No. 673,981. Patented May 14, 1901.

W. C. FARNUM.

TYPE WRITER.

(Application filed Aug. 31, 1893.)

(No Model.) 2 Sheets—Sheet 1.

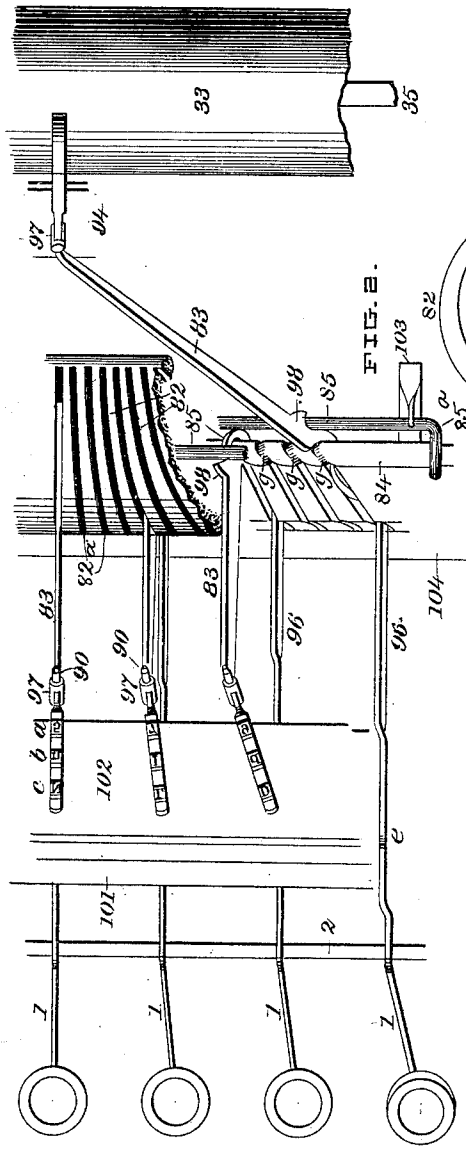


FIG. 2.

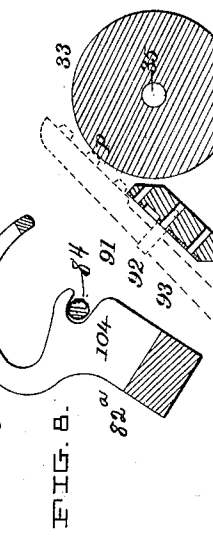


FIG. 8.

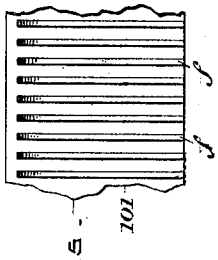


FIG. 5.

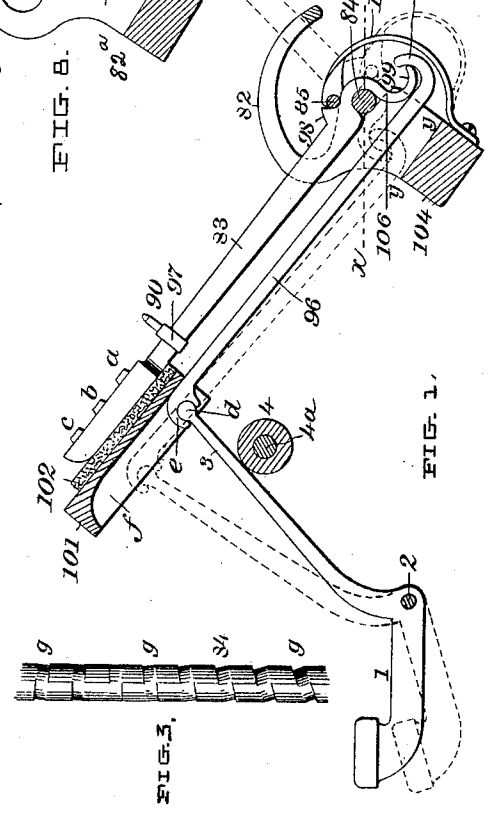


FIG. 1.

FIG. 3.

WITNESSES,

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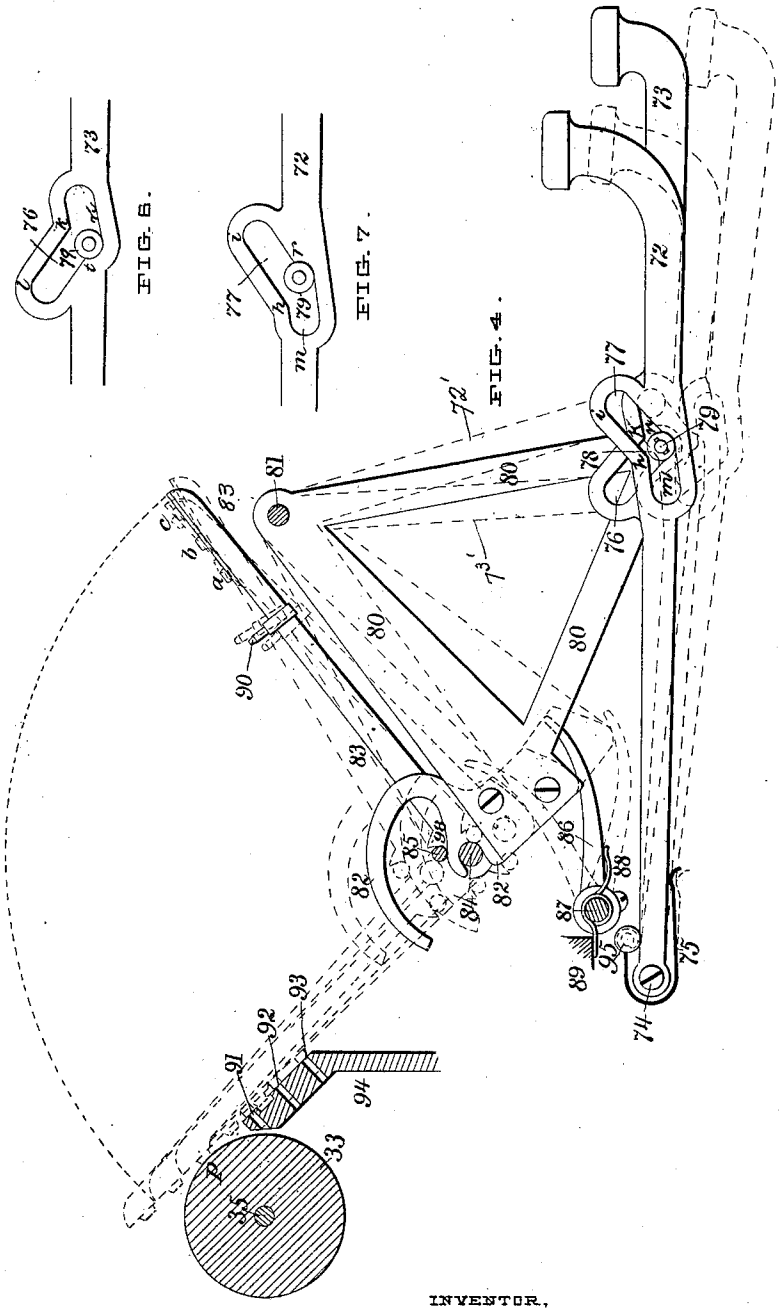
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UNITED STATES PATENT OFFICE.

WILLIAM C. FARNUM, OF ARLINGTON, VERMONT.

TYPE-WRITER.

SPECIFICATION forming part of Letters Patent No. 673,981, dated May 14, 1901.

Application filed August 31, 1893. Serial No. 484,530. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM CARLTON FARNUM, of the town of Arlington, in the county of Bennington and State of Vermont, have invented certain new and useful Improvements in Type-Writers, of which the subjoined description, in connection with the accompanying drawings, constitutes a specification.

This invention relates to the following improvements in type-writers in which type-bars are employed, viz: a novel construction for a type-bar, novel devices for hanging it, novel devices for operating it, novel devices for regulating alinement, novel devices for protecting the paper from puncture, and novel devices for effecting shift of the type-bars for the purpose of bringing into action a different set of printing characters.

In this application only such parts of a type-writer are illustrated in the drawings as serve to elucidate the invention.

Figure 1 of the drawings is a side elevation of the type-bar and its actuating devices. Fig. 2 is a plan view of the same. Fig. 3 is a detail of a section of the skew fulcrum-bar on which all the type-bars are hung. Fig. 4 is a side elevation of the shift-key apparatus. Fig. 5 is an inverted plan of a section of the guide-plate, in the grooves of which the articulation of the finger-key with the connecting-link plays. Fig. 6 is a side view of the incline slot in shift-key 73. Fig. 7 is a like view of the slot in shift-key 72. Fig. 8 is a transverse section of the housing-bar, taken through one of the slots in which the type-lever plays.

In this machine the type-bars are of substantially the form shown at 83 in Fig. 1, being of thin plate having a head of proper proportions to carry a plurality of printing characters, as *a*, *b*, and *c*. The tail end of the bar is wrought to an **S** form, as seen at 106, the inner and under side curve constituting a bearing, which, in connection with the fulcrum-bar on which it turns, constitutes the fulcrum or pivot upon or across which the type-bar swings, and the terminal curve 99 constitutes a hook with which a sliding link 96, which terminates in a similarly-shaped hook 99, coöperates. All the type-bars are hinged to the straight rod 84, which is seated in a socket provided therefor in the housing 104, as shown in Fig. 6. This housing is a substantially solid casting of the general form shown in sectional contour in Figs. 1 and 8 at 104 and 82. That part of it designated 82 is provided for the purpose of supporting and guiding the type-bar during its stroke and for that purpose is slotted, as seen at 82^a, Fig. 2. These slots are cut through from the top of the housing at 82 curvilinearly down to the line *y y*, Fig. 1, and the upper parts of the slots incline inwardly toward the center of the machine, as seen in Fig. 2. The type-bars play in these slots, and the ends of those which lie on each side of the central type-bar have their head ends bent outwardly, as shown, so that when the bar is thrown forward the faces of the characters on the bar shall strike the printing-point on the platen fairly. The fulcrum-bar 84 is of peculiar construction, as will be seen by an enlarged section thereof shown in Fig. 3. It is constructed by reducing the bar at those points where the same when inserted in its seat in the housing crosses the several slots 82^a to a cylindrical form, of which the axis is perpendicular to the slot. This results in a skewed cylindrical section, as seen at *g g g*, Fig. 3, adapted to receive and afford an oscillating seat for the upper inner curve of the **S**-shaped bearing of the type-bar, the said fulcrum bar or shaft presenting thus a series of inclined bearings of progressively-varying inclination suited to the respective planes of motion of the type-bars in printing. Care is taken when adjusting the fulcrum-bar in its seat in the housing that it shall be so adjusted that the axes of these bearings *g g g* shall be perpendicular to the walls of the several slots 82^a, in which they respectively fall. By leaving the bearing of the type-bar open on its under side, as shown, the same can be detached from the fulcrum-bar and removed from the machine without disturbing or disconnecting any other part of the machine. This construction of all the fulcrum-pivots on a single straight bar which is capable of insertion in and withdrawal from its seat in the housing at any time possesses special points of advantage both in construction and assemblage of the parts of the machine and in their use.

Just above and back of the keyboard and extending beneath the whole rank of type-bars is a pillow-block 101, which is simply a

table carrying a cushion 102 on its upper side, which receives the heads of the type-bars when they are thrown back and upon which they rest when idle. The under side of the block is grooved, as shown at *f f*, Fig. 5, for the reception of and to provide guideways for the upper ends of the key-levers and for the connecting-links 96, which articulate with them, as seen at *e d*, Fig. 1. The lower ends of the connections 96 also enter the slots 82^a to connect with the lower ends of the type-bars and slide therein. In both instances of the pillow-block and the housing the walls of the slot preserve the relative adjustment and connection of the connecting-link with its adjuncts at each end. The finger-keys are hung on pivot-bars, one of which is seen at 2, and their upper ends fall back and rest against a cushioned bar 4 when not depressed. The type-bar is operated by depressing the finger-piece 1, which causes the link 96 to be drawn up to the dotted position, thereby, through the hook connection 99 and 100, throwing the type-bar over into the dotted position, one of the printing characters striking the platen at the proper point. The type-bar is returned to its dormant position by means of a bail 85, which is hung at each end 85^a on the axis of the skew pivot-bar 84, the bail stretching across and over the whole rank of type-bars and is adapted to throw them backwardly under the action of the spring 103, which connects with the bail for that purpose. This bail exerts its back throw against a lug 98 at the end of each type-bar.

The devices provided for securing accurate alinement consist of a pin 90 on the front edge of the type-bar and a perforated guide-plate 94, placed abreast the printing-point near the platen. When the type-bar is thrown forward, the tapering point of pin 90 enters one of the holes in the guide-plate 94 in advance of the contact of the printing character with the paper and then accurately guides it to its exact printing position. Located around or in close proximity to the pin 90 is a buffer-pad or elastic cushion, which strikes the guide-plate at such a time in reference to the impression of the type on the paper as will modify the tendency of the small types to indent or puncture the paper excessively and at the same time not impair the force of the printing blow. This buffer may be applied in a variety of ways—as, for instance, by constructing the guide-plate of elastic material or by covering its upper side where the bar strikes it with an elastic facing, as shown in dotted line in Fig. 1. As many guide-holes are provided in plate 94 as there are ranges of type on the type-bars. This pin 90 and the socket in which it is seated constitute an enlargement of the type-bar, which in practice serves to prevent collision of the faces of the type with any of the other type-bars. As such it performs a function independent of the guide-plate 94.

The provisions for shifting the type-bars to bring different sets of type into printing position are all found in Fig. 4. The housing-bar 104, which carries the fulcrum-bar 84, on which all the type-bars are hung and adapted to oscillate, may be connected with any kind of an apparatus which is adapted to impart to the type-bar, when thrown athwart the platen in position to print, a movement in the direction of its length, so as to bring different characters, which it carries on its head, over the printing-point. In this case I have attached this fulcrum-bar housing to two swinging hangers 80, one at each end thereof, which are suspended from pivot 91. One of these triangular hangers has a pin and truck-roller 79 projecting from one side thereof, with which the two slotted operating-levers 72 and 73 are adjusted to cooperate. Both of these levers are pivoted at 74 and are normally supported in an elevated position by springs 75, attached to the stud 95, as shown. Each has an elongated angular slot, as shown, in both of which the same truck-roller 79 plays. The slot 76 in lever 73 has a portion of its length *n* made concentric with the center 81 on which the lever is hung and a backwardly-inclined section *k l*, while the slot 77 in lever 72 has a similar concentric section *m* and a forwardly-inclined section *h i*. The concentric section in either affords room for the swing of the roller 79 when actuated by the other. When both levers are at rest, the frame 80 is held firmly locked, so that it cannot rise or drop, by means of the two shoulders *t* and *r*, (shown in Figs. 6 and 7,) between which the roller 79 rests when the springs 75 have thrown the levers up to the limit of their stroke. Whenever lever 72 is depressed the incline *h i*, acting on truck 79, swings frame 80 on its pivot, so as to lower the housing and drop the type-bars down to a point which brings the type *c* into position to strike the printing-point *p* on the platen, and when it is so depressed the roll 79 is swung out into the concentric part *n* of the slot in lever 73, thus preventing that lever being operated, while if lever 73 is depressed the incline *k l* will act on roll 79 to throw the housing and type-bars upwardly into the position shown in the dotted lines, whereby the lower range of type on the type-bars will be put in operative position to strike the platen at *p*. The slots 76 and 77 are so shaped as to leave a concave jog or offset in each, as at *t* and *r*, respectively, for the purposes above described. These provisions hold the type-bars firmly in a position to bring the middle range of characters into printing position.

Ordinarily the weight of the type-bars and their housing would be sustained by the slotted shift-keys 72 and 73, and therefore for the purpose of relieving the operator of the burden of lifting such weight whenever the shift is brought into play and to render the action of the shift-keys as light and free as possible I have applied below the housing a device designed to counterbalance the gravity of the

type-bars and the swinging frame in which they are hung, which I have termed a "gravity-balance." It consists of a horizontal arm 86, pivoted on a center 87 and projecting beneath the under corner of the housing-bar and carrying the same thereon. It is supported by the spring 88, which is coiled around pivot 87, one end finding abutment under the ledge 89 of the frame of the machine and the other end bearing against the under side of arm 86. The pivot 87 is so placed with reference to the swing of the type-bar frame that when the latter is lowered the contact-point between the frame and the arm 86 will move out toward its outer end, while the upward movement of the frame will move such contact-point in toward pivot 87, thus changing the leverage of arm 86 to adapt it to the varying force of the coiled spring 88, which coils up and is stiffest when arm 86 is depressed and uncoils and weakens as the frame is raised. The strength and coil of the spring 88 and the movable point of contact between the type-bar frame and the supporting arm are mutually so adjusted to each other as to maintain substantial equilibrium, and the gravity of the swinging type-bar frame and its load is practically eliminated from the operation of the machine.

In the foregoing description the platen has been treated as a fixed and the type-bars and their housing as a movable element in the combination; but I do not restrict myself to such relative arrangement.

I therefore claim as my invention—

1. A series of type-bars having the fulcra upon which they oscillate arranged in a straight line on bearings of progressively-varying lateral inclination, adapted to give an impression at a common printing-point, in combination with a platen and mechanism connected with said type-bars for operating them.

2. A series of type-bars pivoted on a straight line of fulcra on bearings of progressively-varying lateral inclination and adapted to give an impression at a common printing-point, in combination with the platen and mechanism connected with said fulcra adapted to move said type-bars longitudinally in the line of the impression plane toward and away from the platen, substantially in the manner described and for the purposes specified.

3. A type-bar and fulcrum consisting of a shaft or pivot-bar of skewed cylindrical section presenting a series of bearings of progressively-varying lateral inclination, in combination with an operating-key and a link connecting said key with the short arm of the type-bar, substantially as specified.

4. The combination of the printing finger-key and type-bar, the connecting-link and the grooved bar or pillow-block in which the articulation between the key and link works, said articulation consisting of a disk-shaped head and a concave gap in the edge of the link in which said rounded head plays, the said key-head and link being fitted to reciprocate in one of the grooves of said grooved bar, substantially in the manner and for the purposes specified.

5. The housing for the attachment of the type-bars consisting of a bar transversely slotted with grooves radiating from an axis which passes perpendicularly through the impression plane at a point opposite the printing-point and the middle part of the housing-bar, and having a seat for the insertion of a straight line of fulcra inclined laterally with progressively-varying inclination upon which the type-bars oscillate in combination with said type-bars and mechanism for operating them, substantially as specified.

6. The described housing and type bars hung in a shifting frame, in combination with a skewed shaft or pivot and means connected therewith for shifting said frame, the said housing being provided with slots of successively-varying curvature, to guide the said type-bars, and the said shaft or pivot-rod presenting opposite each slot a cylindrical part having its axis perpendicular to the said slot and serving as a bearing for the type-bar which is guided therein, substantially as described and for the purposes specified.

7. The combination of the platen-roll, type-bar, and fulcra with the housing-frame and attachments to which it is pivoted, the said fulcra being inclined laterally in progressive series and located in a horizontal plane lower than the printing-point and the pivot of oscillation of the said housing-frame substantially as set forth.

8. The combination with the shifting frame, of the counterbalancing-lever, the spring connected therewith and coiled around its fulcrum as described, the lever-pivot and shifting-frame pivots being relatively so placed that the point of supporting contact between the lever and the frame shall shift toward or from the lever-fulcrum as the frame is raised or lowered, substantially in the manner and for the purposes specified.

9. As an improved means of pivoting in a straight line type-bars adapted to swing in radial planes, the fulcrum-bar 84, having sections at intervals thereof reduced to a cylindrical form for journaling thereon the type-bar bearing, the several axes of which journal-sections are perpendicular to said radial planes, in combination with a housing for the reception and retention of said bar, and guides connected therewith for guiding the type-bars during its stroke in its proper plane of movement, substantially in the manner described and set forth.

In witness whereof I have hereto subscribed my name this 23d day of August, A. D. 1893.

WILLIAM C. FARNUM.

In presence of—
FRANKLIN SCOTT,
WILLIAM WILCOX.