My invention relates generally to typewriting machines, and more particularly to an improved mechanism adapted for attachment to a standard typewriter to vary the character spacing thereof.

One of the principal objects of my invention is to eliminate the displeasing appearance of uneven typewritten lines which usually occurs at the right hand margin of typewritten sheets. It is the desire of this invention to produce on a typewriter an even or squared-up column of typewritten material similar to that found in the prevailing newspaper columns and book pages. Not only is the appearance of the typewritten material enhanced when its margins are even but also the squared up column of typewritten material can be readily duplicated or reproduced in photolithography, photo-engraving, stencil duplicators, and other processes in the graphic arts. The invention accomplishes the above desired results without a minimum amount of work in assembling the attachment to the typewriter and with a minimum amount of effort on the part of the typist during the actual typing of the material.

Another object of my invention is to provide an improved device which when attached to the typewriter mechanism enables the operator to type any typewritten material changing the usual uneven lines to even lines thus forming an even or squared up column of typewritten material.

Another object of my invention is to provide a variable character spacing apparatus for all standard makes of typewriters which is housed in a neat appearing, unitary structure, is readily attachable and detachable, and is conveniently regulatable on the part of the operator when attached. When housed within a unitary structure, the apparatus is protected from dust and abuse, and when not in use, it may be unobtrusively shelved in small locations.

Another object of my invention is to provide a typewriter with an improved apparatus for contracting or expanding the typewritten lines in order to make them conform with a certain prescribed line length.

Another object is to provide a typewriter with a variable character spacing apparatus which is readily employable with any desired marginal or column width of typewritten material. This provision enables the operator to utilize the same regulation for increasing or decreasing the number of character spaces for a given line length as it would to increase or decrease the number of character spaces for any other line length, thereby considerably simplifying the operation of the combined typewriter and variable spacing apparatus.

A further object of my invention is to provide a typewriter with a variable character spacing device which includes two manually adjustable mechanisms, one for selectively determining the marginal or column width of the typewritten material, and the other for contracting or expanding a typewritten line in order that it shall conform with the selected column width.

A further object of my invention is to utilize the mechanism of a typewriter which permits intermittent travel of the typewriter carriage upon key action at the typewriter keyboard to also directly vary the extent of intermittent carriage travel.

A further object of importance is to provide a typewriter with an escapement mechanism which not only permits intermittent movement of the typewriter carriage but also varies the amount of intermittent movement in accordance with a control exercised by the operator.

A meritorious feature in this invention is the employment of a plurality of variable elements, such as cams, representing a plurality of typewriter line lengths, which are operatively connected through a selective mechanism with a second plurality of variable elements, representing increases or decreases in the number of character spaces per line, which are in turn operative by connected through a selective mechanism with an apparatus for increasing or decreasing the intermittent movement of the typewriter carriage resulting from key action.

In one desirable arrangement, there is provided a typewriter escapement mechanism which is operable from a plurality of selectable variable elements to move laterally with respect to the typewriter carriage. Upon movement of the carriage the escapement mechanism engaging therewith is moved either with or contrary to the movement of the carriage thereby lengthening or shortening the travel of the carriage. The power which is utilized for lengthening or shortening the carriage travel is obtained from the very movement of the carriage itself, and this movement operates through the variable elements which in turn transmit this movement in controlled variable quantities to the escapement mechanism to move it either with or against the movement of the carriage.

In the particular embodiment illustrated in the drawings, the typewriter carriage rack is engaging a pinion about which axis the typewriter escapement mechanism is pivoted. The
The escapement mechanism is likewise in mesh with the pinion and is adapted upon key action to permit the pinion, and thus the carriage, to travel one gear tooth. Since the escapement mechanism is pivoted upon the axis of the pinion it will be in constant mesh with the pinion regardless of the position to which the escapement mechanism is swung. Upon actuation of the escapement mechanism, the carriage moves one character space, and in the event the attachment has been regulated for character space variation, the carriage motion is transmitted through adjustable variable elements to the pivoted escapement mechanism to swing the latter either with or against the rotation of the meshing 24's thereby either increasing or decreasing the rotation of the pinion for every key action. This rotation controls the extent of carriage travel for each key action on the typewriter.

The variable elements previously mentioned are two series of arcuate cams mounted each on a separate axis. One series of cams is for regulating the variable spacer mechanism for any desired typewriter line lengths. The other cam series is for contracting or expanding a typewriter line one or more character units in order that there will be produced a squared up column effect conforming with the desired typewritten line length. The first cam series is operable directly upon movement of the carriage and it transmits this movement to actuate the second cam series. The second cam series upon actuation is adapted to produce through selective mechanism the aforementioned lateral movement of the escapement mechanism, and it is apparent that as the latter permits intermittent movement of the carriage it also simultaneously varies the extent of intermittent movement. It is easily conceivable that other variable elements, such as angular slide bars, could be employed in place of the arcuate cams shown in the drawings and the same action produced.

In the embodiment shown in the drawings the variable character spacing mechanism is mounted within a separate unitary structure alongside of the typewriter. However, it is entirely feasible to mount the mechanism in or on the typewriter frame if it is so desired.

In following out the latter arrangement the mechanism could be introduced into the typewriter during its manufacture.

Various other objects and advantages of my invention will more fully appear from the following specification, appended claims, and accompanying drawings, wherein:

Figure 1 is a perspective of a cabinet structure enclosing one embodiment of my invention showing mechanism for attachment to a standard typewriter and two manual control means for regulating adjustments.

Figure 2 is a sectional view of the embodiment of my invention within the cabinet, the sectional view being along line 2—2 of Figure 3.

Figure 3 is a top sectional view of the embodiment enclosed within the cabinet structure.

Figure 4 is a side sectional view of the embodiment of my invention employed within the cabinet structure.

Figure 5 is a detailed view, partly in section, of some of the manual adjusting devices utilized in the cabinet enclosed embodiment.

Figure 6 is a detailed top elevation of a portion of the cabinet showing a manual adjusting mechanism and its associated scale, and

Figure 7 is a detailed view of several cam elements illustrating the manner of varying the marginal width of the typewritten material.

A general structure enclosing one embodiment of my invention is shown in Figure 1. The cabinet structure is indicated generally at 10 and is usually disposed alongside of the typewriter 12 as shown in Figure 2. Clamping elements 14 are adapted to securely fasten the cabinet to the typewriter 12 frame. Actuating arms 18 and 19 whose purpose and function will be described later extend from the side of the cabinet in the direction of the typewriter. Handles 20 and 22 and their corresponding scales 24 are on the cabinet and they likewise will be described in more detail later. A slot 26 in the top of the cabinet permits a rack 28 containing downwardly extending teeth to reciprocate therein. As clearly indicated in Figures 1 and 4 the rack 30 is of a general T shape facilitating a roller support by the rollers 32 within the protruding housing 34. A clamping element 36 probably best illustrated in Figures 2 and 4 is utilized for connecting the rack 30 with the customary typewriter carriage 38. The rack 30 is adapted to reciprocate with the carriage 38 in the carriage in its travel across the typewriter.

Referring to Figures 2 to 7, one embodiment illustrating the principle of my invention is shown. In this embodiment the customary escapement mechanism for allowing intermittent movement of the typewriter carriage is located within the cabinet 10. It is not essential that the escapement mechanism be mounted within the cabinet, and as will become apparent from further description, the escapement mechanism could be located on the typewriter carriage itself. The escapement mechanism utilized in this embodiment is of standard design, the only difference being the novel manner of mounting which permits lateral movement of the escapement mechanism.

In Figures 2 and 3 a frame structure 40 supports a shaft 42 upon which is keyed a gear 44 meshing with the rack 30. As probably best indicated in Figure 4 a cage-like structure 46 is swingably mounted about the shaft 42 on either side of the typewriter frame if it is so desired. A bar 48 is carried by the swingably mounted cage-like structure 46 in constant mesh with the gear 44 regardless of the position to which it is swung. The pinion 48 forms part of the typewriter escapement mechanism and mounts on its pinion shaft 50 the escapement star wheel 52. Supported above the star wheel on the cage structure is a standard rockably mounted escapement member 54 carrying the ratchet escapement pawls 56 and 58 which, upon rocking of the member 54, permit the star wheel to rotate the 90 degree distance of one tooth. It is this movement of the star wheel which produces the intermittent movement of the carriage upon key action from the keyboard of the typewriter.

Mechanism extending from the typewriter to 65 the cabinet structure is provided for rocking the member 54 to produce intermittent carriage movement. A portion of this mechanism is shown in Figure 1 as lever 15. This lever is pivotally mounted in any desired manner as it enters the 70 cabinet at 58. Any reciprocal movement in the typewriter produced upon actuating a key on the keyboard could be utilized to swing the lever 15 about its pivot 58. Swinging action of lever 15 is transmitted as shown in Figure 4 to a ver-
tical swinging member 69 pivotally mounted at its upper end about a frame member 62. The lower end of swinging member 60 contacts the upper end of the rocking member 54 which is pivotally mounted and outwardly disposed on the cabinet 8. This member 54 is an inclined member which is actuated upon movement of the release lever 8. This mechanism is preferably best shown in Figures 3 and 4 and includes a vertically reciprocating link 68 connected to a lateral extending arm 70 on the pivoted release pawl. Link 68 extends up to a point in alignment with the swinging axis of the gear-like structure 46 in order that full release of the escapement can be had at any position of the escapement mechanism on its arc of movement. A small shaft 72 is rotatably mounted in shaft 42 and is provided with a slot 74 for positioning the reciprocating link 68. A slot 76 in the side of the link engages with the release lever 8, and upon upward movement of the latter the pawl is moved to a release position. In the normal operation of the typewriter when no character spacing variation is desired, the connecting levers 16 and 18 and other contributing mechanism perform the usual functions of actuating the escapement mechanism for standard intermittent and full release movement of the carriage.

Mechanism for varying the character spacing of a typewriter is included within the cabinet 8 in the form of variable elements such as cams, connected together and with the escapement mechanism by actuating arms. In order to vary the number of character spaces for a given typewriter line, a series of cam elements indicated generally at 88 in Figure 2 is provided. This series of cams can be either separate individual cams assembled together or a plurality of cam surfaces on one large member. Each cam element represents a number of character units which can be added or subtracted from a given typewriter line. The escapement mechanism in Figure 2 is the neutral cam and does not produce any change of character spacing in a typewriter line. Those cam elements adjacent to this neutral cam on either side thereof either add or subtract a character unit to a given line length and thus increase or decrease the number of character units per line.

Mechanism for transmitting the cam action to the escapement to swing the latter either with or against the rotation of gear 44 is provided in the form of a link 82 pivotally attached at one end to the cage-like structure 46 by a bolt and nut generally indicated at 84. The other end of the link is pivotally mounted at a swinging arm 86 which is swung from a portion of the cabinet frame 116. A roller 88 on a shaft supported on the arm 86 is provided for contacting the cam surfaces 80. Resilient mechanism (not shown) such as a spring, is employed for actuating the cam surfaces 80 to the right in order to keep it at all times in constant contact with the cam elements 80. It is clear from Figure 2 that upward movement of the cams 80 will cause the roller and link to reciprocate either to the right or left depending on the cam element selected and swing the cage-like structure including the pinion 48 in an arc about the gear 44.

To produce the upward movement of the cams 80, a rocking shaft 86 is rotatably mounted within the cabinet frame by bearings at either end and along its length, as shown in Figure 4. Arms 92 and 94 extending at approximately right angles to one another are keyed to the shaft 86. Arm 92 supports at its outer end the cams 80. Arm 94 is in the form of two arms 94 and 94', as probably best illustrated in Figure 4, and supports between the ends of the arms 94 and 94' a threaded shaft 96 upon which is threaded a sleeve 98 rotatably carrying a roller 100. This roller is selectively adapted to contact any one of a series of variable elements 102 such as cams, mounted upon the shaft 92. These cam elements 102 rotate with the shaft 42 which is connected through the keyed gear 44 and the rack 30 to the typewriter carriage.

Each of these cam elements 102 represent a predetermined typewriter line length. All of the cam elements 102 begin at a certain radial position and extend outward to a certain radial position. The difference between each cam element 102 is the arcuate distance between the beginning and end of these radial positions. Those elements 102 having the shorter arcuate cam path represent the shorter typewritten line lengths and those having the longer arcuate path represent the longer line lengths. The principle is illustrated in Figure 7 where several representative cam elements 102 are shown. These cam elements include or may be selected from a typewriter line which reaches its greatest radial distance at 20U. Fifty-five characters per line is represented at 55U, while the point representing ninety characters extends almost around to the beginning position. It is readily apparent that since all the cam elements begin their arcuate paths at the same radial distance and finish at the same radial distance the arms 94 and 82 will rock the same distance regardless of the cam element 102 selected to act on roller 100.

Mechanism for selecting any one of the cam elements 102 is provided on the threaded shaft 96. As indicated in Figure 4 a depending portion 104 on the sleeve 98 is slidably mounted about a rod 106 carried between the arms 94 and 94' intermediate their ends. In this manner the sleeve 98 is prevented from rotating on the threaded shaft 96. Rotation of the threaded shaft 96 by handle 20 will screw the sleeve along the shaft. A pointer 110 carried by the sleeve 98 is movable over the scale 83 which indicates to the operator which of the typewriter line lengths has been selected by the roller 100.

Likewise, mechanism for moving the roller 88 75.
to select any one of the character cam elements 80 is provided in the form of a reciprocating shaft 112 carrying the roller. This shaft 112 lies below a stationary shaft 114 mounted at one end in the wall of the cabinet and at the other end in an interior framework 116. Arm 86 comprises two spaced arms 86 and 88' which support the reciprocating shaft 112 at intermediate portions of its length. The arms 86 and 88' extend upward and are formed integral with a sleeve 116.

This sleeve is rotatable with respect to the shaft 114 and permits rocking motion of the arms 86 and 88' as the latter are swung outward and inward by the action of the roller 88 on the cams 80. To reciprocate the shaft 112 and the roller 88, a sleeve 120 having a depending arm 122 fixedly secured to the shaft 112 is slidably mounted on shaft 114. Adjacent the sleeve 120 a second slidable sleeve 124 is employed and this sleeve is provided with a finger 126 engageable in a radial groove 128 in the sleeve 120. Such a connection between the sleeves allows both sleeves 120 and 124 to reciprocate together but permits sleeve 120 to rotate freely with respect to the sleeve 124.

A manual control for sliding the sleeves 120 and 124 and thus the roller 88 is best indicated in Figure 5. Sleeve 124 is provided with a lateral extending flange 130 having a groove 132 in its upper surface. Positioned above the flange 130 is a second flange 134 having a downwardly extending roller 136 engageable in the groove 132. Flange 134 is formed part with a vertical form extending sleeve 138 extending through the top of the cabinet 10. Positioned within the sleeve 138 is a hollow tubular member 140 which extends beyond either end of the sleeve and is provided with a handle 22 at its upper end. A vertical slot 144 in the sleeve 138 is engaged by a lateral extending pin 146, the combination of the two together permitting relative reciprocal movement of the tubular member 140 with respect to the sleeve 138 but locking both together when the handle 22 is turned. As a roller 148 is fixedly secured to the sleeve 138 and indicates on the dial 26 the number of character units a typewriter line must be contracted or expanded to conform with a selected line length.

In order to permit the roller 88 to step from one character cam element 80 to another without frictionally contacting, a combination of levers is provided for manually rocking the frame arms 86 and 88' outward away from the cam elements. Such combination is probably best shown in Figures 3, 4, and 7 and comprises a rock shaft 150 supported at its opposite ends by the cabinet framework 152. At the inward end of the shaft is fixed an arm 154 which is adapted to rock and engage an extending pin 156 on the arm 88'.

At the other end of the shaft 150 is provided a fixed arm 158 carrying a small roller 160 at its outer end. The roller 160 contacts an outward extending base portion 162 on the tubular member 140. The tubular member is slidable supported on a vertical rod 164, and a spring 166 tensioned between the cabinet and the base portion 162 resiliently urges the tubular member and its attached handle 22 to its upper position. Downward pressure on the handle 22 is transmitted through the tubular member 140 to the lever 158, rocking the shaft 150 and lever 164 to kick the arms 86 and 88' and their accompanying roller 88 to one side in order to permit the roller and its shaft 112 to reciprocate freely.

One preferred method of operating this attachment on a typewriter is to type the material in rough on a sheet of paper containing a right hand margin determining the desired width of the typewritten line length which conforms with the column width shown on the sheet of paper. Upon such cranking of the handle 20 the roller 100 moves along the threaded shaft 80 and stops at one of the character cam elements 102 which, as indicated on the scale, will provide full movement of the justifying mechanism in the cabinet for that selected marginal width. Since all the cam elements 102 begin their radial expansion at the same horizontal level, as shown in Figure 7, the radial movement of the roller 100 is not hindered.

After once setting the mechanism for the desired marginal width of typewritten material, the operator merely has, thereafter, to actuate the control handle 22 before beginning of the retyping of each line shown on the rough draft. Before retyping each line, the operator looks at the rough typewritten draft and notes the number of character units it extends beyond or lacks at 25 the right hand margin, and he turns the handle 22, utilizing downward pressure, around the scale 26 to a point which indicates the number of character units the rough typewritten line must be contracted or expanded in order to make the line conform with the desired marginal width of typewritten material. Thereafter the typist has merely to type the line shown on the rough draft. Other methods of operation will suggest themselves, and it is clearly apparent that inserts can be made in typewritten material which will adequately and neatly fill up the space provided therefore in the typewritten material.

When the attachment is set for character space variation, depression of a key on the typewriter keyboard causes the escapement pawls 86 to permit the escapement star wheel 52 to rotate one tooth. This rotation is brought about by the fact that the typewriter carriage is tensioned by a spring in the typewriter to move across the 45 typewriter from right to left. The intermittent movement of the carriage is transmitted through the extension rack 30 to the gear 44 keyed on shaft 42. Upon the intermittent rotation of shaft 42, the associated cam element 182 causes the rocking roller 100 to rock to the right. As clearly shown in Figure 2 this rocking movement will be transmitted through the rock shaft 80 to the cam elements 80. Rocking movement of these latter cams will cause the roller 88 and its associated link 82 to reciprocate and swing the escapement mechanism. All this movement takes place automatically and simultaneously with the movement of the carriage. As a result, when the escapement star wheel 82 and its associated gear 60 wheel 48 rotate about their axis, their axis is shifted simultaneously outwardly and inwards, as a result of the rotation of the meshing gear 44. If the gear wheel 48 moves about the circumference of the gear 44 in the same direction as the rotation of 65 the latter, the character space movement of the carriage occurs in the manner described above. If the gear wheel 48 moves in the other direction about the circumference of the gear 44 as the latter rotates, it will check the rotation of latter sooner than 70 normal, and the carriage travel per key depression will be shortened.

Other means of employing this principle for shortening or lengthening the intermittent travel of the carriage are obvious to those skilled
of said variable element to swing said escapement mechanism about its axis either with or against the rotation of the pinion whereby the intermittent travel of the carriage is lengthened or shortened.

6. In a typewriter, a carriage movable with respect thereto, means for permitting intermittent movement of said carriage, space varying mechanism including a plurality of variable elements each representative of a unit increase or decrease in the number of intermittent movements of the carriage per typewritten line length, a device for selecting any one of the plurality of variable elements, said space varying mechanism adapted upon movement of said carriage to operate through said selective device to vary the number of intermittent carriage movements per typewritten line length.

7. In a typewriter, a carriage movable with respect thereto, means for permitting intermittent movement of said carriage, a plurality of variable elements each representative of a quantum increase or decrease in the number of intermittent movements for a given typewritten line, a second plurality of variable elements each representative of a certain marginal width for a given typewritten line, said variable elements operable upon movement of the carriage to vary the intermittent movement of the carriage, and selective mechanism for selecting any one of the plurality of variable elements whereby the extent of movement of the carriage can be predetermined.

8. In combination with a typewriter having a carriage mounted thereon for intermittent movement with respect thereto, a space varying mechanism comprising two series of variable elements, means connecting the carriage with one of said series to operate the latter upon movement of said carriage, means connecting said series with said second series of variable elements to actuate the latter upon operation of said first series, means extending from said second series and operable upon actuation thereof to vary the extent of intermittent movement of the carriage, and selective mechanism between said first series and said second series and between said second series and said last mentioned means for selecting any variable element desired.

9. In combination, a typewriter having a carriage tensioned to travel in one direction on said typewriter, a cabinet adjacent said typewriter, a rack extending from said carriage to said cabinet, escapement mechanism in said cabinet operatively connected with said rack and operable from said typewriter for checking the carriage travel at uniformly spaced intervals, and adjustable graduating means in said cabinet operable upon movement of the carriage to bodily shift said escapement mechanism relative to said carriage to vary the uniformly spaced travel of the carriage.

10. In a printing device having a travelling carriage thereon, mechanism in said device for causing intermittent movement of said carriage, said mechanism being mounted for bodily shiftable movement with respect to said carriage, and an adjustable variable element operable upon movement of said carriage to shift said mechanism with respect to said carriage as the former causes the intermittent movement of the carriage so as to vary the extent of each intermittent movement of the carriage.

11. In a printing device, a movable carriage, mechanism for causing intermittent movement of said carriage, said mechanism being mounted
so as to shift with respect to the rest of the device and the carriage, and means for shifting said mechanism as the same causes intermittent movement of the carriage whereby the extent of the intermittent movement of the carriage is varied.

12. In a printing device, a movable carriage, mechanism for causing said carriage to move intermittently, said mechanism being mounted to shift either with or against the movement of the carriage so as to vary the extent of the intermittent movement caused by the mechanism.

13. In a typewriter, a movable carriage, and mechanism for causing intermittent movement of said carriage, said mechanism adapted to shift either with or against the intermittent movement of the carriage simultaneously as it causes intermittent movement of the carriage so as to vary the extent of the intermittent movement of the carriage with respect to the typewriter.

14. In a typewriter, keys, a movable carriage, mechanism operably connected with said keys and said carriage and adapted to cause a determined movement of the latter for every key action, said mechanism being mounted for bodily shiftable movement relative to the typewriter, and means adapted to bodily shift said mechanism simultaneously as the latter causes a determined movement of the carriage so as to vary the length of movement of the carriage for every key action.

15. The method of varying the spacing between characters produced on a typewriter having a movable carriage and an escapement mechanism for causing intermittent movement of the carriage which consists in bodily shifting the escapement mechanism as it causes intermittent movement of the carriage.

16. That method of varying the distance of movement of a carriage in a printing device having mechanism for producing an intermittent movement thereof which consists in bodily shifting said mechanism either with or against the movement of said carriage as the latter is caused to be moved by said mechanism.

17. In a character space varying typewriter, a movable carriage, means for causing said carriage to move a determined character space, said means being mounted for bodily shiftable movement with respect to said typewriter, character space varying mechanism including two selective controls, one for determining the column width of the typewritten material and the other for expanding or contracting a given typewritten line so that it will conform with the column width selected, said character space varying mechanism adapted to bodily shift said means in accordance with its selective controls as the means causes movement of said carriage.

18. In a printing device, a movable carriage, mechanism for causing intermittent movement of said carriage, an adjustable variable element operably connected with said carriage and with said mechanism and operable upon movement of said carriage to transmit movements thereof to the mechanism to control the operation of the mechanism in accordance with the adjustment of said variable element.

19. In a typewriter, a carriage movably mounted thereon, escapement mechanism for causing said carriage to move a certain predetermined distance, an adjustable variable element operationally connected with said carriage and said escapement mechanism and adapted to transmit movements from the carriage upon movement of the same to the escapement mechanism to control the operation of the escapement mechanism in accordance with the adjustment of said variable element.

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