

No. 616,840.

Patented Dec. 27, 1898.

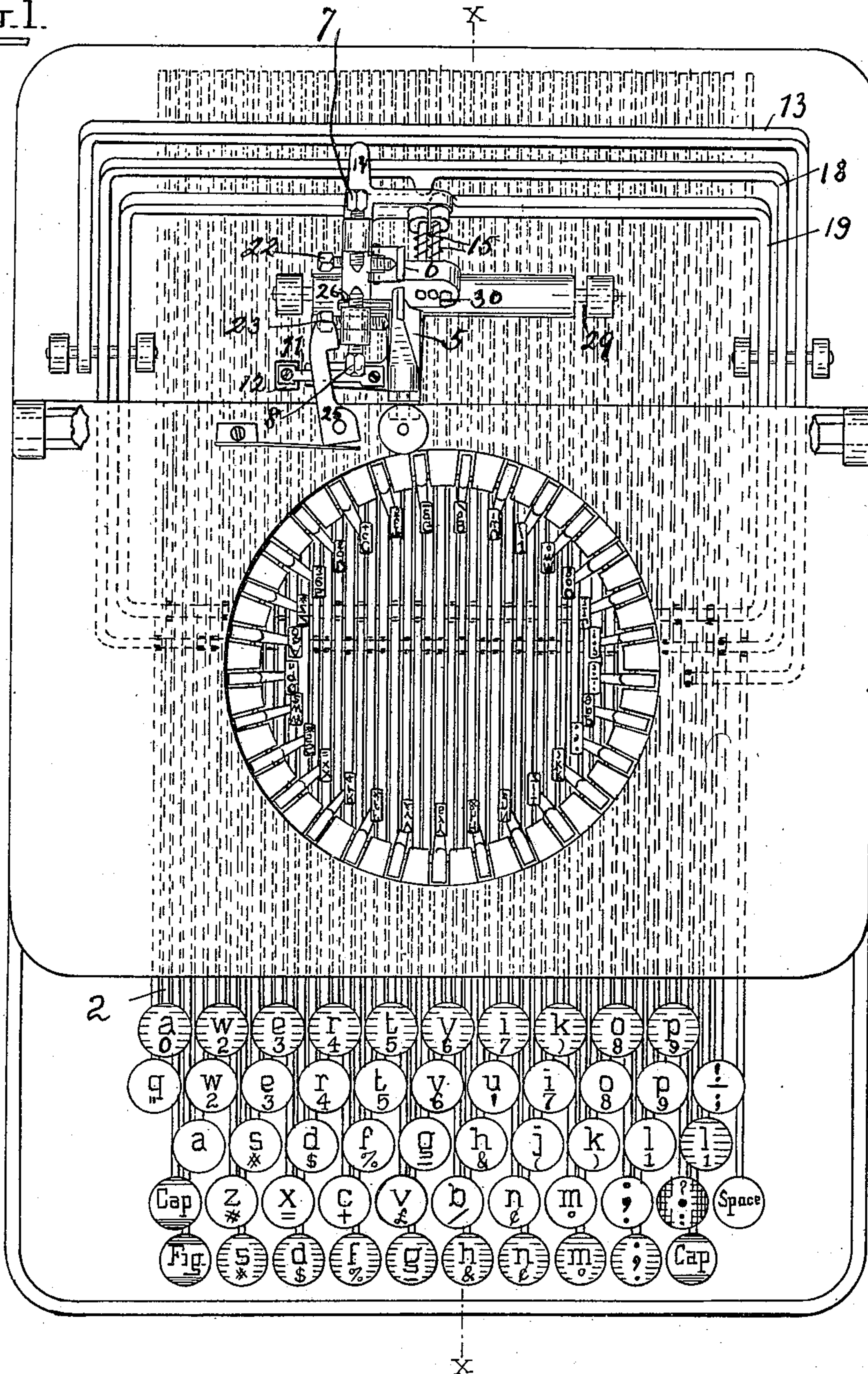
F. W. HILLARD.  
TYPE WRITING MACHINE.

(Application filed Feb. 14, 1893.)

(No Model.)

3 Sheets—Sheet 1.

Fig. 1.



Witnesses:

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*Frederic W. Hillard*

*By Thomas Ewing, Jr.*  
*Attorney*

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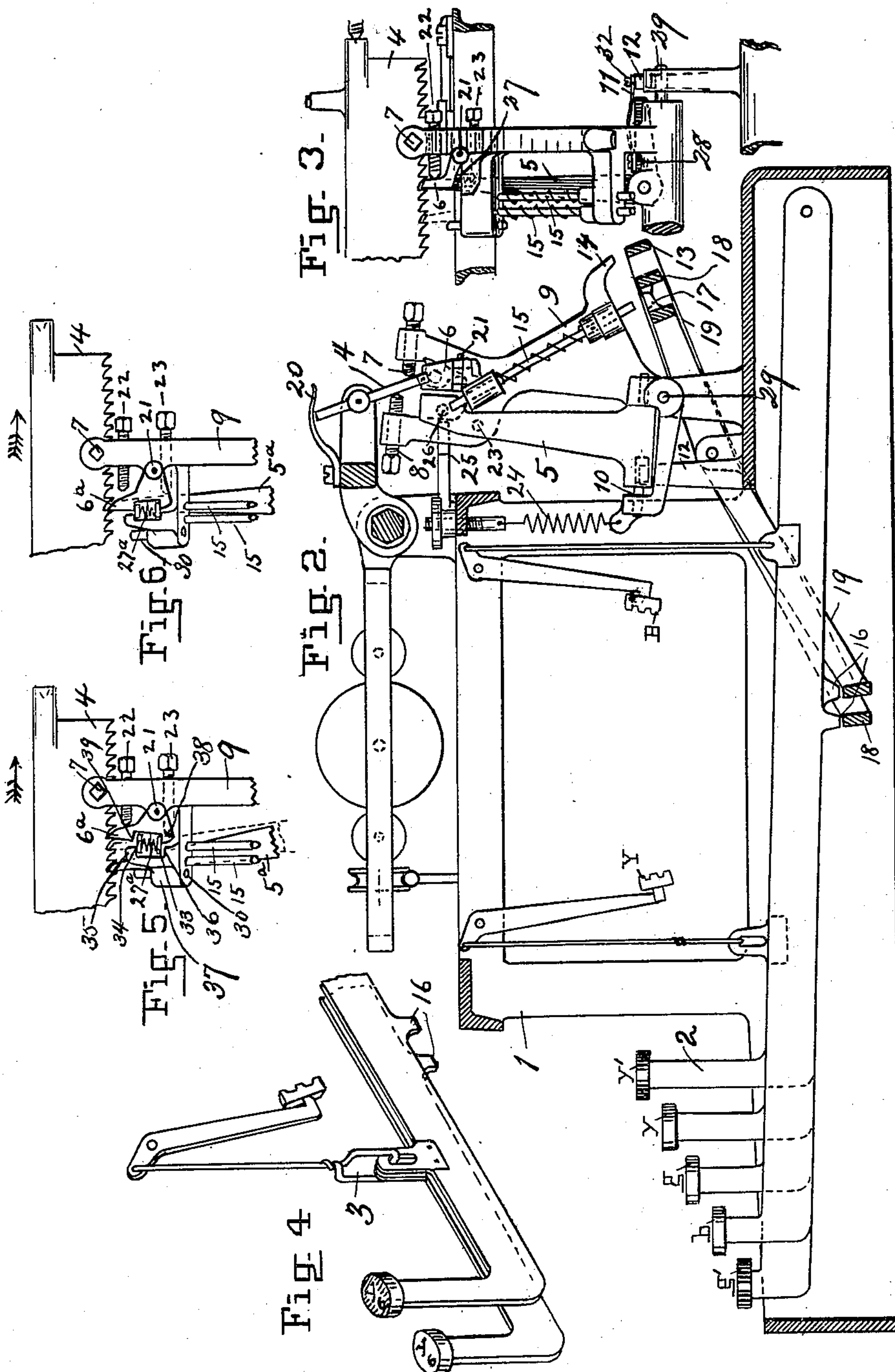
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3 Sheets—Sheet 2.



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3 Sheets--Sheet 3.

(No Model.)

Fig 7

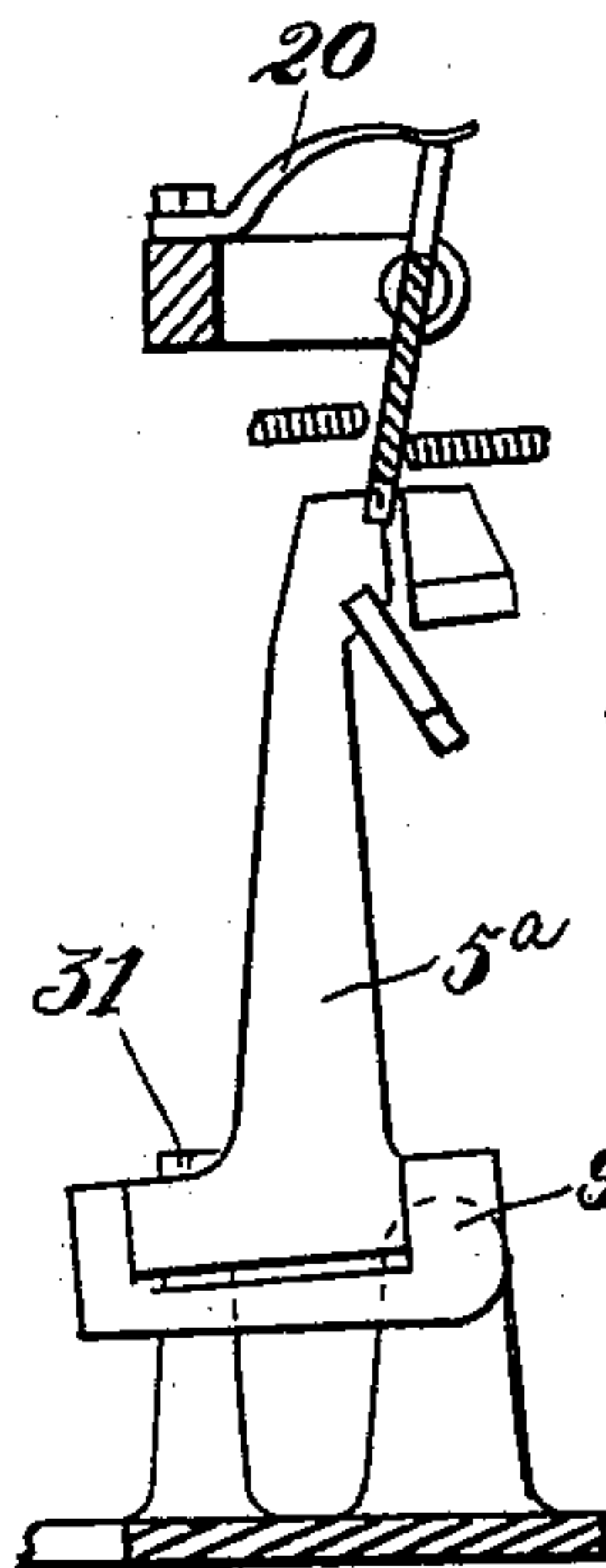
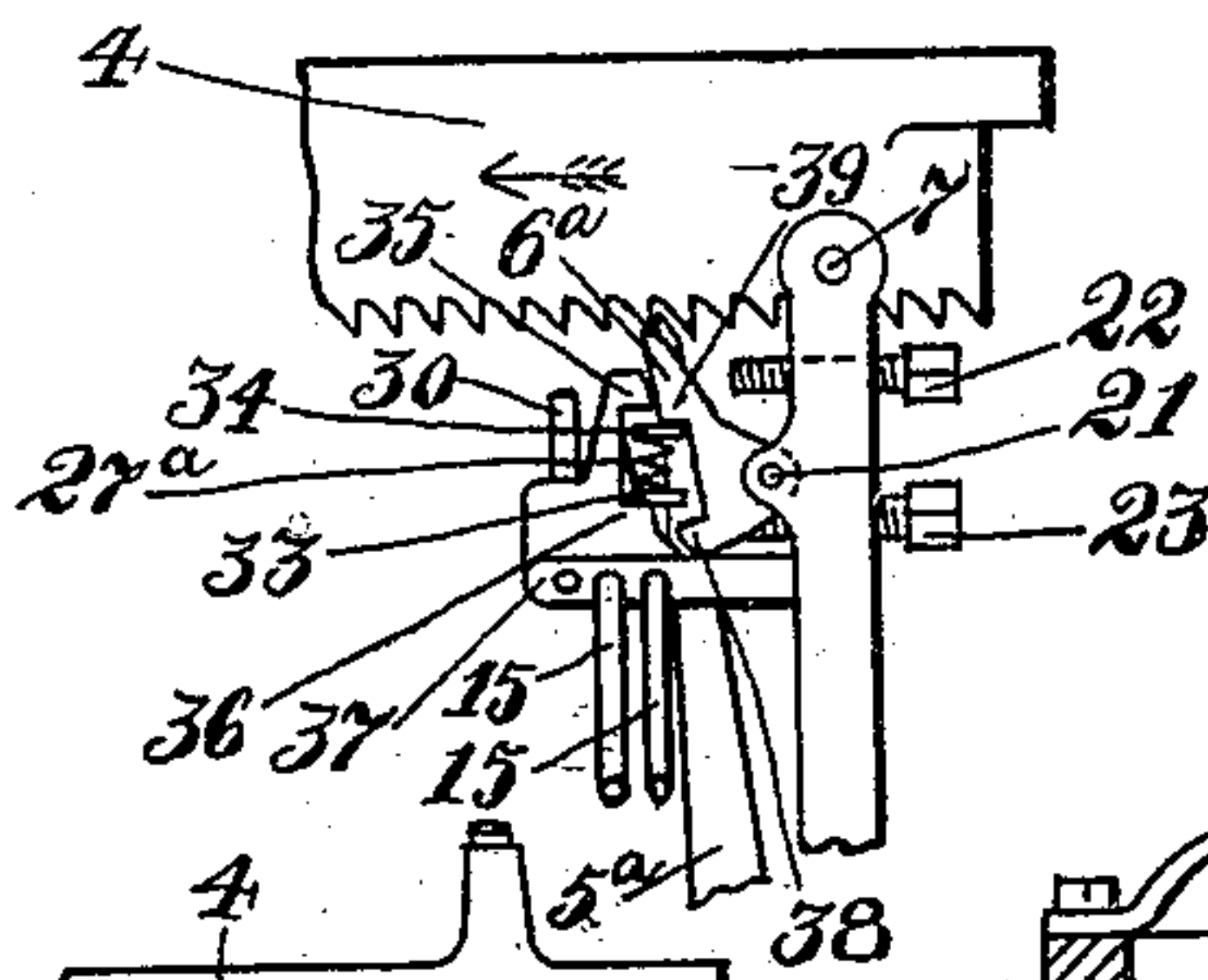


Fig 12

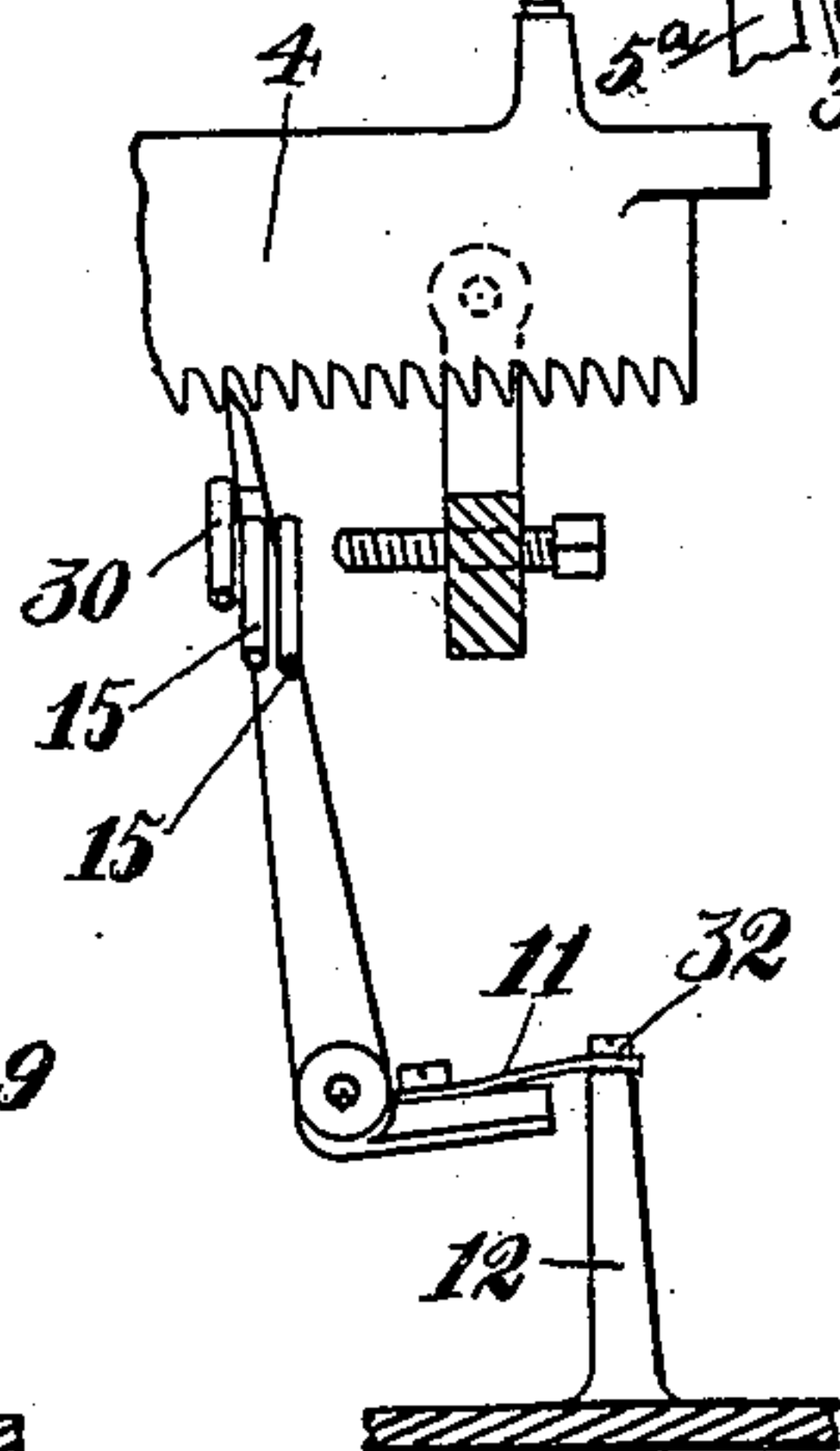


Fig 13

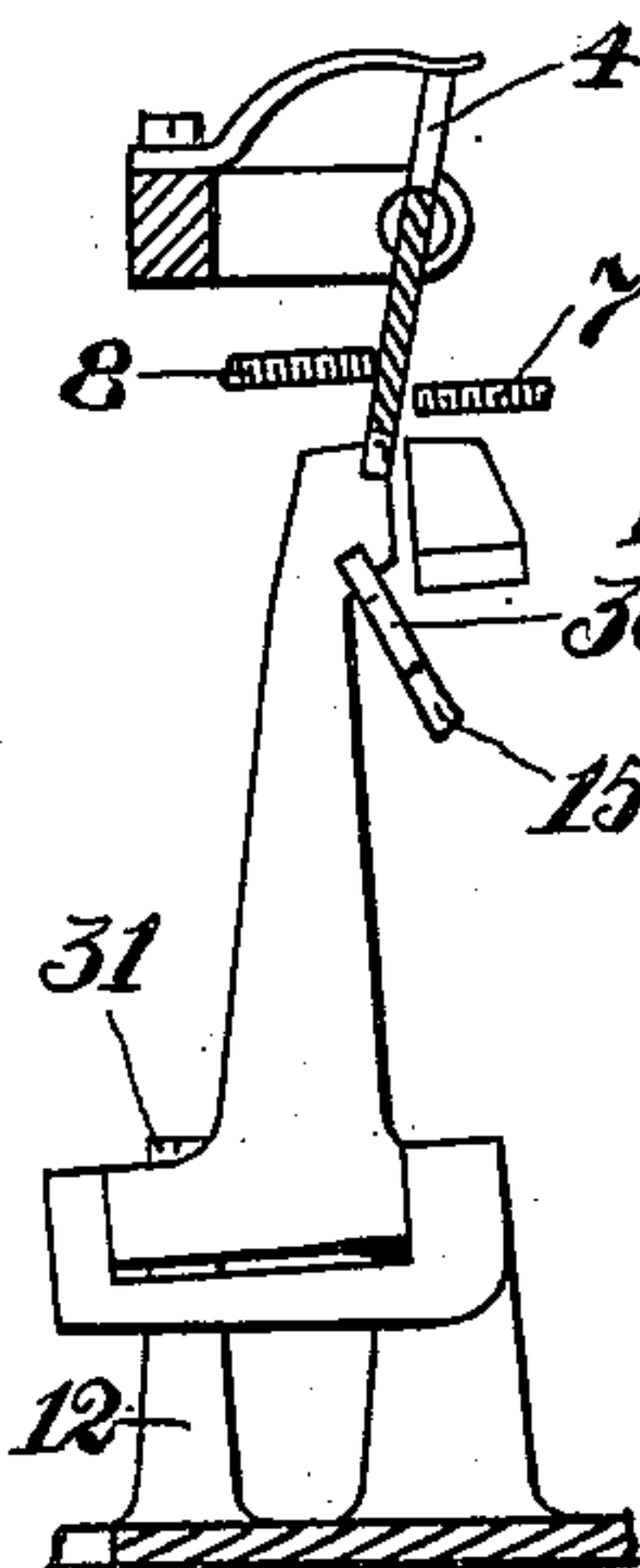


Fig 14

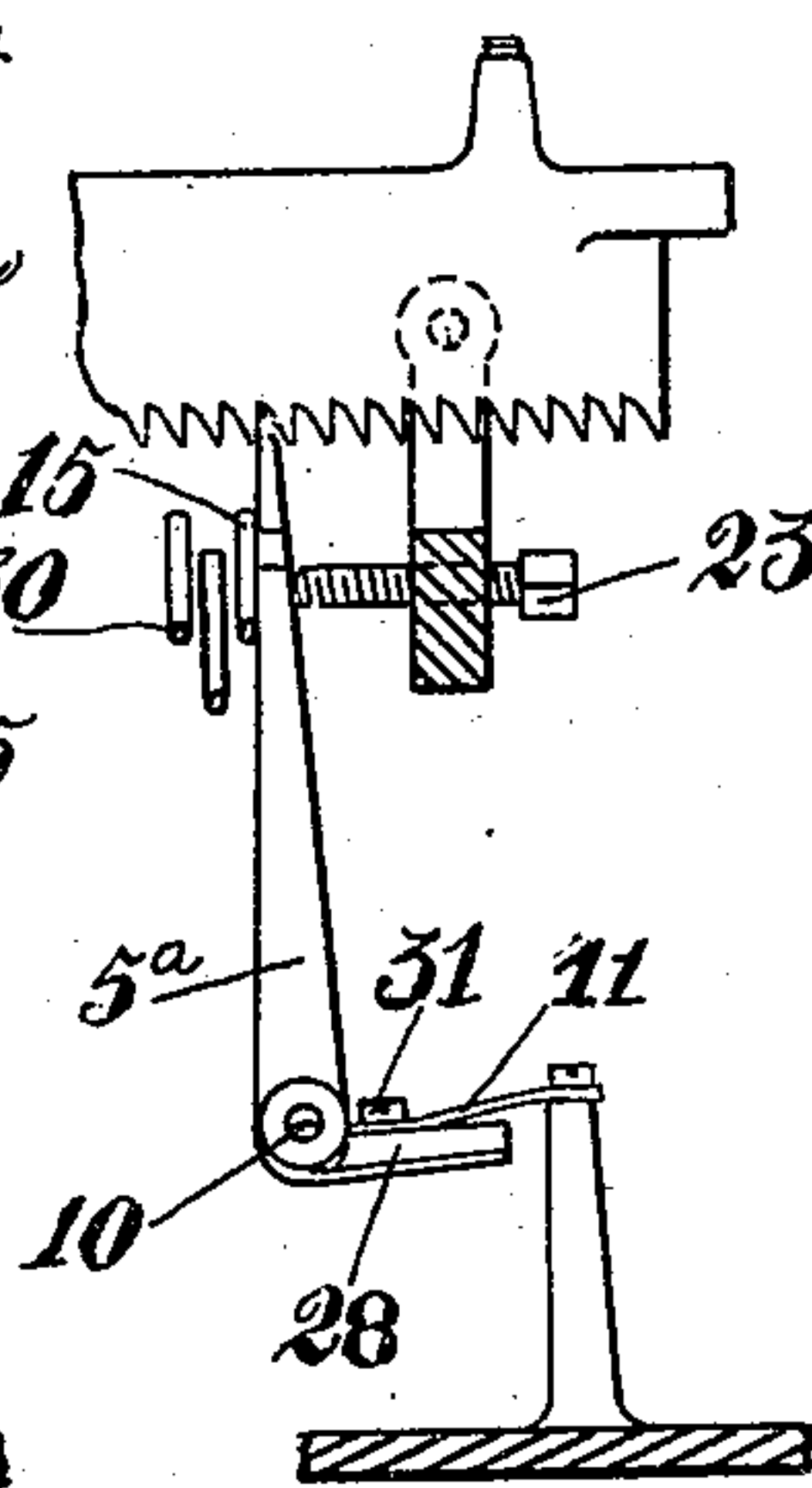


Fig 15

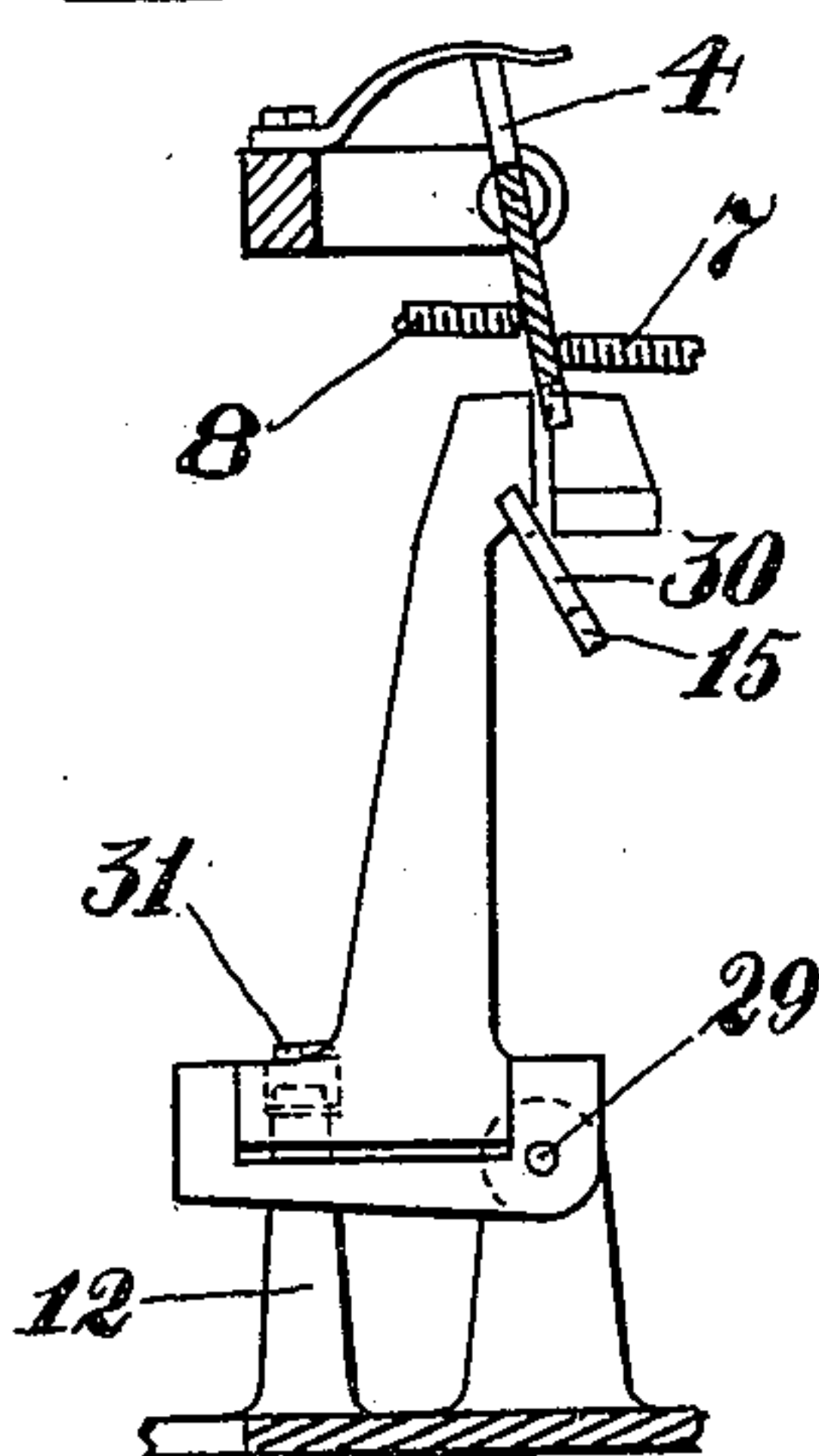


Fig 8

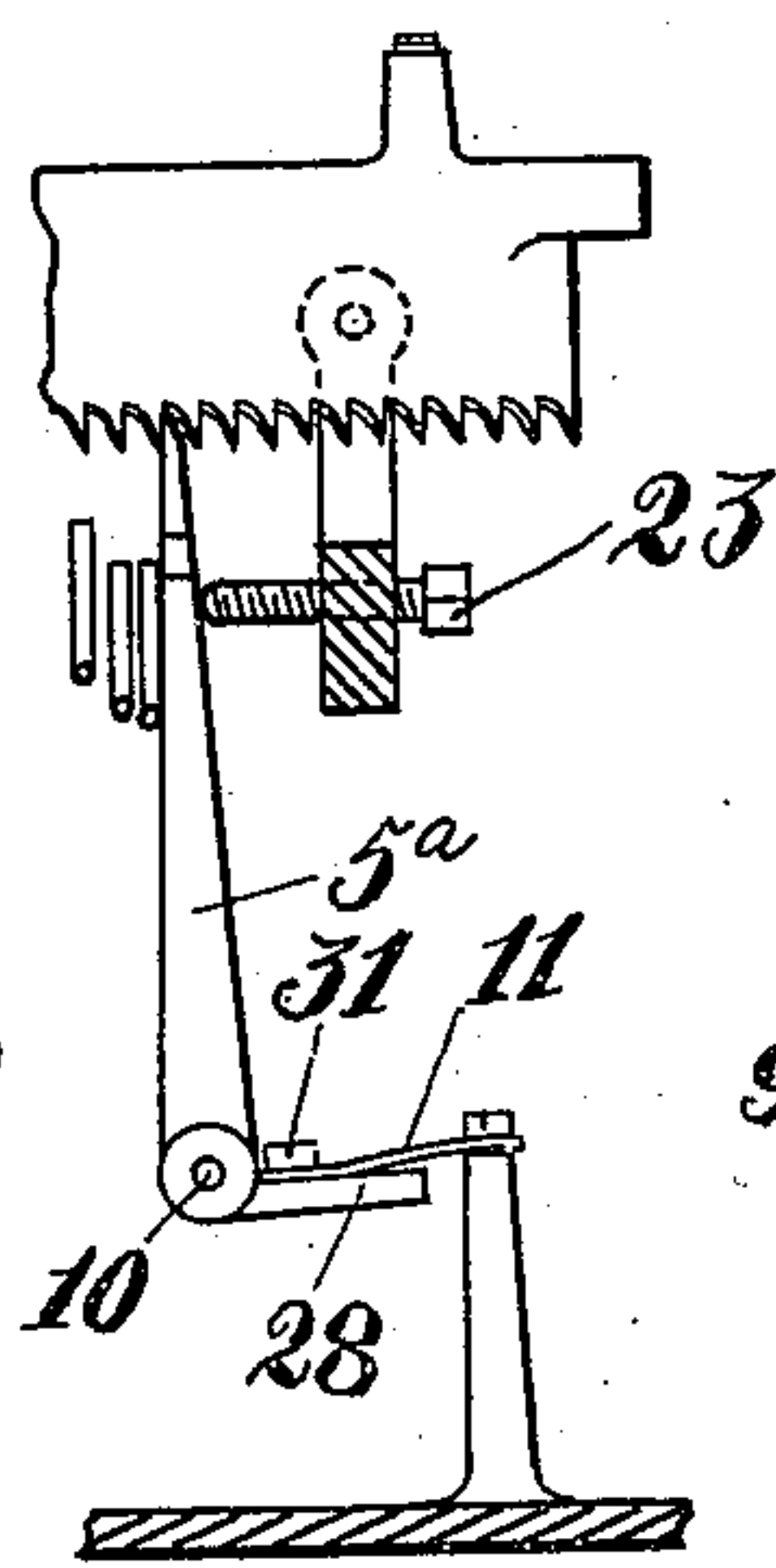


Fig 9

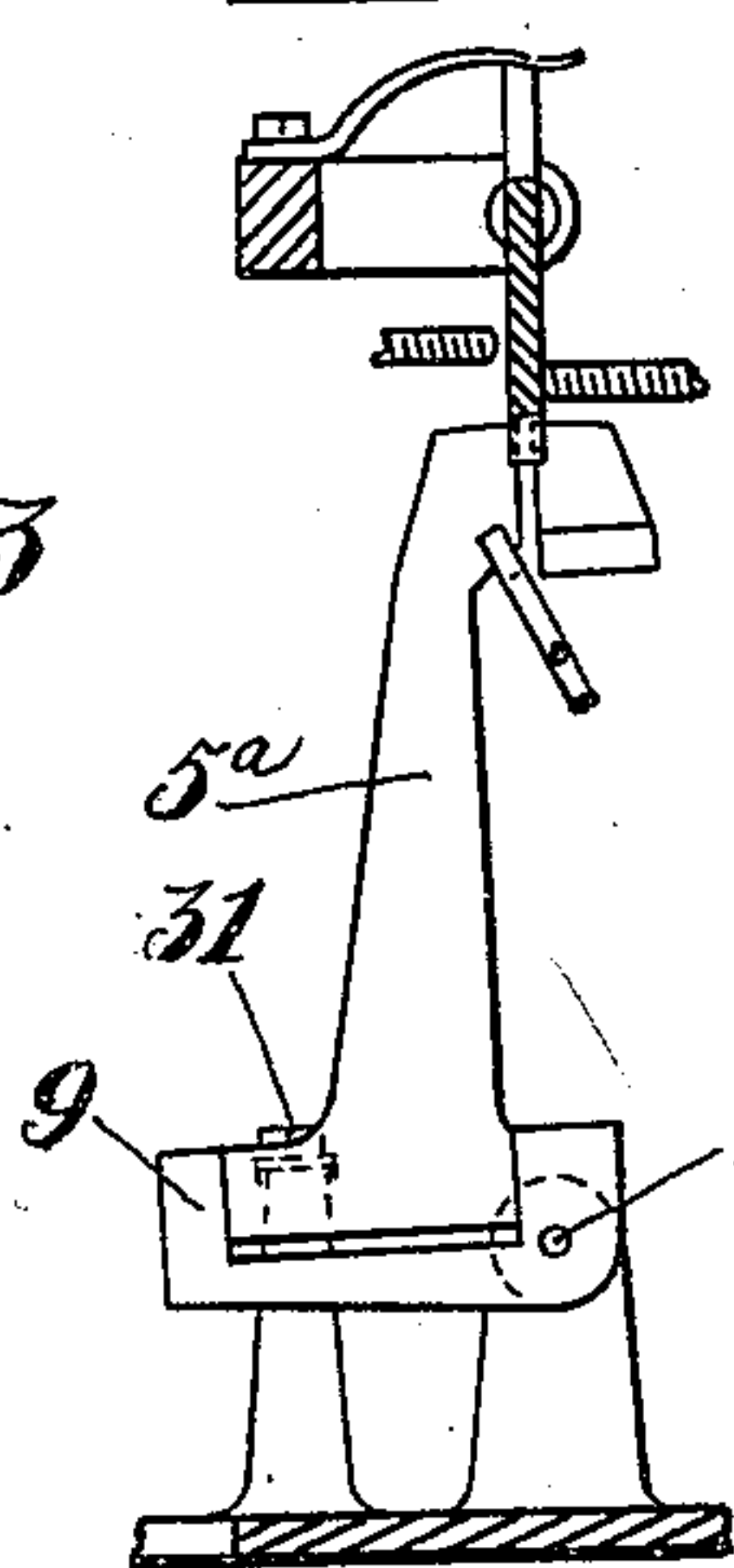


Fig 10

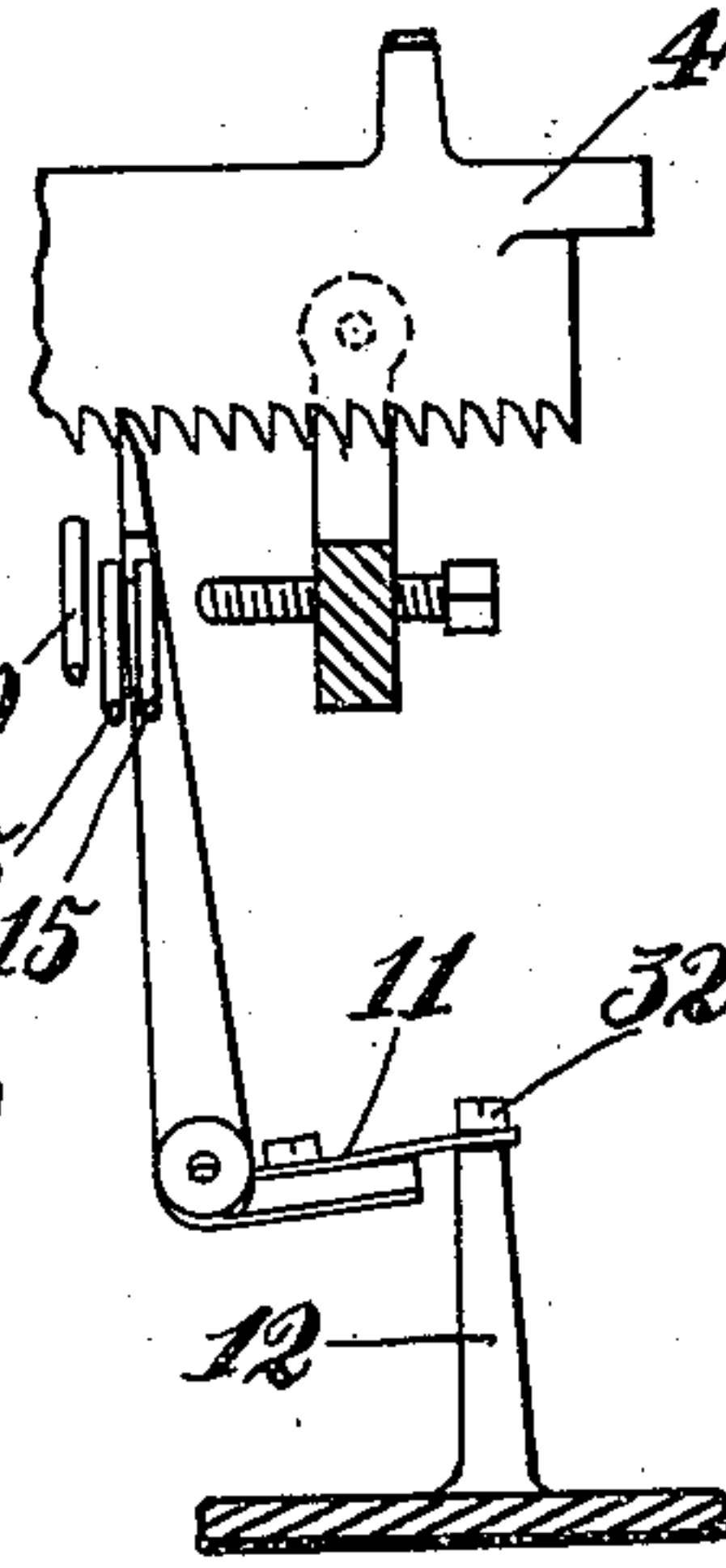


Fig 11

WITNESSES=

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# UNITED STATES PATENT OFFICE.

FREDERIC W. HILLARD, OF NEW YORK, N. Y.

## TYPE-WRITING MACHINE.

SPECIFICATION forming part of Letters Patent No. 616,840, dated December 27, 1898.

Application filed February 14, 1893. Serial No. 462,253. (No model.)

*To all whom it may concern:*

Be it known that I, FREDERIC W. HILLARD, a citizen of the United States of America, residing at New York, (Tottenville,) Richmond county, State of New York, have invented certain new and useful Improvements in Type-Writers, of which the following is a specification.

In type-writing mechanism generally when a type-key is depressed the corresponding character is printed and the paper-carriage is spaced forward through one space, so that the consecutive letters printed will be separated by a convenient distance. Words are usually separated by one space by the operation of a spacing-bar. The last letter of every word and the first letter of the following word are thus separated by double spacing. After printing a period it is customary to operate the spacing-bar twice before printing the first letter of the next sentence. There is thus treble spacing between the terminal character—say the period—of one sentence and the first letter of the next sentence; but to effect this requires one operation of the period and two operations of the spacing-bar.

An important object of my invention is to procure a type-writing machine in which type characters are operated by any one of two or more keys and in which the spacing mechanism is operated by the different keys to effect single and multiple spacing, respectively, whereby when the character occurs in the body of a word it can be printed accompanied by single spacing by the use of one key and where the character occurs at the end of a word it can be printed accompanied by double spacing by the use of another key and without operating the spacing-bar. Preferably each key is independently connected to its type character and to the spacing mechanism, so that the multiple-spacing keys may be depressed independently of the single-spacing keys, and vice versa. To accomplish this object, two distinct but coöperating improvements have been necessary, one of which relates to the means for operating the type characters and the other to the means for operating the spacing mechanism. These improvements are applicable with the various forms of type-bearing mechanism and spacing mechanism known to the art.

The improvement which has to do with the means for operating the printing characters consists in the introduction of keys for printing the characters when they are accompanied by multiple spacing and in connecting such keys to operate multiple-spacing mechanism. Keys which operate single-spacing mechanism are also provided for printing the characters when they are accompanied by single spacing. Therefore the printing characters to which this improvement is applied are provided with a plurality of keys.

The improvement may be applied to all the printing characters or to only such as will derive the greatest benefit therefrom. I prefer to thus select the characters and to provide only one key each for printing the remainder of the characters. In this specification I have illustrated and discussed this improvement as used in connection with characters that are frequently followed by multiple spacing—viz., terminal characters.

I have found on investigation that comparatively few characters are very frequently followed by multiple spacing. Hence by the addition of a small number of keys the substantial benefits of multiple spacing are secured, while the disadvantages of so greatly enlarging the keyboard as would be necessary if all printing characters were provided with a plurality of keys are avoided.

The improvement which relates to the means for operating the spacing mechanism has for its object to procure such mechanism that only a single key has to be depressed, whether single or multiple spacing is had. There is a plurality of keys operatively connected with a single printing character. These keys can be depressed independently of one another, and when any one of them is depressed the character will be printed. Neither of the keys is directly connected with the spacing-rocker; but each is operatively connected with an intermediate mechanism (hereinafter broadly designated as a "spacing-frame") for operating the spacing-rocker. All of the single-spacing keys are connected with a single one of these mechanisms or spacing-frames. All of the double-spacing keys are connected with a second such mechanism, and generally all of the keys for a given spacing are operatively connected with



one such mechanism or spacing-frame. The spacing-rocker is not attached to any of these spacing-frames and may be operated without operating any of them; but when any of the spacing-frames is operated it engages the spacing-rocker and operates it. At least one (and it may be all) of the spacing-frames first positions a stop to secure its appropriate spacing.

My invention comprises a construction in which a plurality of keys, preferably independent, is provided for printing each of certain characters, one of which keys operates the spacing mechanism so as to effect single spacing and the other or others of which so operate the spacing mechanism as to effect multiple spacing, each being connected with proper mechanism for printing the character, so that by operating a single-spacing key I can print a character and secure single spacing and by operating a multiple-spacing key I can print the character and secure multiple spacing, or, in other words, I secure the requisite spacing by a single stroke on an independent key, together with the printing of the character.

My invention also consists in the selection of the characters to be operated in the manner above stated. It also comprises a construction in which one or more type-bars are each independently operated by two or more keys for single and multiple spacing and in the introduction of intermediate mechanisms or spacing-frames for operating the spacing mechanism.

My invention also comprises a large number of novel and useful improvements in the escapement mechanism, many of which improvements are equally adapted to single spacing and to multiple spacing. The invention also comprises various other improvements, all of which are hereinafter fully described, and pointed out in the accompanying claims.

The mechanism shown is of the general Remington construction, except that it is a three-shift instead of a two-shift machine. There is one shift for capital letters, exclamation-points, and question-marks operated by either one of two keys located on opposite sides of the keyboard and each marked "Cap," and there is another shift for figures and for numerous other characters operated by a key marked "Fig." The shifting mechanism is not shown or described because it forms no essential part of this invention and may be of any known style; but the arrangement of the characters on the keyboard, the connection between the key-levers and type-bars, and the escapement are all different from the Remington construction. These are fully illustrated and will now be described.

In the accompanying drawings, which form part of this specification, Figure 1 is a plan view of the machine looking down on its top, with the carriage removed. Fig. 2 is a side elevation taken on the plane of the line  $xx$

of Fig. 1. Fig. 3 is a rear elevation of the escapement. Fig. 4 is a detail showing a type-bar and two key-levers, each independently connected thereto. Figs. 5 to 15, inclusive, are details of a modification of the escapement. Figs. 5, 6, and 7 are positional views of the single-spacing dog. Fig. 5 shows the single-spacing dog drawn forward. Fig. 6 shows the single-spacing dog in its normal or central intermediate position. Fig. 7 shows the single-spacing dog tripped backward out of the rack. Figs. 8 to 15, inclusive, are side and rear positional elevations showing detail views of the multiple-spacing dog of Figs. 5 to 15 and of certain of the parts connected therewith. Figs. 8 and 9 show the positions of the multiple-spacing dog and of the rack and of some of the other parts in the normal unused condition of the machine. Figs. 10 and 11 show the positions of the same parts at about the middle of the downstroke of a treble-spacing type-key. Figs. 12 and 13 show the positions of the same parts at about the end of the downstroke of a treble-spacing type-key—viz., either just before or just at or just after the instant of the printing, according to the adjustments of the machine. Figs. 14 and 15 show the positions of the same parts at about the end of the downstroke of a single-spacing type-key—viz., either just before or just at or just after the instant of printing.

In order to save the necessity for operating the spacing-bar at the end of words and sentences, I provide multiple-spacing mechanism, hereinafter more fully described, and keys for printing certain characters where they occur as terminals and for properly operating the multiple-spacing mechanism. To aid in the selection of the characters for which such provision is to be made, I state the following results of investigation: I find that almost all words in common use in the English language end with some one of nineteen letters—viz., small "a," "c," "d," "e," "f," "g," "h," "k," "l," "m," "n," "o," "p," "r," "s," "t," "w," and "y," and capital "I." In type-writing terminal letters are followed by extra spaces or by punctuation-marks, which are followed by extra spaces. To the letters above enumerated, therefore, should be added the more frequent punctuation-marks, of which the period (.) and the comma (,) are the most important. Of the letters, "e" occurs as a terminal about twice as often as any other, and my improvements applied to this letter and to the punctuation-marks will provide for about one-third of the extra spacing. Next in frequency as terminals come the letters "d," "n," "s," and "t." My improvements applied to these five letters and the punctuation-marks will provide for about two-thirds of the extra spacing. Similarly the foregoing characters, with "f," "o," "r," and "y," cover about seven-eighths of the extra spacing, and with the further addition of "a," "g," "h," and "l" cover about ninety-



five per cent. of all extra spacing. The number of characters for which multiple-spacing keys are provided may be varied to suit the preference of different makers or different operators, and if so desired all of the characters may be provided with a plurality of keys. I do not wish to limit myself to providing double-spacing keys for any particular set of letters.

In my machine I provide two key-levers for each type-bar which carries one or more of these letters, and I distribute on these type-bars such other characters as are most frequently followed in printing by double spacing—viz., the figures, (0 to 9,) the terminal parenthesis, (,) the underscore, (—,) the characters representing the words “number,” (№,) “dollar,” (\$,) “percentum,” (%), “and,” (&,) “cents,” (¢,) and “degrees,” (°.) As shown in Fig. 1, the keys corresponding to these characters are located in the upper and lower rows and at the right-hand end of the middle row of the keyboard. These keys are all shaded alike in Fig. 1 and in the actual machine may be given a distinctive color or form. When one of these shaded keys is depressed to print a character on the attached type-bar, the character is printed and the escapement effects double spacing. If to print the same character the corresponding single-spacing key is depressed, the printing is followed by single spacing. The period, (.), question-mark, (?), and colon (:) are frequently followed by two extra spaces in printing, and I have therefore provided a special type-bar which carries all three of these characters and have connected the corresponding key-lever in a combination whereby the desired one of these characters is printed and treble spacing is effected on depression of this key-lever. The key on this key-lever is next to the right-hand-end key in the next to the lowest row of keys.

I have placed the period in the middle place on the type-bar connected with the treble-spacing key-lever, so that it can be printed after a small letter without shifting the carriage. After the period is printed with this key the next character printed is usually a capital letter, to print which the carriage must be shifted. I therefore place the capital shift-key immediately in front of this treble-spacing key, as is shown in Fig. 1. The keys are arranged in rows, rising from the front to the back of the machine. The play of each key is such that when depressed it is about on a level with the row in front.

The operator in order to close one sentence and shift for the capital which begins the next sentence has only to depress the treble-spacing key and then draw his finger forward onto the shift-key and depress it.

If it is desired to print a period after a small letter and follow it by a single space, it is necessary to depress the treble-spacing key and the key marked “Space” together. These two keys are therefore placed side by side.

If the key marked “Space” is depressed by itself, it effects single spacing without printing any character.

On account of the large and varied use of the period I have for convenience and speed also provided a type-bar with the period in two positions, so as to be in place for printing when the machine is shifted for either capitals or for figures, and I have connected this type-bar with a single-spacing key-lever and also with a double-spacing key-lever. The intermediate position on the type-bar is occupied by a comma, which, therefore, prints on depression of either of the key-levers connected with this type-bar without shifting.

It is obvious that all the frequent terminal characters might, like the period, be provided with a plurality of independent type-bars and that I might connect a single-spacing key with one of these type-bars and a multiple-spacing key or keys with other of these type-bars. It is in the case of terminals other than the period cheaper and better to place each character on a single type-bar; but I do not in my broader claims limit myself to placing the selected terminal characters on only one type-bar each; but I wish it to be understood that this part of my invention in its broadest aspect consists, essentially, as above stated, in providing each character to which the invention is applied with a plurality of keys, preferably independent, each of which operates proper mechanism for printing the character, the different keys operating the spacing mechanism for different spacings.

Where in the claims I specify that a plurality of keys is connected with the type-bearing mechanism to print the same character I wish to be understood as referring to the character as it occurs in the line of print and not to the type, since I do not intend to limit myself by these expressions to the use of only one type for each character. There may be a plurality of type as well as of keys for the same character—*e. g.*, each key may be connected with a different type, all the type being of the same character. Thus, for example, I have shown three keys, either of which may be used to print the period (.). Two of these keys are connected with a type-head which carries two period-type, one for each key. The third key is connected with another period-bearing type-head. Hence there are three keys and three period-type with which the keys are respectively connected, but each of the period-keys prints the same character—viz., the period, (.).

Upon a suitable frame I are mounted the key-levers. Such type-bars as carry no double-spacing characters are connected each with a single key-lever in the usual way. Such type-bars as carry double-spacing characters are each connected with two key-levers, so that either will operate the type-bar independently of and without moving the other. This is accomplished, as shown in Fig. 4, by connecting the two key-levers with



the type-bar by a wire, in the lower end of which there is an open loop 3, that passes through a loop on the upper edge of each of the key-levers.

5 The escapement is of the general form shown in my United States Patent No. 580,281, dated April 6, 1897. There is a swinging rack 4 engaging alternately with two dogs, one a spacing-dog 5 and the other a detaining-dog  
10 6, or performing the functions of these dogs, though in the modification shown in Figs. 5 to 15 both dogs are reciprocable in the line of feed to effect the spacing. The rack normally meshes with the detaining-dog and is  
15 swung in and out by contact with screws 7 and 8 in arms on the upper end of the rocker-frame 9, one screw pushing the rack in and the other pushing it out.

The spacing-dog is supported on a pivot 10, and when the rocker-frame is swung in is spaced back by the pressure of an impulse-spring 11 upon a fixed holder 12. To accomplish this, the impulse-spring should be supported by the holder and operatively connected with the spacing-dog off from the line  
25 of the axis of the rocker-frame, the spring being supported independently of the rocker. In the foregoing respects the escapement is like that of the above-named Patent No. 580,281, except in the substitution of an impulse-spring for a rigid arm to cam back the spacing-dog. There are certain other differences between the mechanism herein shown and that of the above-named patent, and  
35 these will now be described.

Instead of a universal bar I provide several spacing-frames (three being shown) mounted on pivots on standards on the sides of the base of the machine. Each frame operates the  
40 rocker-frame and in a distinctive manner effects the spacing. Each is operated by certain of the key-levers and not by others. The rear ends of these frames lie above the key-levers and the front ends lie under the key-levers. The outer frame 13 operates the rocker-frame by impinging upon a point 14 on the rear thereof and causes the spacing-dog to be spaced back the maximum distance, say three spaces. This frame is operated only by the treble-spacing key-lever,  
50 which is connected with the type-bar carrying the period, colon, and question-mark. The two other spacing-frames extend under all of the key-levers; but each is operated only by such key-levers as have teats 16 16 projecting downward over it. When either of these spacing-frames is operated, a projection 17  
55 17 thereon pushes up one of two spring-controlled stop-dog rods 15 15 until its end comes flush with the body of the rocker-frame. This positions the rod back of the spacing-dog and determines the spacing, which is either single or double, according to the spacing-frame and corresponding stop-dog rod operated. When the end of the stop-dog  
65 rod is thus positioned, further movement of the spacing-frame swings the rocker on its

pivot. The stop-dog rods are shown as being mounted on the rocker-frame; but it is immaterial where they be mounted. The outer frame 13 does not operate a stop-dog rod, but only the rocker-frame, thus releasing the spacing-dog from the rack and causing it to be spaced back the maximum distance against a fixed stop carried on the rocker-frame. 70 75

The middle one, 18, of the three spacing-frames effects the single spacing, the inner of the three, 19, effects the double spacing, and the outer one, 13, effects the treble spacing. 80

The general operation of the escapement is as follows: The rack is normally in mesh with the detaining-dog 6, Fig. 2. When one of the spacing-frames engages the body of the rocker-frame and while it is swinging it inward, the rack is pushed inward by the outer screw on the rocker-frame. The adjustment of this screw will determine whether the rack is thrown off from the detaining-dog and onto the spacing-dog during the stroke of the key or not; but this exchange of dogs is sure to occur on return of the rocker-frame, if not effected before, because the rack when swung in engages with a spring 20, attached to the machine-frame. This spring presses upon the rack and prevents its being returned except by a push from the inner screw of the rocker-frame. The detaining-dog is also mounted upon an axis 21, so as to render it capable of adjustment relative to the normal position of the spacing-dog and also so that it will trip off to allow the carriage to be pushed back. Its position in this respect is controlled by a set-screw 22, which bears upon its front face, and by the spacing-spring 27, which holds it forward against the set-screw. Another adjustable set-screw 23 limits the forward movement of the spacing-dog. The rocker-frame, after being swung in by depression of a key, is swung back on release of the key by force of a spring 24 and by other means hereinafter described. 90 95 100 105 110

In spacing the carriage the difficulty encountered is that it may not have time to travel the whole distance each time a key is depressed in rapid writing, so that the spacing between letters will be inaccurate or the letters will be printed the one over the other. This difficulty can be overcome in several ways. Thus I may use the latch 25, which after the carriage has been released prevents the rocker-frame and the rack from swinging back far enough to effect the reengagement of the rack and the detaining-dog before the carriage has moved far enough to assure its traveling its proper distance. As the carriage moves forward with the spacing-dog a pin 26 on the dog throws back the latch and releases the rocker-frame, which is then returned to its normal position, as above described. Figs. 5 to 15 show another way of overcoming this difficulty by dividing the feed of the carriage. This also gives a smoother feed. The latch may be omitted and is not shown in these fig- 115 120 125 130



ures, but it is applicable to the construction of these figures.

In Figs. 5 to 15, inclusive, both dogs are spacing-dogs. The dog 6<sup>a</sup>, which performs the functions of the detaining-dog of the other figures, reciprocates through the distance of a single space only and is called the "single-spacing" dog. The other dog 5<sup>a</sup> reciprocates through the distance of one or more spaces and is called the "multiple-spacing" dog.

When the machine is at rest, the multiple-spacing dog is one space back of the single-spacing dog in the position shown in dotted lines in Fig. 5.

When the rack is thrown off the single-spacing dog and onto the multiple-spacing dog, the former is moved by force of a spring 27<sup>a</sup> from the position of Fig. 5 to the position of Fig. 6. If a multiple-spacing key is struck, the multiple-spacing dog is thrown back by pressure of spring 11 one or two spaces, and when the rack is thrown onto the multiple-spacing dog it will space forward the one or two spaces, then be thrown onto the single-spacing dog and move forward another space to normal position. If a single-spacing key is struck, the multiple-spacing dog is stopped by the single-spacing-stop-dog rod and prevented from spacing, and the carriage is held thereby until the rack is thrown back onto the single-spacing dog, when the carriage moves forward one space.

By having the impulse-spring 11 fastened to holder 12 the spacing-dog 5 or 5<sup>a</sup> is prevented from accidentally tipping backward during the normal unused condition of the machine, while the dog is disengaged from the rack.

In this specification and in the accompanying claims I designate by the term "impulse-spring" that spring which spaces and controls the reciprocating element (shown in Figs. 1 to 4 as the spacing-dog and in Figs. 5 and 15 as the single-spacing dog and the double-spacing dog) when the reciprocating element is disengaged from the other member of the escapement, (shown as the rack.) I use the term "impulse-spring" to distinguish it from the carriage-propelling spring, (not shown,) which usually provides the motive power for feeding the carriage and which is known as the "main spring." I wish to include within the meaning of the term "impulse-spring," besides the spring which I show, the various forms of springs for spacing the reciprocating element known to the art.

The impulse-spring 27<sup>a</sup> and the impulse-spring 11 are in effect mechanical equivalents of one another, since either one may be so disposed as to space the dog to a definite position and hold it there and also return it to that position when it has been spaced out of it in either direction. I do not wish to limit myself narrowly to the use of an impulse-spring of any particular form for spacing the reciprocating element to a central and normal position and for holding it there and also

for returning it to that position when it has been spaced out of it in either direction forward or backward. Neither do I wish to limit myself narrowly to the use of any particular form of impulse-spring for spacing the reciprocating element forward when the rocker-frame is in normal position and for spacing it backward when the rocker-frame is operated.

I have shown the impulse-spring 11 fastened by means of screw 31 at one end to arm 28 of the dogs 5 and 5<sup>a</sup> and at the other end to the fixed holder 12, so as to space the dogs both forward and backward on the rocker-frame when the rocker is moved on its pivot 29; but I do not wish to limit myself by the term "supported independently of the rocker" in the broadest aspect of the impulse-spring to fastening the spring at one end to the dog and at the other end to the fixed holder, for it is obvious that any spring which may be flexed by the dog upon the movement of the rocker-frame and that is held for such flexure by a fixed stop will tend to space the dog backward upon the swinging of the rocker-frame and to return the rocker-frame to normal position; but by fastening the impulse-spring 11 to the fixed stop 12 by the screw 32, as shown, the dog will also be thrown forward by the spring upon the return of the rocker-frame to normal position and be retained at such forward position thereby until spaced rearwardly, as above described. In my said Patent No. 580,281 the dog-camming arm is not fastened to the fixed support against which it presses to space the dog backward when the rocker-frame is swung inwardly, and therefore that camming-arm is not effective for holding the dog forward, but only for spacing it backward. It is also obvious that the farther inward the rocker-frame is swung the harder impulse-spring 11 presses dog 5 or 5<sup>a</sup> backward. The impulse-spring exerts a yielding pressure to cam the dog backward, which pressure constantly augments as the rocker-frame swings inwardly upon its pivot 29 and is greatest when the rocker-frame is at the extreme limit of its inward movement, just at the instant of printing, when the type-key is fully depressed; but at about this time—viz., about the instant of printing—the rack is preferably also swung inwardly far enough to disengage from dog 6 or 6<sup>a</sup> and to engage with dog 5 or 5<sup>a</sup>. When this occurs, the full tension of the carriage-mainspring is exerted on dog 5 or 5<sup>a</sup> to space the dog forward. Therefore at this time the full tension of the impulse-spring is exerted to hold the dog at the limit of its backward spacing and the full tension of the mainspring is exerted to space the dog forward to the limit of its forward spacing; but during the return movement of the rocker-frame, after the release of the type-key, while the tension of the mainspring exerted to space the dog forward remains constant, the backward pressure exerted by the impulse-spring on the dog con-



stantly diminishes until the return of the rocker-frame to normal position. It is also obvious that at the end of the downstroke if a treble-spacing key is depressed and dog 5 or 5<sup>a</sup> spaced backward into engagement with the treble-spacing stop 30 spring 11 will then exert less pressure to hold the dog at the limit of its backward movement than it would if a double-spacing key or a single-spacing key had been depressed and one of the stop-dog rods 15 15 thereby interposed in the path of the dog to limit its backward spacing. This is true because in moving dog 5 or 5<sup>a</sup> forward on the rocker-frame the arm 28 of the dog is thereby depressed, so that an additional tension is imparted to spring 11. Hence it follows that the main-spring may gradually space the dog forward as the rocker-frame is rocked outwardly during the return of the parts to normal position. I have found in practice that such adjustment of the two springs results in a very smooth and rapid carriage feed.

It will be observed that I accomplish the above-enumerated results with spring 11 by supporting the spring independently of the rocker 9. I therefore intend to claim, broadly, herein an impulse-spring which exerts a differential tension at different parts of the stroke for spacing the dog backward and for controlling it in its position at the limit of its backward spacing.

Figs. 5, 6, and 7 illustrate in detail the construction and operation of the single-spacing dog 6<sup>a</sup>.

Referring to Fig. 5, the dog 6<sup>a</sup> is shown at the limit of its forward movement in engagement with screw 22. This position shows the parts with dog 6<sup>a</sup> engaged with rack 4. Rack 4 is drawn forward in the direction indicated by the arrow on the rack by the pull of the carriage-mainspring until the engagement of the single-spacing dog with screw 22 prevents any further movement of the rack. In this figure the position which the multiple-spacing dog 5<sup>a</sup> would occupy in the normal unused condition of the machine is indicated by dotted lines, which show the dog one rack-tooth back of the single-spacing dog. The multiple-spacing dog is shown in full lines two teeth farther back on the rack in engagement with stop 30. Fig. 5 therefore shows the position of the parts during the depression of a multiple-spacing key after dog 5<sup>a</sup> has been spaced backward by spring 11 into engagement with dog-stop 30, but before rack 4 has been swung by screw 7 out of engagement with dog 6<sup>a</sup> and into engagement with dog 5<sup>a</sup>.

Fig. 6 shows the positions of the parts after screw 7 has swung rack 4 off from dog 6<sup>a</sup> onto dog 5<sup>a</sup> and after the rack has been fed forward in the direction indicated by the arrow thereon until dog 5<sup>a</sup> has been brought into contact with screw 23, which limits its forward movement. This view shows the normal intermediate or central position which

is assumed by dog 6<sup>a</sup> under the influence of spring 27<sup>a</sup> when dog 6<sup>a</sup> is disengaged from the rack. In this position the spring 27<sup>a</sup> is held under tension between the upper and lower faces 35 and 36 on the stop-piece 37, which is rigidly fixed to the spacing-rocker. The spring 27<sup>a</sup> also engages with the lower and upper faces 38 and 39 on the dog 6<sup>a</sup>. Washers 33 and 34 are provided at the bottom and top of spring 27<sup>a</sup> for engagement with faces 35, 36, 38, and 39. The compression of spring 27<sup>a</sup> between the faces 35, 36, 38, and 39 prevents the spring from falling out of its place in the stop-piece 37, and washers 33 and 34 provide points of contact between the spring and the faces above enumerated on the stop-piece and on the dog. The compression of the spring between faces 35, 36, 38, and 39 is also requisite in order to support the overhanging weight of dog 6<sup>a</sup> in its central normal position when the dog is out of engagement with the rack. Whenever dog 6<sup>a</sup> is moved either forward or backward out of its central normal position the spring 27<sup>a</sup> will be still further compressed between one of the two faces on the fixed stop 37 and one of the two faces on the dog. In the central normal position shown in Fig. 6 the washer 33 at the bottom of spring 27<sup>a</sup> engages with the face 36 of the fixed stop and also with the face 38 of the dog and washer 34 at the top of the spring engages with the face 35 of the stop-piece and the face 39 of the dog. In the position shown in Fig. 5, with the dog pulled forward into engagement with screw 22, the faces 38 and 39 on the dog have been lifted up above and out of line with the faces 35 and 36 of the fixed stop. Therefore the washer 33 has been lifted up out of its engagement with face 36 and face 39 has been lifted up out of its engagement with washer 34. Hence the washer 34 only engages with face 35 of the fixed stop and washer 33 only engages with face 38 of the dog, thereby still further compressing spring 27<sup>a</sup> and imparting an increased tension thereto.

It follows from the above that as the spring is normally held under tension between the faces 35 and 36 on the stop-piece 37, and while under this tension is also held between the faces 38 and 39 of the dog, the dog will be held in its normal position under tension by a mechanism which tends to throw it in opposite direction, but whose opposing tendencies neutralize each other when the dog is in the normal position shown in Fig. 6. This is important not only as giving the dog a quick return when moved in either direction, but also as obviating the looseness which would result were the dog merely returned to its normal position by a spring mechanism, and the action above described therefore results in accurately centering the dog.

Fig. 7 shows the positions of the parts while the rack is being retracted to the left (in the direction of the arrow in that figure) to re-



turn the carriage to the starting-point for a new line of print. In this position the dog 6<sup>a</sup> is in line with rack 4 and has been swung backward and down, thereby compressing spring 27<sup>a</sup> between faces 36 of the fixed stop and 39 of the dog and disengaging the spring from faces 35 of the fixed stop and 38 of the dog. In this position, therefore, an additional tension has been imparted to spring 27<sup>a</sup>. Hence it is obvious that spring 27<sup>a</sup> always tends to return the dog 6<sup>a</sup> to its central normal position whenever the dog has been moved out of that position either forward or backward, and that the resiliency of the spring tends to always hold washer 33 in engagement with faces 36 and 38 and washer 34 in engagement with faces 35 and 39, thereby holding dog 6<sup>a</sup> securely in its normal intermediate position until force is applied to the dog to move it either forward or backward out of said position, and that by application of force to dog 6<sup>a</sup> the tension of spring 27<sup>a</sup> may be overcome and the dog moved both forward and backward out of its intermediate position. By this construction I am enabled to make my single-spacing dog in one piece and to control it in its central intermediate position by spring mechanism comprising spring 27<sup>a</sup>, the washers 33 and 34, and the faces 35, 36, 38, and 39, which spring mechanism is mounted wholly on the spacing-rocker and admits of the movement of the dog about its pivot 21 both forward and backward on the rocker.

I do not herein claim, broadly, a spring on the rocker-frame for spacing a pivoted dog forward thereon and means for spacing the dog backward, as that is broadly claimed in my Patent No. 554,874; but I claim herein an impulse-spring or spring mechanism which holds a pivoted dog on the rocker in a normal central or intermediate position between the limits of its forward and backward vibrations on the rocker and which returns the dog to its normal central position after movement to either side thereof.

Since dog 5<sup>a</sup> is positioned by spring 11 irrespective of the position of dog 6<sup>a</sup> and dog 6<sup>a</sup> is positioned by spring 27<sup>a</sup> irrespective of the position of dog 5<sup>a</sup>, it follows that each of the dogs is positioned independently of the other. By the term "pivoted dog" or "spacing-dog" as I use those terms in this specification and in the accompanying claims I intend to cover reciprocating elements which are generally known in the art as the equivalents of such dogs.

The escapement herein shown is widely adaptable to suit the preference of the operator or the work to be accomplished. The carriage can be released so as to be free to traverse any part or all of the space to be traversed either before or at or after the instant of printing, and the whole distance can be traversed at once or divided up into steps.

In my United States Patent No. 577,982, dated March 2, 1897, I have described what I designate as a "repulser." This repulser may

be defined as a spring or other force which is brought to bear on the type-key after the key has been so far depressed as to start the type-bar on its excursion to the printing-center and after the carriage has been released sufficiently to begin its letter-space feed, and its function is to cause the operator to lift his finger before any blurring in the print can take place.

A notable advantage of my present construction consists in the repulser effect which I thereby secure.

The impulse-spring 11 spaces dog 5, Figs. 2 and 3, and 5<sup>a</sup>, Figs. 5 to 15, backward by the force of the blow on the key during the depression of the key. This introduces a slight repulser effect. The positioning of either of the stop-dog rods 15 15 by the single-spacing keys or by the double-spacing keys limits the backward spacing of the dog, thereby largely increasing the repulser effect on the key, since the spring 11 must then be flexed.

If the parts in the escapement be so adjusted that the rack is thrown off from dog 6<sup>a</sup> onto dog 5<sup>a</sup> while the key is being depressed, the carriage may immediately begin its letter-face feed, the dog 5<sup>a</sup> being pulled forward with the rack by the force of the carriage-mainspring. In this case spring 11 will be fully flexed, and therefore the full repulser effect will be brought to bear on the key. Hence the operator will naturally lift his finger before any blurring in the print can occur.

The forces that flex the spring 11—viz., the blow on the key and the pull of the mainspring—coöperate not only to produce the repulser effect on the key, but also in conjunction with spring 24 to reengage the rack with the dog 6<sup>a</sup>. The flexing of spring 11 tends to return the rocker-frame 9 to its normal position, and to thereby reengage the rack with dog 6<sup>a</sup>, and since the flexing of spring 11 is caused by the pull of the mainspring and the blow on the key it is obvious that the pull of the mainspring and the force of the blow on the key coöperate in restoring the rocker-frame to normal position and in reengaging the rack with dog 6<sup>a</sup> after the release of the key. Hence the pull of the mainspring assists in reengaging the disengaged members in the escapement, thereby increasing the speed of the carriage feed and lessening the force of the blow on the key required to operate the escapement. The pull of the mainspring also assists the key-lever spring in lifting the key after its depression. Hence the key is lifted more easily and rapidly. The pull of the mainspring may also assist in more rapidly returning the type-bars into the basket, where they normally rest when not in use. The mainspring does not, however, assist in returning the type-bars which are connected with two key-levers, because the loop 3 in the connecting-wire prevents the force from being transmitted from the key-lever to the type-bar.

My present construction differs from that



of my Patent No. 580,281 in this respect, that while the carriage is not released in the former construction until after the release of the key in my present construction the carriage may be freed, as above described, as soon as the rack is thrown onto the spacing-dog. The construction herein and in said Patent No. 580,281 are similar in that the spacing-dog in each is cammed back by the force of the blow on the key, and the repulser effect is thereby transmitted to the key in each instance. In my said Patent No. 580,281 the carriage can be cammed backward by the camming of the dog, while in the present construction the dog is cammed backward and the carriage may or may not be cammed backward, according to the relative tensions of the impulse-spring and of the mainspring; but in both constructions the mainspring assists in reengaging the normally-engaging members in the escapement.

I wish to call particular attention to the synchronal action of the working parts of the type-writer in my construction. In former constructions the various moving parts have been returned to their normal positions, after the printing, by independent forces. Thus the key-lever and type-bar have been returned by one spring, the dog-carrying rocker-frame by another spring, and the carriage has been fed forward by still another spring. Unless the tensions of these three springs were adjusted with the greatest nicety relatively to one another there would be a lack of synchronism between them. Either the carriage would feed too slowly, causing the letter-spacing to be imperfect, or the rocker-frame would not be returned quickly enough to release the carriage and give the mainspring sufficient time for feeding the carriage, or else the key-lever and type-bar would be returned to their normal positions too slowly, and consequently the succeeding type-bar would be in danger of colliding with one which was being returned into the basket. Therefore no matter how speedy some of the parts might be the slowest working part would determine the speed of the machine, and at the same time unnecessary labor would be required to operate the machine because of the greater tensions on the more speedy parts.

In this specification and in the claims I use the terms "engaging" and "disengaging" members in the escapement in a very general sense, intending to include thereby the construction in which one of the engaging members is provided with two elements, herein shown as two dogs, which alternately engage and disengage with the other member, herein shown as a rack. I designate the members as "in engagement" when they are in their normal positions of rest and as "disengaged" when they are in the positions opposite thereto. For a further discussion of the definition of these terms I would refer to the discussion and definition of the terms in my above-mentioned United States Patent, No. 554,874.

By the term "type-bearing mechanism" I mean the vehicle of all the characters—*e. g.*, a wheel or the whole set of type-bars. By the term "type-bearer" I mean the vehicle of a single character—*e. g.*, a single type-bar or a wheel considered as the vehicle of a single character. I do not, however, wish to so limit these terms as to include within their scope only wheel and type-bar machines, as it is immaterial what the form of the vehicle of the characters may be.

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

1. In a type-writing machine, the combination of a type-bar, two keys, means for connecting both of the keys to the said type-bar whereby each key operates the same type-bar to print the same character, spacing mechanism, means for connecting one of the keys therewith for uniform or ordinary spacing, and means for connecting the other key with the spacing mechanism to effect double or extra spacing, substantially as described.

2. In a type-writing machine, the combination of a type-bar, two keys, means for connecting both of the keys to the said type-bar whereby each key operates the same type-bar to print the same character, spacing mechanism including a spacing-dog, a stop normally in inoperative position relatively to the dog, means operated by one of the keys for spacing the dog and bringing the dog and the stop into relatively operative position to effect uniform or ordinary spacing, and means operated by the other key for spacing the dog to effect double or extra spacing, substantially as described.

3. In a type-writing machine, the combination of a type-bar, two keys, means for connecting both of the keys to the said type-bar whereby each key operates the same type-bar to print the same character, spacing mechanism including a spacing-dog, two stops normally in inoperative position relatively to the dog, means operated by one of the keys for spacing the dog and bringing the dog and a stop into relatively operative position to effect uniform or ordinary spacing, and means operated by the other key for spacing the dog and bringing the other stop into relatively operative position to effect double or extra spacing, substantially as described.

4. In a type-writing machine, the combination of a type-bar, two keys, means for independently connecting both of the keys to the said type-bar whereby each key independently operates the same type-bar to print the same character, spacing mechanism, means for connecting one of the keys therewith for uniform or ordinary spacing, and means for connecting the other key with the spacing mechanism to effect double or extra spacing, substantially as described.

5. In a type-writing machine, the combination of a type-bar, two keys, means for independently connecting both of the keys to the same type-bar whereby each key independ-



ently operates the same type-bar to print the same character, spacing mechanism including a spacing-dog, a stop normally in inoperative position relatively to the dog, means operated by one of the keys for spacing the dog and bringing the dog and the stop into relatively operative position to effect uniform or ordinary spacing, and means operated by the other key for spacing the dog to effect double or extra spacing, substantially as described.

6. In a type-writing machine, the combination of a type-bar, two keys, means for independently connecting both of the keys to the same type-bar whereby each key independently operates the same type-bar to print the same character, spacing mechanism including a spacing-dog, two stops normally in inoperative position relatively to the dog, means operated by one of the keys for spacing the dog and bringing the dog and one of the stops into relatively operative position to effect uniform or ordinary spacing, and means operated by the other key for spacing the dog and bringing the dog and the other stop into relatively operative position to effect double or extra spacing, substantially as described.

7. In a type-writing machine, the combination of type-bearing mechanism having a series of characters that are frequently double-spacing characters, means for connecting two keys to each of these characters whereby both keys of each pair operate the type-bearing mechanism to print the same character, a second series of characters on the type-bearing mechanism that are not frequently double-spacing characters, means for connecting one key with each of these characters, spacing mechanism, means for connecting one of the keys connected with the first series of characters therewith to effect double or extra spacing, and means whereby the other key of each pair connected with the first series of characters and the keys connected with the second series of characters operate the spacing mechanism for uniform or ordinary spacing, substantially as described.

8. In a type-writing machine, the combination of a series of type-bars on which are the characters that are frequently terminal characters, means for connecting two keys to each of these type-bars whereby both keys of each pair operate the same type-bar to print the same character, a second series of type-bars on which are the characters that are not frequently terminal characters, means for connecting one key with each of these characters, spacing mechanism, means for connecting one of the keys connected with each of the first series of type-bars therewith to effect double or extra spacing, and means whereby the other key of each pair connected with the first series of type-bars and the keys connected with the second series of type-bars operate the spacing mechanism for uniform or ordinary spacing, substantially as described.

9. In a type-writing machine, the combination of a keyboard having three rows of keys

adjacent to one another with their keys arranged in the order of the Remington standard keyboard and connected with single-spacing mechanism, and a row of keys back of the three said rows connected with frequently double-spacing characters and with double-spacing mechanism, substantially as described.

10. In a type-writing machine, the combination of a keyboard having three rows of keys adjacent to one another with their keys arranged in the order of the Remington standard keyboard and connected with single-spacing mechanism, a row of keys back of the three said rows connected with type-bars which carry frequently terminal letters and connected with double-spacing mechanism, and a row of keys in front of the three said rows connected with type-bars which carry frequently terminal letters and connected with double-spacing mechanism, substantially as described.

11. In a type-writer escapement, the combination of a vibratory rocker and a reciprocating element, an impulse-spring which connects the reciprocating element with a holder and which is so disposed that the reciprocating element is held normally forward thereby when the vibratory rocker is in normal position, and is spaced backward by the impulse-spring when the vibratory rocker is operated, substantially as described.

12. In a type-writer escapement, the combination of a dog-carrying rocker-frame with a spacing-dog mounted thereon and an impulse-spring which connects the dog with a fixed holder, and which is so disposed that the dog is held normally forward thereby when the rocker-frame is in normal position, and is spaced backward by the impulse-spring when the rocker-frame is operated, substantially as described.

13. In a type-writer escapement comprising two engaging members one of which can be spaced step by step with respect to and under control of the other, the combination of a vibratory rocker and a reciprocating element, an impulse-spring which connects the reciprocating element with a holder, and which is so disposed that the reciprocating element is held forward thereby when the vibratory rocker is in normal position, and is spaced backward by the impulse-spring when the vibratory rocker is operated, and a stop to limit the spacing of the reciprocating element, normally out of the path of the reciprocating element, but which is positioned in the path of the reciprocating element when the vibratory rocker is operated, substantially as described.

14. In a type-writer escapement, the combination of a vibratory rocker and a reciprocating element, two yielding and spring-controlled stops which normally hold the reciprocating element in a position intermediate between the limits of its forward and backward vibration, and means to limit the move-



ment of the said yielding stops and determine their normal positions, substantially as described.

15. In a type-writer escapement, the combination of a dog-carrying rocker-frame and a spacing-dog mounted thereon, two yielding and spring-controlled stops on the rocker-frame which normally hold the dog in a position intermediate between the limits of its forward and backward vibration, and a fixed stop to limit the movement of the said yielding stops and determine their normal positions, substantially as described.

16. In an escapement mechanism, the combination with a spaced member, of a pivoted dog engaging therewith, and a spring normally under tension holding the dog in a central intermediate position but permitting it to be moved to either side of such position, substantially as described.

17. In an escapement mechanism, the combination with a spaced member, of a spacing-rocker and a pivoted dog mounted thereon, spring mechanism normally under tension mounted wholly on the rocker, holding the dog in a central intermediate position thereon and returning it to the said central position when moved to either side thereof, substantially as described.

18. In a type-writing machine, the combination of a rack, a spacing-rocker and a pivoted dog mounted thereon and capable of occupying three different positions, and a spring stop mechanism on the rocker, normally under tension, and tending to keep the dog in the central or intermediate position on the rocker.

19. In an escapement, the combination of a pivoted dog and a fixed bracket, the dog and bracket each having oppositely-disposed faces and a single spring contained between the two faces on the dog and bracket, substantially as described.

20. In an escapement mechanism, the combination of a pivoted dog and a fixed bracket, the dog and bracket each having oppositely-disposed faces thereon, a spring contained between the said faces, and normally bearing thereon to maintain the dog in a central normal position, substantially as described.

21. In a type-writer escapement, the combination of a pivoted dog, two yielding and spring-controlled stops which normally hold the pivoted dog in a position intermediate between the limits of its forward and backward vibration, and means to limit the movement of the yielding stops and determine their normal positions, substantially as described.

22. In an escapement, the combination with a rack of a pivoted dog which engages therewith and is made in a single piece, and a single spring for holding the dog normally under tension in a central intermediate position and for returning the dog into that position after movement to either side thereof, substantially as described.

23. In an escapement, the combination with

a rack of a spacing-rocker and a pivoted dog mounted thereon which is made in a single piece and engages with the rack, and a spring mechanism mounted wholly on the spacing-rocker for holding the dog normally under tension on the rocker in a central intermediate position and for returning the dog into that position after movement to either side thereof, substantially as described.

24. In an escapement, the combination with a rack of a spacing-rocker and a pivoted dog mounted thereon, a spring supported independently of the rocker but operatively connected with the dog to hold the rocker in its normal position and to return it to its normal position when it has been moved, substantially as described.

25. In a type-writer escapement, the combination of a spacing-rocker, a pivoted dog mounted thereon and a spring supported independently of the rocker for positioning said dog, substantially as described.

26. In a type-writer escapement, the combination of a spacing-rocker, a pivoted dog mounted thereon, a spring supported independently of the rocker for positioning said dog, and a stop for limiting the movement of the dog on the rocker, substantially as described.

27. In a type-writer escapement, the combination of a spacing-rocker, a pivoted dog mounted thereon and a spring for both positioning the rocker and positioning the dog in relation thereto, substantially as described.

28. In a type-writer escapement, the combination of a power-propelled carriage and an escapement, a spring connected with said escapement, a key for moving the escapement against the spring, and means for bringing the carriage-propelling power into action through said escapement-spring to lift the key when the key is depressed, substantially as described.

29. In an escapement, the combination with a rack of a spacing-rocker and a pivoted dog mounted thereon which engages with the rack and moves on its pivot to effect the spacing, and a spring supported independently of the rocker for positioning the dog, said dog comprising an arm which engages with the rack, and an arm operatively connected with the spring, and a pivotal portion.

30. In an escapement, the combination of two pivoted dogs, each of which moves upon its pivot and permits a part of the spacing movement, and one of which has a normal central position irrespective of the position of the other dog and can be moved to either side of said central position, substantially as described.

31. In an escapement, the combination of two independently-spring-positioned pivoted dogs, one of said dogs being normally held in a central intermediate position and capable of movement to either side thereof, substantially as described.

32. In an escapement, the combination of



a spacing-rocker, two pivoted dogs mounted thereon, one of which is spring-supported in a central intermediate position upon the rocker, and the other of which has a spring supported independently of the rocker, substantially as described.

33. In an escapement, the combination of two pivoted dogs, each of which moves on its pivot to effect the spacing, and a spring supported independently of the rocker for positioning one of said dogs, substantially as described.

34. In a type-writer escapement, the combination of two engaging members one of which can be spaced forward step by step and one of which comprises two letter-spacing elements, one of which elements reciprocates in a direction opposite to that in which the spaced member is advanced to permit the spaced member to be fed forward one letter-space at a time, and the other of which elements reciprocates in a direction opposite to that in which the spaced member is advanced to permit the spaced member to be fed forward an additional letter-space for double spacing, substantially as described.

35. In a type-writer escapement, the combination of a rack member which can be spaced forward step by step and a dog member which engages therewith and comprises two letter-spacing dogs, one of which dogs reciprocates in a direction opposite to that in which the rack member is advanced to permit the rack member to be fed forward one letter-space at a time, and the other of which dogs reciprocates in a direction opposite to that in which the rack member is advanced to permit the rack member to be fed forward an additional letter-space for double spacing, substantially as described.

36. In a type-writer escapement, the combination of two engaging members one of which can be spaced forward step by step and one of which comprises two letter-spacing elements, one of which elements reciprocates in the direction of the carriage-feed to permit the spaced member to be fed forward one letter-space at a time, and the other of which elements reciprocates in the direction of the carriage-feed to permit the spaced member to be fed forward an additional letter-space for double spacing, and means to prevent the said other element from so reciprocating when single spacing is required, substantially as described.

37. In a type-writing machine, a keyboard in which there are a capital-letter shift-key and a period-key, the period-key being immediately behind the shift-key and normally above it, and having sufficient play to bring it when depressed about to the level of the shift-key, substantially as described.

38. In a type-writing machine, a keyboard in which there are a capital-letter shift-key and a period-key, the period-key being immediately behind the shift-key and normally above

it, and having sufficient play to bring it when depressed about to the level of the shift-key, and being connected with a type-bearer on which is a period positioned to print in lower case, and being connected with spacing mechanism, substantially as described.

39. In a type-writer escapement comprising two engaging members one of which is spaced with respect to and under control of the other, means for bringing them into the relation necessary to effect the movement in the spacing, a latch for maintaining them in this relation until the movement is assured and means for throwing off the latch, substantially as described.

40. In a type-writer escapement comprising two engaging members one of which is spaced with respect to and under control of the other, and one of which has a part which reciprocates in the line of spacing, means for bringing them, into the relation necessary to effect the movement in the spacing, a latch for maintaining them in this relation until the movement is assured and a pin on the said reciprocating element which contacts with the latch and throws it off substantially as described.

41. In a type-writer escapement the combination of two engaging members which can be disengaged and reengaged and one of which can be spaced forward with respect to and under control of the other, means for operating the two members together transversely, a spring contacting with one of the members to hold it inoperative, means for operating the other member to effect the separation of the members, means for operating the first-mentioned member to effect their reengagement, means for effecting the spacing by aid of these movements, substantially as described.

42. In a type-writer escapement, the combination of two engaging members, one of which can be spaced step by step, and one of which is provided with a moving part that engages with and is disengaged from the other member, means for feeding the spaced member in one direction, means for spacing the said moving part in one direction, which two said means are antagonistic upon the engagement of said moving part with the said other member, one at least of the said means acting upon the moving part and tending to move it with a force varying at different periods of said engagement, substantially as described.

43. In a type-writer escapement, the combination with a spaced member and an escapement mechanism therefor having a moving part which is engaged with and disengaged from the spaced member, of two springs, acting in opposition upon the moving part of the escapement mechanism when the latter is in engagement with the spaced member, one of said springs tending to move the part with a force varying at different periods of said engagement, substantially as described.

44. In a type-writer escapement, the combination with a spaced member and an escape-



ment mechanism therefor having a moving part which is engaged with and disengaged from the spaced member, of a spring for feeding the spaced member, and a spring acting  
5 upon the moving part of the escapement with a varying force, and in opposition to the first-named spring, at different periods of the engagement of the moving part and spaced member, substantially as described.  
10 45. In an escapement, the combination of two pivoted dogs, each of which moves upon its pivot and permits a part of the spacing movement, one of which has a normal central position irrespective of the position of the  
15 other dog and can be moved to either side of said central position, and means operated by

the type-keys for positioning one of said dogs, substantially as described.

46. In an escapement, the combination of two independently-spring-positioned pivoted dogs, one of said dogs being normally held in a central intermediate position and capable of movement to either side thereof, and means operated by the type-keys for positioning one of said dogs, substantially as described. 20 25

Signed by me, this 13th day of February, 1893, at New York city.

FREDERIC W. HILLARD.

In presence of—

PAUL GORHAM,  
SAMUEL W. BALCH.