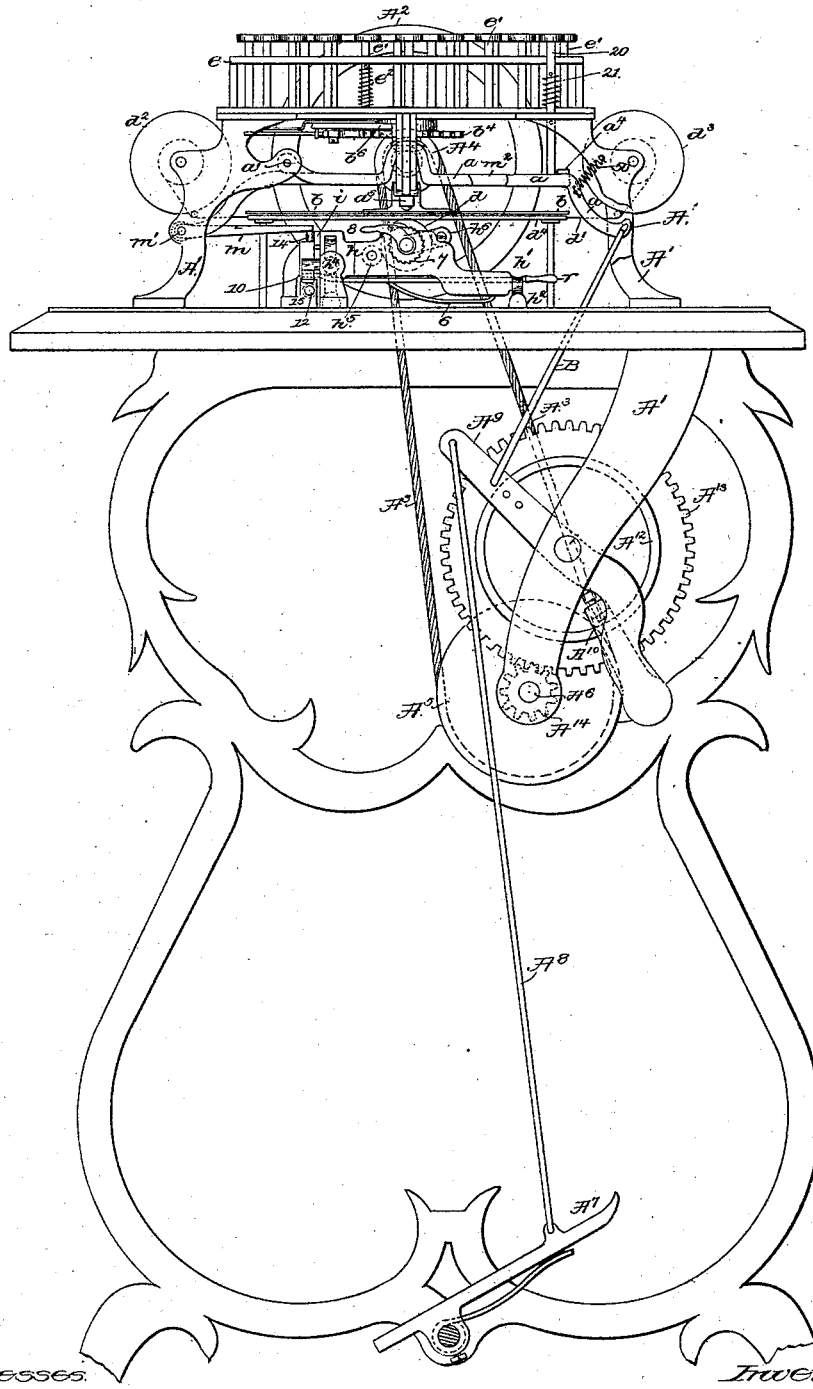
(No Model.) 4 Sheets—Sheet 1.

J. A. AMBLER.

TYPE WRITING MACHINE.

No. 306,045. Patented Oct. 7, 1884.

Fig. 1.



Witnesses.
John F. C. Printzlau
Henry Marsh.

Inventor.
James A. Ambler.
by Crosby & Gregory attys

(No Model.) 4 Sheets—Sheet 2.

J. A. AMBLER.

TYPE WRITING MACHINE.

No. 306,045. Patented Oct. 7, 1884.

Fig. 2.

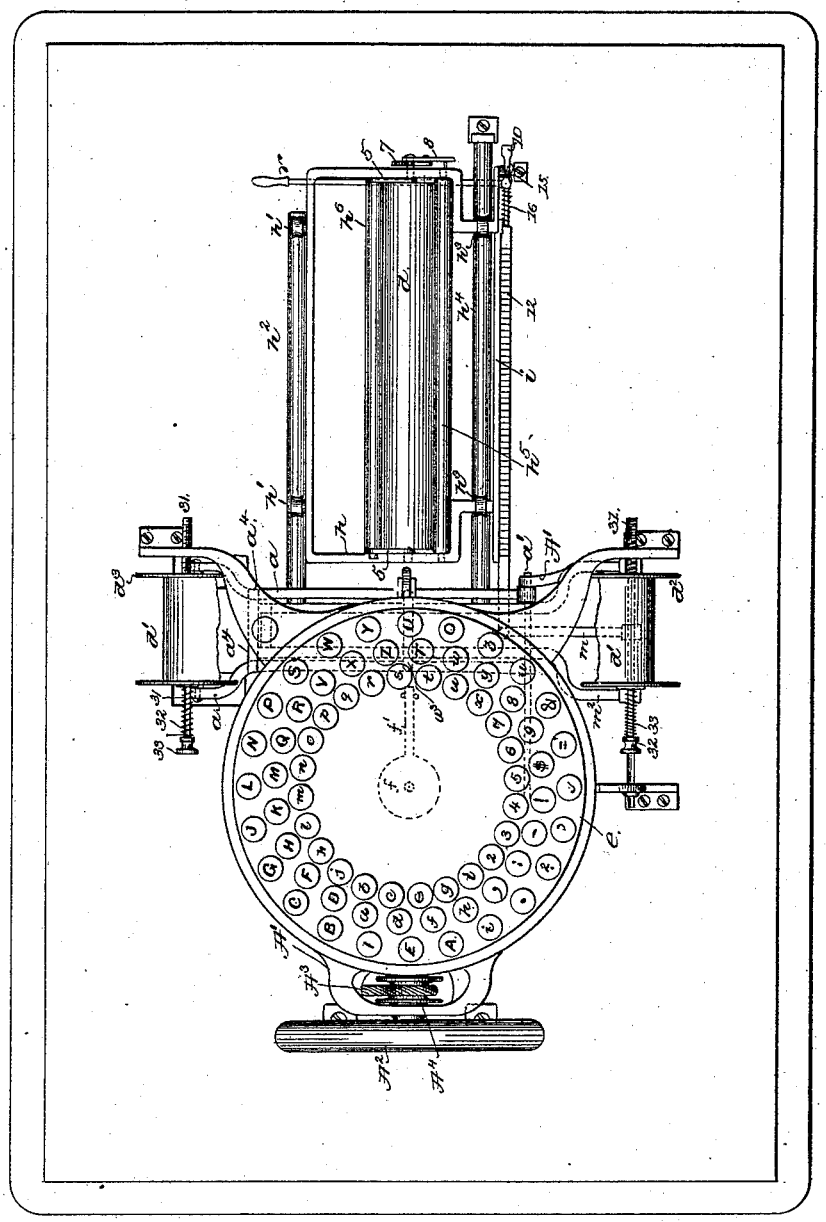


Fig. 11.

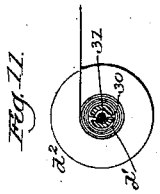
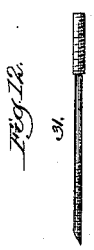


Fig. 12.



Witnesses:
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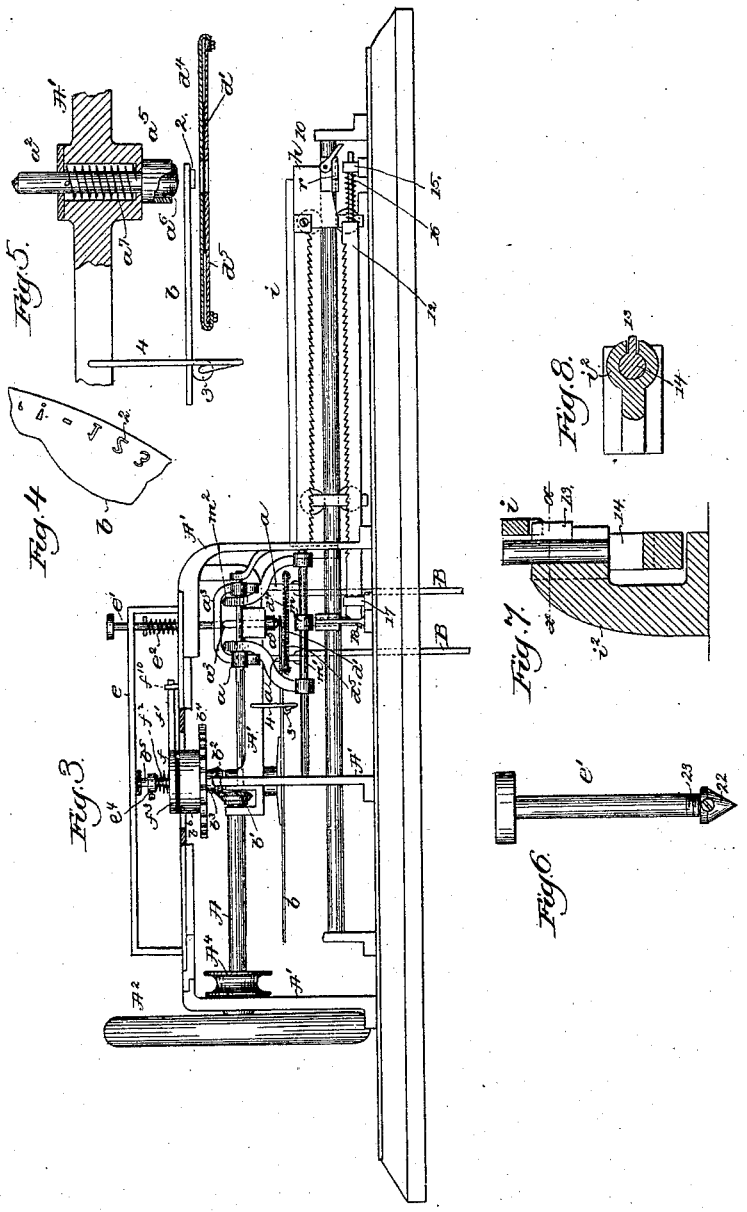
(No Model.) 4 Sheets—Sheet 3.

J. A. AMBLER.

TYPE WRITING MACHINE.

No. 306,045. Patented Oct. 7, 1884.



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(No Model.) 4 Sheets—Sheet 4.

J. A. AMBLER.

TYPE WRITING MACHINE.

No. 306,045. Patented Oct. 7, 1884.

Fig. 9.

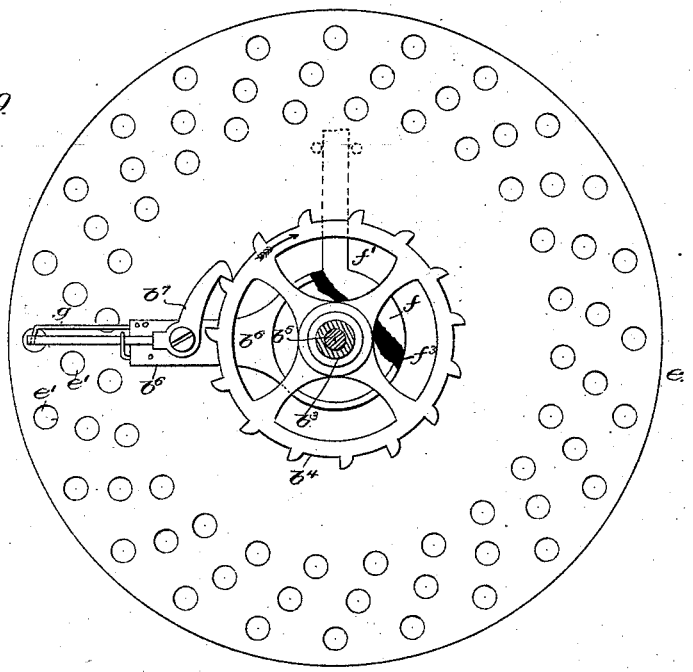
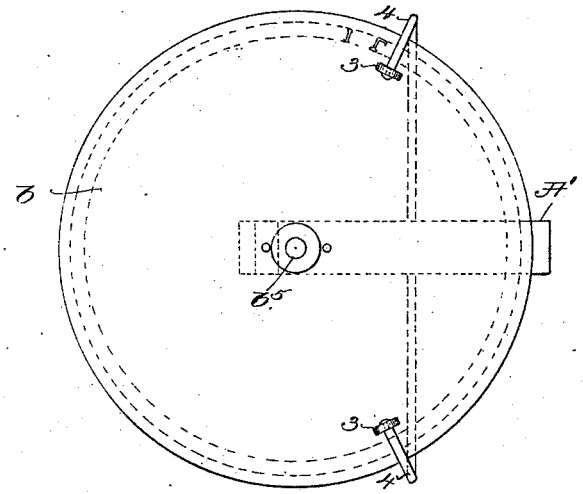


Fig. 10.



Witnesses.
John F. C. Priest Jr.
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Inventor.
James A. Ambler.
By Crosby & Gregory Attys.

UNITED STATES PATENT OFFICE.

JAMES A. AMBLER, OF NATICK, MASSACHUSETTS.

TYPE-WRITING MACHINE.

SPECIFICATION forming part of Letters Patent No. 306,045, dated October 7, 1884.

Application filed November 26, 1883. (No model.)

To all whom it may concern:

Be it known that I, JAMES A. AMBLER, of Natick, county of Middlesex, State of Massachusetts, have invented an Improvement in Type-Writers, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

This invention has for its object the production of a simple, durable, inexpensive, and rapidly-operating type-writer. In my improved apparatus I employ a thin metallic rotating flexible disk, called a "printing-plate," it having the characters to be printed formed upon it by electrotyping. This printing-plate is depressed at suitable times by an impression-plunger, which strikes the upper side of and causes the said plate to descend until the character to be printed on the paper strikes against the usual inking-ribbon. The impression-lever which acts to depress the impression-plunger also actuates a second lever or arm, which effects the movement of a wedge and a sliding spring-held ratchet-bar, which insures the lateral movement of the carriage and roller which supports the paper to properly space the letters, as will be described.

The particular features which constitute my invention will be hereinafter more fully set forth, and specified in the claims at the end of this specification.

Figure 1 in side elevation represents a type-writer embodying my invention; Fig. 2, a top view thereof with the carriage and paper supporting and feeding roller pulled out. In this figure the arm b^6, fully shown in Figs. 1 and 9, is omitted; Fig. 3, a side view of the apparatus, Fig. 1, above the table, a part of the frame-work and key-holding head being broken out to show parts inside of it, the arm i^6 and all but one key being omitted. Fig. 4 represents a portion of the printing-plate; Fig. 5, a detail showing the impression-plunger, printing-plate, and ink-ribbon and means to guide the same. Fig. 6 represents one of the keys detached; Fig. 7, a detail of the wedge for moving the ratchet-bar; Fig. 8, a section of Fig. 7 on the line *x x;* Fig. 9, an under side view of the key-holding head, the shaft b^5 and sleeve b^3 being in section, some of the parts being broken out to more clearly show their construction; Fig. 10, a detail showing the parts for supporting the thin printing-plate, and Figs. 11 and 12 details to be referred to.

The main shaft A of the apparatus, held in suitable bearings in the frame-work A′ and provided with a fly-wheel, A^2, is driven by a belt, A^3, extended over a belt-pulley, A^4, fast on the said shaft. The belt A^3 derives its movement from a pulley, A^5, fast on the shaft A^6, which in practice will be rotated by any usual or suitable friction or clutch gearing set in motion by a treadle, A^7. As herein shown, the treadle is joined by rod A^8 with one end of a lever, A^9, carrying a friction-pawl, A^{10}, which engages a flange, A^{12}, of a gear, A^{13}, which engages a pinion, A^{14}. (See dotted lines on the shaft A^6.) The gear A^{13} may have a flange at its other side to be engaged by a second friction-pawl set in motion by second treadle, if desired, as common in sewing-machine motors. The gear and friction-pawls and treadles are old, so need not be herein further described.

The lever A^9 has a link, B, loosely connected with the impression-lever *a*, pivoted at *a′* on an ear of the frame-work. This lever, between its ends, acts upon the upper end of the impression-plunger a^2. (Shown clearly in Figs. 1, 3, and 5.) The impression-lever is made of two arms joined by a loop, a^3, and a bar, a^4. The impression-plunger a^2 is provided with a head, a^5, having an india-rubber or other soft or elastic pad, a^6, to strike against the upper side of the thin flexible annular metal printing-plate *b*, having thereon letters, characters, &c., suitable for printing, as at 2, the said plate being formed by the process known as "electrotyping." The plunger a^2 is normally held up by a spring, a^7. The shaft A has fast on it a bevel-gear, *b′*, which engages a bevel-gear, b^2, fast upon the sleeve b^3, having attached to it a ratchet-wheel, b^4. (See Figs. 1, 3, and 9.) The sleeve b^3 and its attached parts are loose on the shaft b^5, which, at its lower end, has attached to it the printing-plate *b*, while above the ratchet b^4 the said shaft has attached to it (see Figs. 1 and 9) the hub of the arm b^6, which has pivoted upon it a pawl-like elbow-lever, b^7. (See Fig. 9.) The ratchet b^4 on the sleeve is driven constantly, and when the hook of the pawl-like elbow-lever b^7 engages one of the teeth of the said ratchet b^4 the arm b^6 will be

rotated in unison with the said ratchet, and will effect the rotation of the shaft b^5 and the printing-plate b. The printing-plate having, as stated, characters to indicate all the letters of the alphabet and suitable characters for punctuation, &c., or such characters as are used in printing, has to be stopped with that one of its characters which is next to be used immediately below the impression-plunger a^2, with the said character immediately over the paper-supporting roller or surface d, and over the usual ink-ribbon, d', which is guided at or near the printing-point between a perforated strip of india-rubber, d^4, and a perforated metal plate, d^5, (shown best in cross-section, Fig. 5,) the said parts d^4 and d^5 protecting the said type-ribbon and preventing its upper side from being injured by the characters on the printing-plate b as the latter is being rotated, and preventing the under side of the said plate from soiling the paper which is being printed upon.

The key-holding head e of the apparatus has, as herein shown, three annular series of holes to receive three series of sliding keys, e', each marked upon the top of its head, as shown in Fig. 2, to designate a particular letter or character, which is to be reproduced by printing. Each key is supported by a suitable spring, e^2, so that its lower end is elevated above the range of the arm b^6 in its rotation, and by depressing any one of the said keys its lower end may be made to constitute a stop for the said arm, and consequently stop the shaft b^5 and printing-plate b, with the character thereon corresponding with that shown on the said key in the exact position to be struck by the impression-plunger a^2 to cause the said character upon the plate b, it co-operating with the ink-ribbon, to leave its impression in proper place upon the paper.

The arm b^6 is stopped in the following manner, viz: The outer end of the elbow-like pawl-lever b^7 strikes against the end of the depressed key, and thereafter further movement of the arm causes the said pawl to be disengaged from the said ratchet-wheel, the disengagement of the said pawl causing the arm and its connected shaft and parts to stop. To prevent backward movement or rebound of the said shaft and printing-plate when the arm is checked, as described, I have applied to the shaft b^5 a collar, e^4, and between the said collar and the hub of the arm b^6, I have placed a friction device composed of a plate, f, having an arm or projection, f', (suitably engaged with a fixed part of the frame at f^{10}, Figs. 2 and 3, to restrain it from rotation,) and a spring, f^2, the latter acting to force the plate f down, preferably against a felt or other washer, f^3, (shown in black in Figs. 3 and 9,) interposed between the said plate and the hub of the arm b^6. (See Figs. 1 and 9.)

As herein shown, the projection f' of the plate f is entered between two pins, f^{10} f^{10}. This friction device has sufficient strength to stop the arm b^6 and hold it at the point occupied by it just as when the pawl is fully released from the ratchet b^4. The outer end of the pawl is enough longer than the arm b^6 to extend across the series of keys, whatever may be their number, so as to be stopped by any one key of either series, and this pawl has bearing against it a suitable spring, g, which has two offices—viz., one to lessen the shock when arresting the arm b^6, and the other to turn the hooked end of the pawl toward the ratchet-wheel b^4 as soon as the key holding the pawl is permitted to rise. The under side of the printing-plate b, composed of very thin metal, is supported at two or more places at each side of the printing-point, preferably by small wheels 3 on curved arms or brackets 4, attached to the frame-work A′, and reaching around and under the said plate. One of the said brackets is shown in Fig. 3. The operator having depressed a key will cause the plate b to be arrested, as described, and then, with his foot upon the treadle, will cause the depression of the lever a and the plunger a^2, which will strike the plate and cause it, acting through the ribbon d', to print upon the paper. The roller d, to support the paper, has its bearings in a carriage, h, provided at one side with suitable wheels, h', adapted to run on a track, h^2, and at its other side the said carriage has ears provided each with two wheels or rolls, h^3, to bear both above and below a rod, h^4, which serves not only as a track, but also as a fulcrum, about which the said carriage may be turned when it is desired to get at the under side of the roll or the paper thereon.

This carriage has a small roller, h^5, which has fixed bearings, but pivoted upon the journals of the roller d are bearings 5, which receive the journals of a second roller, h^6, which is thus adapted to be swung in the arc of a circle about but close to the periphery of the roller d. The carriage h has at its under side a shelf, 6, on which is laid the sheet of paper, which is led over the roller or supporting-surface d, to be printed upon while the same is being fed by the rollers d and h^6. The leading end of the paper is passed under the roller d up in front of it, and between the said roller and the roller h^5 and the roller h^6, which latter at such time is thrown over, so as to occupy a position next to the roll h^5. The roller or support d for the paper opposite the point at which the impression is made has at one end of it a ratchet, 7, which is engaged by a pawl on a pawl-carrier, 8, so that the said roller may be turned step by step as is necessary to feed the paper and effect the proper spacing of the lines, as usual. The leading end of the paper having been introduced between the rollers d and h^6, the pawl-carrier is turned to rotate the roller d, and at the same time the roller h^6, resting on it and on the end of the sheet, is moved in unison with it until the said roller h^6 reaches the position shown in Fig. 1, after which further rotation of the roller d causes the paper to be carried forward by it, the paper running freely under the rolls h^5 h^6, which act as presser-rollers. After printing

each letter the carriage and the rolls thereon must be moved longitudinally to properly space the letters. To do this I have provided the carriage with a pawl, 10, which will be made to engage the right-hand tooth of the bar 12. (See Fig. 3.) In Fig. 3 the carriage *h* is shown as moved into its farthest position to the right, so as to permit the paper to be applied to the roller *d*, which having been done, as described, the carriage will be slid along to the left until the end of the rack-bar *i*, attached to the carriage *h*, strikes the projection 13 of the wedge 14, held in the guide-block i^2, attached to the fixed frame, which stops the carriage in such position that the edge of the sheet of paper is in correct position for printing, the pawl 10 at such time engaging the first tooth at the right-hand end of the movable ratchet-bar 12. This bar has one end reduced, is extended through a bearing, 15, has a spiral spring, 16, placed about its reduced end to keep the bar pressed toward the left, and the left-hand end of the said bar beyond the bearing 17 is beveled, as at 18, to be acted upon by the wedge 14 referred to. The wedge is depressed by the action against it of arm *m* on a rock-shaft, *m'*, having attached to it the arm m^2, the outer end of which is acted upon by the cross-piece a^4 of lever *a* at each descent of the said lever. As the wedge 14 is depressed its end strikes the beveled end of the bar and pushes it to the right, (see Fig. 3,) causing one tooth of the bar to pass beyond the pawl 10, attached to the carriage *h*, such movement of the bar compressing the spring 16. An impression having been made, the lever *a* is lifted and the arm m^2 follows after, owing to the action of a suitable spiral spring wound about the rock-shaft *m'*, such movement of the said shaft relieving the pressure of the arm *m* from the upper end of the wedge 14. This done the spiral spring 16 assumes control of and moves the bar toward the left, Fig. 3, carrying with it the pawl 10 and carriage, and as the beveled end of the bar is carried to the left it acts to lift the wedge 14 until its tooth or projection engages a tooth of the ratchet-bar *i*, attached to the carriage, which projection serves to lock the carriage in position. In practice I shall employ two pawl-levers, A^9, and shall connect their rods B with slots at the outer end of lever *a*, so that there will be enough play to let one rod rise under the control of one treadle, while the other rod descends, thus permitting the lever *a* to be depressed very rapidly by first one and then the other rod, each actuated by an independent treadle. The outer end of the lever *a* is held up by a spiral spring, 50. The arm m^2 may be depressed by the key 20, located outside the head *e*, when it is desired to move the carriage to space without printing. In the drawings I have omitted the springs e^2 from most of the keys *e'* to avoid confusion. The lower ends of the keys *e'* are provided with adjustable ends or nuts 22, made adjustable on threads 23, the adjustment of the said ends vertically on the keys enabling me to adjust the point at which the arm b^6 and plate *b* shall be stopped to the greatest nicety. The spools or reels holding the ink-ribbon *d'* may be actuated in any suitable manner, preferably by a pawl-and-ratchet movement, whereby the ribbon may be moved in either direction for a slight distance after each impression. The spools or reels d^2 d^3 have tubular axles slotted longitudinally between their heads, as at 30, to permit the ends of the ink-ribbon to be inserted through said slots, as in Fig. 11, each spindle 31, which holds one of the said spools, being beveled or tapered at one end, as at 32, to enable the point of the spindle to pass the ink-ribbon extended into the hollow axle of the spool, and the spool having been placed on the spindle the full or unreduced part of the latter back of its point acts to wedge the end of the said ribbon between the spindle and the interior of the axle. The end of the spindle, the spool having been placed thereon, is provided with a spring, 32, and nut 33, constituting a tension mechanism by which to produce the necessary friction upon the spool to restrain its too free rotation or undue movement, which would slacken the ribbon. The spindle is provided with a shoulder to receive against it the inner head of the spool, and the inner end of each spindle is threaded, to be screwed into suitable fixed ears of the frame, so that the said spindles may be turned into the said ears for a greater or less distance, thus enabling the spools and the ink-ribbon to be adjusted laterally, so that different portions of the ribbon between its selvages may be used. When it is desired to return the carriage, the pawl-lifting lever *r*, pivoted thereon, is turned so that its short arm, suitably beveled, acts upon and lifts the said pawl from engagament with the sliding ratchet-bar, and at the same time the lever m^2 is depressed to push down the wedge 14 sufficiently to remove the pin or projection from the ratchet bar or rack *i*, attached to the carriage, and thereafter the carriage may be moved freely. An impression having been made, and the arm b^6, connected with the shaft of the printing-plate, having been released, the elbow-like pawl immediately engages a tooth of the continuously-rotating ratchet-wheel b^4 and starts the printing-plate.

I am aware that type-forms composed of india-rubber have been employed in type-printing machines in connection with ink-pads; but a rubber type cannot be practically used in connection with an ink-ribbon. The thin flexible electrotype printing-plate herein employed will preferably be from three to ten one-thousandths of an inch in thickness, or a plate of such thickness as would be formed by electro-deposition in from ten to fifteen hours, and the said plate when used bends as each impression is made.

I am not aware that a flexible electrotype-plate was ever before used or known in a typewriter. An electrotype-plate made thin and

flexible, as described, may be employed upon rollers or plates in ordinary printing-presses, thus enabling the production of a printing-surface of metal more cheaply than heretofore, and at the same time producing a surface which may be more easily applied and handled.

I claim—

1. The thin flexible electrotype printing-plate and a support, *d*, for the paper, combined with an impression-plunger to act upon, bend, and depress that part of the thin metal plate which is provided with characters to be imprinted upon the paper, substantially as described.

2. The thin flexible electrotype printing-plate, combined with an ink-ribbon, and with a support, *d*, for the paper to be printed upon, substantially as described.

3. The thin flexible printing-plate, its attached rotating spindle, means, substantially as described, for rotating the latter, the arm b^6 and its pawl, the keys, and ink-ribbon, combined with a movable impression-plunger adapted to be depressed upon the upper side of the said printing-plate when the latter is to be sprung downward to print, substantially as set forth.

4. The thin flexible electrotype printing-plate and perforated plate below it, combined with an impression-plunger to strike against the upper side of the said plate, substantially as described.

5. The thin flexible electrotype-plate and rollers 3, to support the same at its under side, combined with an impression-plunger to act upon and depress the said plate between the said rollers, substantially as described.

6. The rotating shaft, its gears b' b^2, the sleeve actuated by them, the ratchet thereon, the printing-plate, the shaft to move it, and the arm b^6, attached to the said shaft, combined with a friction device to prevent rebound of the shaft carrying the printing-plate when the arm b^6 is arrested, substantially as described.

7. The printing-plate, the shaft b^5, the arm b^6, and pawl pivoted thereon, combined with a key having an adjustable end, substantially as described.

8. The support *d* for the paper, the flexible metallic electrotype printing-plate, and the impression-plunger, combined with the impression-lever to operate the said plunger, substantially as described.

9. The support *d* for the paper, the flexible printing-plate, and the impression-plunger, combined with the lever to operate the plunger, and with the treadle mechanism to operate the said lever, substantially as described.

10. The support *d* for the paper, the carriage, the flexible printing-plate, the ink-ribbon, the impression-plunger, and the lever *a*, to move it, combined with the arm m^2, and with means, substantially as described, between the said arm and carriage to operate the latter intermittingly, as and for the purpose set forth.

11. The spool having the tubular slotted axle and the ink-ribbon, combined with the spindle extended through the said axle, and adapted to clamp the end of the ink-ribbon, substantially as described.

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

JAMES A. AMBLER.

Witnesses:

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HENRY MARSH.