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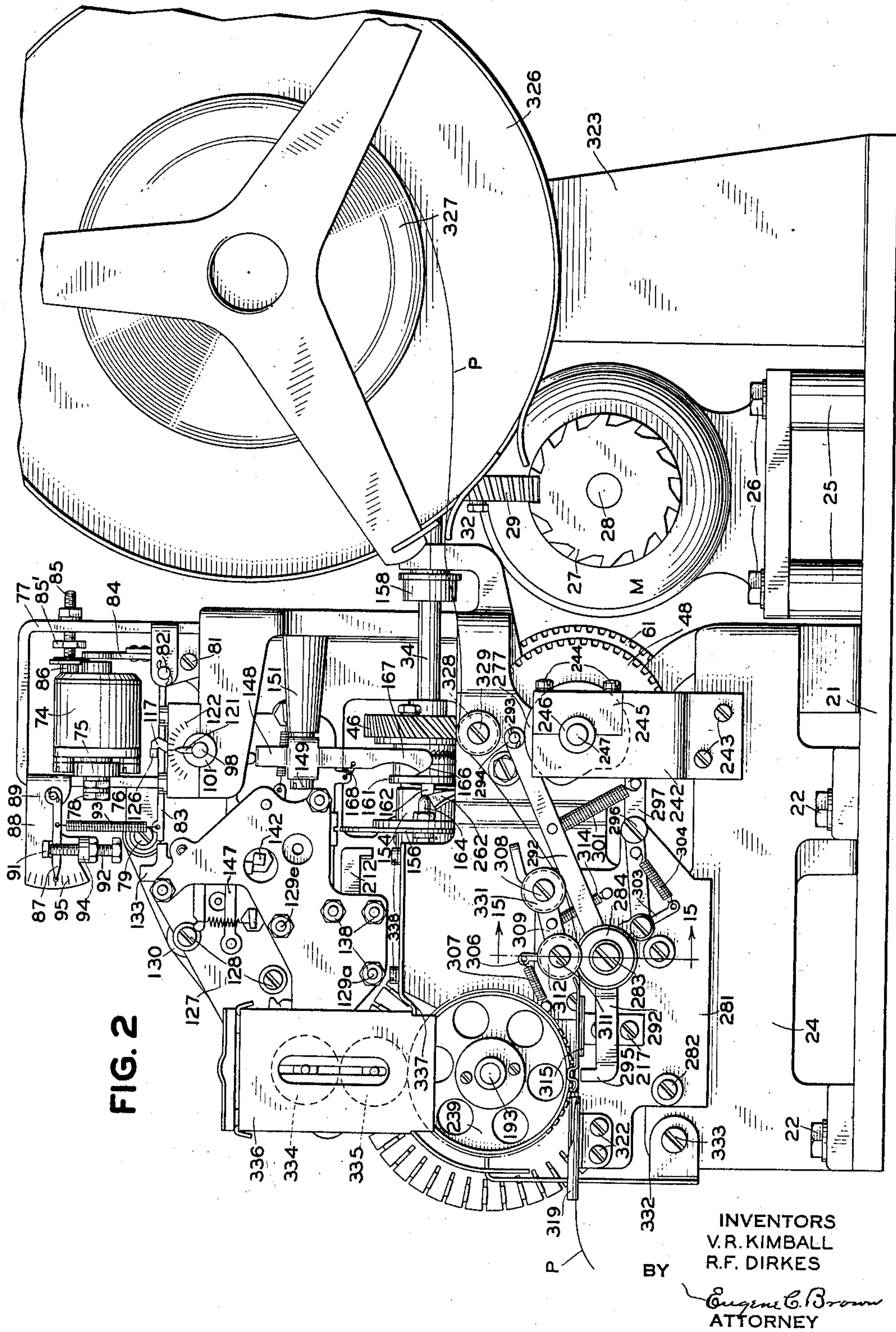
V. R. KIMBALL ET AL

2,135,376

TELEGRAPH PRINTER

Filed Oct. 22, 1935

7 Sheets-Sheet 2



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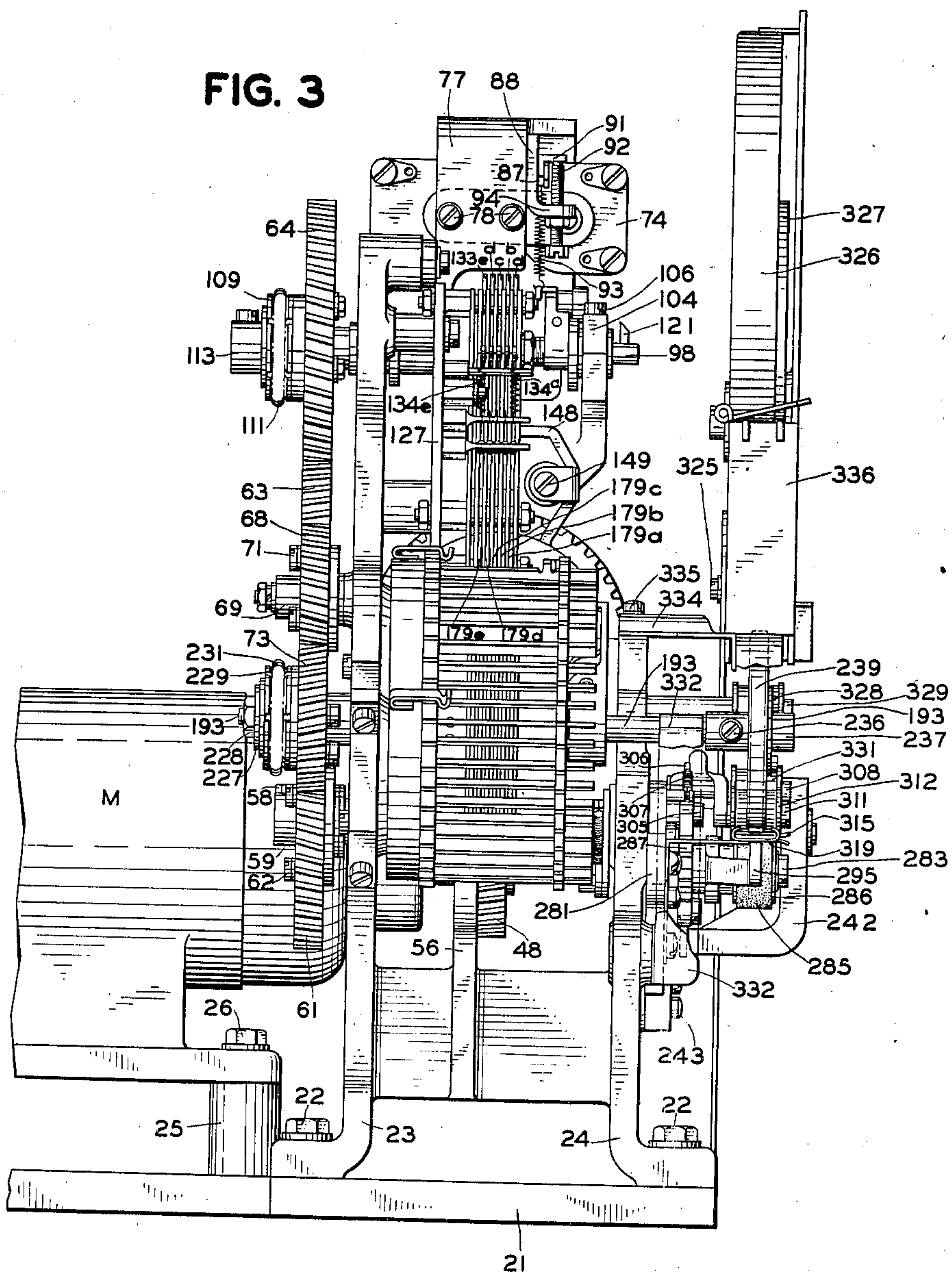
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TELEGRAPH PRINTER

Filed Oct. 22, 1935

7 Sheets-Sheet 3



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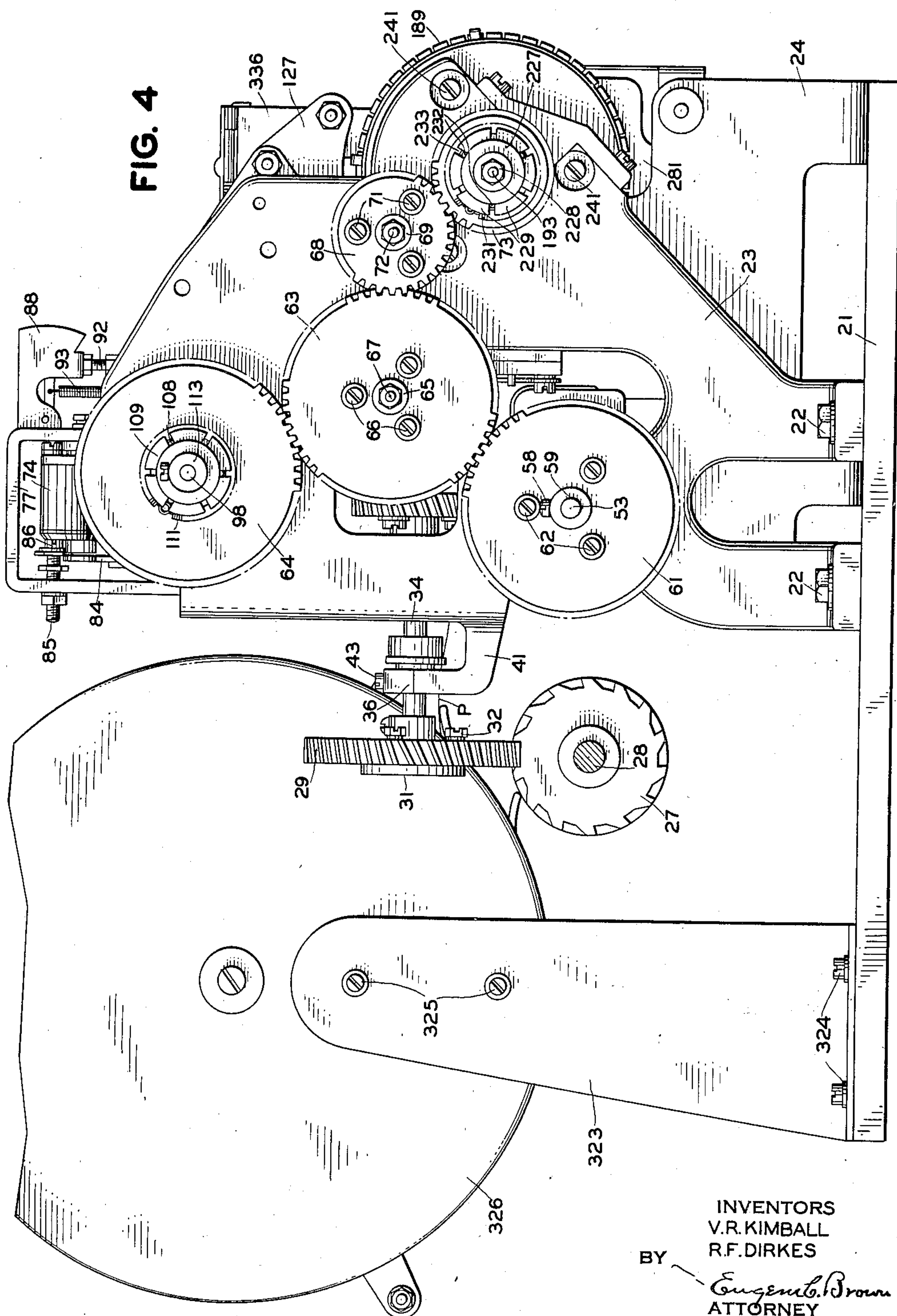
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TELEGRAPH PRINTER

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FIG. 4



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TELEGRAPH PRINTER

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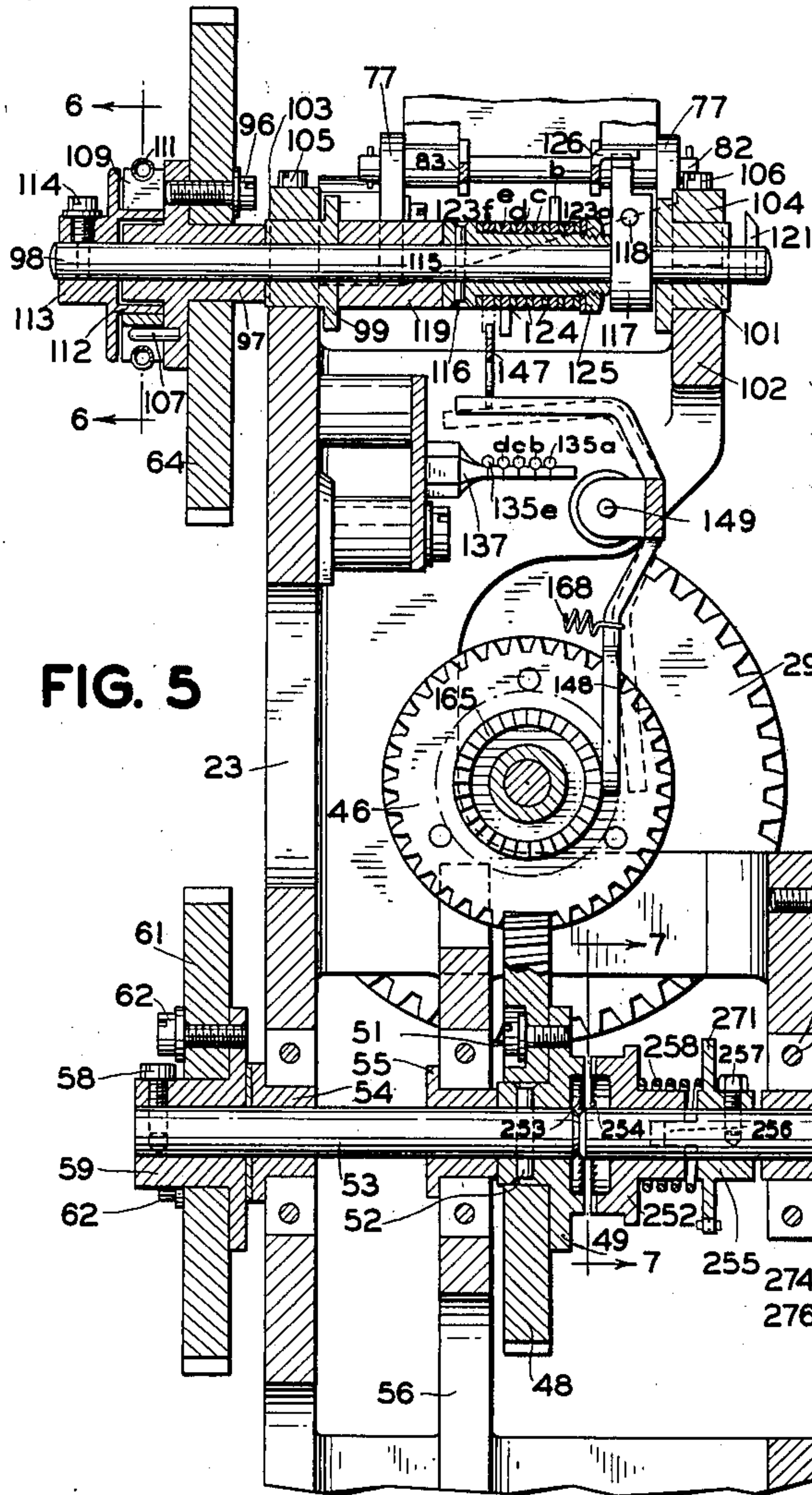


FIG. 5

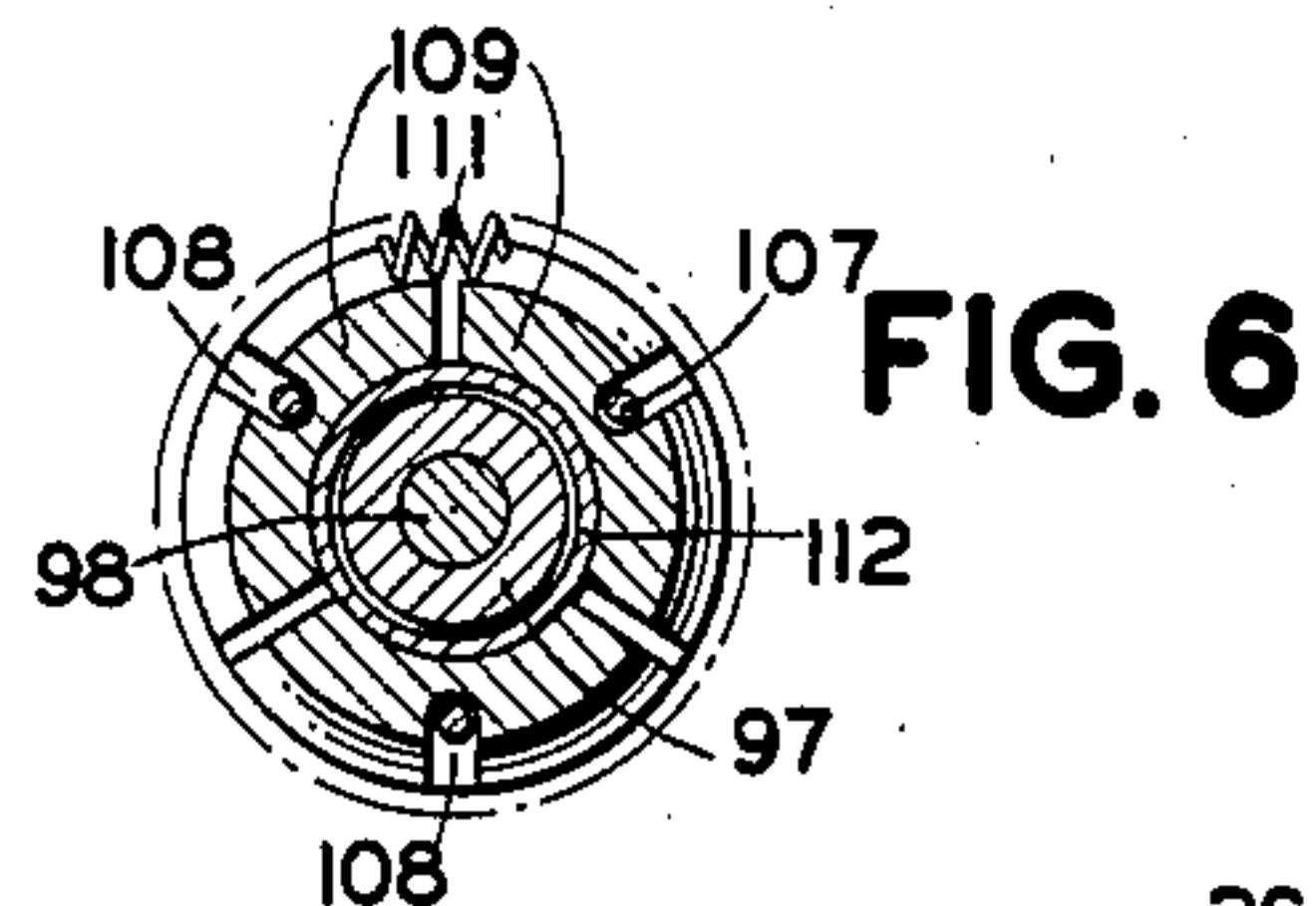


FIG. 6

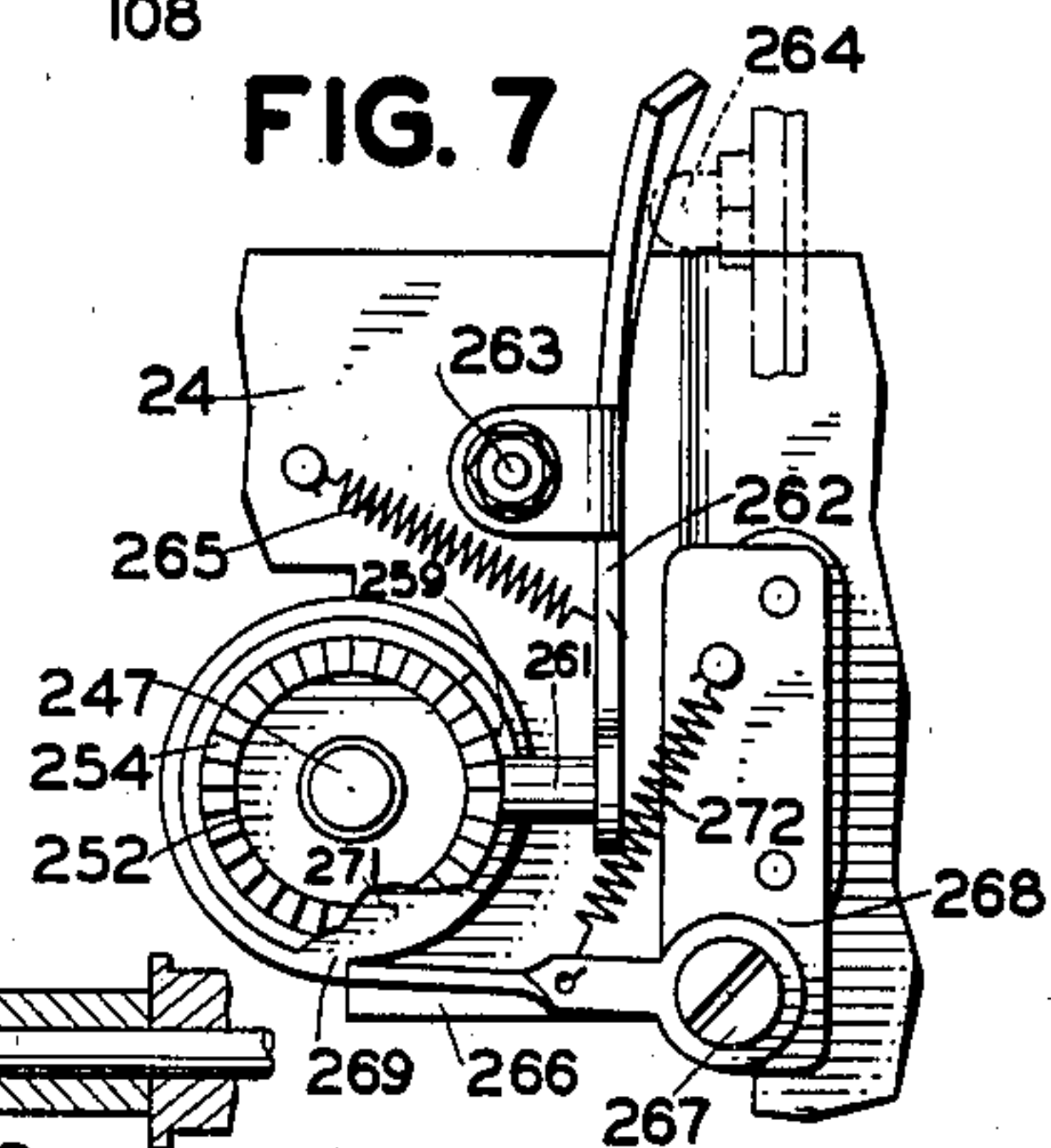


FIG. 7

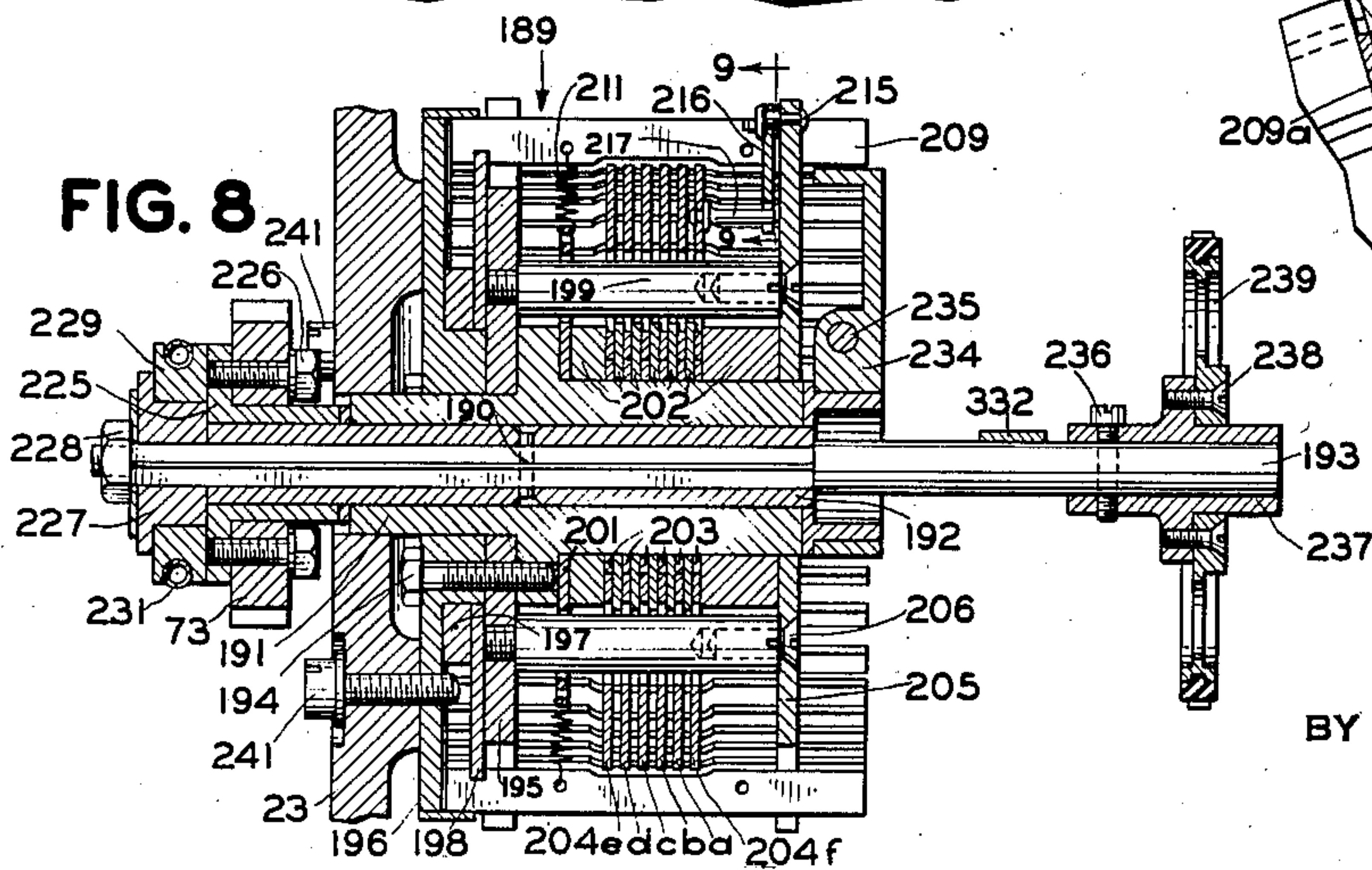


FIG. 8

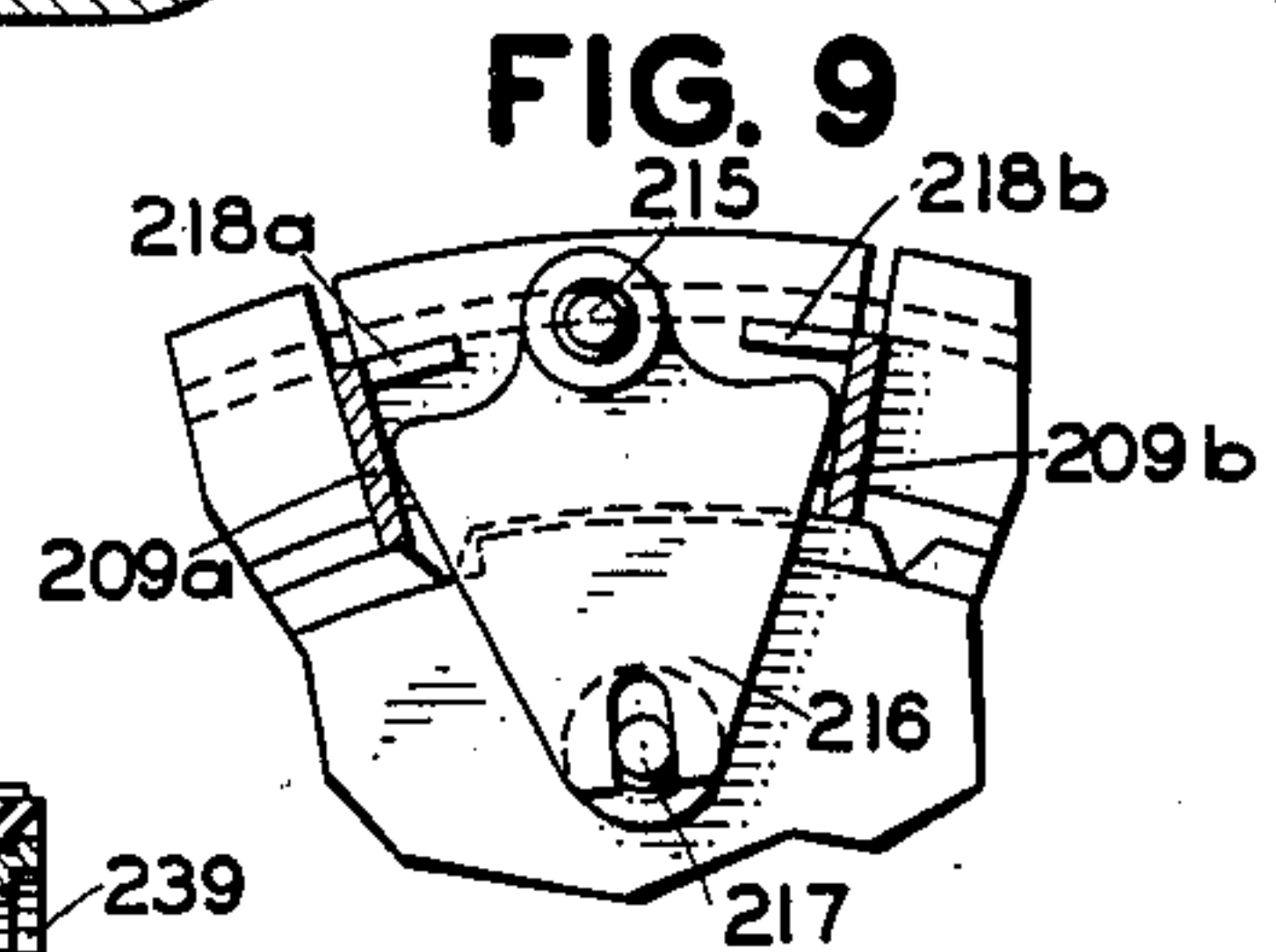


FIG. 9

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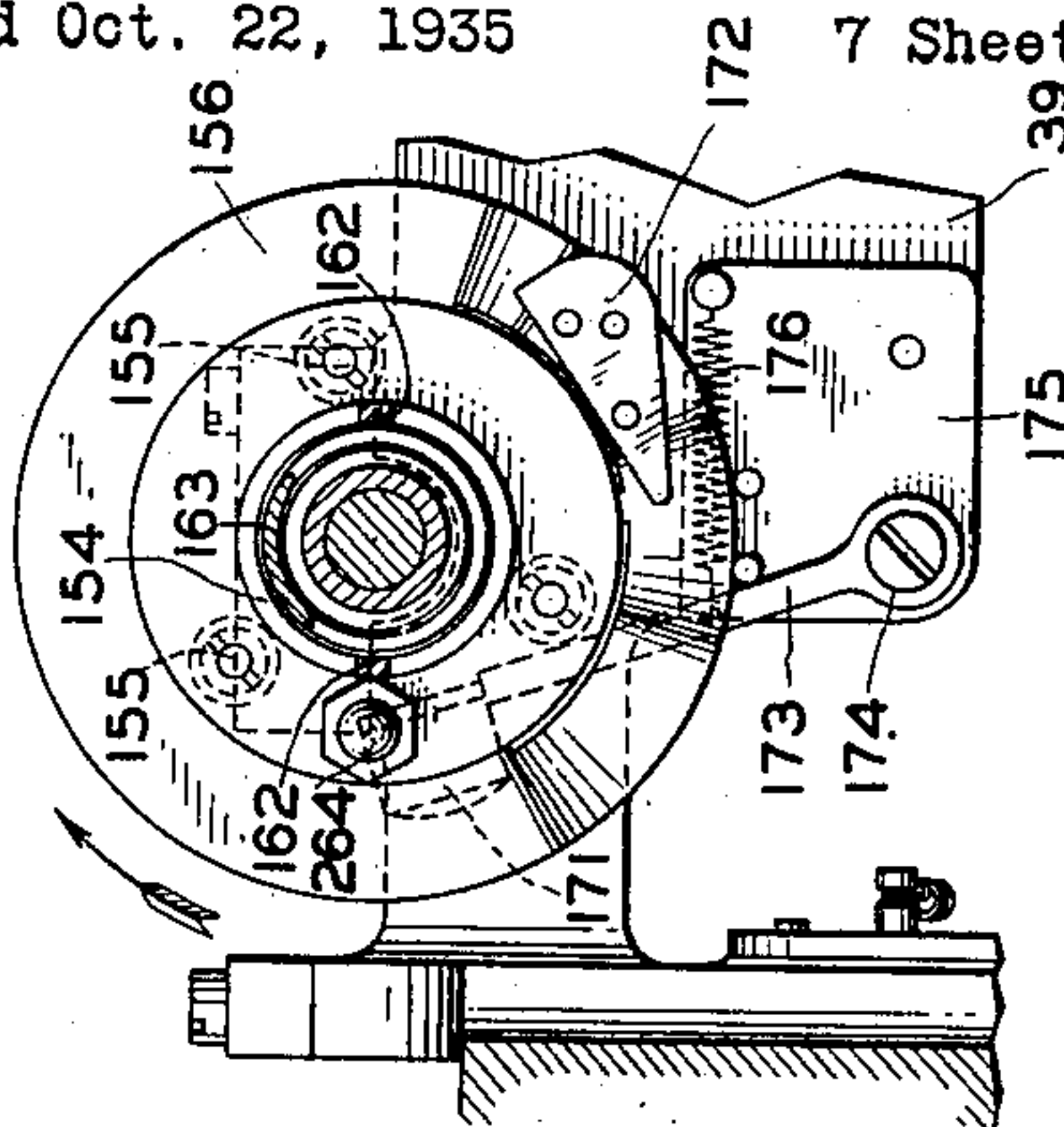
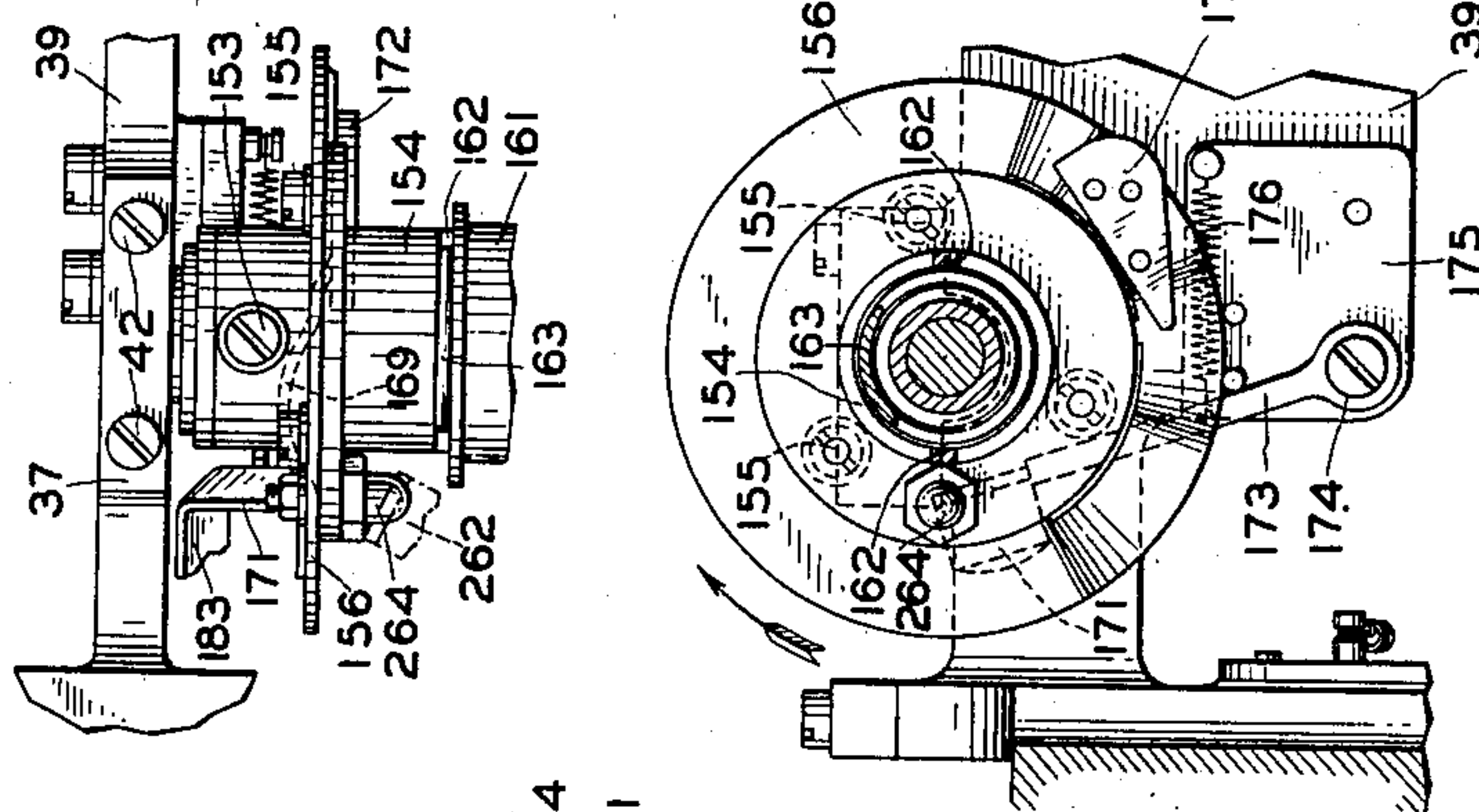
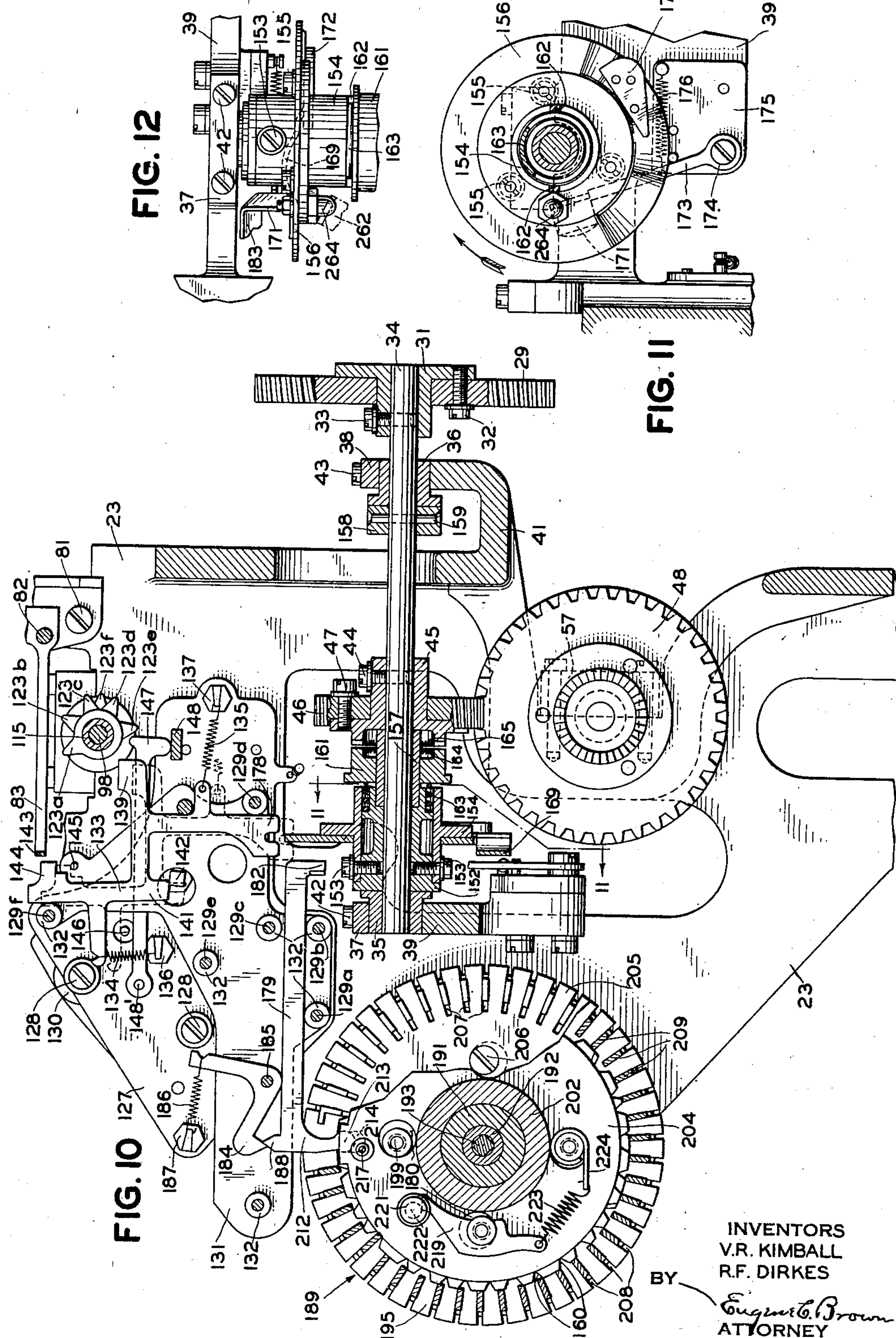
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2,135,376

TELEGRAPH PRINTER

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7 Sheets-Sheet 6



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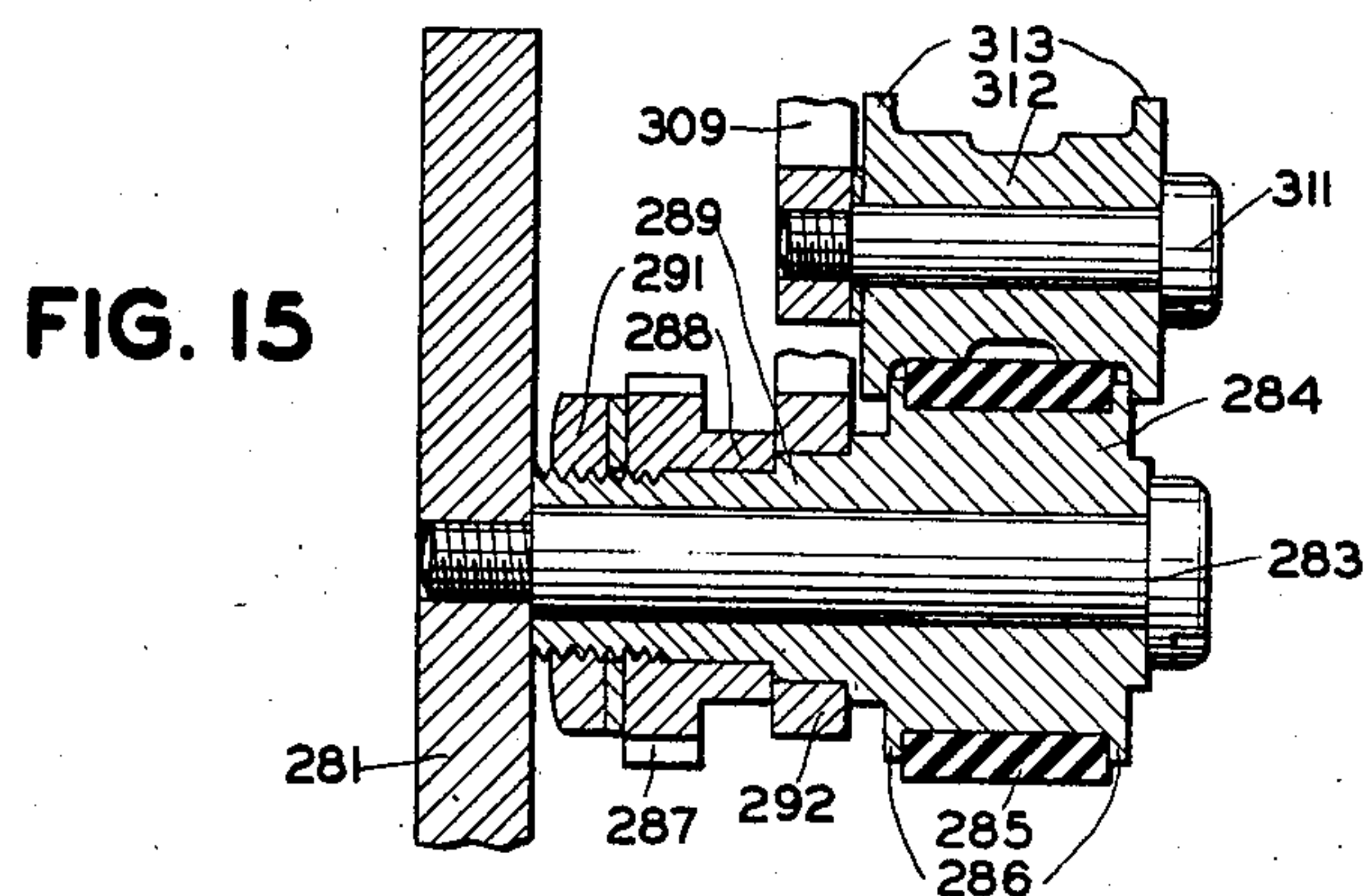
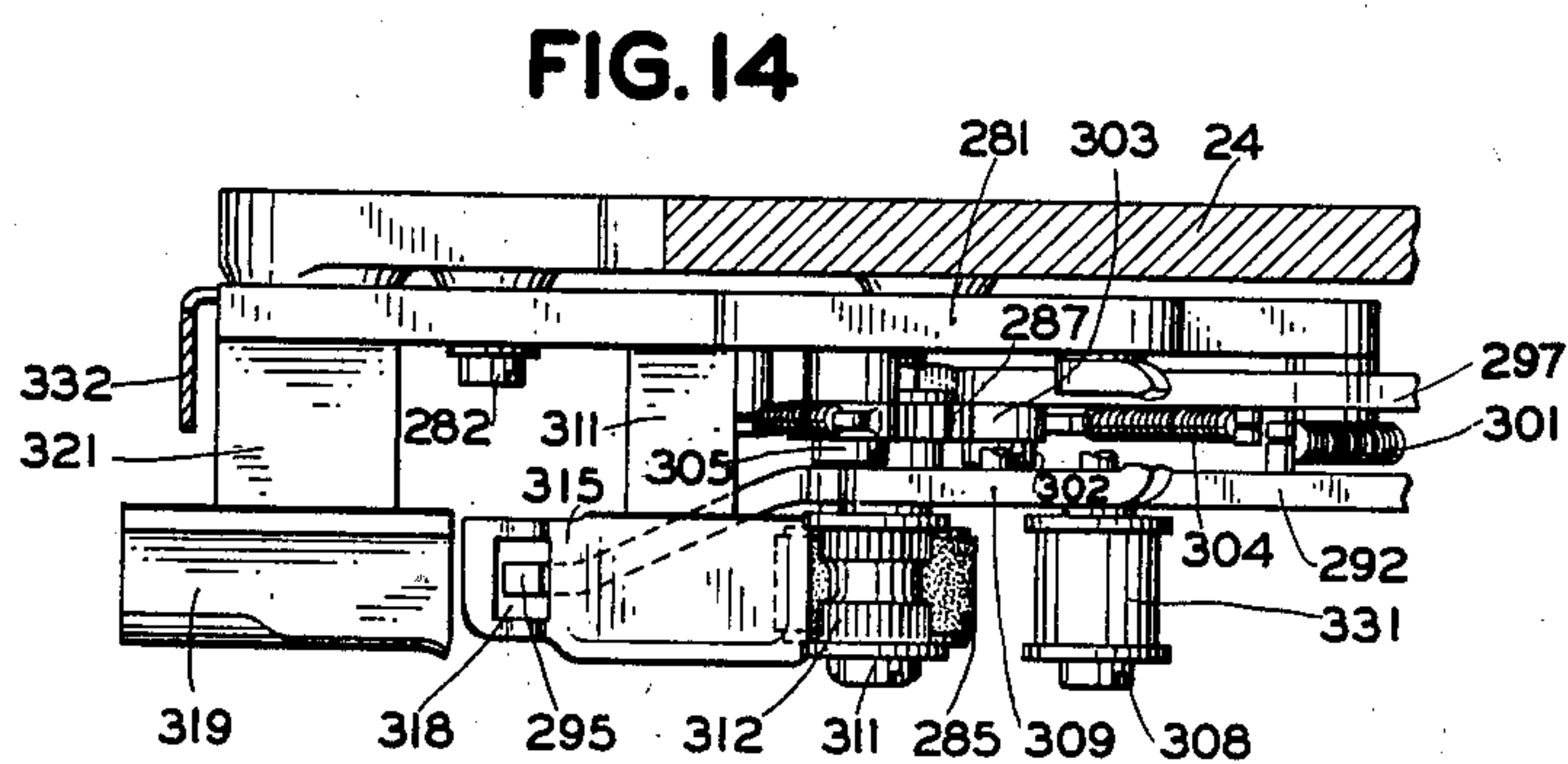
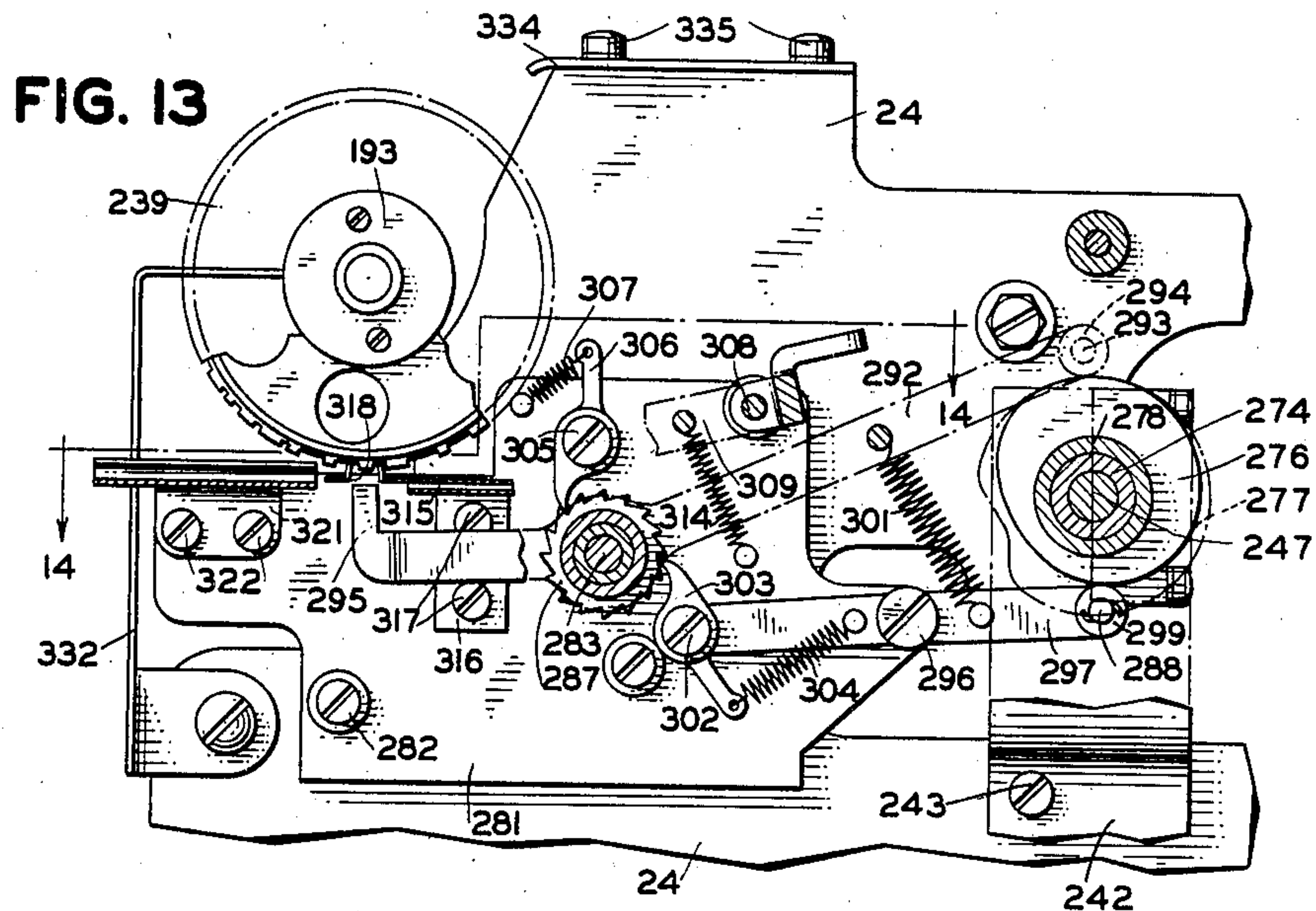
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TELEGRAPH PRINTER

Filed Oct. 22, 1935

7 Sheets-Sheet 7



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UNITED STATES PATENT OFFICE

2,135,376

TELEGRAPH PRINTER

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Application October 22, 1935, Serial No. 46,198

46 Claims. (Cl. 178—35)

This invention relates primarily to recording telegraph printers and like apparatus and more particularly to selecting apparatus for such printers which is operative automatically in response to received permutations of two different line conditions or impulses extending throughout a definite number of successive time intervals.

Accordingly, one of the objects of this invention is to provide selection mechanism for telegraph printers which is of improved efficiency with novel, improved and simplified construction.

Another object of this invention is to provide means whereby the recording of a character representing one combination of code impulses may be effected simultaneously with the receiving and selecting of the next succeeding combination of impulses.

Another object of this invention is the provision of a sub-combination of the mechanisms that perform the relative functions of the complete mechanism, whereby such sub-combination may be used interchangeably in a plurality of types of telegraph recorders, such as for example: the use of the selector and typewheel stop unit mechanisms in recorders of the page printer type and combined perforator and printer as disclosed in the copending applications Serial Nos. 34,080 and 42,692, respectively.

A further object of this invention is the provision of a machine composed of parts which may be easily and cheaply manufactured, thus reducing the manufacturing and maintenance costs to a minimum.

Other objects and advantages will hereinafter appear.

The preferred embodiment of the invention comprises the following sub-combinations of mechanisms: a controlling selector mechanism operating in conjunction with a typewheel stop unit mechanism to selectively position a typewheel, a printing mechanism, a paper tape feeding mechanism and a frame unit to which the various mechanisms are attached. These sub-combinations are so arranged that they may be easily and rapidly removed and interchangeably replaced when requiring repairs or adjustments, thus the replacement of the whole printer is not necessary.

The selector mechanism in the preferred form comprises a set of primary selectors, one for each impulse of the signaling code, a set of secondary selectors, a single line magnet and two locally power driven members. The primary set of selectors are positioned or conditioned in different combinations of settings under the joint mechani-

cal control of the first locally driven member and an armature or member selectively actuated by the single line magnet in response to received code combinations of impulses. The armature of the line magnet is light and acts only to control the selection of the selecting members, hence the mechanism is capable of high speed operation. After the primary selectors are positioned in accordance with the received impulses, their selection is transferred to the secondary set of selectors by the second locally driven member. This transfer takes place in a relatively short interval of time whereupon the primary set of selectors are free to be repositioned where they are responsive to following combinations of impulses while the associated mechanisms have nearly the entire interval of one combination of impulses to perform their related functions.

The secondary set of selectors control the operation of the typewheel stop unit which in turn selectively controls the positioning of the typewheel. The typewheel stop unit comprises a typewheel and typewheel shaft continually tending to rotate and means for selectively stopping the same in positions corresponding to the received code combinations of impulses.

The printing and paper feeding mechanisms function sequentially after the positioning of the typewheel, their operation being controlled by an independently rotatable member.

The functions and operations of the various mechanisms are so timed that there is no interference in the operations thereof.

A continuously rotating electric motor furnishes power for the operation of the various mechanisms through appropriate gearing and clutch mechanisms.

The signaling code used in conjunction with the preferred form of the invention is known as the Simplex or "start-stop" five unit code. It is to be understood, however, that with modifications of the invention various other codes may be employed. As is well known to those versed in the art, if a given unit of time is divided into five intervals during which combinations of electrical conditions are transmitted, it is possible to produce 32 different combinations thereof. As this is not sufficient to represent the required number of characters for telegraphic communication, case grouping of characters is employed. Accordingly, the signals are separated into two groups and two case shift signals are employed, called a shift signal and an unshift signal, which may be termed printer function signals. When the shift signal is received, it positions the re-

recorder so that the following code combinations of impulses will be properly recorded in the figures group. The purpose of the unshift signal is to position the receiving recorder so that the following combinations of impulses will be properly recorded in the letters group. Thus two positions of the typewheel may be common to the same combinations of impulses and which of these positions will be in printing relation with the printing mechanism is determined by the last case shift signal received. Some of the typewheel positions are common to both case groups such as for example, the letters space signal.

The electrical conditions employed in the signaling code are intervals of current and no-current which are known as marking and spacing intervals respectively. As in all start-stop type recorders, each combination of impulses is invariably preceded by a start impulse and invariably followed by a rest impulse. The selector mechanism is so arranged in conjunction with the code, that the start impulse is spacing and the rest impulse marking. As is well known, the start and stop impulses are used to maintain synchronism between the transmitting source and the receiving recorders.

A more complete and thorough understanding of this invention may be had from the following detailed description taken in conjunction with the accompanying drawings showing a preferred embodiment thereof, in which:

Figure 1 is a plan view of a preferred embodiment of the invention in which the front of the machine is shown at the bottom of the drawing;

Figure 2 is a front elevational view thereof;

Figure 3 is a left end elevational view thereof;

Figure 4 is a rear elevational view thereof;

Figure 5 is an enlarged fragmentary sectional view taken on line 5—5 of Figure 1;

Figure 6 is a fragmentary sectional view taken on line 6—6 of Figure 5;

Figure 7 is a fragmentary sectional view taken on line 7—7 of Figure 5;

Figure 8 is an enlarged fragmentary sectional view taken on line 8—8 of Figure 1;

Figure 9 is an enlarged fragmentary sectional view taken on line 9—9 of Figure 8;

Figure 10 is an enlarged fragmentary sectional view taken on line 10—10 of Figure 1;

Figure 11 is a fragmentary sectional view taken on line 11—11 of Figure 10;

Figure 12 is a plan view of the mechanism shown in Figure 11;

Figure 13 is an enlarged fragmentary sectional view taken on line 13—13 of Figure 1;

Figure 14 is a fragmentary sectional view taken on line 14—14 of Figure 13; and

Figure 15 is an enlarged fragmentary sectional view taken on line 15—15 of Figure 2.

Referring first to Figs. 1 to 4, a base plate 21 has attached to it by screws 22, a main frame casting comprising mainly two vertical plate sections 23 and 24 extending transversely of the machine and suitable integral connecting members therefor. These vertical plate members and their connecting members with various projections and sections of the main frame provide journal and mounting points for the various mechanisms. The connecting members and sections of the main frame will be given separate reference numerals when referred to hereinafter in this specification.

Referring to Figs. 1 to 3, the drive mechanism of the machine will now be described. A group of four posts 25 (two only of which are shown in

Fig. 2) attached to the base 21 has mounted thereon by screws 26 an electric motor M. A pinion 27 secured to the motor shaft 28 meshes with a gear 29. The gear 29 is secured to a flanged hub 31 by screws 32 (Fig. 10), the hub 31 being attached by a screw 33 to an operating cam shaft 34 for rotation therewith. The operating cam shaft 34 is transversely journaled in flanged bushings 35 and 36 which are held in place by the bushing clamping members 37 and 38 respectively. The clamping members 37 and 38 are attached to the sections 39 and 41 of the main frame casting by screws 42 and 43 respectively. Fixed to the shaft 34 by a screw 44 is a flanged gear hub 45. A gear 46 is secured to the hub 45 by screws 47 for rotation therewith and meshes with a gear 48. The gear 48 is secured by screws 51 to a flanged gear hub 49, best shown in Fig. 5, which in turn is secured by means of a pin 52 to a counter shaft 53. The counter shaft 53 is journaled in flanged bushings 54 and 55 which are held in the plate member 23 and in a section 56 of the main frame casting, respectively, by bushing clamping members 57, one of which is shown dotted in Fig. 10. Fixed by a screw 58 (Fig. 5) to the left end of the shaft 53 for rotation therewith is a gear hub 59 which carries a gear 61 by means of screws 62. Referring to Fig. 4, gear 61 meshes with an idler gear 63 which in turn meshes with a selector cam shaft drive gear 64. Idler gear 63 is fixed to a hub 65 by means of screws 66, the hub 65 being rotatably mounted on a stud 67 in the plate frame member 23. In mesh with the idler gear 63 is another idler gear 68 fixed to a hub 69 by means of screws 71, the hub 69 being rotatably mounted on a stud 72 in the plate frame member 23. A typewheel shaft drive gear 73 meshes with the idler gear 68 and is driven therefrom. The typewheel shaft gear 73 and the selector cam shaft gear 64 serve to rotate their respective shafts in a manner that will be hereinafter described in connection with their respective mechanisms.

Selecting mechanism

Referring to Figs. 1 to 3, the recorder is controlled by a selector magnet 74 comprising two electromagnets secured to a magnet base 75 by screws such as 76. The magnet base is attached to a selector magnet mounting bracket 77 by means of screws 78. The bracket 77 is attached to the upper part of the plate section 23 of the main casting by screws 79 and 81 (Fig. 2).

An armature pivot rod 82, best shown in Figs. 2 and 5 is located in the bracket 77 and pivotally mounted on the rod 82 is a U-shaped armature lever 83. An armature 84 in operative relation with the selector magnet 74 is rigidly attached to the pivoted end of the armature lever 83. The stroke of the armature 84 and the armature lever 83 rigidly connected thereto are limited by the adjustment of a stud 85 in the bracket 77 and a flanged self-locking nut 86 thereon in operative relation with the armature 84.

A spring tension indicator lever 87 (Figs. 2 and 3) pivotally mounted by a pin 89 in a left extension 88 of the selector mounting bracket 77 has thereon a horizontal projection 91 engaging with the upper end of an adjusting screw 92 carried by a horizontal projection 94 of the left extension 88. A retractile spring 93 has one end attached to the lever 87 and the other end attached adjacent the left end of the armature lever 83. The spring 93 returns the armature 84

and armature lever 83 to their unoperated position when the selector magnet 74 is not energized. The tension of the spring 93 is varied by changing the position of the spring indicator lever 87 by means of the adjusting screw 92. By changing the adjustment of screw 92 the time and speed to which the armature and armature lever respond to line impulses in the selector magnet 74 is varied. The greater the tension on the spring 93 the longer it will take the armature lever to be positioned by the selector magnet 74 when the magnet is energized. Also, the greater the tension on the spring 93 the quicker the armature 84 will be returned to its back stop when the selector magnet is deenergized. The etchings 95 on the extension 88 of the bracket 77 serve to indicate the relative tension of the spring 93.

As heretofore described, the gear 64 (Fig. 5) is continuously rotating due to the power communicated thereto from the continuously rotating motor M through the described gear train. The gear 64 is fixed by screws 96 to a flanged hub 97 loosely mounted on a selector cam shaft 98. The selector cam shaft 98 is transversely journaled in flanged bushings 99 and 101 which are held by bushing clamping members 103 and 104 attached to the top of sections 23 and 102 of the main frame casting by screws 105 and 106 respectively. The flange of the gear hub 97 carries a series of three pins 107 (Figs. 5 and 6) equally spaced around the left face thereof. These pins engage radial slots 108 in associated bakelite segments 109. A groove on the outer edge of the segments 109 has therein a circular coiled radially contractible spring 111 which causes the inner surfaces of the segments 109 to be frictionally engaged with a sleeve 112 on a hub 113. The hub 113 is fixed to the selector cam shaft 98 by a set screw 114 for rotation therewith in abutting relation with the left side of the gear hub 97. The right side of the gear hub 97 is in abutting relation with the flanged bushing 99. It can be seen from the above description that, as the gear 64 and hub 97 rotate, the selector cam shaft 98 will tend to rotate therewith due to the action of the segments 109 frictionally engaged with the sleeve 112 of the hub 113.

A selector cam sleeve 115 (Fig. 5) is attached to the shaft 98 for rotation therewith by a pin 116. On the cam sleeve 115 are fixed in a predetermined arrangement a series of six disc cams 123a to 123f intermediate with spacers 124. These cam discs are clamped against the flange on the cam sleeve 115 for rotation therewith by means of a nut 125 in threaded engagement with the right end of the cam sleeve. A selector cam shaft stop-arm 117 is also attached to the shaft 98 for rotation therewith by means of a clamping screw 118 carried in said stop-arm. A spacing collar 119 on the shaft 98 between the cam sleeve 115 and the flanged bushing 99 co-acting with the gear hub 97 keeps the shaft 98 and the members carried thereby from longitudinal movement. A pointer pin 121 (Fig. 2) is located in the right end of the selector cam shaft 98 for rotation therewith and a radial scale 122 is etched on the bushing clamping member 104. This pointer 121 and the scale 122 in conjunction with the adjustment of the stop arm 117 on the selector cam shaft 98 determines the elapsed time between the release of the selector cam shaft and the engagement of a cam 123 with its associated selector lever as will be hereinafter described.

As hereinbefore stated, the signaling code is composed of two line conditions. These line con-

ditions are also called marking and spacing impulses. In the preferred embodiment of this invention the selecting magnet 74 is adapted to be rendered energized by marking impulses and rendered deenergized by spacing impulses. The marking impulses are therefore intervals during which current is transmitted and the spacing impulses are intervals during which no current is transmitted. The machine is so arranged that the start impulse is spacing and the rest impulse marking.

It will be assumed that a marking impulse is being received on the selector magnet 74 (Fig. 2) and therefore the armature 84 will be drawn toward the pole pieces of the magnet into its marking position. It will also be assumed that the motor M is continuously rotating and through the progressive gear train comprising gears 27, 29, 46, 48, 61, 63 and 64, respectively, as shown in Figs. 2, 4 and 10, the selector cam shaft 98 is tending to rotate by action of the power communicated thereto through the slip friction clutch on the shaft 98. The selector cam shaft 98 (Figs. 2 and 5) is restrained from rotation by the stop arm 117 rigidly secured thereto, the end of which is engaged with a horizontal projection 126 on the armature lever 83. This projection 126 is adapted to be interposed into the path of the end of the stop arm 117 when the armature and armature lever are placed in their marking position by the energization of the selector magnet 74. When the magnet 74 is deenergized, the spring 93 raises the armature lever 83 and moves the projection 126 thereupon free from the end of the stop arm 117 whereupon the selector shaft is free to rotate.

Referring to Figs. 1, 2, 3 and 10, a selector unit mounting plate 127 is secured in a vertical position to bosses 130 in the front side of the plate section 23 of the main frame casting, by screws 128. Studs 129a to 129f (Fig. 10) extend horizontally from the front of the mounting plate 127 and have arranged thereon a plurality of selector lever guide plates 131 and spacers 132 intermediate therebetween. Between the six front guide plates 131 are located five selector levers indicated in general at 133 in Fig. 10, and individually by reference characters 133a to 133e in Fig. 3. The spacers 132 are slightly thicker than the selector levers 133 and therefore the selector levers are movable between the guide plates 131. The selector levers 133 are not rigidly attached to the selecting unit or pivoted at any one point, but slide between the guide plates 131, being restrained and guided in their movements by springs and guide pins. The springs attached to the selector levers are indicated in general at 134 and 135 in Fig. 10, and individually by reference characters 134a to 134e in Fig. 3 (134a and 134e only being shown), and 135a to 135e in Fig. 5. The fixed ends of the springs 134 and 135 are attached to spring posts 136 and 137 (Fig. 10) respectively, extending horizontally from the selector unit mounting plate 127. The selector lever 133a is shown in its normal position in Fig. 10 with respect to its associated springs and guide members with the front guide plate 131 removed. The other four selector levers 133b to 133e are held in their normal position in substantially the same manner by their associated springs. The guide plates 131 and spacers 132 are clamped together by nuts 138 (Fig. 2) in threaded engagement with the front ends of the studs 129a to 129f.

Assume that the printer is in its unoperated po-

sition as positioned by the rest impulse of the preceding signal and that it is desired to select another character. The electrical impulses that comprise the character code being received on the selector magnet in a predetermined arrangement will be transformed into mechanical selections of the selector levers 133 as will be hereinafter described. Assume that the character to be selected is represented by a code combination composed of the following five intelligence impulses: spacing, marking, spacing, marking, and marking. These impulses are preceded by a spacing start impulse and are followed by a marking stop impulse. The spacing start impulse, which is an interval of no-current, renders the selector magnet 74 deenergized and thus allows the spring 93 (Fig. 2) to rock the armature 84 and armature lever 83 in a clockwise direction as seen in Fig. 2. The amount that the spring 93 is allowed to rock the armature lever is determined by the position of the flange 85' on the stud 85. The flange 85' being so located that when the armature 84 comes in contact therewith, the projection 126 (Fig. 5) extending from the side of the armature lever 83 will be withdrawn from the path of the end of the stop arm 117. The receipt of the start impulse on the selector magnet, therefore, disengages the projection 126, and the stop arm 117, whereupon the selector cam shaft 98 is free to rotate with the gear 64 through the action of the heretofore described friction clutch thereon. The speed of rotation of the selector cam shaft 98 and the selector cam sleeve 115 is so arranged relative to the speed of transmission of the impulses that when the transmitting source is ready to transmit the first impulse, the selector cam sleeve 115 is revolved to the proper position to receive it. When the transmitting source is positioned to send out the second impulse, the selector cam sleeve will be rotated to the proper position to receive it and so on for the other three impulses. After the fifth impulse has been received, the reception of the stop impulse which is marking, causes the armature lever 83 to be actuated to bring the projection 126 thereon into the path of the end of the stop arm 117. At the end of a revolution of the selector cam shaft 98, the stop arm 117 and projection 126 will engage and bring the selector cam shaft to a stop in its normal rest position.

When the selecting magnet is associated with and receiving signals from a distributor transmitter, the selecting cam shaft 98 may be geared to rotate a substantial amount faster than the transmitting shaft of the associated distributor transmitter. In such case the selecting cam shaft 98 will complete its revolution before the transmission of the complete signal. The difference in speed, however, should be such that the marking rest impulse is being received on the selector magnet when the selector cam shaft completes its revolution. This difference in speed between the rotation of the selector cam shaft 98 and the speed of transmission is provided in order to insure that the selector cam shaft will return to, and be stopped in its normal stop position before the transmission of the start impulse of the following signal begins.

To return now to the five intelligence impulses that comprise the character to be selected. The start impulse which was spacing rendered the selector magnet deenergized and as the first intelligence impulse is spacing, the selector magnet still remains deenergized for the duration of this

impulse. During the first part of the time interval during which the first intelligence impulse is being transmitted and received on the selector magnet, the high part of the disc cam 123a (Fig. 10) in operative relation with a vertical projection 139 on a rightwardly extending arm of the first selector lever 133a starts to engage said projection. As the disc cam 123a continues to rotate the high part thereof will rock the selector lever 133a in a clockwise direction against the action of springs 134a and 135a about the tip of a downwardly extending portion 141 thereof which rests on a square-shaped selector lever pivot stud 142 extending horizontally from the selector unit mounting plate 127. As the selector cam shaft 98 continues to rotate, the high part of the disc cam 123a passes off the projection 139 on the selector lever 133a and said selector lever is rocked in a counter-clockwise direction back into its original and normal position by the action of its attached springs 134a and 135a.

The second intelligence impulse of the code combination is marking and the reception of this impulse energizes the selector magnet 74 and therefore the armature lever 83 is actuated into its marking position, as shown in Fig. 10. This brings the cross-member 143 of the U-shaped armature lever 83 into operative relation with rightwardly extending projections 144 adjacent the top of the selector levers 133a to 133e. During the first part of the time interval during which the second intelligence impulse is being received on the selector magnet, the high part of the disc cam 123b engages with the projection 139 of the selector lever 133b. This rocks the selector lever 133b in a clockwise direction about the tip of its downwardly extending portion 141 and brings the projection 144 of said selector lever in contact with the cross-member 143 of the armature lever 83. Thus the rotation of the selector lever 133b with the stud 142 serving as a pivot, is stopped, and as the cam 123b continues to rotate, the selector lever is rocked with the end of the projection 144 thereof in contact with the cross-member 143 acting as a pivot point. As selector lever 133b rocks with the projection 144 acting as a pivot, the downwardly extending portion 141 thereof slides to the left and off the square-shaped pivot stud 142, whereupon the springs 134b and 135b actuate the selector lever 133b downwardly into its selected position. A selector lever 133 is shown in its selected position by the dotted outline in Fig. 10. The downward movement of the selector lever is limited by pins 145 and 146, upon which arms of the selector lever rest with the lever in its selected position.

The third impulse of the signal code is spacing and the third selector lever 133c will be left positioned in its normal position in the same manner as the first selector lever was left positioned in its normal position. The fourth and fifth impulses being marking, the fourth and fifth selector levers 133d and 133e respectively, will be actuated to their selected position in the same manner as the second selector lever 133b was actuated to its selected position.

From the above paragraphs, it is evident that the reception of spacing impulses on the selector magnet are transferred to and represented by their respective selector levers being in their unselected or normal position. The marking impulses are transferred to and represented by their respective selector levers being in their selected position. Hereinafter the unselected and selected

positions of the selector levers will be referred to as spacing and marking positions respectively of said selector levers.

At a predetermined point in the revolution of the selector cam shaft 98, a high part of the cam 123f engages the top-right end of a substantially T-shaped lever 147, the left end of which is pivoted on a pin 148', which in turn is rigidly secured to the selector unit mounting plate 127. The lower-right end of the lever 147 rests on the upper horizontal section of an operating cam trip lever 148 (Figs. 2 and 10) which is pivoted on a shoulder screw 149 screwed into a section 151 of the main frame casting. Thus, in conjunction with the sixth cam 123f and the T-shaped lever 147, the operating cam trip lever 148 will be tripped on every revolution of the cam shaft 98. The purpose of the trip lever 148 will be hereinafter described.

Loosely mounted adjacent the left end of the operating cam shaft 34 (Fig. 10) is a hub 152. Attached to the hub 152 by screws 153 for rotation therewith is an operating cam hub 154 which in turn has an operating cam 156 attached to it by screws 155 (Fig. 11). A spacing sleeve 157 (Fig. 10) on the shaft 34 between hubs 45 and 152 assists in keeping the operating cam 156 properly aligned with its associated parts. A collar 158 attached to the shaft 34 by a pin 159 in abutting relation to the flanged bushing 36 prevents the shaft 34 from moving to the right. A sleeve member 161 slidably mounted on the sleeve 157 is operatively connected to the hub 154 by means of interengaging teeth members 162 (Fig. 2). The sleeve member 161 comprises the driven member of a ratchet clutch by means of which the independently rotatable operating cam 156 is rotated. A spring 163 (Fig. 10) coiled about a sleeve portion of the hub 152 tends to keep teeth 164 disposed on the right face of the sleeve member 161 engaged with similar teeth 165 disposed on the left face of the gear hub 45. The gear hub 45 comprises the driving member of the ratchet clutch, it being attached for rotation therewith to the shaft 34. When the teeth 164 and 165 on the driven and driving members respectively are engaged, the operating cam 156 will rotate with the shaft 34.

A side cam surface 166 (Fig. 2) disposed on a circumference of the driven member 161, is in operative relation with the lower end 167 of the trip lever 148. With the teeth 164 and 165 (Figs. 2 and 10) engaged and the operating cam 156 rotating with the shaft 34, the side cam surface 166 is so arranged that it engages with the end 167 of the trip lever 148 at a predetermined point in its rotation. As the sleeve member 161 rotates further, the action of the side cam surface 166 on the end 167 of the trip lever slides the sleeve member to the left and consequently the teeth 164 thereon are disengaged from the teeth 165 of the driving member 45. A further projection of the side cam surface 166 then engages the end 167 of the trip lever and brings the operating cam assembly to a stop in its predetermined rest position. When the trip lever 148 is tripped as herebefore described, the end 167 thereof and the side cam surface 166 are disengaged which allows spring 163 to slide the driven member 161 to the right and cause its teeth 164 to be engaged with teeth 165 of the driving member 45 whereupon the operating cam will rotate with the operating cam shaft 34. Since the cam 123f and the T-lever 147 actuate the trip lever 148 for a short interval of time, the trip lever is quickly returned to its nor-

mal position by an attached spring 168 (Fig. 5) whereupon the end 167 (Fig. 2) rides on the circumference of the sleeve member 161 in the path of the side cam surface 166. Thus as the operating cam 156 nears the end of its revolution, the engagement of the side cam surface 166 and the trip lever 148 cause the disengagement of the ratchet clutch as heretofore described and further rotation of the operating cam 156 due to the inertia thereof brings a further projection of the side cam surface 166 into engagement with the lower end 167 of the trip lever 148 as seen in Fig. 2, to bring said operating cam to a stop in its predetermined rest position. The shaft 34 is geared to rotate a substantial amount faster than the selector cam shaft 98 and it will therefore complete its revolution and be stopped in its rest position before the selector cam 123f can actuate the trip lever 144 to again release the sleeve member 161 in conjunction with a following signal code combination.

The operating cam 156 (Fig. 10) is a disc with a portion 169 thereof, shown dotted in Fig. 12, disposed axially toward the left end of the machine. A gathering cam 171 and a reset cam 172 attached to the left and right sides respectively of the operating cam disc 156 rotate therewith. These three cams, namely, the operating cam 156, the gathering cam 171 and the reset cam 172, comprise what will hereinafter be referred to as the operating cam assembly.

A latch lever 173 (Figs. 11 and 12) is pivoted on a shoulder screw 174 screwed into a plate 175 which in turn is secured to a section 39 of the main frame casting. The end of the latch lever 173 is engageable with an edge of the gathering cam 171 when the operating cam assembly is in its stop position. A spring 176 attached to the latch lever 173 and to a pin 177 in the plate 175 normally keeps the latch lever 173 in operative relation with the gathering cam 171. The purpose of the latch lever is to prevent any rebound or rotation in reverse direction of the operating cam assembly that might occur due to its sudden stop by the operating cam trip lever 148.

The lower ends 178 (Fig. 10) of the selector levers 133 are bifurcated and are so placed in relation to the operating cam 156 that when they are in their selected or marking position, the bifurcated ends thereof straddle the disc of the operating cam 156 as shown by the dotted outline of a selected selector lever.

A series of five code disc levers indicated in general at 179 in Fig. 10 and individually by reference characters 179a to 179e in Fig. 3 are held in position by the guide plates 131. The code disc levers 179 rest on spacers 132 (Fig. 10) on the selector unit assembly screws 129a and 129b and are prevented from moving upward by spacers 132 on the assembly screw 129c. The location of one code disc lever is shown in Fig. 10, the others being similarly located one behind the other. The spacers 132 are slightly thicker than the code disc levers 179 and hence the levers can slide easily between the guide plates 131. Each code disc lever is aligned with a separate selector lever 133 and when a selector lever is in its selected or marking position, the bifurcated end thereof is adapted to be operatively engaged with the right end of its associated code disc lever. A selector lever in its spacing position is not adapted to be operatively engaged with its associated code disc lever.

Referring to Figs. 10, 11 and 12, as the operating cam assembly starts to rotate, when released

as heretofore described, and has completed about a quarter of a revolution, the gathering cam 171 which is attached to the operating cam 156 and rotating therewith, comes into operative relation with the downwardly extending projections 182 on the right ends of the code disc levers 179. Due to the shape of the section 183 of the gathering cam 171 and its rotating movement, it progressively slides all the code disc levers 179 that may be in their left position to their right position. Some or all or none of the code disc levers 179 may be in their left position, depending on the previous character selected. Thus all the code disc levers 179 are to the right and in position to have the selection that is set up in the selector levers 133 transferred to them in a manner that will hereinafter be described. As the operating cam assembly continues to rotate, the operating cam disc 156 slides in the bifurcated ends 178 of the selected selector levers 133 and after about half a revolution of said disc, the displaced portion 169 thereof actuates the bifurcated ends of the selected selector levers toward the left. As the bifurcated ends of the selected selector levers move to the left, the left sides thereof engage with the right end of their associated code disc levers 179 and consequently slide said code disc levers to the left into their left position. As will be remembered, the second selector lever 133b, the fourth lever 133d, and the fifth lever 133e, were positioned to their selected or marking position in response to received code combinations of impulses. Consequently, the second, fourth and fifth code disc levers 179b, 179d, and 179e, respectively, will be slid to the left into their marking position, as the displaced portion 169 of the operating cam disc 156 actuates the selector code disc levers. The first and third code disc levers 179a and 179c will remain as positioned by the gathering cam 171 in their right or spacing position because their associated selector levers 133a and 133c remaining in their normal or spacing position retain their bifurcated ends 178 out of engagement with the operating cam disc 156.

The code disc levers 179 remain in either their spacing or marking positions corresponding to the selection transferred to them from the selector levers until the first part of the subsequent revolution of the operating cam assembly, whereupon all the code disc levers in a marking position are again moved to their spacing position by the gathering cam 171.

Individual to each code disc lever 179 is a code disc lever detent pawl 184. These detent pawls 184 are pivoted on a common stud 185 attached to the selecting unit mounting plate 127. Individual springs 186 attached to an arm of each detent pawl and to a spring post 187, keep said pawls engaged with a wedge-shaped portion 188 of their associated code disc levers. The detent pawls 184 in conjunction with their associated springs 186 act as jockeys and tend to keep the code disc levers 179 in either their marking or spacing position as set by the operating or gathering cams respectively.

As the operating cam assembly rotates further, the displaced portion 169 of the operating cam disc 156 in passing out of operative relation with the bifurcated ends of the selected selector levers returns said selector levers to their right hand position. Further rotation of the operating cam assembly brings the reset cam 172 into operative relation with the bottom of the selected selector levers and due to the shape of the reset cam and its rotating movement, the selected selector levers

are raised. When the portion 141 of each of the selector levers is high enough to clear the pivot stud 142, attached springs 135 pull the selector levers over onto the stud 142. The reset cam 172 then passes out from beneath the selector levers and they stay in their spacing position, as the stud 142 prevents them from returning to their marking position. Thus all the selector levers 133 that were actuated to their marking position by the selector cams 123 in conjunction with the armature lever 83 are returned to their spacing or normal unselected position and all the selector levers 133 are ready for the next character code selection. Further rotation of the operating cam assembly is stopped after one complete revolution, as previously explained, by the operating cam trip lever 148.

The various functions of the selector cam and of the operating cam assembly are so timed that there is no interference in their operation, the selector cam having completed its selection before the operating cam assembly starts to transfer this selection to the code disc levers 179.

Typewheel stop mechanism

The typewheel stop assembly, indicated in general by the reference numeral 189 (Figs. 8 and 10) comprises a flanged bearing sleeve 191 surrounding a typewheel shaft sleeve 192, a typewheel shaft 193 and associated parts. The typewheel shaft sleeve 192 is attached to the typewheel shaft 193 for rotation therewith by a pin 190. Attached to the bearing sleeve 191 by screws 194, only one of which is shown in Fig. 8, is a rear, or left as seen in Fig. 8, stop member guide plate 195 and a stop unit mounting plate 196. A clamping washer 197 between the plate 196 and a stop member pivot disc 198 keeps said pivot disc against the left guide plate 195. Screwed into the right face of the left guide plate 195 are a series of four posts 199. On the right side of the flange of the sleeve 191 is a spring plate 201, a series of spacers 202 and a series of filler-washers 203. Supported on each filler-washer are code discs indicated in general at 204 in Fig. 10, and individually by reference characters 204a to 204f in Fig. 8. The spring plate 201, spacers 202, and filler-washers 203, are held fast and in position by a right stop member guide plate 205 attached to the posts 199 by screws 206 in the right ends thereof. As the filler-washers 203 are slightly thicker than the code discs 204, the discs are not clamped tight but are free to rotate on the filler-washers 203, being limited in the amount of their rotation by elongated holes 180 therein, through which pass the posts 199. The code discs 204 are provided with V-shaped notches 160 cut along their circumferential edge in a manner well known in the art.

As will appear from the following, each code disc 204 has two positions. For each combination of settings of these discs corresponding V-shaped notches 160 on each disc will be in alignment with each other. At right angles to and equally spaced around the circumference of the code discs and guided in radial slots 207 and 208 in the right and left guide plates 205 and 195, respectively, are a series of stop members indicated in general by reference numeral 209. Each stop member 209 is pivotally or otherwise carried on the periphery of the supporting and pivot disc 198 adjacent the left end thereof and is provided with a V-shaped edge on the section engageable with the circumferential edges of the code discs 204. Each stop member has one end of an individual coil spring

211 attached to it, the other end of the spring being attached to the spring plate 201. By the action of these springs, the stop members 209 are pulled radially inward and are urged into engagement with the V-shaped notches in the code discs 204.

As stated above, for each setting of the code discs 204 one of the stop members 209 will have six of the notches under it in the six discs in alignment and will accordingly be pulled by its attached spring into said notches, it being understood by those skilled in the art that the notches are so cut around the circumference of the discs 204 that only one such alignment of notches can exist at a time. The five code discs 204a to 204e are in operative relation with the five code disc levers 179a to 179e, respectively. Each code disc lever 179 (Fig. 10) is provided on the left end thereof with a downwardly extending projection 212, the end 213 of which is rounded and projects into a U-shaped slot 214 of its associated individually notched code disc 204. The discs 204 are so mounted in relation to the code disc levers 179 that a transverse motion of the levers imparts a rotary motion to the code discs about the bearing sleeve 191. The code discs remain as positioned by the code disc levers 179 until the following rotation of the gathering cam 171 (Fig. 12) whereupon all the discs 204 in a marking position are rotated a few degrees in a clockwise direction (Fig. 10) into a spacing position by their associated code disc lever acting in conjunction with said gathering cam as heretofore described.

With a signaling code composed of five impulses, there are 32 possible selections and in order to increase the number of possible selections without the addition of another impulse, case shift signals are employed called "shift" and "unshift" signals. These two signals by means hereinafter described control the movement of the code disc 204f. The notches on the code discs 204a to 204e are so arranged that for a predetermined number of combinations of settings two rows of notches therein are in alignment. Which one of the two stop members 209 associated with the aligned notches will be operated toward the axis of the stop unit is determined by the position of the code disc 204f, called the shift disc. In one position of the shift disc 204f those stop members associated with the unshift signals are selectable and in the other position the stop members associated with the shift signals are selectable. The selection of the shift and unshift signals causes the stop members 209a and 209b, respectively, (Fig. 9) to be actuated toward the axis of the stop unit. The disc 204f has no control of the selection of the stop members 209a and 209b as it is cut away beneath these stop members and therefore either of these stop members are selectable for either position of the shift disc 204f.

Pivotally mounted on a pin 215 in the top of the right stop member guide plate 205 is a shift disc lever 216. The lower end of the lever 216 is slotted and engages a pin 217 rigidly attached to the shift disc 204f. Stop members 209a and 209b have projections 218a and 218b thereon which are adapted to operatively engage the left and right sides respectively of the shift disc lever 216. Assume that the shift disc 216 is in its unshift position as shown in Fig. 9. Now when the alignment of the notches in the code discs 204a to 204e are such as to allow the shift stop member 209b to move inward, the projec-

tion 218b thereon will engage the right side of the shift disc lever 216. The spring 211 attached to the stop member 209b actuating said stop member causes the shift lever 216 to rotate about its mounting point a few degrees. The shift lever in turn causes the shift disc 204f to be rotated a few degrees in a counter-clockwise direction to a position corresponding to its shift position whereinafter the stop members 209 associated with the shift signal are selectable. With the shift disc in its shift position, a selection of the unshift stop member 209a will cause said disc to return to its unshift position whereinafter the stop members associated with the unshift signal are selectable. It will be noted, therefore, that with the shift disc 204f in one position a certain stop member is allowed to be moved toward the center in response to a certain signal code combination and a different stop member is allowed to be moved toward the center by the same signal code combination when the shift disc is in its other position.

A shift disc detent lever 219 (Fig. 10) pivotally mounted on one of the studs 199 is engageable with a detent roller 221 pivotally mounted on a pin 222 in the shift disc 204f. A spring 223 one end of which is attached to the detent lever 219 and the other end to a spring clip 224 keeps the end of the lever engaged with the detent roller 221. The purpose of the detent lever and associated parts is to keep the shift disc in either of its actuated positions during reception of signals following the shift or unshift signals.

Loosely mounted for independent rotation on the left end of the typewheel shaft sleeve 192 (Fig. 8) is a flanged gear hub 225. Attached to the gear hub 225 for rotation therewith by screws 226 is the gear 73. A flanged hub 227 on the left end of the shaft 193 is clamped in abutting relation to the sleeve 192 for rotation therewith by means of a nut 228 in threaded engagement with the left end of the typewheel shaft 193. On the periphery of the hub 227 are placed a series of three friction members 229 which are held in place by a circular coiled radially contractable spring 231. Radial slots 233 (Fig. 4) in the friction members 229 engage the three pins 232 carried in the left side face of the gear hub 225 (Fig. 8). The friction members 229 are frictionally engaged with the peripheries of the hub 227 by the spring 231 and tend to rotate said hub therewith. The above described members comprise a friction clutch which is constructed to operate in substantially the same manner as the hereinafter described friction clutch on the selector cam shaft 98 shown in Figs. 5 and 6. As heretofore described, the gear 73 (Fig. 4) is continually rotating due to the power communicated thereto from the idler gear 68 and therefore the typewheel shaft 193 will tend to rotate by means of the power communicated thereto through the attached friction clutch.

An index or typewheel stop member 234 (Fig. 8) secured to the typewheel shaft sleeve 192 for rotation therewith, by means of a clamping screw 235 therein, rotates in operative relation to the right ends of the stop members 209. The stop members are normally out of the path of the end of the stop arm 234 as it rotates with the typewheel shaft. However, when one of the stop members is positioned in a row of aligned notches, the right end thereof moves into the path of said stop arm 234 and blocks the rotation thereof, thus bringing the typewheel shaft 193 to rest in a selected angular position. By selecting var-

ious stop members, the typewheel shaft may be selectively stopped at various positions in its rotation. It is to be understood, however, that as the code discs 204 are moved in response to a different code combination of impulses, the selected stop member 209 will be cammed out of its selected position into its normal position, the right end thereof being thus disengaged from the stop arm 234. The stop arm is then free to rotate with the typewheel shaft until stopped by the stop member selected by the new positions of the code discs 204 corresponding to the new code combination of impulses. When the typewheel shaft is stopped, the friction members 229 slide on the periphery of the hub 227.

On the right end of the typewheel shaft 193, secured by a screw 236 is a flanged typewheel hub 237. Secured by screws 238 to the flange of the hub 237 for rotation therewith is a typewheel 239. The typewheel 239 comprises a cylinder having a single row of characters formed on the periphery thereof.

The complete typewheel stop unit mechanism is secured to the front side of the section 23 of the main frame casting by screws 241, only one of which is shown in Fig. 8, in threaded engagement with the mounting plate 196.

Printing and tape feeding mechanisms

The printing and tape feeding operations are controlled by an independently rotatable cam, and a description of the structural relation and operation of their associated parts will now be given.

A bracket casting 242 (Figs. 1, 2 and 5) is attached to the front side of section 24 of the main frame casting by screws 243 (Fig. 2). Clamped to the top right side of the bracket 242 by screws 244 is a bushing clamping member 245 which serves to hold a flanged bushing 246. Referring to Fig. 5, the right end of an independently rotatable shaft 247 is journaled in the bushing 246. A bushing clamping member 248 attached to the section 24 of the main frame casting by screws 249 holds a flanged bushing 251 which serves as another journal for the shaft 247. The shaft 247 and the counter-shaft 53 are on the same axis and the shaft 247 is adapted to be independently rotated from said counter-shaft by means of a hereinafter described ratchet clutch. The ratchet clutch comprises a driving ratchet integral with the hub 49 attached to the shaft 53 for continuous rotation therewith and a driven member 252. Teeth 253 disposed on the right face of the driving ratchet 49 are adapted to be operatively engaged with similar teeth 254 disposed on the left face of the driven member 252. The driven member 252 is operatively engaged with a hub 255 by means of interengaging tooth members 256. Hub 255 is fixed to the shaft 247 for rotation therewith by means of a screw 257. Thus the driven member 252 is keyed to shaft 247 for rotation therewith but is adapted to be slid along said shaft to bring its teeth 254 into or out of engagement with the teeth 253 on the driving member 49. The means by which the driven member 252 is actuated along the shaft 247 will be hereinafter described. A circular coiled spring 258 around the sleeve portion of the driven member 252 tends to keep the driven member engaged with the driving member.

A side cam surface 259 (Fig. 7) formed on the hub portion of the driven member 252 is adapted to be operatively engaged with a cam follower 261 on the lower end of a trip lever 262. The trip

lever 262 is pivotally mounted on a stud 263 in the frame section 24. A pin 264 (Figs. 2, 7, 11 and 12) secured to the hub 154 of the operating cam assembly is arranged to engage the upper end of the lever 262 and cause the cam follower 261 on the lower end thereof to be withdrawn from engagement with the side cam surface 259, whereupon the driven member 252, by action of the spring 258 (Fig. 5) is free to slide to the left and engage the continuously rotating driving member 49.

The driven member 252 upon engagement with the driving member 49 will be rotated thereby until cammed out of engagement therewith and stopped in its predetermined stop position at the end of one revolution. After being tripped, a spring 265 (Fig. 7) attached to the trip lever 262 returns said trip lever to its normal position, whereupon the cam follower rides on the hub of the driven member and in the path of the cam 259 until near the end of a revolution, at which time the cam follower 261 reengages the side cam surface 259 to force the clutch members apart. The pin 264 on the operating cam assembly is adapted to actuate the trip lever 262 during the latter part of the revolution of the operating cam assembly.

A latch arm 266 is pivotally mounted on a shoulder screw 267 in a plate 268 attached to the frame section 24. The end of the latch is engageable with a radial shoulder 269 on a disc 271 integral with the hub 255. A spring 272 attached to the latch arm 266 tends to keep said arm and disc 271 operatively engaged. The purpose of the latch is to prevent rotation in a reverse direction or rebound of the shaft 247 and attached members due to their sudden stop when the cam follower 261 engages the side cam surface on the driven member 252.

The shaft 53 is geared to rotate a substantial amount faster than the selector cam shaft 98 and therefore the shaft 247 will complete its revolution and be in its rest or normal position before the trip lever 262 is again actuated to initiate the rotation of the shaft 247 in conjunction with another code combination of impulses.

Attached to the shaft 247 (Fig. 5) for rotation therewith by a pin 273 is a cam sleeve 274. The left and the right ends of the sleeve 274 are in abutting relation to the flanged bushings 251 and 246, respectively. The cam sleeve 274 has a section 275 thereof of smaller diameter upon which are placed a print cam 276 and a tape feed cam 277, and between the two cams a spacing collar 278. The cams and spacing collar are clamped against the flanged portion of the sleeve 274 and rotate therewith by means of a nut 279 in threaded engagement with the right end of the section 275 thereof.

Referring to Figs. 2, 3 and 13, a plate 281 is attached by screws 282 to the front side of section 24 of the main frame casting. A shoulder screw 283, extending horizontally from the plate 281, pivotally supports a sleeve 284 (Fig. 15). The right end of the sleeve is of increased diameter and supports for rotation therewith a ring of rubber 285 or other resilient material between two extending flanges 286. A ratchet wheel 287 integral with a collar 288 is in abutting relation with a flange 289 on the sleeve 284. A nut 291 in threaded engagement with the left end of the sleeve 284 clamps the ratchet wheel 287 to the sleeve 284 for rotation therewith. Pivotaly mounted on the flange 289 of the sleeve 284 is a print lever 292, best shown in Figs. 2 and 75

13. The right end of the print lever 292 has thereon a pin 293 upon which is pivotally mounted a roller cam follower 294 in operative relation with the print cam 277. The left end of the print lever comprises a vertical projection 295 adapted to force a paper tape P into contact with the typewheel 239 at predetermined intervals as will be hereinafter described. Pivotally mounted on a shoulder screw 296 (Fig. 13) is a feed pawl lever 297. The right end of the lever 297 has therein a pin 298 upon which is pivotally mounted a roller cam follower 299. The roller cam follower 299 is in operative relation with the feed cam 276 located directly above. The cam followers 294 and 299 are held in engagement with their respective cams 277 and 276 by a retractile spring 301 attached to the two associated levers 292 and 297 at the right of their respective pivot points. At the left end of the lever 297 is a shoulder screw 302 upon which is pivotally mounted a feed pawl 303 adapted to operatively engage the ratchet wheel 287. A spring 304 attached to the lower end of the feed pawl and to the lever 297 keeps the ratchet wheel and feed pawl engaged. On a shoulder screw 305 in the plate 281 is pivotally mounted a retaining pawl 306 which is held operatively engaged with the ratchet wheel 287 by a spring 307.

Pivotally mounted on an inner shoulder of a shoulder screw 308 (Fig. 14) is a pressure roller lever 309. The left end of the lever 309 carries a shoulder screw 311 (Figs. 14 and 15) upon which is pivotally mounted a knurled roller 312 with extending flanges 313. The knurled roller 312 is pulled down onto the rubber ring 285 by a spring 314 attached to the lever 309 and keeps the paper tape P disposed therebetween frictionally engaged with the rubber ring 285.

A paper tape guide 315 (Figs. 13 and 14) comprises a substantially horizontal U-shaped member adapted to guide the tape P from the rollers 285 and 312 to the typewheel 239. The guide 315 is supported by an arm 316 which is attached to the plate 281 by screws 317. A rectangular hole 318 in the left end of the guide 315 allows the projection 295 of the print lever to force the paper tape P into engagement with the typewheel 239 and thus take impressions therefrom. Another paper tape guide 319 supported by an arm 321, which in turn is attached to the plate 281 by screws 322, guides the tape P after it passes from beneath the typewheel.

The operation of the printing and feeding mechanism will now be described. The cam sleeve 274 will be released for rotation as heretofore described in timed relation with the received signal impulses. As the feed cam 276 (Fig. 13) rotates from its rest position, it causes the feed lever 297 to rock in a clockwise direction and consequently by means of the pawl 303 to rotate the ratchet wheel 287 an amount equal to one tooth. As the rubber ring 285 rotates with the ratchet wheel and the paper tape P is frictionally engaged therewith, the tape will be advanced a distance equal to one letter space. On the last part of the revolution of the cam 276, the lever 297 is allowed to rock back into its normal position by the spring 301, ready to step the ratchet wheel another tooth in conjunction with the next received signal combination. During the last part of the revolution of the cam sleeve 274, the cam follower 294 drops into the notch in the print cam 277. This allows the spring 301 to rock the print lever 292 and cause the projection 295 on the left end

thereof to rise and press the tape P against the typewheel, thus taking an impression therefrom. The typewheel is dampened with ink by means to be hereinafter described and is stopped in a selected position corresponding to the received impulses as heretofore described. As the cam follower 294 is in the notch of cam 277 for a short period of time, the projection 295 on the print lever 292 is quickly withdrawn from engagement with the typewheel. Thus the typewheel has practically the complete interval of one signal to be repositioned in response to the following impulses. The printing operation is adapted to take place after the advancing of the paper tape and not while the tape is in motion.

Referring to Fig. 4, a bracket 323, attached to the base plate 21 by screws 324, has attached to its upper end by screws 325 a paper tape container 326. The tape container 326 (Fig. 2) is adapted to hold a roll of tape 327 and allow it to be freely unrolled as it is fed through the machine. A roller 328 pivotally mounted on a shoulder screw 329 screwed into the section 24 of the main frame and another roller 331 pivotally mounted on the shoulder screw 308 guides the tape P from the container 326 to the feed mechanism.

A spring arm 332 attached to the section 24 of the main frame by a screw 333 has the upper end thereof engaged with the typewheel shaft 193 to assist in steadying the typewheel shaft as it rotates.

A typewheel inking means comprising an absorbent ink roller 334, an intermediate roller 335 contained within a container 336, is supported by an arm 337 which is attached by screws 338 to the top of section 24 of the main frame. The rollers 334 and 335 are pivotally supported in vertical slats in the walls of the container directly above the typewheel 239. The circumference of the intermediate roller 335 is in contact with the circumference of the typewheel just below it and also with the circumference of the ink roller 334 just above it. Thus the circumference of the typewheel is dampened with ink as the typewheel rotates.

As will be remembered from the description of the operation of the operating cam assembly, on the first part of the revolution thereof, the gathering cam 171 (Figs. 11 and 12) positions all of the code disc levers 179 (Fig. 10) to their spacing position. They in turn position the code discs 204a to 204e to their spacing position. This causes the selection of the stop member 209, corresponding to a signal in which all the impulses are spacing. The associated space on the typewheel is a blank and no character can be printed for this position of the typewheel. As the code discs 204a to 204e are being positioned to allow the spacing stop member 209 to be selected, the previously selected stop member is cammed out of the notches in the discs by the movement thereof. This releases the typewheel stop arm 234 (Fig. 8), whereupon the typewheel will rotate until the stop arm engages the spacing stop member. Now, if the same stop member corresponding to the received signal is again selected, the spacing stop member will be cammed out of the notches in the discs and the typewheel will rotate until the stop arm again engages the selected stop member. From the above it is apparent that successive selecting and associated printing of the same character does not result in an appreciable diminishing intensity of copy, be-

cause the typewheel rotates and is re-inked for every printing operation.

In some of the views the ink roller container 334 is not shown in order to more clearly show some of the other essential parts.

While this invention has been shown in but one form, it will be obvious to those skilled in the art that it is not so limited but is susceptible to various changes and modifications, without departing from the spirit or essential attributes thereof, and it is desired, therefore, that only such limitations shall be placed thereon as are imposed by the prior art or are specifically set forth in the appended claims.

What is claimed is:

1. Signal receiving apparatus comprising a series of selector elements, a receiving magnet, a rotatable shaft, means carried by said shaft to actuate said elements into motion, means controlled by said receiving magnet cooperating with said selector elements to modify selectively the motion thereof, and means to actuate further only said elements having modified motion to selectively control a typewheel positioning mechanism.

2. In combination, a rotatable member having a plurality of cams thereon, a plurality of selecting members each having a normal and a selected position, electrically operated means, responsive to received code combinations of impulses, said means and said cams acting directly on said selecting members to variably control the operation thereof to their selected position, means for retaining said selected members in their selected position, a series of notched discs, rotatable means released for rotation by said rotatable member for successively positioning said series of notched discs in accordance with the position of said selecting members, a rotatable typewheel, mechanism cooperating with said notched discs for selectively positioning said rotatable typewheel, means controlled by said rotatable means for subsequently effecting a printing operation and means for subsequently returning said selecting members and said notched discs to their normal positions.

3. Signal receiving apparatus comprising a series of movable selector levers, an independently rotatable selector cam sleeve with a series of cams thereon equal in number to said selector levers and movable past said levers in substantial synchronism with received line impulses, means operated by said cam sleeve to initiate the rotation of a second cam sleeve, means operated by said second cam sleeve to initiate the rotation of a third cam sleeve, and means operated by said third cam sleeve to effect a printing operation and a paper feeding operation.

4. A telegraph receiver comprising a typewheel, a series of selector elements having a variety of motions but normally restrained from movement by unequal pressure at two points, means operating to move said elements in succession in a movement of least normal restraint, means to positively restrain the movement of said elements in the variety of motion of least normal restraint and thereby compel the movement thereof in the variety of motion of greater normal restraint, in combination according to the signals received, and means operative after the positioning of said selector elements to actuate those elements moved in the variety of motion of greater normal restraint whereby said elements control the position of said typewheel.

5. In a telegraph recorder, a set of primary

selectors having a selected and a normal position, a set of secondary selectors having a selected and an unselected position, a member responsive to received line conditions, an independently rotatable member cooperating with said member to selectively position said primary selectors in accordance with received line conditions, a second independently rotatable member released for rotation by said first mentioned rotatable member before the complete positioning of said primary selectors and operative after the positioning of said primary selectors to position said secondary selectors to their unselected position and subsequently thereafter to actuate selected of said primary selectors to transfer the selection set up thereon to said secondary selectors, and means operative after said transfer operation to return the selected ones of said primary selectors to normal.

6. In a printing telegraph receiver, a plurality of selectors, means for selectively positioning said selectors in accordance with received code combinations of impulses comprising a first rotatable member, rotating in timed relation to received impulses, a series of code discs, means for transferring the selection set up in said selectors to said code discs comprising a second rotatable member rotating in timed relation to said first rotatable member, a typewheel selectively positioned under control of said code discs, a third rotatable member rotating in timed relation to said first and second rotatable members and means operable by said third rotatable member for effecting printing and tape feeding operations.

7. Selective signal apparatus comprising selecting mechanism including a plurality of elements each having a plurality of varieties of motion, a rotatable member, means controlled by a signal responsive member cooperating with said rotatable member for determining which of two varieties of motion said elements have, a rotatable typewheel, means coacting with said elements in one of said first varieties of motion whereby said elements are actuated in a third variety of motion to selectively control the positioning of said rotatable typewheel and means whereby said elements responsive to said third variety of motion are responsive to a fourth variety of motion whereby they are normally positioned.

8. A telegraph receiving apparatus comprising a series of elements, each having two cycles of operation, means responsive to received code combinations of impulses for determining which of said cycles said elements have, means whereby said elements in one of said cycles are immediately returned to normal, a typewheel positioning mechanism, means whereby said elements in the second of said cycles control said typewheel positioning mechanism and means whereby elements in said second cycle are subsequently returned to normal.

9. A telegraph receiving apparatus comprising a plurality of elements each having two unequal cycles of operation and normally being restrained from motion, means operative to actuate said elements in successive order and signal controlled power operated means to positively restrain the movement of said elements in one cycle of operation and to compel the movement of said elements in the other cycle of operation in combinations in accordance with received code combinations of impulses, a recording mechanism, and means whereby said elements in only

one cycle of operation are actuated to control said recording mechanism in accordance with said received impulses.

10. In combination, a plurality of code discs each having a normal and a selected position, a shift disc having a plurality of operative positions, means for sequentially positioning said code discs in various combinations according to the received code combinations of impulses, a plurality of stop members arranged about the periphery of said code discs substantially parallel to the axis thereof, notches arranged about the periphery of said code discs so that for a predetermined number of combinations of settings thereof two rows of notches therein will be in alignment, means controlled by said shift disc in one operative position to determine which one of said two rows of notches a stop member will be urged into and individual means for moving said stop member into said aligned row of notches.

11. In combination, a plurality of notched code discs each having a normal and an operative position, means for sequentially positioning said discs to normal, means operative thereafter for subsequently positioning said discs in combinations of settings corresponding to received code combinations of impulses so that for a plurality of predetermined settings thereof two rows of notches in the periphery thereof will be in alignment, a plurality of stop members arranged about the periphery of said discs substantially parallel to the axis thereof, individual means for urging said stop members into a selected position in a row of aligned notches, a shift disc having an unshift and a shift position, means controlled by a predetermined stop member to position said shift disc in one position, means controlled by the position of said shift disc to determine which one of the two stop members associated with said two rows of aligned notches will be selected, means controlled by another predetermined stop member whereby said shift disc is positioned to allow the selection of the other of said two stop members, a rotatable typewheel and means co-acting with said selected stop members to selectively position said typewheel.

12. In a telegraph receiver, a group of primary selectors having normal and selected positions, selecting cam means acting directly and invariably on each of said selectors in succession, means for causing said cam means to shift selected ones only of said selectors to a selected position, under the selective control of line signals, a secondary group of selectors having normal and selected positions, means for successively gathering said secondary selectors into their normal position, transfer means for successively transferring the selection set up in the primary selectors directly to the secondary selectors and means for restoring said primary selectors to normal position, said gathering, transfer and restoring operations occurring in a time interval less than that required to actuate the primary selectors.

13. A telegraph receiving apparatus comprising a series of elements having a plurality of varieties of motion but normally restrained from motion, power operated means to actuate said elements successively in one variety of motion, signal control means to positively restrain the movement of said elements in said first variety of motion whereby said power operated means compel the movement of said elements in a second variety of motion in combinations according to the signals

received, and means to actuate elements which have previously been actuated in a predetermined one of said first two varieties of motion, in a third variety of motion, and recording means controlled by said latter motion.

14. In a selecting mechanism, a plurality of selecting members each having a normal and a selected position, means including a single magnet responsive to received combinations of impulses and cam members acting directly on said selecting members for positioning predetermined of said selecting members to their selected position in accordance with said impulses, a typewheel stop mechanism, means to further actuate said selectively positioned selecting members to control said typewheel stop mechanism and means for restoring said selectively positioned selecting members to their normal position.

15. In combination, a rotatable member having a plurality of cams thereon, a plurality of selecting members each having a single normal and a single selected position, electromagnetically operated means responsive to received code combinations of impulses, said means and said cams acting directly on said selecting members to variably control the operation thereof to their selected position, means for retaining said selecting members in their selected position, a series of notched discs, rotatable means released for rotation by said rotatable member for successively positioning said series of notched discs in accordance with the position of said selecting members, a rotatable typewheel and mechanism cooperating with said notched discs for selectively positioning said typewheel.

16. A telegraph receiver comprising a series of movable selecting elements, means for setting said elements in marking and spacing positions in combinations in accordance with and during the period of reception of received signals, a plurality of notched code members having normal and operated positions, means for moving said notched code members to their normal position in successive order, means engaging said selecting elements in one of said positions for moving said code members into their operated positions successively in combinations according to the position of said selecting elements, said last two mentioned means being operative upon said notched code members whereby the movements thereof into normal and operative positions occur in an overlapped relation and the first selecting element is restored to said normal position prior to the movement of the last notched code member into operated position.

17. A telegraph receiver, a plurality of selector elements, a support for said selector elements, said elements having a normal position on said support and a selected position off of said support, means for selectively actuating said selector elements to move the same from off said support into said selected position, a recording mechanism selectively controlled by said elements in their selected position and means for returning said selected elements to normal position on said support.

18. A telegraph receiver, a selecting magnet, a plurality of selector elements, a support for said selector elements, said elements having a normal position on said support and a selected position off of said support, means normally retaining said selectors on said support, a cam for actuating said selector elements, under the selective control of said magnet, for idly pivoting said elements about said support or to move the same

from off said support into said selected position, means for retaining said elements in said selected position, a plurality of code members and means engaging said elements in their selected position for positioning said code members in accordance with the setting of said elements.

19. In a telegraph receiver, a plurality of selector elements, said elements having a plurality of working faces, means engaging one of the faces of each of said elements in cyclic order, means engaging another of said faces selectively in accordance with received impulses for determining the movement of said elements by said first means, a code member corresponding to each element and means engaging a further face of said elements, in a predetermined position, thereby to actuate said code members.

20. In a telegraph receiver, a selecting magnet having an armature controlled member, a plurality of selector elements, a support for said selector elements, said elements having a normal position on said support and a selected position off of said support, individual springs normally retaining said selectors on said support, a cam for actuating said selector elements under the selective control of said magnet for idly pivoting said elements about said support or for pivoting said elements about said armature controlled member whereby to move said elements into said selected position, individual springs for retaining said elements in said selected position, a forked extension on said elements, a plurality of code members and a cam engaging the forked extension of said elements in their selected position for successively positioning said code members in accordance with the setting of said elements.

21. In a telegraph receiver, a plurality of selector elements each of said elements having a plurality of arms, cam means directly engaging one of the arms of each of said elements in cyclic order, means engaging another of said arms selectively in accordance with received impulses for determining the movement of said elements by said first means, a code member corresponding to each element and means engaging a further arm of said elements, in a predetermined position thereof, to actuate said code members thereby.

22. In a telegraph receiver, a plurality of selector elements, means for causing said elements to be rocked idly about one point thereof or to be given a combined sliding and pivotal movement about another point thereof selectively in accordance with received signaling conditions to selectively position said elements, a code member and means for pivoting said elements, in one selective position thereof, about a third point to actuate said code members thereby.

23. In a telegraph receiver, a plurality of selector elements each of said elements having a notch therein, a plurality of code members, a transfer member having an offset portion, means for normally retaining said elements above said transfer member, means for selectively lowering said elements into engagement with said transfer member whereby said transfer member engages in said notches and means for moving said transfer member through said notches to oscillate the selector elements to bring the same into engagement with said code members whereby to selectively position the latter members in accordance with the setting of said selector elements.

24. A telegraph receiver comprising a type-wheel, a series of movable selector elements hav-

ing two varieties of motion but normally restrained from movement by two unequal pressures, means operative to move said elements in succession, means to positively restrain said movement of said elements in the motion of least normal restraint and to compel movement thereof in the motion of greater normal restraint in combinations according to the signals received, a plurality of notched code discs having normal and operated positions, power driven cam means cooperating directly with said selector elements for moving said discs to their normal position and thereafter for moving them to their operated position in combinations in accordance with the position of said selecting elements and means controlled by said discs for stopping said type-wheel in printing position.

25. A telegraph receiving apparatus comprising a series of elements having a plurality of varieties of motion but normally restrained from motion, power operated means to actuate said elements successively in one variety of motion, signal controlled means to positively restrain the movement of said elements in said first variety of motion whereby said power operated means compel the movement of said elements in a second variety of motion in combinations according to the signals received and means to actuate said elements having a second variety of motion in a third variety of motion.

26. In a telegraph receiver, a group of primary selectors having normal and selected positions, selecting cam means acting directly and invariably on each of said selectors to shift selected ones thereof to a selected position under the selective control of line signals, a secondary group of selectors, transfer means for successively transferring the selection set up in the primary selectors directly to the secondary selectors and means for restoring said primary selectors to normal position, means to operate said transfer and restoring means to effect said transfer and restoring operations in a time interval less than that required to actuate the primary selectors.

27. In a telegraph receiver, a plurality of selectors, means for positioning said selectors into marking and spacing positions in combinations in accordance with and during the period of reception of received signals, a plurality of code discs having normal and operated positions, means for moving said discs in succession to their normal position, and means for moving only the selectors which have been positioned in a predetermined one of the aforesaid positions to actuate corresponding ones of said discs into their operated position.

28. A telegraph receiver comprising a series of elements each having a single normal cycle of operation and a single selected cycle of operation, signal controlled means, means operative to actuate said elements in successive order cooperating with said signal controlled means to selectively determine which of said cycles said elements have in accordance with received impulses, a recording mechanism and means actuating said elements in said selected cycle of operation to selectively control said recording mechanism.

29. In a telegraph receiver, a first group of selecting members, a second group of selecting members, means for selectively positioning said first group of selecting members in cyclic order in response to received code combinations of impulses, transfer means for successively transferring the selection set up in said first selecting

members to said second selecting members, said transfer means starting and completing said transfer operation after the selective operation of the last selecting member of the first group, and printing means controlled by said second group of selecting members.

30. In a printing telegraph receiver, a plurality of notched disc elements, a plurality of stop members arranged about the periphery of said discs substantially parallel to the axis thereof, means for operating said discs sequentially in combinations in accordance with received code signals to bring certain of said notches into alignment, individual resilient means for forcing said stop members into said aligned notches, and means for forcing said selected stop member from said aligned notches on subsequent movements of said discs.

31. In a telegraph recorder for permutation code signals comprising a uniform number of two different line conditions for each character code group, each group being preceded by a starting condition and followed by a rest condition, a plurality of selector levers equal in number to the number of selecting conditions in each group, an independently rotatable selector cam sleeve, a corresponding series of cams carried thereby for invariably moving said levers in synchronism with received line conditions, electro-magnetically operated means movable into and out of the path of movement of said selector levers in accordance with said line conditions whereby said levers are selectively conditioned in accordance with the received permutations of line conditions, a series of notched code discs having a normal and selected position, equal in number to the number of said selecting levers, means employing only selectively conditioned of said levers for selectively actuating said code discs and means operable by said electro-magnetically operated means to initiate the rotation of said selector cam sleeve for one revolution and bring the same to a stop thereafter.

32. In a printing telegraph receiver, a series of selecting elements, a series of associated discs each having a normal and a selected position, a shift disc having two operative positions, means for sequentially transferring the selection of said selecting elements to said associated discs, means controlled by said discs to actuate said shift disc from one position to another, means to bias said shift disc in an actuated position, a rotatable typewheel, and means controlled jointly by all of said discs to selectively position said rotatable typewheel.

33. In a telegraph receiver, a group of primary selectors, selecting cam means acting directly and invariably on each of said selectors to shift selected ones thereof to a selected position under the selective control of line signals, a secondary group of selectors and transfer means for successively transferring the selection set up in the primary selectors directly to the secondary selectors, said transfer means performing said transfer operation in a time interval less than that required to actuate the primary selectors.

34. In a telegraph receiver, a group of primary selectors having normal and selected positions, selecting cam means acting directly and invariably on each of said selectors to shift selected ones thereof to a selected position under the selective control of line signals, a secondary group of selectors having normal and selected positions, means for successively gathering said secondary selectors into their normal position, transfer

means for successively transferring the selection set up in the primary selectors directly to the secondary selectors and means for restoring said primary selectors to normal position, said gathering and transfer means performing said gathering and transfer operations in overlapped relation and in a time interval less than that required to actuate the primary selectors.

35. A telegraph receiver, a plurality of selector elements, a support for said selector elements, said elements having a normal position on said support and a selected position off of said support, a spring normally retaining said selectors on said support, means for selectively actuating said selector elements against the action of said spring to move the same from off of said support into said selected position, means for retaining said elements in said selected position and a recording mechanism selectively controlled by said elements in their selected position.

36. A telegraph receiver comprising a series of movable selecting elements, cam means acting directly and invariably on each of said elements for setting selected ones of said elements in marking position in accordance with received signals, a plurality of notched code members having normal and operated positions, means for moving said notched code members to their normal position in successive order, means engaging said selecting elements in marking position for moving corresponding ones of said code members into their operated positions successively, said last two mentioned means being so adapted and arranged as to effect the successive movements of the notched code members into normal position and into operated position in overlapped relation, whereby certain of said notched code members are being restored to normal position while others are being moved into operated position.

37. A telegraph receiver, a plurality of selector elements, a support for said selector elements, said elements having a normal position on said support and a selected position off of said support, individual springs normally retaining said selectors on said support, means for selectively actuating said selector elements against the action of said springs to move the same off said support into said selected position, individual springs for retaining said selector elements in said selected position, a recording mechanism selectively controlled by said elements in their selected position and means for returning said selector elements to normal position on said support against the action of said latter springs.

38. A telegraph receiver, a plurality of selector elements, a support for said selector elements, said elements having a normal position on said support and a selected position off of said support, means for selectively actuating said selector elements to move the same from off said support into said selected position, means for retaining said elements in said selected position, a forked extension on said elements, a plurality of code members and a cam engaging in the forked extensions of said elements, in their selected position, for positioning said code members in accordance with the setting of said elements.

39. A telegraph receiver, a plurality of selector elements, a support for said selector elements, said elements having a normal position on said support and a selected position off of said support, means for selectively actuating said selector elements to move the same from off said support into said selected position, means for

retaining said elements in said selected position, a forked extension on said elements, a plurality of code members and a cam engaging in the forked extensions of said elements in their selected position for successively positioning said code members in accordance with the setting of said elements.

40. In a telegraph receiver, a selecting magnet, a plurality of selector elements, a support for said selector elements, said elements having a normal position on said support and a selected position off of said support, a spring normally retaining said selectors on said support, a cam for actuating said selector elements under the selective control of said magnet for idly pivoting said elements about said support or for moving the same from off said support into said selected position and a recording mechanism selectively controlled by said elements in their selected position.

41. In a telegraph receiver, a selecting magnet having an armature controlled member, a plurality of selector elements, a support for said selector elements, said elements having a normal position on said support and a selected position off of said support, a cam for actuating said selector elements under the selective control of said armature controlled member for idly pivoting said elements about said support or for pivoting said elements about said armature controlled member whereby to move the same from off said support into said selected position and a recording mechanism selectively controlled by said elements in their selected position.

42. In a telegraph receiver, a plurality of four armed selector elements, a first means normally engaging one of the arms of each element, a second means engaging another of the arms of each of said elements in cyclic order, a third means engaging still another of said arms selectively in accordance with the received impulses for causing said elements to be pivoted about either said first or said third means by said second means to selectively position said elements, a code member corresponding to each element and a fourth means engaging a further arm of said elements, in a predetermined position thereof, to actuate said code members thereby.

43. In a telegraph receiver, a plurality of four armed selector elements, means cooperating

with three of said arms to selectively position said elements in accordance with received code combinations of impulses, a code member corresponding to each of said elements and means engaging the fourth arm of said elements, in a predetermined selective position thereof, to actuate said code members invariably in one direction thereby.

44. In a telegraph receiver, a plurality of selector elements, cam means engaging said elements in cyclic order, means for causing said elements to be pivoted by said cam means about one or the other of two spaced points thereof selectively in accordance with received signaling conditions to selectively position said elements, a code member and means for pivoting said elements, in one selective position thereof, about a third point to actuate said code members thereby.

45. In a telegraph receiver, a plurality of selector elements each of said elements having a notch therein, a plurality of code members, a cam disc having an offset portion, means for normally retaining said elements above said disc, means for selectively lowering said elements into engagement with said disc whereby said disc engages in said notch, and means for rotating said disc to oscillate the selector elements so lowered into engagement therewith whereby to bring the same into engagement with said code members to selectively position the latter members in accordance with the setting of said selector elements.

46. In a telegraph receiver, a plurality of selector elements each of said elements having a forked extension, a plurality of code members, a transfer member having an offset portion, means for normally retaining said elements with said forked extension out of contact with said transfer member, means for selectively moving said elements to cause said forked extension to straddle said transfer member and means for moving said transfer member through said forked extension to oscillate the selector elements so as to bring the same into engagement with said code members whereby to selectively position the latter members in accordance with the setting of said selector elements.

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