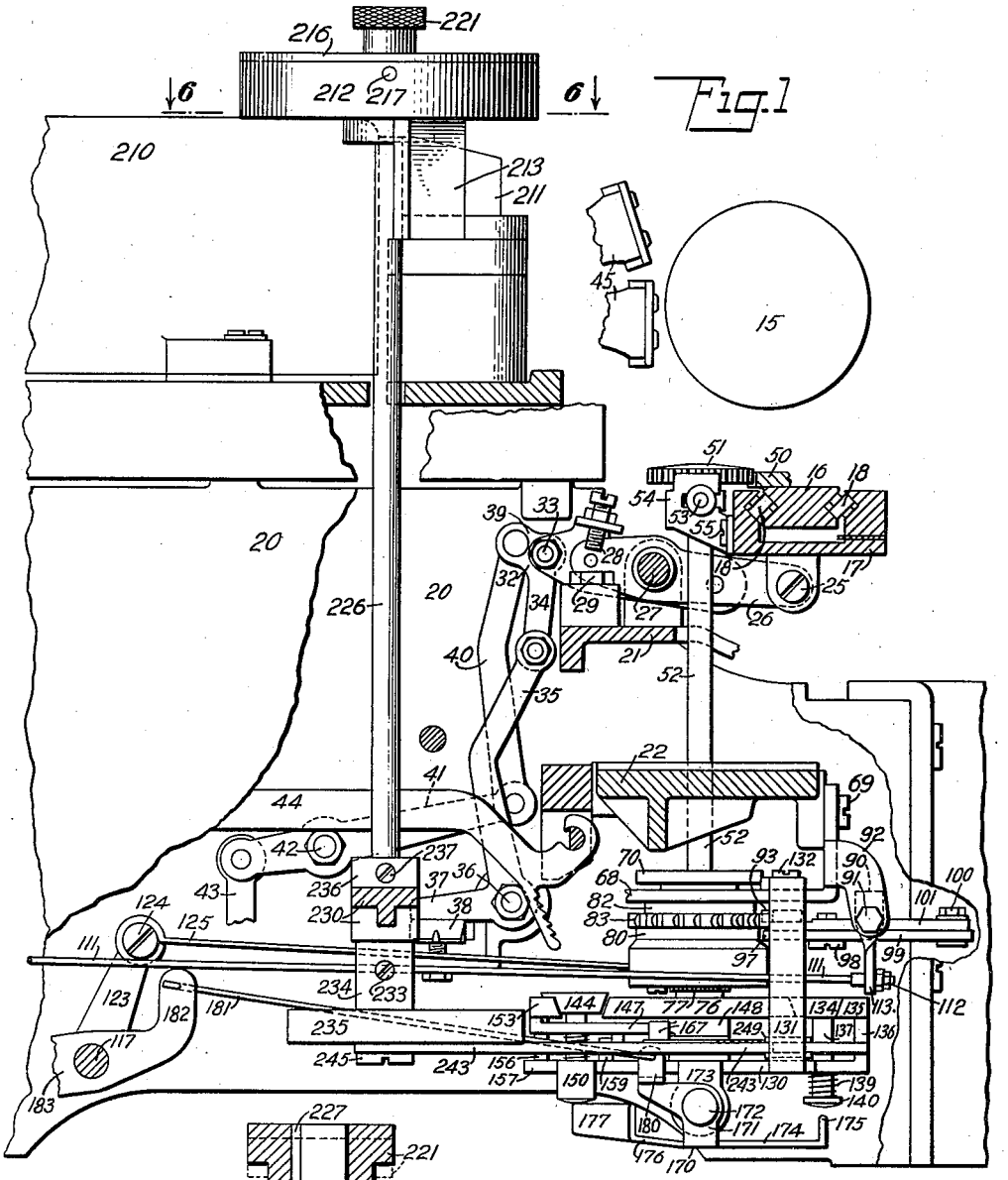
Dec. 17, 1940. E. W. SIBLEY 2,225,356

TYPEWRITING AND LIKE MACHINE

Filed Feb. 14, 1938 5 Sheets-Sheet 1



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TYPEWRITING AND LIKE MACHINE

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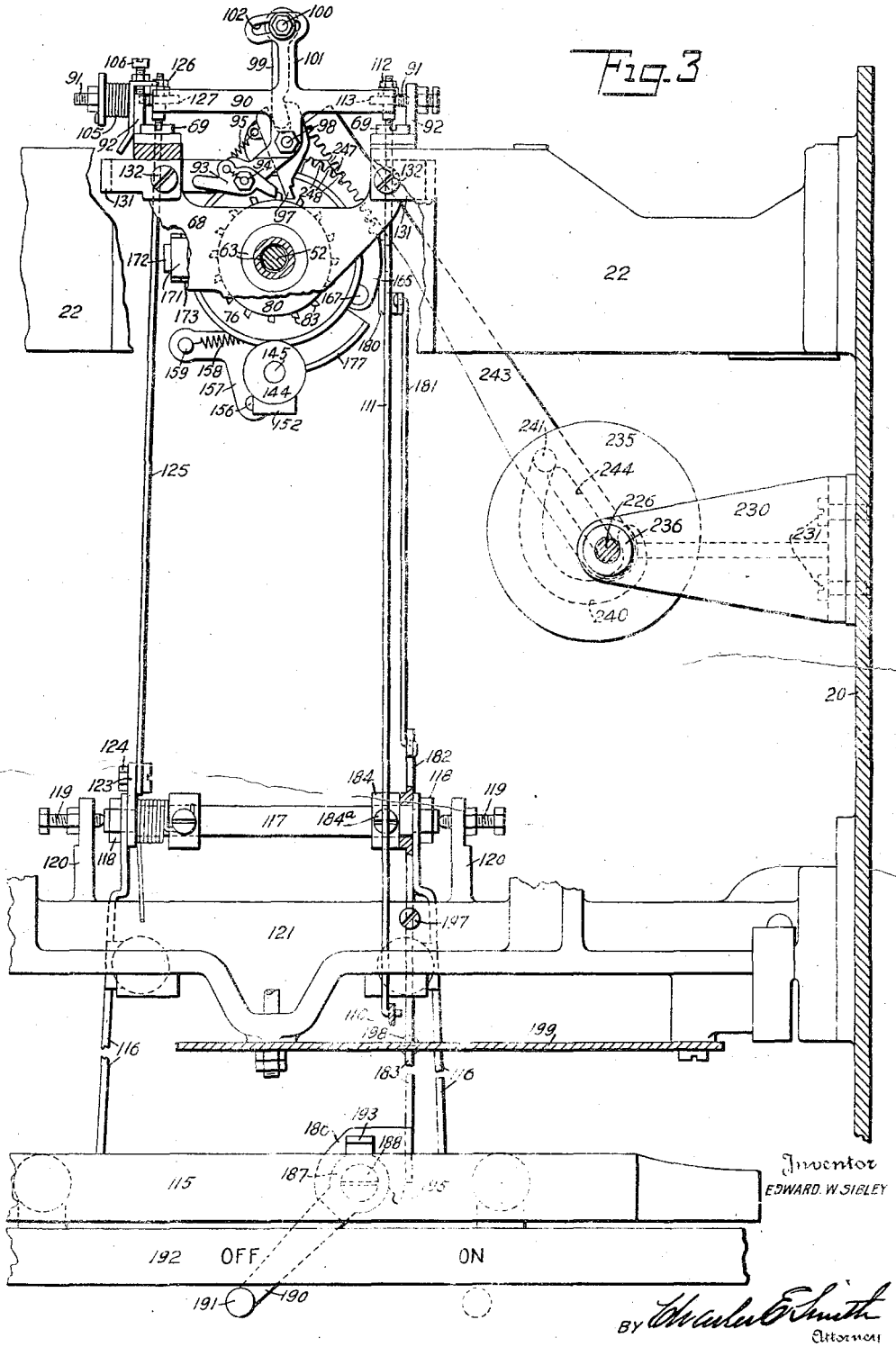
Fig. 3



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TYPEWRITING AND LIKE MACHINE

Filed Feb. 14, 1938 5 Sheets-Sheet 3

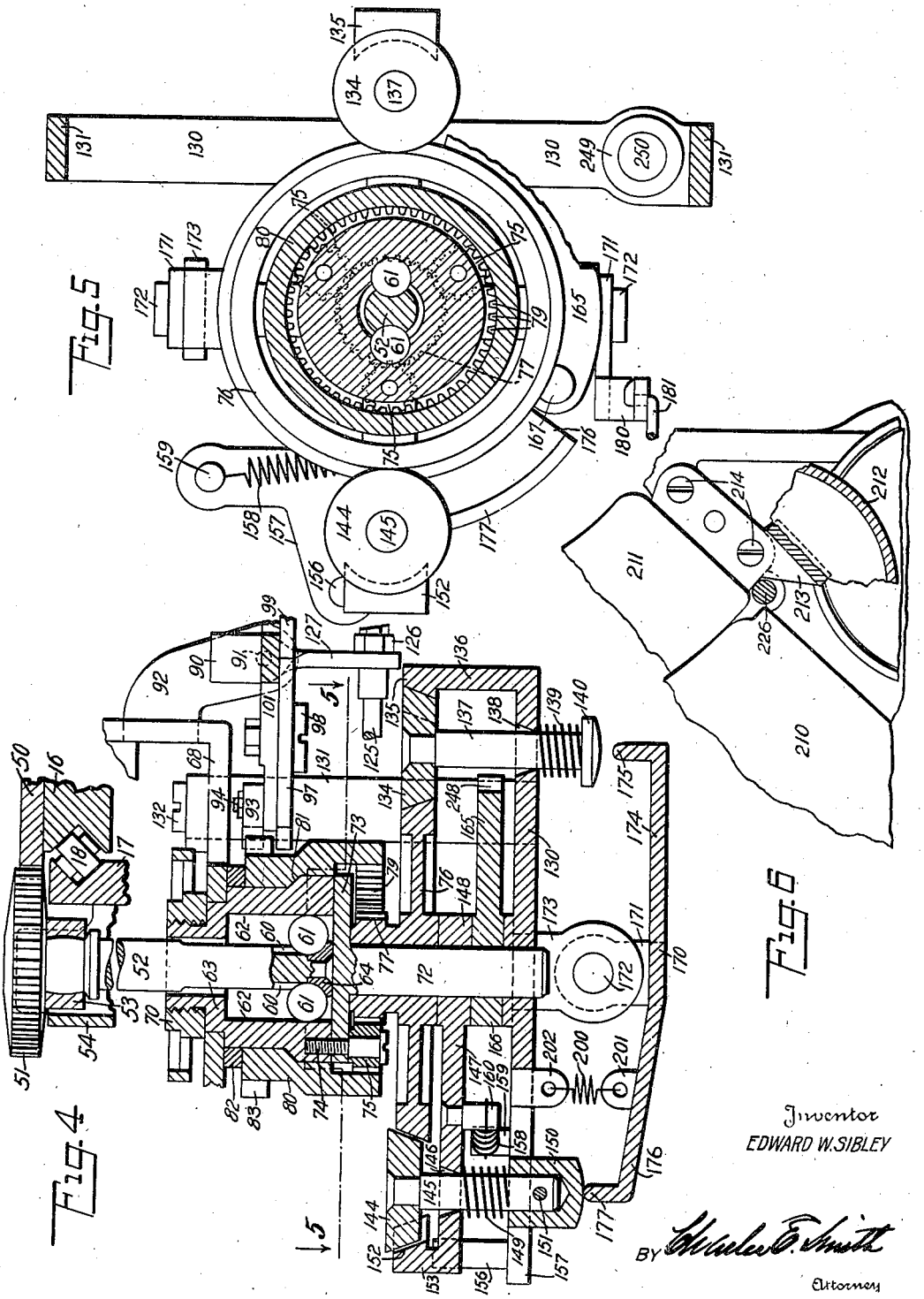

Fig. 5

Fig. 6

Fig. 4

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TYPEWRITING AND LIKE MACHINE

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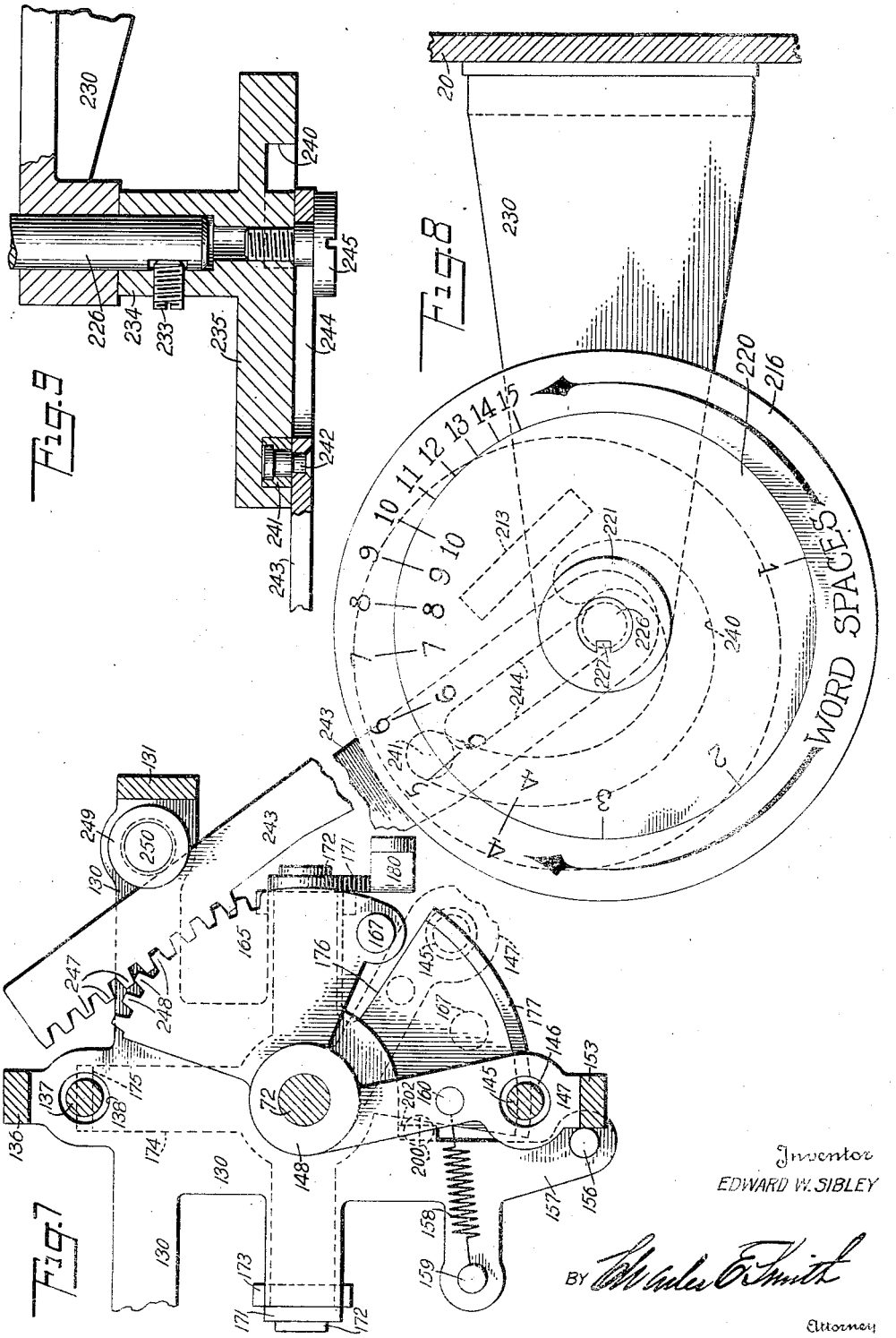

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TYPEWRITING AND LIKE MACHINE

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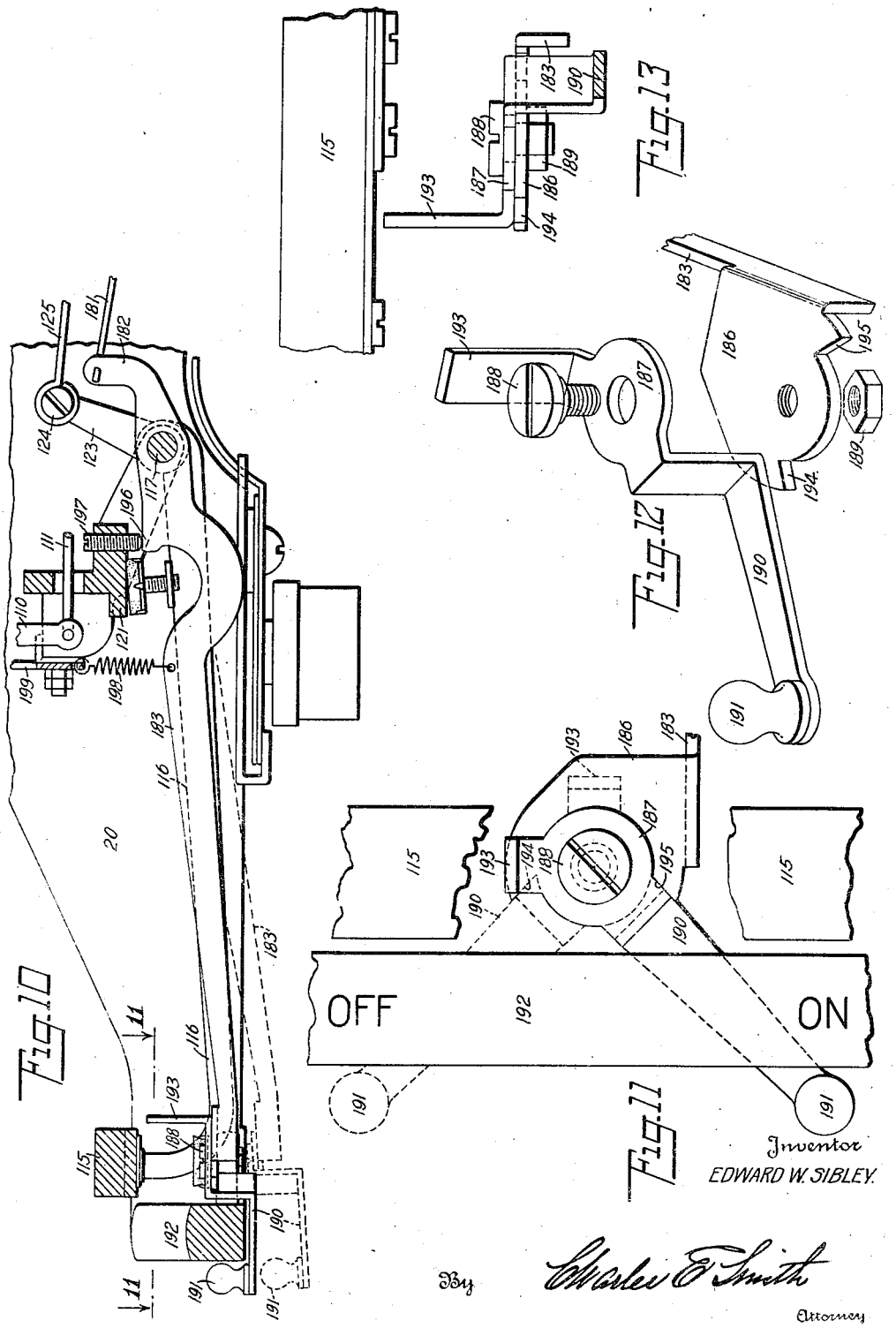

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UNITED STATES PATENT OFFICE

2,225,356

TYPEWRITING AND LIKE MACHINE

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Application February 14, 1938, Serial No. 190,389

14 Claims. (Cl. 197—84)

My invention relates to typewriting and like machines, and more particularly to improved means for justifying typewritten lines, whereby lines of uniform length may be produced to provide typing having uniform right-hand as well as left-hand margins.

One of the main objects of my invention is to provide improved, highly efficient and reliable mechanism which may be readily set to rewrite lines of unjustified copy into lines of uniform length.

Another object of my invention is to provide means as specified above which may be readily embodied in a typewriting machine of standard construction without modifying or materially modifying the existing structure, and which is comparatively simple in construction, reliable and highly efficient in use and which may be manufactured at a comparatively small cost.

Another object of my invention is to provide means in a typewriting machine which may be accurately and conveniently adjusted to justify lines in recopying by varying the extent of spacing between words and without modifying the ordinary spacing between the letters of the words.

A more specific object of my invention is to provide in a typewriting machine two escapement means, wherein one only of said escapement means is operable to control the carriage independently of the other under operation of the printing keys and space bar to effect a normal letter space advance of the carriage, and wherein both of said escapement means, when desired, are operable to conjointly control the carriage for justification under the operation of the space key alone.

A further object of my invention is to provide in an arrangement, as above specified, an auxiliary escapement mechanism operable, when desired, conjointly with a normal escapement mechanism to afford infinitely fine variations in movement of the carriage above the normal letter space movement afforded by the normal escapement mechanism alone.

A still further object of my invention is to provide a simple and highly effective means for adjusting the extent of operation of said auxiliary escapement mechanism to automatically obtain the extent of carriage movement required at each actuation thereof to justify a line when said adjusting means is set in accordance with the number of times the auxiliary escapement mechanism will be actuated in rewriting the line and in accordance with the total extent of change required in length of the line to be justified. More specifically stated, it is proposed to provide simple and highly effective means for adjusting the extent of operation of the auxiliary escapement mechanism to automatically obtain the required extent of increase in each inter-word space, in recopying, to justify a line when the adjusting means is set in accordance with the number of inter-word spaces in the line and in accordance with the number of letter spaces which the line is short of the uniform length.

To the above and other ends which will hereinafter appear, my invention consists in the features of construction, arrangements of parts and combinations of devices set forth in the following description and particularly pointed out in the appended claims.

In the accompanying drawings, wherein like reference characters designate corresponding parts in the different views:

Fig. 1 is a side elevational view of a portion of a No. 6 Remington Noiseless typewriting machine equipped with the devices of my invention, the view showing the rear portion only of such machine with certain parts thereof broken away and other parts in section.

Fig. 2 is an enlarged sectional view of the manual adjusting means for the variable escapement mechanism of my invention.

Fig. 3 is a top plan view of a portion of the machine shown in Fig. 1, this view showing certain parts in section and various other parts omitted in order to more clearly illustrate the actuating means for the escapement mechanism of my invention.

Fig. 4 is an enlarged fragmentary vertical sectional view of the escapement mechanism.

Fig. 5 is an enlarged sectional view of a portion of the escapement mechanism taken on line 5—5 of Fig. 4 and viewed in the direction of the arrows at said line.

Fig. 6 is a detail horizontal sectional view showing the manner of mounting the manual adjusting means, the view being taken on line 6—6 of Fig. 1 and viewed in the direction of the arrows at said line.

Fig. 7 is an enlarged, detail, top plan view with parts in section of another portion of the variable escapement mechanism.

Fig. 8 is an enlarged, detail, top plan view of the manual adjusting means for the variable escapement mechanism.

Fig. 9 is an enlarged, fragmentary, vertical sectional view of another portion of the adjust-

ing means for the variable escapement mechanism.

Fig. 10 is a detail, fragmentary, vertical sectional view of the space key and some of the associated parts.

Fig. 11 is an enlarged, detail, top plan view of a portion of the same and with parts broken away, the view corresponding to a section taken on line 11—11 of Fig. 10 and viewed in the direction of the arrows at said line.

Fig. 12 is a perspective view of certain parts of the mechanism shown in Fig. 11, the view showing the parts displaced from their actual assembled position.

Fig. 13 is an enlarged, fragmentary, sectional view of certain of the parts shown in Fig. 11.

I have shown my invention embodied, in the present instance, in a No. 6 Remington Noiseless machine in which the invention may be readily embodied with but few changes in the existing structural features. However, it is desired to be understood that my invention is not restricted to embodiment in such machine but may be employed in various other types of typewriting machines as well, wherever found available.

I have shown in the accompanying drawings only so much of the usual structure of the No. 6 Remington Noiseless machine as is necessary to arrive at a complete understanding of my invention in its embodiment therein. It will be clear that the present form of my invention may be embodied in substantially the same manner in a No. 10 Remington Noiseless machine and also in the No. 11 Remington machine which are very similar to the illustrated No. 6 machine.

The portion of this machine illustrated in Fig. 1 comprises a platen 15 mounted in the usual manner on a carriage which has not been shown in detail but which includes a cross bar or carriage rail 16 mounted for longitudinal movement on a case shifting guide rail 17 by crossed anti-friction rollers 18.

The carriage guide rail 17 is mounted in the usual manner on the machine frame which includes side plates 20 joined by cross members 21 and 22. The case shift mechanism is of the usual construction wherein the carriage supporting rail 17 is pivotally attached at 25 to the rear ends of parallel arms 26 carried by a rock shaft 27 pivotally supported at its ends by the cross member 21. A forward extension of one of the arms 26 carries an adjustable stop screw 28 engageable with a headed screw 29 carried by the cross member 21 for adjustably limiting the upper case shift movement of the carriage. The lower case shifted position of the carriage is determined by the usual toggle stop arrangement comprising a bell crank 32 pivotally mounted at 33 to the forward end of one of the arms 26, and having a depending arm 34 pivotally connected to an upwardly extending arm 35 pivotally mounted at 36 to the side plate 20. A forward extension 37 of the arm 35 engages a stop 38 adjustably mounted on the side plate 20 when the carriage is in its lower case position.

The usual key control mechanism for effecting a case shifting operation of the carriage is employed in the present instance. This mechanism has not been shown in detail but includes a forwardly extending arm 39 of the bell crank 32 which is pivotally connected to a depending link 40, which in turn is pivoted to the rearward end of an arm 41 pivotally mounted intermediate its ends at 42 to one of the side plates 20 of the machine frame. The forward end of the arm 41 is connected by a link 43 to the usual shift key lever mechanism, not shown.

The printing instrumentalities or type actions may be of the usual construction employed in the No. 6 or No. 10 Remington Noiseless machine and accordingly have not been shown in detail in the accompanying drawings. However, it will be understood that the usual printing keys are employed such as the printing key 44 illustrated in Fig. 1 which are connected to the usual type actions to operate the companion type bar such as 45, partially shown in Fig. 1, to a printing position in relation to the platen 15.

The carriage is mounted to travel transversely of the machine from side to side thereof and is propelled in the letter spacing direction or from right to left by the usual spring drum and pull band arrangement, not shown. The movement of the carriage in a letter space direction is controlled by escapement mechanism, as will hereinafter appear.

It should be understood that the portion of the machine thus far described may be the same as the construction employed in the No. 6 or No. 10 Remington Noiseless machine, and it is intended that the accompanying drawings be interpreted as a complete disclosure of such portion of the machine although various parts and certain refinements herein have been omitted in order to simplify the disclosure of my invention. The portion of this complete machine which is chiefly effected by the incorporation of my invention therein is the carriage feed or escapement mechanism and the parts directly associated therewith.

This escapement mechanism includes a releasable feed rack 50 which is pivotally mounted on the carriage in the usual manner to coact with a feed pinion 51 fixed at the upper end of an upright feed shaft 52. In the present instance the feed pinion 51 is slightly larger than the feed pinion ordinarily employed in this machine, as will hereinafter be described. As may be seen in Fig. 1 and Fig. 4, the feed pinion 51 is mounted for case shifting movement with the carriage by the usual universal bearing arrangement including a bearing member 53 pivotally mounted in a bracket 54 which is in turn secured to the case shift guide rail 17 by screws 55.

The escapement or feed shaft 52 passes downwardly through an enlarged opening in the cross member 22 of the machine frame, and in accordance with the present invention, there are two independently operable escapement mechanisms operatively connected with the lower end of this feed shaft 52. It may be generally described at this point that one of these two escapement mechanisms is controlled by the actuation of the printing keys or the space bar to afford a normal letter space advance of the carriage, while the other escapement mechanism is operable in conjunction therewith when desired under the actuation of the usual space bar to afford a variable additional advance of the carriage as predetermined by a manual setting means.

In order to allow the two escapement mechanisms to coact with the feed shaft 52 independently of each other, these mechanisms are connected thereto through an epicyclic or planetary gearing means. This mechanism may be specifically described by referring particularly to Figs. 4 and 5 wherein it may be seen that the lower end of the feed shaft 52 is provided with longitudinal grooves 60 receiving anti-friction

bearing balls 61 received in companion grooves 62 in a hub member 63 mounted concentrically with the shaft 52. This is the usual arrangement for operatively connecting the shaft 52 with the hub member 63 for rotation therewith and yet to afford vertical case shifting movement of the feed shaft 52 relative thereto. A retaining ring 64 is secured to a reduced diameter lower end of the shaft 52 for retaining the bearing balls 61 in their proper position when the shaft 52 is moved upwardly by a case shifting movement of the carriage.

The hub member 63 is rotatably supported by a bracket 68 attached at 69, (see Fig. 1) to the cross member 22 of the machine frame. The bracket 68 may be similar to that ordinarily employed to support the usual escapement wheel, wherein a bearing hole therein receives a reduced diameter upper end portion of the hub member 63, and the hub member 63 is retained in place thereon by the hub 70 of a brake wheel threaded on a further reduced diameter end portion of the hub member 63 and bearing against the upper surface of the bracket 68. This brake wheel functions in the usual manner and is to be employed in conjunction with a brake shoe which has not been shown but which operates to prevent too rapid carriage movement when released by depression of a tabulator key.

A shaft 72 is attached by a flange portion 73 to the lower end of the hub member 63 so that the shaft 72 extends downwardly in axial alignment with the feed shaft 52. In the present instance the flange 73 is attached to the lower end of the hub member 63 by three equally spaced shoulder screws 74. A planet pinion 75 is rotatably mounted on the downwardly extending body portion of each of the three screws 74, the heads of the companion screws 74 serving to retain the companion planet pinion 75 against the lower surface of the disc 73.

An auxiliary escapement wheel or disc 76 is rotatably mounted on the shaft 72, and the upper end of the hub portion thereof carries a sun pinion 77 which may be integral therewith. The teeth of this sun pinion 77 mesh with the teeth of each of the planet pinions 75. The teeth of each of the planet pinions 75 also mesh with internal gear teeth 79 of a cylindrical outer member 80. Said member 80 is mounted to rotate freely around the hub member 63, and is maintained thereon by its engagement with a beveled shoulder portion 81 of the hub member 63, as may be seen in Fig. 4. The cylindrical member 80 is maintained in spaced relationship with the bracket 68 by a spacing ring 82. The cylindrical member 80 is provided with an annular row of teeth 83 (see Fig. 3) at the upper end thereof to be the equivalent of the normal escapement wheel usually employed in this machine.

In the present arrangement, the teeth 83 on the cylindrical member 80 coact with the feed dogs of the usual dog rocker assembly which is under control of the printing keys and space bar to afford a normal letter space advance of the carriage, and accordingly the member 80 will hereinafter be referred to as the normal escapement wheel. The second escapement disc or wheel 76 is not herein provided with teeth but is arranged when desired to coact with a novel frictional control mechanism for affording variable extents of advance of the carriage under control of the usual space bar, and accordingly this escapement wheel 76 will hereinafter be referred to as the auxiliary escapement wheel.

Referring to Figs. 3 and 5, it will be seen that the carriage being biased by the force of the usual spring drum to move from right to left tends to rotate the feed shaft 52 in a counter-clockwise direction through the feed rack 50 and feed pinion 51. The hub member 63 will accordingly tend to rotate in a counter-clockwise direction with the shaft 52, which through the planet pinions 75, will tend to rotate both the normal escapement wheel 80 and the auxiliary escapement wheel 76 in the same direction. Although normally both the normal and auxiliary escapement wheels are held against rotation in a counter-clockwise direction by their respective escapement mechanisms, it will be clear that a rotative movement of the feed shaft 52 may be afforded by allowing a movement of the normal escapement wheel 80 independently of the auxiliary escapement wheel 76 or by allowing a movement of these two wheels conjointly. In one instance, the rotation of the normal escapement wheel 80 affords rotation of the hub member 83 relative to the then stationary sun pinion 77 due to a rotation of the planet pinions 75 in a counter-clockwise direction around their respective pivot screws 74. In this instance, the afforded rotation of the hub member 63 results in a letter space advance of the carriage through the pinion 51 and rack 50. In the other instance the rotation of both the normal escapement wheel 80 and the auxiliary escapement wheel 76 combine to afford a greater extent of rotation of the hub member 83 wherein any differential movement between the two wheels 76 and 80 is afforded by rotation of the planet pinions 75 about their respective pivot screws 74. In this last instance, the greater extent of rotation of the hub member 63 results in an additional advance movement of the carriage also through the rack 50 and pinion 51, which additional movement is in accordance with the setting of the present justifying mechanism.

It is well known that various different ratios of relative speeds of the relatively movable members may be provided in an epicyclic or planetary gearing arrangement of the present type, and the choice of such ratios determines to a large extent the design of certain parts of the present escapement mechanism. It is not intended that the present choice of gear dimensions represents one that should be provided in every instance, but rather these dimensions have been selected with certain considerations in mind as will hereafter appear and are shown merely as an example to illustrate one method of designing the present device in view of the various factors involved therein.

In the present instance, it was elected to retain the same number of teeth on the normal escapement wheel 80 as ordinarily employed in the No. 6 and No. 10 Remington Noiseless machines. Thus, as may be seen in Fig. 3, sixteen teeth are provided on the normal escapement wheel 80, the same as ordinarily used in this machine with "Elite" type to provide the desired uniform letter spacing movement of the carriage by a one tooth movement of the escapement wheel. However, it will be clear that if the machine were provided with other type, for example "Pica" type, the number of teeth on the normal escapement wheel 80 in the present arrangement would be modified in accordance with the usual practice.

In the usual construction of the above mentioned Remington machines, the escapement

wheel is directly connected to move at the same speed as the escapement shaft 52, but in the planetary gearing arrangement of the present type, the normal escapement wheel 80 does not rotate at the same speed as the feed shaft 52, and in order to compensate for this difference in speed, the size of the feed pinion 51 has been slightly changed. In the present specific arrangement, the size of the planetary gears have been so arranged that the speed of the feed shaft 52 is approximately two-thirds the speed of the normal escapement wheel 80. Accordingly, the feed pinion 51 is made one and one-half times the size ordinarily employed in this machine, whereby a one-tooth movement of the normal escapement wheel 80 allows the same extent of letter space advance of the carriage in the present instance as is allowed by a one-tooth movement of a similar escapement wheel directly connected to the feed shaft.

In the present planetary gearing arrangement, the ratio of the speed of the auxiliary escapement wheel 76 to the speed of the feed shaft 52 will be different from that of the normal escapement wheel 80 to the feed shaft. With the size of the planetary gears selected in the present embodiment, the speed of the feed shaft 52 is approximately one-third the speed of the auxiliary escapement wheel 76. Inasmuch as the speed of the normal escapement wheel is two-thirds the speed of the feed shaft, and the speed of the auxiliary escapement wheel is one-third the speed of the feed shaft, it will be clear that the speed of the auxiliary escapement wheel is double the speed of the normal escapement wheel. Thus, a one-tooth movement of the normal escapement wheel, or one-sixteenth of a revolution, affords a normal letter space advance movement of the carriage while one-eighth of a revolution of the auxiliary escapement wheel will be required to afford the same letter space advance of the carriage.

As previously stated, the escapement mechanism which coacts with the normal escapement wheel 80 is of the usual construction which is shown particularly in Figs. 3 and 4. A dog rocker 90 of usual construction is mounted at down turned end portions thereof on pivot screws 91 carried by rearward and downward extensions 92 of the same bracket 68 employed to support the hub member 83. A forwardly extending arm of this dog rocker 90 carries on the upper side thereof a normally engaged holding dog 93 pivoted at 94 thereon and biased to normal position by a spring 95. This holding dog 93 is arranged in the usual manner to allow the escapement wheel 80 to turn backward in a clockwise direction by forcing the holding dog 93 rearwardly out of the path of the teeth 83 against the force of the spring 95.

A stepping dog 97 is pivoted at 98 on the under side of the forwardly extending arm of the dog rocker 90 to receive a limited resilient movement against the force of the same spring 95 employed to bias the holding dog 93. This resilient movement of the stepping dog 97 in the direction of feed of the escapement wheel 80 is limited by a stop arm 99 pivoted at 100 to a rearward extension 101 of the dog rocker 90. The forward end of the stop arm 99 enters a bifurcation in the tail of the stepping dog 97 to variably arrest the movement of the stepping dog 97 according to the adjustment of its pivot 100 in a slot 102 in the arm 101.

The dog rocker assembly is resiliently held in its normal position under the force of an adjustable spring 105 wherein an adjustable stop screw 106 engages the edge of one of the arms 92 of the supporting bracket. The dog rocker assembly is operable about the pivot screws 91 against the force of the spring 105 by any one of the type actions under control of the printing keys or by operation of the space bar. Thus, the usual universal bar arrangement (not shown) is operated during a forward movement of any one of the type actions, and this moves an arm 110 (see Figs. 3 and 10), operatively connected to the universal bar, in a forward direction in the usual manner. A pull link 111 extends rearwardly from the lower end of the arm 110 and is connected at 112 to a depending arm 113 of the dog rocker 90.

The usual space bar mechanism is shown, particularly in Figs. 3 and 10, wherein it may be seen that a space bar 115 is mounted on the forward ends of parallel arms 116 which are fixedly secured to the ends of a rock shaft 117 by respective nuts 118. The rock shaft 117 is mounted by pivot screws 119 carried by respective rearward extensions 120 of a front cross member 121 of the machine frame. An upwardly and rearwardly extending arm 123 is fixedly secured at one end portion of the rock shaft 117, which arm is pivotally connected at 124 to a pull link 125. The rearward end of the pull link 125 is operatively connected at 126 to a depending arm 127 (see Fig. 4) of the dog rocker 90, whereby the dog rocker assembly is operated by a depression of the space bar 115 in the usual manner.

The operation of the normal escapement mechanism thus far described has not been materially changed by the incorporation of my invention therein. That is, an operation of any one of the printing keys or an operation of the space bar effects a forward movement of either the pull rod 111 or 125 respectively, thereby moving the holding dog 93 upwardly out of the path of one tooth of the normal escapement wheel 80 and moving the stepping dog 97 into the path of the oncoming tooth. When the type action returns from the printing point or when the space bar is released, the dog rocker mechanism returns to its normal position, thereby moving the stepping dog out of the path of the tooth engaged thereby and moving the holding dog back into the path of this tooth released by the stepping dog. In this manner the normal escapement wheel 80 is allowed to rotate one tooth space by the complete operation of any one of the printing keys or the space bar, which movement operates through the planetary gearing as previously described to allow a normal letter space advance of the carriage.

Justification is accomplished in accordance with the present invention by increasing the length of certain lines which are shorter than the desired uniform line length by uniformly increasing the extent of each space betweeen words of such line. Thus in accordance with the present arrangement, there are means provided under control of the space bar 115, and which are rendered operative at will, for affording a variable extent of movement of the carriage through the auxiliary escapement wheel 76 in addition to the uniform movement effected through the normal escapement wheel 80. Inasmuch as the extent of variation in movement which can be afforded in the usual form of toothed escapement wheel is ordinarily limited by the spacing of the teeth thereof, I have here-

in dispensed with the use of such teeth on the auxiliary escapement wheel 76 in order to obtain an infinitely fine variation in the extent of movement thereof.

In order to obtain positive intermittent control of the auxiliary wheel 76, I have provided two clutch members coacting frictionally with a substantially smooth edge on the wheel 76 in lieu of the usual feed dog and toothed wheel arrangement.

Referring particularly to Figs. 4, 5 and 7, it will be seen that the mechanism coacting with the auxiliary escapement wheel 76 is carried by a bracket 130 which is supported by upwardly extending arm portions 131 secured at 132 to the upper bracket 68. The bracket 130 is provided with a bearing hole receiving the lower end of the shaft 72. The outer edge of the auxiliary escapement wheel 76 is beveled as may be seen in Fig. 4, and rotation thereof is normally prevented by the engagement of a clutch member 134 with this beveled outer edge. The clutch member 134 in the present instance is in the form of a disc having a beveled edge to conform with the beveled edge of the wheel 76. The clutch member 134, when in effective engagement with the wheel 76, is also in effective engagement with a seat portion 135 at the rearward side thereof, which seat is formed at the upper end of a rearward extension 136 of the bracket 130. The clutch member 134 is secured to a reduced diameter upper end of a vertical push rod or shaft 137 which extends downwardly through an opening 138 in the bracket 130. The clutch member 134 is normally spring pressed into effective engagement with the beveled edge of the wheel 76 and into engagement with the seat 135 by an expansion spring 139 surrounding the protruding lower end of the push rod 137 and acting between the lower surface of the bracket 130 and a head 140 at the extreme lower end of the push rod 137.

A second clutch member 144 is normally disposed substantially diametrically opposite the clutch member 134 and normally is held out of effective engagement with the beveled edge of the wheel 76. The clutch member 144 is in the form of a disc having a beveled edge similar to the clutch member 134, and is mounted upon the reduced diameter upper end of a vertical push rod or shaft 145. The push rod 145 passes downwardly through an opening 146 in a carrier or arm 147, which arm is mounted for rotation concentrically with the wheel 76 by a hub portion 72. An expansion spring 149 is provided around 148 having a bearing opening receiving the shaft the lower end of the push rod 145 and acts between the lower surface of the carrier 147 and the upper edge of a cap member 150 secured to the lower end of the push rod 145 by a pin 151

The clutch member 144, as previously stated, is normally held out of effective engagement with the edge of the wheel 76, but is operable downwardly under the force of the spring 149 to effectively engage the edge of the wheel 76 and also engage a seat portion 152 of an upward extension 153 of a carrier arm 147. Referring to Fig. 7, it may be seen that the carrier arm 147 is normally held in engagement with a stop pin 156 carried by a forward extension 157 of the bracket 130 by a contractile spring 158 extending between an upwardly extending pin 159 on the bracket extension 157 and a downwardly extending pin 160 on the carrier member 147.

When the present escapement mechanism is set to afford justification as will be described later, this auxiliary escapement mechanism is operated for word spacing to afford a variable extent of advance movement of the carriage in addition to the normal letter space advance afforded by the normal escapement mechanism. Thus, there are means provided which are operated by a depression of the space bar to first engage the clutch member 144 with the auxiliary escapement wheel 76 and with the seat 152 of the carrier 147, and to then disengage the clutch member 134 from the escapement wheel 76 and from its seat 135. Thus, when the auxiliary escapement wheel 76 is released from the stationary holding arm 136 by the disengagement of the clutch member 134, the auxiliary escapement wheel 76 has already been connected to the carrier 147 through the effective connecting engagement of the clutch member 144, and the carrier arm 147 is rotated in a counter-clockwise direction about the shaft 72 in unison with the auxiliary escapement wheel 76 under the force of the carriage spring drum.

The movement of the carrier arm 147 in a counter-clockwise direction against the force of the spring 158 is limited in the present instance by an adjustable stop mechanism. This stop mechanism includes a stop member 165 having a hub portion 166 with a bearing opening receiving the shaft 72, whereby it is mounted for adjustment concentrically with the auxiliary escapement wheel 76. The stop member 165 carries a pin 167 which projects upwardly into the path of the carrier arm 147 to arrest counter-clockwise movement thereof in accordance with the adjusted position of the stop member 165. The means for adjusting the position of the stop member 165 and for holding it in such adjusted position will be later described in detail.

The control or operating means for the auxiliary escapement mechanism in the present instance comprises a rocker member 170 (Figs. 4 and 5) having spaced upturned portions 171 pivotally mounted at 172 to downwardly extending portions 173 of the bracket 130. As may be seen in Figs. 4 and 7, the rocker member 170 is provided with a rearwardly extending arm portion 174 having an upturned end 175 which underlies the lower end of the push rod 137 of the clutch member 134. A forwardly extending portion 176 of the rocker 170 terminates in an upturned portion or bead 177 which underlies the cap 150 at the lower end of the push rod 145 for the clutch member 144. As shown in Figs. 5 and 7, the upturned bead 177 of the forwardly extending arm 176 is segmental in form and extends in a counter-clockwise direction from the normal position of the cap member 150 in an arc concentric with the shaft 72, thereby maintaining a cooperative relation with the cap 150 regardless of the rotated position of the carrier 147 about the shaft 72.

Referring to Figs. 1 and 5, it will be seen that an upward extension 180 is provided on one of the upturned supporting portions 171 of the rocker member 170. This upward extension 180 is connected by a pull rod 181 which extends forwardly of the machine to an upwardly extending arm 182 of an actuating lever 183 for controlling the auxiliary escapement. As best shown in Figs. 3 and 10, the actuating lever 183 is mounted to turn around the space key rock shaft 117 between one of the space key levers 116 and a collar 184 secured by a set screw 184a to the shaft 117.

In the present arrangement, the actuating lever 183 of the auxiliary escapement mechanism

is not intended to be operated by the space bar 115 when the machine is being used to type the original unjustified copy, but when the machine is being employed to justify such copy, a selecting means is provided which is operable to place the actuating lever 183 under control of the space bar 115 to be actuated thereby.

Referring to Figs. 3 and 11, 12 and 13, it will be seen that the actuating lever 183 extends forwardly to a position underlying the space bar 115 but spaced downwardly from the lower surface thereof a sufficient distance so that it is not engaged by a full depression thereof. The extreme forward end of the actuating lever 183 is provided with a horizontally bent portion 186 on which is pivotally mounted a manually controlled selecting member 187 by a shoulder screw 188 cooperative with a nut 189. The manual selecting member 187 is provided with a forwardly extending arm 190 carrying a finger piece 191, the arm 190 being bent downwardly to pass beneath the usual front cross member 192 of the machine frame, whereby the finger piece 191 is positioned outside of said frame for convenient manipulation by the operator.

An upward extending lug portion 193 of the manual selecting member 187 serves at times as an interponent to operatively connect the lever 183 with the space bar 115. In other words when the finger piece 191 is moved to the left as shown in dotted lines in Fig. 3, to the "off" position, the upwardly extending lug 193 is moved to a rearward position out of the path of travel of the space bar 115 during a depression thereof, but when the finger piece 191 is operated to the right, full line or "on" position shown in Fig. 11, the lug 193 underlies the space bar 115 and accordingly an operation of the lever 183 results upon a depression of the space bar 115. The "off" position of the selecting member 187 is limited by the engagement of one edge of the arm 190 with a ledge 194 formed on the portion 186 of the lever 183, and the "on" position is limited by the engagement of the other edge of the arm 190 with a similar ledge 195.

Referring to Fig. 10, it may be seen that the normal position of the actuating lever 183 for the auxiliary escapement mechanism is limited by the engagement of a portion 196 of said lever with an adjustable stop screw 197 threaded into a tapped opening in the front cross member 121 of the machine frame. A contractile spring 198 is provided between the lever 183 and the usual front guide comb 199 of the machine to hold the lever 183 in its normal position.

In order to retain the rocker member 170 in its normal position shown in Fig. 4 against the force of the spring 149 of the clutch member 144, a contractile spring 200 is provided between an upwardly extending lug 201 on the rocker member 170 and a downwardly extending lug 202 on the bracket 130.

In operating the present auxiliary escapement mechanism, it will be clear that when the selecting member 187 is placed in the "on" position, a depression of the space bar 115 will effect an actuation of the actuating lever 183 in addition to controlling the operation of the normal escapement mechanism in the usual manner. Referring to Fig. 4, it will be seen that an operation of the lever 183 will rock the member 170 through the pull rod 181 in a direction to lower the forwardly extending arm 176 and to raise the rearwardly extending arm 174.

A certain amount of lost motion is provided between the upturned portion 175 of the arm 174 and the lower end of the push rod 137. Therefore, the clutch member 144 is effectively engaged with the auxiliary escapement wheel 76 and its seat 152 by the downward motion of the forwardly extending arm 176 before the upward motion of the arm 174 is effective to release the normally engaged clutch member 134. Thus, when the clutch member 134 has released the escapement wheel 76 from the fixed bracket extension 136 the clutch member 144 has already connected the wheel 76 to the carrier 147, so that the force of the spring drum immediately moves the carrier 147 together with the escapement wheel 76 in a counter-clockwise direction until the edge of the carrier 147 engages the stop pin 167 settable as hereinafter described to determine the extent of feed of the carriage under control of the auxiliary escapement wheel 76.

The actuating mechanism for the rocker member 170 is so designed that a certain amount of lost motion or space is afforded between the bead 177 of rocker 170 and the lower end of the cap 150 when the space bar is fully depressed. Therefore, upon release of the space bar 115, the return motion of the rocker member 170 engages the clutch member 134 with the escapement wheel 76 before the clutch member 144 is disengaged from the wheel 76. Thus, the auxiliary escapement wheel 76 is held by the clutch member 134 before it is released by the clutch member 144. It will be clear that when the clutch member 144 is operated to its released position shown in Fig. 4 for example, the spring 158 will be effective to return the carrier 147 to normal position against the pin 156.

Still referring to Fig. 4, it will be noticed that the openings 138 and 146 which receive the push rods 137 and 145 respectively flare upwardly so that the rods may receive slight lateral movements at the upper end portions thereof in every direction. This arrangement permits not only an axial movement of each of the rods 137 and 145 but also such a slight lateral movement at its upper end portion as may be required for the companion clutch members 134 and 144 to properly seat both with the escapement wheel 76 and with their respective seats 135 and 152 under the force of the companion springs 139 and 149 respectively.

It will now be clear that when the present justifying mechanism is set for justifying by affording an expansion of the word spaces by moving the finger piece 191 to the "on" position, a depression of the space bar 115 will cause a normal letter space advance of the carriage through the normal escapement mechanism in the usual manner, and also will cause an additional forward movement of the carriage to the extent afforded by the counter-clockwise movement of the carrier 147 of the auxiliary escapement mechanism. It also will be clear that infinitely fine variations in the extent of this counter-clockwise movement of the carrier 147 may be afforded by adjusting the stop member 165 about the shaft 72, as will now be described.

It will be clear that in order to justify any particularly line by uniformly increasing the extent of each word space, the extent of such increase will be equal to the total extent of elongation of the line required for justification divided by the number of word spaces in this line. In accordance with the present invention means are provided whereby the operator does not need

to calculate the required increase in each word space, but is merely required to set a single adjusting member in accordance with the number of word spaces and the number of deficient character spaces in a line. This adjusting member then operates to automatically establish the correct position of adjustment of the stop member 165 to justify the line.

The mechanism for obtaining the above result in the present instance operates on a principle similar to that of the ordinary slide rule, or that is, two cooperating logarithmic scales are employed whereby the operator establishes a setting of a single adjusting member by placing a point on one scale denoting the required number of character spaces of expansion in register with a point on the other scales denoting the number of word spaces in the line. The resulting position of the adjusting member then denotes or corresponds to the quotient obtained by an actual division of the number of character spaces of expansion by the number of word spaces.

Thus in the specific form of the present setting means, a single manual adjusting means is operatively connected with the adjustable stop member 165, and as shown in Fig. 8, numerals are placed on this adjusting member on a scale which is graduated to the logarithms of these numerals. The numerals of this scale on the adjusting member cooperate with numerals on a fixed member which numerals are likewise placed on a scale graduated to the logarithms thereof. The connection between the adjusting member and the adjustable stop member 165 is so designed that when a numeral on the movable scale denoting the number of deficient character spaces in a line to be justified is placed in register with a numeral on the fixed scale corresponding to the number of word spaces in the line, a position of the stop member 165 is automatically selected which affords exactly the correct amount of advance movement of the carriage through the auxiliary escapement mechanism at each actuation of the space bar to justify the particular line.

Referring to Fig. 1, it will be seen that the manual setting means comprising the housing 212 is, in the present instance, mounted above the usual cover plate 210 of the machine and at the right-hand end of the usual type bar guide comb member 211, as shown in Fig. 6. Thus, a housing 212 is mounted by a depending bracket portion 213 secured by the screws 214 which ordinarily hold the member 211. The housing 212 is provided with an annular retaining ring 216 (see Fig. 2) secured around the upper circular edge thereof by pins 217.

From a consideration of Fig. 2, it will be seen that a manual adjusting member in the form of a disc or wheel 220 is located within the retaining ring 216, said disc 220 being provided with a central finger wheel or knob 221 by which the disc may be rotatively adjusted. An expansion spring 222 is provided around a depending hub portion 223 of the disc 220 and within an upstanding guide sleeve or hub 224 on the housing 212. The spring 222 normally bears upward on the lower surface of the disc 220 to forcefully engage a beveled outer rim on the disc 220 with a correspondingly beveled inner edge of the retaining ring 216, thus frictionally retaining the adjusting disc 220 in position against accidental displacement from its position of rotative adjustment.

An opening is provided through the center of the disc 220 and the finger piece 221 which receives a vertically disposed adjusting shaft 226. The finger wheel 221 and disc 220 are connected to transmit a rotary motion to the shaft 226 through an inwardly extending spline 227 on the finger wheel 221 which enters a longitudinal spline groove 228 at the upper end of the shaft 226. This spline connection permits a slight downward movement of the disc 220 relative to the shaft 226 against the force of the spring 222 in order to free the frictional engagement of the outer surface of the disc 220 from the retaining rings 216, although the disc and shaft are connected to turn together.

It will be seen from a consideration of Figs. 1, 3 and 8 that the adjusting shaft 226 extends downwardly through the central portion of the machine and the lower end thereof is supported by a bracket 230, said bracket 230 being supported by screws 231 threaded into tapped openings in the side plate 20 of the machine frame. Referring to Fig. 9 it may be seen that the lower end of the shaft 226 extends through a bearing opening in the bracket 230 and the lower end of said shaft is operatively connected at 233 to a hub portion 234 of a cam member 235. Upward movement of the shaft 226 is prevented by the upper end of the hub 234 engaging the lower surface of the bracket 230, and a collar 236 (Fig. 1) is attached at 237 to the shaft 226 and engages the upper surface of the bracket 230 to prevent any downward movement of the shaft 226.

A means is required in the present instance for adjusting the position of the stop member 165 in a particular definite relation to the rotation of the shaft 226. Thus, a spiral cam groove 240 is provided in the lower surface of the cam member 235 as may be seen in Figs. 8 and 9, which cam groove 240 receives a roller 241 pivotally mounted at 242 to a slide member 243. The end portion of the slide member 243 which underlies the cam member 235 is provided with a guide slot 244 which receives the body portion of a headed, shouldered, screw 245 threaded into a tapped opening in the cam member 235 concentrically with the shaft 226.

Referring to Figs. 3 and 7, it will be seen that the slide member 243 extends diagonally of the machine to a position where it coacts with the stop member 165. A connection to impart rotary adjusting movement to the stop member 165 by reciprocal movement of the slide member 243 is provided in the present instance by rack teeth 247 on one end portion of the slide member 243, which teeth 247 mesh with teeth 248 provided on the stop member 165 arranged in a concentric relation with the shaft 72. The teeth 247 and 248 are held in meshed relation by a grooved roller 249 receiving the edge of the slide member 243 and pivotally mounted at 250 on the bracket 130.

In changing the position of adjustment of the present mechanism, the operator merely pushes downwardly on the finger piece 221 against the force of the spring 222 to release the disc 220 from its frictional engagement with the retaining ring 216. The operator, while thus holding the disc 220 depressed, may turn the finger piece 221 which turns the cam member 235 through the vertical connecting shaft 226. The turning of the cam member 235 will effect a longitudinal movement of the slide 243 through the cam groove 240 and roller 241, which movement of the slide 243 will in turn effect a corresponding

rotative adjustment of the stop member 165 through teeth 247 and 248. When the operator has thus turned the member 220 to the desired position of adjustment, the finger piece 221 is released and the spring 222 forces the adjusting disc 220 back to normal position into engagement with the retaining ring 216, whereby it is locked by the frictional engagement therewith against any accidental displacement from adjusted position. Incidentally this firmly holds the adjustable member 165 in its adjusted position.

Although the auxiliary escapement mechanism is not limited to any particular range of adjustment, it has been elected for the purpose of the present disclosure that the extreme position of the stop member 165 should afford a movement of the carrier 147 which will afford an extent of forward movement of the carriage equal to one normal letter space distance corresponding to that afforded by the normal escapement. The stop member 165 is shown in Fig. 7, for example, in such extreme position of adjustment, which affords a movement of the carrier arm 147 from its solid line position to the dotted line position, which extent of movement when operating through the planetary gearing as previously described is sufficient to afford a full normal letter space movement of the carriage. It will then be clear that at this adjusted position of the stop member 165, the machine will operate upon a depression of the space bar to afford two normal letter spaces between the words in typing a line, one letter space advance of the carriage being through the normal escapement mechanism and the other being through the auxiliary escapement mechanism. Thus at this setting, a line which has four word spaces will be increased to the extent of four letter spaces in recopying for justification.

Referring to Fig. 8 it may be seen that there are numeral indices "1" to "10" marked around the upper surface of the movable adjusting disc 220, which numerals are placed opposite scale divisions which are graduated according to the logarithms of these numbers. A second set of numeral indices from "4" to "15" are placed around the upper surface of the stationary retaining ring 216, which numerals are also placed opposite scale divisions which are graduated in the same manner to the logarithms of these numbers.

In the present instance, the numerals on the movable member 220 designate various extents of total change required in the length of a line to justify it, which in the present instance are various numbers of letter spaces which may be required. The numerals on the fixed member 216 represent various numbers of operations of the auxiliary escapement means in justifying a line, which in the present instance are the various numbers of inter-word spaces in a line.

It will be apparent however, that the particular arrangement of the two sets of numerals on the two members 220 and 216 is immaterial to the operation of the present arrangement, or that is, the set of numerals which are placed on the movable member 220 designating the number of character spaces could have been placed on the outer fixed member 216 as well, and the numerals now shown thereon could have been placed on the movable member 220.

It will now be clear that in the present arrangement, the stop member 165 will be positioned in accordance with the adjusted position of the adjusting disc 220 so that the part of a letter space movement of the carriage afforded by each actuation of the auxiliary escapement mechanism will always be equal to the quotient of any number on the movable member 220 divided by a number on the fixed member 216 which registers therewith. Thus, referring to Figs. 7 and 8, it will be noticed that the numerals from "4" to "10" on the movable member 220 are in register respectively with the numerals from "4" to "10" on the fixed member 216. This is in accord with the maximum position of adjustment of the stop member 165 to afford one normal letter space advance of the carriage through the auxiliary escapement mechanism.

Now considering for example that the adjusting disc 220 is moved in the manner previously described to a point wherein the numeral "2" thereon registers with the numeral "4" on the fixed member 216. Due to the logarithmic arrangement of the numerals on the two members 216 and 220, it will be clear that when the numeral "2" on the member 220 registers with the numeral "4" on the member 216, the numerals "3," "4," "5," "6" and "7" on the member 220 will also register with numerals "6," "8," "10," "12" and "14" respectively on the member 216. In other words, the two scales on the members 216 and 220 cooperate in a very similar manner to two cooperating scales of a slide rule.

At the above assumed position of adjustment of the member 220, it will be clear that the quotient resulting from the division of a number on the member 220 by a number on the member 216 which registers therewith will be one-half. Thus, the shape of the cam groove 240 in the cam member 235 is designed so that at this position of the member 220, the stop member 165 has been moved in a clockwise direction through the slide member 243 to a position allowing a movement of the carrier 147 which will afford one-half a normal letter space advance of the carriage through the auxiliary escapement mechanism.

From the above, it will be clear that if the operator adjusts the movable member 220 to a position wherein any numeral thereon which corresponds to the number of deficient character spaces in a line is placed in register with any numeral on the fixed member 216 which corresponds with the number of word spaces in that line, a position of the stop member 165 will be automatically obtained to afford the proper advance movement of the carriage at each actuation of the space bar to justify that particular line.

In typing the original or unjustified copy with a typewriting machine equipped with the devices of the present invention, the selecting lever 190 is placed in the "off" position and the machine operates in the usual manner during which the auxiliary escapement mechanism is inactive and a fixed spacing between words is obtained which is equal to one normal letter space distance. In rewriting such original copy for justification, the selecting lever 196 is moved to the "on" position, and the operator before starting to type each line, merely sets the single adjusting member 220 in accordance with the number of word spaces in that line and in accordance with the number of letter spaces which such line falls short of the desired right-hand margin line. Thus, the operator is entirely relieved of calculating the required extent of increase in each word space to justify the line.

The present arrangement not only saves time and effort on the part of the operator by eliminating the necessity for calculation, but also has the distinct advantage of obtaining a more accurate adjusting by its automatic operation than could otherwise be obtained. In other words, it may happen in many instances that an irrational number will result from the actual division of the number of deficient character spaces by the number of word spaces, and it is usually impossible by ordinary manual adjusting means to establish a setting which will be in exact accordance with such an irrational number. In the present arrangement however, it will be clear that the automatic setting of the stop member 165 is equally accurate irrespective of whether the quotient which would actually be obtained by calculation is a rational or an irrational number.

It will further be clear that in the present arrangement, this mechanism for obtaining absolute accuracy of adjustment has been provided in combination with an escapement mechanism capable of affording infinitely fine variation in the extent of carriage movement. In other words, all of the advantages of the extreme accuracy obtained by the present logarithmic adjusting mechanism would not be obtained in the usual form of escapement mechanism employing a toothed escapement wheel because of the fact that the variations in the carriage movement are limited in such arrangements to multiples of the teeth of the escapement wheel, and it is impracticable to provide sufficiently fine teeth to afford the absolute variation in carriage movement required in every instance. However, in the present arrangement, the members 134 and 144 which coact frictionally with the smooth edge of the auxiliary escapement wheel 76 imposes no limitation to obtaining the accuracy which may be required in the variation of the carriage movement.

The justifying mechanism of the present invention has been shown and described in connection with the usual form of normal escapement mechanism under control of the printing keys for affording uniform letter spacing. However, it will be understood that the present justifying mechanism may equally well be employed in combination with an escapement mechanism for affording variable letter spacing to accord with different widths of printed characters. If such a variable letter spacing mechanism is employed in the present arrangement, the deficiency in the length of an unjustified line may be reckoned in terms of a unit which is a divisor of all of the various units of letter spacing and the numeral indices on the movable member 220 may be accordingly arranged.

It may be further pointed out that although the present invention has been shown and described in connection with a justifying mechanism operating to vary the word spacing only, the present logarithmic dial arrangement may be employed to automatically establish a setting of any other means for varying the advance movements of the carriage. In other words the numerals on the member 216 may be employed to denote various numbers of intermittent operations of any escapement means whether it be for word spacing or for character spacing in a line, and the numerals on the member 220 may be employed to designate various extents of total change in length of the line required for justification.

It is also to be understood that the devices of the present invention could be employed in various other characters of typewriting machines, and in referring to a "carriage" in the foregoing description and in the appended claims, it will be understood that such term is employed in a generic sense to apply to flat platen machines wherein the printing instrumentalities are carried by and travel with the carriage, as well as the platen carrying carriage of the type herein illustrated, unless said "carriage" be otherwise more specifically defined.

It is also to be understood that in the foregoing description, an attempt has not been made to point out all the alternate or optional features of construction that may be employed and that various modifications, adaptations and alterations may be applied to meet the requirements of practice and some parts of the construction may be employed without others without departing from my invention as it is defined in the accompanying claims.

What I claim as new and desire to secure by Letters Patent is:

1. In a typewriting and like machine, the combination of a carriage, and means for affording variable spacing of the carriage, said means comprising variable escapement means and manually settable adjusting means including a single adjusting member having indexing means designating the extent of total change required in a line to justify it, and indexing means to accord with the number of intermittent operations of said escapement means in writing the line.

2. In a typewriting and like machine, the combination of a carriage, and means for affording variable spacing movements of the carriage, said means comprising adjusting means having indexing means to accord with the number of spaces between words in a line and cooperating indexing means to accord with the number of deficient letter spaces under those required to justify a line, and means controlled by said adjusting means for automatically affording the necessary movement of the carriage when spacing between words to expand such spacing sufficiently to justify the line.

3. In a typewriting and like machine, the combination of a carriage, means for affording variable extents of letter feed movement of the carriage, and indexing means connected therewith for predetermining the amount of movement of the carriage afforded thereby, said indexing means comprising a single adjusting means settable to select the required extent of movement of the carriage when spacing between words to justify a line in accordance with the number of inter-word spaces and the number of deficient character spaces in the line, said extent of movement of the carriage being uniform throughout any given line.

4. The combination of a carriage, a uniform escapement mechanism for affording a uniform extent of character spacing movements of the carriage, a variable escapement mechanism for affording a variable extent of word spacing movements of the carriage, and adjusting means for said variable escapement mechanism operable to automatically determine the extent of movement to be given the carriage at each actuation of the variable escapement mechanism for spacing between words which is required to justify each line, said adjusting means comprising a single member manually set in accordance with the number of inter-word spaces and the extent of total change in length required in each line.

5. In a typewriting machine, the combination

of a carriage, means controlled by the printing keys for affording a normal character space advance of the carriage, a space key intended for spacing between words, means under control of the space key for affording a variable extent of advance of the carriage, and a single adjusting means settable in accordance with the number of word spaces and the extent of the total change in length required in each line to automatically determine the required extent of advance to be afforded the carriage at each operation of the space key to justify the line.

6. The combination of a carriage, escapement mechanism therefor including means for affording variable extents of advance movement of the carriage, and manually settable controlling means therefor, said controlling means comprising cooperating fixed and movable scales having indices on one scale designating the number of inter-word spaces in a line and having indices on the other scale designating the total extent of change in length of the line required for justification.

7. The combination of a carriage, escapement mechanism therefor including means for affording variable extents of advance movement of the carriage, and manually settable controlling means therefor comprising cooperating fixed and movable logarithmic scales having indices on one scale designating the number of inter-word spaces in a line and indices on the other scale designating the extent of change in length of the line required for justification.

8. The combination of a carriage, escapement mechanism therefor including means for affording variable extents of advance movement of the carriage, and manually settable controlling means therefor comprising cooperating fixed and movable scales having graduations on one scale corresponding to the number of inter-word spaces in a line and graduations on the other scale corresponding to the extent of change in length of the line required for justification.

9. In a justifying mechanism for typewriting and like machines, the combination of a carriage, escapement means for affording variable extents of intermittent movement of the carriage, and manually settable adjusting means for said escapement means comprising cooperating fixed and movable scales having numerals on one scale designating the number of intermittent operations of said escapement means in a line and numerals on the other scale designating the extent of total change in length of the line for justification.

10. In a justifying mechanism for typewriting and like machines, the combination of a carriage, escapement means for affording variable extents of intermittent movement of the carriage, and manually settable adjusting means for said escapement means comprising cooperating fixed and movable scales having numerals on one scale designating the number of intermittent operations of said escapement means in a line and numerals on the other scale designating the extent of total change in length of the line for justification, said scales being graduated to the logarithms of the numerals thereon.

11. In a typewriting machine, the combination of a carriage, a normal escapement means under control of the printing keys for affording a character space advance of the carriage, an auxiliary escapement means for affording a variable advance of the carriage, a space key, and means for at times operating said normal escapement means and said auxiliary escapement means at each actuation of said space key.

12. In a typewriting machine, the combination of a carriage, a normal escapement means under control of the printing keys for affording a character space advance of the carriage, an auxiliary escapement means for affording a variable advance of the carriage, a space key, and selecting means for affording either an operation of said normal escapement means and said auxiliary escapement means or an operation of said normal escapement means only at each actuation of said space key.

13. The combination of a carriage, and escapement mechanism therefor comprising a rotatble disc operatively connected with said carriage, a fixed member having a frictional clutch normally engaging said disc to prevent movement thereof, a carrier having a variable movement around the axis of said disc, a frictional clutch carried by said carrier and normally out of effective contact with said disc, and key operated means for alternately effectively engaging said clutch on said carrier with said disc and disengaging said clutch on said fixed member from said disc.

14. The combination of a carriage, and escapement mechanism therefor comprising a rotatable disc operatively connected with said carriage, a fixed member having a frictional clutch normally engaging said disc to prevent movement thereof, a carrier movable around the axis of said disc, a frictional clutch carried by said carrier and normally out of effective contact with said disc, key operated means for alternately effectively engaging said clutch with said disc and disengaging said clutch on said fixed member from said disc, adjustable stopping means for variably limiting the movement of said carrier from normal position, and spring means for returning said carrier to normal position.

EDWARD W. SIBLEY.