

(No Model.)

4 Sheets—Sheet 1.

E. M. HAMILTON.  
TYPE WRITING MACHINE.

No. 357,666.

Patented Feb. 15, 1887.

Fig. 1

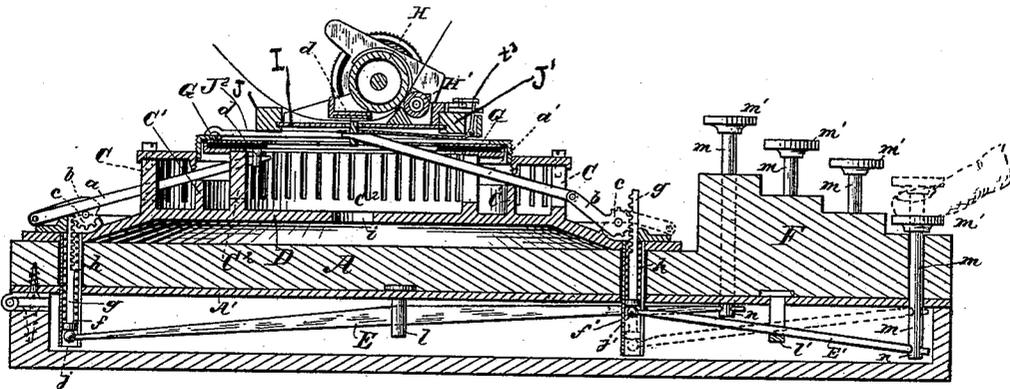


Fig. 2

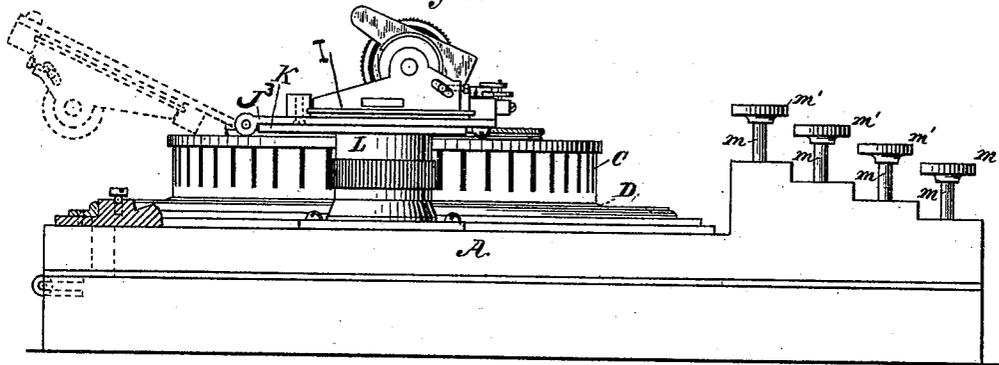
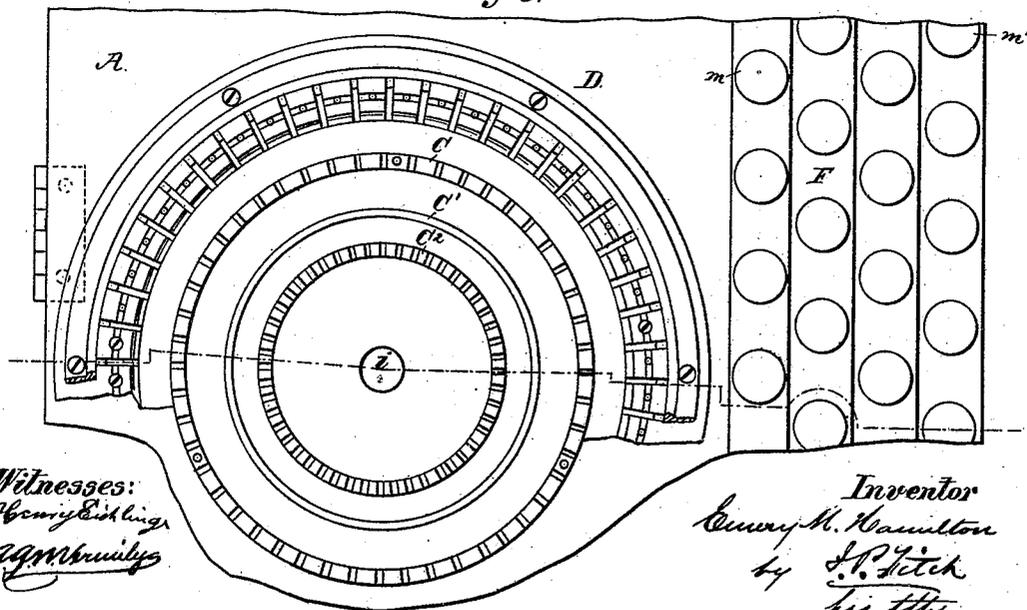


Fig. 3



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Inventor  
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(No Model.)

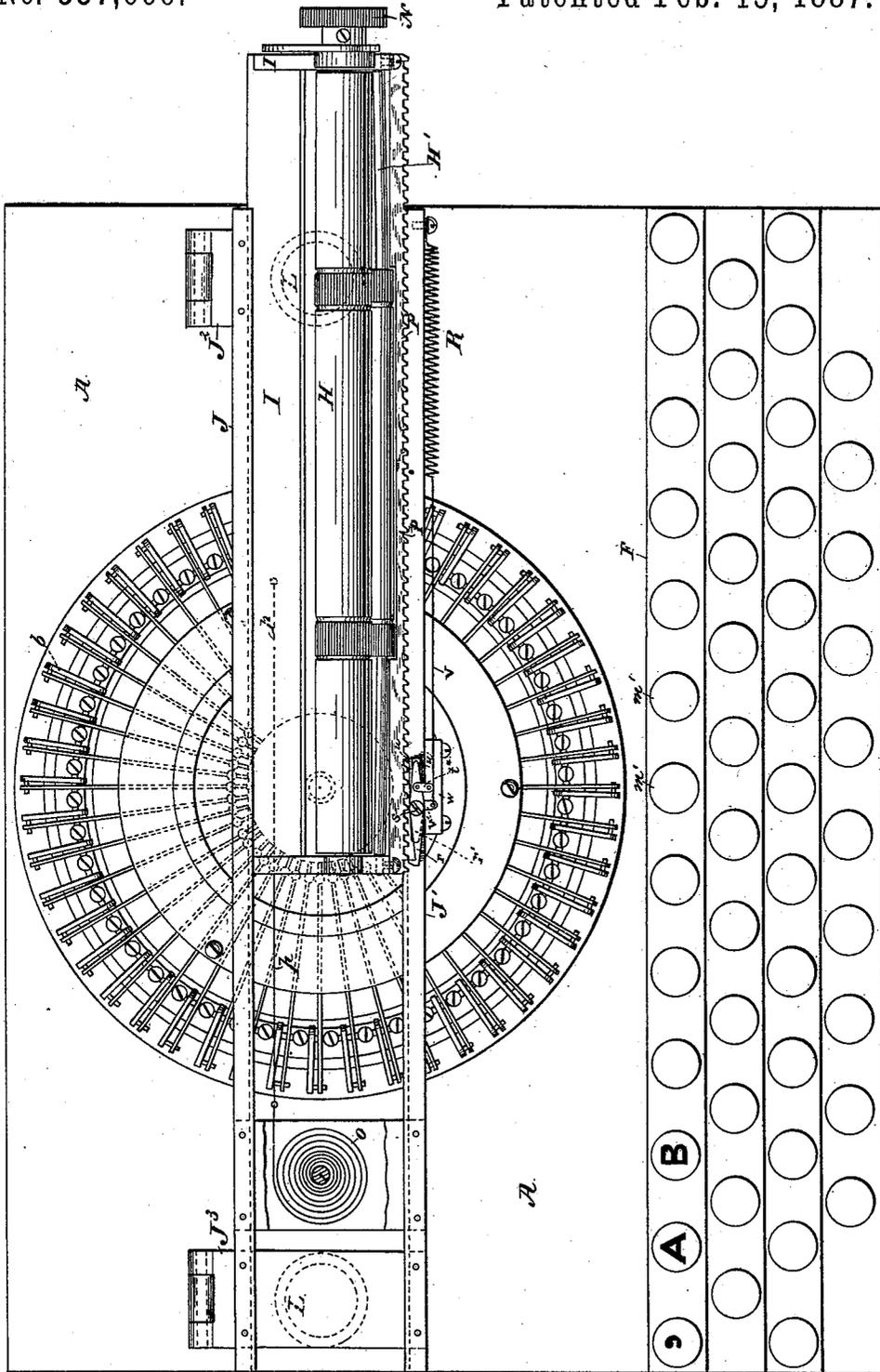
4 Sheets—Sheet 2.

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Fig. 4.



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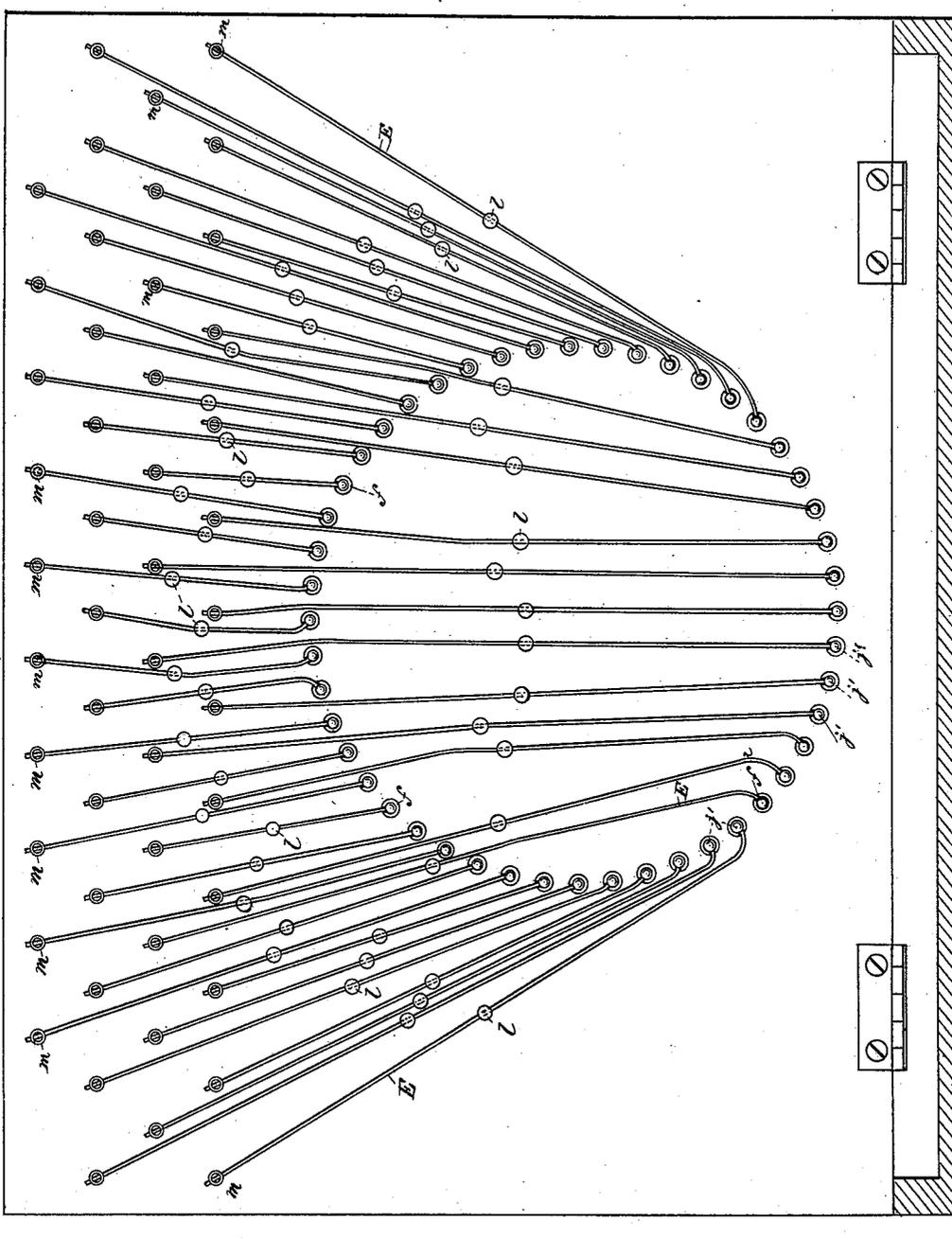
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*fig. 5*



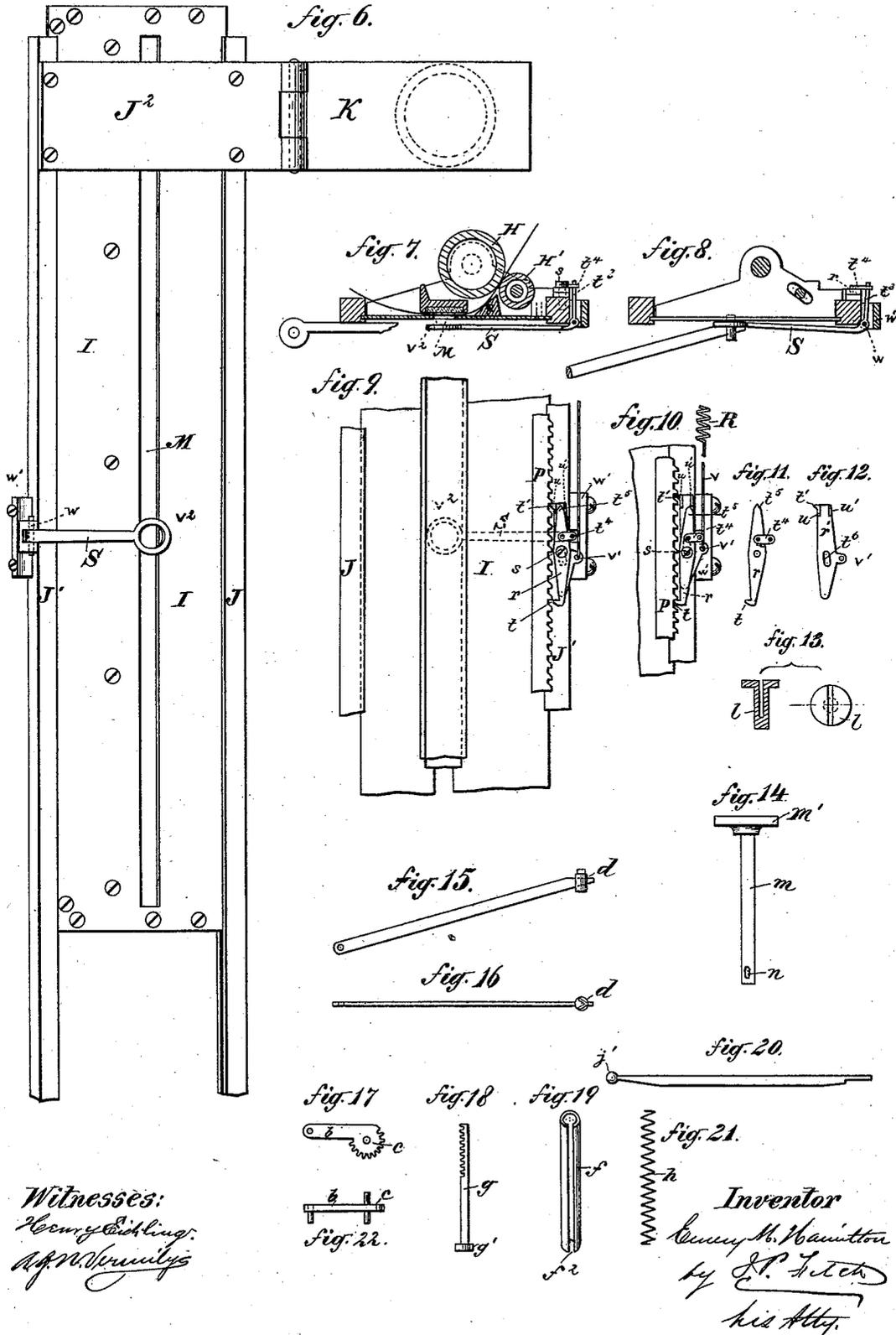
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E. M. HAMILTON.  
TYPE WRITING MACHINE.

No. 357,666.

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# UNITED STATES PATENT OFFICE.

EMERY M. HAMILTON, OF NEW YORK, N. Y., ASSIGNOR TO THE HAMILTON  
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## TYPE-WRITING MACHINE.

SPECIFICATION forming part of Letters Patent No. 357,666, dated February 15, 1887.

Application filed March 13, 1884. Renewed May 3, 1886. Again renewed December 2, 1886. Serial No. 220,527. (No model.)

To all whom it may concern:

Be it known that I, EMERY M. HAMILTON, of the city of New York, in the county and State of New York, have invented a new and useful Improvement in Type-Writing Machines, of which the following is a specification, reference being had to the accompanying drawings, forming a part of the same, in which—

10 Figure 1 is a central vertical section of a type-writing machine containing my invention. Fig. 2 is an end view of said machine. Fig. 3 is a plan of a broken portion of the same. Fig. 4 is a plan of the machine entire. Fig. 5 is a view of the key-levers as seen on the under side of the machine. Fig. 6 is an under face view of the carrier. Fig. 7 is a cross-section of said carrier. Fig. 8 is a cross-section of the said carrier with the rollers and guide-bars removed. Fig. 9 is a plan or top view of a broken middle portion of the carrier-frame, showing the feed devices; and Figs. 10 to 22, inclusive, are detailed views of several parts of the machine, hereinafter more particularly described.

25 In this machine the printing is effected by type fixed on the inner ends of a series of levers that are arranged radially around a circle, so that each lever, when actuated, carries its type to the center of the circle, when the printing impression is made upon the paper, which is properly presented to the type by the described carrier. The levers are severally actuated by a crank-arm on a short rotary shaft, to which the requisite motion is given from a key-lever, preferably communicated through a rack that is reciprocated by the key-lever and meshes into a toothed segment on the arms. The inking of the type is effected by means of an annular inking-pad placed and arranged concentric to the center of said circle, so that when the types are withdrawn from the paper after severally making their printing impressions they strike against the face of the inking-pad and take up the requisite ink. By these means the printing impression is made by the type directly upon the paper, without the intervention of an inking ribbon or apron or any similar device, thereby giving a clear and distinct impression.

The paper carrier consists of a pair of rollers journaled to rotate in bearings on a plane plate or bar that slides laterally in a frame hinged to supports over the center of the circle of type-levers, and a lateral step-by-step movement is given to the carrier by a suitable spring and an escapement that is actuated by a lever that is operated by the type-levers.

I will proceed to describe my machine in detail.

A is the platform on which the working parts of the machine are mounted. It may be a plane piece of board or deal, but preferably strengthened by a metal plate, A', secured to its under face.

D is a disk, on which are formed the upwardly-projecting annular flanges or rings C C', two of which, C and C', are each provided with a series of radial slots. (Indicated on C in Fig. 2 by heavy black lines and on both in Figs. 1 and 3 by two thinner lines.) The type-levers, the entire series of which is shown in Fig. 4, and two of them marked a a' in Fig. 1, pass through these slots or openings and fulcrum on the annular flange C'. The outer ends of the levers are pivoted to crank-arms, (one of the series in Figs. 1 and 4 being designated by the letter b,) that are provided for them on the disk D. The axial ends of these arms are enlarged laterally to form toothed segments c. One of them is shown detached at Figs. 17 and 22. As will be seen by said figures, the enlargement forming the segment projects on one side of the arm of the crank, so that one edge of the said arm is tangential to the circle of said segment and the opposite edge is radial to said circle. The toothed segment extends from the latter edge of the said arm around to the opposite edge thereof, as seen in Fig. 17. The rack-bar g is placed and arranged to engage or mesh with said segment between the axis of the segment and the opposite end of the arm when the lever is rocked into a position over the end of the bar, as shown at the left-hand side of Fig. 1. The types d are fixed on the inner ends of the type-levers. At Fig. 15 is shown a side view, and at Fig. 16 an edge view, of one of these levers with a type attached.

f f', Fig. 1, represent slotted metal tubes inserted in apertures made for them through the

platform A and plate A' and into the disk D. A series of these tubes corresponding in number with the type-levers is shown arranged in a circle in Fig. 5, the open lower ends of the series being exposed to view. One of these tubes detached is represented by Fig. 19, Sheet 4, showing the longitudinal slot or opening  $f^2$ . In each of these tubes is fitted to reciprocate vertically a rack-bar,  $g$ , a side view of one of which is shown detached by Fig. 18.

Each tube  $f$  has arranged within it a spiral spring,  $h$ , which bears at the upper end against the plate D and at the lower end against a head,  $g'$ , on the lower end of the rack-bar, thus acting to force the bar downward. This rack-bar meshes with the toothed segment on the crank-arm, so that when the rack-bar is left free to move under the pressure of the said spring and is forced downward the crank-arm will be rocked into the position shown at the left-hand side of Fig. 1, and when the rack-bar is forced upward the said crank-arm will be rocked into the position shown at the right hand of said figure. Now, it is obvious that the described oscillation of the crank-arm by the upward movement of the rack-bar carries the type-lever from its position shown at  $a$  to the position shown at  $a'$ . The lever rocking and sliding on its fulcrum C', the inner end, carrying the type, will first descend and then move inward on a curved line and upward to the central point, where it is to make its printing impression. With the descent of the rack-bar the movement of the type-lever will be reversed and the type brought back to its first position. This lever movement is the subject of a separate application for Letters Patent filed in the Patent Office June 22, 1883, and allowed December 26, 1883.

E E', Fig. 1, represent two of the key-levers. The entire series and their arrangement are shown in Fig. 5. I will describe one of them, it being understood that they are all of corresponding construction, except that they necessarily vary in length. The lever is made of sheet metal, preferably steel, of sufficient breadth to give them the requisite stiffness. They may be cut out conveniently by suitable dies. The preferable form of the shorter ones is shown at E', Fig. 1. The form of the shorter ones may be that shown in Fig. 20. On the inner end is formed an enlargement,  $j'$ , of suitable size to fit into and slide easily in the tube  $f$ . This enlargement is introduced into the lower end of the tube containing the rack-bar  $g$  and spring  $h$ , the neck of the lever at the enlargement passing into the longitudinal opening  $f^2$  in the said tube, whereby the end of the lever is enabled to slide up and down freely in the tube, and, in conjunction with the spiral spring, actuate the rack-bar in the tube.

The key-levers are fulcrumed in a short shaft fixed in the plate A'. Two of these shafts are shown at  $l l'$  in Fig. 1. A side and head end view are shown at  $l$  in Fig. 13, and the lower end view of the entire series is shown at the clear circles in Fig. 5, a few of them in that

figure being designated by the letter  $l$ . They are arranged, as will be observed, so that the fulcrums of the several levers will be at their longitudinal centers, so as to give uniform movements to the type-levers by equal movements of the keys. Openings are made in these shafts  $l$ , through which the levers are passed, the bottom of the slots forming the fulcrums. These openings are easily formed by a cut directly through the head down into the body of the shaft, as seen in Fig. 13.

One of the keys for actuating the key-levers is shown at Fig. 14. It consists of a shaft,  $m$ , provided at its upper end with a button or finger-piece,  $m'$ , and near the lower extremity with an aperture,  $n$ . These keys are arranged to reciprocate vertically in vertical apertures in a key-board, a cross-section of which is shown at F, Fig. 1, and an upper face view at F, Fig. 4. The lower ends of the keys project below the plate A', and the outer ends of the key-levers are inserted in the apertures  $n$  in the shafts of the keys, as seen in Figs. 1 and 5. The levers are put into their places by simply inserting them through the fulcrum shafts, and then passing the inner ends through the holes in the lower ends of the key-shafts. Then, having previously inserted the spiral springs  $h$ , together with the rack-bars in said springs, into the apertures made through the platform A, adjust the enlarged ends  $j'$  of the levers against the heads of said bars, and then pass the tubes  $f$  to their places in the platform, around the springs, the necks of the levers, near the enlarged ends, passing through the slotted openings in the tubes. They will remain in place without other fastenings, but may be readily removed by reversing the movements for their insertion. The keys in the key-board may be arranged in any desired manner, each key being lettered to correspond with the type which its movement actuates.

G represents the inking-pad, which consists of an annulus formed of felt or other suitable material to hold ink. This is placed in a suitable annular case upon the top of the ring C, the pad being arranged, as shown in Fig. 1, so that when the type is drawn back into the position shown at  $d$ , Fig. 1, it will be pressed into contact with the under surface of the pad. For a more particular description of this pad and its case I refer to the specification and drawings accompanying my application for patent for the same filed in the United States Patent Office July 3, 1883, and allowed February 12, 1884.

The paper-carrier consists of a pair of rollers, H H', journaled in bearings in head-blocks secured to a base-plate, I, that is fitted to slide laterally back and forth in grooves in the side rails, J J', of a frame formed of said rails and cross-bars J<sup>2</sup> J<sup>3</sup>. This frame is hinged by its said cross-bars at each end to plates, one of which is shown at K, Fig. 6. These plates K are secured to and supported by pillars, one of which is shown at L, Fig. 2, that rest on and are secured to the platform A. The plate

I is provided with a longitudinal opening, M, extending from end to end, through which the type may project to reach the paper to be printed upon. It is so arranged that when swung into the position shown in Fig. 4 the said opening will come directly over the center of the circle of type-levers. The paper, when passed in between the rollers H H', will, as they are revolved, be carried across the said opening M.

The feed of the paper from line to line is accomplished by rotating the rollers, which may be done by hand, the milled finger-piece N on the end of the roller H being provided for the purpose. Any suitable device for controlling and stopping the movement of the rollers so as to accomplish the proper line-spacing may be employed.

The lateral feeding of the paper to the type is automatically accomplished by the following device:

O is a coiled spring placed in a suitable case secured between the rails J J' near their left-hand end, the inner end of the coil being made fast to the case. To the outer end is attached one end of a cord, p, the opposite end being attached to the carrier-plate I. The action of the spring will then be to draw the said plate, with the rollers mounted on it, toward the spring or the left-hand side of the machine, and when the said carrier is forced in the opposite direction the spring is thereby wound up. The necessary intermission of the movement to the left is accomplished by means of a peculiar detent that is actuated by a lever, to which the necessary movement is communicated from the several type-levers. To one edge of the carrier-plate I is secured a rack, P, with the teeth of which engages the detent. This detent is composed of two dogs, r r', both pivoted on the same screw, s, the dog r' being slotted, as shown at t', Fig. 12, to permit a slight longitudinal movement on its pivot. The dog r is provided with a tooth, t, at one end, and the dog r' with a tooth, t', at its end opposite to the tooth t on the dog r. The dog r' is provided at its toothed end with projecting lips u u', between which the end t' of the dog r projects when the dogs are in the position shown in Fig. 9, so that the vibration of one of the dogs on its pivot when in such position will cause the vibration of the other.

R is a spiral spring, attached at one end to the rail J' and at the opposite end to one end of a cord or wire, v, which is attached to the lug or ear v' on the dog r'. The action of this spring is to rock the said dog on its pivot and press its tooth t' into position to engage the rack P.

S is the long arm of an elbow-lever, pivoted at w in the bar w', secured to the edge of the rail J'. The said long arm extends to the opening M in the plate I, and terminates in a ring, v". This ring is so placed that the type on the several type-levers will pass through it when thrown to the center of the system to

effect the printing, while the end of the type-lever will strike against the ring and force it upward, thus rocking the lever on its pivot, by which the upper end of the short arm t<sup>3</sup> of said lever, Fig. 8, is carried outward. This short arm is connected by a link, t<sup>4</sup>, to the dog r, so that when the long arm of the lever S is carried upward, and its short arm is thereby carried outward, the dog r will be rocked on its pivot to force its tooth t into engagement with the rack P. When this movement of the dog r takes place, the dog r' is thereby disengaged from the said rack against the stress of the spring R. When the dog r' is engaged with the rack P, it is by the stress of the coil-spring O forced to the limit of its movement on its pivot toward the toothed end of the dog r. As soon as it is disengaged from the rack it will by the stress of the spring R be drawn to the limit of its movement on its pivot in the opposite direction. Thus, when the long arm of the lever S is forced upward by the type-lever into the position shown in Fig. 8, the tooth on dog r will engage a tooth in the rack P, and at the same time the dog r' will be disengaged from a tooth on the rack and drawn along to the limit of its movement on its pivot in that direction, and at the same time rocked into position to engage the next tooth on the rack. No movement of the carrier is, however, thereby permitted, as the engagement of the dog r is immediate upon the disengagement of the dog r'; but when the lever S descends upon the withdrawal from it of the type-lever, and the dog r is thereby disengaged, and the dog r' is made to engage the said rack, the carrier makes a movement, the rack carrying with it the dog r' to the limit of its movement on its pivot—a distance equal to the space between the teeth on the rack. Now, it is obvious that with every movement of any one of the type-levers in making a printing impression the carrier is moved a distance equal to the space between the teeth on the rack, thus accomplishing the proper spacing of the letters in the line of printing, the carrier remaining at rest while the printing impression is being made.

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

1. In a type-writing machine, a series of type-levers arranged radially around a circle, carrying at their inner ends printing-type and resting on a fulcrum intermediate their ends, on which they may rock and slide longitudinally, and a corresponding series of crank-arms to which the outer ends of the type-levers are severally pivoted, by the oscillation of which the type-levers are rocked and slid on their fulcrums to carry the types attached to them forth and back to and from the center of the system, all constructed and combined as and for the purpose described.

2. In a type-writing machine, the combination of a type-lever, a, crank-arm b, provided with a toothed segment, c, a rack-bar, g, slot-

ted tube *f*, spring *h*, key-lever *E*, slotted fulcrum-shaft *l*, and key-shaft *m*, as and for the purpose described.

3. The combination, in a type-writing machine, of the slotted tube *f*, fixed in the base-plate *A*, spring *h*, and rack-bar *g*, arranged to slide up and down in said tube, a key-lever, *E*, fulcrumed in a slotted shaft, *l*, and provided at one end with an enlargement, *j*, said end being fitted to slide in said slotted tube, the opposite end being inserted in an aperture, *n*, provided in the lower end of a key-shaft, *m*, all as and for the purpose described.

4. In a type-writing machine, in combination with the type-levers, the metal disk or plate *D*, provided with the upwardly-projecting flanges or rings *C* and *C'*, the former being provided with a series of radial slots or openings, as and for the purpose described.

5. In a type-writing machine, the combination, with the described series of circularly and radially arranged type-levers, respectively carrying type, and the described paper-carrier, of the elbow-lever *S*, pivoted at *w* on the rail *J'*, the free end of its long arm extending to the center of said system of levers and to the slot *M* in the plate *I*, and the short arm *t* extending upward above the rail *J*, together with the rack and escapement connected to arm *t*, as and for the purpose described.

6. In a type-writing machine, the combination, with the described paper-carrier and spring *O*, and the rack *P* and elbow-lever *S*, of the described ratchet formed of the two dogs *r r'*, both pivoted on the same pivot on the rail *J'*, and the dog *r'* being slotted, the dog *r* being provided at one end with a tooth, *t*, and with the ear *t'*, connected to the short arm *t*<sup>2</sup> of the lever *S*, and the dog *r'* being provided with the tooth *t'* and with upwardly-projecting lips *u u'*, between which the end *t*<sup>3</sup> of the dog *r* works, and also with the ear *v'*, to which is connected the spiral spring *R*, all constructed and combined to operate as and for the purpose described.

7. The crank-arm *b*, having formed on it the enlargement constituting the toothed segment *c*, said segment projecting on one side of said arm, so that one edge of the arm is tangential to the circle of the segment and the opposite edge is radial to said circle, in combination with the rack-bar *g*, arranged to engage said segment, as described, and type-lever *a'*, as and for the purpose specified.

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