

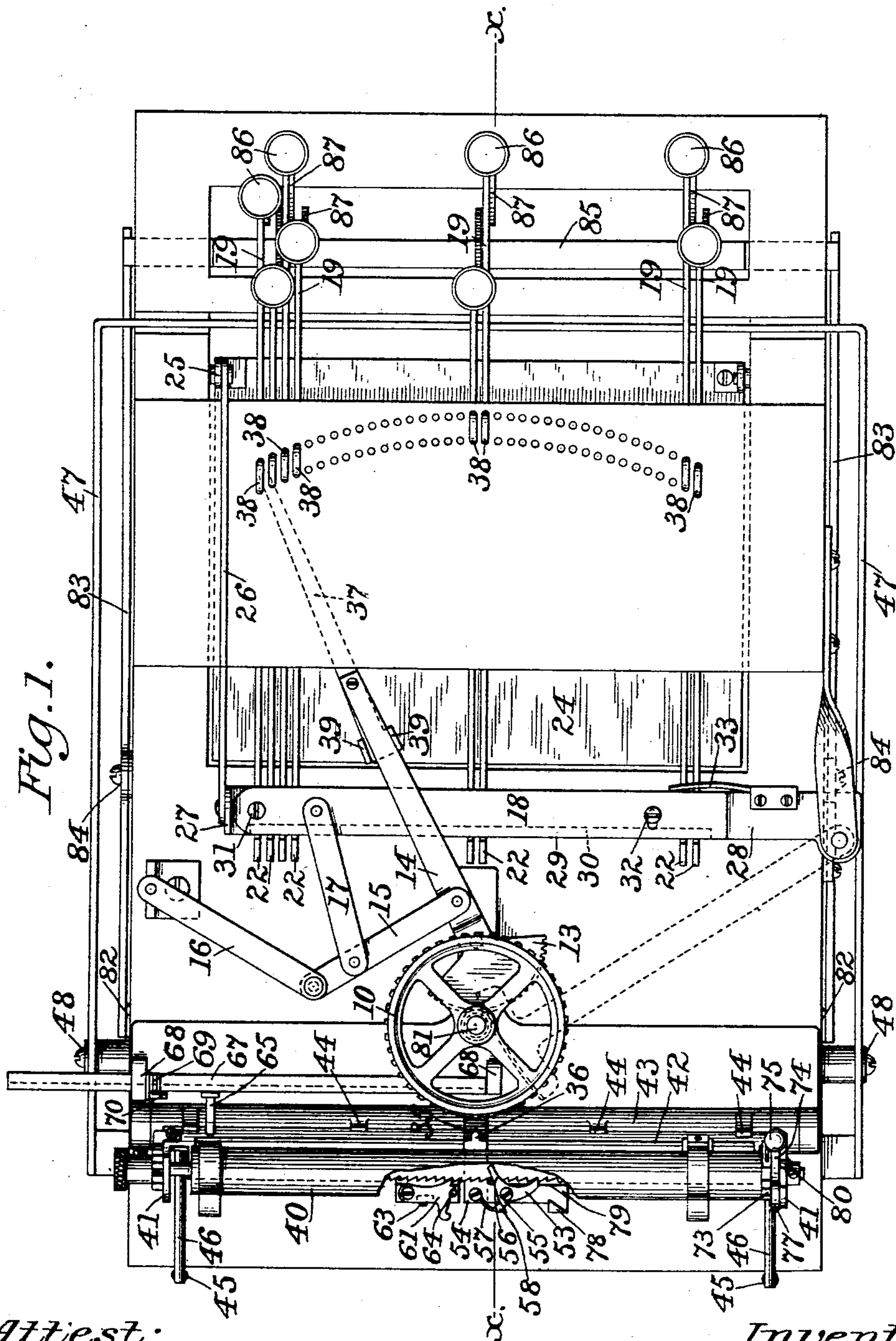
(No Model.)

2 Sheets—Sheet 1.

D. L. TOWER.  
TYPE WRITING MACHINE.

No. 520,172.

Patented May 22, 1894.



Attest:  
A. N. Jespersen.  
A. Widder.

Inventor:  
Daniel L. Tower  
by William B. Greeley  
Atty.

(No Model.)

2 Sheets—Sheet 2.

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Fig. 2.

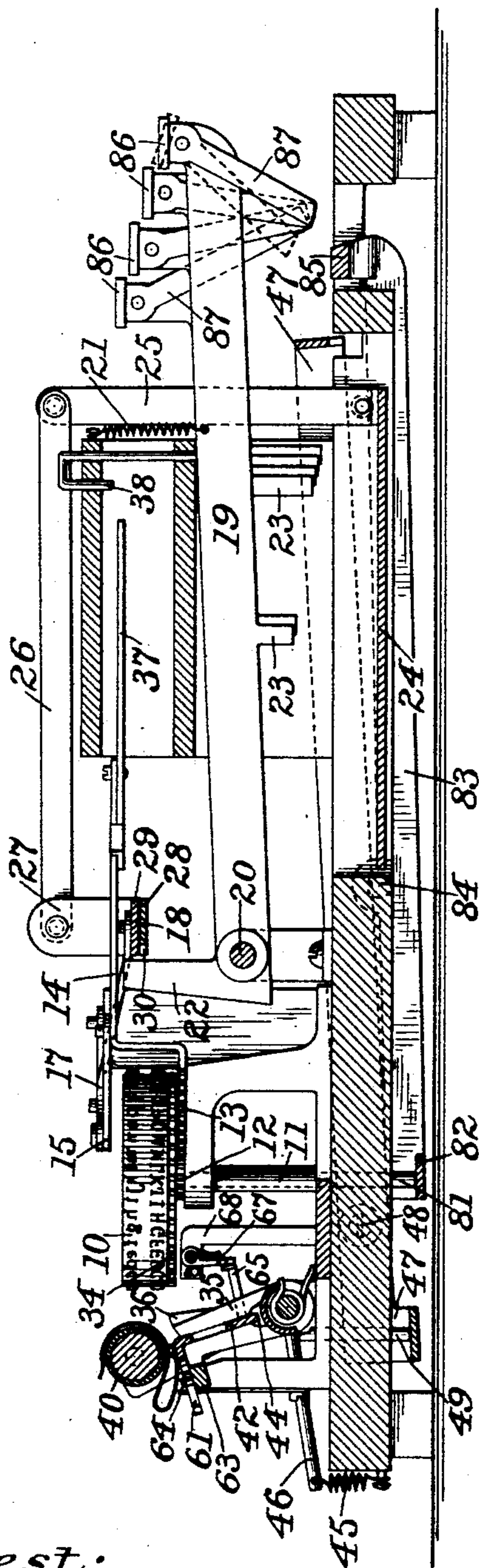


Fig. 3.

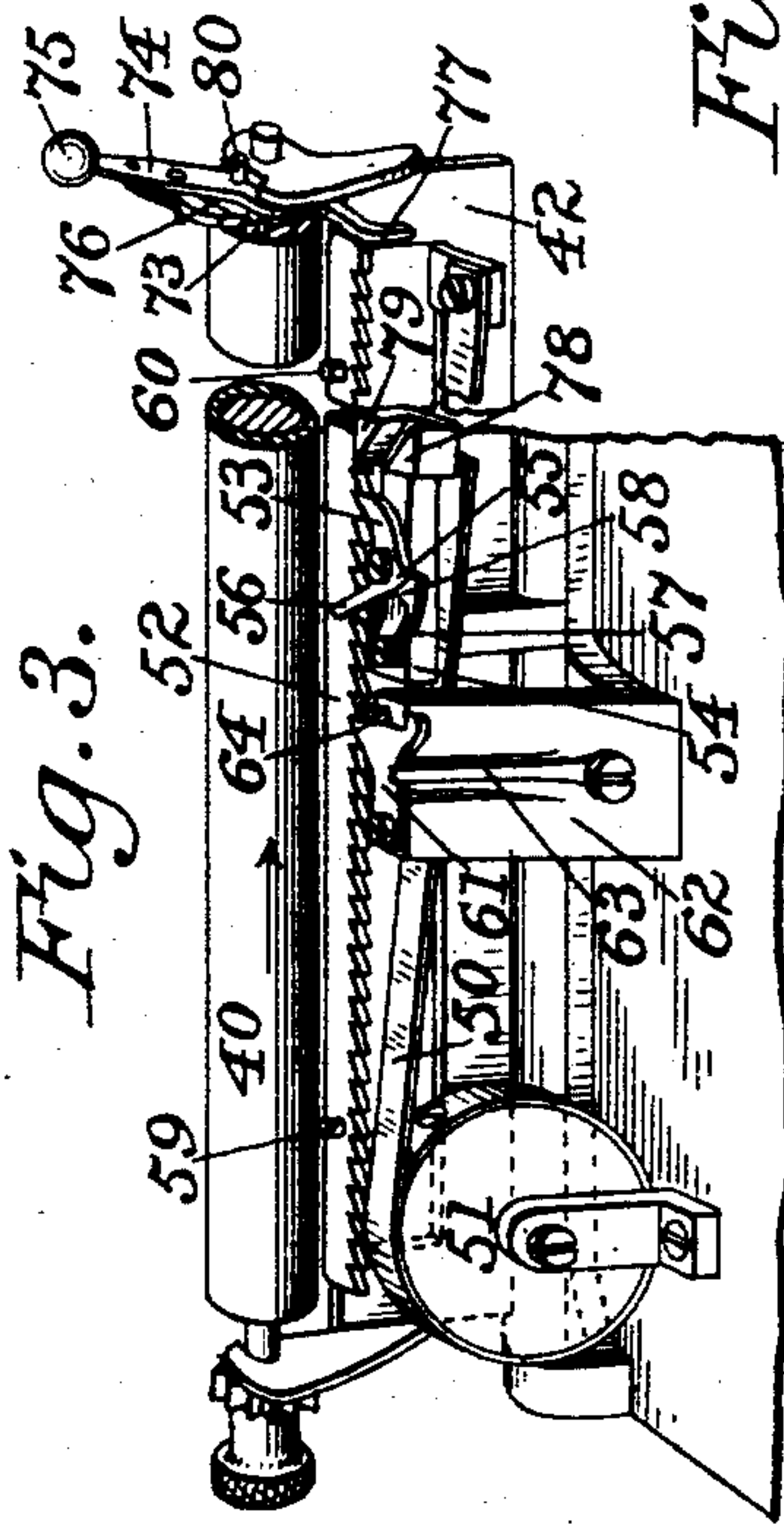


Fig. 4.

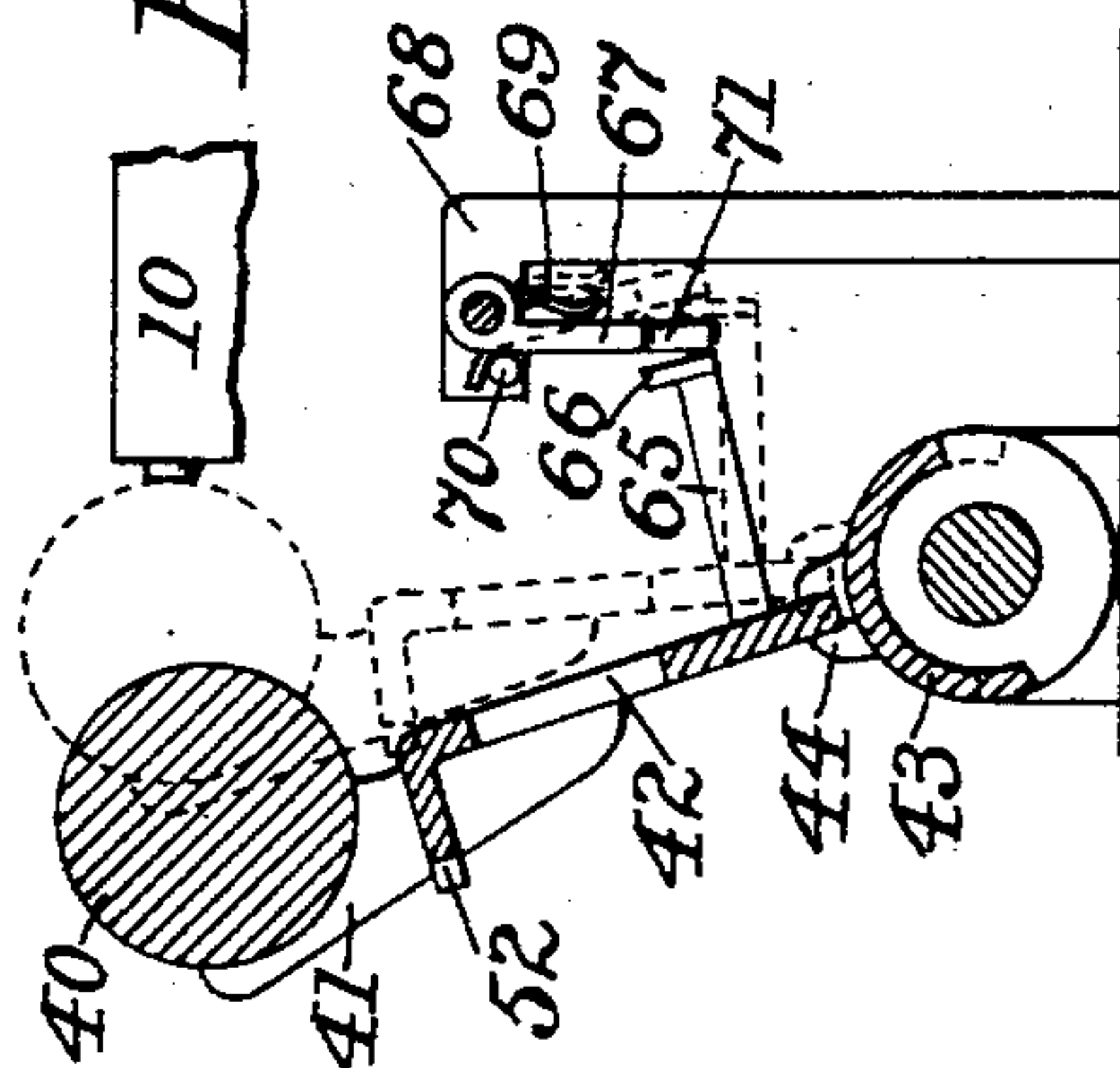


Fig. 5.



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# UNITED STATES PATENT OFFICE.

DANIEL L. TOWER, OF BROOKLYN, NEW YORK.

## TYPE-WRITING MACHINE.

SPECIFICATION forming part of Letters Patent No. 520,172, dated May 22, 1894.

Application filed September 11, 1891. Serial No. 405,363. (No model.)

*To all whom it may concern:*

Be it known that I, DANIEL L. TOWER, of Brooklyn, in the county of Kings and State of New York, have invented certain new and  
5 useful Improvements in Type-Writing Machines; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked  
10 thereon, making a part of this specification.

My invention relates particularly to type-writing machines of the class in which a rotary type-wheel is employed, though some of my improvements, especially those which relate to the paper carriage, are applicable to  
15 other machines.

The invention consists, mainly, in the devices for actuating the type-wheel to bring the desired character to the printing point,  
20 whereby the said wheel may be moved positively from whatever point it may have left by the last preceding action, may be prevented from moving beyond the desired point, and may be locked positively in the desired  
25 position.

It further consists in the devices for moving the paper carriage in the direction of its axis and in various other features.

In the drawings, Figure 1 is a top plan view  
30 of a type-writing machine embodying my improvements, parts being removed and other parts being broken away. Fig. 2 is a section on the line  $x-x$  of Fig. 1. Figs. 3, 4 and 5 are detail views of the devices for advancing  
35 the carriage space-by-space and for returning it automatically at the end of a line.

The type-wheel 10 is carried as usual by a shaft or sleeve 11 and may be actuated through any well known mechanical devices by a lever 18 which is pivoted near one side of the machine. I prefer, however, to fix upon the shaft 11 a pinion 12 with which meshes a gear segment 13 centrally pivoted and having an arm 14 extending therefrom. To this arm is  
45 pivotally connected one of a pair of toggle levers 15, 16, the other being pivoted upon a fixed point. A link 17 connects said toggle levers with the lever 18 and movement of said lever in one direction or the other will  
50 produce a corresponding oscillation of the type-wheel. As indicated in dotted lines in Fig. 1 the gear segment might be carried by

an arm fixed rigidly to the lever 18, and any means may be employed which will transmit the movement of said lever to the type-wheel. 55

The means for imparting the necessary movement to the lever 18 are as follows: The key-levers 19, pivoted as at 20 and held in normal position by springs 21, as usual, are severally provided, preferably near the pivot, 60 with an upwardly extending arm 22 adapted to contact with one side of the lever 18 and to move it in one direction. As the several arms contact with the lever at different distances from its pivot the several keys will 65 act differentially upon the lever to move the type-wheel in one direction to the desired point. But if a key near the left of the board had been struck and it was then desired to strike a key near the right it is obvious that 70 the lever 18 and type-wheel must be moved in a direction opposite to that in which they were moved by the first key. This return of the type-wheel has heretofore been effected in various ways, usually by a spring operating upon its shaft. By my improvement a 75 single movement of the key itself brings the type-wheel to the desired position, whether it is to be moved in one direction or the other. Beneath the key-levers is pivoted a 80 broad lever 24 adapted to be acted upon and depressed to a greater or less degree by pins 23 projecting downwardly from the key-levers. These pins are of different lengths or disposed differentially upon said broad 85 lever. An arm 25 is secured rigidly to the lever 24, near its pivot, and is connected, by a link 26, with an arm 27 fixed to the lever 18. I have found this connection between the levers 24 and 18 to be efficient and practical, but any other convenient connection 90 might be substituted, the object being to move the lever 18 in a direction opposite to that in which it is moved by the arms 22. It will be seen that in the operation of this portion of 95 my invention the depression of any key will operate, through the arm 22, to move the lever 18 and the type-wheel in one direction, if the desired character is at one side of the printing-point, and through the pin 23, lever 100 24 and connections to move said lever and wheel in the opposite direction if the desired character is at the other side of the printing-point, and that when the desired character is



at the printing-point the lever 18 will be held rigidly in its proper position between the two opposing forces. It will thus be impossible for the type-wheel to be thrown too far, as it might be if a spring were depended upon to return it.

In practice I have found it well to allow the lever 18 to yield slightly and have therefore constructed it in two parts 28 and 29, the one overlying the other. The part 28 is cut away, as indicated at 30 in Fig. 2 and by a dotted line in Fig. 1, so that the arms 22 do not contact with it. The part 29 is pivoted at 31 to the part 28 and at the other end has a pin and slot connection 32 therewith, and is pressed strongly toward arms 22 by a stiff spring 33 carried by the part 28. The part 29 thus receives the pressure of the arm 22 and may yield slightly before transmitting it to the type-wheel. To compensate for a slight lost motion thus occasioned and to insure the bringing of the desired character exactly to the printing-point, I fix to the type-wheel a gear 34 having its teeth arranged to correspond with the letter-spaces on the wheel. To the shaft which oscillates the paper cylinder or hammer to bring the paper into contact with the type is fixed an arm 35 having a V-tooth 36 which is adapted to enter the spaces between the teeth of the gear 34 and bring the type exactly into position should it be slightly removed therefrom.

I have shown in the drawings another device which might be employed to stop the type-wheel in exact position, should such device be considered necessary. The arm 14 is extended and carries at its end a finger 37 which is adapted to contact with any one of a series of pins 38 normally held out of the path of the finger by the key-levers but moved into such path when a key is depressed. The finger is pivoted to the arm and has flanges 39 which embrace the arm loosely whereby a limited lost motion is permitted in order to insure the stopping of the arm in the same position whether it be moved toward the pin from one side or from the other.

The paper cylinder 40 is supported to rotate in arms 41 secured to a carriage 42 which is free to slide longitudinally upon an oscillating shaft or shell 43 but is compelled to oscillate therewith, the carriage moving in guides 44 formed upon said shell 43. The shell is moved in one direction by a spring 45 acting upon an arm 46 and in the other direction by the depression of the key-levers acting through a bail 47 which underlies said levers, is pivoted at 48, and transmits its movement to the shell by a link 49 interposed between the bail or an arm extending therefrom, and the arm 46. The carriage when free to move backward is returned to position for beginning a line by a strap 50 and spring box 51. The carriage is also provided with a ratchet 52, as usual, but I have devised a novel arrangement and mode of operation of the pawls which co-operate with said ratchet to

effect the step-by-step forward movement of the carriage. A holding pawl 53 is pivoted upon a plate 54, fixed to the carriage, and is formed with an angular shoulder 55 and a stem 56. A spring 57 having a head 58 holds the pawl in or out of engagement with the rack according to the position which the shoulder of the pawl occupies with reference to the head of the spring. At the end of the forward movement of the carriage a pin 59 thereon strikes the stem of the pawl and throws the shoulder past the head of the spring, whereby the holding pawl is kept out of engagement with the rack and the return of the carriage is permitted. At the end of the return movement a second pin 60 on the carriage strikes the stem of the pawl on the other side and throws the shoulder past the head in the other direction, whereby the pawl is again permitted to engage the ratchet.

The actuating-pawl 61 is pivoted upon a fixed standard 62 and is pressed toward the carriage by a spring 63, the extent of its movement being limited by a pin 64 in the standard. The pawl is in position to be struck by the ratchet as the carriage moves away from the type-wheel and the amplitude of its oscillation is such that from the point of its first engagement with the ratchet to the end of its movement it will advance the ratchet and the carriage the space of one tooth, the carriage being held in its new position by the holding-pawl.

It is evident that the ratchet must be held away from the actuating-pawl in order to permit the return movement of the carriage at the end of a line. To this end an arm 65, having at its end a lip 66, is fixed to the carriage, and a plate 67 is pivoted upon fixed supports 68. The plate is pressed forward by a spring 69, its forward movement being limited by a stop 70. The lower corners of the plate preferably are notched or cut away as at 71, 71. During the forward movement of the carriage the end of the arm 65 abuts against the plate 67 which yields sufficiently to allow the paper on the cylinder to contact with the type-wheel, as shown in dotted lines in Fig. 4. At the end of the forward movement of the carriage and on the last movement of the roll toward the type-wheel, the end of the arm passes into the notch 71 and the plate immediately swings into its normal position as shown in full lines in said figure while the arm 65 is held in the position shown in dotted lines in said figure by the engagement of the lip with the lower edge of the plate, the carriage already having commenced its return movement through the disengagement of the holding-pawl by the pin 59 an instant before. The ratchet is thus held from the actuating-pawl and the plate 67 and arm 65 are so proportioned that the paper cylinder is just clear of the type-wheel.

A ratchet 73 for rotating the paper-cylinder may be fixed to the cylinder itself or otherwise suitably connected thereto. Pivoted



upon the axis of the wheel is an arm 74, preferably over-weighted as by a ball 75, and carrying the pawl 76 which actuates the wheel. The arm is extended, as at 77, and in its path, as it reciprocates with the cylinder, is fixed a cam or guide 78. At the end of the return movement of the carriage the end of the arm 74 enters the guide 78 and thereby throws the pawl forward and rotates the cylinder to advance the paper for a new line. When released from the guide the pawl and arm are moved backward by the weight 75 or they might be returned by a reversely set cam 79. A pin 80 serves to limit the throw of the cam and pawl the carriage already having commenced its return movement through the disengagement of the holding-pawl by the pin 59 an instant before.

The type-wheel 10, as usual, is provided with capitals and small letters arranged in two parallel rows. The wheel itself is fixed to a small shaft 81, which rotates with the sleeve 11, but is free to slide therein. Said shaft 81 rests upon the transverse bar 82 carried by levers 83 which are pivoted at 84. A transverse bar 85, also carried by said levers underlies the key-levers 19. Each finger-key 86, instead of being rigidly secured to the stem of the key-lever, is pivoted thereon and has extended from it an arm 87, which, either by frictional contact with the lever, or by proper weighting of the arm or of the finger-piece or by spring pressure, normally stands so that its end shall not contact with the bar 85 when the key-lever is depressed. Consequently, the type-wheel will be normally in position to print small letters. If, however, it is desired to print capitals the operator, instead of using one hand to hold down a separate key, has simply to take care to strike the particular finger-key in front of its center. This will cause the arm 87 to swing into such position that its end, in the further movement of the key-lever, will strike the bar 85 and so elevate the type-wheel to the necessary distance.

It is obvious that various modifications in the construction and arrangement of parts shown in the drawings may be made without departing from the spirit of my invention.

I claim as my invention—

1. The combination of a type-wheel, a lever and intermediate connections for moving said wheel, a key-lever having an arm adapted to move said first named lever in one direction when the key-lever is depressed, a second lever also adapted to be moved by the key-lever when the latter is depressed, and connections between the first named lever and the last named lever through which the first named lever may be moved in the opposite direction when said key-lever is depressed, substantially as shown and described.

2. The combination of a type-wheel, a lever and intermediate connections for moving said wheel, a series of key-levers having arms adapted to move said lever differentially in one direction, a second lever upon which the

key-levers are also adapted to act differentially, and connections between the first named lever and the last named lever through which the first named lever may be moved in the opposite direction, substantially as shown and described.

3. The combination of a type-wheel, a lever and intermediate connections for moving said wheel, said lever being pivoted near one side of the machine, a series of key-levers having arms adapted to contact with said lever at different distances from its pivot, a broad lever pivoted beneath said key-levers, pins carried by said key-levers and adapted to act differentially upon said broad lever and connections between said broad lever and the first lever, through which the first named lever may be moved in the opposite direction, substantially as shown and described.

4. The combination of a type-wheel, a pinion carried therewith, a gear-segment engaging said pinion, a lever and intermediate connections for moving said segment, a series of key-levers having arms adapted to move said lever differentially in one direction, a second lever upon which said key-levers are also adapted to act differentially and connections between the first named lever and the last named lever through which the first named lever may be moved in the opposite direction, substantially as shown and described.

5. The combination of an oscillating shaft, means to oscillate said shaft, a paper carriage movable longitudinally in ways on said shaft, a spring connected to said carriage to move it, when free, in one direction, a ratchet carried by said carriage, a holding-pawl pivoted on a standard secured to said shaft, and a spring-pressed actuating pawl pivoted upon a fixed support, whereby through the oscillation of said shaft a step by step movement of the carriage is effected in opposition to the spring, substantially as shown and described.

6. The combination of a carriage movable longitudinally and transversely, means to move said carriage transversely, a ratchet carried by said carriage, a holding-pawl for engagement with said ratchet, an actuating-pawl pivoted on a fixed support, a projection carried with said ratchet and adapted to strike said holding-pawl and disengage it from the ratchet at the end of the forward movement of the carriage, a plate supported parallel with the line of movement of said carriage, an arm projecting from the carriage and bearing against said plate, and means to return the carriage to the end of its forward movement, substantially as shown and described.

7. The combination with an axially adjustable type-wheel, of a lever for adjusting said wheel, a series of key-levers, and a movable projection carried by each of said key-levers and adapted to actuate said first named lever, substantially as shown and described.

8. The combination with a type-carrier, a lever for shifting said carrier and having a transverse bar, and a key-lever, of a finger-



key pivotally secured on said key-lever, and a projection carried by said finger-key and adapted to be moved thereby to strike said bar or to clear the same when the key-lever  
5 is operated, substantially as shown and described.

9. The combination with an axially adjustable type-wheel, of a lever for adjusting said wheel, a series of key-levers, a finger-key pivotally secured on said key-lever, and an arm  
10

or projection carried by said finger-key and adapted to actuate said first named lever, substantially as shown and described.

In testimony whereof I have signed my name to this specification in the presence of 15 two subscribing witnesses.

DANIEL L. TOWER.

Witnesses:

W. B. GREELEY,

A. N. JESBERA.