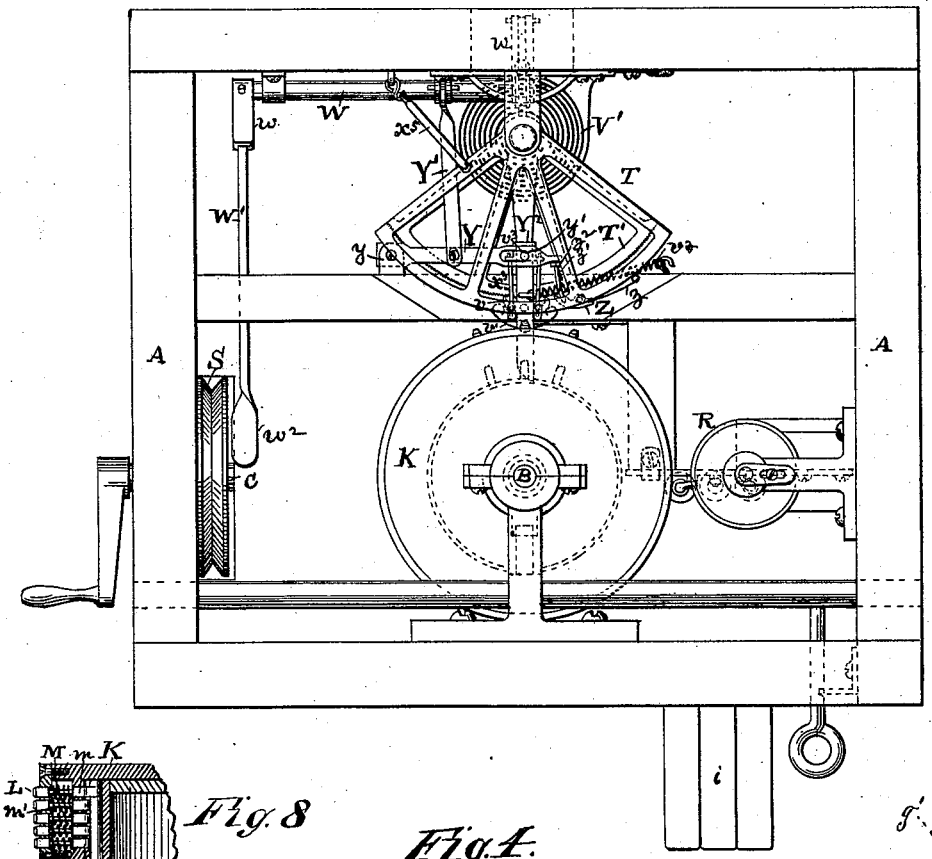
2 Sheets—Sheet 1.

G. H. MORGAN.

TYPE-WRITING MACHINES.

No. 195,149. Patented Sept. 11, 1877.

Fig. 1.



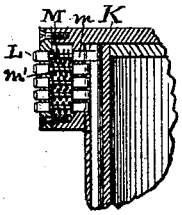
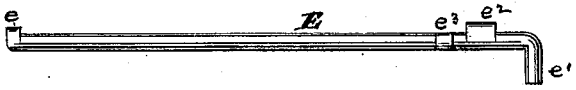


Fig. 8

Fig. 4.



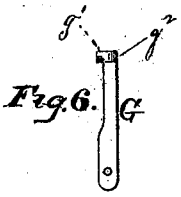


Fig. 6.

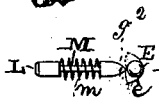


Fig. 9.

Fig. 5.

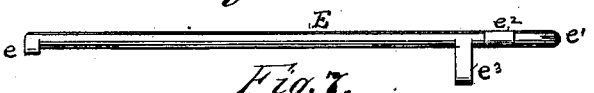
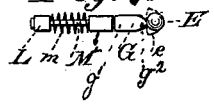


Fig. 7.



Witnesses.
L. Van Riswick
D. G. Stuart

Inventor.
G. H. Morgan

2 Sheets—Sheet 2.

G. H. MORGAN.

TYPE-WRITING MACHINES.

No. 195,149. Fig. 2. Patented Sept. 11, 1877.

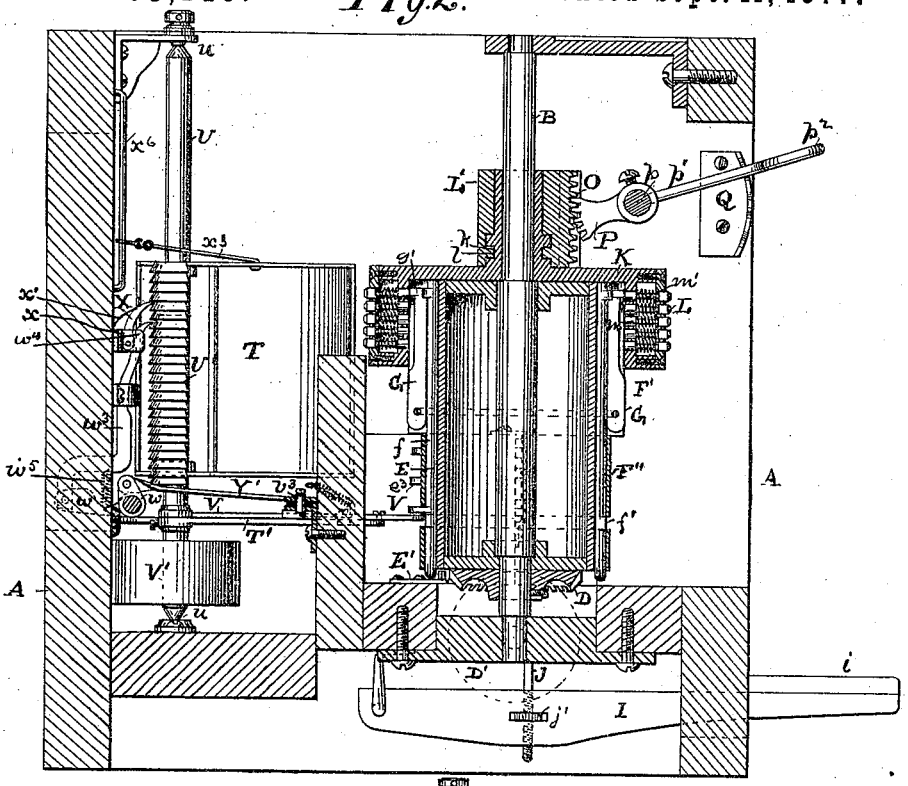
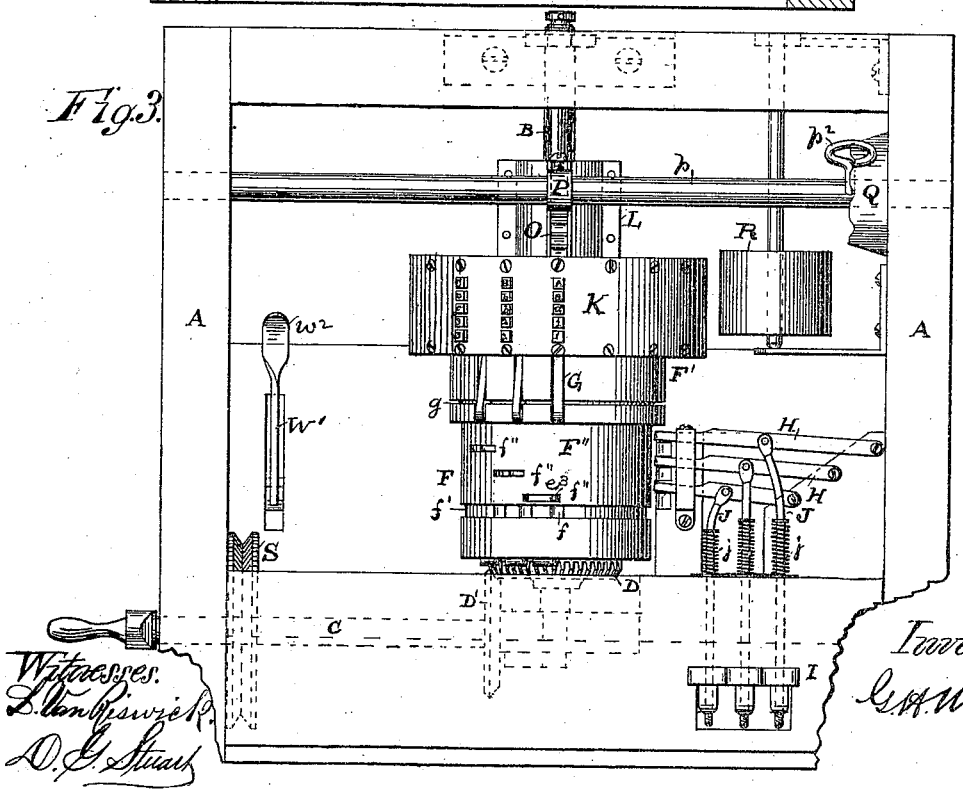


Fig. 3.



Witnesses.
L. Von Briesen Jr.
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Inventor.
G. H. Morgan.

UNITED STATES PATENT OFFICE.

GEORGE H. MORGAN, OF ALEXANDRIA, VA., ASSIGNOR TO TYPOGRAPHICAL MACHINE PRINTING COMPANY OF THE DISTRICT OF COLUMBIA.

IMPROVEMENT IN TYPE-WRITING MACHINES.

Specification forming part of Letters Patent No. 195,149, dated September 11, 1877; application filed March 14, 1876.

To all whom it may concern:

Be it known that I, GEORGE H. MORGAN, of Alexandria, in the county of Alexandria and State of Virginia, have invented certain new and useful Improvements in Type-Writing Machinery; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

The invention relates to a new and improved type-writing machine by means of which the alphabetical characters of words are printed in ordinary text, with due regard to their difference in size and the space which they occupy—that is, properly spaced, or with proper spaces between the letters of each word and between the words themselves—and with mechanism so arranged that the spaces between the letters of each word and between the words may be more or less increased, as occasion requires.

I have accomplished this result by means of a revolving type-wheel carrying a series of independent and adjustable type-carriers, each having a single letter in different styles of type, arranged so as to receive a back-and-forth movement at the will of the operator, so that the type required to be printed is presented to the action of a type-hammer at the right moment.

I have also accomplished the same result—possibly in a better manner—by means of a revolving type-wheel, having type arranged or inserted in the periphery radially, the letters of the different alphabets or styles being inserted in parallel circles, each style or size in its own circle—that is to say, all the capitals of the same style in one circle, all the common text of the same style in another circle, the Italic capitals in another, and the Italic common text in another, and so on, each different style or size of letter having a circle of its own, so that each letter in its different style shall run in a line parallel with the axis of the wheel.

This description of wheel or type-cylinder I have made adjustable, so as to bring the desired style of type opposite to a fixed point, where the required type, through the operation of mechanism connected with the key, is made to receive an impulse of motion which brings it in contact with the paper to be printed upon.

The mechanism I devised for operating the type of this wheel or cylinder consists of sliding cam-rods, which push out key-levers against the stems or heads of the stems of the type, a return movement, and a spring upon the stem of the type, withdrawing the type from a printing position.

The improvements I now desire to secure by Letters Patent consist in the use of cam-rods which turn upon their axis without moving in a longitudinal or vertical direction, said turning cam-rods being journaled in a revolving cylinder, and operating so that, when turned on their axis, the cams will impart a reciprocating motion or motions to the type, whereby the type is first charged with the printing-ink, and then brought in contact with the paper to be printed, and then, if necessary, be brought into contact with a wiper, or device for cleaning the face of the type before again being charged with the printing-ink, all as hereinafter more fully set forth.

The invention also consists in a new paper-carrying device, which receives motion through suitable connecting mechanism from contact with cams on the turning rods, which also impart motion to the type. The paper-carrier remains stationary until the contact between its operating mechanism and the cam on the turning rod takes place, and then the motion continues so long as the type remains in contact with the paper, and a distance beyond sufficient to form the requisite space between the printed letter and the next letter to be printed; or the contact and consequent motion of the paper-carrier may begin before the type begins to print, and the necessary space between it and the last previous letter printed be thus obtained before the second letter is made to print.

The invention further consists in certain new and improved devices and combinations of devices, whereby the movement and adjustment of the paper-carrier is operated and controlled, all as hereinafter more fully set forth.

In the accompanying drawings, Figure 1 is a plan view of my improved machine. Fig. 2 is a vertical sectional view, and Fig. 3 is a front elevation, of the same. Figs. 4 and 5 are detached views of the turning or journaled cam-rods enlarged. Fig. 6 represents a detached view of one of the hammer-headed levers that actuate the type; and Fig. 7, an end view of one of the turning rods and hammers which actuate the type as arranged in connection with one of the type, in order to illustrate their construction and relation to each other, they for this purpose being detached from the machine. Figs. 8 and 9 show a modification of the method of operating the type by the turning cam-rods, by means of which the hammer-headed levers may be dispensed with.

Referring to the parts by letters, A represents the frame-work, to which the parts of the machinery are journaled or otherwise secured. B represents a vertical shaft journaled in suitable bearings in the frame A, and C is a horizontal shaft arranged at right angles to the shaft A, by means of which motion is imparted to the machine, any suitable power being applied. D D′ are gear-wheels on the shafts B and C, respectively, by means of which motion is transmitted from the shaft C to B. F is a cylinder keyed to the shaft B, so as to revolve with it. The upper portion F^1 of the cylinder F is made of greater diameter than the lower, and the whole is formed with a series of grooves, *f*, which extend throughout its length. f^1 is a circumferential groove formed in the periphery of the lower portion of the cylinder F, and f^2 represents a series of slots formed in a band, F^2, which surrounds the periphery of said portion F, the slots being arranged on a spiral line, as clearly shown in Fig. 3 of the drawings.

E represents a series of rods, having cams *e* and bent ends e^1, cam projections e^2, and cranks e^3, the edges of which are rounded or beveled off. These rods E may be of unequal length; but I prefer to have them all of the same length. They are placed or journaled in the longitudinal grooves of the cylinder F, so that the bent ends e^1 will all be in a line or in the same circle, and project from the lower end of the cylinder around its periphery, the other or cam ends, *e*, being arranged in a circumferential line around the cylinder at or near its upper end. The cams e^2 on the rods E are also arranged on a circumferential line, so as to occupy the groove f^1.

The cranks e^3 are arranged at varying distances—that is to say, each rod E has its crank in a different position, or higher up or lower down than the one next adjacent to it, so that they will form a spiral line around the cylinder when all the rods are in position, the cranks being arranged so as to occupy the slots f^2 and project therefrom when the rods are operated, as hereinafter set forth. E′ is a fixed cam or rod turner secured to the frame of the machine, having an upwardly-projecting end, which comes in contact with the lower bent ends of the rods E as the cylinder revolves, thereby turning the rods.

G represents a series of levers corresponding in number with the rods E and grooves *f*. They are pivoted near their lower end within the outer or extended portions of the grooves *f* in the upper part of the cylinder, and outside of the rods E.

The pivoting of these levers G may be accomplished by stringing them on a wire, which is then passed into the circumferential groove *g* formed in the periphery of the upper portion of the cylinder. The upper ends of the levers G, on their side next the type, are each provided with a projection or hammer-head, g^1, and on their opposite side, next the rods E, with a double cam, g^2.

H represents a series of bars corresponding in number with rods E, pivoted at one end to the frame of the machine, and having their other or free ends arranged in a vertical line close to the periphery of the cylinder F, with spaces between them sufficient to permit of the cranks e^3 passing through between them without contact.

I represents a series of pivoted bars, the outer ends of which are formed into finger-keys *i*. These bars correspond in number with the bars H, and are connected therewith by a corresponding series of rods, J, having coiled springs *j*. The rods J have threaded ends, which are passed down through the key-bars I, and are provided with screw-nuts *j′*, which occupy slots in the bars I.

K represents the type-wheel or cylinder. It is loosely mounted on the shaft B, and made so as to fit over the upper portion of the cylinder F^1, as shown in the drawings. It has a series of slots arranged in parallel lines.

L represents the type, and M the type-stem, each having a head or projection, *m*, on its inner end, and a spiral spring, *m′*, placed around the stem M, which bears against the inner side of the outer plate of the type-wheel and against the heads of the type-stems. The types with their stems and heads are inserted in the slots in the type-wheel. The type-wheel has a central projection on its upper side, formed with a circumferential groove, *k*.

L is a sleeve, which may be clamped or loosely mounted on the shaft B. It is provided with an annular ring, *l*, which fits the groove *k*. One part of this sleeve L is formed into a rack-bar, O.

P represents a segmental gear keyed to a shaft, *p*, which is journaled in the frame A. The teeth of the segment-gear engage with the rack-bar O. p^1 is a lever or crank, the inner end of which is secured to the shaft *p*, and its outer end is provided with a handle, p^2, projecting beyond the frame A.

Q is a notched index-plate secured to the frame A, with which the lever or crank p^1 engages. R represents an inking-roller mounted on a vertical shaft journaled in the frame A. S is a band-wheel on the shaft C, by means of

which motion may be imparted to the cylinder and type-wheel through power derived from any convenient source.

The parts hereinbefore described constitute the printing mechanism, and its operation will be more fully described hereinafter.

I will now proceed to describe the paper-carrying device and the mechanism for operating and adjusting the same.

T represents the paper-carrier, consisting of a frame in the form of a segment of a cylinder, loosely mounted or journaled on a vertical shaft, U. T′ is a segment, which is keyed or secured to the shaft U at a point beneath the paper-carrier. The periphery or outer edge of the segment T′ is milled or formed into a ratchet having fine teeth. V is a lever, pivoted to the shaft U at a point immediately above the segment T′, its free end projecting beyond the paper-carrier and into the groove f^1 of the cylinder F, for the purpose hereinafter set forth. v represents a pawl or pawls pivoted to the lever V, and held in contact with the ratchet-teeth of a segment, T′, by springs v^1. v^2 is a spiral spring, one end of which is secured to or connected with the frame of the machine, and the other with lever V. V′ is a spring, one end of which is secured to the frame, and the other to the shaft U, the body of the spring being coiled around the shaft. The shaft U has conical bearings u, and is also formed with a vertical groove for the reception of feathers or keys on the paper-carrier, so as to cause the latter to turn with the shaft, and yet permit of its being moved freely up and down thereon, for the purpose hereinafter described. W is a shaft, journaled in proper bearings secured to the frame of the machine, and having cranks w w^1 on its end. W′ is a lever, secured at one end to the crank w, and having a handle or thumb-piece, w^2, on its other end. w^3 is an elbow-lever, pivoted at one end to the extremity of the crank w^1, its other or upper extremity formed into a pawl, w^4. w^5 is a spiral spring, one end secured to the crank w^1, and the other to the lever w^3. U′ is a ratchet-bar secured to the axis of the paper-carrier T. X is a pawl pivoted to a bracket, x, said pawl being arranged above pawl w^4, and held in contact with the ratchet U′ by a spring, x^1. Y is a lever, pivoted at one end to a bracket, y, and having a slot, y', near its other end.

Z is a pawl pivoted to the frame of the machine, and kept in contact with the ratchet on the segment T by means of a spring, z. This pawl Z is connected with the lever Y by means of a rod, z^1, the end of which passes through a slot in the extremity of said lever Y, which is thereby brought in contact with a projection, z^2, on the rods z^1.

Y^1 is a connecting-rod, pivoted at one end to the lever Y, and between brackets or lugs secured to the shaft W at its other end.

Y^2 is a sleeve, which slides back and forth on the lever V, and carries a pin, v^3, which passes up through the slot y' in the lever Y.

x^3 x^3 are rods having outer slotted ends, through which pins secured to the pawls v pass. Their other ends are threaded, and pass through ears or lugs which project from the sleeve Y^2.

x^5 is a spring or elastic cord, one end secured to the paper-carrier and the other to a ring, which is made to slide up and down on a rod, x^6, secured to the frame of the machine.

The operation of the machine is as follows: With the machine constructed as described, it will be seen that the printing is effected by mechanism operating in connection with a cylinder, which is made to revolve by any suitable power, and that so long as the keys are not operated the cylinder revolves without affecting the paper-carriage, the latter remaining stationary until the printing of a letter, when the paper-carrier will be actuated through connection with the cylinder.

In order to make the operation of the machine clear to those skilled in the art, I will first describe the operation of the printing mechanism.

The cylinder being made to revolve by power, as before described, the type-wheel is first adjusted by means of the lever p^1, shaft p, and segment-gear P, which engages with the ratchet O on sleeve L, so as to raise or lower the type-wheel K and bring the required style of type to be printed into a circumferential line with the hammer-heads of the levers G. The operator then presses upon the finger-key I of the desired letter, thereby drawing down the corresponding pivoted bar H, so that its projecting end will come in contact with the crank e^3 of the corresponding rod E as the cylinder revolves, thereby causing the rod to turn in its groove f and bring the cam e in contact with the cam on the end of the lever G, thereby pushing the hammer end of the lever G against the stem of the type, and pushing the latter out against the inking-roller to receive a supply of ink. As soon as the cams pass each other the spring on the type-shaft retracts the type and pushes the lever G back to its former position.

When this inking operation has been accomplished the finger-key may be released from pressure, the operation of printing being accomplished automatically in the following manner: As the cylinder continues to revolve and the inked type comes to the printing position, the bent end e^1 of the rod E comes in contact with the fixed cam E′, and thereby turns the rod E to its original position—that is, with the crank e^3 projecting from the slot f^2. In turning the rod the cam e will again operate on the lever, and push out the type against the paper to be printed in the same way as it was pushed out against the inking-roller.

In this way it will be seen that it is only necessary to ascertain that the type has been brought in contact with the inking-roller, the printing being effected though the key is released from pressure. And it will also be evi-

dent that, when once the type is inked, it must print, and that no type receives the ink until operated by the key; and, the inking and printing being almost simultaneous, the type is kept clean and free from ink when not in use.

In Figs. 8 and 9 a modification of the actuating printing devices is shown, in which the hammer-headed lever G is dispensed with as an intermediate device between the end of the type and the cam-rods E, the cam *e* of the latter, in this modification, acting directly on the end of the type, which for this purpose, on their end next the cam, are constructed with a double cam-face, g^2, as clearly shown in Fig. 9. The devices for and mode of operating the type are in every other respect the same as when the hammer-headed levers are used.

The operation of the paper-carrier is as follows: As the cylinder revolves and the type has been inked, as before described, the cam e^2 on the rod E has been turned outward in the slot f^2, so as to come in contact with the projecting end of the lever V. This contact may commence a little before the type is thrown out to print; or it may commence at the same time with the movement of the type, and continue a short distance after the type is printed. The effect of the contact is to move the lever V from right to left a distance sufficient to move the paper the distance required for the letter being printed, and for the space between that letter and the next letter to be printed.

As the lever V moves, its pawl or pawls *v* engage with the teeth of the segment T′ and move the latter the required distance, thereby turning the shaft U, and with it the paper-carrier T. The pawl Z, which also engages with the ratchet of the segment T′, prevents any backward movement of the latter.

In this way it will be seen that the paper-carrier will be moved on its axis in a direction from right to left, and that it only moves when the type is printing; and when it does move it only moves the required distance to print that particular letter and leave the necessary space between it and the next letter.

When the end of the line is reached the operator presses upon the end of the lever W′, thereby turning the crank-shaft W. The turning of this crank-shaft superinduces a twofold motion of the paper-carriage: First, through the connecting-rod Y^1, lever Y, and rod z^1, the pawl Z is disengaged from the ratchet on the segment T′, and the spring V′, which has been wound up by the turning of the shaft in the motion of the paper-carrier from right to left, will retract or turn the shaft back to its original position, thereby reversing the paper-carrier. Second, the turning of the crank-shaft W raises the elbow-lever w^3, and causes the pawl w^4 on its end to force up the paper-carrier in a vertical direction, through contact with the ratchet U′, a sufficient distance to form a new line. By repeating the pressure on the lever the paper-carrier may be thus moved vertically upon the shaft U any required distance. After it has been pushed up the required distance the pawl X, which also engages with the ratchet U′, holds it, and prevents it from descending.

When the bottom of the page or printed column has been reached, and a new one is to be begun, the paper-carriage is brought down to its original position. This is also accomplished by pressing on the lever W′, and thereby forcing up the lever w^3 until its end comes in contact with, and presses the pawl X away from contact with, the teeth of the ratchet U′, when the paper-carriage will fall or descend by its own gravity.

It will thus be seen that by the use of the lever W′ all the adjustments of the paper-carriage are effected, and it will be evident that the operator may reverse the paper-carriage at any point, and begin a new line as often as desired, without affecting the printing mechanism, and that no attention requires to be given to the paper-carriage while the printing mechanism is in operation.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination of rocking or turning rods E, having cams *e*, and cylinder F, with type having a simple reciprocating radial motion, in the manner substantially as and for the purpose specified.

2. The combination of rocking or turning rods E and their cams *e* and cylinder F with a type-wheel carrying one or more series of spring-type having a simple radial reciprocating motion, in the manner substantially as and for the purpose specified.

3. The combination of the rocking rods E, having cam-faces *e*, cylinder F, levers G, and type-wheel K, substantially as and for the purpose specified.

4. The rocking rods E, having bent ends e^1, arranged to operate with the cylinder F and fixed cam or rod-turner E′, substantially as and for the purpose specified.

5. The combination of the pivoted bars H and the rocking rods E, having cranks e^3 and cams *e*, with the cylinder F and lever G, for the purpose described.

6. The combination of the key-bars I, rods J, and pivoted bars H with the cylinder F and rods E, having cranks e^3, substantially as and for the purpose specified.

7. The rocking rods E, having cam-faces e^2, arranged to operate in combination with the cylinder F and lever V, substantially as and for the purpose specified.

8. The rocking rods E, having the cams *e*, bent ends e^1, and cranks e^3, arranged to operate in combination with the cylinder F, pivoted bars H, fixed cam E′, and type-wheel K, substantially as and for the purpose specified.

9. The cylinder F and rocking rods E, having cams $e\ e^2$, cranks e^3, and bent ends e^1, arranged to operate in combination with a fixed cam, E′, pivoted bars H, type-wheel K, and the lever V, substantially as described, for

inking and printing the type and moving the paper-carriage, substantially as and for the purpose specified.

10. In a type writing and printing machine, the combination of a revolving cylinder and type-wheel, operating, substantially as described, with an oscillating paper-carrier, substantially as and for the purpose specified.

11. In a type writing and printing machine, the combination of a revolving cylinder and type-wheel, operating substantially as described, with an oscillating paper-carrier, receiving motion from the same mechanism which operates the type while printing, substantially as and for the purpose specified.

12. The combination of an oscillating paper-carrier, T, constructed to form the printing-platen, with the printing devices of a type-writing machine, substantially as set forth.

13. The combination of a lever, V, and pawl or pawls *v* with an oscillating paper-carrier and segmental ratchet T′, substantially as and for the purpose specified.

14. The combination of the pawls *v* and Z with the segment T′, lever V, and shaft U, for the purpose of moving the paper-carrier, substantially as and for the purpose specified.

15. The crank-shaft W, connecting-rod Y^1, lever Y, and rod z^1, operating, in combination, so as to detach the pawl Z from the segment T′ and permit of the reversing of the paper-carrier, substantially as set forth.

16. The crank-shaft W, lever w^3, having pawl w^4, operating, in combination with the ratchet U′, for the purpose of raising the paper-carrier, substantially as set forth.

17. The combination of the spring-pawl X and ratchet U′ with an oscillating segmental paper-carrier, T, in the manner substantially as and for the purpose specified.

18. The crank-shaft W and lever w^3, operating, in combination with the connecting-rod Y^1, lever Y, sleeve Y^2, and rods x^3, for the purpose of disengaging the pawls *v* and X and permitting the descent of the paper-carrier, substantially as set forth.

19. The combination of the lever W′ and crank-shaft W with an oscillating paper-carrier, T, and connecting mechanism, substantially as described, for the purposes set forth.

20. The segmental paper carrier T, having the ratchet U′ secured to its axis, arranged to operate, in combination with the vertical shaft U, substantially as and for the purpose specified.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

G. H. MORGAN.

Witnesses:
D. G. STUART,
E. J. SWEET.