3 Sheets—Sheet 1

# B. HALSTEAD.

## Type Writing Machine.

No. 202,024. Patented April 2, 1878.

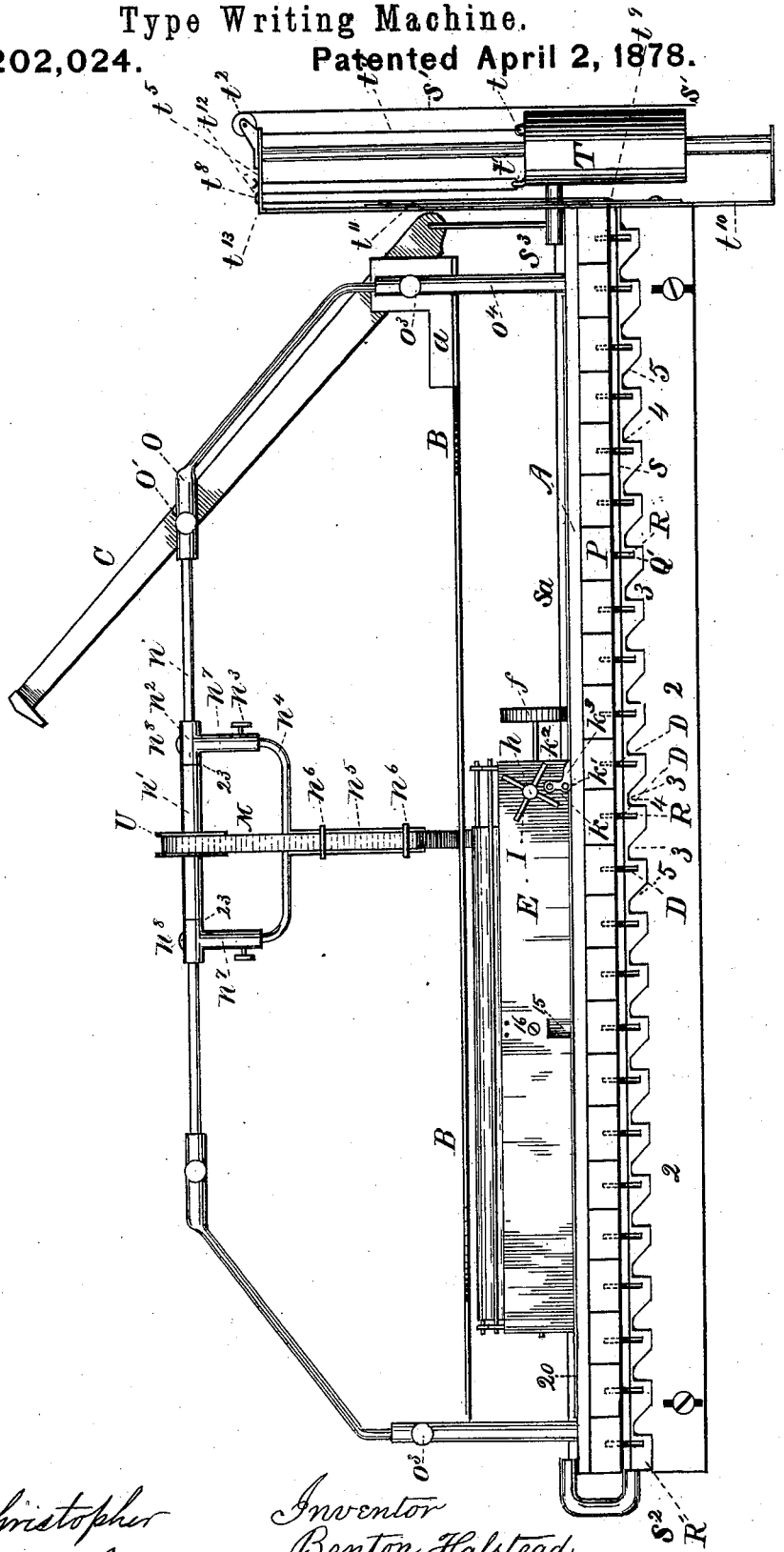

Fig. 1

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3 Sheets—Sheet 2.

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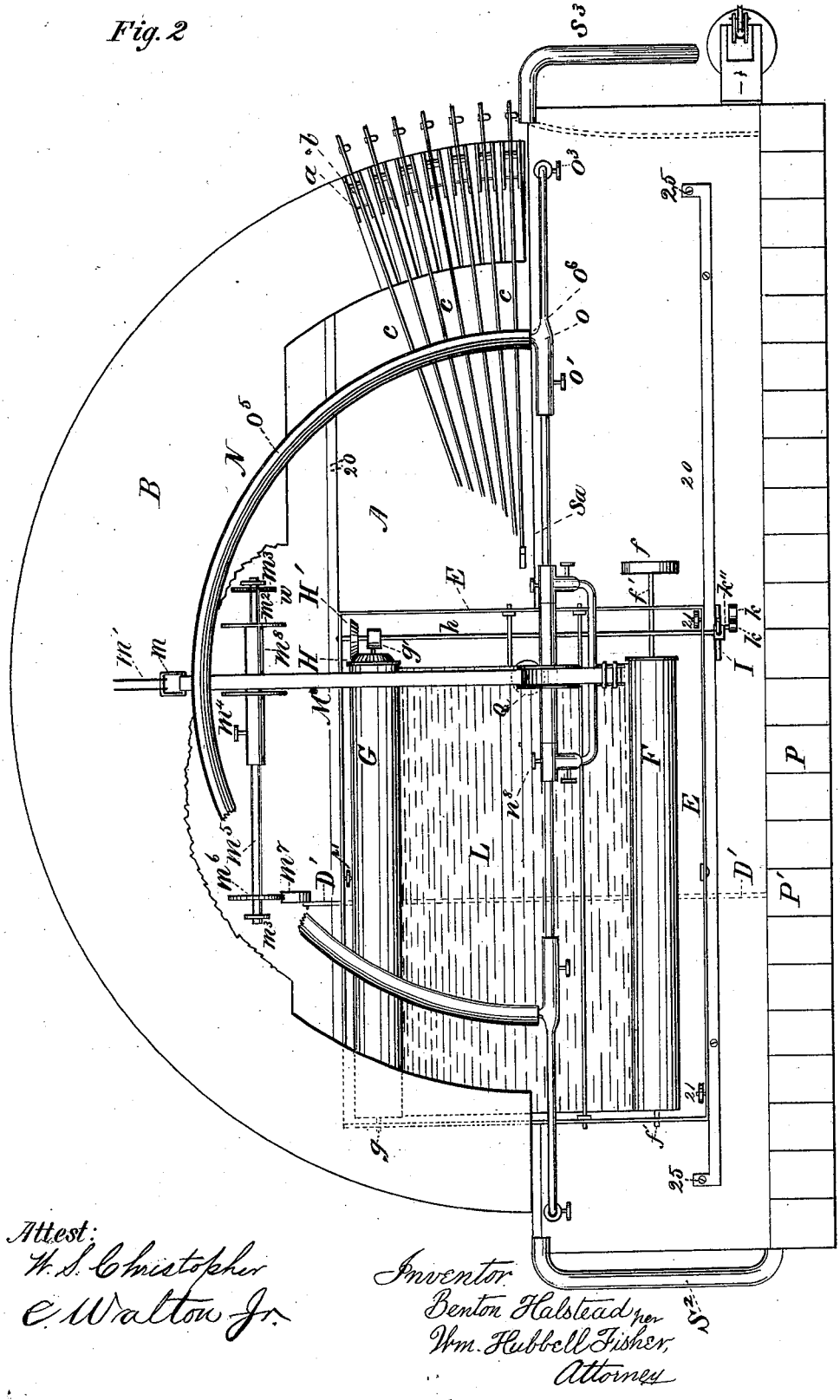
## Type Writing Machine.

**No. 202,024.** **Patented April 2, 1878.**

*Fig. 2*

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## Type Writing Machine.

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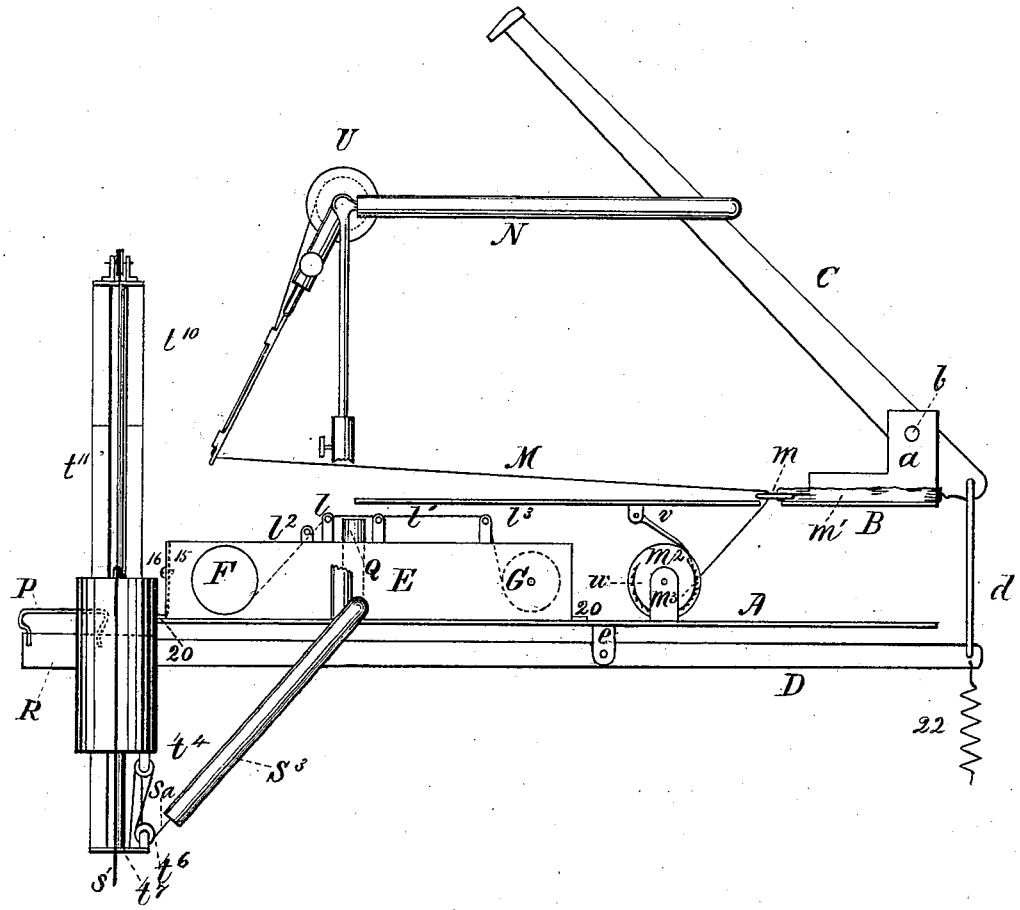
*Fig. 3*

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# UNITED STATES PATENT OFFICE.

BENTON HALSTEAD, OF CINCINNATI, OHIO.

## IMPROVEMENT IN TYPE-WRITING MACHINES.

Specification forming part of Letters Patent No. **202,024**, dated April 2, 1878; application filed March 28, 1877.

*To all whom it may concern:*

Be it known that I, BENTON HALSTEAD, a resident of the city of Cincinnati, in the State of Ohio, have invented certain new and useful Improvements in Type-Writers, of which the following is a specification:

The type-writers to which the first and second parts of my invention are applicable are those which employ an ink-ribbon as the medium through which the types impress their characters upon the paper. This part of my invention, in general, consists in a novel arrangement of the ribbon, and in the construction and arrangement of the devices for sustaining the ribbon, whereby the operator has full opportunity to inspect the page he is printing. He is thus enabled to avoid errors which would occur by being unable to see at the time of printing what he is putting in print. Furthermore, if errors should occur in the printing, he is enabled to correct them the moment they are made, whereas, when the line which is being printed is hidden from view until the printing is finished, such errors can only be corrected by a subsequent revision and a second passage of the printed sheet through the machine, and at an expense of time the saving of which it is one of the purposes and functions of a type-writer to accomplish.

The second part of my invention consists of a device which causes the spacing-key, when depressed, to move the inking-ribbon for a little distance, thus presenting a fresh ink-surface of ribbon to the type.

The third part of my invention relates to new, simple, and efficient devices for enabling each depression of a key to move along the paper to be printed one space.

A fourth part of my invention consists of a new and useful device whereby the paper to be printed is advanced one line whenever the paper on the completion of a printed line is returned from left to right for the printing of a new line.

In the accompanying drawings, Figure 1, Sheet 1, is a front elevation of a type-writer embodying my improvements, only those portions of the machine being shown which are necessary to illustrate my improvements. Fig. 2 is a top view of the same, certain portions being broken away to uncover and exhibit certain portions of my improvements such as in a complete machine could not be seen from above. Fig. 3 is an end elevation of the same, the keys at the said end being omitted to more fully disclose my improved devices.

A represents the main supporting-plate of the machine. Immediately beneath this plate are the keys P, each one of which surmounts a lever, D. Each lever plays vertically in a slot, R, in a plate, R′, the slot operating as a guide for the lever. Below the keys is a thick cross-plate, 2, extending across the machine, its upper edge being cut into teeth 3, so shaped that the slots between adjacent teeth shall have one side, 4, directly vertical, and the other side, 5, shall make an obtuse angle with the length of the plate 2. The two sides approach each other as they approach the bottom of the slot Q′. The teeth are so cut that each lever D, when depressed, comes nearer side 4 than side 5. The slot Q′ is made sufficiently large to allow of considerable space between the oblique side 5 of the tooth and the lever D.

A cord, S, passes over the rounded tops of the teeth, and at the left end of the machine passes through a curved tube, $S^2$, and is attached to the left-hand end of the paper-carrier E. In the other direction the cord S passes through the elongated orifice $t^9$ in upright plate $t^{10}$, and through orifice in upright adjustable plate $t^{11}$, and thence upward through orifice $t^8$, thence downward through orifice $t^{12}$, thence through loop $t^1$, thence upward to an orifice through plate $t^{13}$, where it is made fast. To a fixed point, as $t^7$, (see Fig. 3,) one end of the cord $S^a$ is attached. The cord then passes over the pulley $t^4$, and thence around pulley $t^6$, thence through the tube $S^3$, and is connected to the right-hand end of the paper-carrier E. The depression of a key, P or P′, causes the cord S to conform closely to the top and left-hand surface 4 of the tooth 3, thus producing greater friction than is caused by the conformity of the cord S to the right-hand surface 5 of the tooth 3, and since the cord S, to the right of the point of depression thereof, meets with a firm resistance to being drawn to the left in consequence of the friction occasioned by the cord S being, at the right hand, bent over

and around several frictional points, as $t^9$, $t^8$, $t^{12}$, and $t^1$, together with the weight T and the friction of the latter on its rod $t^3$, the depression of the key P causes the cord on the left of the point of depression to yield, thus drawing the paper-carrierE from right to left the necessary distance for the space between letters or words, there being less friction operating as a resistance to motion on your left of the point of depression on the string than on the right of said point.

As the pressure of the finger on the key is removed the key will rise, and with it the lever D, whereupon the draft of the weight T upon the cord S will at once take up the slack in said cord and have it ready for another depression of a key.

The plate Q is adjusted vertically by means of two set-screws. (Shown in Fig. 1.) When the plate Q is raised, depressing a key forces the string S deeper into the notch beneath said key, and consequently draws the paper-carrier farther forward. Hence the size of the letter-space is regulated by lowering or raising the toothed plate Q.

After the paper-carrier has been moved from right to left as far as desired, it may be returned to the right-hand side of the machine in position for printing a fresh line by lifting the weight T. This movement of the weight draws back the cord $S^a$ and slackens the cord S. The weight may be lifted by hand or by means of the foot. In the latter case the foot may rest upon a lever or stirrup attached to the lower end of cord S′.

The construction of the paper-carrier is as follows: E is the outside frame thereof. In the forward end is cylinder F, and in the rear end cylinder G, the cylinders being parallel to the line of motion of the paper-carrier. These cylinders are of proper size to carry paper enough for the usual need of the type-writer. The paper-carrier runs on wheels 21, journaled in the carrier, and rolling on plate A.

The course of the carrier when in motion is regulated by guides 20, one of which is on either side of the carrier. The ends 25 of the guides are bent inwardly and at right angles to the guide, and operate as stops to prevent the carrier from going too far to the right or left. The plate B, upon which the supports *a* of the bearings *b* rest, is elevated above plate A sufficient distance to allow the paper-carrier and the paper thereon to run under the said plate B. I thus obtain all the room needed for the movement of the carrier, and at the same time obtain great compactness in the arrangement of the type-levers C.

$l$, $l^2$, $l^1$, and $l^3$ are adjustable guides to regulate the distance the canvas is to be above the center post, and to direct the movement of the canvas with reference to the cylinders F and G. The distance of the canvas above the post is usually very little. The canvas, as herein arranged, passes, during the operation of printing, from the under side of the cylinder F under guard $l^2$, over guard $l^1$, over the center post or printing-point Q.

It may be here stated that this post is fixedly attached to plate A.

The canvas next passes over guards $l^1$ and $l^3$, thence under and around the cylinder G. Where the canvas is so arranged as to pass over the cylinder G, and then around it, an additional guard between $l^1$ and $l^3$ may be profitably employed. The paper to be printed on lies upon the canvas, and follows the direction it takes. A gear-wheel, H, (see Fig. 2,) engaging a gear, H′, fixed on shaft *h*, enables the rotation of the said shaft *h*, to communicate a rotary movement to cylinder G. One end of the canvas is attached to roll F and the other end to roll G. The left-hand journal *g* of cylinder G is journaled in the frame E, and the right-hand journal rotates in a box in stud *g*′. The latter also supports the farther portion of shaft *h*, while the front portion of the latter shaft is supported in the front side of the frame E, and terminates in four or more cross-levers, I, (see also Fig. 1,) immediately in front of the frame. These levers enable the shaft *h* and cylinder G to be rotated with great exactness, and the paper to be wound upon or unwound therefrom at the will of the operator. A provision for causing the cylinder G at the completion of one line of printing to wind up the paper, so that it shall present the next blank line in readiness for printing thereon, is made in the device $k\ k^1\ k^2\ k^3$. This device is pivoted at $k^1$ to a fixture on plate A, and provided with two arms, *k* and $k^3$. $k^2$ represents an arm projecting forward horizontally from arm *k*, and at right angles thereto.

The operation of this device is as follows: When the carrier E is moved from right to left, one of the arms I, coming into contact with arm $k^2$, tips the arms $k\ k^3$ over, so that $k^2$ is flat on plate A and $k^3$ is upright, but does not operate to turn the arm I. As soon as arm I has passed over $k^2$, the latter rises to its former position, as shown in Fig. 1. This return is caused in any suitable way, as by a spring, &c. After the carrier E has moved on from right to left so far that the entire line has been printed, the carrier is moved back, and the arm I strikes against the arm $k^2$, and as the latter does not yield on account of the arm $k^3$ being against plate A, the arm I is turned so that shaft *h* is rotated one-quarter of a revolution or less, and the cylinders G and F are rotated sufficiently to bring a fresh line of the paper in position to be printed on. Cylinder F has its left-hand journal supported by and rotating in the left-hand side of frame E, and its right-hand journal rotates in the right-hand side of said frame. Said last-named journal projects through the frame, and terminates in a thumb-wheel, *f*, whereby the paper may be wound on or off of the cylinder F at pleasure. A steel spring, 15, is attached on the inside of frame E near the top of the latter. The

lower portion of the spring plays through an opening in said frame, and presses against the inner edge of guide 20. The pressure of said spring against said guide is regulated by set-screw 16. In this manner any momentum of the paper-carrier E is destroyed, and the carrier is always pressed against rear guide 20. As the latter is straight, the movements of the carrier will always be in a straight line.

The arrangement of the inking-ribbon and its accompanying devices is as follows: An upright, $O^4$, is stationed at each end of the forward portion of the frame. Into the hollow upper end thereof is inserted an arm, O, the depth of the latter in $O^4$ being regulated by set-screw $O^3$ in $O^4$. The upper end of arm O is bored, and receives the end of a shaft, *n*, the distance which the latter is permitted to enter the bore being regulated by set-screw $O^1$. On the shaft *n* loosely works a sleeve, $n^1$, on which latter is fixedly centered the spool U, which carries the fresh ink-ribbon. On either side of sleeve $n^1$ is a sleeve, $n^2$, provided with an arm, $n^7$, whose front end is bored out, and receives one end of the cross-piece $n^4$, the distance of whose penetration into said arm is regulated by set-screw $n^3$. From the middle of the cross-piece $n^4$ extends a guide, $n^5$. Guards $n^6$ cross over the front of the guide to prevent the ribbon from slipping off. The sleeves $n^2$ are each secured to the rod in the desired position (preferably that shown in Fig. 2) by means of the set-screws $n^8$. The inking-ribbon M on the spool U passes from the front side thereof along on the guide $n^5$, under the guards $n^6$, thence across the machine at right angles to the direction in which the paper is printed through metal loop *m*, and down around spool $m^8$, provided with high sides $m^2$. The loop *m* is secured to plate B by elastic strips $m^1$. The spool $m^8$ is a sleeve, and is fitted on a spindle, $m^5$, rotating in journal-boxes $m^3$. Set-screw $m^4$ enables the spool to be set at any desired portion of its revolution fixedly on shaft $m^5$. A cog-wheel, $m^6$, fixedly centered on shaft $m^5$, is operated by a ratchet, $m^7$, pivoted to lever D′, which latter is fulcrumed at *e* (see Fig. 3) to the under side of the table, and is operated by key P′. Each lever D, operated by a key, P, is so fulcrumed that a depression of a key causes its respective type-lever C to descend with sufficient momentum to carry its type end on ribbon M down upon the paper and print through the ribbon a clear character.

Each fulcrum-pivot is rigidly attached to its respective lever C, and rotates in a bearing, *a*, on either side of the lever. This rigid attachment between lever and fulcrum-pivot insures great and continuous precision in the descent and impress of the type end of same. The arrangement of the lever D in connection with link *d* and lever C is such that when D has been fully depressed the type end of lever C is about an inch from the face of the paper. The momentum of the lever C, after being rapidly started in motion, is what carries it through the last inch of its journey and impresses its character upon the paper. After delivering its impression, lever C is instantly returned back to a position an inch above the paper, and allows the operator to inspect the printed line. Upon the finger being removed from its operations, key-spring 22 returns lever C instantly to its former position against guard N. In practice the type-lever returns instantly to guard N. This latter extends around the backs of the type-levers and hold them in a uniform position. It consists of a center rod or wire, $O^6$, connected to arm O, and covered with a rubber surface, $O^5$, to break the force of the return of the levers C after printing, and also prevent the wear of rod $O^6$ and the noise which the striking of metal against metal occasions.

Sleeve $n^2$, on the right, is tightly secured at the proper angle to rod *n* by set-screw $n^8$, and sleeve $n^2$, on the left, being first firmly pressed to the right against sleeve *n*, and there secured by set-screw $n^3$, thus adjusted creates a lateral pressure at the points 23 and 23, thus securing a friction which tends to prevent the turning of sleeve $n^1$, so that the ribbon cannot be unwound from spool U until a force sufficient to overcome said friction is exerted upon the ribbon at spool $m^8$ by lever $D^1$, as hereinbefore described, so that the ribbon is always taut while being operated, and it is the elasticity of the ribbon and the spring of the guide, together with the flexibility of the elastic cord $m^1$, that causes the ribbon to return to its place at a distance above the printing-point.

The general operation of the machine is as follows: The sheets of paper to be printed are successively rolled around cylinder F by the aid of thumb-wheel *f*, the upper end of the last sheet being passed under the guard $l^2$ and over guards $l$ $l^1$ $l^3$ and around cylinder G. The keys P, operating appropriate characters, are struck at will. The depression of the key causes the type-lever to descend and carry the ribbon M upon the paper with force enough to make the type transfer sufficient ink from the ribbon to the paper to make a clear impression thereon of the character on the face of the type, the paper and canvas being sustained by the center post at this instant of printing. The lever C, after printing, instantly rises to its former position against the guard N, this elevation of the lever being accomplished by the spring 22. The upper end of this spring is attached to the lever D and the lower end to a plate fixed in the lower portion of the machine, but not shown in the drawing. As the ribbon is carried down by lever C the guide $n^5$ and metal loop M yield. The movement of the guide causes a torsion of the rod *n*, and the tendency of the latter to assume its former position, together with the elasticity of $n^4$ and $n^5$, raises guide $n^5$ back to its original position and stretches the ribbon taut as soon as the lever C rises. The height of the ribbon above the paper, when not deflected by lever C, is preferably about an inch. All rotation of the

spool $m^8$ in the direction which would unwind the ribbon is prevented by the ratchet W and pawl V. At each depression of a key the carrier E is moved one space from right to left, this movement being accomplished by the lever D under the key acting on the cord S, hereinbefore described. To move the carrier a space without printing thereon, the spacing-key $P^1$ is depressed, and the lever $D^1$ of said key acts on the cord S, as before mentioned. The blank space can be multiplied, as desired, by continuous successive depressions of said key $P^1$. Key $P^1$ performs another function, viz: Each depression thereof elevates the ratchet $m^7$, and rotates the wheel $m^6$ the distance of one tooth, thereby rotating spool $m^8$ and winding up the ribbon about the the length of a letter, drawing a like amount of fresh ribbon from spool U and presenting a fresh surface of ribbon for use.

The spool U is prevented from unwinding by means of ratchet-wheel W on shaft $m^5$ and pawl $v$ pivoted to plate B. As a space has to be made between every word, the machine is sure to be duly supplied with fresh ribbon. The operator is thus relieved of the care of moving the ribbon. This I deem a valuable improvement. After a line has been printed the weight T is lifted by the hand or foot and the carrier retracted in position for printing a new line. In its retraction an arm, I, has been turned by arm $k^2$, and thus cylinders G and F are rotated, and the paper is moved one line forward. After the desired amount of printing has been done, the paper may be wound off cylinder G, and at the same time fresh paper wound on cylinder F by turning thumb-wheel $f$.

To accomplish the purposes for which the ribbon is located as described—namely, to enable the operator to inspect the printing at the instant of printing and while a line is being printed—it is not necessary that the ribbon should cross the machine at exactly a right angle to the line of printing, and it is deemed that any location thereof, substantially as specified, which accomplishes the above result belongs to my invention.

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

1. The ribbon stretched across the machine at right angles to the lines of printing, at a distance above the paper to be printed, and supported by yielding supports, and adapted to receive the impingement of the face of the type forced down to be printed, and be carried down by said type against the paper, printing thereon the character of said type, and, upon the retraction of said type, assuming its original position at a distance above the paper, substantially as and for the purposes set forth.

2. The combination of ribbon M, spool U, guide $n^5$, loop $m$, elastic cord $m'$, and spool $m^8$, substantially as and for the purposes set forth.

3. The combination of spacing-key $P^1$, lever $D^1$, pawl $m^7$, ratchet-wheel $m^6$, axis $m^5$, and spool $m^8$, the latter preferably made loose on said axis, and provided with set-screw $m^4$ and ratchet-wheel and pawl, substantially as and for the purposes set forth.

4. The device for regulating the resistance to the rotation of the spool U, consisting of sleeve $n^1$ and sleeves $n^2$ and set-screws $n^3$ on rod $n$, substantially as set forth.

5. The combination of spool U, sleeve $n^1$, arms $n^7$ $n^2$, set-screws $n^3$ and $n^8$, guide $n^5$, provided with loops $n^6$, substantially as and for the purposes set forth.

6. The cord S, weight T, and friction devices $t^9$, $t^8$, $t^{12}$, and $t^1$, and brake 15, substantially as and for the purposes set forth.

7. The combination of the adjustable toothed plate 2, cord S, and key-lever P R, substantially as and for the purposes set forth.

8. The combination of the upright plate and the adjustable toothed plate, for the purposes set forth.

9. The combination of cord $S^a$, paper-carrier E, tube $S^3$, pulleys $t^4$ $t^6$, and weight, substantially as and for the purposes set forth.

10. The combination of uprights $O^4$, with set-screws $O^3$, arms O, with set-screws $O^1$ and guard $O^6$ N, and arm $n$, substantially as and for the purposes specified.

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