No. 648,921. Patented May 8, 1900.

L. S. BURRIDGE.

TYPE WRITING MACHINE.

(Application filed Feb. 10, 1898.)

(No Model.) 4 Sheets—Sheet 1.

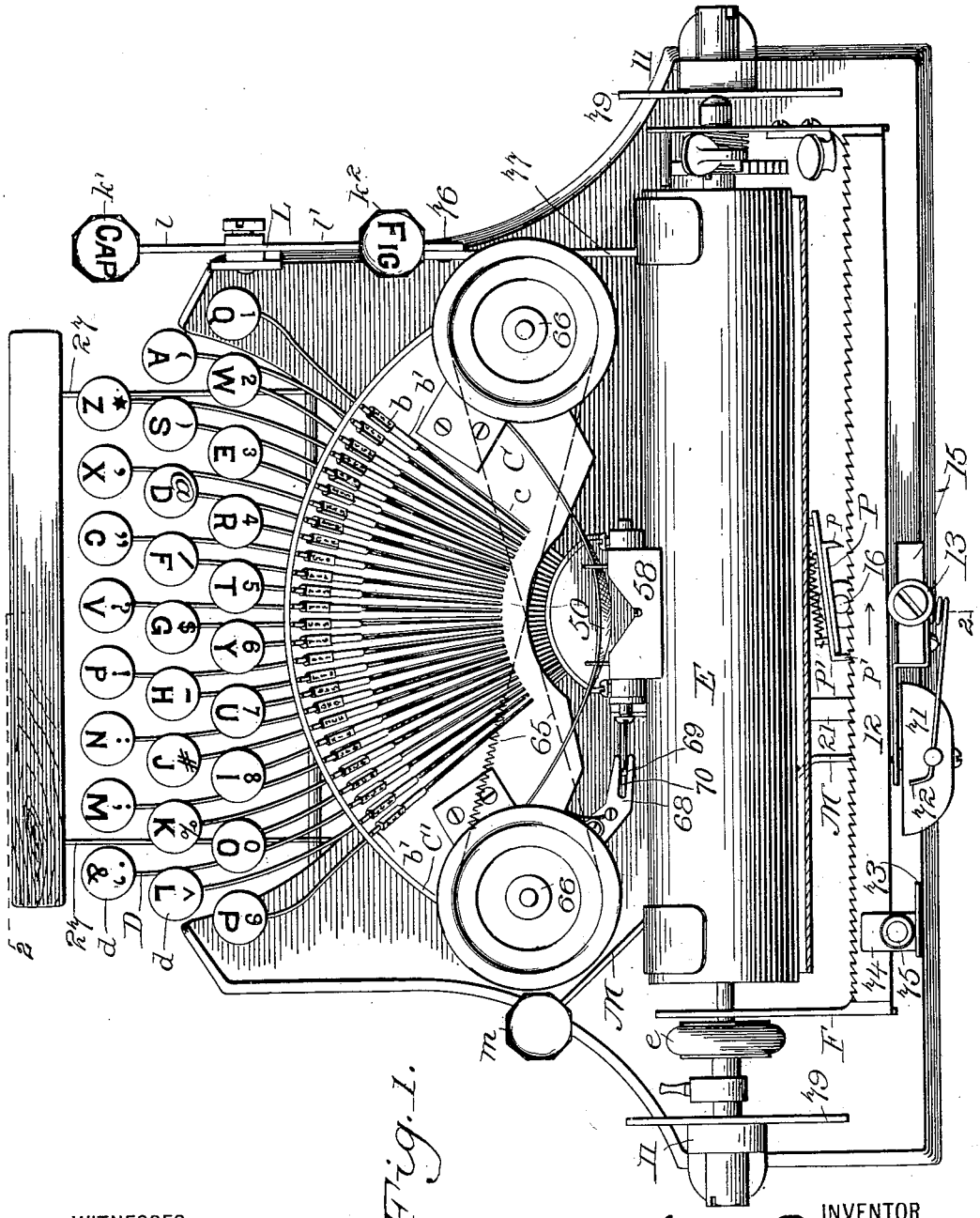

Fig. 1.

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Fig. 2.

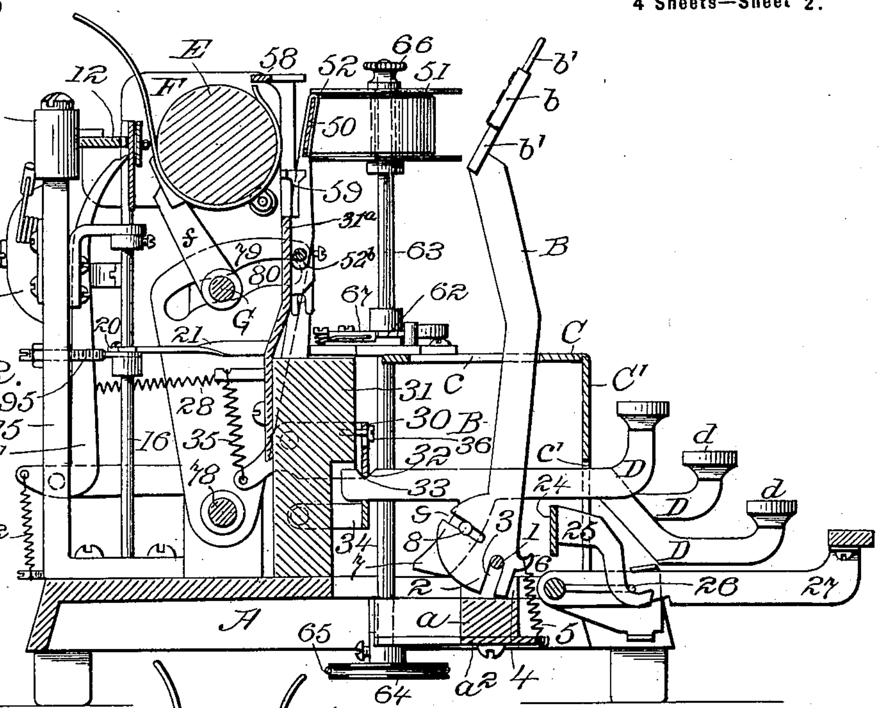

Fig. 3.

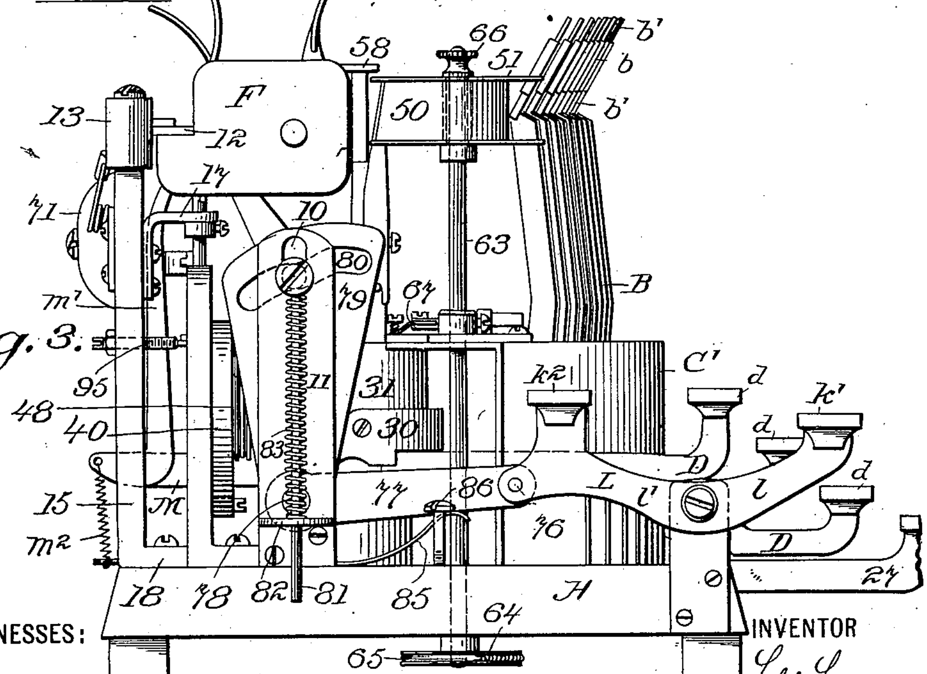

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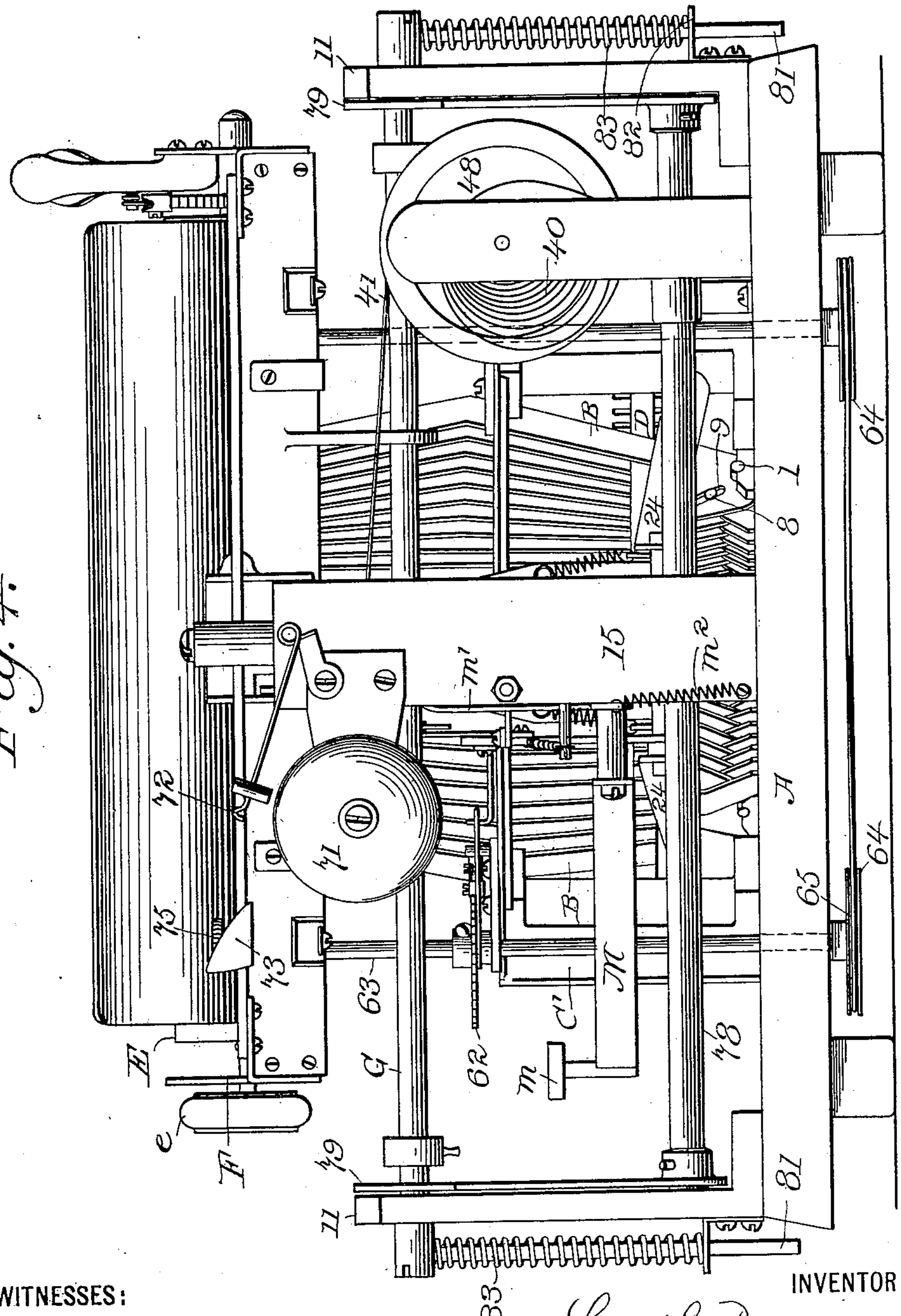
Fig. 4.



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No. 648,921. Patented May 8, 1900.

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(No Model.) 4 Sheets—Sheet 4.

Fig. 5.

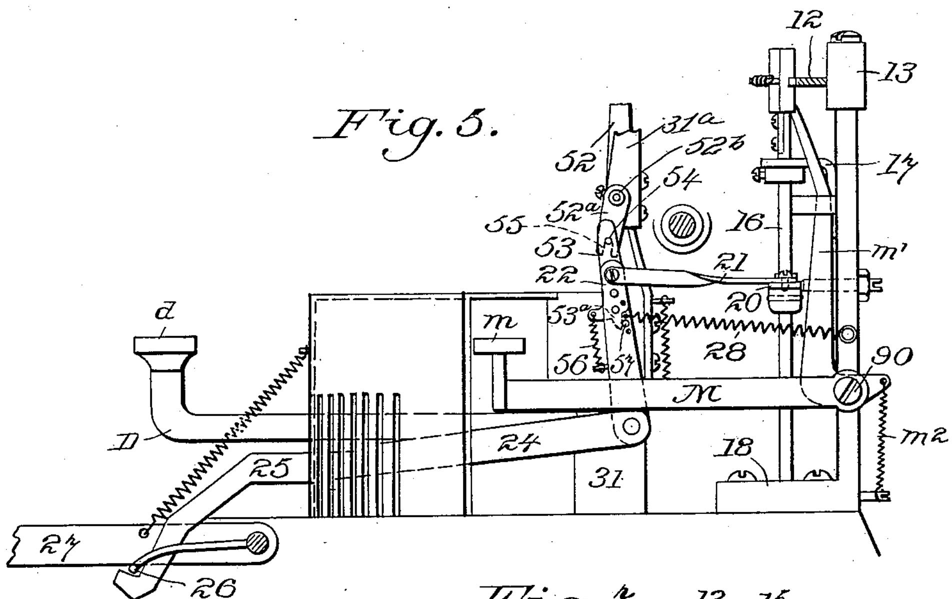


Fig. 7.

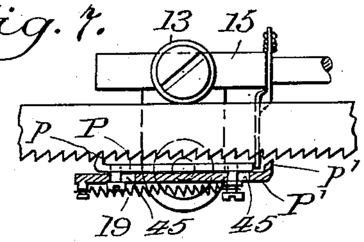


Fig. 6.

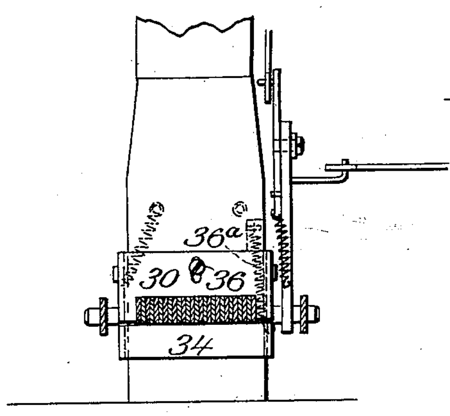
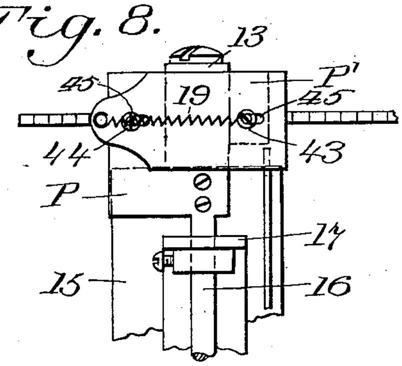


Fig. 8.



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UNITED STATES PATENT OFFICE.

LEE S. BURRIDGE, OF NEW YORK, N. Y., ASSIGNOR TO THE UNION TYPE-WRITER COMPANY, OF JERSEY CITY, NEW JERSEY.

TYPE-WRITING MACHINE.

SPECIFICATION forming part of Letters Patent No. 648,921, dated May 8, 1900.

Application filed February 10, 1898. Serial No. 669,807. (No model.)

To all whom it may concern:

Be it known that I, LEE S. BURRIDGE, a citizen of the United States, residing at New York, in the county and State of New York, have invented certain new and useful Improvements in Type-Writing Machines, of which the following is a specification.

This invention relates to improvements in type-writing machines, and has especial reference to machines with individual type-bars, each carrying a plurality of types, although certain features of the invention are applicable to other forms of type-writing machines.

One of the leading objects of my invention is to reduce to a minimum the path of travel of the type from its position of rest to contact with the platen. In most machines having pivoted type-bars the angular distance passed over by the type-bars when in action is about ninety degrees, and attempts to reduce this distance have generally involved the use of compound or jointed levers, adding greatly to the complication of the machine. I have found that by pivoting the type-bars in a segment of a circle whose plane is substantially at right angles to a line joining the center of said circle with the printing-point of the platen and arranging the types upon said type-bar so that they face the printing-point and when at rest lie in a plane approximately parallel with the plane of the segment of the type-bars they move in a very short arc toward and away from the platen. With such an arrangement, furthermore, there is sufficient space for all the type-blocks to stand side by side when at rest, provided type-bars with a plurality of type are employed, so as to correspondingly reduce the number of type-bars necessary. The type-bars being mounted so that their paths converge to the printing-point, no jointed levers are necessary, and the type are therefore carried by simple levers pivoted to a fixed support. I prefer to mount the type-bars in front of the platen, to pivot them in a plane considerably lower than the platen, and to cause the types to move to and from the platen in substantially-horizontal paths, this construction resulting in a visible impression.

My invention further relates to an elastic or cushioned support or fulcrum for the key-levers.

In the accompanying drawings, which form a part of this specification, Figure 1 is a plan view of a type-writing machine embodying my invention. Fig. 2 is a central vertical sectional view of same, the plane of section being indicated by the dotted line 2 2, Fig. 1. Figs. 3 and 4 are respectively side and rear views. Figs. 5, 6, 7, and 8 show details.

A represents the frame or base of the machine, provided near its front end with a segmental rib *a*, which serves to support the type-bars. A round rod 1, bent to the form of an arc corresponding to the rib *a*, lies in a horizontal plane and is set into a corresponding notch or seat in the top of said rib, and the type-bars B are loosely pivoted on said rod, a notch 3 in the lower end of each type-bar engaging with said rod 1. I indicate this as a simple method of pivoting the type-bars; but instead any usual or preferred method may be adopted. The form of construction adopted by me enables me to use for all of the type-bars B identically-shaped flat metal bars, none of them twisted or bent in any way; but the type-blocks are fixed at the upper ends of the bars at varying angles from the center outward, so that they face the printing-point and strike the same squarely when the bars are vibrated to effect an impression. In the example shown the type-blocks *b* are mounted upon or fixed to round stems or wires *b'*, secured at the upper ends of the type-bars and which pass through round holes in the blocks. By this construction the blocks may be adjusted to the proper angles relative to the printing-point and there secured by solder or otherwise. If, however, the stems *b'* be omitted and the type secured directly upon extended ends of the type-bars B, the upper portions of said bars would have to be bent where the types are attached, so that the types might strike the printing-point properly.

The lower ends or feet 2 of the type-bars extend down into slits 4, formed transversely in the supporting-rib *a*, and are thereby guided and held from lateral displacement. Springs 5, attached at their lower ends to a fixed plate a^2, are fastened at their other ends to lugs 6

on the respective type-bars and tend to throw the upper ends of said bars toward the front of the machine and also tend to hold said bars firmly on the rod 1. The motion of the type-bars in this direction is limited by a comb-plate C, horizontal or parallel with the plane of fulcrum-rod 1 and having slots *c*, wherein the type-bars play and are guided, and the forward ends of such slots are so placed that the type-bars are normally held in a more or less vertical position. Each type-bar B carries at its upper end a type-block *b*, having a plurality of types formed thereon or affixed thereto. I prefer to form it with three type arranged one above another, corresponding to three different positions of the platen, as hereinafter described.

The horizontal comb-plate C is fastened to and supported above the base A by a vertical comb-plate C', fastened in any suitable manner to the base A. Vertical slots *c'* in this comb-plate receive and guide the key-levers D, carrying the keys *d*, and said key-levers are pivoted at their inner ends to a support or fulcrum, as hereinafter described, and have downwardly-projecting arms 7, carrying pins 8, engaging in notches 9 in the lower portion of the respective type-bars. As the key-levers are depressed they carry the pins 8 downward, and thus throw the type-bars forward. It will be seen by reference to the drawings that the key-levers pass between the type-bars and converge in radial lines parallel to the slots in the horizontal comb-plate C. It will also be seen that the outer or key ends of the levers are bent or curved laterally toward the center, so as to produce a series of straight rows of keys in parallel planes transversely of the keyboard, by which construction the objectionable circular or curved keyboard heretofore produced in machines wherein the key-levers are radially arranged is avoided and the ideal condensed straight-row keyboard with keys or buttons equally spaced in all rows is thereby secured. Owing to the arc or segmental form of the pivot-rod for the type-bars and the consequent segmental disposition of said bars, the latter are caused, when in action, to move toward the platen in converging paths, the point of meeting of these paths being the point at which impression is effected against the platen. The slots *c* in comb-plate C are of course properly arranged to conform to these converging paths.

The cylindrical platen E is substantially in the same horizontal plane as the types, (it is here shown shown slightly below them,) and is turned in the usual manner on a carriage F by a knob *e*. The carriage is supported by arms *f*, attached to the carriage-frame and loosely embracing a horizontal rod G, which is arranged below and parallel with the carriage and is guided at the ends in slots 10, formed in vertical standards 11 on the base. Shifting devices hereinafter described support this rod G in the said slots at different elevations corresponding to the several sets of types on the type-bars. Thus there being in this case three types on each type-bar, the platen is by the aforesaid devices held in any one of three different elevations, so as to cause one or another of these types to come against the platen when the corresponding key is struck. Each type-block moves directly toward the printing-point when in action by reason of the segmental arrangement of the type-bar pivot-points and owing to the shortness of the arc and the fact that the pivots of the type-bars are in a plane considerably below that of the platen and type this motion is almost straight, thus giving a much shorter path to effect the required displacement of the type-blocks from the printing-point than could be the case with a bar that moves through a large arc—say about a right angle. A type moving through such a large angle does not move directly toward and away from the printing-point throughout its path; but when started from a position of rest it first moves almost at right angles to its final direction of movement, and the circuitous path thus pursued leads to necessarily slower action and greater friction and jar than when the movement is made direct, as above stated. Moreover, by the above-described arrangement the desired direct movement is accomplished by a simple lever action without the intervention of slides or compound levers of any kind.

The converging guide-slots *c* in comb-plate C would if extended meet at a point substantially vertically under the impression-point on the platen. The arc-shaped fulcrum-rod 1 of the type-levers lies in a circle whose center is also substantially vertically under the said impression-point. Taking, therefore, as an axis an imaginary line drawn through the impression-point, through the center from which radiate the guide-slots *c* and through the center about which the type-lever fulcra are arranged it will be seen that the type-levers are arranged in the form of a segment of a cylinder about said axis and lie with their type-bearing portions in vertical planes radiating from said axis. Furthermore, the arc-shaped pivotal line of the type-levers may be regarded as the base-line of a conical segment whose apex is at the impression-point of the platen and whose axis is said imaginary vertical line joining said impression-point with the center of the arc in which lie the type-bar pivots.

In order to provide an elastic or yielding support or fulcrum for the key-levers D, I prefer to support them at their rear ends as follows: A U-frame 30, whose two arms embrace and are pivoted to a central standard 31, projecting up from the base of the machine, has a knife-edge 32 bearing down on the top of the rear ends of the key-levers, said knife-edge engaging in notches 33 in the tops of the key-levers. Another U-frame 34, embracing and pivoted to the standard 31,

bears up against the bottom of said key-levers. A strong spring or springs 35 holds the frame 30 down against a fixed stop 36, and a weaker spring 36ª holds the frame 34 up against the key-levers. The effect of this arrangement is that the rear ends of the key-levers are normally supported in fixed positions between the frames 30 34; but when in operating the machine rapidly the key-levers on being depressed reach the lower end of their movement, the jar or strong pressure, due to the contact of the type with the platen, is transmitted to and partly taken up by the frame 30, whose springs 35 yield sufficiently to give a certain amount of cushioning effect, and thus form a yielding support or fulcrum for the key-levers and relieve the jar which would otherwise be given to the fingers. The spring-supported lower frame 34 merely holds the key-levers up against the frame 30 in such manner as to prevent loose movement.

From the foregoing and from the drawings it will be observed that my type-bars are all mounted upon fixed pivots, arranged in the segment of a circle that lies in a plane substantially at right angles to a line drawn from the center of said circle to the printing-point; that the type-bars are rigid or unjointed and are of a length considerably greater than the length of the radius of the arc in which they are pivoted; that the printing-point is distant from the center of the arc in which the type-bars are pivoted approximately equal to the distance from the pivot of the type-bar to the types thereof; that the type-bars do not print at the center of the segment in which they are arranged, but at a point far removed therefrom and which lies in a plane substantially at right angles to the plane of the arc in which the type-bar pivots are arranged; that the type-bars in moving to print travel through an arc much shorter in length than the length of the type-bar; that the printing-point is arranged at a greater distance from the center of the type-bar fulcra than the type-bar fulcra are distant from said center, and that the type-bars are of a length substantially equal to the distance between the printing-point and the center of the type-bar fulcra; that in the example shown the printing-point is on the front side of the platen, the type-bars are arranged in an upright manner in front of said platen, and that their type ends are arranged about on a level with the platen, and that in consequence of the upright arrangement of the type-bars it is not necessary to lift them to swing their type ends to the printing-point.

At the back of the carriage F is the escapement rack-bar 12, whose smooth rear edge runs against the periphery of a roller 13, mounted on a vertical pivot on the top of a standard 15. The carriage is thus held against backward movement, and the roller 13 is made of sufficient length or height to permit of the above-described up-and-down movement of the carriage without the bar 12 leaving the roller 13. The carriage is so constructed that its center of gravity is in rear of the supporting and guiding bar G, and thus its rearmost member—to wit, the rack-bar 12—rests normally against the roller 13.

The escapement mechanism consists of a sliding vertical plate P′ and a vertical plate P, carried by a vertical pivot-post 16, pivoted in the brackets 17 and 18, extending from standard 15. The plate P′ slides on the plate P and is held toward the starting end of the carriage by a spring 19, which is attached at its opposite ends to the respective plates. Vertical knife-edge flanges p p' are formed, respectively, on said two plates and form escapement teeth or detents, which engage with the teeth on the front side of rack-bar 12. The detents are made in this vertical knife-edge form so as to maintain engaging relation with the rack as the carriage is moved up or down by the shifting mechanism hereinafter described. An arm 20 on pivot-post 16, working against an adjustable screw-stop 95, is connected by link 21 to an arm 22 of the universal lever, whose other arm 24 is in the form of a U frame extending under all of the type key-levers, so as to be operated by the depression of any one of said levers, and also carries an arm 25, engaging with a pin 26 the spacing-key 27. A spring 28 serves to hold the arm 22 of the universal lever toward the back of the machine, and thereby to normally so turn the pivot-post 16 as to force the detent p' into engagement with the rack 12. Under these circumstances the rack-bar, under the impulse of the carriage-propelling spring 40, (which is connected to the carriage by the usual drum 48 and a flexible connection 41 wound thereon,) drives the plate P′ in the direction of the arrow in Fig. 1 until its knife-edge flange strikes the end of the plate P, which acts as a stop, and the carriage is thus brought to rest. As soon as any key-lever, whether of a type or space key, is depressed, it operates through the universal mechanism above described to turn the pivot-post 16 and the plates P P′, carried thereby, so as to carry the detent p into engagement with the rack and then to free the detent p' from such engagement. The detent p catches the rack before it is released and prevents any movement thereof, while the detent p' is protracted by its spring 19 into position for engagement with the next succeeding tooth. Such engagement is, however, prevented by the angular position of the plates P P′ until the key-lever is released, whereupon the plates are turned in the reverse direction and the detent p' is thus brought into engagement with the rack and the detent p then released therefrom. The carriage-propelling spring then drives the rack-bar, as before, until the detent p' is stopped by the end of the plate P. Thus the carriage is advanced one tooth on each operation of the universal spacing mechanism. In order to enable the carriage to be drawn freely in the reverse direction whenever de-

sired, the plate P′ is mounted loosely on plate P by means of studs 43 44 on plate P passing through slots 45 in plate P′, the stud 44 farther from the starting end having a head holding the plate P′ in said plate P, but said head being removed sufficiently from the plate to permit the other end of plate P′ to be tilted away from plate P, so as to allow the detent p' to ride freely over the rack-teeth when the inclined faces of same strike the said detent. The spring 19 serves the double purpose of holding the plate P′ in yielding contact with the plate P, as well as of protracting the plate P′ for engagement with the next tooth, as above described. It being understood that the detent p is normally disengaged from the rack-bar, it is clear that the carriage may be completely freed from the escapement at any time by pressing the plate P′ forward, so as to release the detent p' from the rack. To effect this, I provide a lever or arm M, having an operating-key m and fastened to a rock-shaft 90, with an arm m' arranged to engage with or strike against the plate P′ when said key is depressed, so as to push said plate forward and release the detent p', whereupon the carriage may be freely moved in either direction. Arm M has a spring m^2 for returning it to normal position.

50 represents the ink-ribbon carried by ribbon-spools 51 and passing through a vibrating frame 52, which is so connected to the universal spacing mechanism as to carry the ribbon toward and away from the platen as the type approaches and leaves the platen. For this purpose the frame 52 is pivoted at 52^b to an extension 31^a of the standard 31 and has an arm 52^a connected to the arm 22 of the universal spacing mechanism, such connection being preferably effected through an intermediate lever 53, which permits the ink-ribbon frame to yield when it comes in contact with the platen, so as not to prevent the continued movement of the universal spacing mechanism. This lever 53 engages by a pin 54 with a slot 55 on the arm 52^a of frame 52 and is pivoted to the arm 22, a spring 56 holding an arm 53^a of said lever 53 against a stop 57, so that vibration of the universal spacing mechanism causes vibration of the frame 52, as aforesaid. The spring 56 is stiff enough to hold the lever 53 ordinarily against its stop during such motion, but permits the frame 52 to yield when brought up against the platen, as aforesaid.

Fixed guide-plates 58 59 are placed, respectively, above and below the printing-point—that is to say, the point at which the type strike the platen—these guide-plates being placed far enough apart to permit the passing of the ribbon and the type-blocks between them and being supported by the standard 31. Each of these fixed guide-plates has a notch in line with the printing-point to insure exact alinement of the type in printing, and the type-blocks 6 are mounted on stems b', which engage in such notches both above and below the type-block. On each side of said notches the forward sides of the guide-plate are flared forward and outward in V shape, with the aforesaid notch at the apex, so as to insure the passage of the type-block stems into said notches.

The ribbon-feed mechanism consists of a ratchet-wheel 62, operated by the universal mechanism, as hereinafter described, and fast on one of the vertical posts 63 on which the ribbon-spools 51 are mounted. The posts 63 turn freely in the machine-frame and are connected together, as by pulleys 64 and reversed cord or belt 65, so as to turn unitedly in opposite directions. At the top of each spool 51 is a hand-nut 66, whereby either spool may be clamped to its supporting-post. The ratchet-wheel 62 is operated by a pawl 67, carried by an arm 68, swinging around the same post 63 which carries the ratchet-wheel, and a pin 69 on the arm 22 of the universal spacing mechanism engages in a slot 70 on the arm 69, so as to vibrate the pawl 67, and thus turn the ratchet-wheel and its post one step at every operation of the universal spacing mechanism. Assuming one of the spools to be clamped to its post by its hand-nut 66, while the other hand-nut is loose, then the clamped spool will be turned with its post and will slowly wind up the ribbon on said spool and unwind it from the other spool. Whenever it is desired to reverse the motion, the hand-nut of the other spool is tightened up and the previously-clamped spool is loosened by turning its hand-nut, and the ribbon will then be wound on the other spool on account of the reverse movement of the two posts 63. This ribbon mechanism is not claimed herein, as the same has been made the subject-matter of a divisional application filed October 1, 1898, Serial No. 692,397.

To operate the bell 71, so as to indicate when the carriage has arrived at a certain point of its path, I provide the clapper of said bell with an extension or arm 72, capable of engaging with a trip device consisting of a block 73, having an inclined bearing-face for striking the clapper-arm and supported on the rack-bar 12 by arms 74, embracing said rack-bar and drawn together by a thumb-screw 75, by which the said arms may be clamped tightly on the rack-bar, so as to hold the block 73 in any desired position thereon, and thus determine the point at which the bell will be operated.

I will now describe the mechanism whereby the carriage, with the platen carried thereby, is shifted vertically to correspond to the different sets of type on the type-blocks. Normally the carriage is supported in an intermediate or central position, and it is shifted up or down, as the case may be, by a two-armed shift key-lever L, whose arms $l l'$ carry, respectively, the raising-key k' and the depressing-key k^2. The shift-lever L engages by a pin 76 with an arm 77, fastened to a rock-shaft 78, passing from end to end of the machine and

journaled in the standards 11. The rock-shaft 78 also carries at the respective ends of the machine arms or plates 79, wherein are formed eccentric slots 80, which receive the carriage-supporting rod G. Said rod G slides up and down in the slots 10 in standards 11, and a vertical arm 81 on each end of said rod passes down through and slides in a hole in a lug 82 on said standard. Springs 83 between the rod G and lugs 82 are of such length that when the said rod is depressed from its middle position these springs will tend to force it upward; but when said rod is raised from its middle position it leaves said springs, and thus tends to return to such position by the action of gravity. The cam-slots 80 are formed with a depression or "rest" in the middle, and in the normal position of the shift-key L (shown in Fig. 2) this portion of the cam-slots is in engagement with the rod G, thus holding the carriage and platen in the normal or mean position. On striking either of the shift-keys the arms 79 will be thrown one way or another, and the eccentric portions of the cam-slots 80 will engage with the rod G and force the carriage up or down, as the case may be, the three positions of the rod corresponding to the positions of the type on each type-block, as above stated. A spring 85 may also be arranged on the base to engage with the arm 77 when the latter is depressed, so as to "kick" the carriage back to its middle position. The upward motion of the spring 85 is limited by a screw-stop 86.

The carriage feeding and shifting mechanism herein described is not claimed, being claimed in my divisional application, Serial No. 692,398, filed October 1, 1898.

Having thus described my invention, the following is what I claim as new therein and desire to secure by Letters Patent:

1. In a type-writing machine, the combination of a platen, a segmentally-arranged series of substantially-vertical type-bars pivoted in an arc in a plane at a point below the platen and having their types arranged substantially in the plane of the platen and their printing-point in a line substantially vertical to the center of the arc of the type-bar pivots, substantially as set forth.

2. In a type-writing machine, the combination of a platen, the segmental series of substantially-vertical type-bars having their fulcra in a plane distant from the printing-point and the comb-plate parallel to said plane having converging slots for guiding said type-bars, substantially as set forth.

3. In a type-writing machine, the combination of pivoted type-bars and a series of key-levers of the second order fulcrumed on the machine and connected at a point intermediate of their fulcrum and keys directly with said type-bars.

4. In a type-writing machine, the combination of a series of key-levers and a spring-frame fulcrum engaging all of said levers and adapted to yield when the key-levers are completely depressed, substantially as set forth.

5. In a type-writing machine, the combination of a series of converging key-levers, a U-frame fulcrum pivotally supported on the main frame and engaging all of said levers and suitable spring or springs for holding said U-frame fulcrum against said levers, substantially as set forth.

6. In a type-writing machine, the combination of a series of key-levers, a yielding fulcrum-frame for all of said key-levers and means for supporting said key-levers against said yielding fulcrum-frame, substantially as set forth.

7. In a type-writing machine, the combination of a series of key-levers, a yielding fulcrum-frame for said key-levers and a yielding supporting-frame for holding said key-levers against said yielding fulcrum-frame, substantially as set forth.

8. In a type-writing machine, the combination with a series of converging key-levers, with U-shaped spring-frame having pivotal support on the machine-frame and engaging said key-levers, a fixed stop for said U-frame and a yielding supporting U-frame for holding said key-levers against the first U-frame, substantially as set forth.

9. In a type-writing machine, the combination with a platen, a series of type-bars pivoted in the arc of a circle forming the base of a conical segment and arranged to make the impression at the apex of said conical segment.

10. In a type-writing machine, the combination of a platen, the segmental series of substantially-vertical type-bars and the horizontal comb-plate having converging slots for guiding said type-bars the entire length of their travel, substantially as set forth.

11. In a type-writing machine, the combination with the segmental series of substantially-vertical type-bars, a series of converging key-levers fulcrumed inside of the segment and passing between the type-bars substantially as set forth.

12. In a type-writing machine, the combination of a platen with a series of type-bars pivoted in a segment of a circle, and having type thereon all substantially vertical, like a segment of a cylinder and adapted to meet in the center of such cylinder in substantially the same horizontal plane as the types occupy normally.

13. In a type-writing machine, the combination of a platen with a series of substantially-vertical type-bars pivoted in a segment of a circle at a point below the platen, and having their types arranged substantially in the horizontal plane of the platen and above the plane of the circle.

14. In a type-writing machine, the combination of a key-lever operatively connected to an unjointed type-bar, with a spring connected to the type-bar and tending to return

the type-bar and key-lever to their normal position and also to hold the type-bar on its fulcrum.

15. In a type-writing machine, the combination with a platen, of a series of type-bars mounted upon fixed pivots arranged in the segment of a circle which lies in a plane substantially at right angles to a line drawn from the center of said circle to the printing-point.

16. In a type-writing machine, the combination with a platen, of a series of unjointed type-bars, pivotally arranged in the segment of a circle and of a greater length than the radius of said circle; the printing-point and the said center of the arc being arranged in substantially the same plane, and the arc in which the type-bars are pivoted being arranged exterior to said plane.

17. In a type-writing machine, the combination of a series of pivoted type-bars arranged in the arc of a circle, a platen, the plane of whose printing-face is substantially coincident with the center of the arc about which the type-bars are arranged, and the said arc being arranged some distance away from the said plane passing through its center and each type-bar in said arc being of a length greater than the radius of the said arc.

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Witnesses:
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