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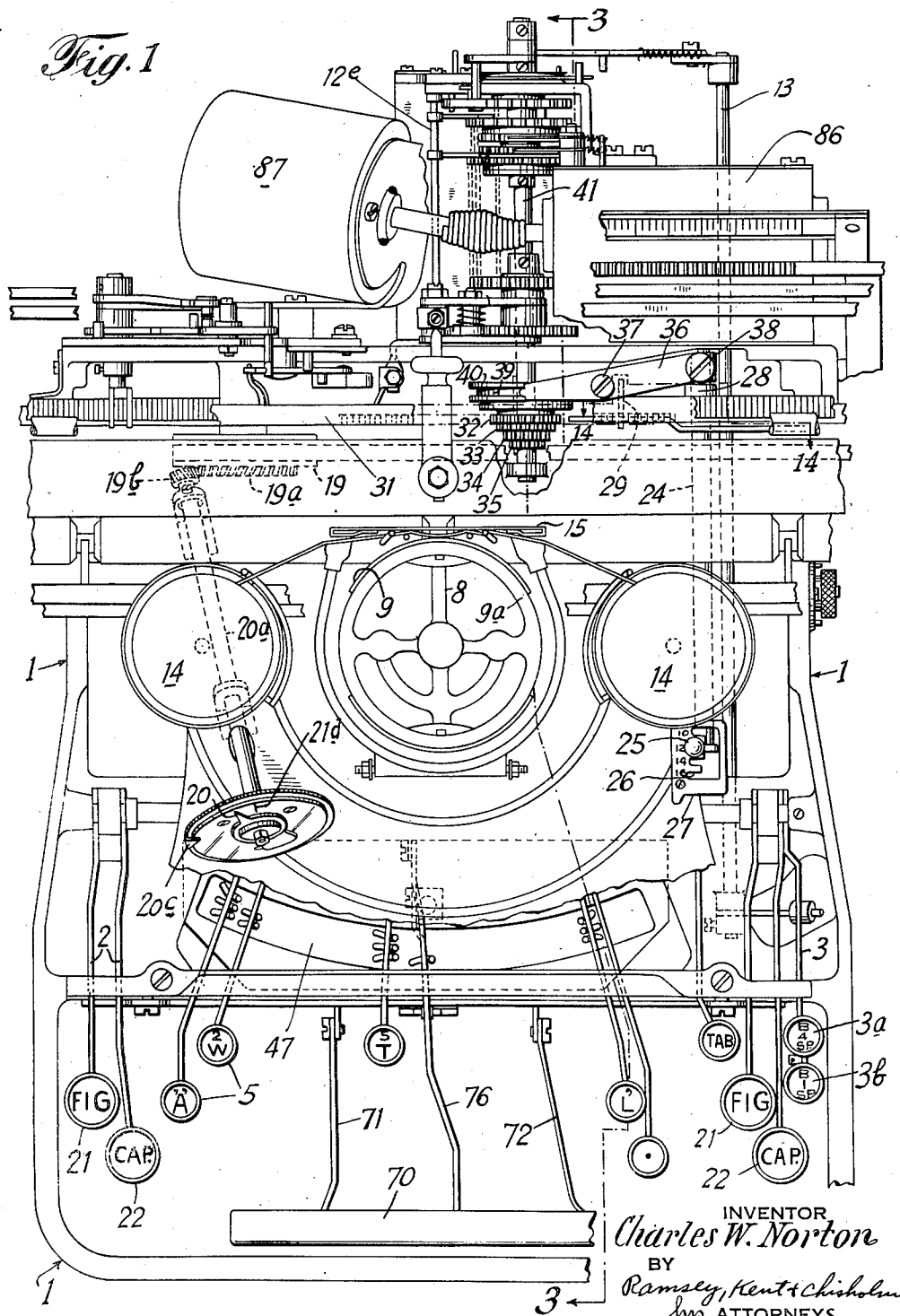
C. W. NORTON

2,477,702

BACKSPACING MECHANISM

Original Filed July 8, 1944

3 Sheets-Sheet 1



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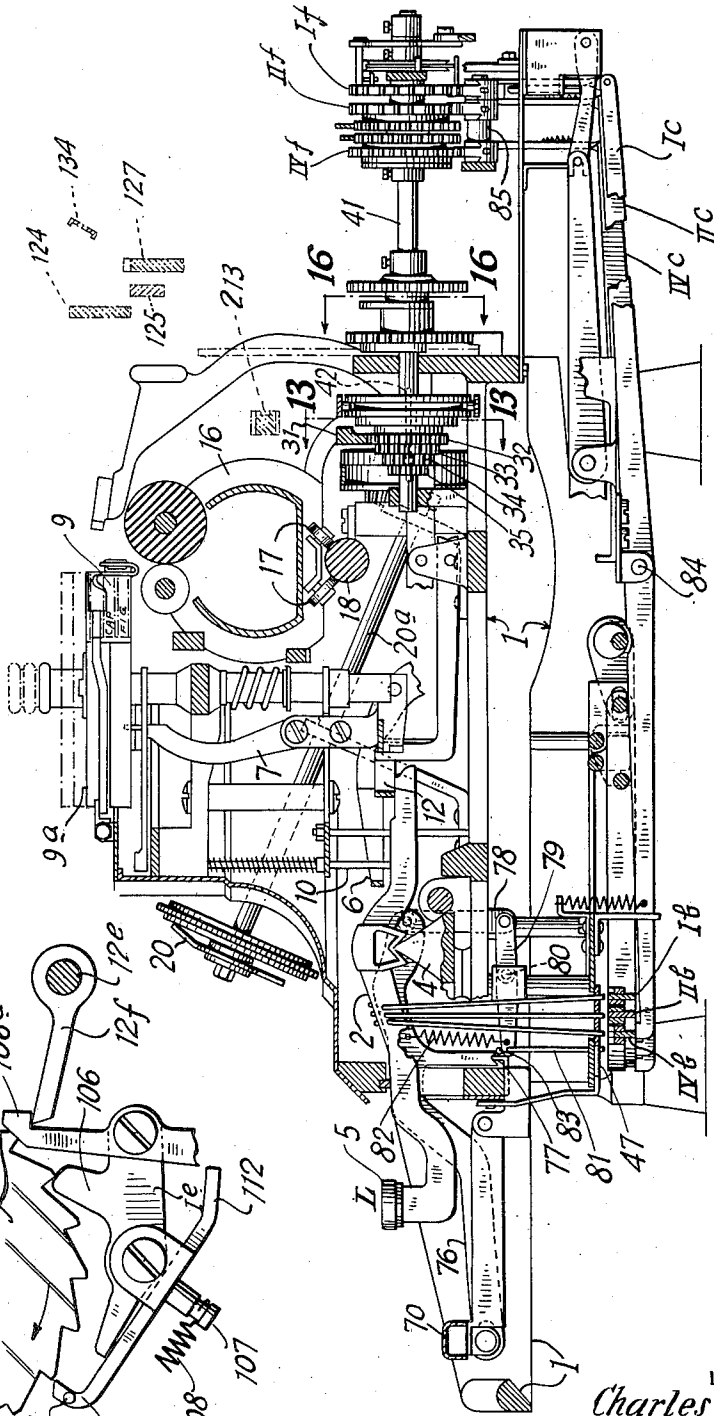
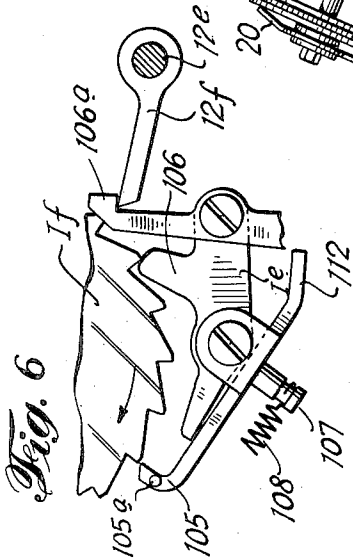
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Fig. 2



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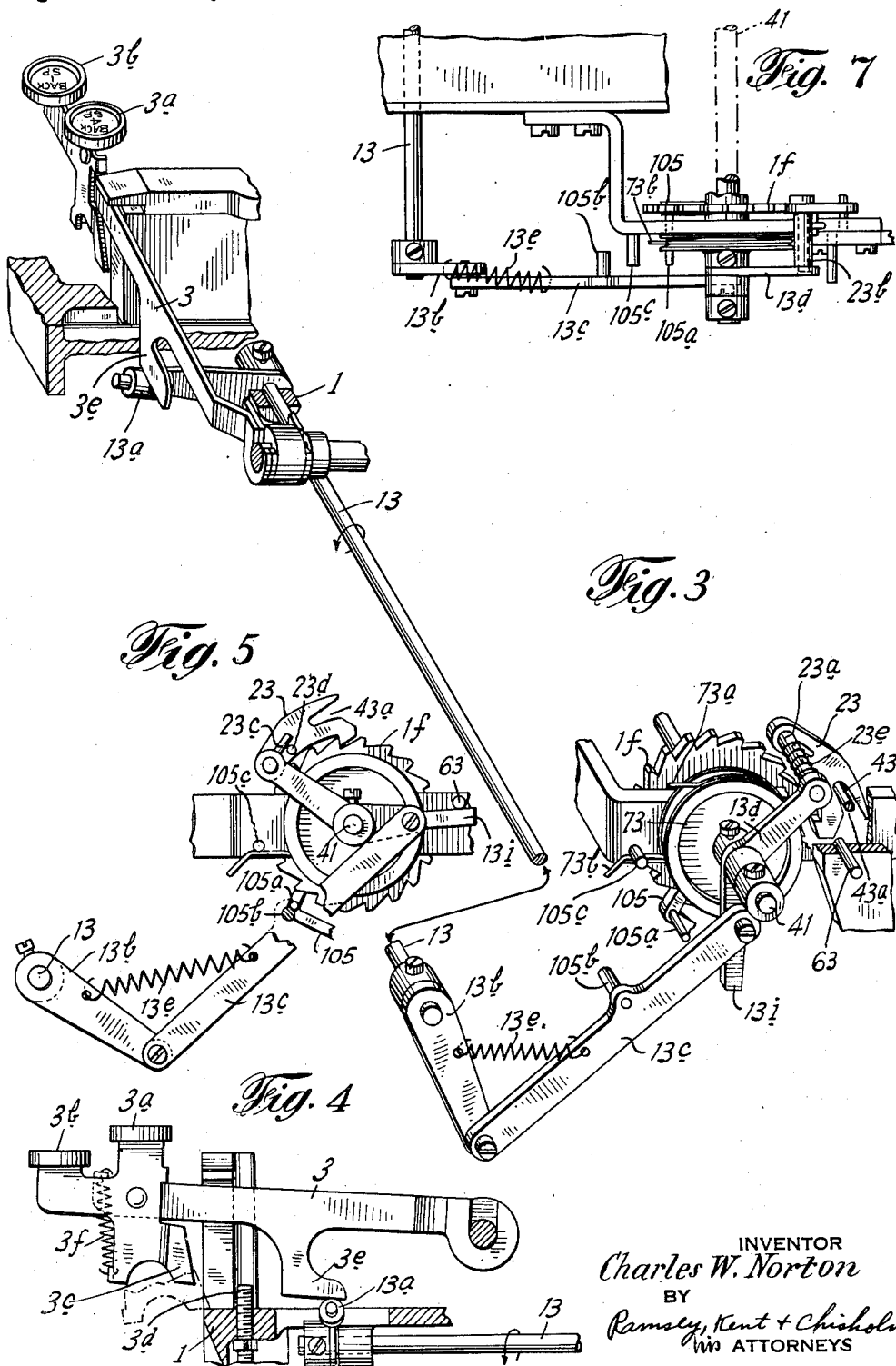
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BACKSPACING MECHANISM

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3 Sheets-Sheet 3



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## UNITED STATES PATENT OFFICE

2,477,702

## BACKSPACING MECHANISM

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Original application July 8, 1944, Serial No.  
543,981. Divided and this application May 15,  
1946, Serial No. 669,805

9 Claims. (Cl. 197—91)

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This invention relates to typewriting machines and as illustrated and described is embodied in a machine known in the art as a "Varityper," in which a supporting anvil carries interchangeable type shuttles, so that various styles and sizes of type may be used at will. This application is a division of my application Serial No. 543,981, filed July 8, 1944, now issued as Patent No. 2,405,974.

Machines according to this invention are capable of producing typed sheets in simulation of ordinary printed matter which may be used as "make ready" for reproduction of photolithographic or other printing processes. The printing type, however, must be given various conventional dimensions as to width, and it is desirable that different styles and sizes of type, such as occur in ordinary printed matter in the way of headings, emphasis and the like, may be used. Means for attaining this result is disclosed in my Patent No. 2,298,805, issued October 13, 1942.

The invention disclosed herein is capable of producing a typed sheet in characters of conventional dimensions differentially spaced in many different fonts of type; to accomplish this result requires new structures in respect of some of the functions, and a novel coordination of the different mechanisms and devices which must be conjointly employed; and it provides mechanism whereby the carriage feed may be advanced according to the varying width of the different characters, and at the same time affords means for appropriate back-spacing adapted to the requirements of such differential spacing.

The object of this invention is to provide improved back-spacing mechanism whereby the carriage may be back-spaced different distances per stroke.

In the claims as well as in the description parts are identified by specific names for convenience, but such nomenclature is intended to be as generic, in its application to analogous parts, as the prior art will permit. The best form in which I have contemplated applying my invention is illustrated in the accompanying drawings forming a part of this application in which:

Fig. 1 is a plan view of a preferred form of typewriting machine with such parts omitted as are well-known in the art and may not be necessary to a complete understanding of the present invention.

Fig. 2 is a vertical section on the line 3—3 of Fig. 1.

Fig. 3 is a broken perspective view of the back-spacing key and mechanism.

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Fig. 4 is a view in side elevation of the two-button back-spacing key.

Fig. 5 is a side elevation of the back-spacing ratchet in the position taken in back-spacing four units.

Fig. 6 is a detailed view of the escapement dog and a portion of the escapement wheel that is acted upon by the back-spacing mechanism.

Fig. 7 is a plan view of the back-spacing ratchet shown in Fig. 3.

The machine herewith illustrated and described is of the key-controlled shuttle type, where the printing impression is formed by the impact of a printing hammer which forces the paper against the ribbon and type. The particular machine illustrated is known in the art as the "Varityper." Referring to Fig. 1, it comprises a main frame 1 which carries the mechanism of the machine. Type keys 2 (only a few being illustrated) are mounted on a pivot bar 4 (Fig. 2) supported by the main frame 1. These type keys 2 at their front ends carry finger buttons 5 and at the rear ends cooperate with the actuator bars 6 (one of which is shown in Fig. 2) to operate actuators 7. These actuators 7 swing the shuttle arm 8 (Fig. 1) so that it oscillates the shuttle 9 on an anvil 9a to bring the proper type to the printing point. This mechanism is old in the art and will not be described in detail. See patent to Trego No. 1,880,592, October 4, 1932.

The paper carriage 16 (Fig. 2) is provided with antifriction rolls 17 which travel upon the carriage supporting rod 18 as the carriage moves to the left under the influence of the carriage spring. This mechanism is also old and well-known in the art and therefore will not be described in detail. The carriage is moved in letter space direction by a carriage spring which is mounted in a drum 19 (Fig. 1) that carries a band 40 which is attached to the carriage, as is well-known in the art.

The carriage 16 is progressed from two to seven units of space upon the printing of a character or symbol, the exact spacing being dependent upon the width of the character. For example, a lower case L is allocated three units of space, while the lower case M or W is allocated seven units. This variable spacing in accordance with the width of the letters occurs within the same font of type. The unit of space referred to is an arbitrarily selected unit which is an aliquot part of and smaller than any of the letter spaces. The term "letters" as used herein includes the various symbols and figures found on a typewriter keyboard, as well as letters of the alphabet.

The escapement mechanism which produces this variable spacing within the same font of type consists in part of three individual but interconnected escapement wheels, indicated in Fig. 2 as I—f, II—f and IV—f. Rotation of escapement wheel I—f/the space of one tooth produces forward movement of the carriage 16 one space unit while similar movement of the escapement wheels II—f and IV—f causes carriage movement of two and four space units respectively. By suitable mechanism, escapement wheels I—f, II—f and IV—f are selectively or simultaneously released for rotation of a single tooth upon depression of a printing key 5. The details of construction by which the variable spacing is accomplished are set forth in detail in the above-referred-to parent application.

A system of variable letter spacing of the type above described requires that the backspacing mechanism be capable of backspacing the carriage 16 for any number of space units. In order that the carriage may be returned for the retyping of any character or symbol which may be poorly or illegibly printed, or for the maintenance of an indented column, as well as for other reasons, it is essential to provide backspacing mechanism which is capable of backspacing one unit only. For greater speed in backspacing, it is desirable to also provide additional mechanism for backspacing the carriage a plurality of space units. To meet this need the back-spacing key 3 (Fig. 1) has two buttons, 3a and 3b, one of which operates to back-space four units at each stroke, and the other of which operates to back-space a single unit on each stroke. It is essential in such case that back-spacing be free from mechanical error, and the back-spacing mechanism is so constructed as to secure exact spacing. It is constructed to act upon escapement wheel I—f. It will be seen on reference to Fig. 6 that the escapement wheel I—f is controlled by the action of dogs 105 and 106. The action of typing a character operates to release dog 105 from the escapement wheel. When the dog 105 is being released, the dog 106 is in the path of an oncoming tooth of the escapement wheel before that wheel is entirely free from the dog 105, and the relation of dog 106 and dog 105 is such as to permit a very slight movement of the escapement wheel after dog 105 has been disengaged and before the escapement wheel has been stopped by dog 106. When dog 106 releases the escapement wheel, it is re-engaged by dog 105, and the escapement wheel has turned one tooth, progressing the carriage 16 one unit. A more detailed description of this escapement mechanism is contained in the above-mentioned parent application. The back-spacing mechanism of Fig. 3 is designed to actuate the escapement wheel I—f in the reverse direction.

The buttons 3a and 3b (Figs. 3 and 4) are carried by a member pivoted on the key 3. This member is yieldably held in the position shown in Fig. 4 by a tension spring 3f. It has a point or toe 3c which on downward movement of the key by pressure on button 3a is not changed in position but clears the frame 1 and permits the key 3 to move downward until it contacts the adjustable stop 3d. This movement effects a back-spacing of four units, and button 3a is marked "Back space 4." If, however, the key is operated by pressure on button 3b the pivoted member, which carries the operating buttons, is first deflected against the tension of the spring 3f and on downward movement of the key 3, toe 3c takes the

dotted-line position and contacts frame 1 of the machine, thereby preventing further downward movement. This limited movement is designed to effect only one backspacing unit. The button 3b is marked "Back space 1."

The motion of the backspacing key 3 is communicated to the escapement mechanism by shaft 13, mounted in the frame 1. This shaft has rigidly secured thereto an arm carrying the roller 13a in contact with extension 3e on the back-spacing key. On the rear end of shaft 13 there is rigidly secured an arm 13b (see Fig. 3) connected by a link 13c with a bell-crank lever 13d freely mounted for oscillation on escapement shaft 41. The arm 13b and link 13c are biased by a spring 13e tending to draw them toward each other, the effect of which is to bias shaft 13 in such manner as to maintain roller 13a in contact with the extension 3e on the back-spacing key, and to bias bell-crank lever 13d toward the position shown in Fig. 3, which is the normal or inactive position of the mechanism.

A pawl 23 is pivoted on a pin 23a, rigidly secured to the bell-crank lever 13d. The pawl 23 is spaced from the bell-crank 13d by a sleeve 23b, as is shown in Fig. 7 (with the spring 23e omitted). It is to be observed that both bell-crank lever 13d and escapement wheel I—f are freely mounted on escapement shaft 41; and that the sleeve 23b serves to position pawl 23 for co-action with the teeth on escapement wheel I—f. To obtain proper engagement between the pawl 23 and the teeth of the escapement wheel I—f, sleeve 23b has a projecting pin 23c (Fig. 5) which engages pin 23d on pawl 23 and imparts thereto the pressure of spring 23e surrounding sleeve 23b and attached at one end to the bell-crank 13d and at the other end to pin 23e, which spring tends to hold the pawl in engagement with the escapement wheel.

However, in normal or inactive position (Fig. 3), pawl 23 is out of engagement with escapement wheel I—f, and it is held in this inactive position by a pin 43 secured on the machine frame, which pin engages a notch 43a in pawl 23. In this position escapement wheel I—f being under the influence of the carriage drive, is controlled in its rotation partly by dog 105 and partly by dog 106, as has been explained.

Dog 105 carries a pin 105a which is engageable by a pin 105b on link 13c when in the position shown in Fig. 5. In that position the extension 13e on bell-crank lever 13d contacts stop pin 63 on the machine frame. The purpose of this contact is to take the principal shock of the back-spacing stroke, and thus protect the dogs 105 and the pins 105a and 105b as well as the escapement wheel from excessive force and injury.

When the key 3 is given a full stroke so that it contacts the stop pin 3d the back-spacing mechanism will take the position shown in Fig. 5, in which pin 105b contacts pin 105a and so holds dogs 105 in contact with a tooth of escapement wheel I—f. This will prevent any further backward rotation of the escapement wheel at the end of the full stroke; and the movement is such that the escapement wheel has moved backward a distance equal to four and one-half teeth before further movement is stopped. On the return of the mechanism, dog 105 will permit a forward rotation of the escapement wheel for a distance of half a tooth, when the next tooth will be engaged by dog 105. The resultant backward motion of the full back-spacing stroke is a back-

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ward movement of four teeth of escapement wheel I—f. This rotation transmitted through the train of escapement gearing (shown in Fig. 2) results in an angular rotation of shaft 41 which is the equivalent of four spacing units. Obviously a backward movement of only one tooth would transmit to shaft 41 a movement of only one unit; and this is the backward movement occasioned by a stroke on button 3b.

It is to be observed that when the back-spacing key is released and the pawl 23 returns to its normal position the spring 23e permits the pawl to move outward as it passes over the ratchet teeth; and as it approaches pin 43, notch 43a is in position to engage pin 43. Further return movement of the pawl completely disengages it from the teeth on escapement wheel I—f.

In order to avoid friction and noise on carriage return the escapement mechanism is provided with a construction that lifts the dog 105 of escapement wheel I—f at this time. This comprises a grooved wheel 73 around which is a bight of strand material, in this instance spring wire 73a, frictionally engaging the bottom of the groove and terminating in a bent end 73b (Figs. 3 and 5). The grooved wheel 73 is fixedly mounted on shaft 41 and turns counterclockwise on return movement of the carriage. The spring 73a rotates with the wheel 73 until the end of this spring engages pin 105a (Fig. 5) and cams outwardly the pin 105a carried on the dog 105, thus removing the dog 105 from engagement with the escapement wheel I—f. When the carriage moves in letter space direction the spring 73a is carried along with wheel 73, restoring the normal action of dog 105. When the end 73b of the spring engages the fixed pin 105c the spring tends to open around grooved wheel 73 so that no perceptible friction occurs during letter space travel of the carriage.

It is to be understood that while the invention is described herein as applicable to a typewriting machine of the kind known as a "Varityper" it is capable of use with typewriting machines of other kinds, and is not to be understood as limited in its scope other than is indicated in the claims.

What I claim is:

1. In a typewriting machine, in combination, a movable paper carriage, a spacing mechanism for controlling the movement of said carriage, a back-spacing key lever, an oscillator shaft, an arm rigid on said shaft adapted to contact said back-spacing key lever, a second arm rigid on said shaft, an escapement shaft, a member freely oscillatable on said escapement shaft, a link connecting said second arm with said member, a spring operative to hold said first mentioned arm in contact with said back-spacing key lever, an escapement wheel mounted on said escapement shaft and connected therewith, a pawl pivoted on said member for actuating said escapement wheel, and means controlled by said link for preventing overthrow of said escapement wheel at the end of its pawl-actuated movement.

2. In a typewriting machine, in combination, a movable paper carriage, a spacing mechanism for controlling the movement of said carriage, a back-spacing key lever, an oscillator shaft, an arm rigid on said shaft adapted to contact said back-spacing key lever, a second arm rigid on said shaft, an escapement shaft, a member freely oscillatable on said escapement shaft, a link connecting said second arm with said member,

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a spring operative to hold said first mentioned arm in contact with said back-spacing key lever, an escapement wheel mounted on said escapement shaft and connected therewith, a pawl pivoted on said member for actuating said escapement wheel, said pawl being normally held out of contact with said escapement wheel, and means controlled by said link for preventing overthrow of said escapement wheel at the end of its pawl-actuated movement.

3. In a typewriting machine, in combination, a movable paper carriage, a letter spacing mechanism operable within the same font of type and including a plurality of interconnected escapements operable selectively or combinationally for variably controlling the carriage movement in accordance with the width of letters within a single font of type, one escapement being effective to space an aliquot amount of any of the carriage letter spacings, and backspacing mechanism for backspacing said one escapement a like aliquot amount.

4. In a typewriting machine, in combination, a paper carriage, a letter spacing mechanism operable within the same font of type and including three interconnected escapements selectively operable for variably controlling the carriage movement, one escapement being effective to space an aliquot amount of any of the carriage letter spacings, and back spacing mechanism for backspacing said one escapement a like aliquot amount.

5. In a typewriting machine, in combination, a paper carriage, a letter spacing mechanism operable within the same font of type and including three interconnected escapements operable selectively or combinationally for variably controlling the carriage movement, one escapement being effective to space an aliquot unit less than any of the carriage letter spacings, and backspacing mechanism for backspacing said one escapement a like aliquot unit.

6. In a typewriting machine, in combination, a movable paper carriage, an escapement mechanism, including an escapement wheel, for controlling the spacing movement of said carriage, a backspacing key lever, a pawl oscillatable about the axis of the escapement wheel, said pawl being normally held out of engagement with said wheel and engageable therewith upon oscillatory motion of the pawl for backspacing the carriage, means operatively connected with said backspacing key lever for oscillating said pawl, and an escapement-wheel-engaging means actuated by said pawl oscillating means at the end of its carriage backspacing travel to prevent overthrow of the escapement wheel by said pawl.

7. In a typewriting machine, in combination, a movable paper carriage, an escapement mechanism, including an escapement wheel, for controlling the spacing movement of said carriage, a backspacing key lever, a pawl oscillatable about the axis of the escapement wheel, said pawl being normally held out of engagement with said wheel and engageable therewith upon actuation of the backspacing key lever for backspacing the carriage, means operatively connected with said backspacing key lever for oscillating said pawl, and an escapement-wheel-engaging means actuated by said pawl oscillating means at the end of its carriage backspacing travel to prevent overthrow of the escapement wheel by said pawl.

8. In a typewriting machine, in combination, a movable paper carriage, an escapement mechanism, including an escapement wheel and a dog

normally engaged therewith, for controlling the spacing movement of said carriage, a backspacing key lever, a pawl oscillatable about the axis of the escapement wheel, said pawl being normally held out of engagement with said wheel and engageable therewith upon oscillatory motion of the pawl to move the escapement wheel in reverse direction, said dog being displaceable by reverse movement of the escapement wheel, and means operatively connected with said backspacing key lever for oscillating said pawl and restricting displacing movement of said dog at the end of the pawl's carriage backspacing travel to prevent overthrow of the escapement wheel by said pawl.

9. In a typewriting machine, in combination, a movable paper carriage, an escapement mechanism, including an escapement wheel and a dog normally engaged therewith, for controlling the spacing movement of said carriage, a backspacing key lever, a pawl oscillatable about the axis of the escapement wheel, said pawl being normally held out of engagement with said wheel and engageable therewith upon oscillatory motion of the pawl to move the escapement wheel in reverse direction, said dog being displaceable by reverse movement of the escapement wheel,

and a link operatively connected with said backspacing key lever to cause oscillation of said pawl, said link being adapted to restrict the displacing movement of said dog at the end of the pawl's backspacing travel to prevent overthrow of the escapement wheel by said pawl.

CHARLES W. NORTON.

#### REFERENCES CITED

- 10 The following references are of record in the file of this patent:

#### UNITED STATES PATENTS

| Number       | Name                   | Date          |
|--------------|------------------------|---------------|
| 15 656,658   | Phelps -----           | Aug. 28, 1900 |
| 694,073      | Peterson -----         | Feb. 25, 1902 |
| 1,183,056    | Wiley -----            | May 16, 1916  |
| 1,243,955    | Krusius -----          | Oct. 23, 1917 |
| 1,918,304    | Trego -----            | July 18, 1933 |
| 20 1,941,018 | Murray -----           | Dec. 26, 1933 |
| 1,984,410    | Hart -----             | Dec. 18, 1934 |
| 2,127,431    | Schremp -----          | Aug. 16, 1938 |
| 2,224,766    | Dodge -----            | Dec. 10, 1940 |
| 2,268,867    | Gabrielson et al. ---- | Jan. 6, 1942  |
| 25 2,294,721 | Dobson -----           | Sept. 1, 1942 |
| 2,364,653    | Pollock et al. -----   | Dec. 12, 1944 |