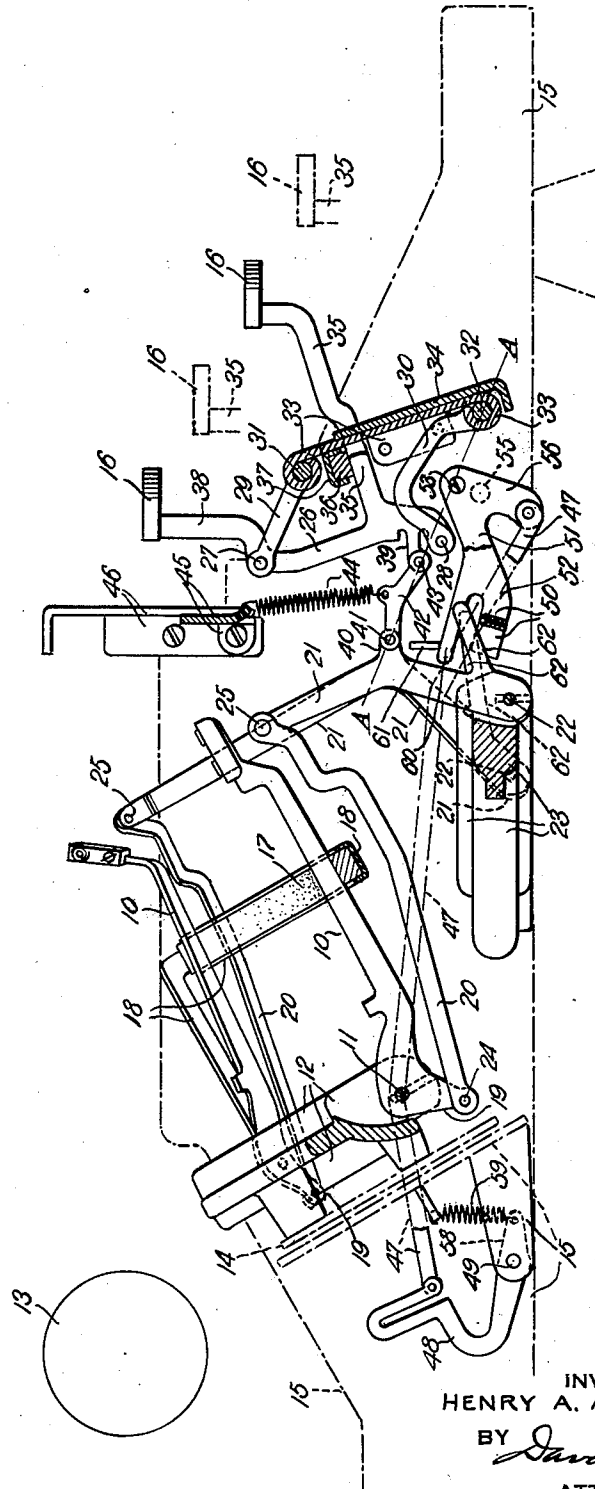
1,981,982

TYPEWRITING MACHINE

Filed Jan. 13, 1932

2 Sheets-Sheet 1

Fig. 1.



INVENTOR
HENRY A. AVERY

BY *Davis & Davis*
ATTORNEYS

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H. A. AVERY

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Fig. 2.

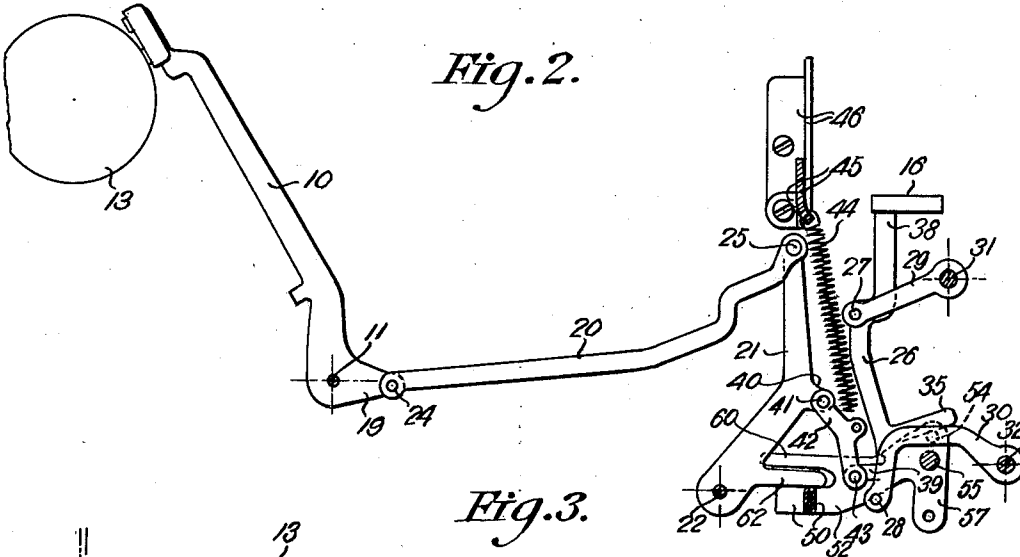
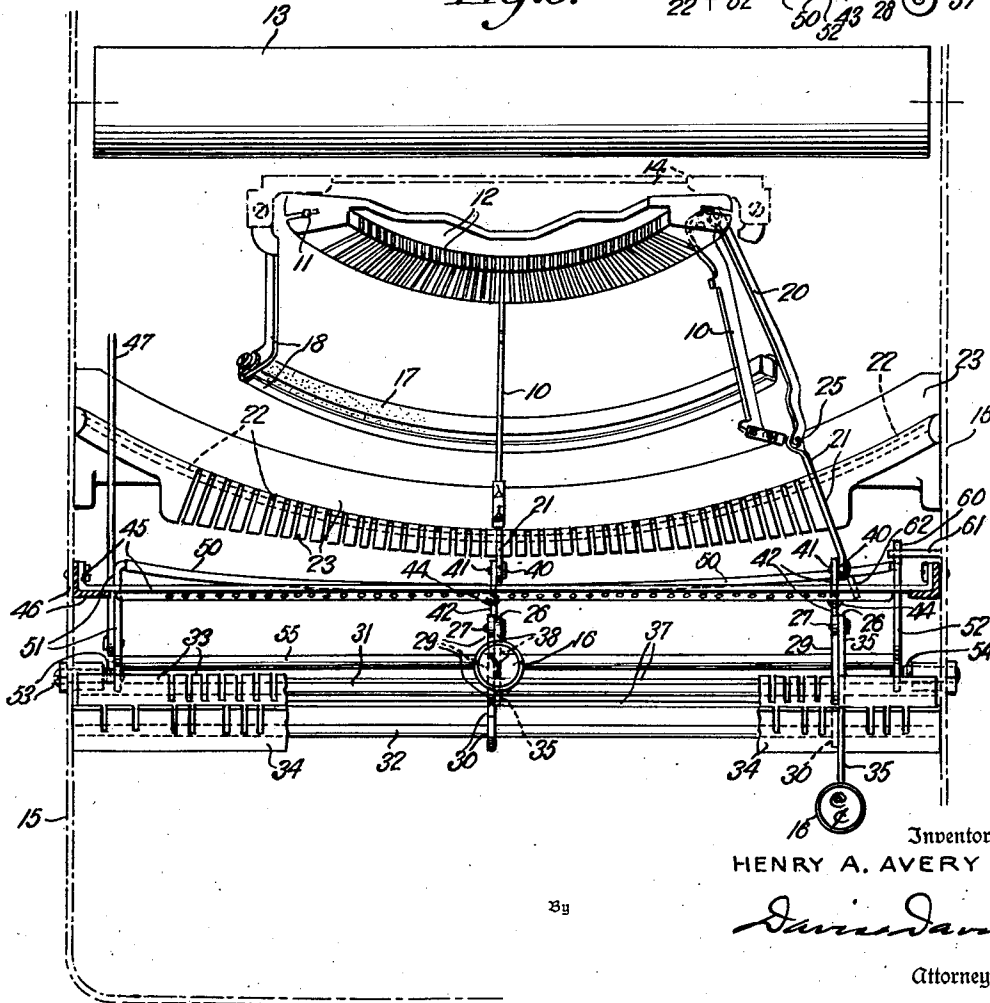


Fig. 3.



Inventor
HENRY A. AVERY

David Davis

Attorneys

UNITED STATES PATENT OFFICE

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TYPEWRITING MACHINE

Henry Allen Avery, Groton, N. Y., assignor to
L. C. Smith & Corona Typewriters Inc., New
York, N. Y., a corporation of New York

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9 Claims. (Cl. 197—30)

This invention relates to improvements in typewriting machines, and more particularly to improvements in the construction and arrangement of the actuating mechanism for the types and of the universal bar associated with said type actuating mechanism for operation thereby to actuate other parts of the machine at the type key strokes.

The invention provides a key to type actuating train affording an easy starting and high degree of acceleration of the printing stroke of the type, good manifolding power, a quick return, and a locking of the returned type bar against rebound, all in a type action of few parts very compactly arranged in all dimensions of the machine; and, at the same time, avoids extending any parts of the system of type actions to the rear of the type bar segment, keeps the platen and the highest parts of the system of type actions substantially at the level of the highest or rear bank of keys of the keyboard, brings the heads of the type bars very close to the keyboard and locates the type bar segment at a very low level in the machine frame.

The invention also affords a very compact and efficient construction and arrangement of the universal bar with reference to the system of type actions, and efficient, uniform and easy operation of the universal bar by single-arm upstanding sub-levers pivoted in a horizontal arc at substantially the lowest part of the machine frame.

The type action is particularly suited for small and low portable typewriting machines of the three-quarter strike variety in which the types strike on the upper front quarter of the platen, and is shown embodied in such a machine.

In the drawings,

Fig. 1 is a vertical longitudinal sectional view of the machine showing a central type action and the type action at the right hand side of the machine;

Fig. 2 is a detail view showing the central type action operated to place the type against the platen; and

Fig. 3 is a top plan view of the parts shown in Fig. 1.

The type bars 10 are pivoted on the usual arcuate pivot wire 11 in the usual slotted type bar supporting segment 12 to strike at a common center on the upper front quarter of the platen 13 which is supported on the usual platen carriage, not shown. The segment 12 is held to a suitable support 14 in the machine frame 15 with the segment and pivot wire lying in a rearwardly inclined plane, making an angle of approximately 30 de-

grees with a vertical plane parallel with the platen, the pivot wire lying in a plane tangential to the periphery of the platen. The central or lowest part of the segment is close to the level of the lowest edge of the machine frame. The machine is provided with the usual universal or standard keyboard with four stepped banks or rows of type keys 16.

The type bars normally, or when at rest, extend upwardly and forwardly substantially perpendicularly to the plane of the segment and are provided at their forward ends with the usual printing type carrying heads or blocks, as shown. The heads of the type bars are close to and behind the highest or rear bank of type keys and approximately at the level of said bank of keys, as shown. An arcuate type rest 17 supports the type bars in their rest position, said rest 17 engaging under the arcuate system of type bars about midway between the heads and pivots of the bars and is supported by a frame 18 held to segment support 14.

The rear end of each type bar is formed with a short heel 19 extending downward from its pivot, the heels of the central bars extending very close to the level of the lower edge of the machine frame 15. The heel of each type bar is connected by a sheet metal link 20 to the upper end of one of a series of upstanding single-arm sub-levers 21 extending downward to the lower edge of the machine frame. The several sub-levers 21 are pivotally supported at their lower ends on a curved pivot wire 22 in a slotted sub-lever segment 23 lying in a horizontal plane at the lower edge of the machine frame with its ends curving toward the rear end of the machine and secured to the sides of the machine frame.

The pivot wire 22 lies in a horizontal plane with its ends curved toward the rear of the machine, and the radius of this arcuate pivot wire and of segment 23 is much greater than that of pivot wire 11 and segment 12, being such that each sub-lever 21 swings in a vertical plane in which is located the pivoted connection of the link 20 with heel 19 of the type bar that is actuated by the sub-lever, so that each link 20 extends substantially parallel with the connected type bar from the type bar to the sub-lever. The upper end of each sub-lever is close to the head of the type bar actuated by the lever, being at a slightly lower level than the said head and in practically the same vertical plane transverse of the machine in which the said head lies, while the lower end and fulcrum of each sub-lever are substantially directly under the upper end of the lever,

when the type bars are in rest position. The respective upright sub-levers thus swing about horizontal axes at their lower ends, and swing in radial planes converging to the medial fore and aft vertical plane of the machine at a point behind the type bar segment.

The pivotal connection of each link 20 with a type bar heel is designated 24, and the pivotal connection of each link with the upper end of a sub-lever 21 is designated 25, and all links 20 are of the same length, the curvature of segment 22 being such as to permit this with sub-levers having their upper and lower ends positioned as above described.

The type keys 16 are fixed on vertically reciprocable key-carrying bars formed of sheet metal, which key bars have upstanding portions 26 normally in register transversely of the machine a short distance forward of the sub-levers 21 and the lower ends of which are at a slightly higher level than the sub-lever segment 23. The upstanding portion 26 of each key bar is pivotally held at 27 and 28 to the rear ends of a pair of superposed short sheet metal links 29 and 30 normally inclined upward and rearward and fulcrumed at their forward ends on horizontal pivot rods 31 and 32 extending in a straight line directly transversely of the machine.

Rods 31 and 32 are supported by a transverse sheet metal frame piece 33 held at its ends to the sides of machine frame 15, to which frame is also attached a slotted sheet metal guide comb 34. Each key bar has a portion 35 extending forward from upright portion 26 at a point between its pivots and normally engaged under a horizontal key lever stop cushion 36 held in a channel member 37 secured to frame piece 33 at the rear face of said frame piece below the rod 31. Portions 35 of the key bars for the three forward banks of keys are extended forward of the cushion and comb and support the keys of these banks, these forwardly elongated portions 35 being guided in the slots of the comb to prevent lateral flexure. The key bars for the rear banks of keys are provided with key supporting portions 38 extending upward from the upper ends of portions 26 of these key bars and located above the series of links 29.

All links 29 are of the same length, all links 30 are of the same length, all pivots 27 are in register transversely of the machine in a single straight horizontal line, and all pivots 28 are in register transversely of the machine in a single straight horizontal line. Portion 26 of each key bar has a short rearwardly extending lug 39 just above pivot 28, which lug is permanently bendable up and down to adjust the normal level of its rear end vertically. Each sheet metal sub-lever 21 has a forwardly extending lug 40 at a slightly higher level than lugs 39 of the key bars, all lugs 40 having their forward ends in register transversely of the machine in a single straight horizontal line and connected by normally transversely registered pivots 41 to the rear ends of short sheet metal links 42, all of the same length and normally slightly inclined forward and downward to lugs 39 to the rear ends of which they are connected by normally transversely registered pivots 43.

The several links of the three series of links 29, 30 and 42 all lie and swing in vertical planes parallel with the vertical medial plane of the machine. Each link 42 has the lower end of one of a series of type action return springs 44 attached thereto about midway its ends, the upper

ends of the springs being attached to a straight horizontal bar 45 secured at its ends to brackets 46 held to the sides of the machine frame.

It will be observed from Fig. 1 that springs 44 normally hold all the type actions in an idle position in which an inclined plane indicated by line A—A passing through the centers of all the pivots 41 and the axis of pivot rod 32 passes slightly below the centers of all the pivots 43 to thereby lock each type bar against rebound from the type bar rest 17—18 when the type bar returns from the platen to idle position. This is due to the fact that each sub-lever is rocked by its actuating type key through a novel toggle linkage of which pivot 43 is the center pivot connecting the two branches of the toggle. One branch or leg of the toggle is formed by link 42 and the other branch or leg of the toggle is a compound or multi-part up and down swinging leg formed by the key bar and the substantially parallel links 29 and 30 anchored respectively at 31 and 32 and tied together at their opposite ends by the key bar to which center pivot 43 of the toggle is connected. The three parts of the forward multi-part leg of the toggle swing up and down substantially as a unit, and in the idle position of the type action the toggle is very slightly closed in the upward direction by the lifting of the center pivot slightly above line A—A through the end or anchorage pivots 32 and 41, thus preventing rebounding of the type bars from the type rest.

It will be seen that the toggle linkage occupies very little space either fore and aft of the machine or vertically and that, even with this small space requirement, the major part of the system of toggles is located in space under the rearmost banks of keys, while the levers and the links from the levers to the type bars are almost entirely located within the space under the system of type bars, which in turn are located very low in the machine frame. The higher ends of links 29 are about level with the upper ends of the shortest sub-levers, the higher ends of links 30 are at a slightly higher level than the sub-lever segment, and the lower ends of links 39 are below the level of the sub-lever segment and very close to the bottom of the machine frame. The toggle linkage is connected to the upstanding sub-levers at 41 at a level a short distance higher than the pivoted lower ends of these sub-levers. This all affords a very compact machine wherein, however, an easy and rapid action is maintained for operating the type bars, as will now be explained.

On the down stroke of a type key, the key moves substantially directly downward without tilting and the slightly upwardly broken or closed toggle is straightened or fully opened by a slight initial depression of the key after which continued downward movement of the key begins to close or break the toggle in the downward direction, thereby pulling the connected sub-lever 21 forwardly with minimum initial effort and at a speed which gradually increases as the key goes down, the bar speed being further increased and the operating effort being lessened by reason of the arrangement of the single arm sub-levers and the connections of the toggle linkage and type bar links 20 with these sub-levers. The type head of the type bar is thus quickly and powerfully thrown against the platen, arriving at the platen when the toggle is broken to an angle of about ninety degrees, as shown in Fig. 2, in which it will be observed that a line passing

through toggle anchorage 41 and toggle center pivot 43 will make an angle of about ninety degrees with a line passing through pivot 43 and toggle anchorage 32.

5 A universal bar for actuating other type key controlled parts of the machine such as the ribbon mechanism and the escapement mechanism for the platen carriage is arranged and constructed for actuation by the type actions in an efficient and easy manner and also so as to contribute to compactness of the machine. The universal bar 50 is arcuate in plan, curving around the segment 23 in front of and close to the forward edge or face of the segment on a radius greater than that of pivot wire 22. It is formed of metal, preferably of inverted U-shape in vertical section, and welded or otherwise secured at its ends to the rear ends of a pair of upwardly and forwardly extending metal side arms 51 and 52 journaled at their forward ends on the inner ends of pivot screws 53 and 54 tapped through the sides of the machine frame slightly in rear of frame plate 33 and at a slightly higher level than pivot rod 32. For greater rigidity, the side arms of the universal bar are connected by a metal tie rod 55 below the level of their pivots, and, for purposes of clearance, links 30 are bowed upwardly so as not to strike this tie rod when the type keys are depressed.

30 These side arms have pendent arms 56 and 57 which may be connected with a mechanism to be actuated by the universal bar. To the left hand one 56 of these pendent arms a link 47 leads to an arm 48 on a shaft 49 journaled on part of the frame of the machine for actuating one of the mechanisms controlled by the universal bar. Shaft 49 has a rock arm 58 connected to part of the machine frame by a return spring 59 which also serves to normally hold the universal bar rocked up into the position shown in Fig. 1 with a stop finger 60 on side arm 52 engaged under a fixed stop 61 held to the machine frame.

The universal bar is depressed on the down strokes of the type keys by lugs 62 on the sub-levers 21. Each of these lugs extends in the idle position forward and slightly upward in the radial plane of its sub-lever from the lower pivoted end of the sub-lever with its lower edge extending across and slightly above the upper edge of the universal bar 50. The normal spacing of these lugs above the universal bar is the same for all the lugs. As the universal bar is actuated by the sub-levers and only after the type bar has moved part way to the platen the universal bar is picked up and started downward without appreciable shock on the operator's finger or resistance to continued depression of the actuated type key. The slight curvature of the universal bar compensates for the progressive variation in angular throw of the sub-levers from the central to the side actions and permits each action to depress the bar the same extent for uniform and certain operation of the parts actuated by the universal bar.

What I claim is:

1. In a typewriting machine, a type action comprising a type carrier, a type carrier actuating lever pivoted to swing fore and aft of the machine, means connecting said lever to the type carrier to actuate the type carrier, a key, and an up and down vibrating key-supporting toggle forward of said lever, comprising a link connected at its rear end to said lever by a horizontal pivot, a bar to which said key is rigidly held having a

vertical portion forward of said lever and to which vertical portion said link is connected by a horizontal pivot, a pair of vertically spaced links connected at their rear ends to said vertical portion of the bar at vertically spaced points by horizontal pivots spaced from the pivot connecting the first-mentioned link with the bar, two fixed horizontal pivots anchoring the forward ends of said pair of links at different levels, a fixed stop arresting upward movement of said bar, and a type action return spring connected with a part of said action to normally hold the bar up against said stop, in which normal position of the bar the toggle is vibrated upward slightly beyond its fully straightened or open position and is adapted to be straightened by a slight initial downward movement of the key and to be thereafter closed by continued key depression to slowly and easily start the printing stroke of the type carrier and continued said stroke at a speed which accelerates as the key goes down, a pivoted universal bar extending below said toggle forward of said lever and spring urged toward the lever, and a stop limiting movement of said universal bar toward said lever, said stop and spring normally holding the universal bar in position for engagement of said lever therewith to rock the universal bar after said toggle has been straightened and the lever has been rocked forward by a partial depression of the key to start the type carrier on its printing stroke.

2. In a typewriting machine, the combination of a main frame, a cylindrical platen, a type bar segment supported in the frame in a rearwardly tilted position with the lowest part of the segment close to the lowest level of the frame, a series of type bars pivoted on the segment with their pivots lying in an arc in a rearwardly inclined plane tangent to the platen at the upper front portion of the platen, said type bars extending upward and forward from their pivots and having heels extending downward from their pivots, a horizontally disposed segment supported in the frame substantially at the lowest level of the frame extending under the type bars and curving toward the rear of the machine from the middle of the segment, a series of upstanding levers progressively increasing in length from the middle toward the sides of the machine and all pivoted at their lower ends in said horizontal segment with their pivots in an arc curved in the same direction as said segment and in a horizontal plane to swing in vertical planes converging toward the middle of the machine at a point behind the type bar segment, a series of links connecting the upper ends of said levers with the type bar heels and extending upward and forward from said heels to said levers, a keyboard comprising stepped banks of keys arranged closely in front of said series of levers, the highest levers and highest forward type bar ends and the platen being approximately at the level of the highest bank of keys, and a series of key-supporting toggle devices pivotally anchored to the frame under the keyboard and pivotally connected at their rear ends to said levers between the lever pivots and the connections of said levers with said links, a stop engaged by said toggle devices to arrest upward movement of the keys after straightening of the toggle devices, and a series of return springs forward of said levers and connected with the frame and said toggle devices to normally hold said devices against said stop, the medial joints of

said toggle devices being substantially in the vertical plane of the rearmost bank of keys.

3. In a typewriting machine, the combination of a main frame, a cylindrical platen, a type bar segment supported in the frame in a rearwardly tilted position with the lowest part of the segment close to the lowest level of the frame, a series of type bars pivoted on the segment with their pivots lying in an arc in a rearwardly inclined plane tangent to the platen at the upper front portion of the platen, said type bars extending upward and forward from their pivots and having heels extending downward from their pivots, a horizontally disposed segment supported in the frame substantially at the lowest level of the frame extending under the type bars and curving toward the rear of the machine from the middle of the segment, a series of upstanding levers progressively increasing in length from the middle toward the sides of the machine and all pivoted at their lower ends in said horizontal segment with their pivots in an arc curved in the same direction as said segment and in a horizontal plane to swing in vertical planes converging toward the middle of the machine at a point behind the type bar segment, a series of links connecting the upper ends of said levers with the type bar heels and extending upward and forward from said heels to said levers, a keyboard comprising stepped banks of keys arranged closely in front of said series of levers, the highest levers and highest forward type bar ends and the platen being approximately at the level of the highest bank of keys, and a series of key-supporting toggle devices pivotally anchored to the frame under the keyboard and pivotally connected at their rear ends to said levers between the lever pivots and the connections of said levers with said links, a stop engaged by said toggle devices to arrest upward movement of the keys after straightening of the toggle devices, and a series of return springs forward of said levers and connected with the frame and said toggle devices to normally hold said devices against said stop, the medial joints of said toggle devices being substantially in the vertical plane of the rearmost bank of keys, a spring-retracted universal bar pivoted on the frame to swing up and down and extending under said toggle devices at the front of the lever segment, a stop on the frame arresting upward retracting movement of the universal bar, and a series of universal bar depressing lugs each extending upward and forward from the lower pivoted ends of a different one of said levers in the plane of swinging movement of the lever and overhanging said universal bar.

4. A typewriting machine having a frame, a keyboard in the front part of the frame comprising stepped banks of keys, a roller platen at the rear part of the frame substantially at the level of the highest bank of keys, an arcuate system of type bars pivoted to strike at a common printing point on the upper front part of the platen and normally extending upward and forward from their pivots between the platen and keyboard and having heels, an arcuate system of upstanding levers interposed between the type bars and keyboard and pivoted at their lower ends to swing in rearwardly converging planes, the highest parts of the systems of type bars and levers being substantially at the level of the platen and the highest bank of type keys, said levers having portions above their pivots normally registering in a straight line across the frame, a sys-

tem of parallel fore-and-aft extending toggle devices of identical length anchored at their rear ends to said lever portions and at their front ends to the frame, a system of key stems each extending from and rigidly held to a portion of a different one of said toggle devices and carrying one of the type keys, and a system of draw links of identical length connecting the upper ends of the levers to the heels of the type bars, the height of the levers increasing from the middle toward the sides of the machine.

5. A typewriting machine as claimed in claim 4, having a transversely extending spring anchor member supported in the frame above the toggle devices and between the keyboard and the system of levers, and a system of return springs anchored to said member and to the toggle devices and normally yieldingly holding said toggle devices in slightly upwardly closed condition.

6. A typewriting machine having a frame, a platen, an arcuate system of rearwardly swinging pivoted type bars having heels and normally extending upward and forward from their pivots forwardly of the platen, a keyboard comprising stepped banks of type keys arranged in front of the system of type bars, a system of upstanding levers pivoted at their lower ends and interposed between the system of type bars and the keyboard, said platen, the highest bank of said keys and the highest parts of the systems of levers and type bars being all located substantially at the same level, a system of draw links connecting the upper ends of the levers to the heels of the type bars, a system of toggle devices anchored at their rear ends to said levers above the lever pivots and at their forward ends to the frame and extending under the keyboard, and key stems each rigidly joined to a portion of a different one of the toggle devices and carrying one of the type keys.

7. A typewriting machine as claimed in claim 6, wherein each toggle device comprises an upstanding member pivoted to which one of the key stems is rigidly joined, a pair of superposed links anchored at their forward ends to the frame and at their rear ends to said upstanding member, and a third link anchored at its forward end to said upstanding member and at its rear end to one of the upstanding levers.

8. In a typewriting machine, the combination of a main frame, a keyboard at the front of the frame having stepped banks of type keys, a rearwardly tilted type bar segment in the frame behind the keyboard, a system of normally upwardly and forwardly inclined type bars pivoted at their rear ends in said segment to strike at a common printing point, said bars having pendent heels and the pivot of the central type bar being located close to the bottom of the frame, a platen located to receive impacts of types on the bars at a printing point at the upper front portion of the platen, the platen and highest parts of the system of the bars being approximately at the level of the highest bank of keys, a system of links extending longitudinally of the type bars and attached at their rear ends to the heels of said bars, a system of upstanding fore-and-aft swinging levers adjacent the forward ends of the type bars and to the upper ends of which levers the forward ends of said links are connected close to the forward ends of the bars, said levers having their lower ends pivoted on horizontal axes in the frame at a common level close to the bottom of the frame, a system of fore-

and-aft extending toggle devices forward of the system of levers and each supporting one of the type keys, each toggle device being anchored to the frame under the keyboard and anchored to one of the levers between the lever pivot and the connection of the lever with the link leading to the heel of the connected type bar, a stop engageable by the toggle devices to limit upward movement of the keys by said devices, return springs connected to the toggle devices to normally hold them engaged with said stop, and a universal bar pivoted on the frame and extending across the machine under the toggle devices forward of the system of levers for rocking by said levers when the type keys are actuated.

9. A typewriting machine, as claimed in claim 8, wherein all the links are of equal length, all the toggle devices are of equal length and are normally in register transversely of the machine with their rear ends pivoted to the levers in a straight horizontal line transversely of the machine, the levers have forwardly extending lugs overhanging the universal bar at the same horizontal level and have their pivots in a horizontal arc which curves rearward from the middle to the sides of the machine, and the universal bar is curved in the same direction as said arc and is pivoted to swing up and down and is spring urged upwardly.

HENRY A. AVERY. 90

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