3 Sheets—Sheet 1.

V. F. LAKE.

TYPE WRITING MACHINE.

No. 344,839. Patented July 6, 1886.

Fig. 1.

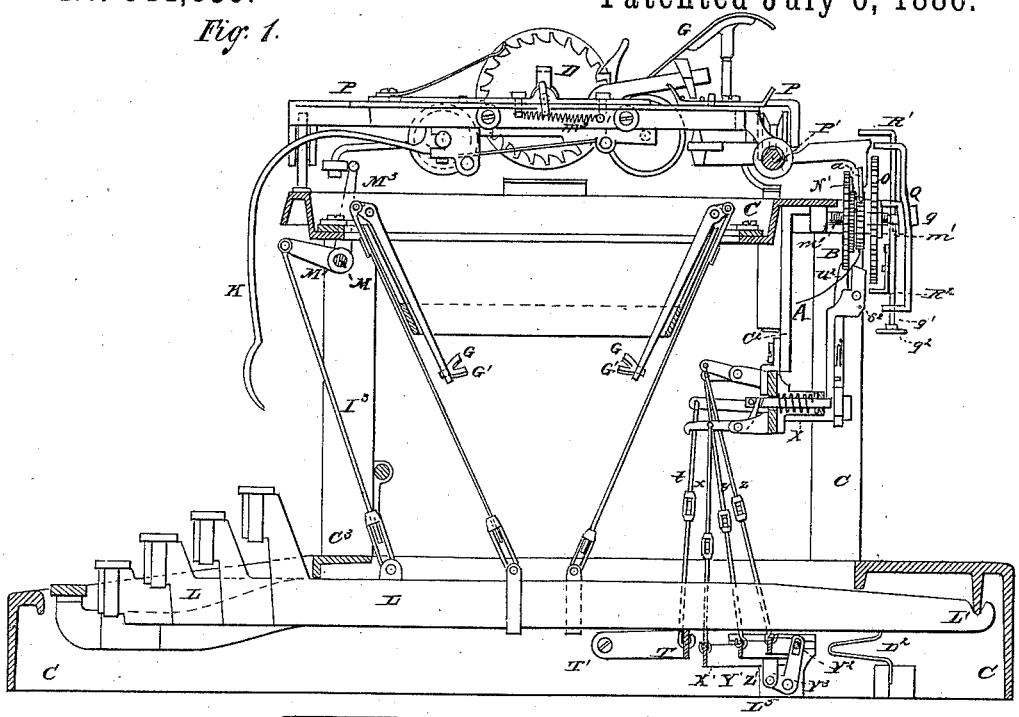
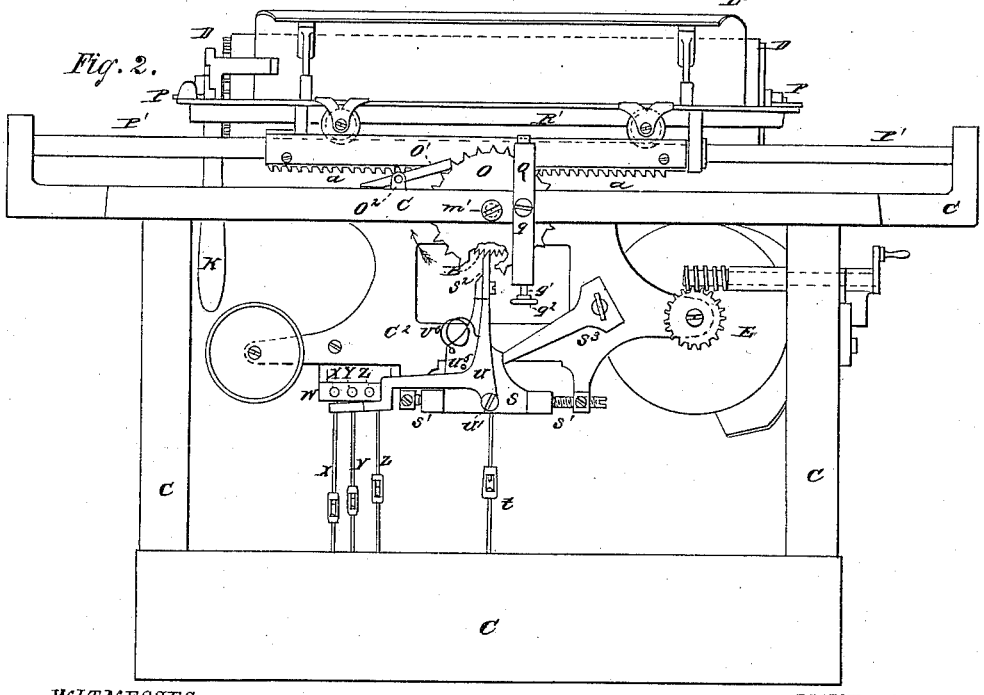


Fig. 2.



WITNESSES

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3 Sheets—Sheet 2.

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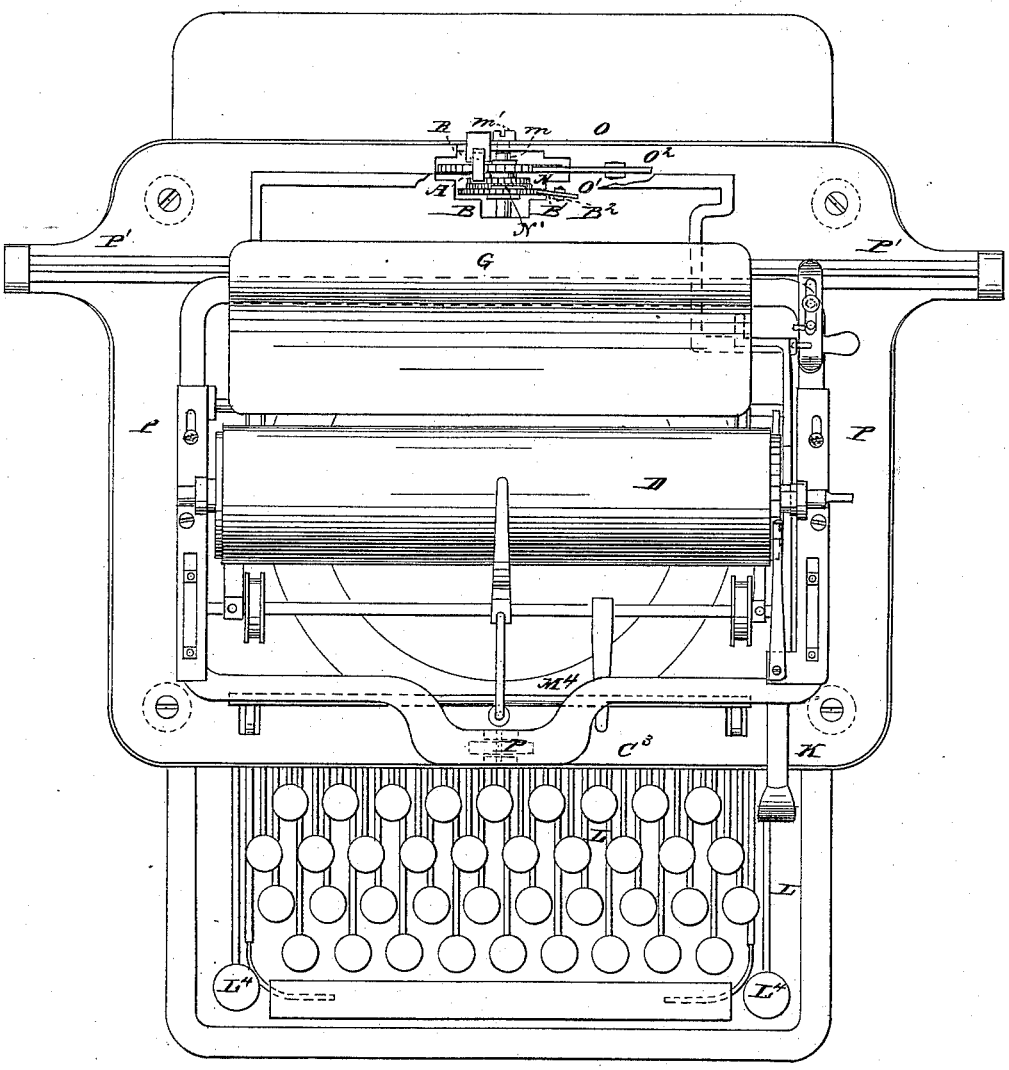
Fig. 3.



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3 Sheets—Sheet 3.

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Fig. 5.

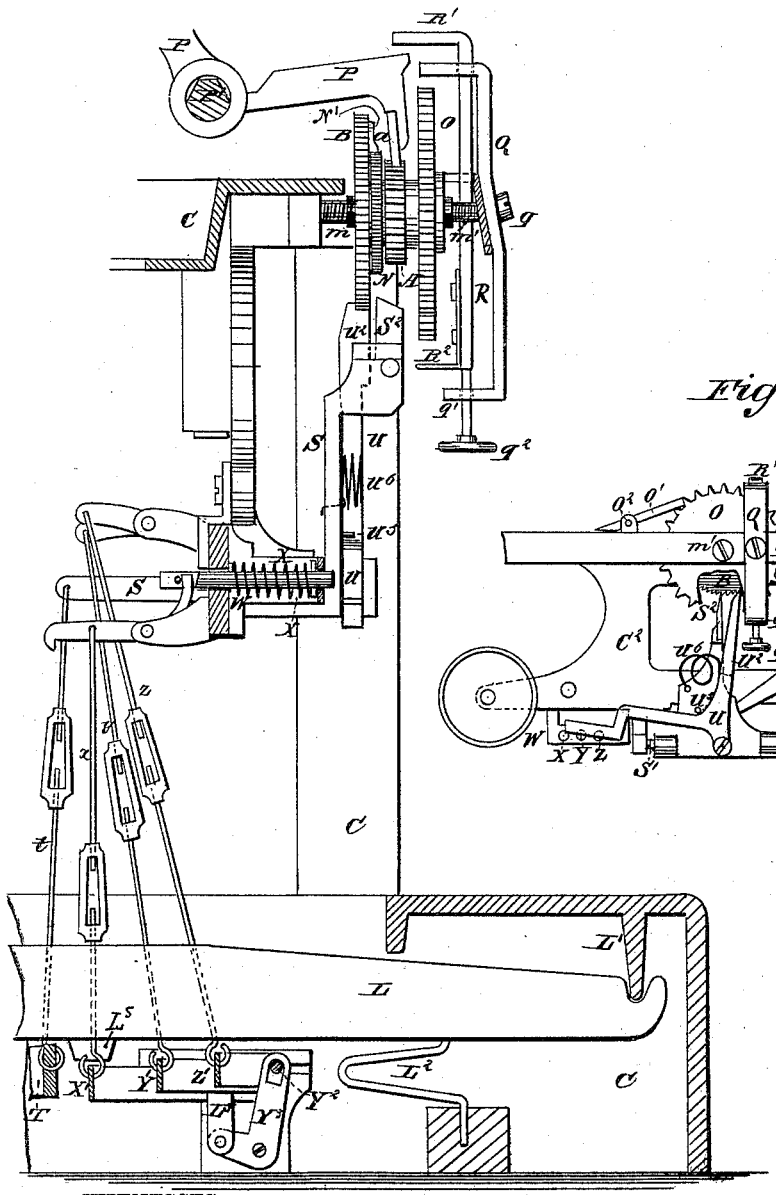

Fig. 4.

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UNITED STATES PATENT OFFICE.

VINCENT F. LAKE, OF PLEASANTVILLE, NEW JERSEY, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE AMERICAN WRITING MACHINE COMPANY, OF NEW YORK.

TYPE-WRITING MACHINE.

SPECIFICATION forming part of Letters Patent No. 344,839, dated July 6, 1886.

Application filed August 12, 1879.

To all whom it may concern:

Be it known that I, VINCENT F. LAKE, of Pleasantville, county of Atlantic, State of New Jersey, have invented a certain new and useful Improvement in Type-Writing Machines, of which the following is a specification.

My invention is applicable to that class of type-writing machines in which the successive depression and release of a series of key-levers vibrate and throw a series of types against an inking substance and the paper or other substance to be written on, and after each depression and release of any key, and while the type and key-lever are resuming their original position, move the paper a type-space distance, and thus print or write one letter at a time.

The object of my invention is to provide a variable feed for the paper-carriage of a type-writing machine, so that on striking a key-lever actuating a narrow type like that of the letter "i," the paper-carriage will be fed a less distance than when a wider letter or character is to be written, thus accomplishing what is known among printers as "spacing" the type, and thereby making the written page appear like ordinary print.

My invention is shown as applied to a machine which writes capitals and small letters and which has a paper-carriage hung on a guide-rail moved transversely to the key-levers by a spring-wheel and strap, and reversed by hand after a line has been written. I have provided three variations in spacing. Taking the letter "i," requiring the smallest space as the unit, I give a space and a half to characters of the width of "a," and two spaces for characters of the width of the letter "M."

In the accompanying drawings, in which similar letters of reference indicate like parts, Figure 1 is an end elevation of a type-writing machine, showing my improved feeding mechanism. Fig. 2 is a view from the rear. Fig. 3 is a plan. Figs. 4 and 5 are enlarged views of the feeding mechanism.

Referring to the drawings, C is the frame of the machine.

P is the paper-carriage, having mounted upon it a rotating platen, D, paper-table G, carriage-lever K, and moved along the guide-rail P′ by a spring within the cam E and a connecting-strap. To the back side of the paper-carriage and parallel to the guide-rail P′ is screwed a rack, *a*, into which meshes a pinion, A, which turns freely on a shaft, *m*. The shaft *m* turns on pivots in the frame of the machine. Its end-play is checked by the screw *m′*. On either side of and attached to the pinion A, and turning with it on shaft *m*, are two ratchet-wheels, N O. The ratchet-wheel N is in front of the pinion A and has three times as many teeth. The wheel O, behind the pinion A, is of much larger diameter than A, but has the same number of teeth. By the side of the wheel N, and attached to the shaft *m*, is a larger ratchet-wheel, B, having the same number of teeth as the wheel N—viz., three times as many as the pinion A. Engaging with the teeth of the wheel O, and limiting its backward movement to the space between two of its teeth, is the pawl O′, turning upon a pin, O^2. The weight of the pawl O′ keeps it in contact with the teeth of the ratchet-wheel O. On the back side of the ratchet-wheel B is a pawl, N′, which engages with the teeth of the ratchet-wheel N, so that when the pinion A and wheel N turn in the direction of the arrow, Fig. 2, the ratchet-wheel B will turn with them; but when the pinion A and wheel N are turned in the other direction the pawl slips over the teeth of the wheel N and the wheel B is stationary. To prevent a possible backward movement of the wheel B, a pawl, B′, hinged on the frame at B^2, is provided.

Q is a guide screwed to the top plate at *q*, a little to the right of the shaft *m*, when looked at from the rear, and extending above and below the top plate. In this guide slides vertically a dog, R, the upper end of which, R′, is bent over, and rests upon the top of the rack *a*, while the lower end has two branches, one of which terminates in a cylinder, *q′*, on which a screw-thread is cut, and on which a thumb-nut, q^2, turns. The other branch of the dog R is bent inward and rests under the wheel O. When the dog R is raised, the lower end, R^2, engages itself with one of the teeth of the

wheel O, and turns it backward, contrary to the direction of the arrow, Fig. 2, until it is stopped by the pawl O'.

S is a bell-crank lever having its fulcrum on the pivots S' S', attached to a hanger, C^2, on the frame of the machine.

L is a series of key-levers fulcrumed on a pivot, L', at the back of the machine. Springs L^2 L^2 hold the key-levers up against the pivot L' at the back, and in front against a bar, C^3. Each key-lever L, by means of a connecting-rod and a pivoted type-bar, causes a type to strike against the substance to be written on as it is held on the platen D.

T is a bar, called a "space-bar," directly beneath all the key-levers, and running transversely to them. The ends of this bar are bent at right angles, and form arms which are attached by screws T' to the sides of the frame C. These screws serve as an axle about which the bar T may vibrate. Near the middle of the bar T a connecting-rod, *t*, is attached, the other end of which passes over a pin in the end of the horizontal arm of the bell-crank S. To the extremity of the upper arm of the lever S is screwed a steel knife-edged ratchet, S^2, called the "stiff ratchet," the edge of which is at right angles to the ratchet-wheel B. When the lower-arm of the bell-crank lever S is depressed, the stiff ratchet S^2 is brought forward between two teeth of the ratchet-wheel B, and any movement of the ratchet-wheel is prevented. When the lower arm of the lever S resumes its former position, the stiff ratchet S^2 is withdrawn from between the teeth of the wheel B.

S^3 is a spring attached by a screw to the hanger C^2, and bears against the upper arm of the bell-crank lever S, so as to hold the stiff ratchet S^2 out of contact with the wheel B when the lever S is at rest.

U is another bell-crank lever, pivoted at U' on the back of the upper arm of the other bell-crank lever S, and moving with it, but moving also in a plane at right angles to the plane of movement of the former and parallel with the line of motion of the paper-carriage P and rack *a*. The vertical arm of the lever U terminates also in a knife-edged ratchet, U^2, called the "limber ratchet," which, when the horizontal arm of the lever U is at its lowest point, stands in line with the ratchet S^2. As long as the lever S is at rest, the limber ratchet U^2 is between two teeth of the wheel B; but when the lever S is vibrated, the limber ratchet U^2 is swung out of contact with the wheel B, and a spring, U^6, on the back of the lever S, presses against the vertical arm of the lever U and moves the limber ratchet U^2 away from but parallel to the stiff ratchet S^2. When the bell-crank S is returned to its position of rest by the spring S^3, the stiff ratchet S^2 is moved out from between the teeth of the wheel B and the limber ratchet U^2 is moved in, but between two teeth, distant, in a direction contrary to the arrow, Fig. 2, from two to four teeth from the space vacated by the stiff ratchet S^2. The spring within the cam-wheel E is constantly acting through a connecting-strap to draw the paper-carriage and feed-rack *a*, and to turn the pinion A and ratchet-wheel B in the direction of the arrow, Fig. 2. When the stiff ratchet S^2 in engaged with the teeth of the wheel B, that wheel cannot turn; but when the stiff ratchet is moved out and the limber ratchet U^2 comes in a few teeth behind, there is nothing to resist the action of the spring in the cam-wheel E but the weak spring U^6. Accordingly the carriage moves, the pinion A and ratchet-wheels are turned, and the limber ratchet U^2 and the vertical arm of lever U swing toward the stiff ratchet S^2. When the two ratchets are in line, the vertical arm of lever U is in contact with that of the lever S, and the movement of the ratchet-wheel B, and consequently of the pinion A and paper-carriage P, is checked. The distance which the paper-carriage moves depends upon the amplitude of the arc of vibration of the limber ratchet U^2. When it swings over its greatest arc, the horizontal arm of the lever U strikes the pin U^5 and the wheel B will move four teeth a space equal to one and one third teeth of the pinion A. The length of the lesser arcs over which it swings is determined by the slides X Y Z. These slides reciprocate at right angles to the plane of vibration of the lever U in holes in a frame, W, attached to the hanger C^2. Spiral springs surround each slide and are pinned thereto, which return them to their position of rest after they have been moved. The slides Y and Z when at rest are withdrawn from the plane of movement of the limber-ratchet lever U. The slide X in its normal position is in the plane of movement of the limber-ratchet lever U and limits the number of teeth spaced off by the ratchet U^2 to three. The slide Y, when pushed out to strike the limber-ratchet lever U, allows the limber ratchet to space off three teeth. The slide Z allows the limber ratchet to space off but two teeth. The slides Z and Y are pushed out and the slide X is withdrawn by rocking cams, connected by rods *z y x* to bars Z' Y' X', which I call "stop-bars," which are parallel to the space-bar *t*, and rest similarly beneath the key-levers. The bars Y' and Z' are hinged on a rod, Y^2, which is supported on each side of the machine in bearings in one arm of a bell-crank, Y^3, to the other arm of which the "upper-case lever" is connected, as hereinafter described. The bar X' is hinged on screws at each side of the machine and vibrates thereon. The upper surface of these bars is straight, but on the under side of the key-levers are projections L^5, so arranged that when a certain lever is struck it will bear down one bar and clear the others.

In machines which write upper-case only, or in machines which have separate key-levers for each character, instead of having projections on the key-levers they may be made of uniform depth and projections and notches may be formed on the stop-bars. The space-

bar T is actuated by all the key-levers and the space-key.

As was mentioned, the machine herein described writes capitals and small letters, or upper and lower case. The devices for accomplishing this are not a part of the present invention, but reference to them is necessary. Each type-bar carries two type, G G', one an upper-case character, the other a lower. The bearings supporting the paper-platen axle slide on the top of the paper-carriage, so that the axis of the platen can be shifted to alter the striking-point of the type. When the paper-platen is toward the back of the paper-carriage, the lower-case characters write, and when it is moved into its forward position the upper-case characters only are impressed. This forward movement of the platen is accomplished by means of upper-case levers, L^4, one at each side of the machine, which are pivoted at the rear, as are the key-levers, and to which are pinned connecting-rods I^3, nearly under the front of the top plate of the machine. The other ends of these connecting-rods are attached to the arms M' of a rock-shaft, M, from which extend vertically through the top plate arms M^3, connected by a rod, M^4, in front of which bears a rod attached to the paper-platen. Spiral springs m^2 hold the platen at the back of the paper-carriage when it is at rest. The machine then writes lower-case only. When upper-case is desired, the operator presses one of the two upper-case key-levers, L^4, and by the action of the connecting mechanism the platen is brought forward. Upon the release of the upper-case lever the springs m^2 draw the platen and connections back to place. These upper-case levers are connected by short rods, L^5, with the lever-arms of the bell-cranks, in which the axle of the bars Y' and Z' is supported, so that when the upper-case levers are depressed the fulcrum of the bars Y' and Z' is brought forward. When in its normal position, the bar Z' is depressed by the key-levers which actuate the type for characters like the letter "i," to which I allot two teeth of the ratchet-wheel B.

When the machine writes upper-case, it is obvious that of the upper-case characters corresponding to those in the lower-case, which require two-teeth space, the greater number will require a larger space.

When the machine is writing upper-case, the key-levers are depressed, and, the fulcrum of the bar Z' being brought forward, the bar itself is moved forward and is beneath a new surface of the key-levers. Thus the key-lever for the letter "l" will depress the bar Z' and push out the slide Z so that the carriage will move but a two-teeth space, while the same key-lever, if struck to write the letter "L," will cause the carriage to move twice as far. In the first position the bar Z' is depressed by a projection on the under side of the key-lever; in the second it is removed from contact with the key-lever.

Projections are made on the key-levers so that when writing lower case the keys for the following letters may be struck without any movement of the stop-bars, viz: a b c d e g h k n o p q r s u v x y z, and several of the punctuation-marks. Under the same circumstances the stop-bar Z' will be depressed and the slide Z pushed out. When any one of the following letters is written, f i j l t, for m and w the stop-bar X' is depressed and the slide X withdrawn.

When the machine is writing upper-case, the stop-bar Z' and slide Z are not called into action, except when an apostrophe is struck, as no other upper-case character requires so small a space. The upper-case levers bear against the stop-bar X' and withdraw the slide X, so that, except when the slide Y is pushed out, the carriage moves its greatest space—viz., four teeth of the wheel B. For the few upper-case characters that require a three-teeth space the stop-bar Y' and slide Y are actuated.

The operation of this invention is as follows: When any key-lever is struck and a type impressed on the platen D, the space-bar T is depressed and with it the horizontal arm of the stiff ratchet S^2, which engages this ratchet with the teeth of the ratchet-wheel B. This brings the limber ratchet U^2 out from the teeth of the ratchet-wheel B, and the spring U^6 causes it to stand at the distance of a certain number of teeth of the ratchet-wheel B from its former position. Then, when the key-lever which was struck is released, the stiff ratchet, under the action of the spring S^3, releases the ratchet-wheel B, and the spring in the cam-wheel E draws the paper-carriage and rack and turns the wheels on the shaft *m* till the limber ratchet U^2 brings up against the vertical arm of the stiff ratchet S^2. The carriage remains stationary until another key is struck, when a key-lever which actuates a narrow type like the letter "i" is struck. A projection on the key-lever bears upon the stop-bar Z' and pushes out the slide Z. As the depression of the key-lever continues, the limber ratchet U^2 is disengaged from the ratchet-wheel B and is pressed off by the spring U^6; but its movement is limited by the contact of its horizontal arm with the slide Z, and on the release of the key the carriage will move but two teeth of the ratchet-wheel B. In a similar manner the other stop-bars and slides are acted upon to determine the number of teeth which the limber ratchet shall space off. When the carriage drawn by the spring-cam E reaches the end of its movement, it is reversed by the operator. To do this it is necessary to raise the rack *a* off the pinion A. Inasmuch as there are three teeth on the ratchet-wheel B to one on the rack and pinion, it follows that after the operator has moved the carriage back for the commencement of a new line, and has replaced the rack *a* on the pinion A, the stiff ratchet may be between some of the other teeth of the ratchet-wheel B than those in line with the face of one of the teeth of the pinion A. Now, as the position of the rack depends upon

the position of the pinion A, in order to commence a new line exactly under the first letter of the preceding line the stiff ratchet must be in the same relative position to the teeth of the pinion A that it was when the first letter of the preceding line was written. It is most convenient to have this starting point opposite one of the teeth of the pinion A. To accomplish it, it is necessary to turn the pinion backward until one of its teeth is in the proper position relative to the stiff ratchet. For this purpose, when the rack *a* is raised by the operator, the sliding dog R is also raised, the lower branch of which, R^2, engages with a tooth of the wheel O and turns it contrary to the direction of the arrow, Fig. 2, until its further movement is checked by the pawl O′. The wheel O has the same number of teeth as the pinion A, and is affixed to the shaft *m*, so that both turn together. By this device the wheel O, and consequently the pinion A, is brought back at the commencement of each line to a given point. During this operation the pawl N′ slips over the teeth of the ratchet-wheel N, and the ratchet-wheel B remains stationary. It is apparent that by making the number of teeth on the rack *a* and pinion A greater, the letter-space ratchets might be made to work directly upon the teeth of the pinion; but this involves making the number of teeth to the inch on the rack and pinion so great that they would be narrow and easily break; or, if they were to be made wider—that is, a less number to the inch—inasmuch as the letter-space ratchets cannot space off a distance of less than one tooth of the wheel with which they engage, a sufficiently short movement of the paper-carriage could not be obtained. The ratchet-wheel B, rotated by the pinion A, has a greater number of teeth than the pinion A, which enables the teeth on the rack and pinion to be made wide and strong, and allows the paper-carriage to move but a short distance when the ratchet-wheel moves the space of one tooth.

I am aware that a carriage and rack, an escapement-lever carrying two detents, and a graduated stop have been combined with type-bars having a common point of impression on a printing-bed of the carriage, said type-bars having type so cut upon their face that the left-hand edge of the letters fall upon a fixed line at the point of impression; and I make no claim to this subject-matter.

Having thus described my invention, what I claim is—

1. In combination with the rack-bar *a* of a type-writer, the ratchet-wheel B, pawl N′, ratchet-wheel N, pinion A, ratchet-wheel O, pawl *o*′, and sliding frame R, substantially as and for the purpose described.

2. The combination of the rack-bar and pinion of a type-writer with the ratchet B, the stiff and limber pawls s^2 u^2, capable of movements with relation to each other, as described, and the devices, substantially as described, for controlling the amount of lateral vibration of the limber pawl, substantially as set forth.

3. In a type-writing machine, a letter-space ratchet pivoted so that it may vibrate in the same plane with another letter-space ratchet when moving in one direction, and parallel to the plane of the other when moving in the opposite direction, in combination with one or more slide-stops, X Y Z, substantially as and for the purpose described.

4. In combination with the key-levers, space-bar, and stiff and limber letter-space ratchets of a type-writing machine, the mechanism described for altering the length of the arc of vibration of the limber letter-space ratchet, consisting of one or more vibrating stop-bars, X′ Y′ Z′, communicating motion to one or more slide-stops, X Y Z, substantially as and for the purpose described.

5. In a type-writing machine, the combination of the pinion A, rack *a*, capable of being raised from its pinion A, the dog R, guide Q, ratchet-wheel O, attached to the pinion A and pawl O′, to rotate the pinion A reversely, substantially as and for the purpose described.

6. In a type-writing machine, the combination of a rack with its pinion A, turning independently on a shaft, *m*, an intermediate ratchet-wheel, N, attached to the pinion, a letter-space ratchet-wheel, B, a pawl, N′, on the ratchet-wheel B, engaging with the teeth of the ratchet-wheel N, to rotate the letter-space ratchet-wheel, substantially as and for the purpose described.

7. The combination of the carriage and rack with the escapement-lever carrying a fixed detent and a shifting detent, and mechanical means, substantially such as described, by which the shifting detent is retracted at each impression a variable number of teeth of the rack, according to the width of the character printed, substantially as described.

VINCENT F. LAKE.

Witnesses:
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ELMER P. HOWE.