

June 6, 1944.

C. D. LAKE

2,350,561

TYPEWRITING MACHINE

Filed Nov. 6, 1941

8 Sheets-Sheet 1

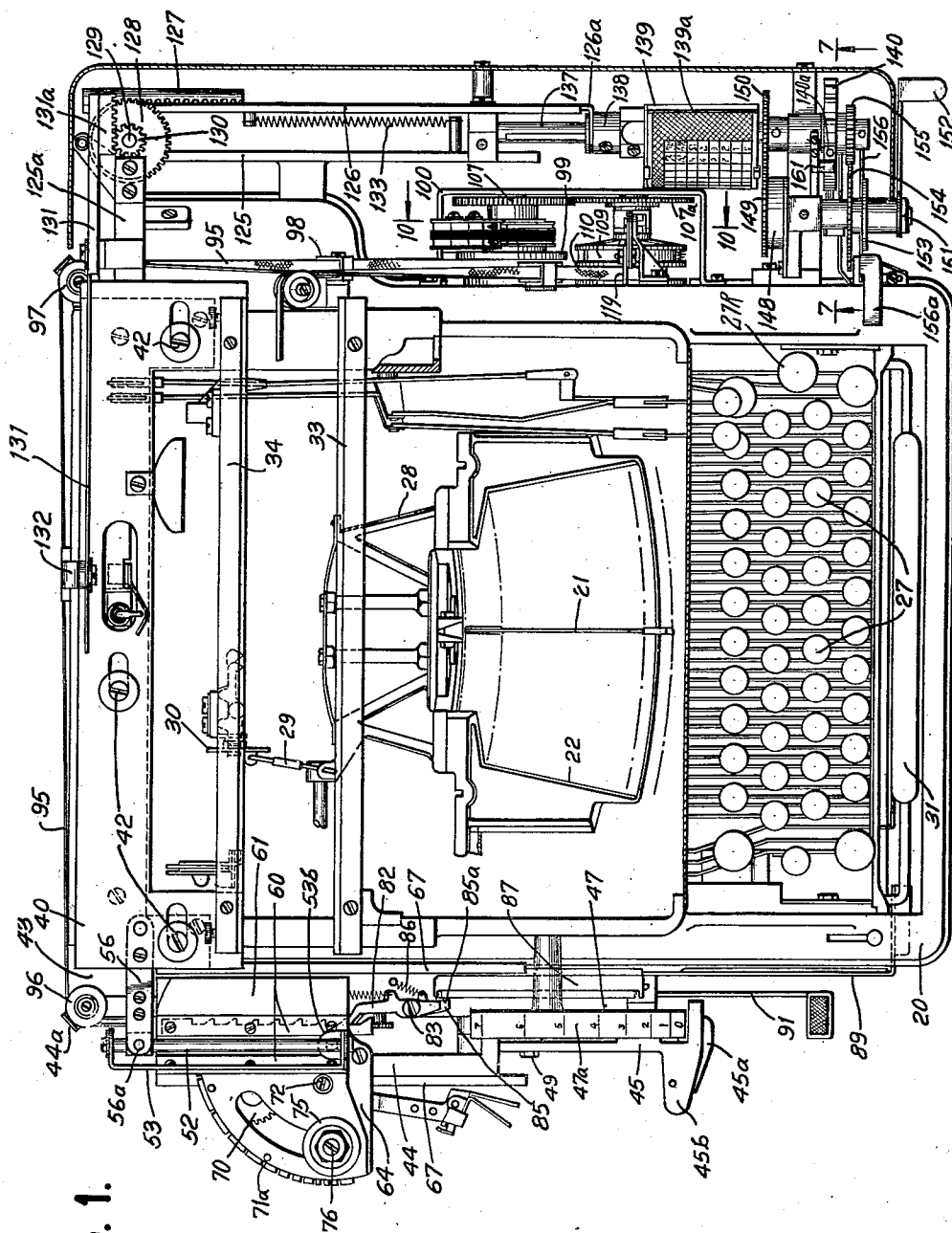


FIG. 1.

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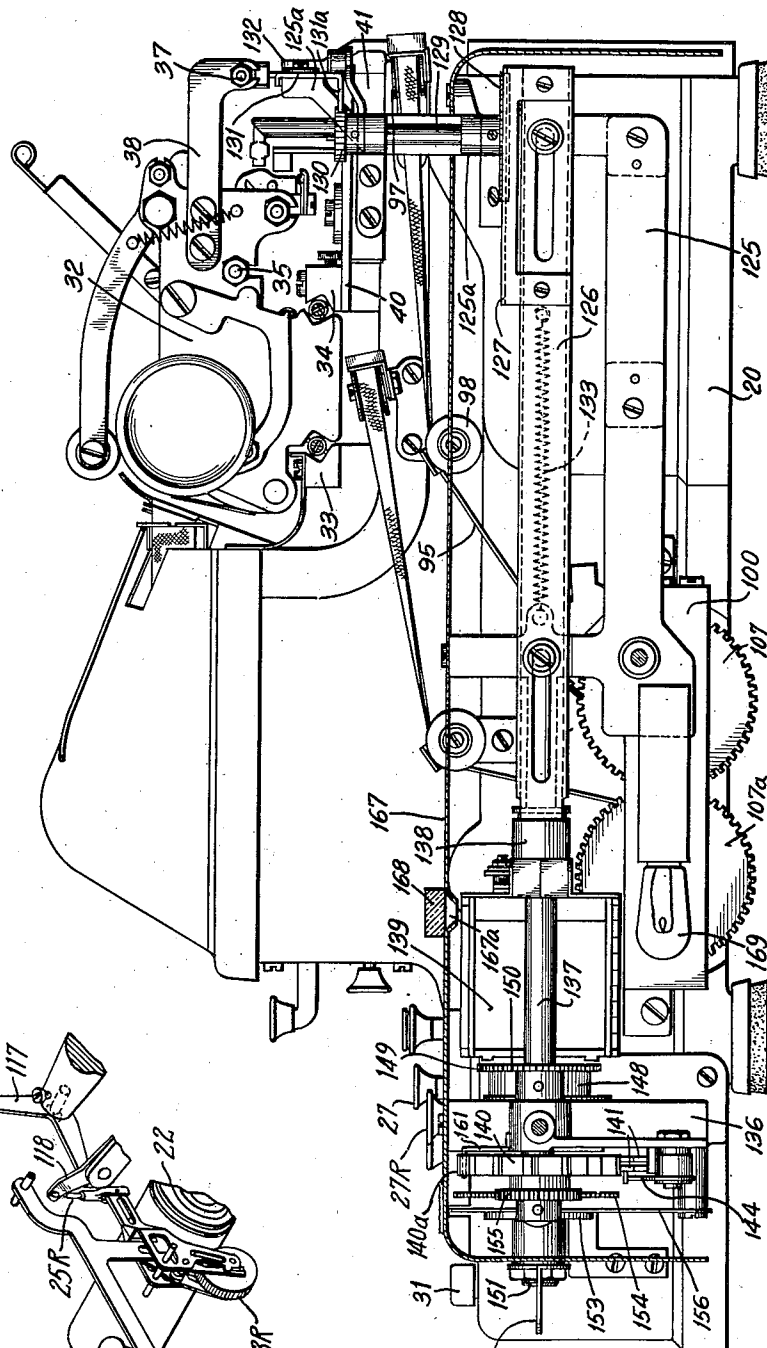
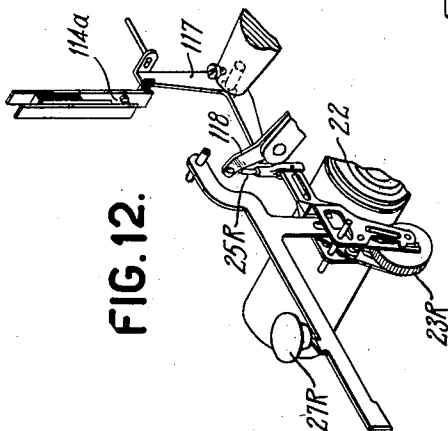
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TYPEWRITING MACHINE

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8 Sheets-Sheet 2

FIG. 2.



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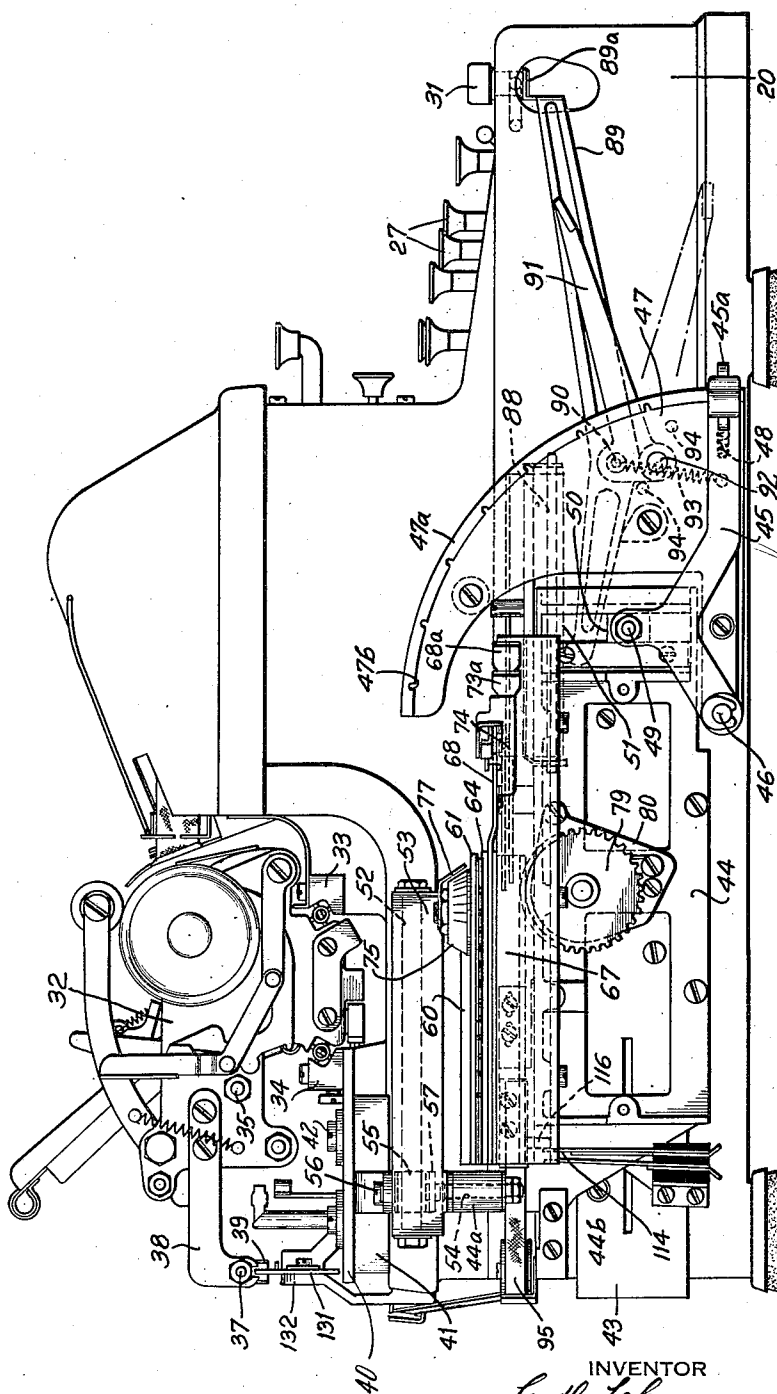
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TYPEWRITING MACHINE

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FIG. 3.



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TYPEWRITING MACHINE

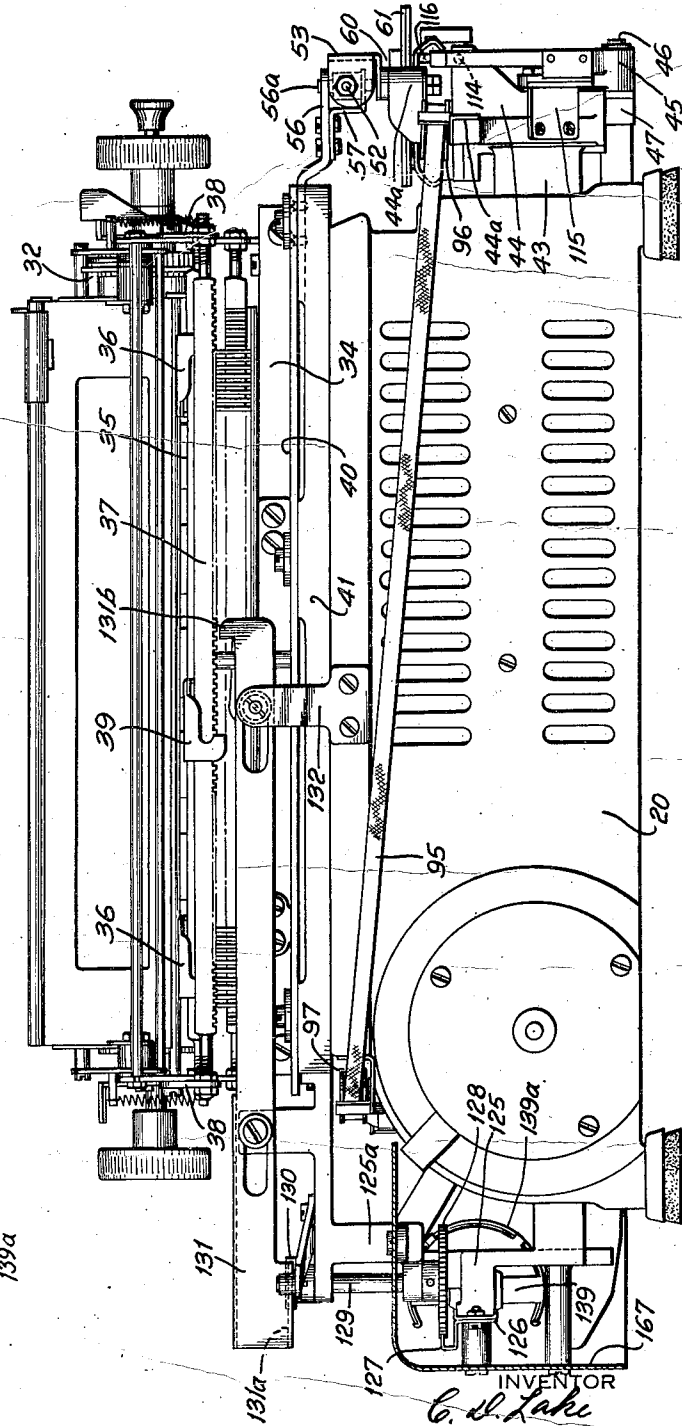
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8 Sheets-Sheet 4

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0	0	0	0	0	0	0	0	0	0	0	0	0	0

FIG. 13.

FIG. 4.



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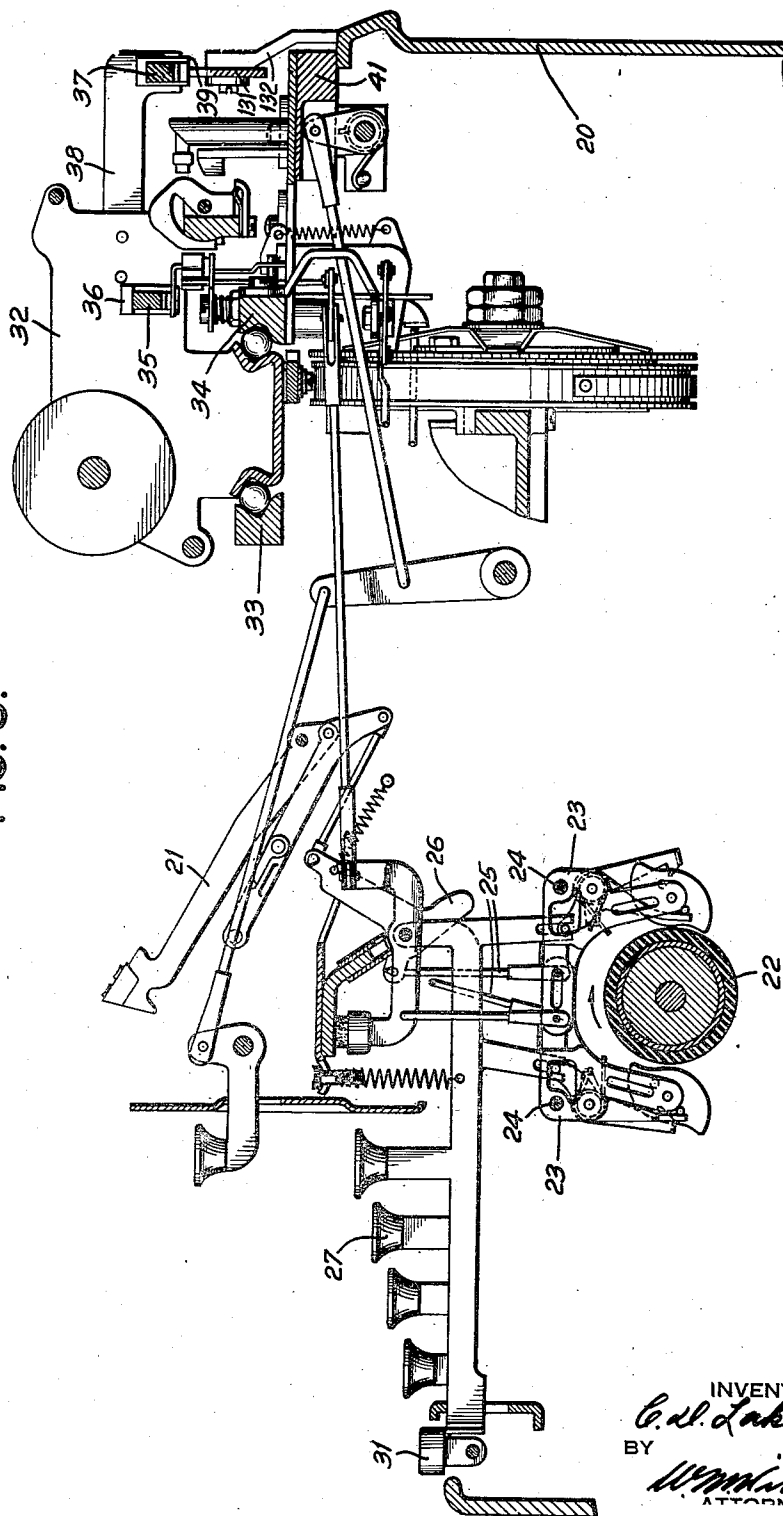
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TYPEWRITING MACHINE

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FIG. 5.



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TYPEWRITING MACHINE

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FIG. 6.

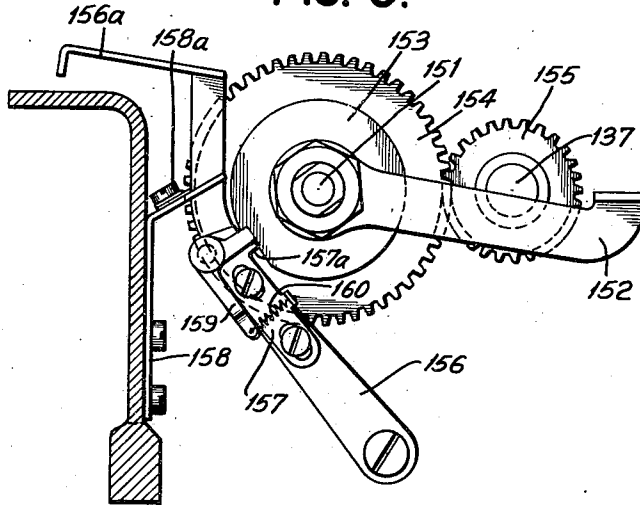
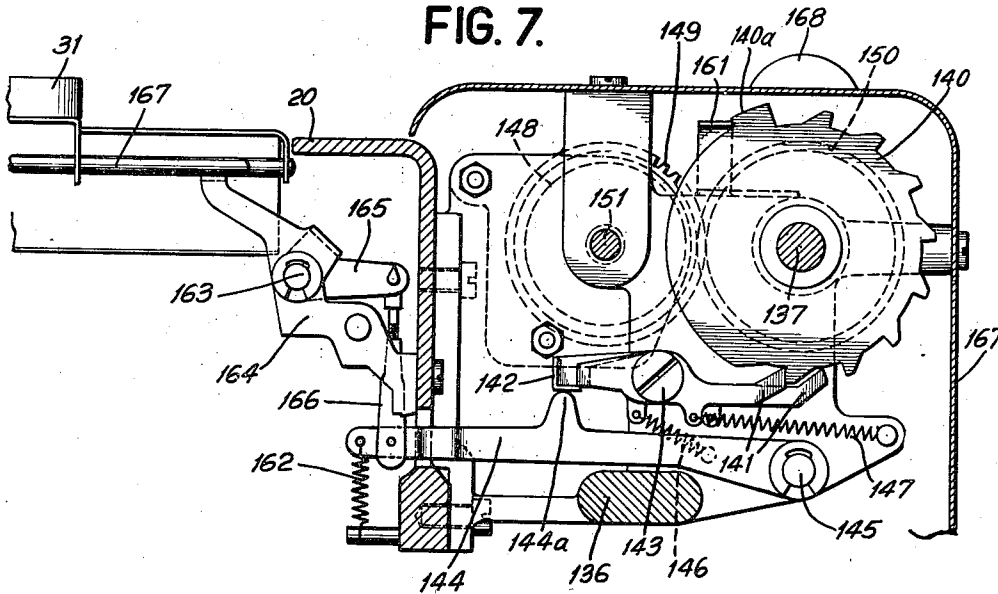


FIG. 7.



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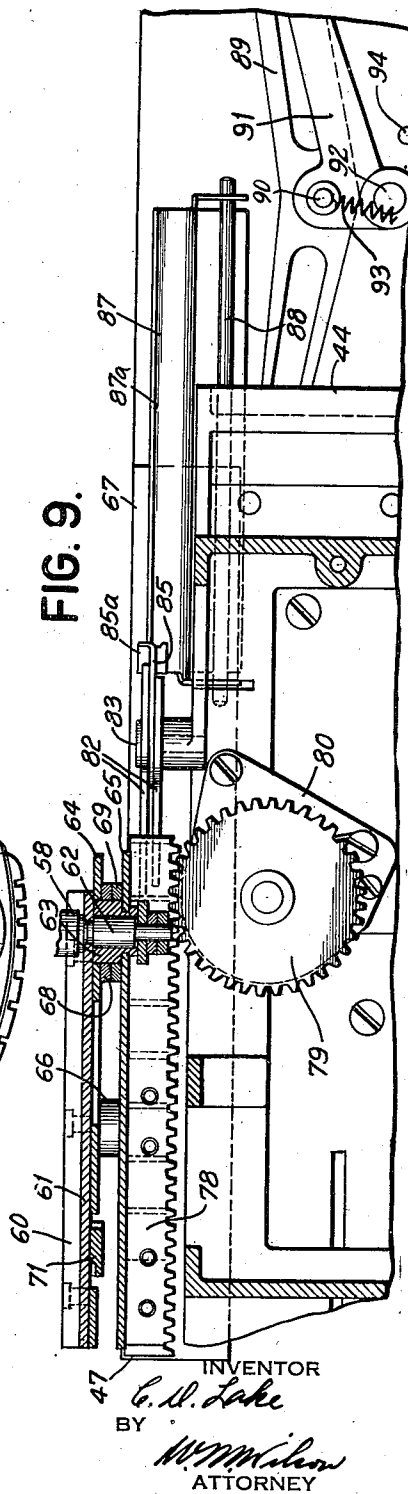
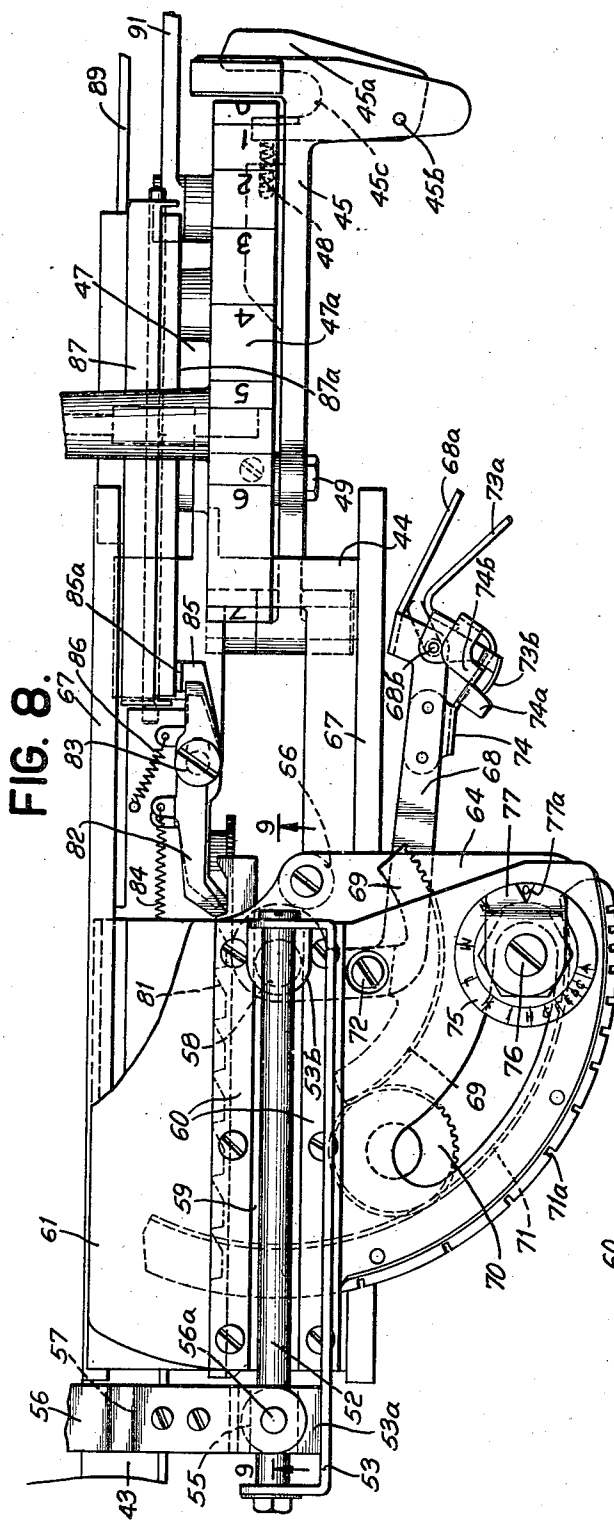
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TYPEWRITING MACHINE

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8 Sheets-Sheet 7



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TYPEWRITING MACHINE
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FIG. 11.

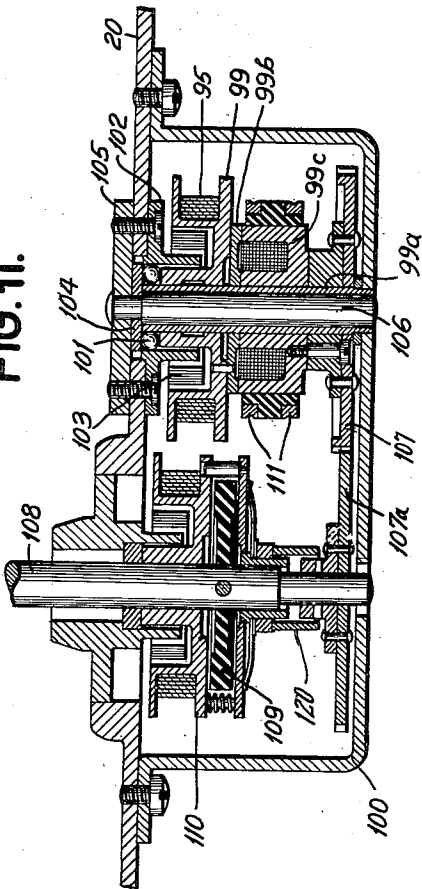
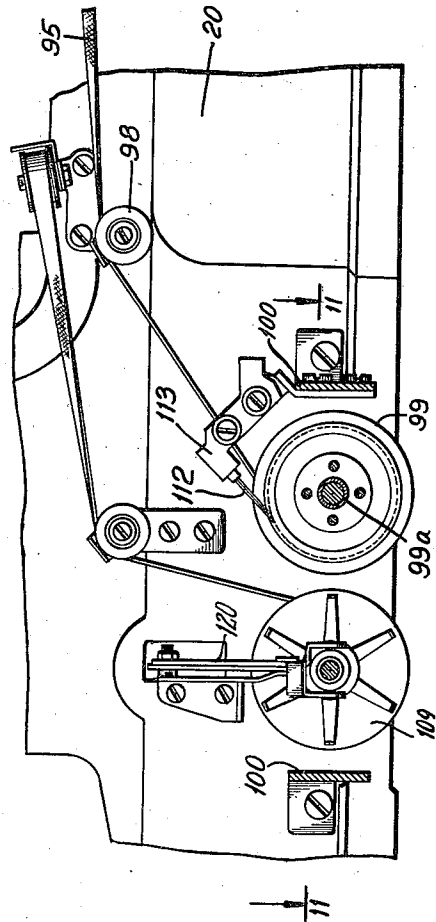


FIG. 10.



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UNITED STATES PATENT OFFICE

2,350,561

TYPEWRITING MACHINE

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Application November 6, 1941, Serial No. 418,017

27 Claims. (Cl. 197—84)

This invention relates to typewriting machines.

The primary object of the present invention is to provide a mechanism for producing justified lines by means of a typewriting machine.

Another object is to provide a novel indicating mechanism for a justifying typewriter to indicate the proper setting of the justifying mechanism which will produce a justified line.

Other objects of the invention will be pointed out in the following description and claims and illustrated in the accompanying drawings, which disclose, by way of example, the principle of the invention and the best mode, which has been contemplated, of applying that principle.

In the drawings:

Fig. 1 is a plan view of the machine with the carriage, front cover plate, and part of cover for indicating mechanism cut away.

Fig. 2 is a right side elevation with the cover for the indicating mechanism cut away.

Fig. 3 is a left side elevation.

Fig. 4 is a rear view.

Fig. 5 is a vertical section.

Fig. 6 is a detail view showing the indicator release mechanism.

Fig. 7 is a vertical section on the line 7—7 in Fig. 1.

Fig. 8 is a large scale plan view of the justification mechanism which appears at the right hand side of the machine with reference to Fig. 1.

Fig. 9 is a vertical section on the line 9—9 in Fig. 8.

Fig. 10 is a vertical section on the line 10—10 in Fig. 1.

Fig. 11 is a horizontal section on the line 11—11 in Fig. 10.

Fig. 12 is a detail view of the mechanism controlling the contacts which control the magnetic clutch.

Fig. 13 is a developed view of the indicator drum or chart.

The invention is illustrated in the drawings as applied to the well known "Electromatic" typewriter, also known as the "International." This machine is provided with power mechanism for operating the type bars, shift mechanism, back space mechanism, tabulating mechanism, and carriage return mechanism which power mechanism is driven by a suitable electric motor located in the base 20 of the machine. It will be understood, however, that the disclosure of a particular form of power operated typewriter is purely for purposes of description and that the

invention may be applied to other typewriters whether operated manually or by power. Since the foregoing mechanisms involved in the "Electromatic" are well known and described in numerous patents, only a very brief general description will be given of the machine.

The type bars 21 (Figs. 1 and 5) of which only one is shown in these views, are mounted in the type basket 22 (Fig. 1) which is mounted for case shift movement in a well known way. The type bars and other mechanisms of the machine are operated by a power roller 22 which rotates continually in the direction of the arrow (Fig. 5) while the machine is in use, being driven by the motor through suitable reduction gearing. Co-operating with the power roller 22 are cam units 23 which are pivoted on rods 24 supported by the framework. The type bars are actuated by certain of the cam units 23 through links 25 connected to sub-levers 26 which are rocked counter-clockwise (Fig. 5) by the cam units whenever such units are rendered operative by depression of a character key 27.

The type bars strike a universal bar 28 (Fig. 1) in the course of their movement to the printing position and through a link 29 actuate the usual escapement mechanism generally designated 30 in Fig. 1. This escapement mechanism normally causes the carriage to feed equal amounts for each letter typed and for each space produced by depression of the space bar 31. The latter controls a cam unit which has connections to the escapement mechanism 30 (not shown) whereby an operation of the escapement occurs whenever the space bar is depressed.

The main typewriter carriage is generally designated 32 in Figs. 2 to 5 and is mounted in a well known way on the front and rear rails 33, 34 by means of suitable antifriction bearings. Usually the rails 33, 34 are rigidly secured to the base 20 of the machine but in the present case provision is made for moving the rear rail 34 parallel with the front rail for the purpose of effecting a supplemental feed of the carriage to augment the feed produced by the escapement mechanism 30. The carriage in the present case includes all of the equipment usually found in such a carriage and, in addition to the conventional marginal stop rack 35 having the usual marginal stops 36 (Figs. 4 and 5), is provided with a supplemental marginal stop rack 37 secured in extensions 38 attached to the side frames of the carriage. Adjustably mounted on the marginal stop rack 37 is a marginal stop 39 similar to the left hand marginal stop shown at the left in Fig.

4. This marginal stop 39 controls an indicator which is used to determine the amount of justification required.

The rear rail 34 is secured on top of a plate 40 (Figs. 1 to 5) which plate is slidably mounted on the top surface of a casting 41 secured to the base 20. The plate 40 is mounted on the casting 41 by means of three screw studs 42 which extend through slots in the plate 40 to permit the latter to have limited movement parallel with the carriage. The escapement mechanism 30 is secured to the rear rail 34 and it is quite evident that, if the rail 34 is allowed to move to the left (Fig. 1) during the course of a spacing operation on the carriage, the carriage will be allowed to feed a greater extent than would be normally the case. For the purpose of controlling the extent of this movement of the rail 34, mechanism is provided at the right hand side of the machine which is controlled by the space bar and is operative to cause an additional feed of the carriage each time the space bar is operated between words and other groups of characters in a line.

Secured to the left hand side of the machine (Figs. 1, 3, 4 and 8) is a track bar 43 on which is slidably mounted a frame casting 44. This carrier 44, as it may be conveniently termed, supports the bulk of the mechanism which is used to effect supplemental movement of the rear rail 34. The carrier 44 may be set manually at the positions corresponding to the number of spaces necessary to justify a line by means of a setting lever 45 (Figs. 1, 3, and 8) pivoted at 46 to a frame 47 secured to the side of the base 20. Part of the frame 47 is formed as an arcuate flange 47a (Fig. 3), the face of which is provided with graduations designated by the numerals 0 to 7.

The inside of the flange is provided with notches 47b, one for each graduation, with which notches cooperates a locking piece 45a pivoted at 45b in the end of the lever 45. This locking piece is provided with a deep notch 45c (Fig. 8) embracing the flange 47a and a spring 48, seated in a hole in the lever 45 extending radially of the pivot 46, presses the left hand branch of the locking piece 45a formed by the slot 45c into engagement with one of the notches 47b as a means of locking the lever 45 in any of its set positions. The lever 45 has a pivotal connection by means of a stud 49 to a block 50 (Fig. 3) slidably mounted in a guideway 51 disposed vertically of the frame 44. When the lever 45 is rotated in a counterclockwise direction from the position of Fig. 3, the carrier 44 will be moved to the left an extent depending upon how far the lever 45 is moved. Seven steps of movement are provided to allow for seven word spaces of shortage in a line.

Pivotaly mounted at the rear (Fig. 1) or left hand end (Figs. 3 and 8) of the carrier 44 is a ratio lever which is connected to the plate 40 and is also connected to certain mechanism mounted on the carrier 44. This ratio lever consists of a rod 52 rigidly supported by the ends of an elongated bracket 53 which is provided with a lug 53a pivoted on a stud 54 carried by a projection 44a formed in the carrier 44. This enables the rod 52 and its supporting bracket 53 to swing in a horizontal plane.

Slidably mounted on the rod 52 is a block 55 (Figs. 3 and 8) which is pivoted at 56a to an arm 56 attached to the underside of the plate 40. This block 55 is formed with two trunnions, one

of which 56a extends through a hole in the arm 56 while the other extends through a hole in a bracket 57 attached to the underside of the arm 56. By the foregoing means the ratio lever comprising rod 52 and bracket 53 is pivotally slidably connected to the plate 40 and also is pivotally connected to the carrier 44. When the lever 45 is locked in the zero position by means of the locking detent 45a, the centers of the trunnions 56a will be in vertical alignment with the center of stud 54, whereby, if the ratio arm is rocked in a clockwise direction (Fig. 8), no movement of the arm 56 or plate 40 can take place. When the lever 45 is set to any of the graduations on the flange 47a, the entire carrier 44 and mechanism supported thereby will be moved to the left (Figs. 3 and 8) and the rod 52 will slide through the block 55. If now the ratio lever 52-53 is rocked clockwise (Fig. 8), the carriage will be moved with the plate 40 in a letter spacing direction and the amount the main carriage will move for a given rotation of the ratio lever will depend upon the distance of the block 55 to the right of the stud 54 (Figs. 3 and 8). It is possible, therefore, by shifting the carrier 44 relative to block 55 to compensate for the number of spaces a line is short of the desired margin. The carrier 44 supports a supplemental or justifier carriage 32 according to the number of word spaces in the line to be justified. This supplemental carriage will now be described in detail.

The right hand (Figs. 3 and 8) or forward (Fig. 1) end of the ratio lever 52 is provided with a roller 58 (Figs. 8 and 9) which is carried by a bent-over lug 53b formed in the bracket 53. This roller 58 rides in a guideway 59 formed by two parallel ways or guide bars 60 secured to the top of a plate 61. The plate 61 as most clearly shown in Fig. 9 has attached thereto a pivot stud 62 which is rotatable in a bushing 63 rigidly securing together a pair of plates 64, 65. Similar bushings 66 like 63 secure the plates 64, 65 in parallel relation. The lower plate 65 is slidably mounted in parallel guideways 67 forming part of the carrier 44, whereby the assembly of parts carried by the plates 64, 65 forms a supplemental carriage capable of sliding movement in the same direction as the carrier 44. By rotating the plate 61 in a counterclockwise direction (Fig. 8) about its pivot 58, the angularity of the track 59 in relation to the line of travel of the supplemental carriage may be adjusted. For example, assuming the parts are in the position of Fig. 8 and the plate 61 is rotated counterclockwise 45°, the roller 58 will travel along the guideway 59 and the ratio lever 52 will pivot about trunnion 56a and assume an angle somewhat smaller than 45° with reference to the line of travel of the carrier 44 and carriage 64. If the plate 61 is locked in this position and the supplemental carriage 64 is moved to the right (Fig. 8), the roller 58 will ride further along the track 59 and the guideway 59 will function as a cam to rock the ratio lever 52 clockwise and may thereby draw plate 40 to the left (Fig. 1). However, if the lever 45 is set in the zero position, this movement will be merely idle and will not have any effect upon the supplemental or justifier carriage because the plate 40 will not be moved.

Means are provided for adjusting the plate 61 according to the number of word spaces in a line and locking it in its adjusted position. This means consists of a lever 68 pivoted on the bushing 63 which secures the plates 64, 65 together. Also pivoted on the bushing 63 is a gear sector 69

which meshes with an idler gear 70 on the plate 64. This gear 70 meshes with a circular rack 71 secured to the underside of the plate 61. The lever 68 and the sector 69 are secured together by a screw 72, the plate 61 being provided with an opening to permit the insertion of the screw 72.

The sector 71 is provided with notches 71a (Fig. 8) which are designed to index the plate 61. The end of the lever 68 is provided with a finger piece 68a and pivoted at 68b is a pinch lever having a finger piece 73a and a locking projection 73b. A torsion spring surrounding the pivot 68b and engaging the pinch lever 73a tends to rock the finger piece 73a in a clockwise direction. A bracket 74 is secured to the lever 68 and is bent to form a stop projection 74a engaged by the lug 73b to limit clockwise rotation of the finger piece 73a. The bracket 74 is also formed with a lug 74b which is designed to ride along the top surface of the circular rack 71 adjacent the notches 71a. When the lever 68 is to be set, the finger pieces 68a, 73a are pinched between the fingers and the lever 68 rocked clockwise (Fig. 8) to bring lug 73b into register with the desired one of the notches 71a which locks the lever in its set position. In order to facilitate the setting of the plate 61, there is provided a dial 75 which is pivoted on a stud 76 carried by the plate 64. Secured to the dial 75 is a gear which meshes with the circular rack 71, whereby the dial 75 is rotated when the plate 61 is set by means of the lever 68. The stud 76 also secures an index plate 77 to the plate 64 which index plate has a notch through which letters engraved on the dial 75 may be viewed from the front of the machine. In order to accommodate the pivot for the dial 75, the plate 61 is formed with an arcuate slot which also serves to limit rotation of the plate 61 to approximately 45°.

The supplemental carriage comprising plates 64, 65 and parts carried thereby is moved progressively to the right (Figs. 3, 8 and 9) by an escapement mechanism which is operative each time the space bar 31 is operated. Secured to the plate 65 (Fig. 9) is a rack 78 which meshes with a gear 79 forming part of a spring motor 80 which is secured to the carriage 44. The spring motor 80, through the gear 79, constantly urges the carriage 64 to the right. Also secured to the plate 65 is an escapement rack 81 (Fig. 3) with which cooperates escapement dogs 82 slidably pivoted on a stud 83 carried by the frame 44. The escapement dogs are urged to the left and into engagement with the teeth of the escapement rack 81 by springs 84. Also pivotally mounted on the stud 83 is an actuating lever 85 having a lug 85a capable of engaging the tail of either dog 82. Lever 85 is urged in a counterclockwise direction by a spring 86.

The escapement disclosed in Fig. 8 is of the same form used to space the main carriage 32 and designated 30 in Fig. 1 and its mode of operation is well known. It will suffice to say that each time the lever 85 is rocked clockwise (Fig. 8) one or the other of the dogs 82 will be disengaged from the rack 81 and permit the carriage 64, 65 to move one-half a tooth space to the right. In this form of escapement, the rack is provided with one-half as many teeth as there are spaces.

The lever 85 is operated by means of a universal bar 87 (Figs. 1, 3, 8, and 9) pivoted on a rod 88 supported by the frame 44. The lug 85a bears against the upper edge 87a of the universal bar 87 which is in the form of an elongated plate having lugs at its ends which pivot the universal

bar in vane fashion on the rod 88. Thus, if the upper edge of the universal bar 87 moves forwardly in Fig. 9, the lug 85a will be pressed downwardly (Fig. 8) to rock the arm 85 clockwise, thereby actuating one of the escapement dogs. The universal bar 87 is operated by the space bar through the medium of a lever 89 (Figs. 1, 3, 8, and 9) which is pivoted at 90 on a hand lever 91. The latter is pivoted at 92 to the frame 47 and a toggle spring 93 attached to the pivot point 90 and to a fixed part of the frame holds the lever 91 in cooperation with one or the other of two stop pins 94.

The left hand end of the lever 89 is provided with a roller underlying the lower edge of the plate which comprises the universal bar 87, whereby, when the lever 89 is rocked clockwise with the lever 91 in the position of Fig. 3, the universal bar 87 will be actuated. The lever 89 has at its right hand front end a portion extending through an opening in the base 20 underneath the space bar 31 (Fig. 1) whereby the lever 89 may be rocked clockwise whenever the space bar is depressed. However, if the lever 91 is rocked clockwise (Fig. 1) by hand, the lever 89 will be lowered and at the same time moved slightly to the right, thereby removing the roller which cooperates with the universal bar 87 out of cooperation with the universal bar. Also, the extension 89a which cooperates with the space bar 31 will be moved out of cooperation therewith.

The purpose of the foregoing mechanism is to impart to the carriage two components of movement to supplement the movement controlled by the escapement mechanism 30. One of these components of movement results from the leverage ratio of ratio lever 52—53 obtained by shifting the carriage 44 bodily to the left (Fig. 3) while the second component results from angular movement of the lever 52—53 which is dependent upon the angularity of the guideway 59.

After each line has been typed, it is necessary to restore the supplemental carriage 64 to the position of Fig. 8. This is accomplished by a supplemental carriage return mechanism for the carriage 64. Secured to the carriage 64 is a tape 95 (Figs. 1 to 4, 10, and 11) which passes over a pulley 96 (Figs. 1, 3, and 4) attached to a bracket 44b carried by the carrier 44. The tape 95 then passes across the back of the machine, as shown in Figs. 1 and 4, and around a pulley 97 carried by bracket secured to the rear right hand corner of the machine. From this point the tape 95 passes forwardly parallel with the base of the machine and around a pulley 98 (Figs. 1, 2, and 10) carried by the base 20. Thence, the tape passes downwardly and around a tape drum 99 (Figs. 1, 10, and 11). This tape drum is rotatable on a sleeve 99a (Figs. 10 and 11) and has secured to it a clutch plate 99b forming part of a magnetic clutch including the magnetic element 99c, which is also rotatably secured to the sleeve 99a. The sleeve 99a is rotatably supported at its outer end in a bracket 100 secured to the base 20, and at its rear end is supported by the balls 101 which ride in a ball race 102, secured in register with a suitable opening in the base 20. The ball race 102 has a flange which extends internally of the drum 99 to which is anchored one end of a tension spring 103, the other end of such spring being anchored to the drum 99. The balls 101 are confined between the end of the hub of the drum 99 and a washer 104 secured to a cover plate 105 by means of a long

stud 106 which passes through the bore of the sleeve 99a.

The magnetic clutch element 99c is secured to a gear 106 fixed to sleeve 99a and gear 106 meshes with a gear 107a secured to the end of the shaft 108 on which the usual main carriage return clutch 109 and main carriage return tape drum 110 are mounted. The shaft 108 is driven continually by the motor while the machine is in use, consequently the magnetic clutch element 99c rotates continually. The clutch element 99c is provided with slip rings 111 with which cooperate brushes 112 carried by a brush holder 113, secured to the bracket 100. When current is passed through the coil of the magnetic clutch by means of a suitable external control circuit, the plate 99b is drawn snugly against the clutch element 99c, causing the drum 99 to turn, thereby winding the tape 95 on the drum 99. The pull on the tape is transmitted to the carriage 64, thereby drawing the supplemental carriage to the left (Figs. 3, 8, and 9).

When the carriage 64 reaches the position shown in the drawings, the magnetic clutch is deenergized through the medium of contacts actuated by the carriage 64, 65. These contacts are designated 114 in Figs. 3 and 4 and are insulatably supported on a bracket 115 attached to the carrier 44. The contacts 114 are engaged by a suitable insulating pin 116 on the carriage 64 which forces the contacts apart when the carriage is within approximately half a space of the final stopping position at the end of its movement to the left with reference to Fig. 3. While the carriage 64 is in the position of Fig. 3, the contacts 114 are held open but close as soon as the carriage moves one space away from such position.

The circuit through the magnetic clutch is closed by means of the contacts 114a shown in Fig. 12. The contacts 114a are arranged to be closed when a lever 117 in Fig. 12 is rocked counterclockwise. This lever forms part of the train of connections between the main carriage return clutch 109 and the clutch release mechanism which causes the clutch to be disengaged when the main carriage 32 is returned as described in Patent No. 1,753,450. When the main carriage return key 27R (Fig. 12) is depressed, the cam unit 23R associated with this key is rendered operative and actuated by the power roller 22. This cam unit rocks clockwise in Fig. 12, drawing down a link 25R connected to one of the levers 118 of the toggle 119, 120 (see Figs. 1, 10, and 11 also) which actuates the clutch engaging lever. This toggle holds the clutch in the engaged position. The lever 117 has one of its arms underlying the arm of lever 118 to which the link 25R is connected, whereby the lever 117 will be rocked counterclockwise each time the clutch is engaged and will remain in this position until the carriage is returned, thereby holding the contacts 114a closed.

The coil of the magnetic clutch element 99c and the contacts 114, 114a are in a series circuit across the supply line to the main driving motor of the typewriter whereby the closure of the contacts 114a causes the energization of the coil 99c to effect engagement of the clutch each time the main carriage 32 is returned. This, of course, causes the supplemental carriage 64 to be returned automatically.

It will be seen from the foregoing description that variable ratio means is provided for effecting a supplemental movement of the carriage. 75

This variable ratio means includes two separate variable ratio devices of which one includes the variable ratio lever 52, 53 while the other device includes the inclinable track 59. Each of these devices has its own indexing means in the form of the manual levers 45 and 68, respectively, by means of which the two factors of justification may be inserted in the machine. This variable ratio means, when the two indexing means have been preset according to the factors of number of word spaces and shortage of the line, automatically performs the equivalent of the mental operation of division necessary to arrive at the increment of feed of the carriage required with each word spacing operation to expand a line sufficiently to justify the line.

An indicating mechanism is provided to indicate in a code the settings of the levers 45 and 68 necessary to justify a line.

It is contemplated that a draft copy of the matter to be justified will first be produced and, during typing of this preliminary draft, the operator will record the code reading of the indicator at the end of each line by typing the code designations so that when the draft is retyped in justified form, the machine may be set according to the code designations prior to typing each line. This indicating mechanism is mounted on the right hand side of the machine (Fig. 1) and is controlled both by the main carriage movement and by the operation of the space bar.

Secured to the right side of the machine is a frame casting 125 (Figs. 1, 2, and 4) which slidably supports a bar 126 which is provided with a rack 127 at its rear end. This rack meshes with a gear 128 secured to a vertical shaft 129 rotatably mounted in a suitable frame 125a attached to the base 20. The shaft 129 is provided at its upper end with a pinion 130 which meshes with a short rack 131a forming part of a bar 131. This bar is slidably mounted on the frame 130 and in a bracket 132 attached to the rear of base 20 near the middle of the machine. The bar 131 has a lug 131b which is in the path of the adjustable supplemental marginal stop 39 so as to be engaged by such marginal stop when the carriage is moving in a letter spacing direction, or to the right in Fig. 4. A spring 133 (Figs. 1 and 2) urges the bar 126 to the left in Fig. 2, thus holding the bar 131 in its extreme right hand position (Fig. 1) or the left hand position (Fig. 4).

Secured to the base 20 near the forward right hand corner (Figs. 1 and 2) is a frame 136 which, with the frame 125, rotatably supports an indicator shaft 137. Slidably mounted on the shaft 137 and splined thereto is a hub 138 to which is secured an indicator drum 139. The hub 138 is provided with an annular groove into which projects a bent-over lug 126a formed in the bar 126; whereby the indicator drum 139 may be slid along the shaft 137 by movement of the bar 126 and also may be rotated by rotating the shaft 137.

The shaft 137 is rotated an increment for each operation of the space bar 31. For this purpose, it is provided with an escapement ratchet 140 (Figs. 1 and 7) which is secured to the shaft 137 and with which cooperates the escapement dogs 141 best shown in Fig. 7. The escapement dogs 141 cooperate with the ratchet 140 in the same way as the escapement dogs 82 cooperate with the rack 81 and are provided with a similarly shaped arm 142 which is pivoted on a fixed stud 143. The arm 142 is actuated by an operating arm 144 pivoted at 145 to the frame 136. A light spring 146 holds the arm 142 lightly against a

projection 144a in the arm 144. Springs 147, similar to the springs 84 in Fig. 8, urge the dogs 141 to the right and also counterclockwise in Fig. 7. Since it is only necessary that the drum 139 rotate approximately one-half a revolution, the ratchet 140 is provided with escapement teeth over only half of its circumference.

For the purpose of furnishing power to rotate the shaft 137 and the indicator drum 139, there is provided a spring motor 148 (Figs. 1 and 7) having a gear 149 meshing with a gear 150 secured to the shaft 137. The spring motor tends to turn the shaft 137 in a clockwise direction (Fig. 7). The gear 149 is loose on shaft 151 which is journaled in the frame 136 and at its forward end has secured thereto a resetting lever 152 (Figs. 1 and 6). Secured to this resetting lever is a locking disk 153 and a gear 154 which meshes with a smaller gear 155 secured to the forward end of shaft 137. Cooperating with the locking disk 153 is a lock arm 156 on which is adjustably slidably secured a detent plate 157 having a lug 157a engaging a notch in the locking disk 153. The locking disk 153 is urged in a counter-clockwise direction by the spring motor 148 through the gears 149, 150, 155, 154 but the locking plate 157 will prevent rotation of the gear 154 and shaft 137 when the arm 156 is in the position of Fig. 6.

The arm 156 is guided in a slot formed in a bracket 158 attached to the base 20 and is urged in a clockwise direction (Fig. 6) by a wish-bone spring coiled about a stud 158a carried by the bracket 158 and engaging the left hand vertical edge of the arm 156. The upper end of the arm 156 is provided with a finger piece 156a by means of which the locking arm 156 may be rocked counterclockwise manually to disengage the lug 157a from the notch in the locking disk 153.

Pivotaly mounted on the detent plate 157 is a detent lever 159 which is urged in a counterclockwise direction by a spring 160 anchored to a lug formed in the detent plate 157. The spring 160 is considerably weaker in effect than the spring motor 148, whereby normally the parts are held in the position of Fig. 6. When the locking arm 156 is moved in a counterclockwise direction to release tooth 157a or the detent plate 157 from the notch in the locking disk 153, the spring 160 rocks the detent lever 159 in a counterclockwise direction and, by engagement with disk 153, prevents the lug 157a from re-entering the notch in the locking disk 153 when the locking arm 156 is released by the operator.

When it is not desired to use the justification indicator, the indicator is restored to starting position by pressing down on the restoring lever 152 which rotates the shaft 137 and consequently the indicator drum 139 in a counterclockwise direction, this movement being limited by a lug 140a formed in the ratchet 140 engaging a stop lug formed in a bracket 161 secured to the frame 136. Prior to beginning the typing of a new line of the first draft of the matter to be justified; the finger piece 156a is pressed downwardly to release the mechanism for rotating the indicator drum 139 but during the typing of the justified copy, the indicator mechanism is kept locked in respect to the means for rotating the drum 139.

The operating arm 144 for the escapement pawls 141 extends through an opening in the base 20 (Fig. 7) and is urged in a counterclockwise direction by a spring 162 anchored to a pin carried by the base. Pivotaly mounted at 163 on a bracket 164 secured to the inside of the base 20 is

a rock lever 165 connected by a link 166 to the operating lever 144. One arm of the rock lever 165 extends underneath the bail 167 on which the space bar 31 is mounted.

When the space bar is depressed, assuming that the locking disk 153 has been released, the lever 165 will be rotated counterclockwise in Fig. 7, thereby through the link 166, actuating the arm 144 in a clockwise direction to operate the escapement. This allows the ratchet 140 to turn half a tooth space which is, of course, communicated to the indicator drum 139 through the splined connection of the hub 138 to the shaft 137. The net effect of this mechanism is to count the number of word spaces in a line and indicate the number of word spaces by the extent of rotation of the indicator drum.

The indicator drum 139 is provided with a chart, 139a, a developed view of which is shown in Fig. 13, in which the number of word spaces is indicated by the numerals 1 to 7 while the number of units of spacing that the line is short of the margin is denoted by the letters A to M, each square of the chart 139a having both a number and a letter.

The mechanism on the right hand side of the machine is protected by a suitable cover 167 having a viewing window 167a (Fig. 2) over which may be placed a small cylindrical lens 168 to facilitate reading of the figures on the drum. The chart 139a on the drum 139 may be made translucent and a suitable electric lamp 169 (Fig. 2) is mounted on the frame 125 directly beneath the indicator drum so as to illuminate the figures which appear through the viewing opening 167a. The viewing window, when the indicator drum 139 is in the position shown in the drawings, permits a view of only the upper right hand square (Fig. 13) of the chart which is marked "7M." If the line comes out even and does not require justification, the chart indicates "0" since the drum 139 will be moved by the main carriage the full width of the justification zone. This may be denoted on the first draft by typing "0" at the end of the line.

While it is believed that the specific description given above of the individual mechanisms of the machine will enable those skilled in the art to appreciate its use and advantages, a very brief description of the general operation will now be given.

As a preliminary to producing a justified copy, a first or rough draft will be prepared. In the typing of the first draft, the supplemental marginal stop 39 will be set according to the scale marked thereon to the desired right hand marginal position. The left hand marginal stop 36, that is, the right hand one in Fig. 4, will be set to the left hand marginal position. The design of the parts is such that a predetermined distance before the carriage reaches the final right hand marginal position as determined by the left hand stop shown in Fig. 4, the stop 39 will engage the lug 131b on bar 131 and commence to turn the indicating drum 139. The left hand stop in Fig. 4 functions in the usual way in co-operation with the usual bell to warn the operator when the end of the line is approaching. This stop also serves as a final limit which defines the actual margin of the justified copy and prevents the operator from overtyping the line. This feature is necessary because the mechanism as illustratively described herein is incapable of shortening the line and is only capable of expanding the line to a predetermined standard

of line length, which will be determined by the marginal stops 36 in the usual way.

The operator will now proceed to type the draft and at the end of each line the code indication of the indicating drum 139 will be noted and typed, the operator trying to come as close as possible to the final right hand marginal position without typing the last word in the line too far to be split properly. During the typing of the first or rough draft, the lever 91 will be depressed to prevent movement of the justifier carriage 64 to the right in Fig. 3 and the levers 45 and 68 may be left in the position of Fig. 1. With the levers so set and the carriage 64 immovable, the spacing of the characters typed will be uniform during the preparation of the draft copy.

At the end of each line of rough draft, the operator will reset the indicator drum 139 by pressing down on the lever 152 and, before commencing the typing of the next line will release the indicator drum for operation by pressing down on the finger piece 156a. When the last line of the draft is finished, the finger piece 152 will again be depressed to restore the indicator 139.

With the rough draft before her, the operator will note the code at the end of the first line which determines the settings of the levers 45 and 68 and will set these levers accordingly. The lever 91 will be raised to enable the justifying mechanism to be controlled by the space bar 31 through the lever 89 which is operated every time the space bar is depressed as described above. The operator will now proceed to retype the first line of the rough draft. Each time the space bar is depressed, the lever 89 will be operated which will cause the escapement mechanism for the justifier carriage 64 to operate, thereby imparting rotation to the ratio lever 52, 53 to shift the carriage rail 34 to the left (Fig. 1) an increment which will depend upon the position of pivot 56a in relation to the pivot 54 and upon the angularity of the track 59. At the end of each line, the depression of the main carriage return key 27R will cause the justifier carriage 64 to be drawn toward the rear of the machine as described above.

The levers 45, 68 will now be set according to the code at the end of the second line and the second line typed, and the procedure repeated for subsequent lines.

While there has been shown and described and pointed out the fundamental novel features of the invention as applied to a single modification it will be understood that various omissions and substitutions and changes in the form and details of the device illustrated and in its operation may be made by those skilled in the art, without departing from the spirit of the invention. It is the intention, therefore, to be limited only as indicated by the scope of the following claims:

What is claimed is:

1. In a justifying typewriter, a main frame, a carriage, a carriage supporting guide rail mounted on said frame for movement parallel with the movement of the carriage in letter spacing, an escapement mechanism mounted on said rail, a space bar, means controlled by the space bar for causing an operation of the escapement mechanism, a ratio lever having a pivotal connection to the rail and a relatively fixed pivotal connection to said frame, said ratio lever when moved imparting movement to the rail in the direction of letter spacing movement of the car-

riage, means to vary the ratio between a movement imparted to said lever and the movement imparted to the rail by said lever, means to move said ratio lever, a control device for regulating the extent of movement of the last named moving means, and means controlled by the space bar for producing movement of the ratio lever.

2. In a justifying typewriter, a main frame, a carriage, a carriage supporting guide rail movably mounted on said frame, carriage feed mechanism mounted on said rail, a carrier movably mounted on said frame, a ratio lever having a first pivotal connection to said carrier and having a second pivotal connection to said rail, said carrier when moved changing the point of first pivotal connection of the rail to said lever to vary its distances from the second pivotal point, a manual setting lever for adjustably moving said carriage, an inclinable track movably mounted on said carrier and having a pivotal operating relationship to said ratio arm whereby, when the track is moved relative to the carrier, the ratio lever will be rocked on its pivot to impart movement to said rail; an indexing device for adjustably changing the inclination of said track, and means controlled by the space bar for moving said track relatively to the supplemental carriage.

3. In a justifying typewriter, the combination of a carriage, a movable carriage supporting rail, carriage feed mechanism mounted on said rail, a carrier movable transversely of the main carriage, a lever extending transversely of said rail and pivotally connected at one end to the carrier and having a pivotal sliding connection intermediate its ends to said rail, said carrier, when moved transversely of the rail, varying the distance of the point of connection of the rail to said lever from the other pivot for said lever according to the extent of movement of the carrier, a manual member for adjustably moving said carrier, a supplemental carriage mounted on said carrier for movement transversely of said rail; a track pivotally mounted on said supplemental carriage and having a sliding pivotal connection with the ratio lever whereby, when the track is set at an angle to the direction of movement of the supplemental carriage and said carriage is moved, such ratio lever will be rotated to impart motion to said rail; an indexing device on the supplemental carriage for manually adjustably setting said track at an inclination to direction of movement of the supplemental carriage, a space bar for controlling the carriage feed mechanism, and means controlled by such space bar for effecting movement of the supplemental carriage relative to the carrier.

4. In a justifying typewriter, a main frame, a carriage, a carriage guiding rail movably mounted on said frame for movement parallel with the carriage, means mounted on said rail for spacing the carriage, a space bar for controlling the last named means, and means controlled by the space bar for effecting a supplemental movement of the carriage by moving said rail.

5. In a justifying typewriter, a main frame, a carriage, carriage supporting and guiding means slidably mounted on said main frame for movement parallel with movement of the carriage; variable ratio controlling means including a variable ratio lever having a relatively fixed pivot and a sliding pivot to the carriage guiding means whereby rotation of said lever effects a movement of said rail and including indexing means settable according to a factor of justification; and a

device controlled by said space bar for effecting rotation of said ratio lever and including a second indexing means settable in accordance with another factor of justification.

6. In a justifying typewriter, a main frame, a carriage supporting and guiding means mounted on said main frame for movement in the direction of letter spacing movement of the carriage, letter spacing means mounted on the carriage guiding means, a space bar for controlling the spacing means, variable ratio moving means connected to the carriage guiding means and including indexing means settable in accordance with one factor of justification, and operating means for said variable ratio means including another indexing means settable in accordance with another factor of justification.

7. In a justifying typewriter, a carriage, an element movable with the carriage, spacing means mounted on said element for spacing the carriage relative to said element, variable ratio mechanism for moving said element including a variable ratio lever connected thereto and having indexing means settable in accordance with one factor of justification, and variable operating means for the ratio mechanism having a second indexing means settable in accordance with another factor of justification.

8. In a justifying typewriter, a main frame, a carriage, means to movably mount the carriage on the main frame, said mounting means being movable in the direction of the carriage letter spacing movement, a variable ratio lever system connected to the mounting means and operable to effect movement of the mounting means, letter spacing means in part mounted on said mounting means and in part on the carriage and movable therewith, a space bar for controlling the spacing means, an indexing device settable in accordance with one factor of justification for controlling the driving ratio of the variable ratio means, and means controlled by the space bar and including indexing means for another factor of justification, for operating the variable ratio means.

9. In a justifying typewriter, in combination with the main carriage, letter spacing mechanism for said carriage, means to mount the letter spacing means in the main frame for movement in the direction of letter spacing movement of the carriage, a variable ratio lever pivotally connected to said mounting means with a variable operating ratio, means to vary the operating ratio of said lever according to one factor of justification; means for variably actuating said variable ratio lever including a second carriage having a member variably settable in accordance with another factor of justification for variably rotating said lever when said second carriage is spaced, and spacing means for the second carriage; a space bar, and means controlled by the space bar for operating both spacing mechanisms concurrently.

10. In a justifying typewriter, the combination with the main carriage, letter spacing mechanism for said carriage, means to mount said letter spacing mechanism for movement in the direction of letter spacing of the main carriage, a variable ratio lever having a pivotal connection to said mounting means and a pivot shiftable variable extents according to one factor of justification to vary the movement of the mounting means of said lever; a second carriage having means engaging a part of said lever to effect rotation of said lever when said second carriage

moves and including indexing means for varying the extent of rotation of said lever according to another factor of justification; spacing means for the second carriage, and means to cause concurrent operation of both spacing means.

11. In a justifying typewriter, in combination with the main frame, a main carriage, spacing mechanism for the carriage, movable means to mount the spacing mechanism in said frame for movement parallel with the carriage to enable a supplemental feeding movement to be obtained from the carriage besides the feeding movement produced by the spacing mechanism, a second carriage, means controlled by the space bar for spacing the second carriage a unit with each operation of the spacing mechanism for the main carriage, and variable ratio means operated by the second carriage for actuating said movable means including a pair of indexing means each settable in accordance with a factor of justification for controlling the extent of movement of said movable means by the second carriage.

12. In a justifying typewriter, a main carriage, a supplemental carriage, a space bar, spacing means for said carriages, a movable support for the spacing means for the main carriage, means operated by the second carriage for moving said support including a variable ratio lever system, means on said supplemental carriage for operating said lever system; and a pair of indexing devices, each settable according to a factor justification, for controlling the ratio lever system and the extent of operation thereof by the supplemental carriage.

13. In a justifying typewriter, in combination with the main carriage, a variable ratio lever having a connection to the spacing means for moving the spacing means as a unit in the direction of letter spacing movement of the carriage, means to vary the ratio of said lever according to one factor of justification; variable operating means for said ratio lever including a movable member for actuating said lever, automatic spacing means for said member, and indexing means settable according to another factor of justification for varying the effect of the movable member on said lever; and means for causing an operation of said operating means concurrently with an operation of the spacing means.

14. In a justifying typewriter, the combination with the main carriage, letter feed mechanism for the main carriage, a variable ratio lever having a connection to the feed mechanism to bodily shift said mechanism to effect a supplemental feed of the carriage, means settable according to a factor of justification for varying the ratio of said lever, means to variably rotate said ratio lever including a variably inclinable cam acting upon said variable ratio lever and including means to change the inclination of the cam according to another factor of justification, and means to cause concurrent operation of said feeding means and said operating means.

15. In combination with the carriage of a typewriting machine, a space bar, a movable support, a pair of spacing mechanisms both controlled by the space bar, one spacing mechanism being mounted on said support and directly associated with the carriage for spacing the printed characters; and means controlled by the second spacing mechanism for bodily moving the first spacing mechanism including a variable ratio lever connected to said support, variable means for operating said lever, and indexing means for controlling the driving ratio of said ratio lever

and the extent of operation of said ratio lever respectively, said indexing means being settable according to a plurality of factors of justification.

16. In combination with the main carriage of a typewriting machine, a pair of spacing mechanisms, one being bodily movable and cooperating with the carriage to space printed characters, a movable support for the first spacing mechanism, a second carriage controlled by the second spacing mechanism, an inclinable track on said second carriage, a ratio arm having a normally fixed pivot and a sliding pivotal connection to support for the first spacing mechanism and also having an element moving over said track, indexing means for bodily displacing the relatively fixed pivot for the ratio arm for varying the driving ratio of said arm, and indexing means for changing the inclination of said track.

17. In a justifying typewriter, the combination with the carriage, spacing mechanism for the carriage; a support for said spacing mechanism, movable parallel with the carriage; a ratio lever pivotally slidably connected to the carriage, a second carriage having adjustable means to rotate said ratio lever, indexing means settable according to one factor of justification to control the extent of rotation of said lever, a movable support on which the ratio lever is pivotally mounted, and means for bodily moving said support for said pivot to vary the ratio of the ratio lever including indexing means settable according to another factor of justification.

18. In a justifying typewriter, the combination with the platen carriage, a supplemental carriage, justifying means operated by the supplemental carriage, means to space the carriage, a space bar for controlling the spacing means, power means to return the carriage including a carriage return key, and separate power means controlled by said key for also returning the supplemental carriage.

19. In a justifying typewriter, the combination with the main carriage, spacing mechanism for said carriage, a space bar controlling said spacing mechanism, a supplemental carriage, spacing mechanism for said supplemental carriage controlled by said space bar, means controlled by movement of the supplemental carriage for bodily moving the spacing mechanism for the main carriage to effect a supplemental spacing movement of the carriage, power means to return the main carriage including a carriage return key, and separate power means controlled by said key for returning the supplemental carriage.

20. In a justifying typewriter, the combination with the main carriage, spacing mechanism for the main carriage, means to mount the spacing mechanism for movement in a letter spacing direction, a movable carrier; a ratio lever pivoted on said carrier and having a pivotal connection to the mounting means, one of said pivots being movable relative to the other by moving said carrier; manual means for adjustably moving said carrier according to a factor of justification to vary the operating ratio of said lever to the mounting means; a justifier carriage mounted on said carrier and having adjustable means to rotate said ratio lever when the second carriage is moved, including means to set said adjustable means according to another factor of justification; an element for controlling the spacing means for the main carriage, and means controlled by said element for spacing the second carriage.

21. In a justifying typewriter, the combina-

tion with the main carriage, spacing mechanism for the carriage, means to mount the spacing mechanism for movement in a letter spacing direction, a movable carrier; an arm pivoted at one end on said carrier; a member slidably mounted on said arm and pivotally connected to the mounting means for the spacing means, said carrier when moved changing the driving ratio between said arm and the mounting means; a manually settable lever for adjustably moving said carrier to represent a factor of justification, a carriage movably mounted on said carrier and having means adjustable according to another factor of justification for swinging said arm to thereby move the mounting means for the spacing means and effect a supplemental feed of the carriage, spacing means for the second carriage, and means to operate both spacing means simultaneously.

22. In a justifying typewriter, the combination with the carriage, power return mechanism for the carriage, means to initiate the operation of the return mechanism, automatic justifying mechanism including a carriage movable step by step from a starting position, and separate power means to return said carriage controlled by said initiating means.

23. In a justifying typewriter, the combination with the main carriage, letter spacing mechanism for the main carriage, a lever having a variable ratio connection to said spacing mechanism whereby a unit angular displacement of said lever effects a variable displacement of the spacing mechanism in the direction of letter spacing movement of the carriage, means to vary the leverage ratio according to one factor of justification, and a second variable ratio device for rotating said lever variable extents including indexing means settable according to another factor of justification.

24. In a justifying typewriter, in combination with the main carriage, an auxiliary carriage, spacing mechanisms for the main carriage and auxiliary carriage, means to mount the spacing mechanism for the main carriage for movement in the direction of letter spacing movement of the main carriage; and mechanism interposed between the auxiliary carriage and said mounting means for transmitting movement of the auxiliary carriage to the main carriage, said interposed mechanism including a variable ratio lever having a connection to the mounting means and means for varying the ratio of the ratio lever, and including means on the auxiliary carriage for variably rotating said ratio lever, and including means for varying the effect of the rotating means in accordance with another factor of justification.

25. In a justifying typewriter, in combination with the main carriage, an element movable parallel with the main carriage, spacing means for the main carriage mounted on said element, said element when moved imparting movement to the carriage through said spacing means to augment the spacing of the carriage effected by the spacing means, an element for controlling the spacing means; and operating means controlled by said controlling element including an element movable step-by-step under control of the control element and a pair of variable ratio devices, one of said devices including a variable ratio lever connected to the first named element for variably actuating said element in accordance with one factor of justification, said other ratio device being mounted on said movable element and operated by said

operating means and variably actuating said ratio lever with each step of movement of the movable element in accordance with another factor of justification, said ratio lever and said second variable ratio device including separate indexing means each settable in accordance with one of said factors of justification.

26. In a justifying typewriter, a platen carriage, spacing means for said carriage; a movable element connected to the spacing means, said spacing means imparting a normal spacing movement to the carriage, said element being movable to impart to the carriage a supplementary spacing movement through said spacing means; variable ratio means for moving said element including a variable ratio lever and a variably inclinable track for actuating said lever; an element for controlling the spacing means, operating means controlled by said control element for operating the variable ratio means each time an operation of the spacing means is effected under control of the control element, and indexing means for varying the ratio of the ratio lever and the inclination of said track according to a plurality of factors of justification.

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27. In a justifying typewriter in combination with a platen carriage, means to define a marginal position of the platen carriage, power means to return the platen carriage to the marginal position, spacing means for the platen carriage, a movable element for imparting a supplementary spacing movement to the main carriage through said spacing means in addition to the normal spacing movement effected by the spacing means, variable ratio means for moving said element including a justifier carriage movable away from a normal position, means for causing an operation of the spacing means, means controlled by the last named means for moving said justifier carriage away from its normal position an increment each time the controlling means is operated to effect an operation of the spacing means, power means to return said second named carriage to the normal position, and means to concurrently initiate an operation of both returning means.

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