3 Sheets—Sheet 1.

J. B. HAMMOND.

Type-Writing Machine.

No. 224,183. Patented Feb. 3, 1880.

Fig. 1.

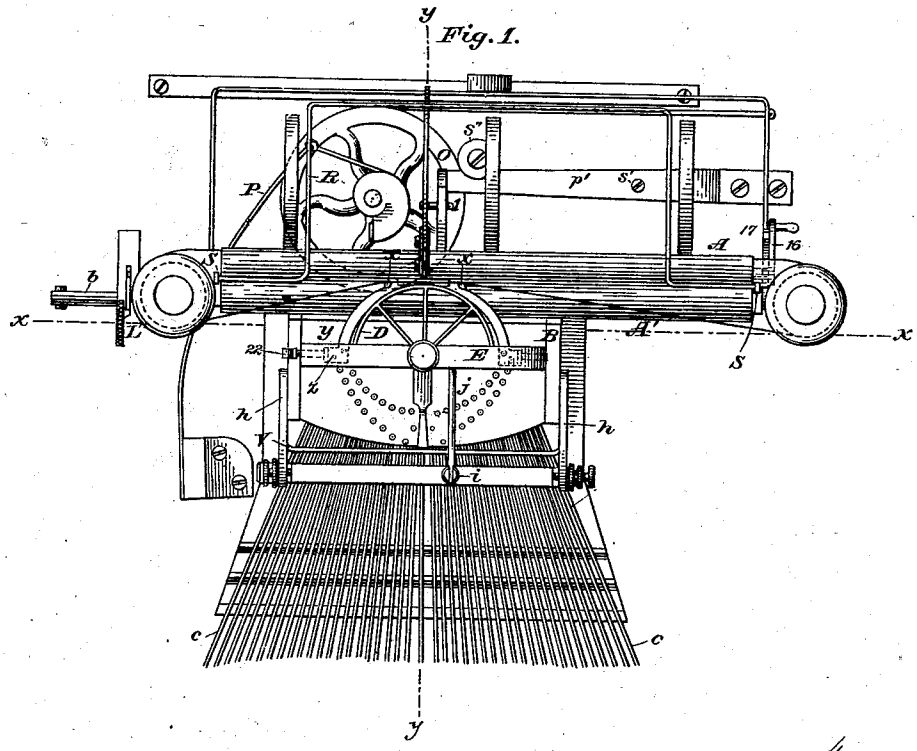
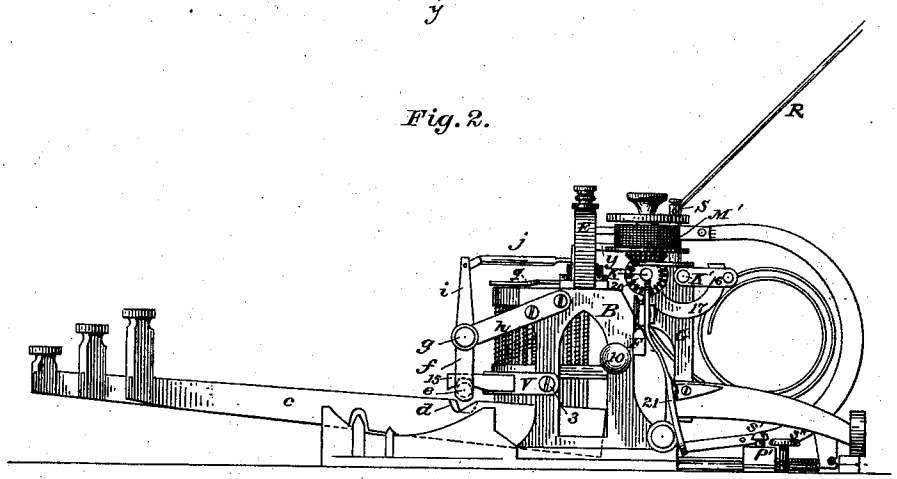


Fig. 2.



Witnesses:

C. Clarence Poole

L. W. Sulz

Inventor:

James B. Hammond

by Ellis Spear

Attorney

3 Sheets—Sheet 2.

J. B. HAMMOND.

Type-Writing Machine.

No. 224,183. Patented Feb. 3, 1880.

Fig. 3.

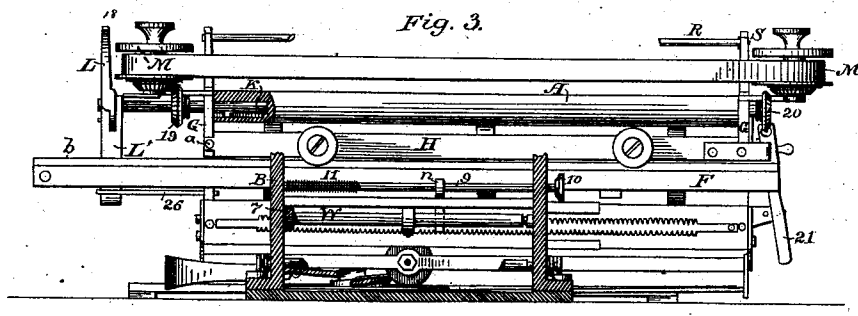


Fig. 4.

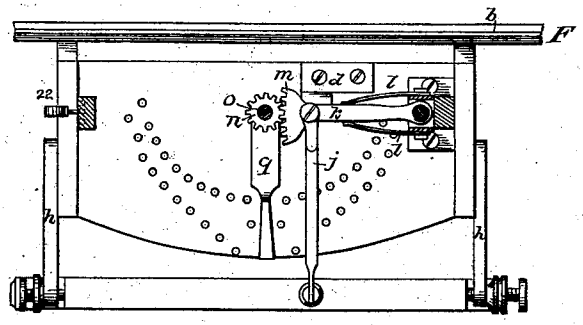


Fig. 7.

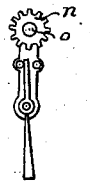
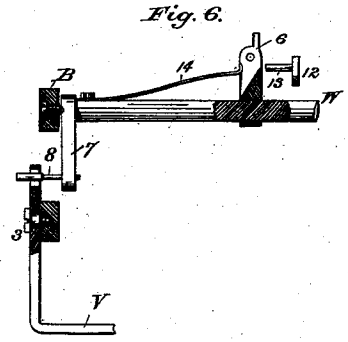


Fig. 6.



Witnesses:

C. Clarence Poole

L. W. Seelye

Inventor:

James B. Hammond,

by Ellis Spear

Attorney.

3 Sheets—Sheet 3.

J. B. HAMMOND.

Type-Writing Machine.

No. 224,183. Patented Feb. 3, 1880.

Fig. 5.

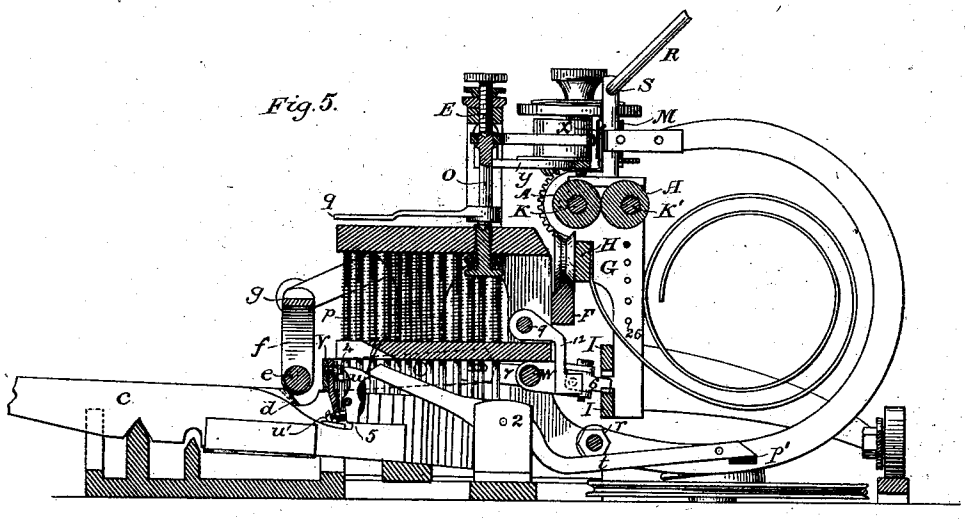


Fig. 8.

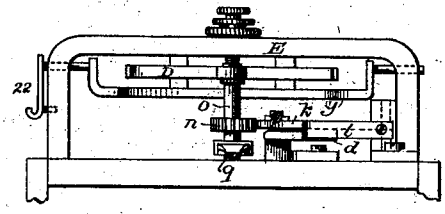
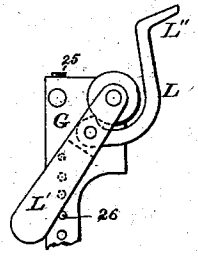


Fig. 9.



Witnesses:

C. Clarence Poole

L. W. Seely

Inventor:

James B. Hammond

by Ellis Spear

Attorney

UNITED STATES PATENT OFFICE.

JAMES B. HAMMOND, OF HARTFORD, CONNECTICUT.

TYPE-WRITING MACHINE.

SPECIFICATION forming part of Letters Patent No. 224,183, dated February 3, 1880.

Application filed January 10, 1880.

To all whom it may concern:

Be it known that I, JAMES B. HAMMOND, of Hartford, in the county of Hartford and State of Connecticut, have invented a new and useful Improvement in Type-Writers; and I do hereby declare that the following is a full, clear, and exact description of the same.

My invention relates to a type-writing machine of that class in which the type are placed upon a segment revolving or oscillating to bring any given letter into position to receive the impression from the hammer, and particularly to a machine heretofore described by me, the distinguishing feature of which is that the segment is moved and other co-ordinate operations accomplished by the sole motive power of the fingers upon a finger-board of separate keys. In this essential feature the machine now described is the same as that which has heretofore been the subject of applications made by me, and now pending in the Patent Office.

The invention consists of certain important details of construction whereby the machine is greatly simplified and its operation rendered more certain and accurate.

In the drawings hereunto attached, and forming part of this specification, Figure 1 is a plan view of my improved machine. Fig. 2 is a side elevation; Fig. 3, the front view of a section on line *x x* of Fig. 1. Fig. 4 is a plan view of part of the machine, showing the location of the stop and the construction of the parts which rotate the type-segment. Fig. 5 is a section on line *y y* of Fig. 1. Fig. 6 is a detached view of the shaft which carries the detent of the escapement, together with the levers by which it is operated. Fig. 7 is a modification of the stop-arm. Fig. 8 is a rear elevation of the type-segment, with its immediate connections, and of the yoke or frame in which it is mounted; and Fig. 9, an elevation of the weighted lever.

In the machine thus illustrated the feed-rollers A A′ are mounted upon a carriage, *a*, which moves upon the track *b* in the same manner as heretofore represented by me.

The construction of the key-levers of the rollers for holding the paper, the construction and arrangement of the hammer and its mode of operation upon the type-segment, the type-segment itself, and the paper-carriage are all substantially as heretofore shown by me in my previous applications. I have also shown the same construction and arrangement of the escapement devices for giving the step-by-step movement to the carriage.

My present improvements relate principally to improved devices for imparting the motion of the key-levers to the type-segment, and to a simpler and more certain system of stops for arresting the momentum of the type-segment and for holding it accurately in place at the instant when it receives the blow from the hammer which effects the printing. Other important details of construction are fully described and particularly indicated hereinafter.

In Fig. 1 of the drawings, *c c* represent the key-levers, also partially shown in Figs. 2 and 5. The general construction and arrangement of these are, as before indicated, the same as I have shown in previous applications, except that those carrying the first bank of keys and part of the second work upon a front knife-edge, and the remaining levers work upon a rear knife-edge for the purpose of equalizing the levers. Instead of causing these levers to lift frames to impart motion to the type-segment and the stop for the said type-segment, I have formed the key-levers with notches *d d*, Figs. 2 and 5, on their upper edges for operation upon a bar, *e*, fixed in the lower end of arms *f f* of a vibratory frame, *g*. This vibratory frame has its bearings in fixed arms *h h* upon the frame-work B. Upon this vibratory frame *g* is fixed a vertical arm, *i*, a little upon one side of the center, as shown in Fig. 1.

The bar *e* is preferably cylindrical in form, is pivoted, and rolls to save sliding friction, and extends across the entire width of the space occupied by the key-levers, and at right angles to the central lever.

The notches *d d*, which have approximately the form shown in Fig. 5, are so arranged in the levers that the line formed by the bottom of the operative sides of the notches is not exactly parallel with the cylindrical rod *e*, but crosses the said rod at a slight angle, so that when any lever on the right-hand side of the central line of the machine is depressed the rear edge of the notch in that lever will impinge against the rear side of the rod *e* and move it slightly forward. The notches are

so arranged and are made of such form that the outside notches impart the greatest motion to the rod *e*.

The length of the incline in the notch grows gradually less toward the center, and the motion of the rod is correspondingly decreased by the action of the levers as the operator approaches the center in the use of the keys. The direction of the line of notches in relation to the rod *e*, crossing the said rod, as has been heretofore explained, at the center, causes the inclines on the left-hand side of the machine from the center to the outside to strike when the levers are depressed upon the forward part of the bar *e*, push backward that bar, and vibrate the shaft outward instead of inward, as is done when the levers are operated upon the right-hand side.

The arrangement of the notches in relation to the rod *e* from the center to the left is the same as that described from the center to the right. It will plainly appear, therefore, from the description now given that the depression of the key upon the extreme right of the machine will throw the bar *e* forward, imparting to it the greatest amount of motion, and throwing backward the upward-projecting arm *i* in a corresponding manner and extent, while the depression of the key on the extreme left will give an equal amount of motion to the arm *i* in an opposite direction, and the direction changes in passing from the key next on the right of the central key to the key next upon the left of the said central key.

The acting surfaces of these notches form a double set of cams eccentric from the knife-edge. The greater the eccentricity the greater the movement of the rod. Where, in a former application, a double-faced cam attached to the type-segment shaft was operated by lifting-frames moved the varying distances required by the key-levers operating only through a portion of their motion, greater or less, the present arrangement shows a double series of cams formed on the levers themselves, the varying operation of the levers being governed by the varying eccentricity of the cams, which represent in this machine, in a modified form, another feature of earlier applications—*i. e.*, the incline of the bottom rail of the intermediate frame or its equivalent—*i. e.*, the inclined plane of the acting surfaces of the key-levers. The same result could also be conveniently attained by arranging such a frame as is described in previous applications diagonally across the keys, so that it might be lifted by the key-levers at varying distances from the knife-edge. Other connections of the intermediate frame or frames with the type-segment will also be easily suggested. The essential feature of all these methods is, that a segment is moved by key-levers through the means of an intermediate frame or frames, the varying distances being effected in the various methods suggested and others that will readily occur.

The top of the vertical arm *i* is connected, as shown in Figs. 2 and 4, by a rod, *j*, to a lever, *k*. This lever *k* is pivoted as shown in Fig. 4, and is accurately held between springs *l l*, fitted to press equally upon each side. Underneath this lever or bar *k*, which carries the segment at its free end, is a piece, *d*, of the same width as the bar upon which, as well as upon the bar, the springs rest, so that when the bar swings one way one spring is upon the bar and the other upon the underlying solid piece. The latter spring serves as a stop to bring the bar quickly to rest and prevent the quivering and uncertainty of position which would result if the position depended only upon the adjustment of the springs. This steadying of the segment is further assisted by a piece, 15, attached to the arm V, hereinafter described.

The end of the lever opposite its pivot carries a toothed segment, *m*, which meshes accurately into a gear-wheel, *n*, fixed upon a vertical shaft, *o*, which carries the type-segment D. This vertical shaft has its bearings, as shown in Fig. 5, in thumb-screws, one in the top of the frame B and the other in the upper part of a bridge, E.

The parts are all so adjusted that when at rest the zero or central point of the type-segment shall be opposite the face of the hammer. The letters upon the face of the type-segment are arranged from this central point to the right and left in an order corresponding to the frequency of their use, those most used being nearest, and those least farthest on the right and left from the said zero-point. There being three banks of keys, this order of letters is somewhat modified in the present arrangement upon the segment in favor of the middle bank of keys, and for securing certain combinations or sequences of letters for convenience in fingering, and also to give a larger share of work to the right hand than to the left.

It follows from what has been said that when the parts are accurately adjusted the depression of any given lever will vibrate the shaft *g*, and, through the arm *i*, rod *j*, and lever *k*, rotate the type-segment sufficiently and in the proper direction to bring the type-segment letter of the depressed key into position opposite the face of the hammer.

The release of the key permits the inner end to drop or to be depressed by the spring upon the stop, and the spring upon the side of the lever *k* returns the parts to the normal position from which they started. It is necessary, however, for perfect accuracy of the work that the type-segment should be arrested and held for an instant during the stroke of the hammer in a position invariable for each letter, and determined with the utmost accuracy. In the machine described in my previous application this was accomplished by an arm raised upon a frame by any one of the levers, and adapted to be brought in contact with any one of a double series of serrations underneath the edge of the type-segment. By a modification

of this method of arresting the type-segment I have simplified the apparatus and rendered it much more certain and accurate in its operation. The means devised for this purpose are shown clearly in Figs. 4 and 5.

The stops consist of pins *p p*, arranged vertically in the upper and lower plates of the frame B, passing down through the lower plate and resting upon the upper edge of the keys. They are normally depressed by spiral springs, which surround them and bear against the under surface of the upper plate, and at their lower ends upon small pins or collars upon the pins *p p*. When the keys are in their ordinary position the pins resting upon the inner and depressed ends of the key-levers fall below the upper surface of the upper plate, and when the keys are depressed the pins are raised and project through above the said upper surface, so as to arrest the stop-arm *q* in its motion over the upper plate. This arm *q* is fixed upon the shaft *o* of the type-segment, Fig. 5. When the said type-segment is at rest, with the zero-point opposite the face of the hammer, the stop-arm *q*, being directly opposite said zero-point, projects exactly over the middle of the upper plate. The arrangement of the perforations in the plates through which the pins *p p* pass is such that when any given lever is depressed it raises the pin at exactly that point where it is necessary to arrest the stop-arm *q* to bring the proper letter on the type-segment in front of the face of the hammer. These pins being placed each exactly over its appropriate lever, the same depression of the key which elevates the pin rotates the type-segment, and swings the stop-arm *q* toward the said pin until it comes in contact therewith. Upon the dropping of the inner end of the lever the pin is returned, by means of its spring, to its proper position, out of the way of the stop-arm *q*. This arm *q* can strike any given pin only on one side of the arm, or by moving only in one direction. The position of the pins must take into account the width of the arm in fixing the position of any given letter.

A modification of the arm may be made which will admit of its action on either side of the pin, and moving in either direction.

The arm may have its operative end provided with a loose joint, giving it a slight movement by contact with the pin in either direction, as shown in Fig. 7. By this means the same system of stops might be used, and the segment not returned to position after each letter, but left there, the returning devices being removed to be carried by the next key to position. This would simply require an enlargement of the notches, as shown in Fig. 2, the end of their motion being as represented in the present machine. Either side of the notch would, however, be operative on the rod if left in one or another position, and should also be capable of starting the rod from either extreme of its vibratory arc. The dotted lines show the formation of the notches for moving the rod from any position to the desired position indicated by the bottom of the notch.

The improved construction and arrangement of devices for operating the hammer are shown in Fig. 5. The hammer is pivoted at *r*, and is forced against the type by a spring, *p'*. (Shown more clearly in Fig. 1.) In the form shown in the drawings this spring bears against the lower side of the lever *t*, connected to the hammer by a pin, 1, which works in a slot in the said hammer. This lever *t* is pivoted at 2. Its forward end projects over a pivoted dog, *u*, in such a manner that when the dog *u* is lifted it depresses the rear end of the lever, and with it the hammer and the spring, and when the forward end of the lever is slipped over the edge of the dog *u* the recoil of the spring *p'* causes the blow; but the adjustment of the spring *p'* by means of the top screw, *s''*, is such in relation to the hammer that it does not follow the hammer quite to the point of its contact with the segment, and its own weight causes the hammer to rebound and remain supported upon the spring *p'* at a slight distance from the surface of the paper passing before the type. This spring *p'* (shown clearly in Figs. 1 and 5) bears against the lever *t*, but may bear directly against the arm of the hammer instead. It has a screw, *s'*, to increase or diminish its tension, and thereby the force of the blow, as required for greater thickness of paper, or for manifolding, or when the inking-ribbon is pale. The other screw, *s''*, is shown in Fig. 1. It is made with a broad head, which bears against the upper side of the spring *p'* and limits its upward motion. By means of this adjusting-screw the spring is made to serve as a rest for the hammer at a proper point as it rebounds, and sufficient room is also given for the hammer-lever above the dog *u*.

Referring again to the dog *u*, it will be observed that it is pivoted between lugs upon the inner face of a bar, V. (Shown in section in Fig. 5, and in plan in Fig. 1, and part of it in Fig. 6.) The ends of the bar V are bent backward and pivoted to the main frame, as shown at 3, Figs. 2 and 6. This bar V extends over all the levers, and may be lifted by any one of them. When so lifted by any except the central bar the dog *u*, which falls backward by gravity or is assisted by a spring, 4, so as to pass under the extremity of the lever *t*, lifts this end of the lever to depress the hammer, as before described.

The upper or bearing surface of the dog *u* is formed upon a circle from the pivot of the dog, in order that when the frame V returns to rest it may readily fall under the tail of the lever *t*, and that there may be no lost motion when the dog is elevated to act upon the lever. A set-screw, *w'*, bears against a projection opposite the lower end, and limits the movement of the dog under the end of the lever, and thereby the amount of motion imparted to the lever by the upward rise of the bar V—*i. e.*, it determines how far the lever

shall rise before it falls and releases the hammer. It must be adjusted so as to strike when the stop-arm reaches its pin.

The trip of the lever is determined by the relation of the curve described by the point of the dog *u*, its center of motion being the bearing of the frame V and the curve described by the lever *t*. Where these two curves cross each other the lever *t* drops from the point of the dog, as shown in dotted lines in Fig. 5.

As the central key is designed simply for spacing, it is formed at the inner end, as shown, with an offset, 5, which bears against the inner edge of the lower end of the dog *u*, thereby forcing it out of contact with the end of the lever *t*, so that this spacing-lever may operate the escapement mechanism to move the carriage without operating the hammer.

The mechanism for operating the escapement is shown in Figs. 3 and 6. A small shaft, *w*, is pivoted in the rear of the frame carrying the pivoted pawl 6, which is substantially the same as that heretofore shown by me. This shaft *w* is provided with an arm, 7, carrying a pin, 8, which works in a slot in the end of the arm of the bar V.

The operation of the escapement is effected by the rocking of the shaft *w*, caused by the oscillations of the bar V, communicated through the arms, as described.

The construction and operation of the pawl and the combs in which it operates to permit the step-by-step movement of the carriage have been heretofore described by me in a previous application.

In order to throw the pawl out of connection with the teeth of the combs when for any reason it is desirable to move the carriage to the left more than one step at a time, I have provided a bar, 9. (Shown in section in Fig. 5 and in plan in Fig. 3.) This bar has slight longitudinal motion in proper bearings in the frame, and is provided with a head, 10, and a spring, 11, to hold it out of contact with the pawl. Contact with the pawl is effected by pressing the knob 10 to the left, as represented in Fig. 3. This movement carries the arm 12, Figs. 5 and 6, slightly to the left, and causes the pin 13 to push the pawl sidewise out of connection with the teeth. The pawl is held in one direction by a yielding spring, 14, and in the other by a rigid stop.

Upon the right-hand side of the bar V a guard-hook, 15, is fixed, projecting over the rod *e*, holding it in place when the type-segment is in its normal position. This renders important service in arresting the momentum of the wheel and frame on their return to a normal position.

The carriage rides upon a way, F, by means of grooved wheels, in the ordinary manner. The construction of these parts is sufficiently shown in Fig. 5, G being vertical parts of the frame-work, to which the longitudinal bar H is fixed, and which carry the combs I I.

The rollers are mounted as shown at K K′, K′ being hung eccentrically, so that it may be swung out to widen the space between the two rollers. By means of the spring-arm 16 it is held in frictional contact with a segmental bar, 17, Fig. 2. This roller is moved by frictional contact with the paper, which passes between it and the other roller. The roller K is moved by the weighted lever L, Fig. 3. The special construction of this weighted lever is shown in Fig. 9.

An arm, L′, is pivoted on the axis of the shaft of the roller K. Upon this arm is a frictional clutch-lever, L″, pivoted so that its eccentric end, when the other end is depressed, shall bear against the periphery of a smooth pulley fixed on the end of the shaft of the roller K, and thereby effect a connection between the lever and the roll. A fixed stop, 25, limits the upward movement of the weighted lever, its motion in the opposite direction being limited by an adjustable stop, 26. This movable lower stop may be placed higher or lower in holes in the frame, and thus permit of easy adjustment of the spaces between the lines. The upper arm, 18, of this clutch-lever L″ may be operated by a touch of the finger, or by coming in contact with an inclined arm on the frame of the machine, as shown in a previous application.

A beveled gear, 19, upon the shaft of the paper-roll operates with another beveled gear to move the spool M. Another beveled gear, 20, on the opposite end of the shaft of roller K, in the same manner, turns a spool, M′. This beveled gear 20 slides with its shaft through the roll, and may be thrown out of gear with its fellow (the opposite pair being thrown into gear) by means of the lever 21. By this means, the ribbon having been completely wound off upon one spool, the motion is reversed, and then the winding begins upon the other spool.

The tape passes from spool to spool through vertical guides *x x*, Figs. 1 and 5. These guides *x x* are made fast to a bow, *y*, just underneath the type-segment. The ends of this bow are journaled in the yoke E, as shown in dotted lines at *z*, Fig. 1. A spring-arm, 22, on the end of one of the journals of this bow permits the bow to be elevated or depressed, in order to raise or lower the ribbon in the guides. This arm 22 being elastic may be provided with a pin fitting in little holes in the frame, whereby the bow may be held in any required position.

For convenience and compactness I have arranged the driving-wheel and spring which move the carriage as shown in Figs. 1 and 5. The wheel is indicated at O. It is laid flat upon the main support of the machine, and the cord attached thereto is carried around and attached to the frame in any suitable manner. A spring, P, is connected with a fusee upon the wheel, and serves to give to it an even pull, compensating for the varying strength of this spring.

The spools M are held upon the spindles by

nuts with a milled head, which are provided with springs to give sufficient friction to prevent them from unwinding and the ribbon becoming loose.

The spools can be readily removed and new ones substituted, saving the labor of unwinding, the ribbon being sold upon such spools to be readily replaced, not soiling the fingers.

A bail, R, is pivoted in standards S, Figs. 3 and 5, being held by set-screws in the head of the standards, so that it may be adjusted at any angle which best serves the purpose of supporting the paper as it rises through the rollers after being printed.

In Fig. 5 the hammer is represented as terminating at the shaft *r*, and as being operated by an independent lever. This lever may be dispensed with, and the hammer itself be prolonged so as to bear upon the dog *u*.

The type-wheel may be made as an entire wheel, or as a segment of a wheel of any size suited to hold the letters, figures, and marks required for printing upon this class of machines.

The spools, it will be observed, move at each movement of the paper to form a new line, so that a fresh surface is always automatically presented to the action of the hammer and the type.

A web of paper may be placed within the paper-holder with perforations, to enable it to be easily separated in sheets when the work is finished.

The subject-matter herein shown, but not specifically claimed, is claimed in other applications now pending in the Patent Office, filed by me previous to the date of this application. This case is a division of the application filed by me April 1, 1879.

Having thus described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. The series of key-levers *c c*, provided with notches, as described, in combination with the oscillating rod *e*, as set forth.

2. The vibrating shaft *g*, provided with an arm, *i*, positively connected to the shaft of the type-segment and imparting motion to it, in combination with the rod *e* and the notched levers, as set forth.

3. The combination, with the bar V and dog *u*, pivoted between ears upon the bar V, of the adjusting-stop *w'* and of the lever which operates the hammer, as set forth.

4. In combination with the dog *u*, the central key, formed with an offset to lift the said dog out of contact with the hammer-lever, as set forth.

5. In combination with the roller K, the beveled gears on the shaft of the said roller and the spool-carrying devices, as set forth.

6. In combination with the roller K, having a shaft capable of longitudinal motion, and with the beveled gears communicating motion to the inking-ribbon, the lever 21, constructed and arranged to operate in connection with the gear 20, as set forth.

7. The combination of the eccentrically-hung roller K', the arm 16, and the segment 17, as set forth.

8. The bow *y*, journaled in the yoke E, and carrying the guides *x x*, arranged in the described relation to the inking-ribbon, whereby the ribbon may be raised or lowered to bring any given part of it into use, as set forth.

9. The combination of the arm *k*, springs *l l*, and the stop beneath the said arm, the parts being adapted to operate in connection with the type-segment, as set forth.

10. The friction-clutch constructed as described, in combination with the rolls and the fixed and adjustable stops, as set forth.

11. In a type writing machine, the combination of levers and intermediate mechanism, substantially as described, adapted to impel the type-segment to bring any given letter into proper position, and of pins arranged to be lifted by the same movement of the levers which operates the type-segment, said pins operating, in connection with an arm on the shaft of the type-segment to arrest said segment, all the parts specified being combined and operating as set forth.

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

JAS. B. HAMMOND.

Witnesses:

WARREN SEELY,

FRANK MIDDLETON.