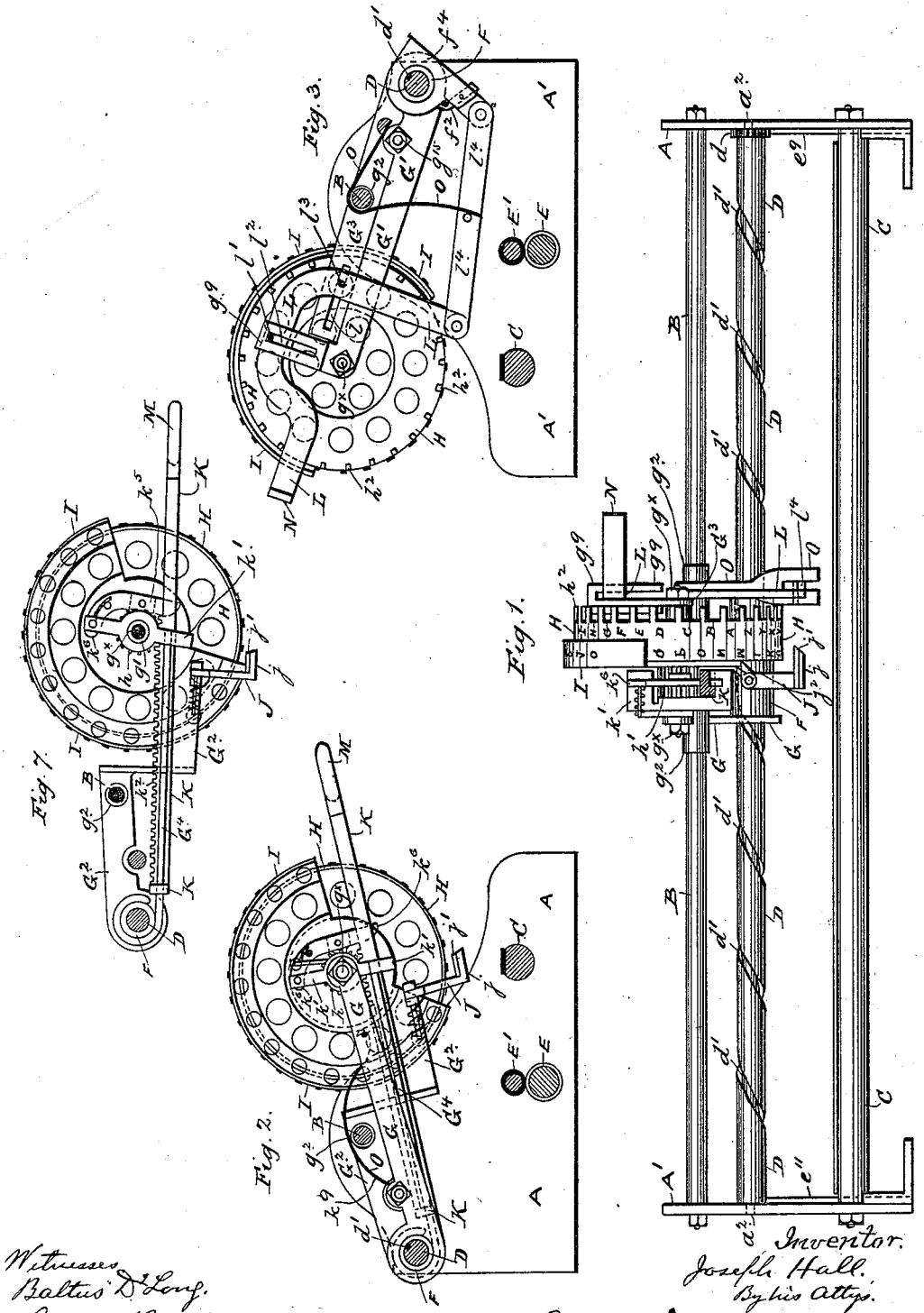
(No Model.) 3 Sheets—Sheet 1.

J. HALL.

TYPE WRITING MACHINE.

No. 421,702. Patented Feb. 18, 1890.



Witnesses
Baltus D. Long.
C. W. Brooke.

Inventor.
Joseph Hall.
By his Attys.
Baldwin Davidson & Wright.

(No Model.) 3 Sheets—Sheet 2.

J. HALL.

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Fig. 6

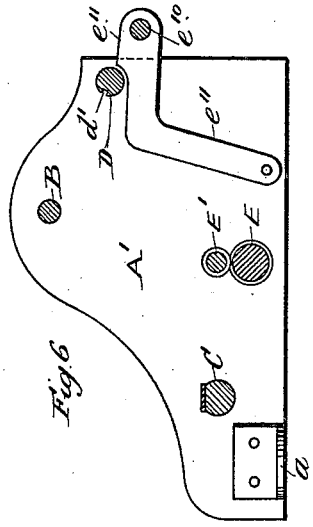


Fig. 14.

Fig. 5

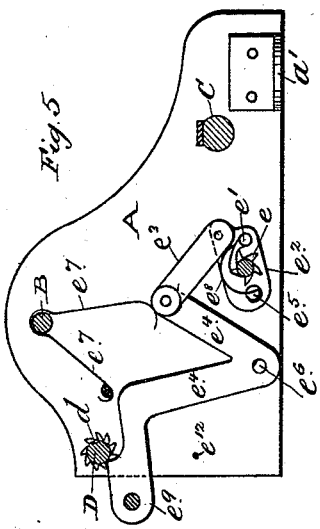
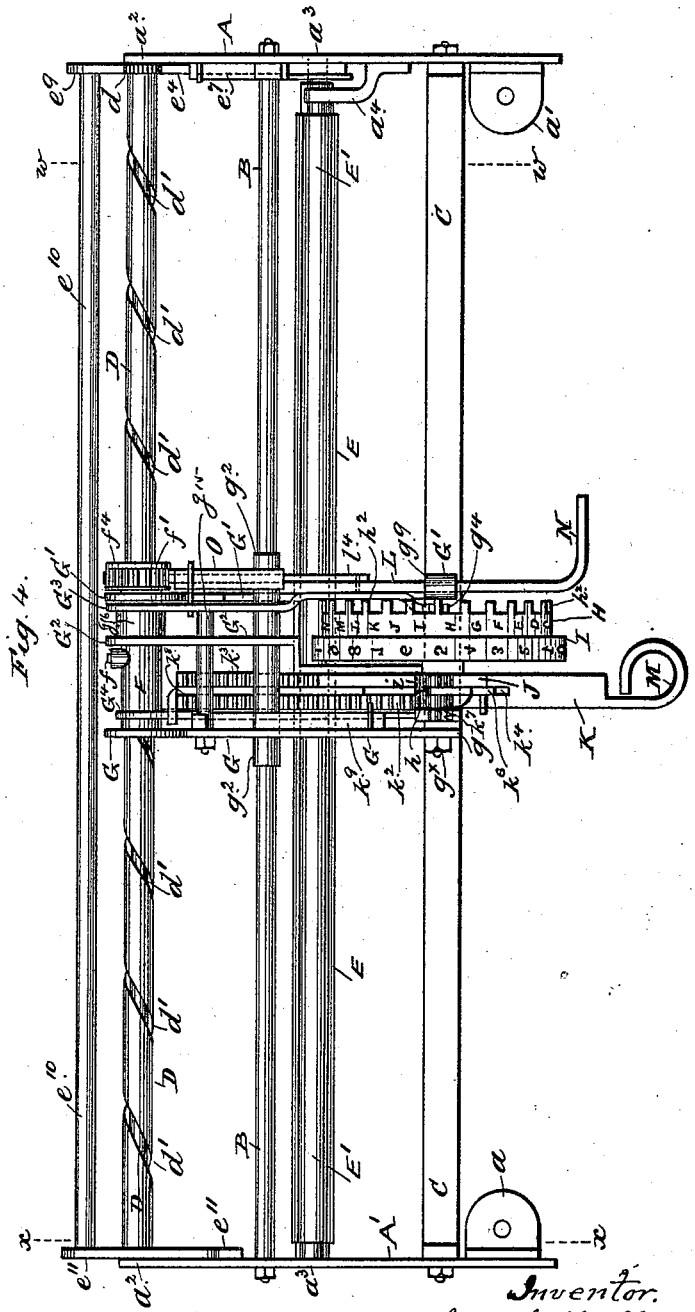


Fig. 4.



Witnesses.
Baltus D. Long.
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(No Model.) 3 Sheets—Sheet 3.

J. HALL.

TYPE WRITING MACHINE.

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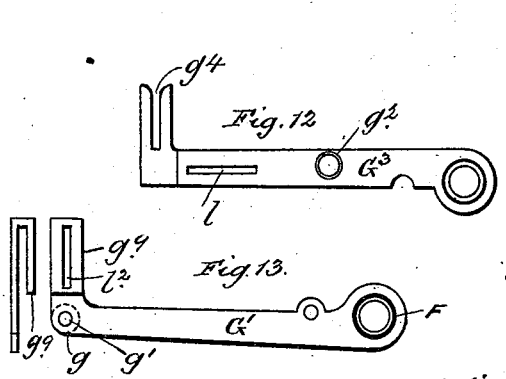

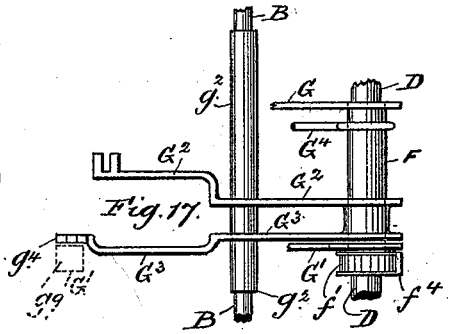

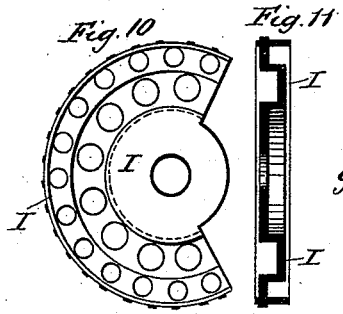

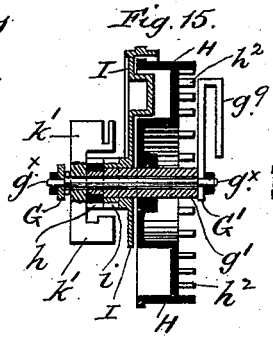

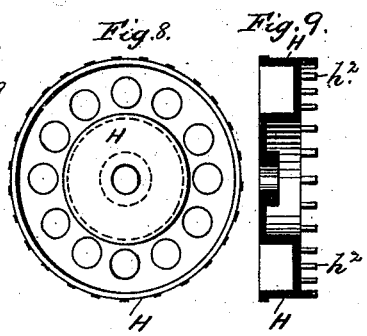

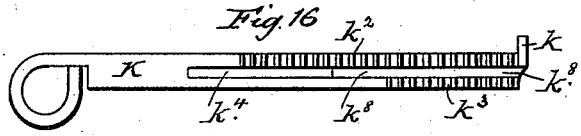

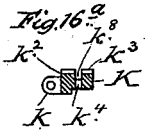

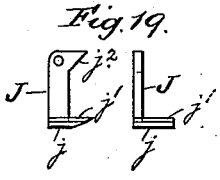

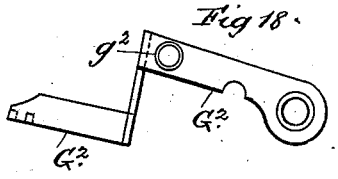

Witnesses,
Baltus D. Long.
C. W. Brooke.

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By his attys,
Baldwin, Dodson & Wright.

UNITED STATES PATENT OFFICE.

JOSEPH HALL, OF MARSKE, NEAR RICHMOND, COUNTY OF YORK, ENGLAND.

TYPE-WRITING MACHINE.

SPECIFICATION forming part of Letters Patent No. 421,702, dated February 18, 1890.

Application filed July 3, 1889. Serial No. 316,419. (No model.) Patented in England March 4, 1889, No. 3,788.

To all whom it may concern:

Be it known that I, JOSEPH HALL, a subject of the Queen of Great Britain, residing at Marske, near Richmond, in the county of York, England, have invented new and useful Improvements in Type-Writers, (for which I have applied for Letters Patent in Great Britain and obtained provisional protection No. 3,788, dated March 4, 1889,) of which the following is a specification.

My invention relates to improvements in type-writers on which a vertically-rotating disk and sector provided with letters, figures, and other characters are moved horizontally across a sheet in such a manner that any desired letter or character may be printed thereon; and the objects of my improvements are, first, to provide a rotative disk and sector that may be brought into operation independently of each other when it is required either to print a letter or figure; second, to afford facilities for spacing the letters and words, and, third, to enable the sector and disk to be readily returned to the commencement of their traverse. I attain these objects by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a front elevation of the entire machine. Figs. 2 and 3 are elevations looking at opposite ends of the machine; Fig. 4, a plan, looking at the top of the entire machine. Figs. 5 and 6 are transverse sections on lines *w w* and *x x*, Fig. 4; Fig. 7, a side elevation of disk and sector and mechanism for actuating the same. Figs. 8 and 9 are respectively an elevation and section of disk. Figs. 10 and 11 are respectively an elevation and section of sector. Figs. 12 to 19 are side and end elevations and sections of details.

Similar letters refer to similar parts throughout the several views.

The end pieces A A′, their lugs or projections *a a′*, the guide-rod B, and the impression-bar C constitute the frame-work of the machine. In bearings a^2 a^2 at the rear of the machine turns a spacing-roller D, armed with a ratchet-wheel *d* at one end engaging with a pawl to prevent it from rotating.

In the roller D is cut or formed a spiral groove or thread *d′*, preferably though not necessarily of about one inch pitch, for purposes to be hereinafter described.

Below the guide-rod B are mounted in suitable bearings a^3 and a^4 the feed-rollers E E′, which may or may not be covered with india-rubber or other flexible material. The lower roller E is armed at one end with a ratchet-wheel *e*, (see Fig. 5,) in which engages a pawl *e′*, pivoted to a lever or plate e^2, which in turn is mounted upon the reduced end of roller E, (see Fig. 14,) said plate being connected by a link e^3 to a double-ended V-shaped lever e^4, pivoted at e^6 to the end A, springs e^7 and e^8 (the latter attached to pin e^5 on plate e^2) being employed for keeping the V-lever and pawl, respectively, in position. A horizontal arm e^9 is also attached to the V-lever, and is so shaped that its upper portion forms a pawl for engaging with the ratchet-wheel *d* on the spacing-roller D. A continuous handle, extending the full length of the machine, is formed by rod e^{10}, which connects the two levers e^4 and e^{11} (the latter pivoted to end A′) together, whereby the feed-rollers may be operated at any point between the two ends. A stop-pin e^{12} is provided to prevent the V-shaped lever from being drawn too far.

On the spacing-roller D, previously referred to, is mounted a sleeve F, provided with a pin or set-screw *f*, adapted to fit the spiral groove *d′*, and at one end of the sleeve is mounted a ratchet-wheel *f′*, in which a spring-pawl f^2, pivoted to the swing-bracket f^4, (mounted on the sleeve, as shown at Figs. 3 and 4,) is made to engage therewith for traversing the printing mechanism across the paper, motion being conveyed to the swing-bracket f^4 through levers hereinafter described.

Mounted loosely on opposite ends of and projecting from the sliding sleeve F are the stays G G′, in the outer ends of which are formed bearings *g* for receiving the spindle $g^\times$, on which the tube *g′* (upon which disk or type-wheel H is fixed and sector I loosely mounted) revolves. On the sleeve F are also mounted and rigidly secured the stays G^2 G^3, between which is interposed a spacing-sleeve g^{16}, to which the stays G^2 and G^3 are secured. These stays are provided with a long bearing-sleeve g^2, which slides on the guide-rod B, and thus the stays are kept in position (shown at Figs. 2, 3, and 7) and steady during the depression of the hereinafter-described disk and sector for printing pur-

poses. A bolt g^{15}, Figs. 2, 3, and 4, connect the stays G and G′, so that they are caused to move together.

The stays G G′ constitute the type-wheel-carrying frame, while the stays G^2 G^3 constitute, respectively, the pad-carrying arm and the arm for carrying the locking and centering devices for the type-wheel. The stay G^2 is bent at or about at right angles to the guide-rod B, immediately beyond the bearing g^2, and carried downward below the center of the disk and sector, when it is again bent forward and carried parallel, or nearly so, with the side of the disk, but at a convient distance therefrom, and to its outer end is pivoted a spring-piece or pad-holder J, the inking-pad j', composed of india-rubber, leather, or other suitable material, being carried on the projecting end j of the holder J. In its normal position the projecting end of the holder J, which carries the inking-pad, is under the disk and sector; but when the latter are depressed the hub of the disk or sector in its descent comes in contact with the tappet-piece j^2, which projects laterally from the upper end of the holder near its pivot, and thus removes the pad clear of the type after inking the same, but before the latter reaches the paper. Stay G^3 is projected from the bearing g^2 to a little beyond the center of the disk, when it is bent in an upward direction at or about at a right angle, and bifurcated at g^4 to engage with the projecting pins or teeth h^2, each of which is adapted to pass between the horns or fork of the stay G^3 for retaining the disk and sector in a fixed position during the printing operation.

H is the disk or type wheel previously referred to, armed with a number of projecting pins or teeth h^2, continuous with its face or periphery for the purposes previously described. On the periphery of the disk are mounted and fixed or formed thereon in any suitable manner one or more (preferably two, as shown in the drawings) sets of metal or india-rubber letters, stops, or characters, one of which is employed for printing purposes, while the other, which may be enameled or lacquered, acts as an indicator to enable the operator to correctly print the required letter or other character.

When two sets of type are provided upon the periphery of the disk, I arrange the same so that each set shall be in opposite directions—that is to say, when the letter "A" of the set employed for printing purposes is at the bottom of the disk the same letter of the indicator-set would be at the top in a line with the bifurcated end g^4 of stay G^3 to enable the operator to see the same.

In practice capital and small or capital letters alone are formed or mounted upon the periphery of the type-wheel, and figures, stops, and other characters are arranged on the perimeter of the sector I, a portion of which is made to cover the printing set of type on the disk H. The type-wheel H and sector I are both mounted (the first a fixture, the latter loosely) upon the same sleeve g', which revolves upon the spindle $g^\times$, fixed to the stays G G′, and each is provided with a spur-pinion h and i, (see Figs. 1 and 15,) that for the sector being on the inner side and a fixture therewith, while the outer pinion h is fixed to the spindle $g^\times$, on which the type-wheel is mounted and fixed.

Motion for first bringing the required letter, figure, or character on the type-wheel or sector into position and afterward depressing the same for printing purposes is obtained by means of a sliding operating-lever K, attached at one end (by a lug k) to the stay G^4, which is secured at one end to sleeve F and at the other to a guide-bracket k', supported by the spindle g'.

The bracket k' forms a bearing for the outer portion of sliding bar K. The upper portion of the bar K is armed with two spur-racks or rows of teeth k^2 k^3 of varying lengths, which are made to engage, respectively, with the pinions h and i, rack k^2 being the longest in order to rotate the type-wheel H a single revolution prior to the rack k^3 engaging with pinion i for rotating the sector, after which both the type-wheel and sector are rotated together.

To prevent the sector from rotating with the type-wheel H, a pawl-lever k^6 is pivoted at one end to the upper portion of the guide-bracket k', while its opposite or free end is made to pass into a slot-hole k^4, provided for its reception in the sliding lever K. On the lever is fixed a tooth or projection k^5, (see Figs. 1 and 7,) which, when the lever k^6 is at rest, is retained in the space between two of the teeth of the spur-pinion i by a spring k^7, thus preventing the sector from rotating while the type-wheel is being acted upon; but as soon as the rack k^3 comes in contact with the pinion i to engage therewith the pawl-lever k^6 is raised by the continued outward movement of lever K until the free end of the former rests and slides in the groove or channel k^8, (see Fig. 16,) formed for its reception between the two racks k^2 k^3, thus withdrawing the projection k^5 from between the teeth of the pinion i and allowing the sector to rotate.

By permitting the flange or periphery of the sector to project partially over that of the type-wheel and allowing the latter to rotate with the former, not only are the type on wheel H kept clear of the paper when the sector is brought into action, but when the sliding lever K has been drawn out to the required length for bringing the required figure into position for printing, the figure on the sector is retained in that position by means of one of the projecting pins or teeth h^2 engaging with the bifurcated end of stay G^3, as previously described.

The type-wheel, sector, and parts connected therewith are retained in the elevated position, (shown at Figs. 1, 2, and 3,) clear of the bifurcated end of stay G^3 by a spring k^9,

(shown at Figs. 2 and 4,) which is secured to the stay-arm G and extends over and bears upon the guide-rod B.

An intermittent horizontal traversing motion is imparted to the type-wheel, sector, and parts connected therewith for spacing purposes on the return of the parts just mentioned to the elevated position shown in drawings at Figs. 1, 2, and 3, after each depression for printing purposes has taken place, motion for this purpose being imparted to pawl f^2 and swing-bracket f^4 (previously referred to) by the curved spacing-lever L (pivoted to the stay G^3 by a pin l^3, movable in the slot-hole l in stay G^3 and working between the bent ends g^9 of the stay G′, being kept in contact therewith by the pin l' sliding in slot l^2) and connecting-link l^4. A spring O, (shown as connected with the link l^4 and the stay G^3 and extending over the guide-rod B) is employed for keeping lever L and parts connected therewith in their normal position, as shown at Figs. 1, 2, and 3.

Handles M and N may be provided, respectively, on sliding lever K and curved lever L for manipulating purposes.

The action of the machine is as follows: The paper to be operated upon is passed over the impression-bar C to and between the feed-rollers E E′, and by means of the continuous handle e^{10}, levers e^4 and e^{11}, springs e^7 and e^8, link e^3, plate e^2, pawl e', and ratchet-wheel e is traversed away from the operator to the required distance. The type-wheel and sector having been moved to the left hand or other part of the machine, the sliding operating-lever K is then drawn outward by means of handle M, sliding on stay-arm G^4 and in guide-bracket k' for rotating the type-wheel (and sector, if required) until the desired letter or character is brought into position for printing purposes, when the type-wheel and parts connected therewith are by means of lever K pressed downward onto the paper for impressing the letter or other character thereon, the type-wheel during this movement being retained in the required position by bifurcated end of stay G^3, as described. During the descent of the type-wheel the stays G G′ work freely on sleeve F without altering its position on the spacing-bar D, and also during the same motion the hub of the type-wheel is made to come in contact with the tappet-piece j^2 (pivoted to stay G^2) of the inking-pad-supporting piece J after the type has been inked, and by its continued descent moves the pad clear of the type-wheel. In like manner the hub of the sector is also made to act upon the tappet-piece when the sector is brought into action. During the return of the type-wheel and sector to their normal position the spacing (between the letters) operation takes place, a slight rotary motion for this purpose being imparted to the ratchet-wheel f' on sleeve F from the front bent end of stay G′, through slot-hole l^2, pin l', curved lever L, movably pivoted in hole l of stay G^3, and connecting-link l^4, to swing-bracket f^4 and pawl f^2, which causes the set-screw f', working in the spiral groove d' of spacing-roller D, (which at this portion of the operation is prevented from rotating by means of pawl on the horizontal arm e^9 with the ratchet-wheel d,) to traverse the sleeves, stays, type-wheel, and sector the required distance—*i. e.*, a distance sufficient to afford the desired space between the letters of a word; but when it is required to obtain the space between the words additional space to that already obtained on the return of the type-wheel and sector (after printing the last character) may be obtained by depressing the handle N, attached to the bent lever L, which causes the pawl f^2 to traverse the sleeve the required distance across the bar without depressing the type-wheel, sector, and parts connected therewith, the stays G G′ being loose on the sleeve F. When the type-wheel and sector have been traversed the required distance across the paper and it is desired to commence a fresh line, the continuous handle e^{10} is depressed, and by means of levers e^4 and e^{11} and their connections with pawl e' and ratchet-wheel e a rotary motion is imparted to feed-rollers E E′, which propel the paper the required distance between the lines at each depression of the handle e^{10}. When the handle e^{10} is depressed, the pawl e^9 is withdrawn from ratchet-wheel d, which permits of the sleeve F and parts connected therewith being moved to any desired position on the spacing-roller D, which roller then acts as a quick-threaded screw. When the screw is thus operated to return the sleeve F, the sleeve is prevented from turning by means of the pawl f^2 engaging with the ratchet f', so that the sleeve slides along the screw-shaft and carries the printing apparatus without operating it, but simply shifting it to the opposite side of the machine.

What I do claim as my invention, and desire to secure by Letters Patent, is—

1. The combination, substantially as hereinbefore set forth, of the type-wheel, the type-wheel-carrying frame, the sleeve to which the type-wheel-carrying frame is pivotally connected, and the spacing-roller on which the sleeve is mounted.

2. The combination, substantially as hereinbefore set forth, of the type-wheel, the type-wheel-carrying frame, the sleeve to which the type-wheel-carrying frame is pivotally connected, the screw-threaded spacing-roller on which the sleeve is mounted, devices for preventing the rotation of the spacing-roller during the printing operation, and means for rotating the sleeve on the roller.

3. The combination, substantially as hereinbefore set forth, of the type-wheel, the sector, the frame on which the type-wheel and the sector are independently supported, and the operating-lever adapted to engage at the

will of the operator with the type-wheel to turn it without turning the sector, and also engaging with the sector to turn it with the type-wheel.

4. The combination, substantially as hereinbefore set forth, of the type-wheel, the sector, the frame on which they are independently supported, the sliding operating-lever having two racks or sets of teeth, and pinions connected with the type-wheel and the sector and engaging with the racks on the sliding lever, for the purpose specified.

5. The combination, substantially as hereinbefore set forth, of the type-wheel, the sector, the frame on which they are independently supported, the operating-lever having two racks or sets of teeth, pinions connected with the type-wheel and the sector and engaging independently with the racks, and a spring-pawl engaging with the pinion of the sector while the type-wheel is being independently operated, but which is moved out of engagement with the sector by the operating-lever when it is desired to print with the sector.

6. The combination, substantially as hereinbefore set forth, of the type-wheel, the type-wheel-carrying frame, the spacing-roller, the sleeve connected to and sliding on the spacing-roller and to which the type-wheel-carrying frame is connected, the spacing-lever connected with the sleeve and also connected with the type-wheel-carrying frame, whereby the movement of the frame turns the sleeve on the spacing-roller and causes it to slide thereon.

7. The combination, substantially as hereinbefore set forth, of the type-wheel, the type-wheel-carrying frame, the screw-threaded spacing-roller, the sleeve engaging therewith and to which the type-wheel-carrying frame is pivotally connected, the ratchet-wheel on the sleeve, the pawl engaging therewith, the pawl-carrying frame, the spacing-lever connected therewith and also connected with the type-wheel-carrying frame.

8. The combination, substantially as hereinbefore set forth, of the main frame of the machine, the impression-bar, the paper-feed rollers, the handle extending from one side of the frame to the other, levers connected with said handle and engaging with the rollers to operate them, the spirally-grooved spacing-roller, a ratchet-wheel thereon, with which a pawl connected with the handle engages, the type-wheel, the type-wheel-carrying frame, the sleeve engaging with the spacing-roller and to which the type-wheel-carrying frame is connected, and the sliding operating-lever engaging with the type-wheel in the manner specified.

In testimony whereof I have hereunto signed my name to this specification in presence of two subscribing witnesses.

JOSEPH HALL.

Witnesses:
W. FAIRBURN HART,
ADAM C. HART.