No. 881,350. PATENTED MAR. 10, 1908.

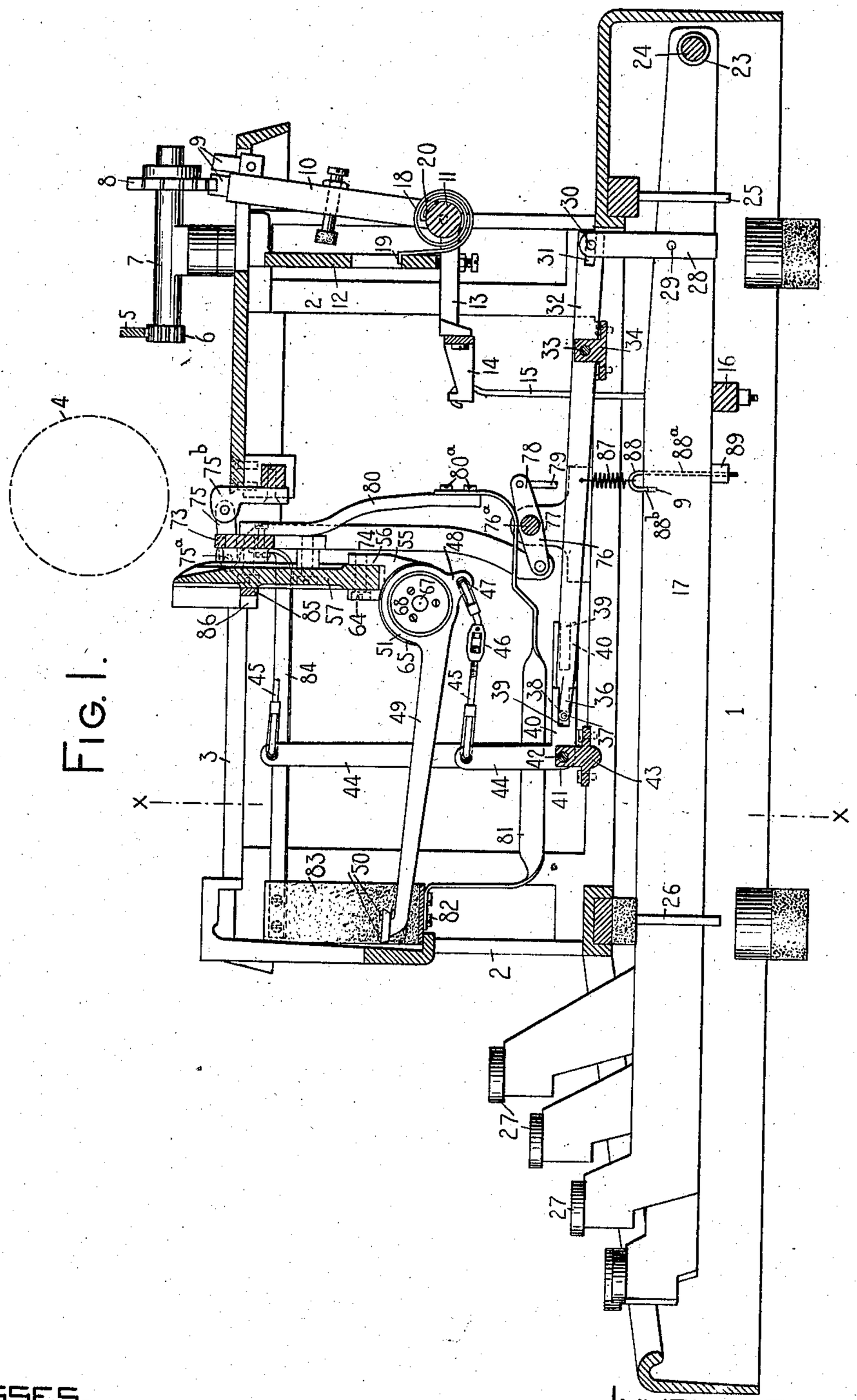
Z. G. SHOLES.

TYPE WRITING MACHINE.

APPLICATION FILED MAR. 16, 1903.

4 SHEETS—SHEET 1.

FIG. 1.



WITNESSES.

K. V. Donovan.

Wm. E. Smith

INVENTOR.

Jalmon G. Sholes

by Jacob Talbel

HIS ATTORNEY

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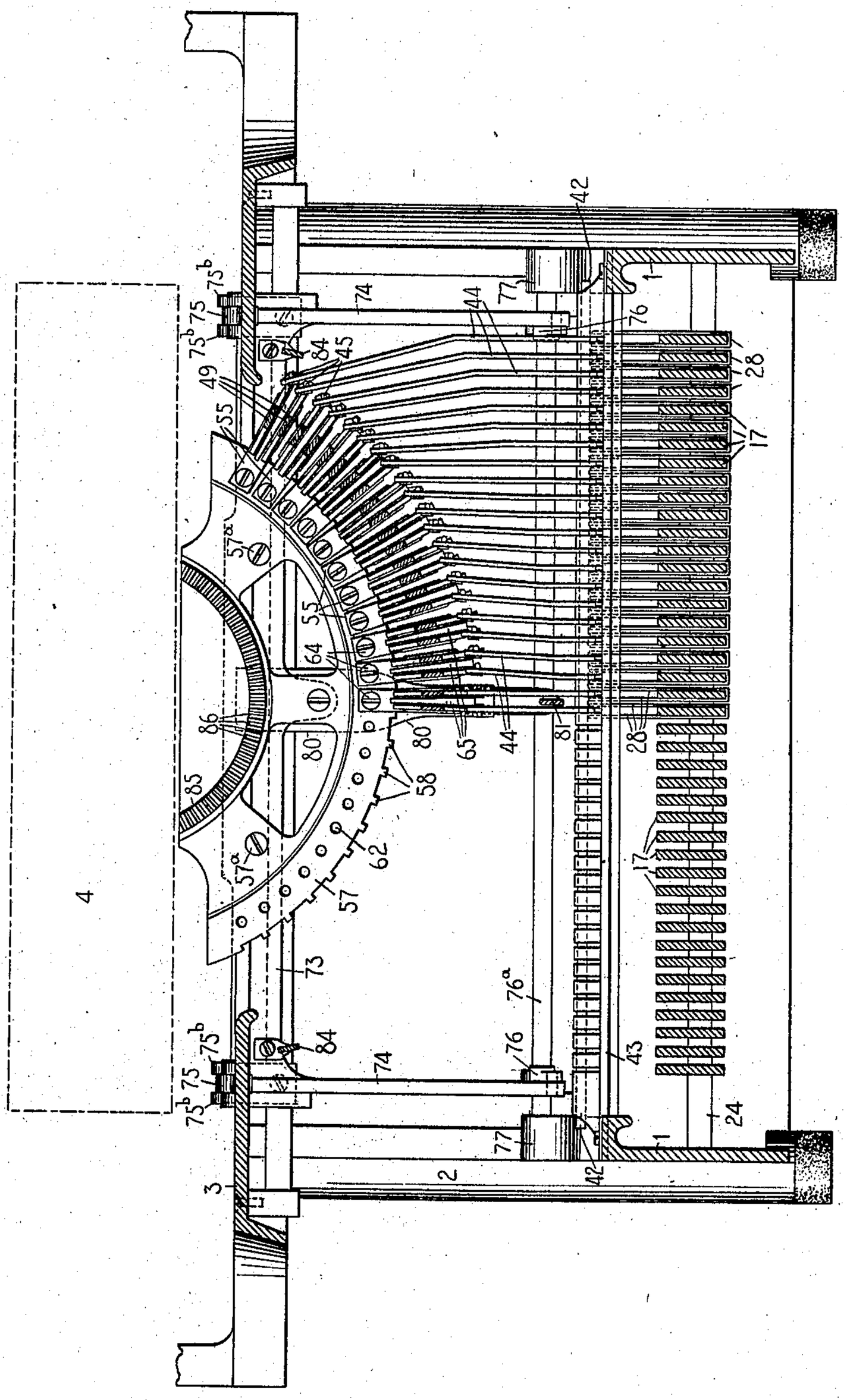
4 SHEETS—SHEET 2.

FIG. 2.



WITNESSES:

K. V. Donovan.

Charles E. Smith

INVENTOR:

Jalmon G. Sholes

by Jacob Falbel

HIS ATTORNEY

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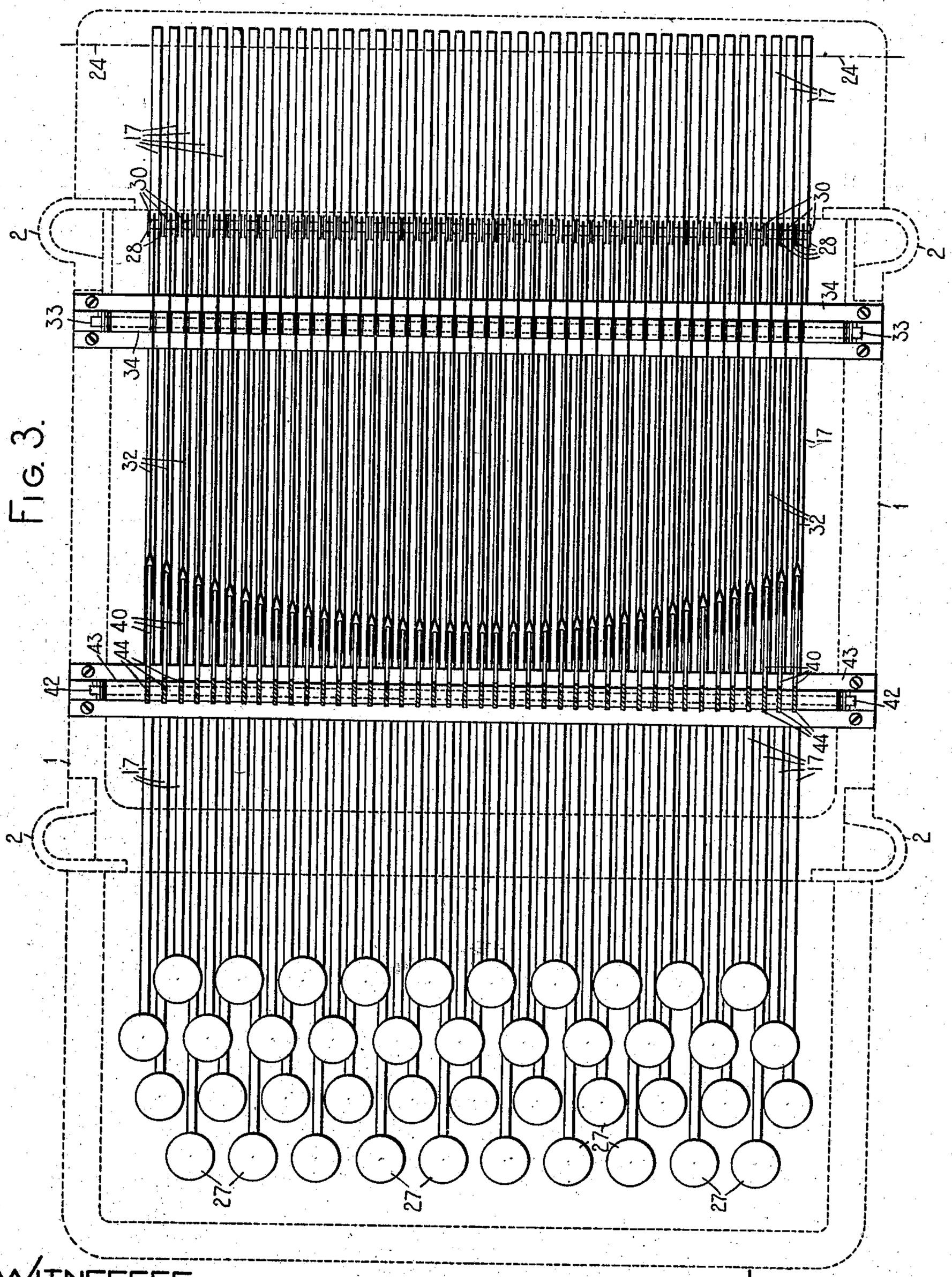
4 SHEETS—SHEET 3.

FIG. 3.



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Jaluon G. Sholes

by Jacob Felbel

HIS ATTORNEY

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4 SHEETS—SHEET 4.

FIG. 8

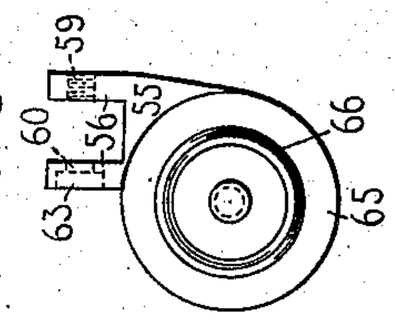


FIG. 12.

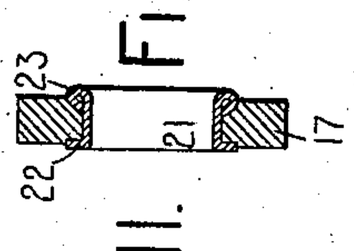


FIG. 7.

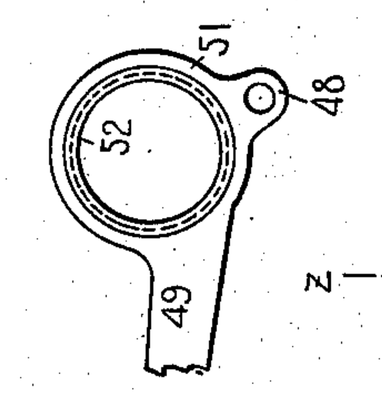


FIG. 11.

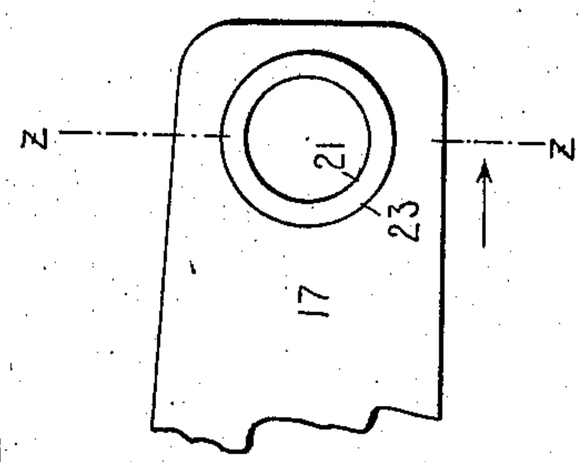
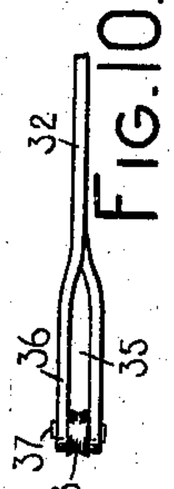


FIG. 10.



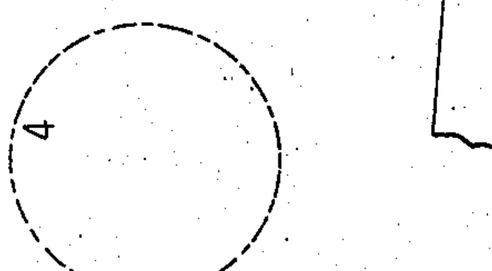


FIG. 5.

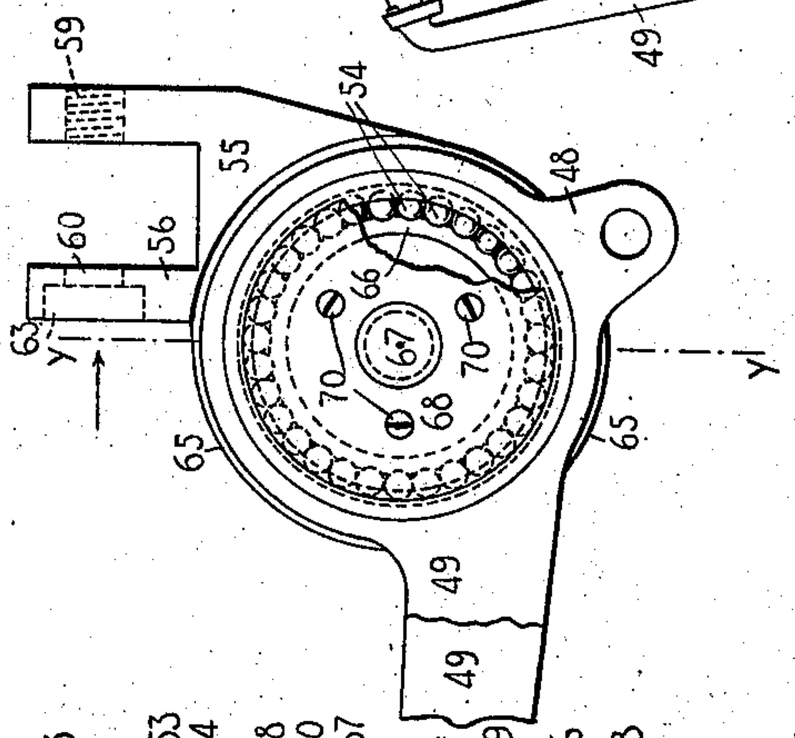


FIG. 9.

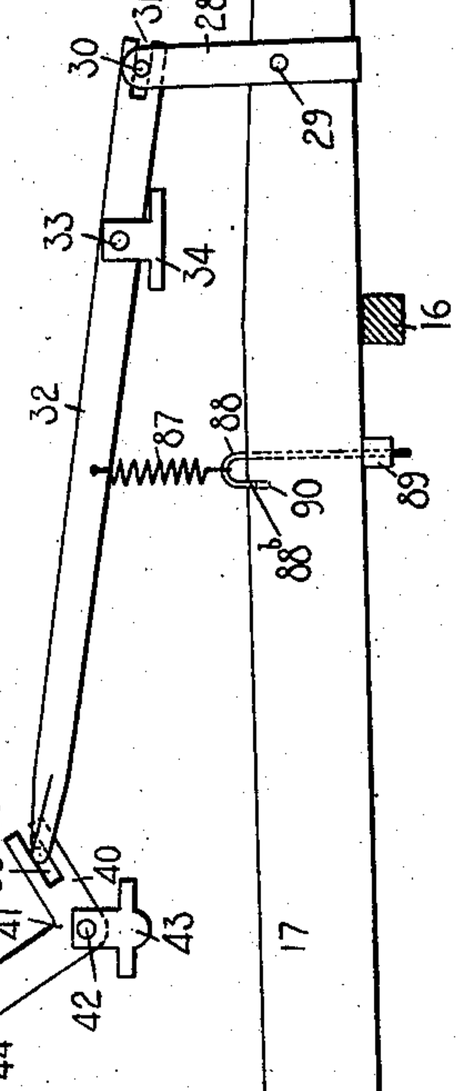


FIG. 4.

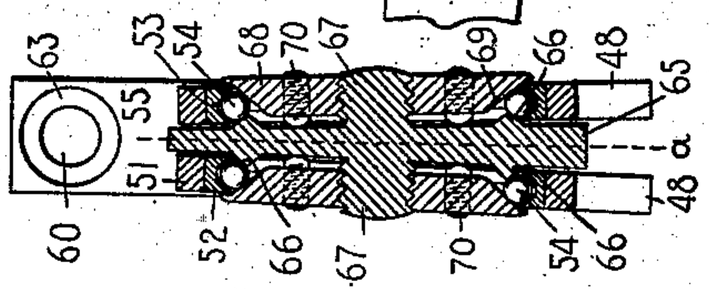
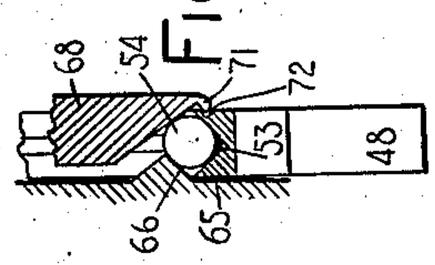
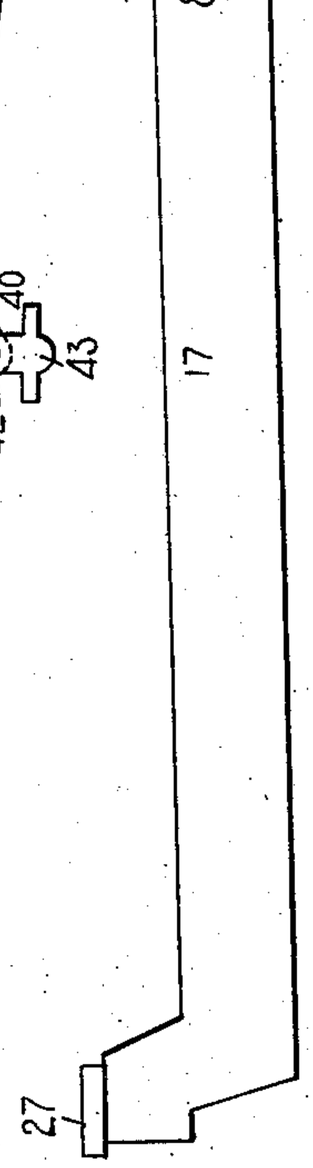


FIG. 6.





WITNESSES=

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INVENTOR=

Zalmon G. Sholes

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HIS ATTORNEY

UNITED STATES PATENT OFFICE.

ZALMON G. SHOLES, OF EVANSTON, ILLINOIS, ASSIGNOR TO UNION TYPEWRITER COMPANY, OF JERSEY CITY, NEW JERSEY, A CORPORATION OF NEW JERSEY

TYPE-WRITING MACHINE.

No. 881,350. Specification of Letters Patent. Patented March 10, 1908.

Application filed March 16, 1903. Serial No. 148,050.

To all whom it may concern:

Be it known that I, ZALMON G. SHOLES, citizen of the United States, and resident of Evanston, in the county of Cook and State of Illinois, 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 the type-actions for "visible" writing machines, and one of the main objects of said invention is to provide a rapid, efficient and easy type-action and to provide a uniform leverage, a uniform extent of dip of the key-levers and a uniform "touch" throughout the system.

A further object of the invention is to provide an efficient roller bearing support for the type-bars and the character of which is such that a large number of type-bars can be mounted or supported upon the segment without increasing the size thereof.

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

In the accompanying drawings, wherein like reference characters indicate corresponding parts in the various views, Figure 1 is a front to rear vertical sectional view of one form of typewriting machine embodying my invention. Fig. 2 is a vertical transverse sectional view of the same, the section being taken on the line *x*, *x*, of Fig. 1 and looking towards the rear of the machine. Fig. 3 is a detail plan view of the key-levers, sub-levers and bell-cranks of the various actions, the upper ends of the bell-cranks being sectioned away. Fig. 4 is an enlarged detail transverse sectional view of a type-bar-hanger with the set of type-bars mounted thereon, the section being taken on the line *y*, *y*, of Fig. 5 and looking in the direction of the arrow in said figure. Fig. 5 is a fragmentary side elevation of the same with parts broken away. Fig. 6 is an enlarged detail fragmentary transverse sectional view of the type-bar-hanger construction and one of the type-bars, the view being taken on the same section line as Fig. 4. Fig. 7 is a fragmentary detail side view of a type-bar shown detached from the hanger. Fig. 8 is a detail side elevation of a type-bar hanger. Fig. 9 is a skeleton view in side elevation of one of the type-actions, the platen being shown diagrammatically in said view. Fig. 10 is an enlarged detail fragmentary plan view of the forward end of one of the sub-levers. Fig. 11 is an enlarged detail fragmentary side view showing the rear end of one of the key-levers. Fig. 12 is a transverse sectional view of the same taken on the line *z*, *z*, of Fig. 11.

I have illustrated my invention applied to a front-strike typewriting machine, or to one character of "visible" writing machines, though it should be understood that from certain aspects the invention may be applied to other styles of writing machines.

The frame of the machine comprises a base 1, corner-posts 2 and top-plate 3, which latter supports a suitable traveling carriage (not shown) that carries a platen 4, diagrammatically illustrated in Figs. 1, 2 and 9. The carriage likewise supports a feed-rack 5, which meshes with a pinion 6 carried upon the forward end of a shaft which is supported in a bearing 7 mounted upon the top-plate of the machine. The rear end of the shaft to which the pinion 6 is secured is operatively connected to an escapement wheel 8 with which feed-dogs 9 coöperate. The dogs are carried by a dog-rocker 10 having a rock-shaft 11 supported in bearings in a bracket-plate 12. A forwardly projecting arm 13 extends from the rock-shaft and carries a transverse bar 14, to the ends of which are connected depending links 15. The lower ends of these links are connected to a universal bar 16 that extends beneath the various key-levers 17. The rock-shaft 11 and the parts connected thereto are restored to the normal position by a spring 18 connected at one end 19 to the bracket plate 12 and at its opposite end 20 to the rock-shaft. The key-levers 17 are preferably made of wood and each key-lever has an opening therein near the rear end, in which is seated a metallic thimble or bushing 21. This thimble has a flange 22 on one end thereof and may be inserted within the opening in the key-lever and turned at its opposite end 23, as indicated in Fig. 2 of the drawings, thus firmly clamping or securing the thimble or bushing to the

key-lever and partly embedding the turned ends of the thimble in the key-lever. The thimble 21 of each key-lever constitutes a bearing for the reception of a pivot rod 24 which extends through the thimbles in the entire series of key-levers and is secured at its ends to the base 1 of the machine.

A depending guide comb 25 is secured to the base of the machine near the rear portion thereof and a like depending comb 26 is secured to the base near the forward portion thereof in order to guide the key-levers in their movements, it being understood that the key-levers are received between the teeth of the combs or guides 25 and 26. The forward ends of the key-levers are provided with the usual finger-keys 27 and a yoke 28 is secured to each key-lever near the rear portion thereof by a rivet 29 or other suitable connecting means. The upwardly projecting free ends of each yoke are united by a pin 30 that extends between the arms and is received within a slot 31 in a substantially horizontally disposed straight sub-lever 32 which is pivoted at 33 in a slotted bar 34 secured to the base of the machine and extending from side to side thereof. The various sub-levers 32 are parallel and extend fore and aft of the machine and are situated directly above the horizontally disposed key-levers 17 and are substantially parallel therewith. The sub-levers are preferably made of metal and the forward end of each sub-lever is bifurcated or split at 35 (see Fig. 10) so as to provide two arms 36 between which extends a pin 37 that constitutes the pivot of an anti-friction roller 38, so that the anti-friction roller is contained within a bifurcated portion of the sub-lever. This anti-friction roller is received within a slot 39 in the rearwardly extending arm 40 of a bell-crank 41 pivoted at 42 in a slotted bar 43 that extends from side to side of the machine.

From an examination of Fig. 2 of the drawings, it will be observed that the bell-cranks are vertically disposed and are substantially parallel and are pivoted in a single transverse line and forward of the pivotal centers of the type-bars, and that the upright arms 44 of the bell-cranks terminate at different heights so that the upper ends thereof are segmentally arranged; the shortest arms being at the center of the system and progressively increasing in height as they approach the sides.

Referring to Fig. 3, it will be seen that the rearwardly extending arms 40 of the bell-cranks are of progressively greater lengths from the center to the sides of the system of bell-cranks and that the ends of said arms are likewise arranged segmentally. It will likewise be seen that the sub-levers 32 vary in length and that the forward ends thereof are segmentally arranged to correspond to the segmental arrangement of the rear ends of the bell-cranks with which they engage, so that the sub-levers are progressively shorter from the center to the sides of the system. From this it will be understood that the arms of the bell-cranks at the center of the system are shortest, whereas those at the sides of the system are the longest and that as the upwardly extending arms increase in height for operative connection to the type-bars, the rearwardly extending arms increase in length to a proportionate degree and that the sub-levers decrease in length as the arms of the bell-cranks decrease in length. The purpose of this construction and arrangement is to afford a uniform leverage, and a uniform "touch" and extent of dip of the key-levers throughout the key-board of the machine.

As will be seen at Fig. 2, the upright arms of the bell-cranks at and near the center of the system are substantially straight throughout their lengths, whereas the upright arms of the bell-cranks at the sides of the system are bent inwardly in order to compensate for the difference in width between the system of key-levers and the segmentally-arranged system of type-bars and so that the upper ends of the arms 44 of the various bell-cranks may be situated in a segmental arrangement which conforms substantially to the segmental arrangement of the type-bars. The upper ends of the arms 44 of the bell-cranks are each connected to a draw-link 45 that preferably consists of a two-part link, the parts being united by a turn-buckle 46 in order that the length of each link may be varied at will. The rear end of each of the links 45 is pivotally connected at 47 to an ear or projection 48 on a type-bar 49, so that a direct fore and aft pull is exerted by each bell-crank on its type-bar. Each type-bar is shown provided with two types 50 and with an eye or hub 51 that has an anti-friction roller-bearing ring 52 secured therein. This ring may be driven in place in the eye and held there by frictional contact or by any suitable means. The inner face of the ring 52 is substantially V-shaped to provide a way or groove 53 for the anti-friction balls or rollers 54. A plurality of type-bars are mounted on each type-bar-hanger 55 which comprises a bifurcated supporting portion 56 that is adapted to straddle the lower edge of the type-bar-segment 57, the various hangers being spaced apart by lugs 58 on the segment. Extending transversely through each hanger are openings 59 and 60, the former of which is screw-threaded for coöperation with the threaded end of a screw 61 that passes through said openings and through an unthreaded opening 62 in the segment. The unthreaded opening 60 in each hanger has a counter-sunk portion 63 for the reception of the head 64 of an associated screw 61.

By this arrangement each hanger is rigidly secured to the type-bar-segment and may be readily mounted on or removed therefrom, the heads of the various screws 61 being readily accessible for this purpose, as will be seen by an examination of Fig. 2. Projecting from the hanger is a central web 65 which has on the opposite faces thereof circular roller-bearings 66 for coöperation with the anti-friction balls or rollers 54. The planes of the opposite faces of the web or of the bearings thereon are inclined to the median plane *a* of the web and of the type-bar-hanger so that the plane of one bearing 66 is at an angle to the plane of the other.

Extending laterally from opposite sides of the web 65 of each hanger and at right angles to the planes of said sides, are oppositely disposed screw-threaded pintles or studs or projections 67, which extend through the eyes of the associated type-bars and constitute supports for bearings plates 68. Each plate 68 has a central screw-threaded aperture by means of which it may be mounted and adjusted on its pintle 67, the adjustment being in a plane parallel to the plane of the associated roller-bearing 66. Each bearing plate 68 has an inclined face 69 that is received within the eye of a type-bar and constitutes an adjustable roller bearing for coöperation with the anti-friction rollers 54. Each plate 68 has one or more threaded openings extending therethrough, (three being shown) for the reception of screws 70 which are adapted to project through the plate and through the eye of the associated type-bar and to bear at their inner ends against a side or face of the web 65 of the hanger, as illustrated in Fig. 4, so as to secure the bearing-plate in the position to which it has been adjusted and to prevent an accidental rotation or rotary displacement of the bearing plate on its pintle 67. By this construction the type-bars on each hanger are arranged side by side and the pivotal centers of the various bars are in a single curved line.

From an inspection of Fig. 6, it will be seen that the outer edge or periphery of each bearing plate or disk forms a circular flange 71 that extends into a circular groove 72 in the hub or eye-portion or the bearing ring of the type-bar so as to overlap the opening in the eye and the joint between the bearing-plate and type-bar and form a "break-joint", in order to prevent dust or grit from entering the bearings for the type-bar. The construction is preferably such that the edge 71 of each plate will be maintained out of contact with the type-bar under the various adjustments of the plate in order not to interfere with the free movement of the type-bar on its bearing rollers.

It will be understood from the foregoing description that the construction provides efficient means for readily mounting or dismounting the type-bars; that it provides efficient roller-bearings that tend to prevent a lateral deflection or movement of the bars at their bearings and during the movements of the bars to and from the printing-point and that a large number of bars can be mounted in the segment without increasing the size thereof and that each hanger supports on interposed bearing rollers, a plurality of type-bars. It will likewise be seen that the construction is such that the median plane of each type-bar and its bearings radiates from the printing point, or a point adjacent thereto and that this median plane for each bar is at an angle to every other bar, so that it is unnecessary to bend the various type-bars at the sides of the system.

The type-bar segment 57 is connected by screws 57ª to a vertically movable frame 73 which has depending arms 74 at the ends thereof. Links 75 are each pivoted at one end 75ª to the upper portion of the frame 73 and at its other end to a bracket 75ᵇ secured to the frame of the machine. The lower ends of the arms 74 are pivoted to parallel arms 76 that project from a rock-shaft 76ª that extends from side to side of the machine and is supported in bearings 77 secured to the base of the machine. The links 76 are extended rearwardly at 78 so as to form shifting lever-arms for effecting a vertical movement of the type-bar segment and type-bars for upper and lower case writing, and the parts 75 and 76 constitute in effect parallel links on which the segment moves. The lever-arms 78 are connected to links 79 and to suitable key-actuating devices (not shown) and by means of which motion may be transmitted to the shifting levers 78. One set of parallel links 75 and 76 and a shifting lever 78 are situated at each side of the machine for connection with the type-bar-segment so that the segment may be elevated or lowered at both sides thereof when the segment is shifted. Secured to the rear of the segment is a depending arm 80 to which is connected by screws 80ª a forwardly and upwardly extending arm 81 which has secured thereto at 82 a segmental pad 83 for supporting the free ends of the type-bars. Forwardly projecting arms 84 extend from the segment, one at each side thereof, and these arms are secured at their forward ends to the segmental pad or support 83 so that a shifting of the type-bar segment will likewise effect a corresponding shifting movement of the segmental pad. The forward face of the type-bar-segment has a forwardly projecting segmental flange 85 that is slotted radially throughout its length at 86 to provide type-bar-guides with which the various type-bars co-act in their movements to the printing position.

As heretofore explained, the key-levers are

guided in their movements between the teeth of the combs 25 and 26, whereas the sub-levers 32 and bell-cranks 41 are guided in their slots in the bars 34 and 43 respectively, and the key-lever, sub-lever and bell-crank of each action are in the same vertical plane. Each sub-lever has one end of a contractile spring 87 connected thereto, whereas the opposite end of said spring is connected to a fastening device 88 that consists of a staple-like piece, one arm 88^a of which projects through an opening in the associated key-lever and is threaded at its lower end where it extends beyond the key-lever for coöperation with a nut 89. This so-called nut may consist of a block of leather apertured to receive the screw-threaded end of the fastening device. The shorter arm 88^b of the fastening device extends into an opening 90 in the key-lever and affords a vertical adjustment of the fastening device or an adjustment thereof relatively to and transversely of the key-lever so that the tension of the spring may be varied and the short arm of the fastening device may, if desired, be removed from the opening 90 in the key-lever to permit a disconnection of the spring from said fastening device. When, however, the short arm of the fastening device is seated in the opening 90 in the key-lever, as illustrated in Fig. 1, the spring cannot be disconnected from said fastening device, though an adjustment of the tension of the spring thereof may be effected. This spring 87 is effective to restore the key-lever, sub-lever, bell-crank and type-bar to their normal positions. From a comparison of Figs. 1 and 9, it will be observed that the spring is under its lightest tension when the parts are in the normal positions represented in Fig. 1, and when a key-lever is depressed, the forward arm of the sub-lever 32 and the key-lever 17 will move in opposite directions, thereby expanding the spring. When the finger-key is released, the contractile spring 87 will draw the forward arm of the sub-lever 32 and the key-lever 17 towards each other, thereby restoring the various parts to their normal positions, as illustrated in Fig. 1. The connection of the restoring spring to the sub-lever and key-lever in the manner described, affords an easy initial movement of the key-lever and the parts controlled thereby and causes a quick restoration of the parts from the printing position by reason of the fact that the ends of the spring are moved away from each other by the parts to which they are connected and the spring is under its greatest strain when the type-bar is in its printing position.

While I have shown and described the embodiment of my invention in one form of typewriting machine, it should be understood that various changes in construction may be made without departing from the spirit of my invention and that certain features thereof may be employed without the others.

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

1. In a front-strike typewriting machine, the combination of a system of parallel key-levers, a system of segmentally arranged upwardly and rearwardly striking type bars, a system of parallel sub-levers pivoted on fixed pivots and arranged in a single substantially horizontal plane, and a second system of sub-levers interposed between the type bars and said first mentioned sub-levers and coacting directly with said first mentioned sub-levers.

2. In a front-strike typewriting machine, the combination of parallel key-levers, a series of upwardly and rearwardly striking type-bars, a series of sub-levers arranged above the key levers pivoted intermediate of their ends on fixed pivots and operatively connected to the key-levers, and a series of angle levers operatively connected to the type-bar and controlled by the sub-levers.

3. In a front-strike typewriting machine, the combination of a series of parallel key-levers, a series of parallel and substantially horizontal sub-levers of the first order extending fore and aft of the machine substantially parallel with said key levers and connected at their rear ends to said key-levers, a series of upwardly and rearwardly striking type bars, and operative connections between the sub-levers and type-bars and connected to the sub-levers at the forward ends thereof.

4. In a front-strike typewriting machine, the combination of a series of parallel key-levers, substantially straight parallel sub-levers of the first order, pivoted to a fixed portion of the machine and operatively connected to the key-levers, and substantially parallel therewith, and bell-cranks between the sub-levers and type-bars.

5. In a front-strike typewriting machine, the combination of a series of upwardly and rearwardly swinging type bars, a series of key-levers, a series of substantially horizontal sub-levers operatively connected to the key levers, a series of vertical sub-levers pivoted to a fixed portion of the machine lower than the type bars and operatively connected to the horizontal sub-levers to be vibrated fore and aft of the machine, and operating links connecting the vertical sub-levers to the type bars.

6. The combination of a set of front-strike pivoted type bars, a system of angular sub-levers each having arms of unequal length, said sub-levers being fulcrumed on a horizontal axis, and their shorter arms increasing in length by degrees on opposite sides of the middle of the system, these arms extending further from the horizontal axis

at the sides than at the middle of the system, means connecting the longer arms of these sub-levers with the type bars, and key-actuated devices connected with the shorter arms of these sub-levers.

7. In a typewriting machine, the combination of a system of type bars secured at elevations progressively increasing from the middle to the sides of the system, a set of key-levers, a set of horizontal sub-levers secured below the type bars, and in operative connection with the key-levers, and another set of sub-levers operatively connected with said horizontal sub-levers and with the type bars.

8. In a typewriting machine, the combination of a system of type bars secured at elevations progressively increasing from the middle to the sides of the system, a set of key levers, a set of horizontal sub-levers secured below the type bars and in operative connection with the key levers, and a set of angular sub-levers operatively connected with said horizontal sub-levers and with the type bars.

9. In a typewriting machine, the combination of a system of type bars secured at elevations progressively increasing from the middle to the sides of the system, a set of key levers, a set of horizontal sub-levers secured below the type bars and in operative connection with the key levers, a set of angular sub-levers operatively connected with said horizontal sub-levers, and links connecting the angular sub-levers with the type bars.

10. In a typewriting machine, the combination of a system of type bars secured at elevations progressively increasing from the middle to the sides of the system, a set of key levers, a set of horizontal sub-levers secured below the type bars and in operative connection with the key levers, said sub-levers varying in length from the middle to the sides of the set, and another set of sub-levers operatively connected with said horizontal sub-levers and with the type bars.

11. In a typewriting machine, the combination of a system of type bars secured at elevations progressively increasing from the middle to the sides of the system, a set of key levers, a set of horizontal sub-levers operatively connected with the key levers, said sub-levers varying in length from the middle to the sides of the set, and a set of angular sub-levers operatively connected with said horizontal sub-levers and with the type bars.

12. In a typewriting machine, the combination of a system of type bars secured at elevations progressively increasing from the middle to the sides of the system, a set of key levers, a set of horizontal sub-levers operatively connected with the key levers, said sub-levers varying in length from the middle to the sides of the set, a set of angular sub-levers operatively connected with said horizontal sub-levers, and links connecting the angular sub-levers with the type bars.

13. In a typewriting machine, the combination of a system of type bars secured at elevations progressively increasing from the middle to the sides of the system, a set of key levers, a set of horizontal sub-levers fulcrumed on a common axis and operatively connected with the key levers, and another set of sub-levers operatively connected with said horizontal sub-levers and with the type bars.

14. In a front-strike typewriting machine, the combination of a set of key-levers, a set of sub-levers, said sub-levers extending longitudinally fore and aft of the machine and which are connected to said key levers by pin and slot connections, both sets of arms of said sub-levers being substantially horizontally disposed, a set of type-bars, and connections between said sub-levers and type bars, said actuating connections being separate from said type bars and sub-levers.

15. In a front-strike typewriting machine, the combination of a type-bar, a key-lever, a horizontally disposed sub-lever connected thereto by a pin and slot connection, a bell-crank to which the sub-lever is connected by a pin and slot connection, and operative connections between the bell-crank and type-bar.

16. In a front-strike typewriting machine, the combination of a set of upwardly and rearwardly swinging type-bars, a set of key-levers, a set of straight sub-levers that extend longitudinally fore and aft of the machine in a single horizontal plane and substantially parallel with said key levers, said sub-levers being connected to the key-levers by pin and slot connections, and operative connections between the sub-levers and type-bars, said connections being separate from said type bars and sub-levers.

17. In a front-strike typewriting machine, the combination of a type-bar, a key-lever, a straight sub-lever that extends fore and aft of the machine and is connected to the key-lever by a pin and slot connection, and a bell-crank connected to said sub-lever by a pin and slot connection and operatively connected to the type-bar.

18. In a typewriting machine, the combination of a system of segmentally arranged type bars, the type bars of the system being situated at elevations progressively increasing from the middle to the sides of the system, a set of key levers, a set of horizontal sub-levers fulcrumed on a common axis and operatively connected with the key-levers, and a set of angular sub-levers operatively connected with said horizontal sub-levers and with the type bars.

19. In a typewriting machine, the combination of a system of segmentally arranged

type bars, the type bars of the system being situated at elevations progressively increasing from the middle to the sides of the system, a set of key levers, a set of horizontal sub-levers fulcrumed on a common axis and operatively connected with the key-levers, a set of angular sub-levers operatively connected with said horizontal sub-levers, and links connecting the angular sub-levers with the type bars.

20. In a typewriting machine, the combination of segmentally arranged type-bars, a series of key-levers and connections between said key levers and type bars, said connections comprising a series of type-bar actuating sub-levers that extend longitudinally fore and aft of the machine, and a series of bell cranks that coöperate with the sub-levers, arms of different bell-cranks being of different lengths.

21. In a typewriting machine, the combination of a series of segmentally arranged type-bars, a series of key levers, and connections between said key levers and type bars, said connections comprising a series of straight type bar actuating sub-levers, and a series of bell-cranks that coöperate with the straight sub-levers, the arms of different bell-cranks being of different lengths.

22. In a typewriting machine, the combination of a series of segmentally arranged type-bars, a series of key-levers, and connections between said key levers and type bars, said connections comprising a series of substantially horizontally disposed sub-levers that extend longitudinally fore and aft of the machine, and a series of bell cranks that coöperate with the sub-levers, the arms of the different bell cranks being of different lengths.

23. In a typewriting machine, the combination of a series of segmentally arranged type-bars, a series of key-levers, a series of substantially horizontally disposed sub-levers that extend longitudinally fore and aft of the machine, a series of vertically disposed bell cranks connected to said sub-levers, the arms of the different bell-cranks being of different lengths, and means for connecting said bell-cranks to said type-bars.

24. In a typewriting machine, the combination of segmentally arranged type-bars, a series of key-levers, and connections between said key levers and type bars, said connections comprising a series of sub-levers that are controlled by said key-levers and extend longitudinally fore and aft of the machine, and a series of bell-cranks, the arms of which increase in length from the center to the sides of the series.

25. In a typewriting machine, the combination of a series of segmentally arranged type-bars, a series of key-levers, and connections between said key levers and type bars, said connections comprising a series of sub-levers that are controlled by the key-levers, and a series of coöperating bell-cranks, both sets of arms of said bell cranks increasing in length to a proportionate degree from the center to the sides of the series of bell-cranks.

26. In a typewriting machine, the combination of a series of segmentally arranged type-bars, a series of key-levers, and connections between said key levers and type bars, said connections comprising a series of substantially straight sub-levers controlled by the key levers, and a series of bell-cranks, both sets of arms of said bell cranks being of progressively greater length from the center to the sides of the series.

27. In a typewriting machine, the combination of a series of segmentally arranged type-bars, a series of key-levers, a series of substantially straight sub-levers controlled thereby, a series of vertically disposed bell-cranks controlled by said sub-levers and both sets of arms of said bell cranks being of progressively greater length from the center to the sides of the series of bell-cranks, and means for connecting said bell-cranks to the type-bars.

28. In a typewriting machine, the combination of a series of segmentally arranged type-bars, a series of key-levers, a series of straight sub-levers of varying lengths controlled thereby, a series of bell-cranks of varying sizes controlled by said sub-levers, and means for connecting said bell-cranks to the type-bars.

29. In a typewriting machine, the combination of a series of segmentally arranged type-bars, a series of key-levers, a series of straight substantially horizontal sub-levers of varying lengths arranged above the key-levers and controlled thereby, a series of bell-cranks of varying lengths controlled by said sub-levers, and means for connecting said bell-cranks to the type-bars.

30. In a typewriting machine, the combination of a series of segmentally arranged type-bars, a series of key-levers, a series of sub-levers that extend fore and aft of the machine and arranged above the key-levers and substantially parallel thereto, connections between said key-levers and sub-levers, bell-cranks that vary in sizes and which are connected to said sub-levers, and connections between said bell-cranks and type-bars.

31. In a typewriting machine, the combination of a series of segmentally arranged type-bars, a series of key-levers, and connections between said key levers and type bars, said connections comprising a series of sub-levers of varying lengths pivoted to a fixed portion of the machine and extending fore and aft of the machine, and a series of type-bar actuating bell-cranks of varying sizes coöperating with said sub-levers.

32. In a typewriting machine, the combination of a series of segmentally arranged type-bars, a series of key-levers, a series of straight horizontally disposed sub-levers arranged above the key-levers and parallel thereto, connections between said key-levers and sub-levers, a series of vertically disposed bell-cranks connected to said sub-levers and the arms of which vary in length from the center to the sides of the series, and connections between said bell-cranks and type-bars.

33. In a typewriting machine, the combination of a series of segmentally arranged rearwardly striking type-bars, a series of key-levers, a series of straight sub-levers that extend longitudinally fore and aft of the machine, a series of bell-cranks that are progressively larger from the center to the sides of the series, pin and slot connections between the key-levers and sub-levers and between the sub-levers and bell-cranks, and connections between the bell-cranks and type-bars.

34. In a typewriting machine, the combination of a series of segmentally arranged type-bars, a series of key-levers, and connections between said key levers and type bars, said connections comprising bell-cranks and straight sub-levers interposed between said key-levers and type-bars, and pin and slot connections between said sub-levers and the parts with which they coöperate.

35. In a typewriting machine, the combination of a series of segmentally arranged rearwardly striking type-bars, a series of horizontally disposed parallel key-levers and connections between said key levers and type bars, said connections comprising a series of parallel horizontally disposed sub-levers, and bell-cranks of varying sizes connected to the sub-levers.

36. In a typewriting machine, the combination of a series of segmentally arranged rearwardly striking type-bars, a series of vertically disposed type-bar actuating bell-cranks which have progressively longer arms from the center to the sides of the series, horizontally arranged parallel sub-levers that cooperate with the bell-cranks, and links between said bell-cranks and type-bars.

37. In a typewriting machine, the combination of a series of segmentally arranged rearwardly striking type-bars, vertically disposed bell-cranks having upwardly and rearwardly extending arms, both sets of said arms being progressively longer from the center to the sides of the series, means for connecting the upwardly extending arms of the bell-cranks to the type-bars, sub-levers connected to the rearwardly extending arms of the bell-cranks, and key-levers connected to said sub-levers.

38. In a typewriting machine, the combination of a series of segmentally arranged rearwardly striking type-bars, vertically disposed parallel bell-cranks having upwardly and rearwardly extending arms, both sets of said arms being progressively longer from the center to the sides of the series, means for connecting the upwardly extending arms of the bell-cranks to the type-bars, parallel sub-levers extending fore and aft of the machine and connected to the rearwardly extending arms of the bell-cranks, and key-levers connected to said sub-levers.

39. In a typewriting machine, the combination of a series of segmentally arranged rearwardly striking type-bars, vertically disposed parallel bell-cranks having upwardly and rearwardly extending arms, both sets of said arms being progressively longer from the center to the sides of the series, draw-links for connecting the upwardly extending arms of the bell-cranks to the type-bars, parallel horizontally disposed sub-levers connected to the rearwardly extending arms of the bell-cranks, and horizontally disposed key-levers connected to said sub-levers.

40. In a typewriting machine, the combination of a series of segmentally arranged rearwardly pivoted type-bars, vertically disposed bell-cranks pivoted to and carried by a fixed portion of the machine and having upwardly and rearwardly extending arms, both sets of said arms being progressively longer from the center to the sides of the series, the upwardly extending arms of the bell-cranks projecting forward of the pivots of the type-bars, draw-links for connecting the upwardly extending arms of the bell-cranks to the type-bars, sub-levers connected to the rearwardly extending arms of the bell-cranks, and key-levers connected to said sub-levers.

41. In a typewriting machine, the combination of a series of segmentally arranged rearwardly striking pivoted type-bars, bell-cranks having upwardly projecting arms that extend forward of the pivots of the type-bars, connections between said upwardly projecting arms and the type bars, sub-levers that extend longitudinally fore and aft of the machine and are connected to said bell-cranks, and horizontally disposed key-levers connected to said sub-levers.

42. In a typewriting machine, the combination of a series of segmentally arranged rearwardly striking pivoted type-bars, vertically disposed bell-cranks having upwardly projecting arms that extend forward of the pivots of the type-bars, connections between said upwardly projecting arms and the type-bars, horizontally disposed parallel sub-levers that extend longitudinally fore and aft of the machine and are connected to said bell-cranks, and horizontally disposed key-levers connected to said sub-levers.

43. In a typewriting machine, the combination of a series of segmentally arranged

rearwardly striking pivoted type-bars, bell-cranks having upwardly projecting arms that extend forward of the pivots of the type-bars, connections between said upwardly projecting arms and the type-bars, sub-levers that extend longitudinally fore and aft of the machine and are connected by a pin and slot connection to said bell-cranks, and key-levers connected by a pin and slot connection to said sub-levers.

44. In a typewriting machine, the combination of a series of segmentally arranged rearwardly striking type bars, a series of parallel bell cranks operatively connected to the type bars for actuating them, the said bell cranks being pivoted in a single line extending transversely of the machine and the ends of the arms of the bell cranks being arranged in two segments, sub-levers connected to said bell cranks, and key levers connected to said sub-levers.

45. In a typewriting machine, the combination of a series of segmentally arranged type-bars, a series of horizontally disposed key-levers, a series of horizontally disposed parallel sub-levers connected to the key levers, a series of vertically disposed parallel bell-cranks having upwardly and rearwardly projecting arms that vary in length throughout the series, the rearwardly extending arms being connected to said sub-levers, and links connecting the upwardly projecting arms of the bell-cranks to the type-bars.

46. In a front strike typewriting machine, the combination of a platen, a type bar which swings upwardly and rearwardly to print against the front face of the platen, a key lever, a substantially horizontally disposed sub-lever of the first order, the key lever being connected to one end of said sub-lever, an angular lever, one arm of which is connected with the other end of said sub-lever, the other arm of the angular lever being operatively connected with the type bar, and a contractile spring connected at one end to the sub-lever and at the other end to the key lever.

47. In a typewriting machine, the combination of a system of type bars, a system of key levers, a system of sub-levers of the first order substantially parallel with said key levers and operatively connected at their rear arms with the key levers and operatively connected at their forward arms with the type bars, and restoring springs connected to and interposed between said key levers and the forward arms of said sub-levers.

48. In a front-strike typewriting machine, the combination of an upwardly and rearwardly striking type bar, a key lever, a substantially horizontally disposed straight sub-lever of the first order extending fore and aft of the machine, the key lever being connected to one end of said sub-lever, an angular lever having a substantially horizontally disposed arm connected with the other end of said sub-lever, the other arm of the angular lever being upwardly directed and operatively connected with the type bar, and a contractile spring connected at one end to the sub-lever and at the other end to the key lever.

49. In a typewriting machine, the combination of a system of type bars, a system of horizontally disposed key levers, a system of horizontally disposed sub-levers extending longitudinally fore and aft of the machine and substantially parallel with said key levers, the forward ends of said sub-levers being operatively connected with the type bars, the rear ends of said sub-levers being operatively connected with said key levers, and contractile restoring springs between said key levers and the forward arms of said sub-levers.

50. In a typewriting machine, the combination of a type-bar, a key-lever, a sub-lever extending longitudinally fore and aft of the machine and operatively connected to the type-bar and key-lever, a contractile spring between said key-lever and sub-lever, and means for adjusting the tension of said spring.

51. In a typewriting machine, the combination of a type-bar, a key-lever, a sub-lever substantially parallel to said key-lever and operatively connected to the type-bar and key-lever, a spring connected to and interposed between said key-lever and sub-lever, and means for adjusting the tension of said spring.

52. In a typewriting machine, the combination of a type-bar, a key-lever longitudinally extending fore and aft of the machine, a sub-lever extending fore and aft of the machine and operatively connected to the type-bar and key-lever, a spring connected to and interposed between said sub-lever and key-lever, and means for adjusting the tension of said spring.

53. In a typewriting machine, the combination of a type-bar, a key-lever, a sub-lever substantially parallel to the key lever and operatively connected to said type-bar and key-lever, a contractile spring interposed between the key-lever and sub-lever and connected at one end to one of said parts by an adjustable fastening device, whereby the tension of the spring may be varied.

54. In a typewriting machine, the combination with a key-lever and a type-bar controlled thereby, of a staple-like fastening device carried by said key-lever, means for affording an adjustment of the staple-like fastening device in a direction transverse to the length of the key-lever, and a restoring spring connected to the fastening device.

55. In a typewriting machine, the combination with a key-lever and a type-bar controlled thereby, of a staple-like fastening device carried by said key-lever and having one arm longer than the other, means coöperat-

ing with the long arm of said fastening device for affording an adjustment of the device in a direction transverse to the length of the key-lever, and a restoring spring connected to the fastening device.

56. In a typewriting machine, the combination with a key-lever and a type-bar controlled thereby, of a staple-like fastening device carried by and having its arms seated in openings in said key lever and having one arm longer than the other, means for affording an adjustment of the device in a direction transverse to the length of the key-lever, and a restoring spring connected to the fastening device, whereby the tension of the spring may be varied at will and the spring may be readily connected to or disconnected from the key-lever.

57. In a typewriting machine, the combination of a type-bar hanger, a plurality of type-bars carried wholly by said hanger on opposite sides thereof, and anti-friction rollers interposed between said type-bars and hangers.

58. In a typewriting machine, the combination of a type-bar hanger, a plurality of type-bars carried and wholly supported by said hanger, anti-friction rollers interposed between said type-bars and hanger, and adjustable bearings for said rollers.

59. In a typewriting machine, the cembination of a type-bar-hanger, a plurality of type-bars carried and wholly supported by said hanger, anti-friction rollers interposed between said type-bars and hanger, and means for readily effecting a detachment of the type-bars from said hanger.

60. In a typewriting machine, the combination of a type-bar-hanger, a plurality of type-bars mounted upon opposite faces of said hanger and wholly supported thereby, and anti-friction rollers interposed between said type-bars and hanger.

61. In a typewriting machine, the combination of a type-bar-hanger, a plurality of type-bars mounted upon opposite faces of said hanger, anti-friction rollers interposed between said type-bars and hanger, and independently adjustable bearings for said rollers.

62. In a typewriting machine, the combination of a type-bar-hanger, a plurality of type-bars mounted upon opposite faces of said hanger and wholly supported thereby and adapted to rotate upon the same or substantially the same pivotal center, and anti-friction rollers interposed between said type-bars and hangers.

63. In a typewriting macnine, the combination of a type-bar-hanger, roller bearings upon opposite sides of said hanger, a set of anti-friction rollers supported on each roller-bearing, and a type-bar supported by each set of anti-friction rollers and wholly supported by said hanger.

64. In a typewriting machine, the combination of a type-bar-hanger, roller-bearings upon opposite sides of said hanger, a set of anti-friction rollers supported on each roller-bearing, a type-bar supported by each set of anti-friction rollers and wholly supported by said hanger, and an adjustable roller-bearing associated with each set of rollers.

65. In a typewriting machine, the combination of a type-bar-hanger, roller-bearings upon opposite sides of said hanger and wholly supported thereby, a set of anti-friction rollers supported on each roller-bearing, a type-bar supported by each set of anti-friction rollers, an adjustable roller-bearing associated with each set of rollers, and means for securing the adjustable bearings in the positions to which they are adjusted.

66. In a typewriting machine, the combination of a type-bar-hanger, roller-bearings upon opposite sides of said hanger, a set of anti-friction rollers supported on each roller-bearing, a type-bar supported by each set of anti-friction rollers, and an adjustable roller-bearing associated with each set of rollers and carried by and adjustable on the hanger.

67. In a typewriting machine, the combination of a type-bar-hanger having a central web, roller-bearings upon opposite faces of said central web, a set of anti-friction rollers supported by each roller-bearing, a type-bar supported by each set of rollers, and adjustable roller-bearings supported by said web upon opposite sides thereof and each coöperating with a set of said rollers.

68. In a typewriting machine, the combination of a type-bar-hanger having a central web, roller-bearings upon opposite faces of said central web, a set of anti-friction rollers supported by each roller-bearing, a type-bar supported by each set of rollers, screw-threaded supports carried by said hanger, and roller-bearings carried by and adjustable on said supports and each bearing coöperating with a set of anti-friction rollers.

69. In a typewriting machine, the combination of a type-bar-hanger having a central web, roller-bearings upon opposite faces of said central web, a set of anti-friction rollers supported by each roller-bearing, a type-bar supported by each set of rollers, screw-threaded supports carried by said hanger, roller-bearings carried by and adjustable on said supports and each coöperating with a set of anti-friction rollers, and means for securing each of the adjustable roller-bearings in its adjusted position.

70. In a typewriting machine, the combination of a type-bar-hanger having a central web, roller-bearings upon opposite faces of said central web, a set of anti-friction rollers supported by each roller bearing, a type-bar supported by each set of rollers, and independently adjustable roller-bearing-plates situated at opposite sides of the web of the

hanger and each coöperating with a set of bearing-rollers.

71. In a typewriting machine, the combination of a type-bar-hanger having a central web, roller-bearings upon opposite faces of said central web, a set of anti-friction rollers supported by each roller bearing, a type-bar supported by each set of rollers, laterally extending bearing studs that project in opposite directions from said web, and roller-bearings supported by and adjustable on said studs.

72. In a typewriting machine, the combination of a type-bar-hanger having a central web, roller-bearings upon opposite faces of said central web, a set of anti-friction rollers supported by each roller-bearing, a type-bar supported by each set of rollers, laterally extending screw-threaded bearing studs that project from said web, and roller-bearings received and adjustable on said screw-threaded studs, one of said adjustable bearings coöperating with each set of bearing rollers.

73. In a typewriting machine, the combination of a type-bar-hanger having a central web, roller-bearings upon opposite faces of said central web, a set of anti-friction rollers supported by each roller-bearing, a type-bar supported by each set of rollers, laterally extending screw-threaded bearing studs that project in opposite directions from said web, and bearing plates that have central threaded openings therein and are supported by and adjustable on said bearing-studs, each of said bearing-plates coöperating with a set of bearing-rollers.

74. In a typewriting machine, the combination of a type-bar hanger which wholly supports a plurality of type bars and has a plurality of roller bearings on opposite sides thereof, anti-friction rollers for the bearings on the hanger, and a plurality of type-bars arranged side by side and supported on said bearing rollers on opposite sides of the hanger.

75. In a typewriting machine, the combination of a plurality of type-bars each having an eye with anti-friction roller-bearings therein, anti-friction rollers received within said bearings, and a single hanger having roller-bearings that coöperate with said rollers to wholly support the type-bars in place on said hanger.

76. In a typewriting machine, the combination of a plurality of type-bars each having an eye with an anti-friction roller-bearing therein, anti-friction rollers received within said bearings, and a single hanger having roller-bearings upon opposite sides thereof, supports upon opposite sides of the hanger which project through the eyes of the type-bars, and roller-bearings mounted upon said supports.

77. In a typewriting machine, the combination of plurality of type-bars each having an eye with an anti-friction roller-bearing therein, anti-friction rollers received within said bearings, and a single hanger having roller-bearings upon opposite sides thereof, supports upon opposite sides of the hanger which project through the eyes of the type-bars, and roller-bearings removable from and adjustable upon said supports

78. In a typewriting machine, the combination of a plurality of type-bars each having an eye with an anti-friction roller-bearing therein, anti-friction rollers received within said bearings, and a single hanger having roller-bearings upon opposite sides thereof, supports upon opposite sides of the hanger which project through the eyes of the type-bars, roller-bearings removable from and adjustable upon said supports, and means for securing said adjustable bearings in their adjusted positions.

79. In a typewriting machine, the combination of a plurality of type-bars each having an eye with an anti-friction roller-bearing therein, a single hanger having a central web with roller-bearings upon opposite sides thereof, screw-threaded projections that extend from opposite sides of said web and through the eyes in the type-bars, and bearing-plates with threaded openings therein and which are received on the threaded projections.

80. In a typewriting machine, the combination of a plurality of type-bars each having an eye with anti-friction roller-bearings therein, a single hanger having a central web with roller-bearings upon opposite sides thereof, screw-threaded projections that extend from opposite sides of said web and through the eyes in the type-bars, bearing plates with threaded openings therein and which are received on the threaded projections, and set screws that prevent the bearing-plates from turning on the projections on which they are mounted.

81. In a typewriting machine, the combination of a type bar hanger, a type bar carried thereby, bearings between the type bar and hanger, said bearings comprising an adjustable bearing plate, anti-friction balls between said bearings, means for affording a relative adjustment of said bearings, and a set screw carried by and passing through said adjustable bearing plate for locking the adjustable bearing plate against rotation and in its adjusted postion.

82. In a typewriting machine, the combination of a type-bar-hanger, anti-friction roller-bearings carried thereby, a type-bar having a roller-bearing, anti-friction rollers in said bearing and interposed between the type-bar and hanger, and a set screw carried by one of said bearings on the hanger and

bearing against the hanger for preventing a movement of one of the bearings on the hanger relatively to the other.

83. In a typewriting machine, the combination of a type-bar-hanger having a roller-bearing, a set of anti-friction rollers for said bearing, a type-bar having an eye with a roller-bearing, an adjustable bearing plate carried by said hanger, and a set screw that passes through the bearing plate and through the eye of the type-bar and bears against the hanger and prevents a movement of the adjustable bearing plate relatively thereto.

84. In a typewriting machine, the combination of a type-bar-hanger having roller-bearings upon opposite sides thereof, a set of anti-friction rollers for each of said bearings, a plurality of type-bars each having an eye with a roller-bearing therein, adjustable bearing-plates carried by said hanger at opposite sides thereof, and set screws that pass through the bearing-plates and through the eyes of the type-bars and bear against the hanger and prevent a movement of the adjustable bearing-plates relatively thereto.

85. In a typewriting machine, the combination of a type bar hanger, a plurality of type bars carried by each hanger, and a set of bearing rollers for each type bar, the plane of each set of rollers being inclined to the median plane of the hanger.

86. In a typewriting machine, the combination of a type bar hanger, a plurality of type bars carried by said hanger, and a set of bearing rollers for each type bar, the plane of each set of rollers being inclined to the median plane of the hanger and the different sets of rollers being arranged in intersecting planes.

87. In a typewriting machine, the combination of a type-bar-hanger having a central web with faces inclined relatively to each other, bearings on said faces, and type-bars supported by said bearings.

88. In a typewriting machine, the combination of a type bar hanger which wholly supports a plurality of type bars and has a plurality of roller bearings, the planes of which are at angles one to another, a plurality of sets of anti-friction rollers for said bearings, said sets of rollers being in intersecting planes, and type bars supported by said anti-friction rollers.

89. In a typewriting machine, the combination of a type-bar-hanger having roller-bearings on opposite sides thereof and at an angle to each other, bearing projections extending from opposite sides of the hanger, each projection extending at right angles to the plane of the side of the hanger from which it projects, roller-bearings supported and adjustable on said projections, anti-friction rollers supported by said bearings, and type-bars supported on said rollers.

90. In a typewriting machine, the combination of a type-bar-hanger having roller-bearings on opposite sides thereof and at an angle to each other, bearing projections extending from opposite sides of the hanger, each projection extending at right angles to the plane of the side of the hanger from which it projects, roller-bearings supported and adjustable on said projections, anti-friction rollers supported by said bearings, and type-bars supported on said rollers, each type-bar having an eye through which one of said projections extends.

91. In a typewriting machine, the combination of a type-bar-hanger having roller-bearings on opposite sides thereof and at an angle to each other, screw-threaded studs extending from opposite sides of the hanger, each stud extending at right angles to the plane of the side of the hanger from which it projects, bearing-plates having threaded openings therein and which are supported and adjustable on said studs, anti-friction rollers supported by said bearing plates, type-bars supported on said rollers, and set screws for maintaining the bearing plates in the adjusted positions.

92. In a typewriting machine, the combination of a type-bar-hanger having roller-bearings on opposite sides thereof and at an angle to each other, screw-threaded studs extending from opposite sides of the hanger, each stud extending at right angles to the plane of the side of the hanger from which it projects, bearing-plates having threaded openings therein and which are supported and adjustable on said studs, anti-friction rollers supported by said bearing plates, type-bars supported on said rollers, each type-bar having an eye through which one of said studs extends, and set screws for maintaining the bearing-plates in the adjusted positions.

93. In a typewriting machine, the combination of a hanger, a plurality of type-bars supported thereby, and a set of anti-friction rollers for each type-bar, the median plane of each type-bar and its set of anti-friction rollers being at an angle to the median plane of the other type-bar and its set of anti-friction rollers.

94. In a typewriting machine, the combination of a type-bar, a roller-bearing support therefor, one of said parts having a circular groove or depression and the other a circular flange coöperating therewith, and bearing rollers arranged in a circle whose diameter is substantially the same as that of said circular groove, the said flanged and grooved parts coöperating to prevent access of dust or grit to the said bearing rollers.

95. In a typewriting machine, the combination of a type-bar, having a circular groove or depression in a side thereof, bear-

ing rollers, and a roller-bearing disk rotatable to adjust it relatively to the bearing rollers and having a circular flange that extends into said groove and prevents access of dust or grit to the bearing rollers.

96. In a typewriting machine, the combination of a type-bar, a bearing-plate, a circular groove in one part, a circular flange on the other part to prevent the passage of dust or grit past the joint formed by the groove and flange, said flange and groove being out of contact, and anti-friction rollers between the type-bar and bearing-plate.

97. In a typewriting machine, the combination of a type-bar having an eye with a roller bearing at the inner opening in said eye, a bearing plate that overlaps the eye in the type-bar, a circular groove in one of said parts, a circular flange on the other and which projects into said groove, and anti-friction rollers between the bearings of the type-bar and the bearing-plate, whereby dust is prevented from reaching the roller bearings.

98. In a typewriting machine, the combination of a type-bar hanger, a type-bar having an eye therein, a circular groove in the side of the eye, a bearing-plate that overlaps the opening in the eye of the type-bar and has a circular flange that extends into the circular groove, means for adjusting said bearing-plate on the hanger, and anti-friction rollers between the bearing-plate and type-bar.

99. In a typewriting machine, the combination of a pivoted, upwardly and rearwardly swinging type bar, a key lever, and operative connections between the key lever and type-bar, said connections comprising a substantially horizontally disposed sub-lever of the first order operatively connected to said key lever, both ends of said sub-lever moving in upright arcs, a second sub-lever controlled by said first mentioned sub-lever, and roller bearing connections between said sub-levers.

100. In a typewriting machine, the combination of a type-bar, a key lever, and operative connections between the key lever and type bar, said connections comprising a substantially horizontally disposed sub-lever substantially parallel throughout its length with and operatively connected to said key lever, a bell crank controlled by said sub-lever, and roller bearing connections between said sub-lever and bell crank.

101. In a typewriting machine, the combination of a type-bar, a key lever, and operative connections between said key lever and type-bar, said connections comprising a substantially horizontally disposed sub-lever of the first order extending fore and aft of the machine substantially parallel with said key lever and operatively connected thereto, a second sub-lever, one of said sub-levers carrying a roller and the other being forked to receive said roller, and operative connections from the second sub-lever to the type-bar.

102. In a typewriting machine, the combination of a type bar, a key lever, and operative connections between said key lever and type bar, said connections comprising a substantially horizontally disposed sub-lever of the first order extending fore and aft of the machine substantially parallel with said key lever and operatively connected thereto, a bell crank or angular lever, one of said sub-lever or bell crank elements carrying a roller and the other being forked to receive said roller, and operative connections from the bell crank lever to the type bar.

103. In a typewriting machine, the combination of a series of type bars, a series of key levers, and operative connections between said key levers and type bars, said connections comprising substantially horizontally disposed sub-levers extending fore and aft of the machine substantially parallel with said key levers and operatively connected thereto, a second series of sub-levers both sets of arms of which are of increasing lengths from the center to the sides of the system, one series of said sub-levers carrying rollers and the other series being forked to receive said rollers, and operative connections from said second series of sub-levers to said type bars.

104. In a front-strike typewriting machine, the combination of a series of parallel key levers, a series of segmentally arranged upwardly and rearwardly swinging type bars, and a series of sub-levers each extending longitudinally throughout its length fore and aft of the machine, said sub-levers being connected with the key levers and being operatively connected at one end of the series with the type bars, and those ends of the sub-levers which are connected with the type bars being all at the same elevation.

105. In a front-strike typewriting machine, the combination of a series of parallel key levers, a series of segmentally arranged upwardly and rearwardly swinging type bars, and a series of sub-levers extending from their pivotal axis or axes towards the front and rear of the machine, said sub-levers being connected with the key levers and being operatively connected at one end of the series with the type bars, and those ends of the sub-levers which are connected with the type bars being all at the same elevation.

106. In a front-strike typewriting machine, the combination of a series of parallel key levers, a series of segmentally arranged upwardly and rearwardly swinging type bars, and a series of sub-levers extending longitudinally from their pivotal axis or axes towards the front and rear of the machine, said sub-levers being operatively connected at the rear end of the series with the key levers and at the front end with the type bars.

107. In a front-strike typewriting machine, the combination of a series of parallel key levers, a series of segmentally arranged upwardly and rearwardly swinging type bars, and a series of sub-levers each of which extends longitudinally lengthwise of the machine, the series of sub-levers being equal in width from end to end of the series of key levers, said sub-levers being connected at one of the series with the key levers and being connected at the other end of the series with the type bars.

108. In a typewriter or like machine, a support, a plurality of hangers thereon, and two type-bars embracing each hanger between them, and mounted to swing thereon, said two type bars being carried exclusively by the said hanger.

109. In a typewriter or like machine, a support, a plurality of tapering hangers thereon, and two type bars mounted to swing on the converging outer faces of each hanger and embracing the said hanger between them, said two type bars being carried exclusively by the said hanger.

110. In a typewriter or like machine, a support, hangers on said support, each hanger having cones on opposite faces, type bars located on each side of a hanger and provided with annular pivot portions having interior ball races, balls interposed between the type bars and said cones, and adjustable caps arranged to engage the outer surfaces of the balls.

111. In a typewriting machine, the combination of a series of type-bars, a series of upright sub-levers, connections between the said upright sub-levers and the type-bars, a series of horizontal sub-levers, a series of key levers, and connections between the key levers and the horizontal sub-levers, the horizontal and upright sub-levers being centrally pivoted and being directly connected together at their meeting ends.

112. In a typewriting machine, the combination of upwardly and rearwardly striking type bars, a series of key levers, a series of horizontally disposed sub-levers located below said type bars and operatively connected to said key levers, and a series of angle levers connected to said type bars and sub-levers.

113. In a typewriting machine, the combination of a system of type bars, the type bars of the system being actuated at elevations progressively increasing from the middle to the sides of the system, a set of key-levers, a set of horizontal sub-levers operatively connected with the key levers, and another set of sub-levers fulcrumed on a common axis and operatively connected with said horizontal sub-levers and with the type bars.

114. In a typewriting machine, the combination of a system of type bars, the type bars of the system being actuated at elevations progressively increasing from the middle to the sides of the system, a set of key levers, a set of horizontal sub-levers operatively connected with the key levers, and a set of angular sub-levers fulcrumed on a common axis and operatively connected with said horizontal sub-levers and with the type bars.

115. In a typewriting machine, the combination of a system of type bars secured at elevations progressively increasing from the middle to the sides of the system, a set of key levers, a set of horizontal sub-levers operatively connected with the key levers, a set of angular sub-levers fulcrumed on a common axis and operatively connected with said horizontal sub-levers, and links connecting the angular sub-levers with the type bars.

116. In a typewriting machine, the combination of a series of segmentally arranged type bars, a series of key levers, and a series of angular levers which coöperate therewith, both sets of arms of said sub-levers increasing in length to a proportionate degree from the center to the sides of the series of angular levers.

117. In a typewriting machine, the combination of a series of segmentally arranged type bars, a series of key levers, a series of angular sub-levers controlled by said key levers, both sets of arms of said sub-levers being of progressively greater length from the center to the sides of the series.

118. In a typewriting machine, the combination of a series of segmentally arranged type bars, a series of key levers, a series of vertically disposed angular sub-levers controlled by the key levers, both sets of arms of said sub-lever being of progressively greater length from the center to the sides of the series of angular levers, and means for connecting said angular levers to the type bars.

119. In a typewriting machine, the combination of a series of segmentally arranged upwardly and rearwardly striking type bars, a series of parallel key levers and a series of vertically disposed angular levers which vibrate fore and aft of the machine, both sets of arms of said angular levers increasing in length to a proportionate degree from the center to the sides of the series of angular levers.

120. In a typewriting machine, the combination of a series of segmentally arranged type bars, a series of key-controlled operating levers, a series of angular levers controlled by said operating levers, both sets of arms of said angular levers increasing in length to a proportionate degree from the center to the sides of the series, and anti-friction rollers between said operating levers and angular levers.

121. In a typewriting machine, the com-

bination of a series of segmentally arranged upwardly and rearwardly striking type bars, a series of key-controlled operating levers, a series of angular sub-levers that are controlled thereby, the arms of the series of angular sub-levers being of progressively greater length from the center to the sides of the series of angular levers, said angular sub-levers being pivoted on fixed pivots above the operating levers and connected thereto by pin and slot connections.

122. In a typewriting machine, the combination of a series of segmentally arranged upwardly and rearwardly striking type bars, a series of parallel key-controlled operating levers, a series of angular sub-levers controlled thereby, both sets of arms of said angular sub-levers being of progressively greater length from the center to the sides of the series, and anti-friction rollers carried by one of the series of angular sub-levers and key-controlled operating levers, and notches or slots in the other series of levers and in which the said anti-friction rollers are received.

123. In a typewriting machine, the combination of a system of type bars, key levers, and actuating mechanism between the type bars and the key levers, said actuating mechanism comprising two sets of sub-levers, one set of sub-levers having arms which are directly connected to arms of the other set of sub-levers, the connecting arms of the sub-levers varying in length from the middle to the sides of the system.

Signed this 9th day of March A. D. 1903.

ZALMON G. SHOLES.

Witnesses:

JENNIE WHITE,

WALTER TRUE.