

Jan. 12, 1943.

G. I. ROBERTS ET AL

2,308,306

PRINTING TELEGRAPH APPARATUS

Filed June 18, 1940

4 Sheets-Sheet 1

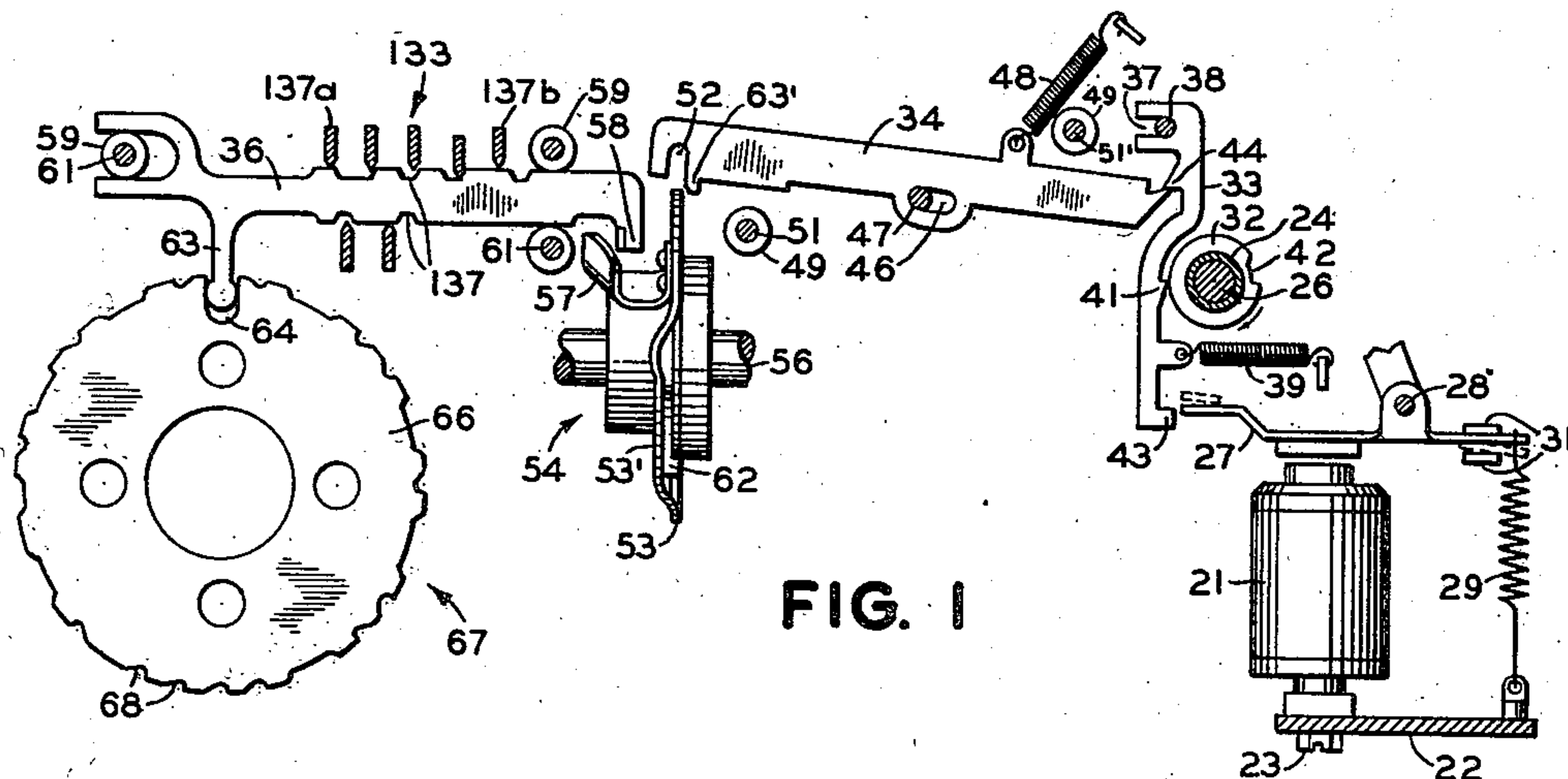


FIG. 1

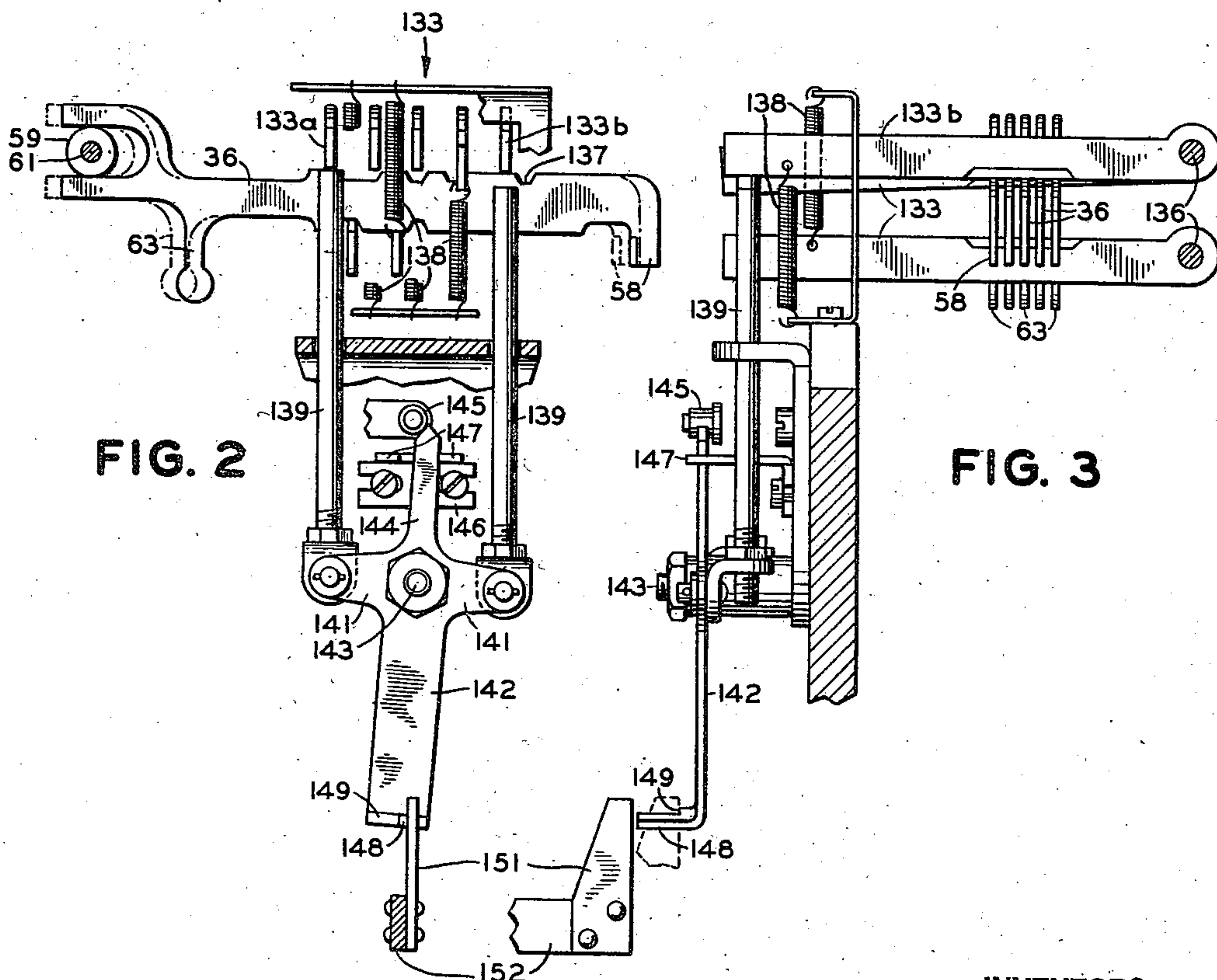


FIG. 2

FIG. 3

INVENTORS
G. I. ROBERTS
J. W. LONG
BY *Mr. Marsh*
ATTORNEY

Jan. 12, 1943.

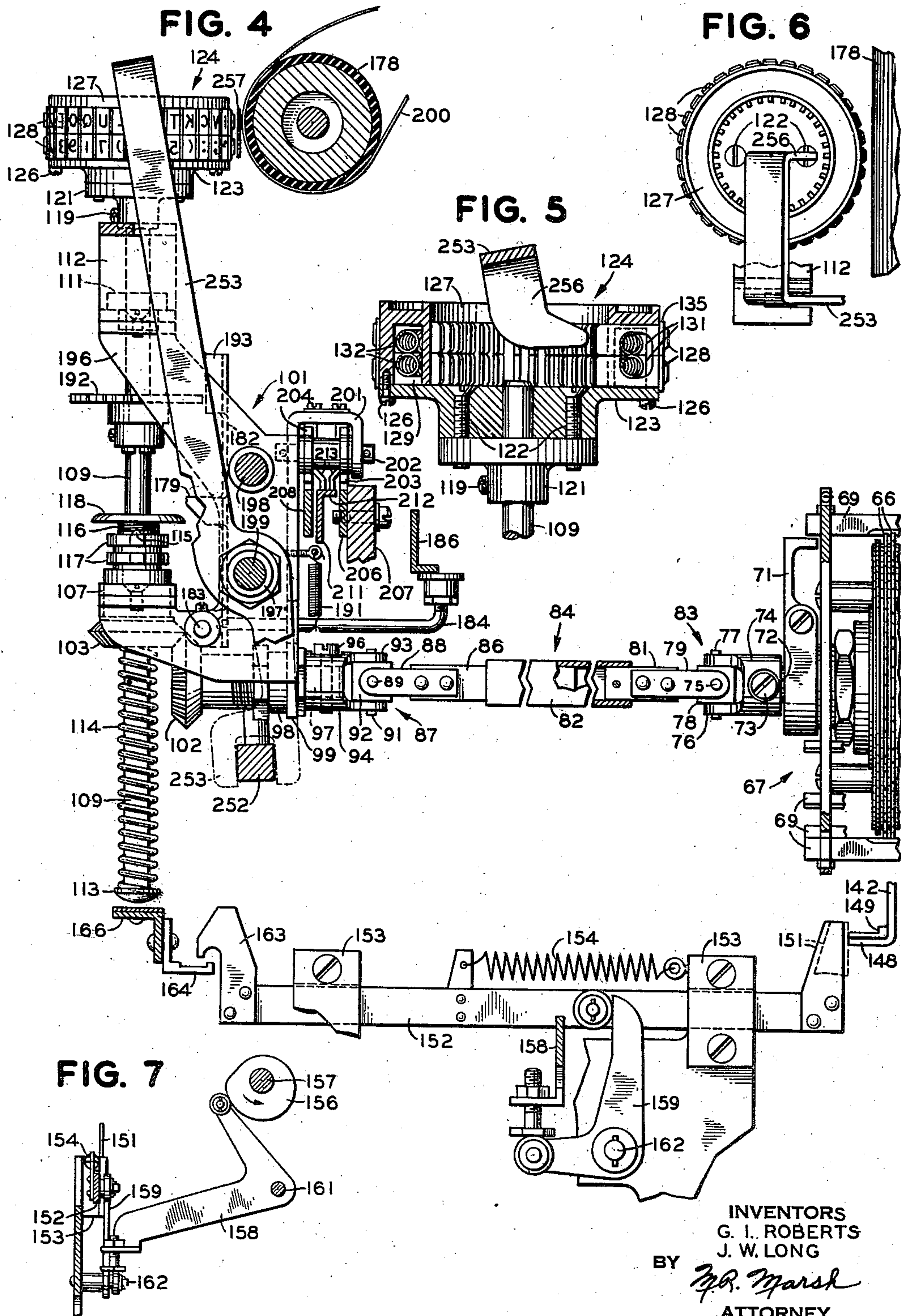
G. I. ROBERTS ET AL

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4 Sheets-Sheet 2



INVENTORS
G. I. ROBERTS
J. W. LONG
BY *W. R. Marsh*
ATTORNEY.

Jan. 12, 1943.

G. I. ROBERTS ET AL

2,308,306

PRINTING TELEGRAPH APPARATUS

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4 Sheets-Sheet 3

FIG. 8

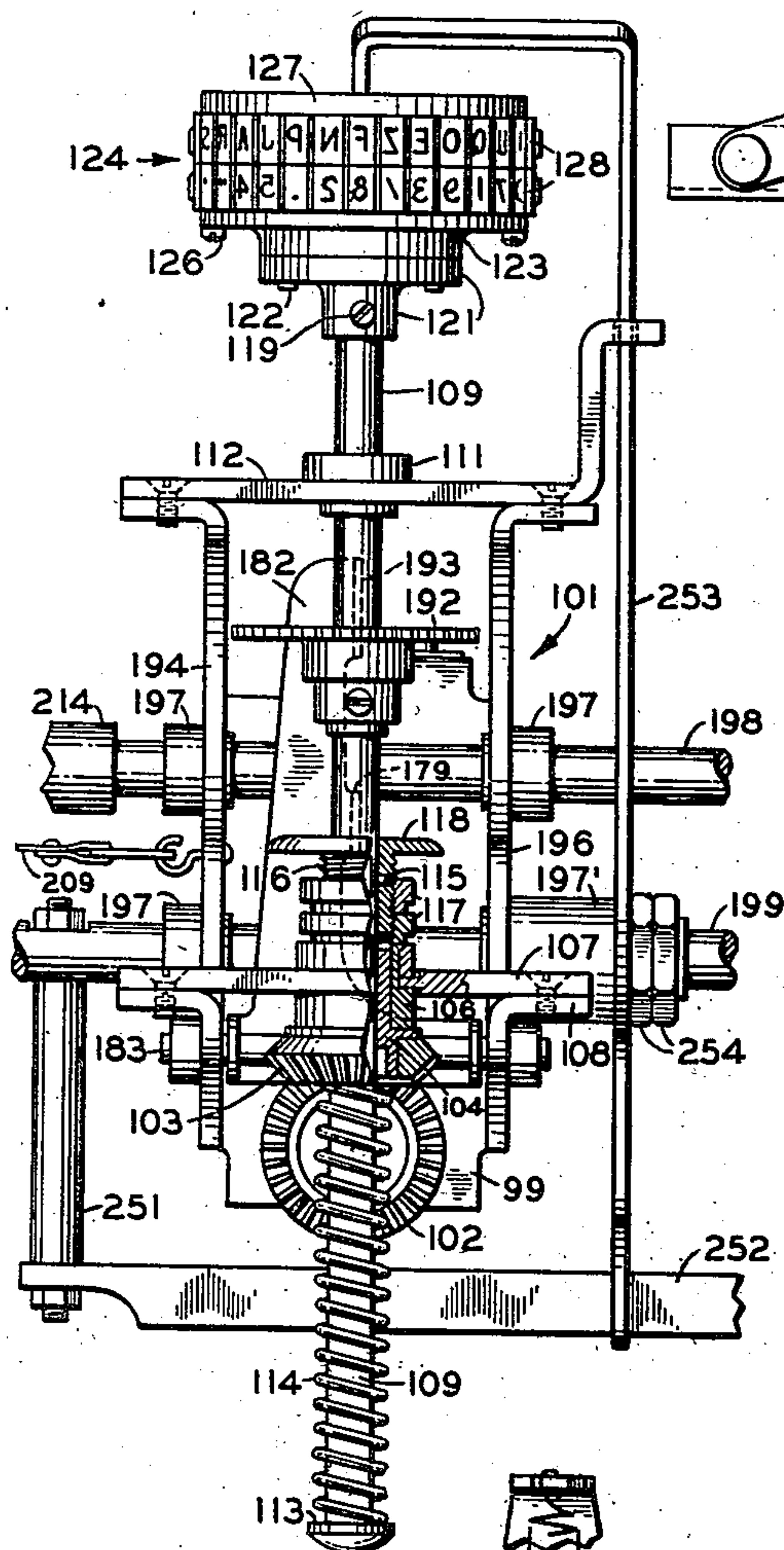
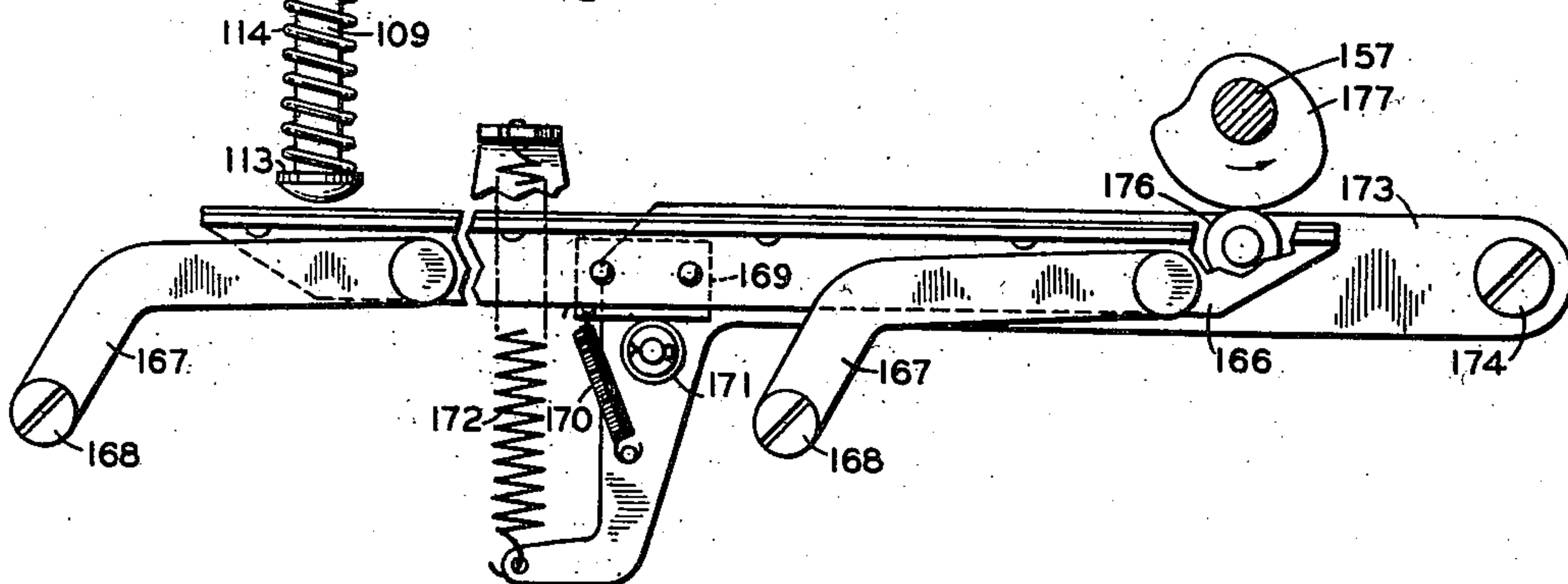
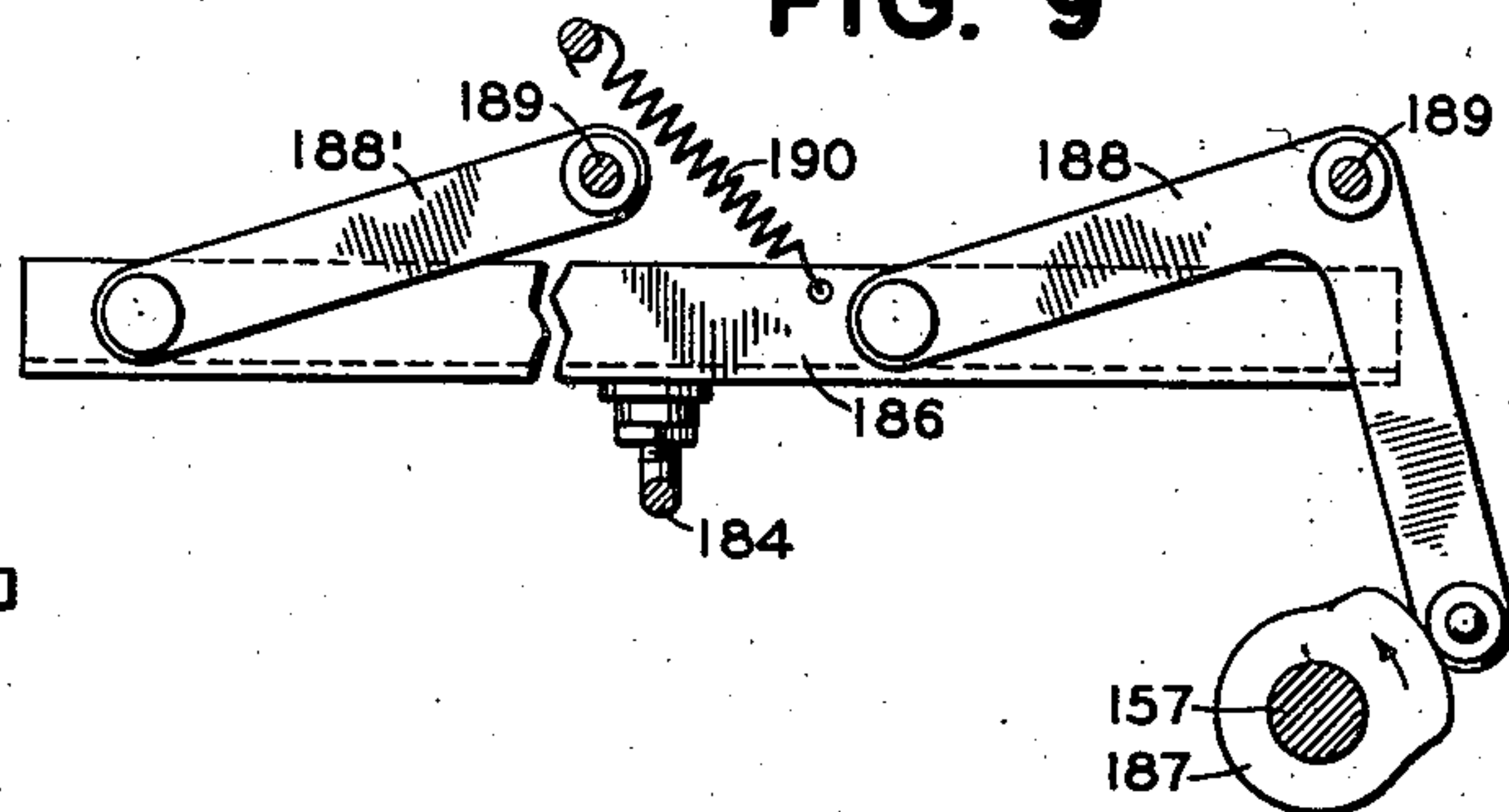


FIG. 9



INVENTORS
G. I. ROBERTS
J. W. LONG
BY *Mr. R. Marsh*
ATTORNEY

Jan. 12, 1943.

G. I. ROBERTS ET AL

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4 Sheets-Sheet 4

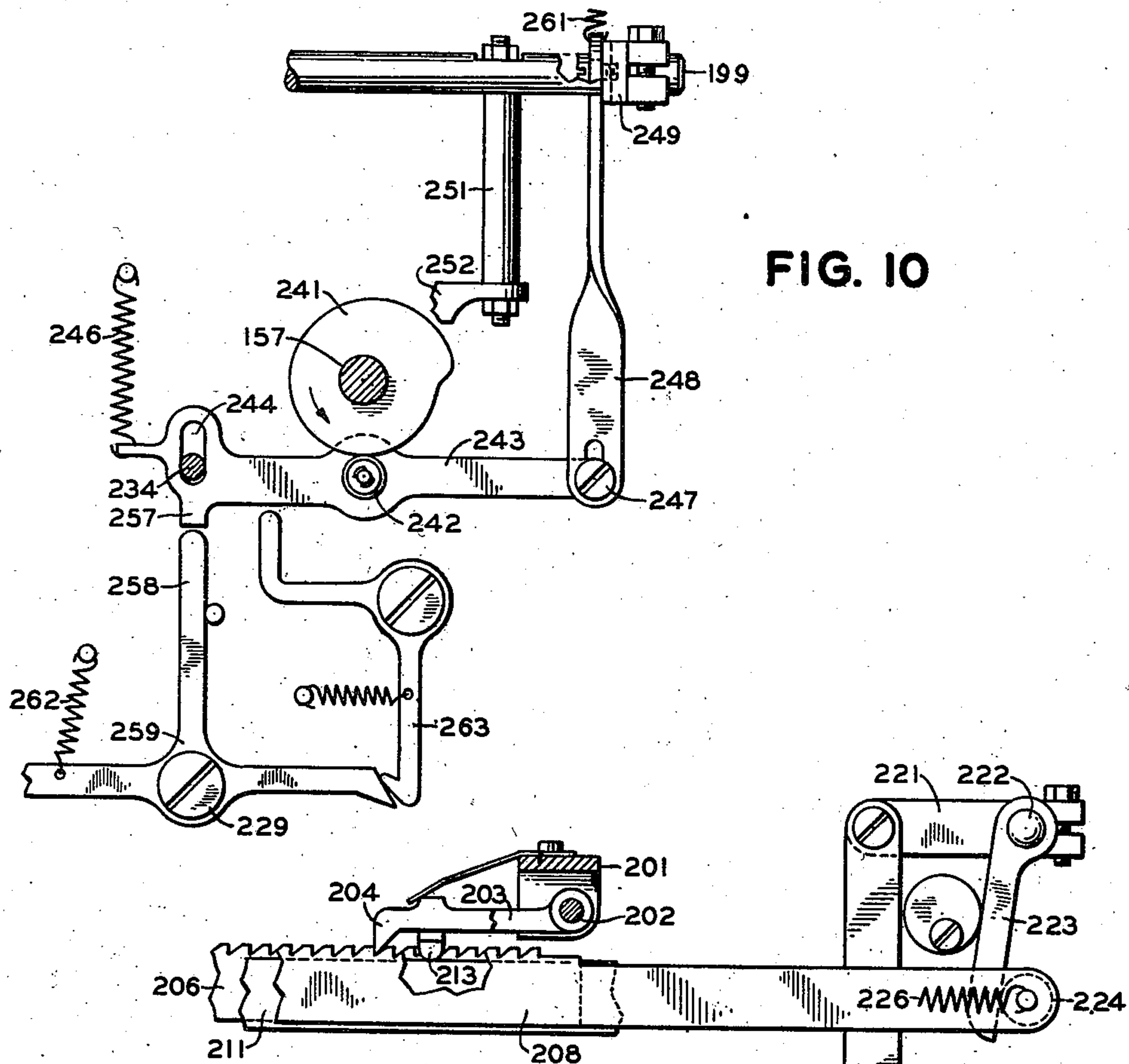
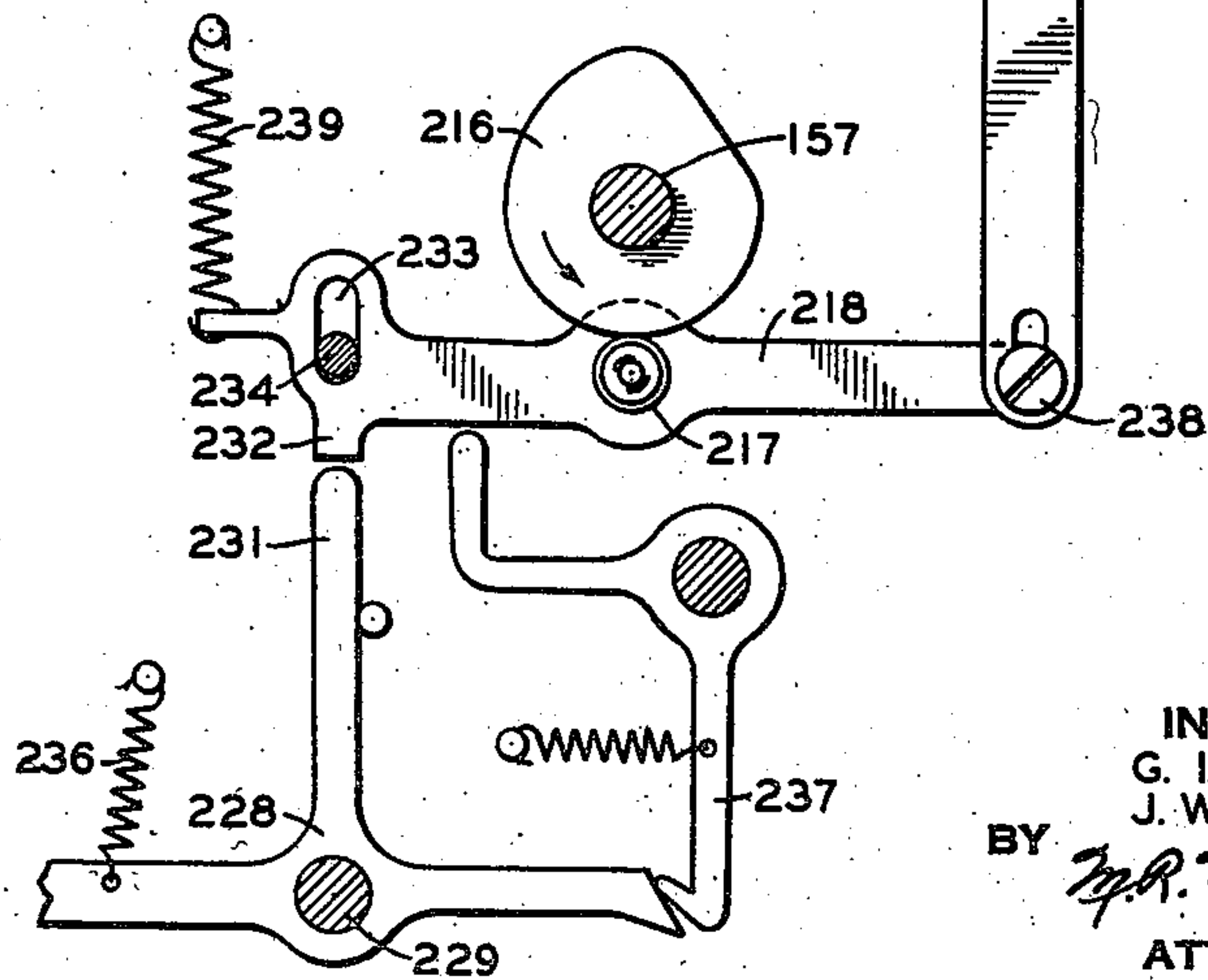


FIG. 11



INVENTORS
G. I. ROBERTS
J. W. LONG
BY *M. R. Marsh*
ATTORNEY

UNITED STATES PATENT OFFICE

2,308,306

PRINTING TELEGRAPH APPARATUS

George I. Roberts, Cresskill, and James W. Long,
Plainfield, N. J., assignors to The Western
Union Telegraph Company, New York, N. Y., a
corporation of New York

Application June 18, 1940, Serial No. 341,092

6 Claims. (Cl. 178—29)

This invention relates primarily to improvements in printing telegraph apparatus, and more particularly to improvements in what is known in the art as stationary platen page printing telegraph machines wherein the printing unit moves to and fro in front of the stationary recording web or recording medium to effect word spacing and the return of the printing unit for the beginning of a new line of print. At the completion of one line of print in such machines and prior to the beginning of a new line, preferably during the return movement of the printing unit in order to save time, the recording web is advanced in the direction of its length to bring a clean surface in operative relation to the printing unit.

The present invention as disclosed and hereinafter described is arranged to cooperate with various of the mechanisms shown and described in a copending application of J. W. Long et al. filed September 13, 1938, bearing Serial No. 229,672, now Patent No. 2,281,775, issued May 5, 1942, and although the principles of the invention are shown cooperating with this particular printer, it will be obvious that the application thereof is not limited to this particular printer as they could readily be applied to various other types of page printers. In the following description and in the drawings only as much of the apparatus and elements of the above mentioned printer are described and shown as are thought necessary for a complete understanding of the principles of the invention and for a complete understanding of all of the elements of a printing telegraph machine embodying the invention, reference may be had to the above mentioned application taken in conjunction with the following description.

As the invention has to do primarily with improvements in and the control of the printing unit, only those elements directly cooperating therewith are shown and described. The printing unit comprises in general a typewheel mounted on a shaft which is selectively rotated and stopped in a selected position corresponding to the received code group of impulses with the selected character in printing position relative to the printing platen. The typewheel shaft is disposed in the preferred embodiment in a vertical position, and the typewheel stop unit in a horizontal position, the two being connected by universal joints and telescoping connections which permit movement of the typewheel and shaft relative to the typewheel stop unit while at all times having the two directly connected. The type on the typewheel is arranged in two periph-

eral rows and to effect the printing of an element in either one of the rows the typewheel is shifted axially thereof. Although the type wheel is referred to as such, it comprises a series of individually movable type elements arranged in concentric circles and to effect the printing of a character only the selected type element is moved.

In view of the above, one of the primary objects of the invention is to provide a printing unit wherein printing is effected by the movement of a minimum number of parts, such an arrangement reducing the inertia of a printing operation giving quieter and more efficient operation.

Another object of the invention is to provide a printing unit where the movements of the typewheel are at a minimum.

Still another object of the invention is to provide a printing unit that is easily and inexpensive to manufacture, simple in construction, quiet in operation and capable of operating at a high rate of speed.

These and other objects of the invention will be more apparent when taken in conjunction with the following detailed description and the drawings, in the latter of which:

Fig. 1 is a vertical sectional view showing one set of elements in the selector mechanism;

Figs. 2 and 3 are front and right hand views, respectively, of the shift control mechanism;

Fig. 4 is a side elevational view of the typewheel and typewheel car and also shows the connections between the typewheel shaft and the shaft of the typewheel stop unit and the shift operating mechanism;

Fig. 5 is a vertical sectional view through the center of the typewheel;

Fig. 6 is a plan view of the typewheel and print lever relative to the printing platen;

Fig. 7 is a vertical sectional view of a part of the shift operating mechanism;

Fig. 8 is a front elevational view of the typewheel and the shift operating mechanism therefor;

Fig. 9 is an elevational view, partly in section, of the shift lock and typewheel locating mechanism;

Fig. 10 is a front elevational view, partly in section, of the print operating mechanism; and

Fig. 11 is a front elevational view, partly in section, of the letter spacing operating mechanism.

Referring first to Fig. 1 wherein a set of the selector elements are shown, a selector magnet 21

suitably mounted on a section of the frame 22 by screws such as 23 controls the operation thereof in a manner hereinafter pointed out. In the above mentioned printer, which operates on the start-stop or simplex principle, the normal line condition is closed and therefore the magnet 21 is normally in a energized position. The start impulse which precedes each code group of impulses is an open line condition and through mechanisms (not shown) releases the selector cam sleeve 24 for one revolution in conjunction with each code group. The selector cam sleeve 24 is frictionally driven from the selector shaft 26 and is brought to rest at the completion of each revolution in response to the rest impulse, which is a closed line condition, following each code group.

Associated with the selector magnet 21 is an armature lever 27 which is pivotally mounted at 28 and has an associated retractile spring 29 which moves the armature lever 27 to its retracted position when the magnet is deenergized. Stops 31 associated with the right hand end of the armature lever 27 limit the movement thereof in its retracted and operated positions.

For general telegraph work, start-stop type of printers usually operate in response to what is known as the 7 unit code, and in such codes there are five intelligence units or impulses which are preceded by the hereinabove mentioned start impulses or unit and followed by the rest impulse or unit, the start and stop impulses being of opposite line condition with the five intelligence impulses composed of one or the other of two line conditions in various permutations. Where there are five intelligence impulses the receiver usually has five sets of selector elements, and one such set of elements is shown in Fig. 1.

In the selector mechanism employed in the above mentioned printer the principal elements of a set of the selector elements are a selector cam 32, a selector latch 33, a selector lever 34 and a transfer lever 36. The selector latches 33 are disposed in a substantially vertical position and the upper ends thereof are horizontally bifurcated, with the openings of the bifurcations toward the left. The bifurcations 37 of the latches 33 engage a stationary horizontally extending pin 38 and pivot thereabout during certain operations of the latches and slide thereon during other operations thereof. Associated with each latch is a selector cam 32, and an individual spring 39 normally tends to keep a cam following projection 41 adjacent the center of the latch in engagement with the periphery of its associated cam 32. The springs 39 are attached to the latches 33 below the associated cams and therefore tend to pivot the latches in a counter-clockwise direction about the upper ends thereof in engagement with the pin 38.

The latches 33 are so-called floating latches and pivot or rock about either one end or the other in accordance with the character of associated received signaling impulse to unlatch associated selector levers 34 or maintain the same in latched position as hereinafter described. The speed of rotation of the cam sleeve 24 is such that the notches 42 in the cams 32 rotate into operative relation with associated cam following projections 41 during the midportion or most effective portion of respective signaling impulses, an orienting mechanism (not shown) being provided which controls the starting and stopping of the selector cam sleeve 24 with respect to the received intelligence impulses so that the notches

42 do cooperate with their associated latches in the mid-portion or most effective portion of respective signaling impulses. With the armature lever 27 in its operated position at the time a notch 42 rotates into operative relation with a cam following projection 41 on an associated latch 33, the attached spring 39 is allowed to rock or pivot the latch 33 a slight amount in a counter-clockwise direction with it pivoting about the stud 38 or until a projection 43 on the lower end thereof engages the left hand end of the armature lever 27 to be blocked thereat. At this time the projection 41 will not have entered to the full depth of the notch 42 whereupon the spring 39 then rocks or pivots the latch 33 in a clockwise direction with the projection 43 at the lower end thereof in contact with the left hand end of the armature lever 27 serving as a pivot point. This amount of clockwise rocking of the latch 33 is determined by the depth of the notch 42 in the associated selector cam 32, and during such pivoting the bifurcation 37 in the upper end slides along the stud 38. Adjacent the upper end of each latch is a latching projection 44 which cooperates with the right hand end of an associated selector lever 34 to latch the same in latched position. The selector levers 34 have adjacent the centers thereof elongated slots 46, through which extends a horizontally mounted stud 47 and springs such as 48, one individual to each selector lever 34, tend to slide the selector levers 34 toward the right and simultaneously pivot or rock the same in a counter-clockwise direction to maintain the right hand ends thereof in latching engagement with the latching projections 44 on the associated selector latches 33. Thus when the latches 33 pivot in a clockwise direction about the lower ends thereof the latching projections 44 are moved out of engagement with the right hand ends of associated selector levers 34 and permit the attached springs 48 to pivot the selector levers a slight amount in a counter-clockwise direction or until they engage spacers such as 49 on horizontal studs 51 and 51'. Accordingly, from the above description it is apparent that on the receipt of a closed line intelligence impulse, the associated selector lever 34 is unlatched and moves to an unlatched position.

The manner in which a selector latch 33 is controlled to maintain the associated selector lever 34 in its normal latched position on the receipt of open line intelligence impulses will now be described. On the receipt of an open line intelligence impulse the left hand end of the armature lever 27 assumes a position such as that shown by the dot-dash outline thereof, and in such a position is out of line with the projections 43 on the lower ends of the latches 33. With the end of the armature lever 27 in such a position, movement of the lower end of a latch is not blocked by the armature lever when the notch 42 in the associated cam 32 rotates into operation relation with the cam following projection 41 on a latch 33, and hence the latch pivots in only a counter-clockwise direction about the upper end thereof on the stud 38. As the latching projections 44 on the latches 33 are adjacent the upper ends and as there is little movement of the projections 44 when the latches pivot about their upper ends, the right hand ends of the selector levers 34 remain in latching engagement with the projections 44 during such pivoting of the latches and accordingly remain in their normal latched positions. Thus, in accordance with the receipt of open and closed line conditions, the selector

levers 34 are selectively positioned in one or the other of two positions. Following the operation of a latch 33 in accordance with the selective position of the armature lever 27, the notch 42 in the associated cam 32 rotates out of operative relation with the cam following projection 41 thereon and pivots the latch back into its normal position. The manner in which the selector levers 34 in normal or latched and operated or unlatched positions control the receiver will hereinafter be pointed out.

Each selector lever 34 has adjacent the left hand end thereof a bifurcation 52 and with a selector lever in its unlatched position the bifurcation 52 straddles a disc 53, comprising a part of the transfer cam assembly, whereas with a selector lever in its normal latched position the bifurcation 52 is above and out of operative relation with the disc 53. The operating cam assembly is indicated in general by reference numeral 54 and is rotated from a shaft 56, the cam assembly being adapted to make one revolution in conjunction with the receipt of each code group and in timed relation to the positioning of the selector levers 34. During the first part of the revolution of the cam assembly 54 a gathering cam 57 engages depending sections 58 at the right hand ends of the transfer levers 36 that happen to be in their operated or left hand positions and moves the same to the right into their normal or unoperated positions. The transfer levers 36 are guided for longitudinal movement in a horizontal plane by spacing collars such as 59 mounted on horizontally extending studs 61. Following the positioning of the transfer levers to their normal position a portion 53' of the disc 53, which is displaced toward the left, rotates into operative relation with the bifurcations 52 in the unlatched selector levers 34 and moves the same a slight amount toward the left. During such movement of the selector levers 34 the left hand ends thereof engage the right hand ends of associated ones of the transfer levers 36 to move these transfer levers from their normal to operated positions. This movement of the selector levers 34 is substantially in a horizontal plane in the direction of their length, it being permitted by virtue of the slots 46 therein and during this leftward movement the tension in the associated springs 48 is increased. While the selected ones of the selector lever 34 are in their left hand position, a resetting cam 62 comprising a part of the transfer cam assembly engages projections 63' on the selector levers to pivot the same in a clockwise direction and during this movement the bifurcations 52 are moved out of engagement with the disc 53 or displaced portion 53' thereof which permits the associated springs 48 to return the selector levers in a combined pivoting and linear movement to their normal latched position. As the left hand ends of the selector levers are elevated prior to the movement thereof toward the right, the right hand ends thereof do not engage the latching projections 44 on associated latches 33 until brought into latching engagement therewith. Accordingly the latches 33 are not disturbed on the relatching operation of the selector levers. As the gathering cam 57 and the disc cam 53 are adapted to operate directly on the transfer and selector levers, respectively, the movement of these elements are sequentially controlled and in the preferred embodiment of the selector these movements overlap one another.

Depending from each of the transfer levers 36

are arms 63 which engage radial slots 64 in associated code discs 66. The code discs 66 are mounted for rotative movement within predetermined limits in a typewheel stop unit indicated in general by reference numeral 67, Figs. 1 and 4, and have arranged around the periphery thereof a series of notches 68, the notches in each disc being different from that in each of the others. Cooperating with the notches 68 of the code discs 66 are a set of stop elements 69 which are urged toward the center of the discs by spring or resilient means (not shown) and for each combination of settings of the code discs 66 one of the stop elements 69 is allowed to enter a row of aligned notches to place the left hand thereof in the path of a stop arm 71. The stop arm 71 is fixed for rotation therewith to a frictionally driven shaft 72 extending through the center of the discs. Thus depending upon which ones of the selector levers 34 are selectively operated, corresponding ones of the discs 66 are also operated by their associated transfer levers to effect selection of one of the stop elements 69 to stop the frictionally driven typewheel stop unit shaft 72 in a selected position.

The left hand end of the typewheel stop unit shaft 72, Fig. 4, has fixed thereto for rotation therewith by means of a screw 73 a collar 74. The collar 74 has extending from the left hand section thereof arms 76 which by means of a pivot pin 77 pivotally carry a block 78. The block 78 has pivoted on opposite sides thereof by a pivot pin 75 two elements 79 which are in turn riveted to the right hand end of a short block of square cross-section 81, the left hand end of which extends into and is fixed to the right hand end of a squared tubular element 82 comprising the outer element of a telescoping connection. The elements 75 to 79 comprise a universal joint which is hereinafter referred to and indicated in general by reference numeral 83 while the telescoping connection, indicated in general by reference numeral 84, comprises the outer element 82 and an inner rod 86 of square cross-section. The left-hand end of the square rod 86 is connected to a second universal joint, indicated in general by reference numeral 87, comprising elements 88, pivot pins 89 and 91, pivot block 92 and arms 93 of a collar 94. The collar 94 is fixed by means of a screw 96 to the right hand end of a short shaft 97 which is pivotally carried in bushings 98, the bushings 98 in turn being carried in a section 99 of a typewheel car frame, indicated generally by reference numeral 101. The left hand end of the short shaft 97 has fixed thereto for rotation therewith a bevelled gear 102 which meshes with a similar gear 103, Figs. 4 and 8, to rotate the same. The bevelled gear 103 is fixed to a sleeve or bushing 104 for rotation therewith which is pivotally carried in a bushing 106. The bushing 106 is in turn supported in a horizontal plate 107 fixed to sections such as 108 of the typewheel car bracket or frame 101. The bushing sleeve 104 has a square hole broached therein and extending through the broached hole is the lower squared section of the typewheel shaft 109. The typewheel shaft 109 is disposed in a vertical position and the squared section thereof has a sliding fit in the square broached hole in sleeve 104. Thus the typewheel shaft 109 is at all times rotatable with the gear 103 but is movable in a direction of its length as hereinafter pointed out. The gears 102 and 103 have a one to one ratio and accordingly the type wheel shaft 109 rotates in synchronism with the shaft 72 of the type

wheel stop unit 67, Fig. 4. The universal joints 87 and 83, connecting the shafts 72 and 97, are so positioned that any angularity in the two universal joints 83 and 87 compensates or cancels one another and therefore the typewheel shaft 109 may be stopped in any selected position corresponding to the stopped position of the typewheel stop unit shaft 72. The telescoping connection 84, connecting the two shafts 72 and 97, permits movement of the typewheel car in a direction at right angles to the axis of the shaft of the typewheel stop unit while at the same time maintaining a positive connection between the typewheel shaft 109 and the stop unit shaft 72. The movement of the typewheel car unit relative to the typewheel stop unit will hereinafter be described in connection with various other functions of the telegraph receiver.

The upper portion of the typewheel shaft 109 is circular in cross section and is journaled in a bushing 111, which in turn is supported in a member 112 fixed to the typewheel car frame 101. At the lower end of the typewheel shaft 109 is a cap 113 and coiled about the shaft and extending between the cap 113 and the beveled gear 103 is a compression spring 114. The compression spring 114 tends to slide the typewheel shaft 109 downward in the direction of the axis thereof and normally maintains adjustable nuts 117 threaded on a flanged sleeve 116 against the upper part of the bushing 106 carried in the member 107 of the typewheel car frame 101. The flanged sleeve 116 is fixed in position on the round part of the typewheel shaft 109 by a pin 115, and the nuts 117 engaging the bushing 106 determine the lower position of the typewheel shaft. The radially extending flange 118 of the sleeve 116 cooperates with an element hereinafter described to latch the typewheel shaft and its associated elements in an elevated position following the elevation thereof as controlled by the shift mechanism.

Attached to the upper end of the typewheel shaft 109 by a screw 119 is a flanged collar 121, Figs. 4 and 5. The flanged collar 121 has attached thereto by screws such as 122 a circular plate 123 which comprises the lower part of the typewheel. As hereinabove stated the typewheel comprises a series of individually movable elements or type slugs, and the composite typewheel is indicated in general and referred to hereinafter by reference numeral 124. Attached to the upper side or face of the disc 123 by screws such as 126 is a collar 127, Fig. 5, which has a series of radial slots therein and disposed in each slot are two individual type elements or slugs such as 128. Also formed in the collar 127 is a circular groove 129, and the type slugs extending through the radial slots in the collar pass through the circular groove 129. Each type slug has an opening 131 adjacent the center thereof, and in these openings are radially contractable circular coiled springs 132. The type slugs 128 are arranged in two rings in the collar 127, and each ring has an associated spring 132. The springs 132 tend to slide the type slugs 128 toward the center of the collar 127, the slugs being slidably carried in the radial slots, to hold shoulders such as 135 on the outer ends of the type slugs against the periphery of the collar 127. Thus the springs 132 hold the type slugs in their normal retracted positions and prevent the same from being thrown out of the collar 127 due to centrifugal force as the typewheel 124 revolves. To effect printing of a selected type ele-

ment, the typewheel is rotated to bring the selected element into operative alignment with the end of a print lever which is subsequently operated to move the selected element axially away from the center of the typewheel into engagement with the recording web supported by a platen. The printing operation will be described in more detail hereinafter in conjunction with various other functions.

As hereinbefore stated the typewheel comprises two circular rows of type elements and to effect the printing of an element in either one or the other of these two rows, the typewheel shaft 109 and attached elements are elevated and depressed in response to shift and unshift signals, respectively. As is the general practice in the art, the shift and unshift signals comprise code groups which condition the printer so that following code groups are recorded in either upper or lower case depending upon the preceding case shift signal. The shift and unshift functions along with various others are controlled by a set of so-called pivot levers indicated generally by reference numeral 133, Figs. 1 and 2, and the shift and unshift pivot levers specifically by reference numerals 133a and 133b respectively. The pivot levers 133 are pivotally mounted adjacent their right hand ends on pivots 136 as shown in Fig. 3 and cooperate with notches such as 137 arranged on the upper and lower sides of the transfer levers 36. On the transfer of certain combinations of settings of the selector levers 34 to the transfer levers 36 the notches 137 therein are arranged to allow predetermined of the pivot levers 133 to enter an aligned row of notches, the pivot levers being biased to an operated position by associated springs such as 138.

Associated with the shift and unshift pivot levers 133a and 133b are individual push rods 139 which are pivotally carried adjacent their lower ends in arms 141, Fig. 2, of a member 142. The member 142 is pivoted adjacent its center on a horizontal stud 143 and is rocked between predetermined limits by the selection of one or the other of the pivot levers 133a and 133b. With the member 142 in a position shown in Fig. 2 the selection of the pivot lever 133a by entering a row of aligned notches in the transfer bars 36 pushes down on the push rod 139 to rock the member 142 in a counter-clockwise direction. This movement of the member 142 elevates the push rod 139 associated with the pivot lever 133b where it can be operated in a downward direction by the subsequent selection of the pivot lever 133b. A spring biased jockey roller 145 cooperates with the end of the upwardly extending arm 144 of the member 142 to bias the same into either one or the other of its two operated positions while a bracket 146 with extensions 147 thereon limit the movement of the member 142. Thus a selection of either one of the pivot levers 133a or 133b rocks the member 142 from one position to the other. The depending arm of the member 142 has at its lower end a horizontally extending section comprising two blocking surfaces, a finger 148 and a shoulder 149. In one of the two above described operated positions of the member 142 the end of the finger 148 is in line with a foot 151 while in the other position the shoulder 149 is in alignment therewith. For each cycle of operation of the receiver the foot 151 moves horizontally toward the member 142 and the position of the latter determines whether the foot engages the end of the finger 148 or the shoulder 149 to thereby control the amount of

movement of the foot 151 which in turn controls as hereinafter pointed out the printing of or the movement of a type slug in the upper or lower ring of the typewheel 124.

The foot 151 is attached to the right hand end of a horizontal slide bar 152, best shown in Fig. 4, which is mounted in elements 153 for horizontal movement. A spring 154, attached to the slide bar 152 tends to slide the same toward the right, while the movement toward the right and the return thereof is controlled by a cam 156 rotated from a shaft 157, Fig. 7, through two bell cranks 158 and 159 pivoted at 161 and 162 respectively. The cam 156 makes one revolution for each cycle of operation of the receiver and consequently the slide bar 152 is permitted to slide toward the right once for each cycle. The amount or distance that the spring 154 moves the slide bar 152 toward the right is determined, as hereinbefore pointed out, by the position of the member 142. At the left hand end of the slide bar 152 is a hook shaped member 163 which is adapted to cooperate with an angle bracket 164 attached to the right hand side of an elevator bar 166. The elevator bar 166, Figs. 4 and 8, extends horizontally a slight amount below the lower end of the cap 113 on the typewheel shaft 109 and has attached thereto two similar pivoting arms 167, which in turn are pivotally mounted on shoulder screws 168 supported from the printer frame. The arms 167 are similar and therefore the elevator bar 166, as hereinafter pointed out, remains horizontal during movement thereof. The movement of the elevator bar 166 is effected through a set of elements comprising a bracket 169, a roller 171, a spring 172 and a lever 173. The bracket 169 is attached to the rear side of the elevator bar 166 as shown in Fig. 8 and the roller 171 adjacent the free end of the lever 173 engages the underside of the bracket 169. A spring 170 holds the bracket 169 down on the roller 171. The lever 173 is pivoted adjacent its right hand end on a shoulder screw 174 and has a cam follower 176 adjacent the center thereof which cooperates with the periphery of a cam 177 on the shaft 157. The cam 177 makes one revolution in conjunction with each cycle of operation, the same as cam 156, and in so doing permits the lever 173 to be pivoted in a clockwise direction by the spring 172. During such movement of the lever 173 the roller 171 thereon engaging the bracket 169 raises the elevator bar 166. The elevator bar 166 in raising engages the cap 113 at the lower end of the typewheel shaft 109 to raise the same and after raising the typewheel shaft is latched in an elevated position by means hereinafter described. As the cam 177 completes its revolution the lever 173 is pivoted in a counter-clockwise direction against the action of the spring 172 to return the elevator bar 166 and associated elements to their normal position.

The cam 177 is such that on a revolution thereof the lever 173 is pivoted an amount sufficient to raise the elevator bar 166, if movement thereof is not blocked in a manner hereinafter pointed out, to place the lowermost ring of slugs 128 in the typewheel in alignment with the platen 178. However, when the movement of the slide bar 152 is blocked by the finger 148 the hooked member 163 on the left hand end thereof is in operative relation with the bracket 164 on the elevator bar 166 to prevent any appreciable amount of elevating thereof. Hence the typewheel shaft remains in its lowered posi-

tion with the upper ring of type slugs in printing position relative to the printing platen 178. Thus the position of the member 142 determines the amount of movement toward the right of the slide bar 152, which in turn controls the amount of elevation of the typewheel shaft 109.

When the typewheel shaft is elevated to bring the lower ring of type slugs 128 in alignment with the platen 178, it is latched in its elevated position by a latching projection 179, Fig. 4, cooperating with the underside of the flange 118 on the collar 116. The latching projection 179 extends horizontally from an upwardly extending arm 182 which is pivotally mounted on a pin 183 carried in the typewheel car frame 101. The arm 182 is operated by a horizontally extending rod 184 forming a part thereof, the free end of which cooperates with a bar 186. The bar 186, Figs. 4 and 9, extends in a horizontal direction and is arranged to move upward once for each cycle of operation of the elevator bar 166 as controlled from a cam 187 which rotates from the shaft 157. The bar 186 has two similar pivoting arms 188 and 188' in fixed pivots 189 attached thereto so that it remains horizontal on movement thereof. As the bar 186 moves in an upward direction under the action of a spring 190, another spring 191, Fig. 4, attached to the arm 184 causes the arm 182 to pivot a slight amount in a counter-clockwise direction to place the latching projection 179 beneath the flange 118. Therefore as the elevator bar 166 is subsequently returned to its normal position the typewheel shaft 109 will be latched in its upper position. Following the printing operation, which will hereinafter be described, the bar 186 is returned to its normal position to withdraw the latching projection 179 from engagement with the flange 118 whereupon due to the spring 114 and the weight of the type wheel shaft it returns to its normal lower position. The latching projection 179 is operated following each printing operation and therefore whenever the typewheel shaft is elevated, it is returned to its normal position following each of such cycles of operation. Thus it is obvious that during the recording of so-called shift characters, the typewheel is not retained in its elevated position but is returned to its lower normal position following the recording of each character. This gives better visibility to the printed record on the printing platen 178 than could be obtained if the typewheel was latched in its upper position during the recording of a series of lower case characters.

Clamped to the typewheel shaft adjacent the center thereof is a locating disc 192 which has formed therein a series of radial slots, one for each pair of type slugs in the typewheel. A knife 193 at the upper end of the arm 182 cooperates with the radial slots of the disc 192 to lock the typewheel shaft in its rotated position during the time of printing and thus corrects any play or looseness in the joints or connections employed to rotate the typewheel shaft.

The typewheel unit comprising the typewheel and shaft 124 and 109 respectively, the typewheel car frame 101, and associated elements, is movable to and fro in a horizontal direction in front of the printing platen 178 to effect letter spacing and the return of the typewheel unit for the beginning of a new line of print. The typewheel car frame 101 has two vertical web sections 194 and 196, Fig. 8, in which are located a set of four bushings such as 197. Extending through

the bushings 197 are two horizontal rods 198 and 199 which guide the movement of the typewheel unit. The rods 198 and 199 are supported from the printer frame and the lower guide rod 199 through mechanisms hereinafter described is operated to effect the printing function.

A projection, Figs. 4 and 11, extending from the rear of the typewheel car frame 101 supports a horizontal pin 202. Upon the pin 202 is pivoted two pawls, a retaining pawl 203 and an operating pawl 204. The retaining pawl 203 cooperates with teeth on the upper edge of a stationary rack 206 supported from a section 207 of the frame while the operating pawl 204 cooperates with the teeth of an oscillating rack 208 to advance the typewheel car unit. When the movable rack 208 is moved longitudinally toward the right, as shown in Fig. 11, by elements hereinafter described, a tooth thereon engages the end of the pawl 204 to move the typewheel car unit toward the right, whereupon the retaining pawl 203 engages a tooth in the stationary rack 206 to hold the typewheel car unit stationary while the rack 208 is returned to its left hand position. Thus the typewheel car unit is advanced a distance equal to one letter space on each oscillation or movement of the movable rack 208. A flexible member 209 attached to the left hand side of the typewheel car frame, as shown in Fig. 8, is connected to a typewheel car returned spring drum (not shown) which biases the typewheel car toward the left, and the movement of the typewheel car unit toward the right tensions the return biasing means. To effect return movement of the typewheel car unit for the beginning of a new line of print to its position at the left hand edge of the recording web 200 and platen 173, the pawls 203 and 204 are disengaged from their associated racks 206 and 208 respectively. The disengagement of the pawls from their associated racks is effected by an elongated bar 211 extending between the racks and having a surface 212 engageable with arms such as 213 on the pawls 203 and 204. The elevation of the elongated bar 211, it being elevated in response to a carriage return function by means (not shown) lifts the ends of the pawls from engagement with the teeth of the racks 206 and 208, whereupon the carriage return means is effective to return the carriage to its left hand position. The left hand position of the carriage or typewheel car unit is determined by a collar 214 fixed to the rod 198 adjacent the left hand end thereof and the engagement of one of the bushings 197 therewith stops movement of the typewheel car unit toward the left.

The movement of the movable rack 208 is controlled by a cam 216, Fig. 11, on the shaft 157 and is arranged to make one revolution in conjunction with each received code group. A cam following roller 217 pivotally mounted adjacent the center of a substantially horizontal so-called feed lever 218 is in operative relation with the periphery of the cam 216, and on each revolution of the cam the lever 218 is normally pivoted or oscillated, in a clockwise direction with the left hand end serving as a pivot point. Attached to the right hand end of the lever 218 is a link 219, the upper end of which cooperates with an arm 221 fixed to a horizontal rod 222. At the front end of the rod 222 is a depending arm 223, the lower end of which cooperates with a roller 224 on the right-hand end of the movable rack 208. As the right hand end of the lever 218 moves downward, the rod 222 through the link

219 and arm 221 is rocked in a counter-clockwise direction, whereupon the arm 223 thereon engages the roller 224 to move the rack 208 to the right. A spring 226 has right hand end thereof attached to the rack 208 and moves the same to the left and the above mentioned arms 223 and 221, the link 219, and the lever 218 back to their normal positions as the hump of the cam 216 rotates out of operative relation with the follower 217. Thus for each revolution of the cam 216 the rack 208 is normally oscillated to advance the typewheel car unit a distance equal to one letter space in conjunction with each received code combination.

In conjunction with the receipt of predetermined signals such as the shift and unshift signals, it is desirable not to advance the typewheel car unit for such signals. The blocking out of the typewheel car feed function is accomplished by a selectively operable lever 228 pivotally mounted on a fixed pivot 229. In the normal position of the lever 228 as shown in Fig. 11, the end of the upwardly extending arm 231 thereof is directly beneath a projection 232 adjacent the left hand end of the lever 218. The left hand end of the lever 218 has a vertical slot 233 therein, which engages a stationary horizontal pin 234, and with the lever 228 in its normal position, the slot 233 permits the left hand end of the lever 218 to move in a downward direction only a slight amount before the said left hand end of the lever 218 is blocked by the projection 232 thereon engaging the upper end of the arm 231, whereupon the lever 218 pivots to oscillate the rack 208 as hereinbefore pointed out. However, when the lever 228 is pivoted in a counter-clockwise direction against the action of its attached spring 236 by selectively operable means (not shown) which may be controlled by the pivot levers 133, Figs. 1 to 3, and latched in an operative position by a spring biased latch 237, the upper end of the arm 231 is no longer beneath the projection 232 on the left hand end of the lever 218. With the lever 228 in this position, which is so positioned prior to the engagement of the hump of the cam 216 with its associated follower 217, the movement of the left hand end of the lever 218 in a downward direction is not blocked. Therefore, as the hump of the cam 216 engages the roller 217, the lever 218 is pivoted in a counter-clockwise direction with the shoulder screw 233 connecting the right hand end thereof to the link 219 serving as a pivot point. The slot 233 in the left hand end of the lever 218 permits this pivoting about the right hand end thereof, and during such pivoting there is no appreciable movement of the link 219 and attached elements, and the rack 208 remains substantially stationary. The strength of a spring 239 attached to the left hand end of the lever 218 relative to the strength of the spring 226 is such that the lever 218 will pivot about its right hand end when the movement of the left hand end is not blocked by the arm 231 of the lever 228. Thus for each cycle of operation that the lever 228 is selectively operated away from its normal position, a feed operation of the typewheel car unit is not performed. On the pivoting of the lever 218 about its right hand end, the latch 237 is operated to unlatch the lever 228 to allow its attached spring 236 to return the same to its normal position so that in conjunction with the subsequent signal the rack 208 will be oscillated to advance the typewheel car unit in a manner hereinbefore pointed out, pro-

vided the lever 228 is not again selectively operated for the succeeding signal group.

The printing function is controlled by a print cam 241, Fig. 10, rotated from the shaft 157 and arranged to make one revolution in conjunction with each received code group of impulses. The printing operation occurs preferably following the typewheel car unit feed operation and in timed relation therewith as determined by the projections of the respective cams. Cooperating with the periphery of the print cam 241 is a cam follower 242 pivotally mounted adjacent the center of a print lever 243. The print lever 243 has in its left hand end a vertical slot 244 which engages the fixed horizontal pin 234 in the same manner as the feed lever 218. A spring 246 attached to the print lever 243 holds the follower 242 in engagement with the cam 241. A shoulder screw 247 at the right hand end of the print lever 243 connects the lower end of a link 248 thereto, the upper end of which is pivotally attached to the free end of an arm 249 clamped for movement therewith and extending substantially horizontally from the right hand end of the typewheel car unit guide rod 199. The guide rod 199 is pivotally supported in the printer frame and has adjacent the ends thereof radially extending rods 251, Figs. 8 and 10, which in turn support in the lower ends thereof a squared print bail 252. The bushing 197' in the typewheel car frame 101 has a shoulder formed thereon, and pivotally mounted on the shoulder is a print lever 253. Nuts 254 on the bushing 197' hold the print lever 253 on the bushing. The lower end of the print lever 253 is bifurcated as shown in the dot-dashed outline thereof in Fig. 4, and engages the squared rod 252. The upper end of the print lever 253 is bent toward the left, as shown in Fig. 8, and has a depending section or foot 256 thereon, which extends down into the inside of the typewheel 124.

On a normal printing operation the hump of the print cam 241 in rotating into operative relation with the associated follower 242, Fig. 10, pivots the print lever 243 first a slight amount in a counter-clockwise direction about the shoulder screw 247 in the right hand end thereof or until a projection 257 at the left hand end thereof engages the upper end of a vertical arm 258 of a print block-out or defeating lever 259. As the projection 257 engages the upper end of the arm 258, further downward movement of the follower 242 on the lever 243 causes the said lever to pivot in a clockwise direction about the left hand end thereof to move the link 248 downward and tension a spring 261 attached to the upper end thereof. The downward movement of the link 248 through the arm 249 causes the guide rod 199 to pivot in a clockwise direction, as shown in Fig. 4. This pivoting of the rod 199 moves the squared rod 252 toward the left, as shown in Fig. 4, causing the print lever 253 to pivot about the bushing 197' in a clockwise direction. As the print lever 253 pivots, the end of the foot 256 at the upper end thereof is brought into engagement with the inner end of the particular type slug 128 which happens to be in operative alignment therewith to force this particular selected slug outwardly to press the inking ribbon 257 against the recording paper 200 and platen 178. The selected slug 128 is lined up with the end of the foot 256, as hereinbefore pointed out, under the control of the typewheel stop unit 67, and the shift control mechanisms described and shown in Figs. 2 and 3, the stop unit 67 rotatively positioning the typewheel while the shift control

mechanisms determine which one of the two type slugs in a radial slot of the collar 127, Fig. 5, will be actuated on the operation of the print lever 253.

The hump of the print cam 241 rotating out of operative relation with the follower 242 permits the lever 243 and its operated elements to be returned by the springs 246 and 261 to their normal positions, where they are in position to be again operated in conjunction with another or following print functions.

The print lever 253 is guided adjacent its upper end by a slot formed in an extension of the member 112 at the right hand end thereof. As the print lever 253 is the only element on the typewheel unit that is movable therewith and that is actuated independently thereof to perform a print operation, it is obvious that the weight and elements on the typewheel car unit can be kept at a minimum. A further advantage of the above arrangement is effected in that the typewheel shaft and its attached elements move only in two directions, i. e. horizontally in a letter spacing direction and vertically to select one of the two rows of type slugs. Furthermore, the arrangement of having a typewheel composed of individually movable slugs has practically all the advantages of a type bar printer or a typewheel printer and none of the disadvantages thereof. By keeping the weight of the typewheel car unit at a minimum, the return thereof to the beginning of a new line of print may be effected in a short interval of time without excessive shock and noise, the rapid returning of the typewheel car unit lending itself admirably to the employment of automatic carriage return, the automatic carriage return, as well known in the art, being the return of the typewheel carriage or typewheel car unit to its initial left hand position automatically and not of necessity requiring a separate typewheel car or carriage return signal.

In conjunction with the receipt of certain signals, the printing operation is blocked out and this is accomplished by the print block-out lever 259, Fig. 10. When it is desired to block out the print operation, the lever 259 is pivoted in a counterclockwise direction against the action of its attached retractile spring 262 to remove the upper end of the arm 258 thereof from out of operative relation with the projection 257 on the left hand end of the lever 243. This operation of the lever 259 is performed in conjunction with the receipt of the predetermined signals by means (not shown) prior to the engagement of the roller 242 with the hump of the print cam 241. Accordingly, when the hump of the print cam subsequently engages the follower 242, the lever 243 pivots idly about the shoulder screw 247 in the right hand end and the elements attached to the right hand end remain in their normal unoperated positions. The strength of the springs 246 and 261 relative to one another is such as to permit the pivoting of the lever 243 about its right hand end when movement of the left hand end is not blocked by the end of the arm 258 of the block-out lever 59. A spring biased latch 263 latches the block-out lever 259 in its operated position and is tripped when the lever 243 is subsequently operated to allow the lever 259 to return to its normal position.

It is obvious, of course, that various modifications of the invention as shown and described herein may be made without departing from the spirit or essential attributes thereof, and it is desired therefore that only such limitations be

placed thereon as are imposed by the prior art or are specifically set forth in the appended claims.

What is claimed is:

1. In a telegraph receiver, a typewheel adapted to cooperate with a platen, the axis of said typewheel being substantially at right angles to the axis of said platen, said typewheel being movable to and fro in a direction substantially parallel to the axis of said platen and comprising a plurality of individually and collectively movable type elements arranged in a plurality of rings, said rings being concentric with the axis of said typewheel, means for moving said typewheel axially to place any one of said rings of type elements at a time in printing relation with said platen, a fixed typewheel rotative positioning means, telescoping means interconnecting said last mentioned means and said typewheel during all movements thereof and means for actuating an individual one of said type elements radially of said typewheel as selected by the rotative and axial movement of said typewheel under the control of said axial and rotative positioning means to effect recording thereof on said platen.

2. In a page printing telegraph receiver, a recording platen, a rotatable typewheel comprising a plurality of individually movable type elements, said typewheel being movable to and fro relative to said platen to effect letter spacing and return of said typewheel to the beginning of a new line of print, a fixed permutation selector mechanism comprising a set of selectively movable elements cooperable with a set of notched elements for selectively controlling the rotative position of said typewheel, elongatable means connecting said fixed selector mechanism and said movable type wheel to control the same in accordance with the operation of said selector mechanism, a print hammer movable to and fro with said typewheel and means operative following the selective positioning of said typewheel to actuate said print hammer to individually operate the selected type element to effect a recording operation thereof on said recording platen.

3. In a page printing telegraph machine, a printing platen, a plurality of concentric rings of individually movable type elements with any one of the elements of one of said rings normally in printing relation with said platen, a permutation selector mechanism comprising a set of selectors selectively controlled by received code groups of impulses, a telescoping connection between said typewheel and said selector mechanism, means including said telescoping connection and said selectors for determining the axial and rotative movement of said rings of type elements to place a selected one of said elements in printing position relative to said platen, means for moving said rings of elements collectively as controlled by said last mentioned means and means operative thereafter for moving only the selected one of said elements relative to said platen to effect a recording operation thereof on said platen.

4. In a page printing telegraph machine, a printing platen, a typewheel having a plurality of concentric rings each of which comprises a

plurality of independently and radially movable type elements, said typewheel being axially and rotatively movable and having a normal position with any one of the elements of one of said rings in printing relation with said platen, a permutation selector mechanism, means including said selector mechanism as controlled jointly by predetermined preselecting code groups of impulses and succeeding selecting code groups of impulses for selecting a type element in said typewheel, means operative concomitantly with each succeeding selecting code group of impulses for axially and rotatively moving said typewheel as determined by said last mentioned means and means operative thereafter for actuating only the selected one of said type elements to record the same on said platen.

5. In combination, in a page printing telegraph receiver, a typewheel shaft stop unit with the shaft thereof disposed in a substantially horizontal position, a typewheel shaft disposed in a substantially vertical position with a typewheel thereon comprising a plurality of concentric rings of individual type elements, a printing platen, means for selectively moving said typewheel shaft in a vertical direction to bring any one of said rings of type elements at a time in operative relation with said platen, means for moving said typewheel shaft in a direction at right angles to the axis thereof and at right angles to the axis of said typewheel shaft stop unit to effect letter spacing, telescoping means connecting said typewheel shaft to said stop unit shaft during all movements of said typewheel shaft, means for selectively rotating said typewheel and means following the selective movements of said typewheel to actuate a single one of said type elements to effect recording thereof on said platen.

6. In a page printing telegraph machine, a printing platen, a set of type elements, a type element operating member associated with said elements, said type elements and operating member being movable along said printing platen to effect letter spacing and return thereof for the beginning of a new line of print, a selector mechanism comprising a set of selectors selectively positioned in accordance with received permutation code groups, a first means controlled by said selectors in response to received predetermined pre-selecting code groups for determining the movement of said type elements in a first selecting direction, a second means controlled by said selectors in response to received code groups following said predetermined pre-selecting groups for determining the movement of said type elements in a second selecting direction, means for moving said type elements as determined by said first and second selector controlled means to place an individual element in operative relation with said type element operating member, and means thereafter operative to actuate said operating member to move the selected type element in operative relation therewith to effect recording of the same on said platen.

GEORGE I. ROBERTS.
JAMES W. LONG.