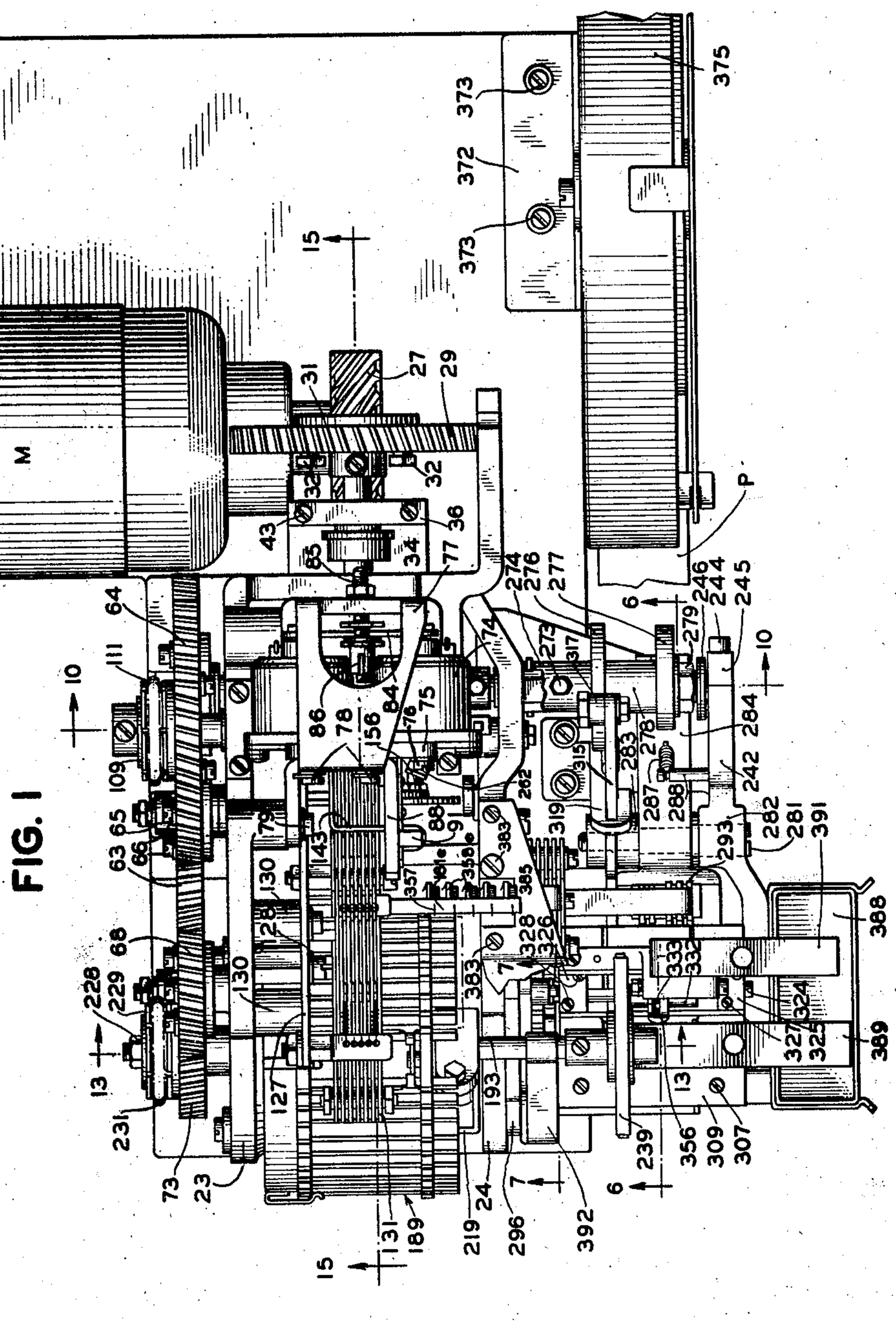
Oct. 3, 1939. R. F. DIRKES ET AL 2,174,731

COMBINED TELEGRAPH PRINTER AND PERFORATOR

Original Filed Sept. 28, 1935 7 Sheets-Sheet 1

FIG. 1



INVENTORS
R.F. DIRKES
E.R. WHEELER

BY Eugene C. Brown

ATTORNEY

Oct. 3, 1939. R. F. DIRKES ET AL 2,174,731

COMBINED TELEGRAPH PRINTER AND PERFORATOR

Original Filed Sept. 28, 1935 7 Sheets-Sheet 2

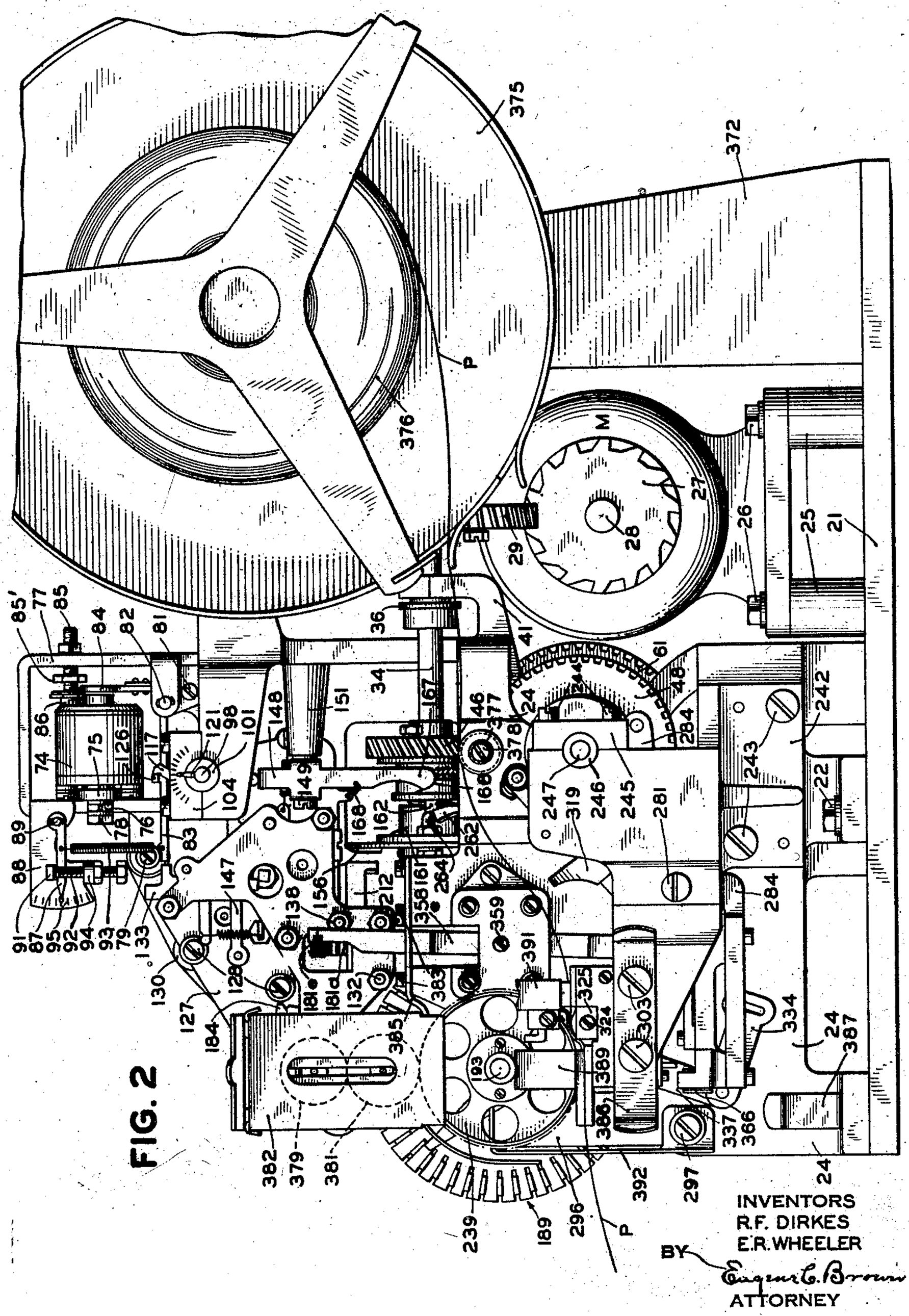


FIG. 2

INVENTORS
R.F. DIRKES
E.R.WHEELER
BY Eugene C. Brown
ATTORNEY

Oct. 3, 1939. R. F. DIRKES ET AL 2,174,731

COMBINED TELEGRAPH PRINTER AND PERFORATOR

Original Filed Sept. 28, 1935 7 Sheets-Sheet 3

FIG. 3

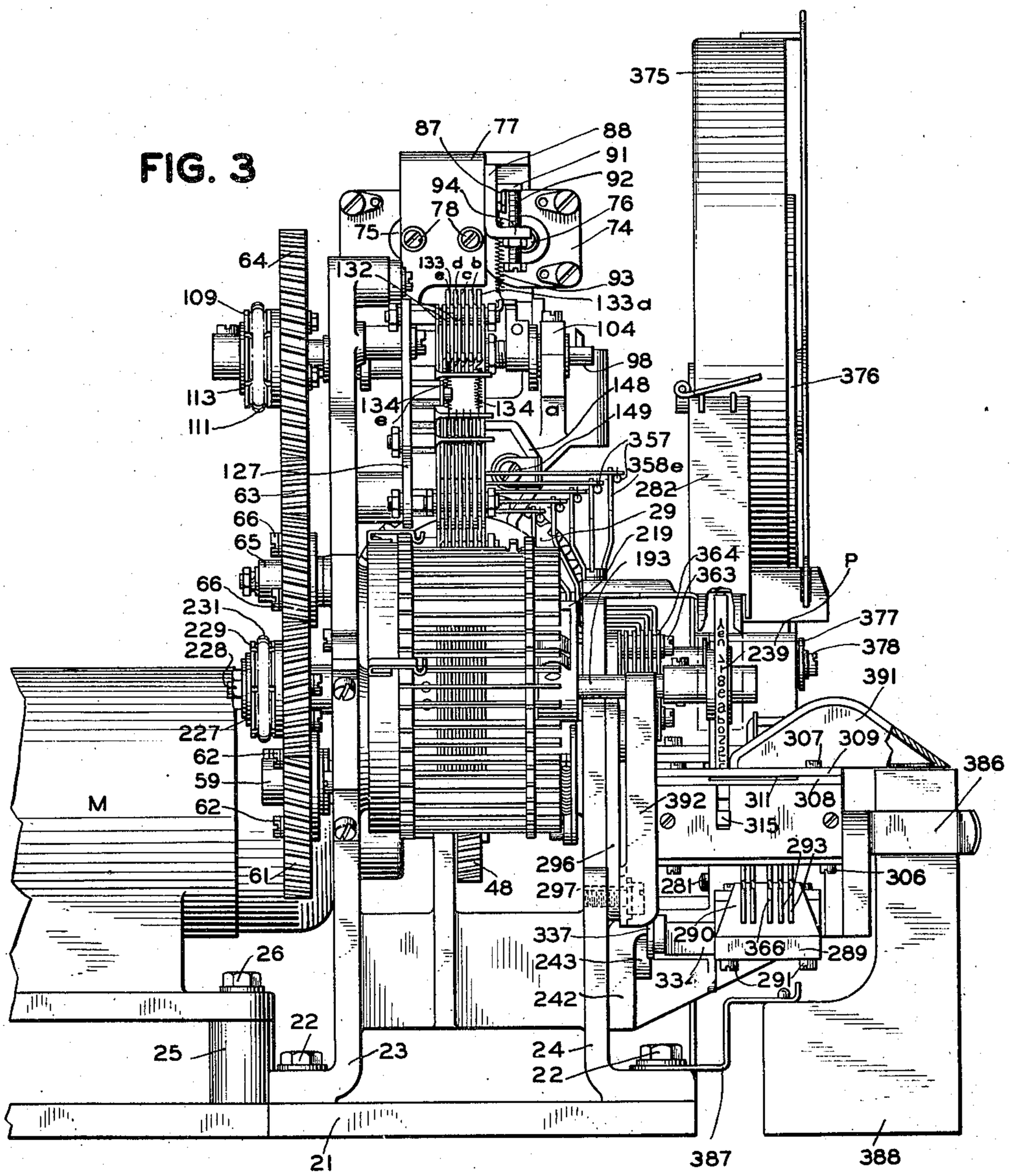
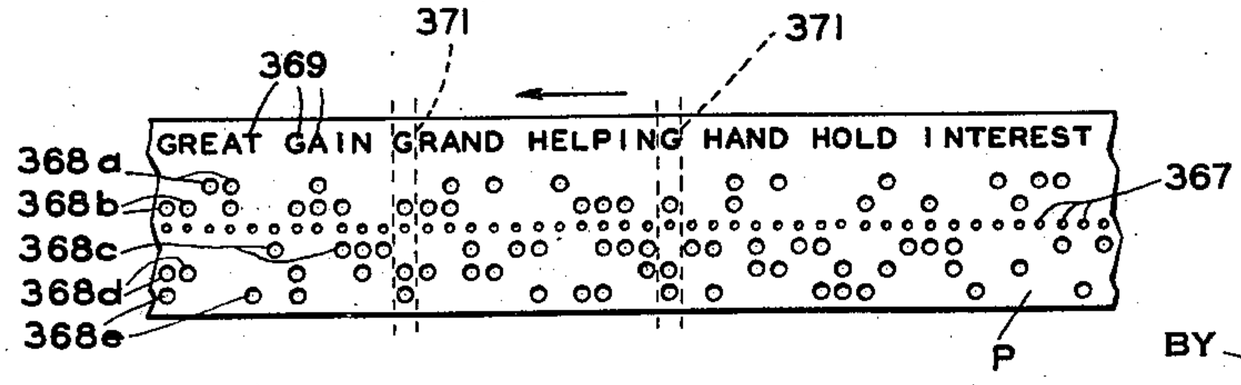


FIG. 4



INVENTORS
R.F. DIRKES
E.R. WHEELER

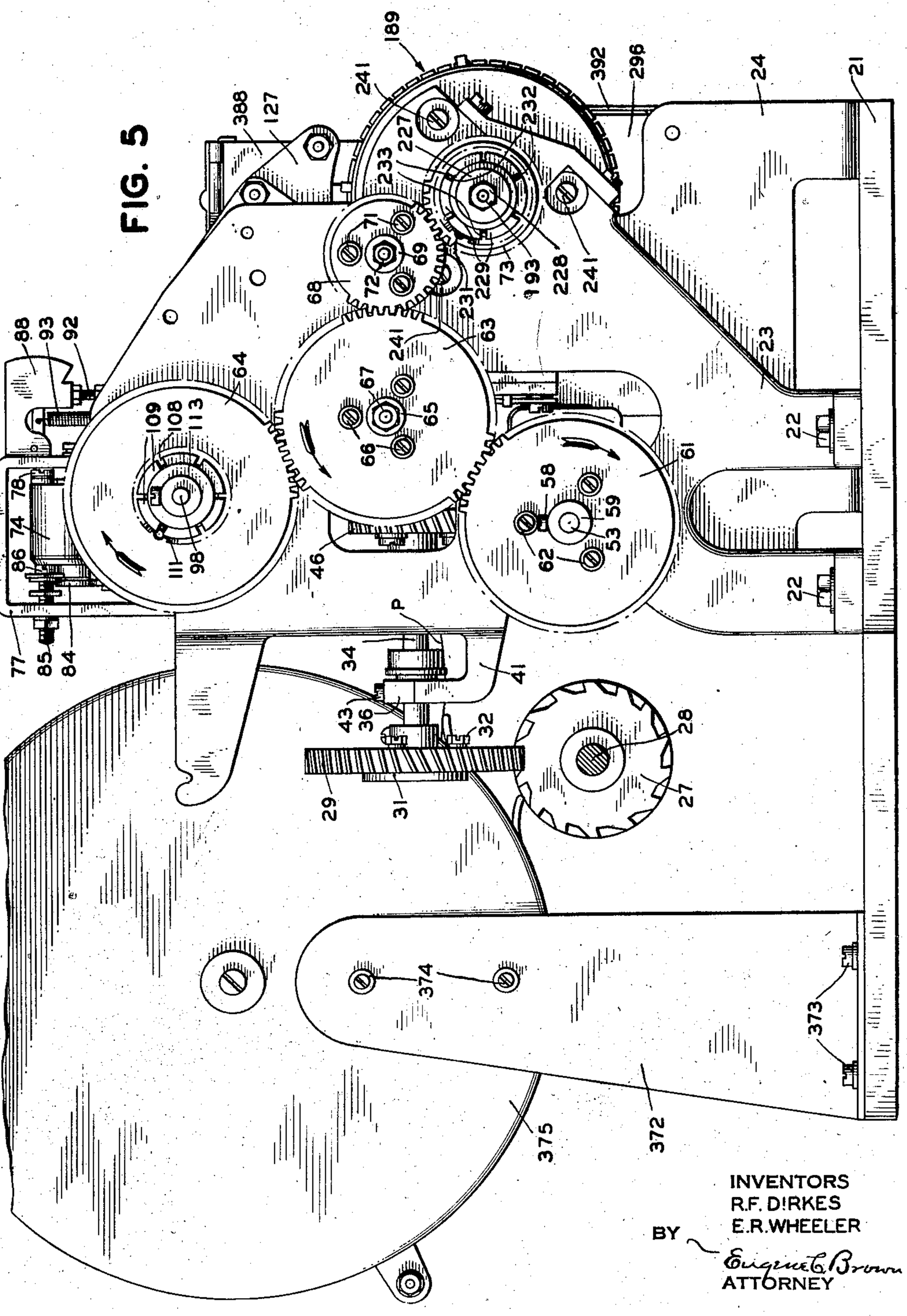
BY Eugene C. Brown
ATTORNEY

Oct. 3, 1939. R. F. DIRKES ET AL 2,174,731

COMBINED TELEGRAPH PRINTER AND PERFORATOR

Original Filed Sept. 28, 1935 7 Sheets-Sheet 4

FIG. 5



INVENTORS
R.F. DIRKES
E.R.WHEELER

BY Eugene C. Brown
ATTORNEY

Oct. 3, 1939. R. F. DIRKES ET AL 2,174,731

COMBINED TELEGRAPH PRINTER AND PERFORATOR

Original Filed Sept. 28, 1935 7 Sheets-Sheet 5

FIG. 6

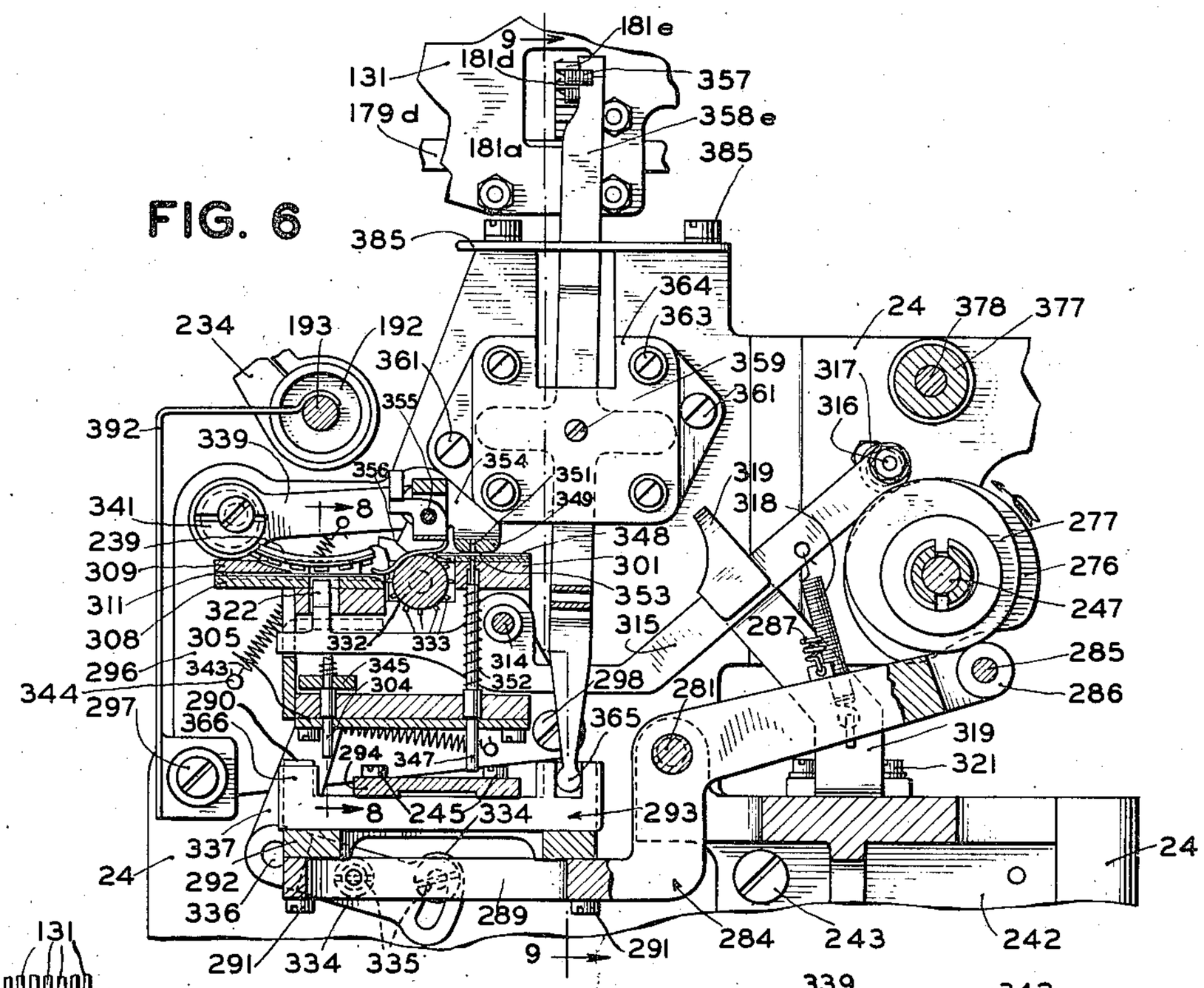


FIG. 9

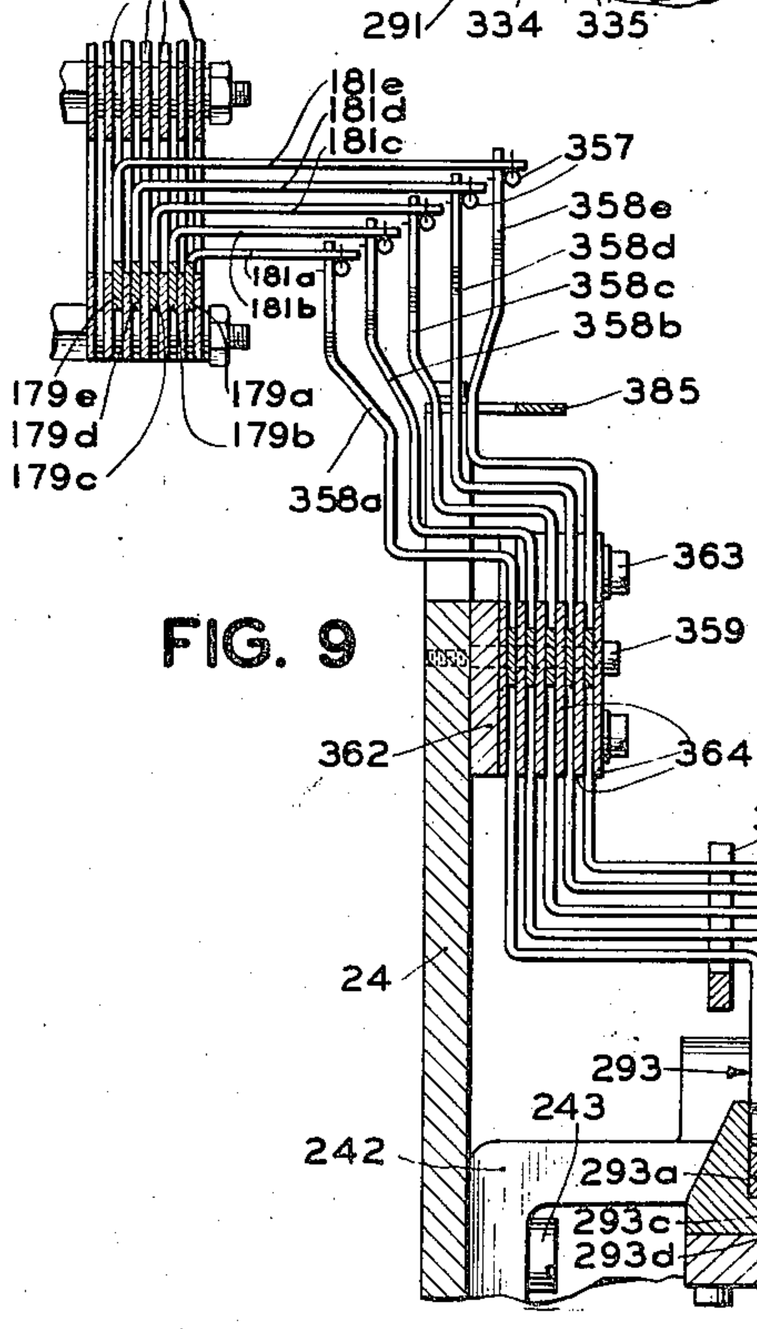


FIG. 7

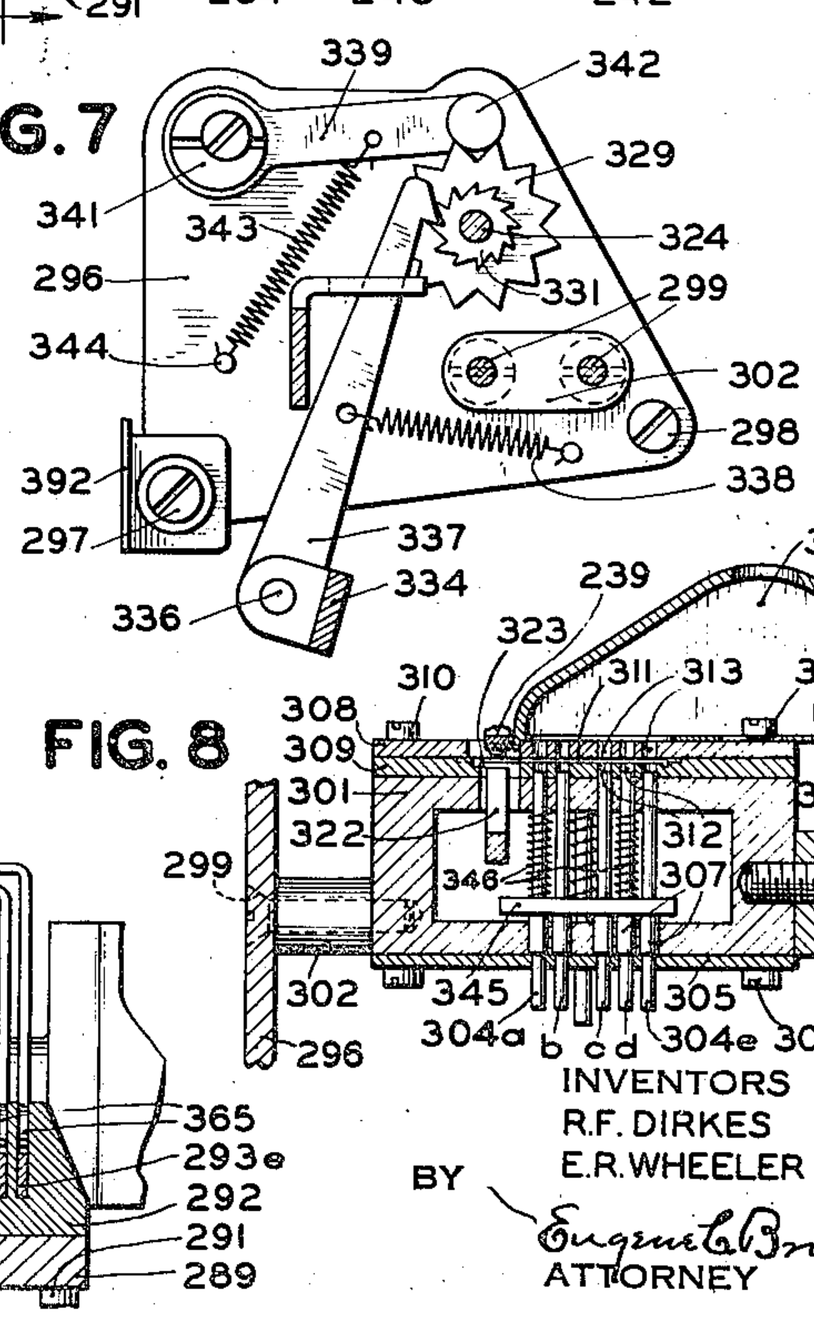


FIG. 8

INVENTORS
R.F. DIRKES
E.R. WHEELER

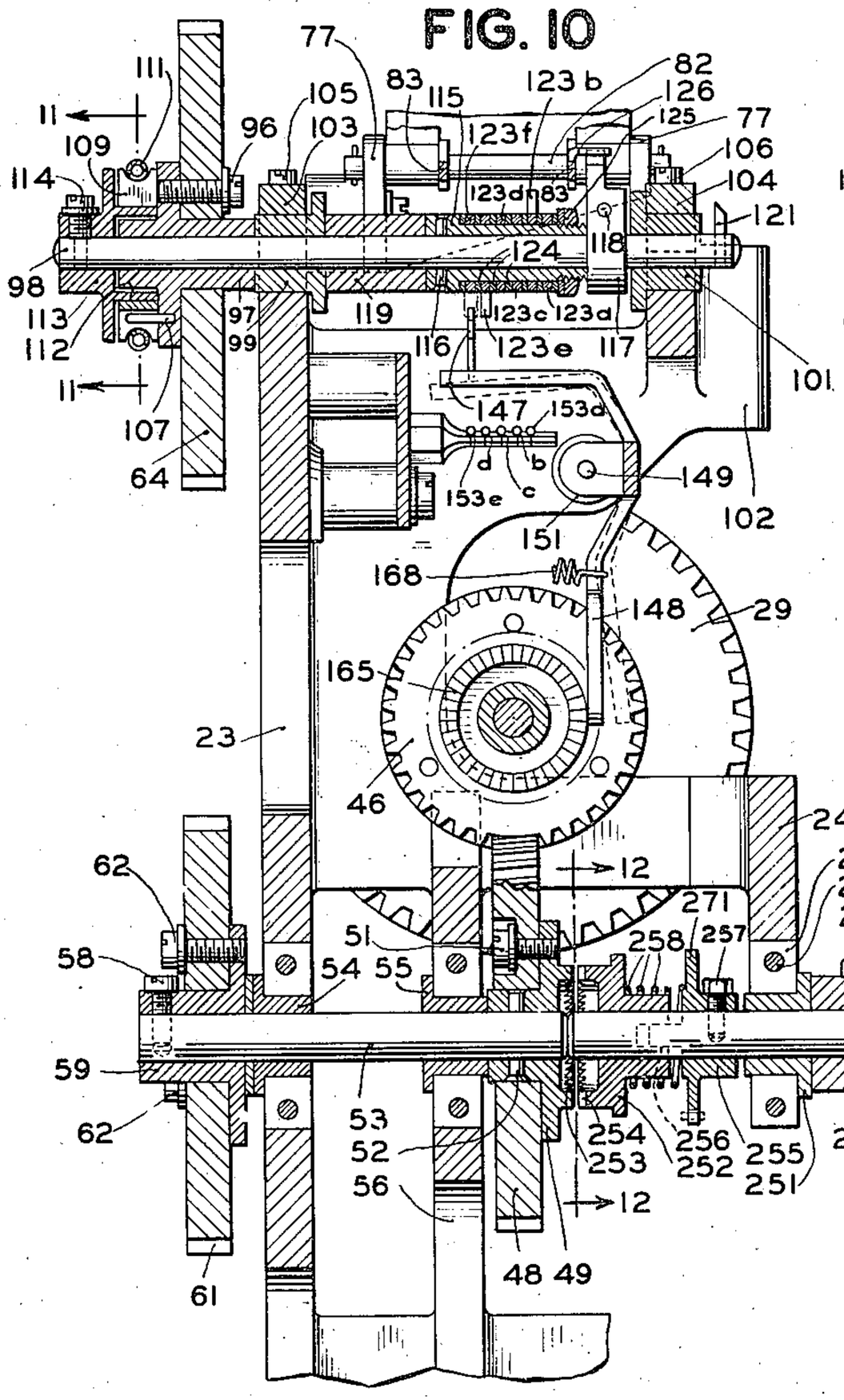
BY Eugene C. Brown
ATTORNEY

Oct. 3, 1939. R. F. DIRKES ET AL 2,174,731

COMBINED TELEGRAPH PRINTER AND PERFORATOR

Original Filed Sept. 28, 1935 7 Sheets-Sheet 6

FIG. 10



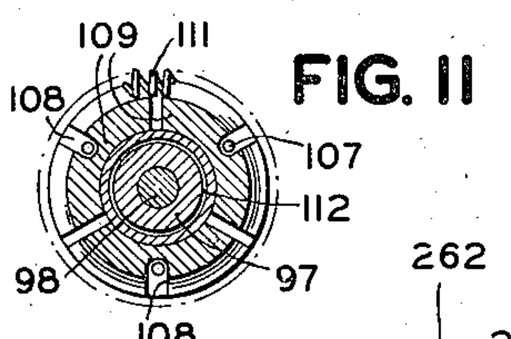


FIG. 11

FIG. 12

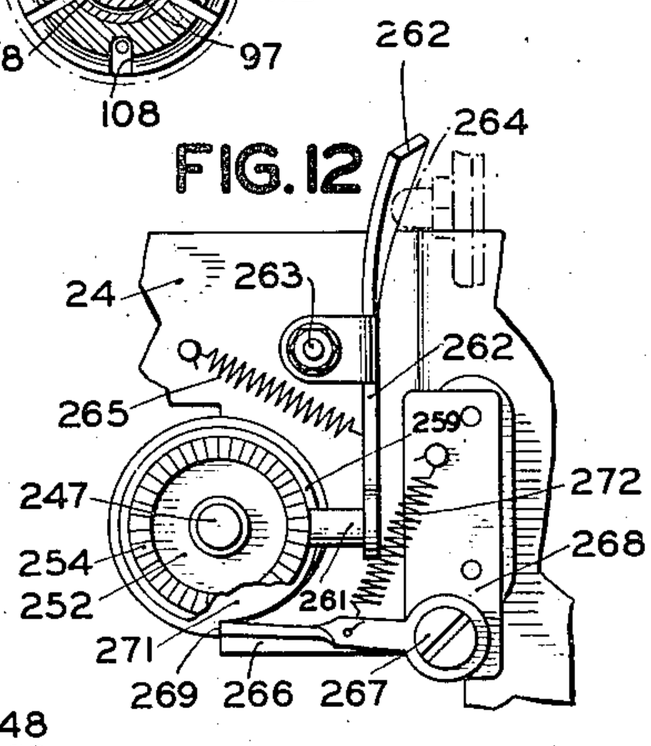


FIG. 14

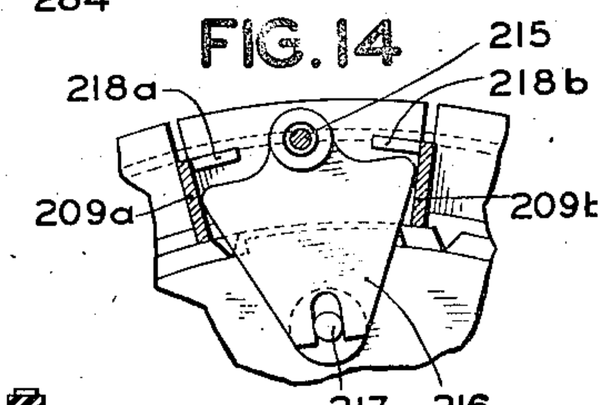
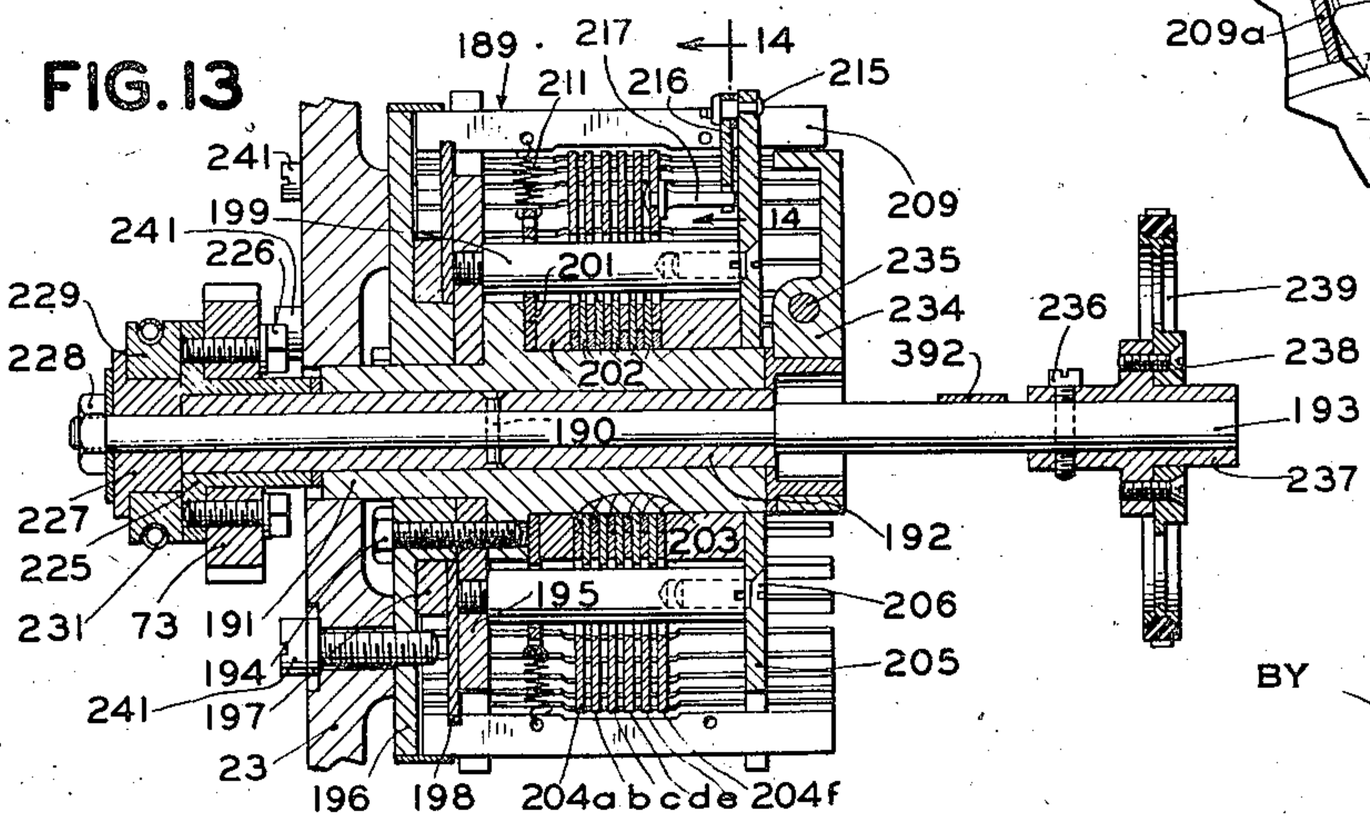


FIG. 13



INVENTORS
R.F. DIRKES
E.R.WHEELER

BY Eugene C. Brown
ATTORNEY

Oct. 3, 1939. R. F. DIRKES ET AL 2,174,731

COMBINED TELEGRAPH PRINTER AND PERFORATOR

Original Filed Sept. 28, 1935 7 Sheets-Sheet 7

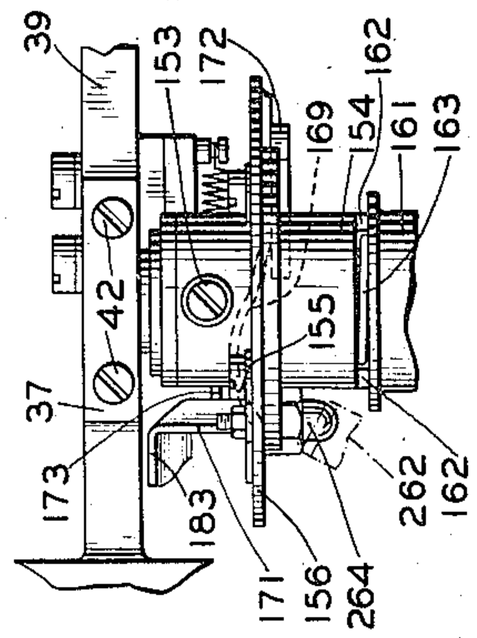


FIG. 17

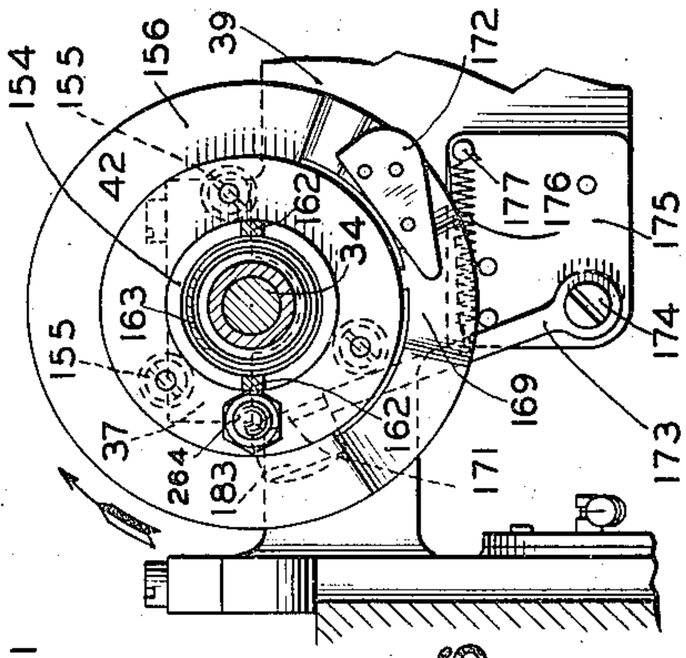


FIG. 16

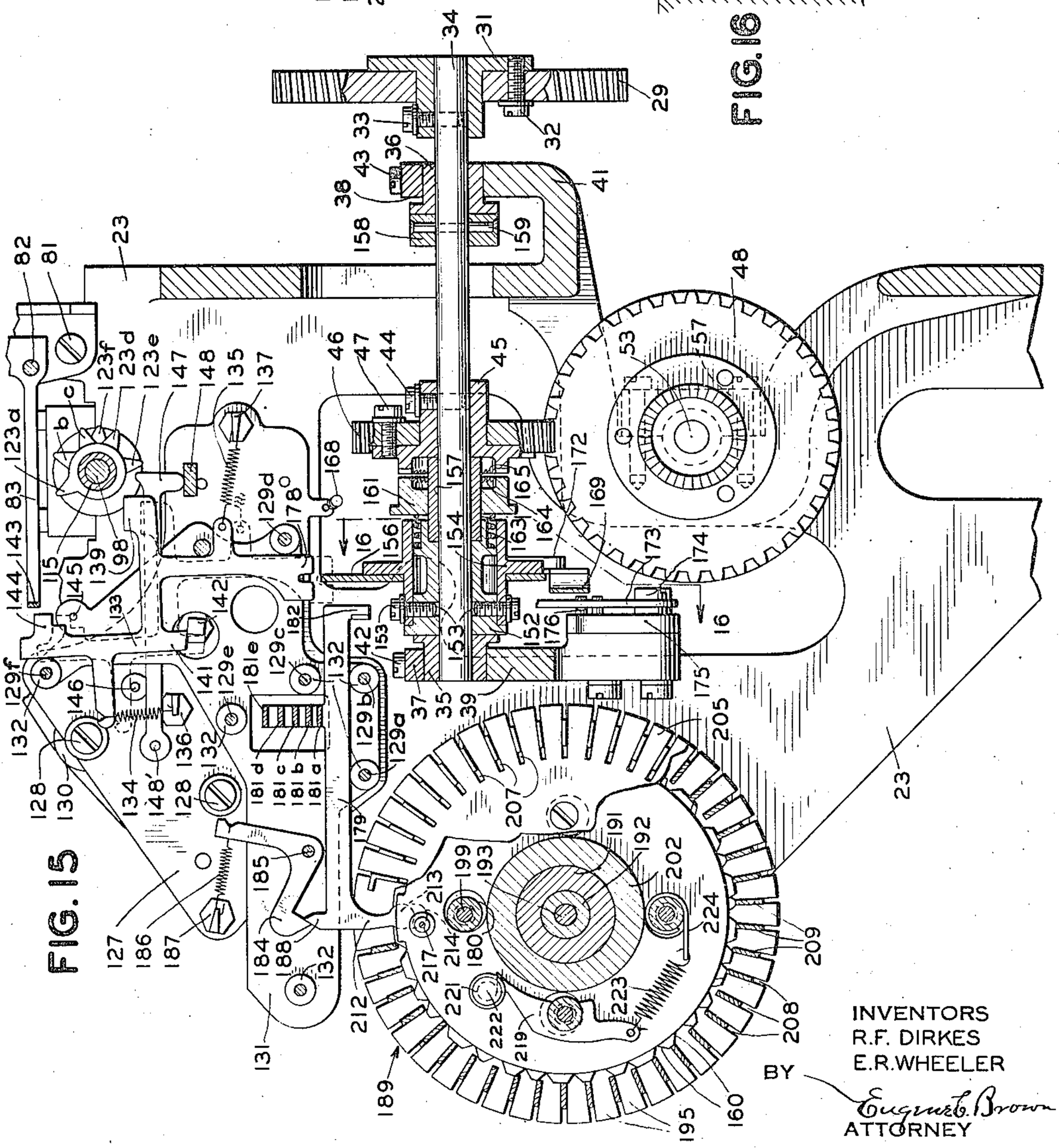


FIG. 15

INVENTORS
R.F. DIRKES
E.R.WHEELER
BY Eugene B. Brown
ATTORNEY

Patented Oct. 3, 1939 2,174,731

UNITED STATES PATENT OFFICE

2,174,731

COMBINED TELEGRAPH PRINTER AND PERFORATOR

Robert F. Dirkes, Jamaica, N. Y., and Evan R. Wheeler, Plainfield, N. J., assignors to The Western Union Telegraph Company, New York, N. Y., a corporation of New York

Application September 28, 1935, Serial No. 42,692
Renewed July 18, 1938

67 Claims. (Cl. 178—92)

This invention relates to a combined recording telegraph printer and perforator and more particularly to apparatus of this nature in which both the printing and perforating operations occur on and in a single tape, respectively.

Commercial telegraph systems generally employ two general classes of circuits; trunk wire circuits and tie wire circuits. The trunk wires extend between central offices and are usually operated by a multiple channel multiplex system. The tie wires terminate in central offices and serve to connect branch offices to the central office. A plurality of branch offices may be connected to a central office through one tie wire, the number of branch offices necessarily depending on the amount of traffic therefrom. In certain types of subscribers' telegraph services, of which the so-called "timed wire service" is an example, the subscriber will have one end of a tie wire terminating in his office. Thus a subscriber's office functions to transmit and receive telegraphic communications similar to a branch office and may be considered as such. Because of the expense, maintenance and attention required to keep multiplex apparatus in operation, the equipment provided to operate the tie wires is of the start-stop or simplex type.

When it is desired to carry on telegraphic communciations between two branch offices associated with the same central office, it is entirely feasible to make direct switchboard connection between their two tie lines. However, ordinary the branch offices are located in remotely separated localities so that they are associated with separate central offices. It is also entirely possible to repeat signals received at one central office from a simplex operated tie wire directly to a multiplex channel of a trunk wire and extend the channel at the other central office directly to another simplex tie wire. Due to the slow speed of operation of the simplex systems as compared with multiplex operated systems, the above system of connecting does not efficiently utilize the multiplex channel. Other objections to the above system are that when a call is received in a central office from a branch office indicating a desire to communicate with a remote branch office, a certain length of time is required to complete such necessary through connections during which time the transmitting branch office must stand idly by. If the called branch office's tie line is busy at this time, the completion of the through circuit may be delayed for a substantial period and after connections are made, the rate of transmission over the start-stop system may be far below the maximum speed of the multiplex channel. Moreover, in order that a multiplex channel will be immediately available for making such through connections, it is necessary to provide a large number of normally idle multiplex channels.

It has been found, therefore, that such messages can be handled expediently and economically by providing signal storage devices at each central office adapted to receive signals from a branch office tie line at any desired rate and from which the signals can be subsequently retransmitted over the first available multiplex channel at the maximum speed thereof. At the opposite central office, these signals are again stored and repeated over the second branch office's tie line, the multiplex circuit thus being immediately available for other service. By this arrangement the calling branch office immediately upon calling the central office with which it is associated may begin the transmission of its message. Any short delays incident to the retransmission of such messages over the multiplex channel do not in any way inconvenience or delay the calling branch office.

In addition to the signal storing device, it is necessary to employ at each central office a telegraph printer by which the calling branch office can communicate to the central office the identity of the called branch office and by which general telegraph business can be transacted. The printer is also required for record and check purposes.

It is the present practice to employ at each central office means for recording the signals on two separate tapes, one tape being in the form of a printed record, and the other in the form of a perforated tape. These recording means are necessarily of two general types, one responsive to signals of the start-stop variety and the other responsive to signals of the multiplex variety.

In certain cases and especially when messages from a branch office are received with practically no intervening time intervals therebetween, it requires considerable checking of the printed record against the perforated tape to insure that the perforated tape will be retransmitted through the proper transmitter. This same checking operation must be performed at the second central office to insure that the messages are retransmitted over the correct tie wire. Delays incident to these checking operations are very objectionable both from the standpoints of economy and lost time. If the printed and perforated records both occurred on one tape, it would greatly

facilitate the handling of such messages in the central offices.

It is therefore one of the objects of this invention to provide a mechanism by which signals may be recorded in the form of a printed record and a perforated record on and in a common tape, respectively, and in which both of said recordings register on the same transverse section of said tape.

Another object of this invention is the design of the parts of a combined printer and perforator whereby such parts may be easily and cheaply manufactured and thus reduce the manufacturing and maintenance costs of the machine to a minimum.

Still another object of this invention is to provide a machine wherein telegraphic traffic on present day circuits may be better and more expeditiously handled.

This invention is adapted to operate in conjunction with the signaling code known as the start-stop five unit code although it is to be understood that with modifications it may be adapted to operate in conjunction with other codes without departing from the spirit of the invention.

As is well known to those versed in the art, this code is composed of a start impulse which is always of uniform line condition followed by five intervals of impulses of two different line conditions in various combinations thereof which in turn are followed by a stop impulse which is always the same and of opposite line condition from that of the start impulse. The maximum number of selections available with the five unit code is thirty-two and in order to provide the requisite number of selections to record letters, figures, punctuation marks, and printer functions, case grouping of signals is employed. Accordingly, two case shift signals are required, called a shift signal and an unshift signal. The purpose of the shift signal is to position the recorder so that the following selections received will be properly recorded in the figures group. The unshift signal positions the recorder to properly record signals in the letters group.

The selecting mechanism of this recorder comprises a single line magnet responsive to line impulses cooperating with an independently rotatable cam sleeve to variably and selectively position a set of primary selecting elements in accordance with the received impulses. The selection set up in the primary set of selectors is transferred in a short interval of time to a second set of selectors whereupon the first set is free to operate in response to a following signal code while the second set has nearly the entire interval of one signal to operate the character selecting, printing and perforating mechanisms.

The typewheel stop unit comprises a typewheel shaft normally tending to rotate and a drum type stop unit for selectively stopping the rotation of the typewheel shaft and typewheel.

The tape perforating mechanism comprises a series of punch pins and elements adapted to be selectively interposed between said pins and a rockable member to selectively perforate the tape in accordance with the received code combinations of impulses. A tape feed mechanism coacting with feed holes perforated in the tape, intermittently feeds the tape through the machine.

The structural part of the machine comprises a base plate upon which is mounted an upright frame casting. The casting serves as journal points for the various shafts and as a support for mechanisms that comprise the machine.

Individual subcombinations of mechanisms that perform the related functions of the complete mechanism are so arranged that they may be easily and readily removed and interchangeably replaced when requiring repairs or adjustments. Thus the replacement of a complete recorder is not necessary.

An electric motor secured to the base furnishes local power for all selecting and recording operations through appropriate gearing and clutch mechanisms, the selector magnet having practically no work to perform, it acting in response to the received impulses to only control the selection.

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 face view of a section of tape perforated and printed upon by the machine herein described;

Figure 5 is a rear elevational view of the machine;

Figure 6 is an enlarged fragmentary sectional view taken on line 6—6 of Figure 1;

Figure 7 is an enlarged fragmentary sectional view taken on line 7—7 of Figure 1;

Figure 8 is a fragmentary sectional view taken on line 8—8 of Figure 6;

Figure 9 is a fragmentary sectional view taken on line 9—9 of Figure 6;

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 fragmentary sectional view taken on line 12—12 of Figure 10;

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

Figure 14 is an enlarged fragmentary sectional view taken on line 14—14 of Figure 13;

Figure 15 is an enlarged fragmentary sectional view taken on line 15—15 of Figure 1;

Figure 16 is a fragmentary sectional view taken on line 16—16 of Figure 15; and

Figure 17 is a plan view of the mechanism shown in Figure 16.

Referring first to Figs. 1, 2, 3 and 5, 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 traversely 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, 2 and 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. 15) the hub 31 being attached by a set screw 33 to an operating cam shaft 34 for rotation therewith. The operating cam shaft 34 is traversely 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 set 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. 10, which in turn is secured by means of a pin 52 to a countershaft 53. The countershaft 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. 15. Fixed by screw 58 (Fig. 10) 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. 5, 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, 2 and 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 10, 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 is 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. 10) 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 traversely journalled 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. 10 and 11) 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. 10) 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 123*a* to 123*f* 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 conditions 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, 5 and 15, the selector cam shaft 98 is tending to rotate by action of the power communicated thereto through the slip friction clutch on shaft 98. The selector cam shaft 98 (Fig. 10) 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 15, 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 129*a* to 129*f* (Fig. 15) 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. 15, and individually by reference characters 133*a* to 133*e* 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. 15, and individually by reference characters 134*a* to 134*e* in Fig. 3 (134*a* and 134*e* only being shown), and 135*a* to 135*e* in Fig. 10. The fixed ends of the springs 134 and 135 are attached to spring posts 136 and 137 (Fig. 15) respectively, extending horizontally from the selector unit mounting plate 127. The selector lever 133*a* is shown in its normal position in Fig. 15 with respect to its associated springs and guide members with the front guide plate 131 removed. The other four selector levers 133*b* to 133*e* 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 129*a* to 129*f*.

Assume that the printer is in its unoperated position as positioned by the rest impulse of the proceeding 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. 10) 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 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 cam shaft is revolved to the proper position to receive it. When the transmitting source is positioned to send out the second impulse, the selector cam 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 thereat 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 insures 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 123*a* (Fig. 15) in operative relation with a ver-

tical projection 139 on a rightwardly extending arm of the first selector lever 133*a* starts to engage said projection. As the disc cam 123*a* continues to rotate, the high part thereof will rock the selector lever 133*a* in a clockwise direction against the action of springs 134*a* and 135*a* 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 123*a* passes off the projection 139 on the selector lever 133*a* 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 134*a* and 135*a*.

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. 15. 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 133*a* to 133*e*. 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 123*b* engages with the projection 139 of the selector lever 133*b*. This rocks the selector lever 133*b* 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 133*b* with the stud 142 serving as a pivot is stopped and as the cam 123*b* 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 133*b* 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 134*b* and 135*b* actuate the selector lever 133*b* downwardly into its selected position. A selector lever 133 is shown in its selected position by the dotted outline in Fig. 15. 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 133*c* 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 133*d* and 133*e* respectively will be actuated to their selected position in the same manner as the second selector lever 133*b* 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 123*f* 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 123*f* 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. 15) 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. 16). A spacing sleeve 157 (Fig. 15) 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. 15) 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 15) 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 hereinbefore 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 123*f* and the T-lever 147 actuate the trip lever 148 for a short interval of time, the trip lever is quickly returned to its normal position by an attached spring 168 (Fig. 10) whereupon 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

side cam surface 166 and the trip lever 148 cause the disengagement of the ratchet clutch as heretofore described and 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 123*f* 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. 15) is a disc with a portion 169 thereof, shown dotted in Fig. 17, 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. 16 and 17) 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. 15) 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. 15 and individually by reference characters 179*a* to 179*e* in Fig. 9 are held in position by the guide plates 131. The code disc levers 179 rest on spacers 132 (Fig. 15) on the selector unit assembly screws 129*a* and 129*b* and are prevented from moving upward by spacers 132 on the assembly screw 129*c*. The location of one code disc lever is shown in Fig. 15, 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. The code disc levers 179*a* to 179*e* have adjacent the center thereof projections 181*a* to 181*e* as shown in Fig. 9 that extend vertically a predetermined distance and are then bent to extend horizontally toward the front of the machine. The purpose of these projections will be described in following paragraphs.

Referring to Figs. 15, 16 and 17, 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 a 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 ends 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 133*b*, the fourth lever 133*d*, and the fifth lever 133*e*, were positioned to their selected or marking position in response to received code combination of impulses. Consequently, the second, fourth and fifth code disc levers 179*b*, 179*d*, and 179*e*, 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 179*a* and 179*c* will remain as positioned by the gathering cam 171 in their right or spacing position because their associated selector levers 133*a* and 133*c* 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 transfered 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 return 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. 13 and 15), 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. 13, is a left 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. 15, and individually by reference characters 204*a* to 204*f* in Fig. 13. 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 204*a* to 204*e* are in operative relation with the five code disc levers 179*a* to 179*e* respectively. Each code disc lever 179 (Fig. 15) 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. 17) whereupon all the discs 204 in a marking position are rotated a few degrees in a clockwise direction (Fig. 15) 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 204*f*. The notches on the code discs 204*a* to 204*e* 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 204*f*, called the shift disc. In one position of the shift disc 204*f* 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 cause the stop members 209*a* and 209*b* respectively (Fig. 14) to be actuated toward the axis of the stop unit. The disc 204*f* has no control of the selection of the stop members 209*a* and 209*b* 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 204*f*.

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 204*f*. Stop members 209*a* and 209*b* have projections 218*a* and 218*b* 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. 14. Now when the alignment of the notches in the code discs 204*a* to 204*e* are such as to allow the shift stop member 209*b* to move inward, the projection 218*b* thereon will engage the right side of the shift disc lever 216. The spring 211 attached to the stop member 209*b* 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 204*f* to be rotated a few degrees in a counterclockwise 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 209*a* 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 204*f* 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. 15) 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 204*f*. 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. 13) 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. 5) in the friction members 229 engage the three pins 232 carried in the left side face of the gear hub 225 (Fig. 13). 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 hereinbefore described friction clutch on the selector cam shaft 98 shown in Figs. 10 and 11. As heretofore described, the gear 73 (Fig. 5) 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. 13) secured to the typewheel shaft sleeve 193 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 various 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. 13, in threaded engagement with the mounting plate 196.

Printing, perforating and tape feeding mechanisms

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

A bracket casting 242 (Figs. 1, 2 and 6) is attached to the front side of the 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. 10, 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 hold a flanged bushing 251 which serves as another journal for the shaft 247. The shaft 247 and the countershaft 53 are on the same axis and the shaft 247 is adapted to be independently rotated from said countershaft 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 and continuously rotating 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 to 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 set screw 257. Thus the driven member 252 is keyed to the 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 described hereinafter. 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. 12) 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, 12, 16 and 17) 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. 10) 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. 12) 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 a shaft 247 (Fig. 10) for rotation therewith by a screw 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 perforating 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.

An eccentric shoulder screw 281 (Figs. 1 and 2) supported in the sections 282 and 283 of the bracket 242 has pivotally mounted on the eccentric center portion thereof a lever 284 (Fig. 6). Pivotally mounted on a stud 285 carried in the right end of the lever 284 is a roller cam follower 286. A spring 287 attached to a post 288 (Fig. 1) in the bracket 242 and to the lever 284 keeps the cam follower 286 operatively engaged with its associated perforating cam 277. The left section 289 of the lever 284 is in a substantially horizontal position and is considerably wider than the right end of the lever, as shown in Fig. 9. Attached to the section 289 of the lever 284 by screws 291 is a substantially U-shaped block 292. Disposed in five longitudinal slots 290 in the block 292 are five sliding bars indicated in general by reference numeral 293 in Fig. 6 and individually by reference characters 293*a* to 293*e* in Fig. 9. A plate 294 is attached to the top center part of the block 292 by screws 295.

A punch and feed mechanism mounting plate 296 (Figs. 3, 6 and 7) is attached to the front side of the section 24 of the main frame casting by screws 297 and 298. Attached to the front side of the plate 296 by screws 299 (Figs. 7 and 8) is a punch block 301. A spacer 302 on the screws 299 keeps the punch block 301 the proper distance from the plate 296. The front side of the punch block 301 is supported by screws 303 (Figs. 2 and 8) through the bracket casting 242. Extending vertically through the left part of the punch block 301 are a series of five punch pins indicated in general by reference numeral 304 in Fig. 6 and individually by reference characters 304*a* to 304*e* in Fig. 8. A plate 305 attached to the underside of the punch block 301 by screws 306 has therein a series of holes through which pass the lower ends of the punch pins. An enlarged section 307 of the punch pin 304 normally rests on the plate 305 and the punch pins are thus retained in the punch block 301. Attached to the left top section of the punch block 301 by screws 310 are two plates 308 and 309. A space 311 is provided between the two plates and is adapted to serve as a paper tape guide, best shown in Fig. 3. The plate 309 has holes 312 (Fig. 8) therein which act as a guide for the upper ends of the punch pins 304. Holes 313 in the plate 308 are in alignment with the upper ends of the punch pins and as the pins are selectively forced upward by means to be hereinafter described, holes will be punched in the paper tape between the two plates.

A plate 345 through which the small upper sections of the punch pins 304 freely pass rests on the top of the enlarged section 307 of said pins. Individual compression springs 346 around the punch pins 304*a* and 304*d* tend to keep the bottoms of the enlarged sections 307 of all the punch pins in contact with the plate 305.

A feed hole punch pin 347 (Fig. 6) extends vertically through the right end of the punch block 301, the upper end being guided by a plate 348. A plate 349 over the plate 348 has a hole 351 therein adapted to act as a die for the punch pin 347 by means of which feed holes are punched in the paper tape. A compression spring 352 around the pin 347 tends to keep the pin in its lower position. The plates 348 and 349 are attached to the right top end of the punch block 301 and have a recessed section 353 therebetween which is adapted to serve as a paper tape guide.

Pivoted on a pin 314 (Fig. 6) in the punch block 301 is a print lever 315 which carries at the right end thereof an eccentric shoulder screw 316 upon which is pivotally mounted a roller cam follower 317 in operative relation with the print cam 276. A retractile spring 318 attached to the print lever 315 and to a print lever guide 319 keeps the roller cam follower 317 engaged with the print cam 276. The print lever guide 319 is attached to the bracket casting 242 by screws 321. On the left end of the lever 315 is a vertical projection 322 (Figs. 6 and 8) extending through aligned holes 323 in the punch block 301 and plate 309.

A shaft 324 (Fig. 1) is journaled in blocks 325 and 326 which are attached to the punch block 301 by screws 327 and 328 respectively. Secured to the rear end of the shaft 324 for rotation therewith is a star wheel 329 (Fig. 7) and a feed ratchet wheel 331. Adjacent the center of the shaft 324 is an enlarged cylindrical portion 332 (Fig. 6) having a plurality of feed pins 333 extending radially therefrom.

A member 334 attached adjacent the left end of the lever 284 by screws 335 has pivotally mounted on a pin 336 in the left end thereof a feed pawl 337 best shown in Fig. 7, the upper end of which is adapted to operatively engage the feed ratchet wheel 331. A spring 338 attached to the feed pawl 337 keeps the upper end operatively engaged with the feed ratchet wheel 331. An arm 339 pivoted on an eccentric shoulder screw 341 secured to the plate 296, has a detent pin 342 in the right end thereof in operative relation with the star wheel 329. A retractile spring 343 attached to the arm 339 and a pin 344 in the plate 296 holds the pin 342 in engagement with the star wheel 329.

The plate 349 (Fig. 6) has a vertically extending portion 354 upon which a tape retaining finger 356 is pivotally mounted at 355. A spring, not shown, keeps the tape retaining finger 356 operatively engaged with the cylindrical portion 332 of the shaft 324. The purpose of the retaining finger 356 is to keep the pins 333 on the cylinder 332 engaged in the feed holes in the paper tape.

Referring to Fig. 9, the right ends of the horizontal projections 181*a* to 181*e* of the code disc levers 179 are operatively engaged by springs 357 to individual transfer levers 358*a* to 358*e*. The transfer levers 358*a* to 358*e* are individually bent and shaped, being pivoted adjacent the center thereof on a common shoulder screw 359 horizontally secured to the section 24 of the main frame casting. Secured by screws 361 to the main frame section 24 is a plate 362 (Fig. 9) upon which a series of transfer lever guide plates 364 is mounted by screws 363. Spacers, not shown, on the mounting screws, slightly thicker than the transfer levers 358, permit the levers to freely pivot on the screw 359. The lower end 365 of each transfer lever is rounded and is engaged by the right bifurcated end of its associated sliding bar 293.

The operation of the printing, perforating and tape feeding mechanisms will now be described in conjunction with the operation of the selector mechanism. As is evident from Figs. 6 and 9, transverse movements of the code disc levers 179 will rock the transfer levers 358 about their pivot mounting point. As was heretofore described, the gathering cam 171 (Figs. 16 and 17) during the first part of the revolution of the operating cam assembly positioned all the code disc levers to their spacing position, thus rendering them adapted to receive the selection set up in the selector levers 133. As any of the code disc levers 179 were moved to the spacing position, its attached transfer lever 358 (Figs. 6 and 9) will be rocked in a clockwise direction whereupon its associated sliding bar 293 will be slid to the left into its spacing position. Thus all the sliding bars 293 will be in their spacing position which renders the left vertical section 366 thereof unengageable with the lower end of their associated punch pin 304. As the second, fourth and fifth code disc levers 179*b*, 179*d* and 179*e*, in the example heretofore assumed, are moved to their marking position by the operating cam 156 and associated selector levers 133, the transfer levers 358*a*, 358*d* and 358*e* will be rocked in a counterclockwise direction and consequently slide the sliding bars 293*b*, 293*d* and 293*e* to the right into their marking position. When a sliding bar 293 is to the right in its marking position, the section 366 thereof is beneath and adapted to operatively engage the bottom end of its associated punch pin 304.

Near the end of the revolution of the operating cam assembly the pin 264 (Fig. 12) actuates the trip lever 262 to initiate the rotation of the shaft 247 with the countershaft 53. The print and perforating cams 276 and 277 (Figs. 6 and 10) being attached to the shaft 244, will rotate therewith. After having completed about a half a revolution, the low part of the print cam 276 (Fig. 6) is operatively engaged with its associated cam follower 317. Thus the spring 318 is allowed to rock the print lever 315 in a clockwise direction and cause the vertical projection 322 on the left end thereof to rise and press the paper tape P against a section of the typewheel 239 located just above. The paper tape being pressed against the typewheel, which is dampened with ink by means hereinafter described, will take an impression therefrom. The typewheel was selectively stopped in a position that would bring the character corresponding to the received code combination of impulses into operative relation with the projection 322 on the print lever as was hereinbefore described. The shaft 247 in rotating about a half a revolution from its rest position also brings a high part of the cam 277 into operative relation with its associated cam follower 286 and consequently causes the lever 284 to be rocked in clockwise direction about its pivot mounting point. This brings the vertical sections 366 of the sliding bars 293 in a marking position in contact with the bottom of their associated punch pins 304 and forces the pins upward, causing the upper ends thereof to punch holes in the paper tape P. As the lever 284 rocks in a clockwise direction, the plate 294 engages the bottom of the feed hole punch pin 347 and causes a feed hole to be punched in the tape. The left end of the lever 284 in rising also allows the pawl 337 (Fig. 7) to rise and engage a higher tooth on the feed ratchet wheel 331, and as the lever is returned to its normal position by the spring 318, as the cam 277 approaches its rest position, the feed ratchet wheel will be stepped an amount equal to one tooth on said ratchet wheel. The ratchet wheel 331 in stepping one step causes the paper tape P to be advanced a distance equal to one letter space by means of the pins 333 in the enlarged cylindrical portion 332 of the shaft 324 engaging feed holes in the tape. This presents a fresh surface in the paper tape P to be in operative relation with the typewheel 239, the feed hole punch pin 347 and the punch pins 304. The pin 342 on the arm 339 engaging the star wheel 329, keeps the shaft 324 and attached members in position after being stepped. The lever 284 in returning to its normal position also allows the springs 346 and 352 on the punch pins 304*a*, 304*d* and 347 to return the actuated pins to their normal lower position. The feed pawl 337 is adapted to rotate the feed ratchet wheel 331 after the punch pins 304 and 347 are disengaged from the paper tape.

From the above paragraphs it is evident that on every revolution of the shaft 247 a feed hole will be punched in the tape and the tape advanced one letter space. It is also evident that the pins 304 will punch a combination of holes in the tape that will represent the selected characters and that the print lever 315 will be actuated to cause the impression on the typewheel representing the selected character to be recorded on the paper tape.

Referring to Figs. 4 and 6, the feed holes 367 are punched by the feed hole punch pin 347. The holes 368*a* to 368*e* are punched by their associated

punch pins 304*a* to 304*e* and the character prints 369 being taken from the typewheel 239. A section of the tape at right angles to the direction of its travel represents the selected character in two forms. The imprint of the typewheel represents the character in a printed form and the combinations of holes represent the combinations of impulses in a perforated form. In the preferred embodiment of the invention the printing and perforating operations for a character are adapted to be recorded and register on the same transverse section of tape. The selection of a character composed of the following impulses, spacing, marking, spacing, marking, and marking, was described and such a character will be registered on the tape by the transverse sections indicated by the reference numeral 371 (Fig. 4).

Referring to Fig. 5, a bracket 372 attached to the base plate 21 by screws 373, has attached to its upper end by screws 374 a tape container 375. The tape container 375 (Fig. 2) is adapted to hold a roll of tape 376 and allow it to be freely unrolled as it is fed through the machine. A roller 377 pivotally mounted on a shoulder screw 378 attached to the section 24 of the main frame assists in guiding the tape P through the machine.

A typewell inking means comprising an absorbent ink roller 379 (Fig. 2), an intermediate roller 381, and a container 382 for the rollers 379 and 381 is supported by an arm 385 which is attached to the main frame section 24 by screws 383. The rollers 379 and 381 are pivotally carried by the container 382 and the circumference of the intermediate roller 381 is in contact with the circumference of the typewheel 239 and with the circumference of the ink roller 379. Thus the circumference of the typewheel is dampened with ink as the typewheel rotates.

Two spring clips 386 and 387 (Figs. 2 and 3) are attached to the machine by the mounting screws 303 and 22, respectively. These clips hold a container 388 adapted to receive the tape punchings. Two hollow members 389 and 391 attached to the top of the plates 309 and 351 respectively, (Fig. 6) by the plate mounting screws, are adapted to guide the tape punchings into the container 388 as they are forced from the plates 309 and 351.

A spring arm 392 (Fig. 6) attached to the plate 296 by the mounting screw 297 has the upper end thereof engaged with the typewheel shaft 193. The arm 392 assists in steadying the typewheel shaft as it rotates.

In some of the views the ink rollers container 382 and the tape punchings container 388 are 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. In combination, a selector mechanism responsive to received code combinations of impulses, a typewheel shaft, a typewheel rotatable with said typewheel shaft, a power driven means continually tending to rotate said typewheel shaft, means controlled by said selector mechanism for selectively stopping said typewheel shaft, a plurality of independently rotatable members, a print lever operable by one of said independently rotatable members to actuate a paper tape against said typewheel to take impressions therefrom, a plurality of punch pins, means coacting with said selector mechanism and operable by another of said independently rotatable members to selectively actuate said punch pins in accordance with received code combinations of impulses to form perforations in said tape, said perforations conforming to a predetermined code arrangement representative of and in register with the impressions taken from said typewheel, means for forming feed holes in said tape and means engaging said feed holes for advancing said tape for every received code combination of impulses.

2. In a combined perforating and printing machine, the combination of a single magnet selector, a printing mechanism and a perforating mechanism jointly controlled thereby, a tape, means for supporting said tape whereby a common transverse section thereof is simultaneously in operative relation with said printing and perforating mechanism, and means for advancing said tape sequentially with printing and perforating operations.

3. In a printing telegraph system the combination of a receiving printer and perforator, a common selecting mechanism therefor, means for effecting printing and perforating in register on a common tape, means for forming feed holes in said tape simultaneously with said perforating operation, and means engaging said feed holes for feeding said tape sequentially with said printing and perforating operations.

4. In combination, a plurality of primary selectable elements, a selector mechanism responsive to received code combinations of impulses to selectively position said primary selectible elements, a set of secondary selectable elements, means for transferring a selection in said primary selectable elements to said secondary selectable elements, a rotatable typewheel, a typewheel stop mechanism controlled by said secondary selectable elements to selectively position said typewheel, a perforator comprising a plurality of punch pins, a punch lever, a plurality of movable members adapted to have projections thereon selectively interposed between said punch pins and said punch lever, means operable by said secondary selectable elements to actuate said movable members in accordance with the setting of said secondary selectable elements, a print lever in operative relation with said typewheel, means for operating said print lever and said punch lever sequentially with the setting of said secondary selectable elements, a paper tape, means for advancing step-by-step said tape and means for supporting said paper tape in operative relation with said typewheel and punch pins whereby said printing and perforating operations register on the same transverse section of said tape.

5. In a telegraph recorder, a primary set of selectors, a selector mechanism for positioning said primary selectors, a secondary set of selectors, means for transferring the selection set up in said primary selectors to said secondary selectors, a printing mechanism, a first means operable by said secondary selectors for controlling said printing mehcanism, a perforating mechanism, a second means operable by said secondary selectors simultaneously with the operation of said printing controlling means to control said perforating

mechanism and means operable by said transferring means to position said printing and perforating mechanisms to normal after each operation thereof.

6. In a telegraph recorder, a single magnet selector mechanism responsive to received code combinations of impulses, a rotatable typewheel selectively positioned by said selector mechanism, a perforating mechanism comprising a series of punch pins, a series of associated interponent members and a punch lever for carrying said interponent members, a print lever in operative relation to said typewheel, means for positioning said interponent members whereby, on the operation of said punch lever, said punch pins will be selectively actuated in combinations according to the signal received on said selector mechanism, and means operating in timed relation to the operation of said selector mechanism for operatively actuating said print and punch levers.

7. In a telegraph recorder, the combination of a printing means and a perforating means for recording telegraph signals in associated dual forms on a common recording medium, a single magnet selector mechanism, means for supporting said recording medium whereby said perforating and printing means are adapted to register on a common section of said recording medium and means for advancing said recording medium in the direction of its length sequentially with the operation of said printing and perforating means.

8. In a telegraph printer, a rotatable typewheel, a paper tape, a printing mechanism adapted to take impressions from said typewheel onto said tape, a feed hole perforating mechanism adapted to perforate feed holes in said tape, means for concomitantly operating said printing and perforating mechanisms and means coacting with feed holes perforated by said feed hole perforating mechanism whereby said tape is sequentially advanced with said printing and perforating operations.

9. In a printing telegraph receiver, a paper tape, a rotatable typewheel, means for forcing said tape against said typewheel to take impressions therefrom, means operative concomitantly with said first mentioned means to form feed holes in said tape and means, operative intermittently with said first and second mentioned means for utilizing said feed holes to advance said tape.

10. In a telegraph receiver for recording code combinations of impulses, a paper tape, a perforating mechanism, a printing mechanism, a print cam, a perforating cam, means for rotating said cams in timed relation to received combinations of impulses, means operable by said print and perforating cams for controlling the operation of their associated mechanisms, and means for advancing said tape in the direction of its length to effect letter spacing.

11. In combination, a typewheel printer comprising a typewheel shaft and typewheel rotatable with said shaft, a perforator comprising a series of punch pins, a paper tape, means for pressing said tape against said typewheel to take imprints therefrom, means for supporting said perforator with said punch pins movable in a plane including said typewheel shaft and means for selectively moving said punch pins in said plane to form holes in said tape in registration with and corresponding to said typewheel imprint.

12. In a telegraph printer, a rotatable typewheel, a paper tape, a perforating mechanism comprising a plurality of punch pins, a support for said tape whereby the movement of said tape is between said punch pins and said typewheel, means for moving said tape against said typewheel, means for selectively moving said punch pins against said tape and means for advancing said tape after each conjoined printing and perforating operation.

13. In combination, a selector mechanism responsive to received code combinations of impulses, a printing mechanism comprising a typewheel shaft, a typewheel rotatable therewith and means responsive to said selector mechanism for selectively positioning said typewheel, a perforating mechanism comprising a series of punch pins and associated punch pin interponents, a feed hole punch pin, a paper tape, a feeding mechanism for said tape, a support for said punch pins permitting movement thereof in a plane including said typewheel shaft, means responsive to said selector mechanism for selectively positioning said punch pin interponents, means operative thereafter to actuate said interponents whereby said punch pins are selectively actuated in said plane to form holes in said tape, means operative concurrently with the operation of said interponent actuating means for taking impressions of said typewheel in its selected position onto said tape, means operative on every operation of said interponent actuating means to actuate said feed hole punch pin to form feed holes in said tape in advance of the printing position thereof and means for operating said tape feeding mechanism intermittently with the conjoined operation of said printing and perforating mechanisms.

14. In a telegraph receiver, a plurality of primary selectors, a notched code member corresponding to each selector, a punch pin and interponent therefor corresponding to each selector, means for setting said selectors in combinations in accordance with received code signals, an operating cam, means for rotating said operating cam in timed relation to received code signals and means operated by said operating cam for sequentially positioning said code members and said punch pin interponents simultaneously in accordance with the position of said primary selectors.

15. In a typewheel printer, a recording tape, a typewheel having a single row comprising both upper and lower case characters formed in the periphery thereof, positioning means therefor, a common code representative of both upper and lower case characters, means operated by the last received one of two predetermined signals for determining in which of said cases succeeding signals are to be recorded and means for recording by perforations in said tape all signals received by said printer.

16. In a permutation code device, a single row typewheel having upper and lower case characters and a plurality of blanks formed thereon, a common code representative of both upper and lower case characters and case shift signals, a recording tape, means for selectively positioning said typewheel in response to received signals, said means acting to bring a blank thereon into printing position on the receipt of a case shift signal, means for recording received signals in a perforated form on said tape and means whereby case shift signals are represented by representative perforations in said tape and by blanks in

the section of said tape in operative relation with said typewheel.

17. In a reperforator, a recording tape, a set of primary selectors, means for positioning said selectors in response to received code signals, a set of secondary selectors, means for transferring the settings of said primary selectors to said secondary selectors, a set of punch pin interponents, means operative by said secondary selectors for positioning said punch pin interponents and means for perforating said tape in combinations representative of the positions of said interponents.

18. In a telegraph recording device employing a code comprising a definite number of variable impulses, a set of selectors having a normal and a selected position equal in number to the variable impulses in said code, means responsive to received impulses for setting said selectors in their selected position or leaving them in their normal position in combinations in accordance with received impulses, a set of associated punch pin interponents having a normal and a selected position, means for actuating said selected or select levers to position associated interponents to a selected position, a set of associated punch pins, means for operating said interponents whereby those in a selected position engage associated punch pins to form holes in said tape and means operative immediately following the operation of said last mentioned means for returning selected of said selectors and interponents to normal.

19. In a single magnet telegraph recorder, a paper tape, a printing mechanism for recording telegraph signals in a printed form on said tape, a punching mechanism for recording said telegraph signals in a punched code form on said tape and means for operating said mechanism substantially concurrently.

20. In a telegraph receiver, a recording tape, a printing means, a perforating means and cyclic means for concurrently operating said printing and perforating means, said cyclic means effecting the operation of said perforating means over a longer interval of time than the operation of said printing means.

21. In a telegraph recorder, a printing mechanism, a perforating mechanism and independently rotatable means for controlling the operation of said mechanisms, said means positively operating said perforating mechanism and acting to start the operation of the same in advance of the operation of said printing mechanism.

22. 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 off said support into said selected position, and a perforating mechanism selectively controlled by said elements in their selected position.

23. In a telegraph receiver, a group of primary selectors having normal and selected positions, a selecting cam acting directly on said selectors to shift the same to a selected position under the selective control of line signals, a group of secondary selectors, transfer means for successively transferring the selection set up in the primary selectors directly to the secondary selectors, a group of transfer means selectively controlled by said secondary selectors, a group of punch pin interponents selectively controlled by said transfer members, a group of punch pins, a paper tape, and means cooperating with said interponents whereby said punch pins are selectively actuated to form perforations in said tape.

24. In a telegraph receiver, a group of primary selectors, a selecting cam acting directly on said selectors to shift the same 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, a group of punch pin interponents, means controlled by said secondary selectors operated simultaneously with the operation of said transfer means to position said punch pin interponents in accordance with the selection set up in said primary selectors.

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 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, a perforating mechanism and means controlled by said elements in said third variety of motion to selectively control said perforating mechanism.

26. In a telegraph receiver, a group of primary selectors having normal and selected positions, a selecting cam acting directly on said selectors to shift the same to a selected position under the selective control of line signals, a secondary group of selectors having normal and selected positions, means for successively actuating 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, a paper tape, a group of punch pin interponents operable by said secondary selectors, means whereby the selection set up in said secondary selectors is transferred to said punch pin interponents, a group of punch pins and means for operating said punch pin interponents whereby those representing the selected position of the primary selectors engage associated punch pins to form perforations in the tape.

27. In a telegraph receiver, a plurality of selectors, means for positioning said selectors in marking and spacing positions in combinations in accordance with received signals, a plurality of punch pin interponents having normal and operated positions, means for moving said interponents in succession to their normal position, means for moving the selectors when in a predetermined one of aforesaid positions to actuate corresponding ones of said punch pin interponents into their operated position, a plurality of punch pins and means to operatively actuate said punch pins in combinations representative of the setting of said punch pin interponents.

28. In a telegraph receiver, a plurality of selectors, means for positioning said selectors into marking and spacing positions in accordance with received signals, a plurality of punch pin

interponents having normal and operated positions, means for successively moving said punch pin interponents to their normal position and means for then successively moving them into their operated positions in combinations according to the position of said selectors, said last two mentioned means operating in timed relation to the first mentioned means and occurring in a time interval less than that required to actuate the selectors.

29. A telegraph receiver, a plurality of selecting elements, a support for said 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 of said support into said selected position, a perforating mechanism selectively controlled by said elements in their selected position and means for returning said selected elements to normal position on said support.

30. In combination, a rotatable member having a plurality of cams thereon, a plurality of selecting members each having a normal and a selected position, electromagnetic means responsive to received code combinations of impulses coacting with said rotatable member to directly and variably control the operation of said selecting members to their selected position, means for retaining said selecting members in their selected position, a punch lever, a series of punch pin interponents carried thereby, rotatable means released for rotation by said rotatable member for successively positioning said series of punch pin interponents in accordance with the position of said selecting members, a series of punch pins, a paper tape, a second rotatable means released for rotation by said first rotatable means adapted to rock said punch lever and said punch pin interponents whereby those in a selected position engage associated punch pins to actuate the same to form holes in said tape.

31. In a telegraph recorder, a single magnet selector mechanism responsive to received code combinations of impulses, a printing mechanism, a punching mechanism, means controlled by said selector mechanism for rendering said punching and printing mechanisms operable in accordance with received code combinations of impulses, a paper tape, means for supporting said tape in operative relation to said printing and perforating mechanisms and means for advancing said tape intermittently with said printing and punching operations.

32. In combination, a selector mechanism, a printing mechanism, a recording tape, a perforating mechanism comprising a plurality of punch pins, a punch lever, a plurality of movable members carried by said punch lever, means cooperating with said selector mechanism to selectively interpose projecting sections of said movable members between said punch lever and said punch pins whereby the operation of said punch lever forms holes in said tape, said printing and said perforating operations registering on the same transverse section of said tape, means for operating said punch lever with each setting of said movable members, and means for intermittently advancing said tape.

33. In a telegraph recorder, the combination of a selector mechanism arranged to be positioned in accordance with received code combinations of impulses, a paper tape, a means for supporting said tape, a printing mechanism and a perforating mechanism jointly controlled by said selector mechanism through solely mechanical means, said printing and perforating mechanisms being arranged relative to said tape whereby printing and perforating operations register on a common transverse section of said tape, and means for advancing said tape step-by-step intermittently with said printing and perforating operations.

34. In a telegraph recorder, a selecting mechanism, a printing mechanism, a paper tape, a support for said tape, a perforating mechanism comprising a series of punch pins, a feed hole punch pin, a paper tape feeding mechanism, a punch lever and a series of slidable members carried thereby, means operable by said selector mechanism for selectively positioning said slidable members in combinations of settings, means for operating said punch lever in timed relation with the operation of said selecting mechanism whereby selectively positioned slidable members actuate associated punch pins to perforate said tape and means carried by said punch lever which on the operation of the punch lever invariably operates said feed hole punch pin and said tape feeding mechanism.

35. In a telegraph recorder, a selector mechanism, a printing mechanism, a paper tape, a perforating mechanism comprising a punch lever, a group of punch pins, a group of associated slidable members each having a normal and a selected position carried by said punch lever, a feed hole punch pin, a paper tape feeding mechanism, means for selectively positioning said slidable members in combinations of settings according to the operation of said selector mechanism, means for actuating said punch lever in timed relation to the operation of said selector mechanism whereby selectively positioned slidable members actuate associated punch pins to form perforations in said paper tape, means operative after the actuation of said punch lever for returning selectively positioned slidable members to normal and means carried by said punch lever for operating said feed hole punch pin and said tape feeding mechanism.

36. In a telegraph printer, a paper tape, a printing mechanism, a feed hole perforating mechanism, means for supporting said tape in operative relation with said printing and perforating mechanisms, means for operating said printing and perforating mechanisms concomitantly, and means engaging the feed holes formed by said perforating mechanism for intermittently advancing said tape whereby the relative movement of said tape is from its feed hole perforating position to its printing position.

37. In a telegraph recorder, a recording tape, a printing mechanism, a feed hole perforating mechanism, means whereby the operation of said mechanisms are conjoined, means for advancing said tape concurrently with the operation of said mechanisms, and means for supporting said mechanisms cooperating with said tape advancing means whereby feed holes are formed in said tape in advance of the printing position.

38. In a telegraph recorder, a paper tape, a printing mechanism for recording telegraph signals in a printed form on said tape, a mechanism for piercing said tape for recording said telegraph signals in code form in said tape, means for operating said mechanisms substantially concurrently, means for forming feed holes as a concomitant with the operation of said operating mechanism and means using said feed holes for advancing said tape.

39. In a telegraph receiver, a recording tape, a printing means, a perforating means, cyclic means for concurrently operating said printing and perforating means, said cyclic means effecting the operation of said perforating means over a longer interval of time than the operation of said printing means, and means operable with the operation of said perforating means for advancing said tape.

40. In a telegraph recorder, a printing mechanism, a perforating mechanism, independently rotatable means for controlling the operation of said mechanisms, said means positively operating said perforating mechanism to perform perforating operations and acting to start the operation of the same in advance of the operation of said printing mechanism and means for initiating the operation of said independently rotatable means.

41. In a telegraph recorder for recording code combinations of impulses, a print cam, a print lever therefor, a punch cam, a punch lever therefor, means for rotating said cams in timed relation to received code combinations of impulses, a paper tape and means operable on the return of said punch lever to its normal position for advancing said tape to effect letter spacing.

42. In a telegraph receiver for recording permutation signals in printed and punched code forms on a common tape comprising a printing mechanism, a punch mechanism including a plurality of punch pins, a plurality of associated punch pin interponents and a punch lever, means responsive to received signals for selectively positioning said interponents, solely mechanical means operative after the selective positioning of said interponents for actuating said punch lever and means for initiating the operation of said last mentioned means.

43. In a telegraph recorder, a plurality of primary selectors, a notched code member corresponding to each selector, a punch pin interponent corresponding to each selector, means for positioning said selectors in combinations in accordance with received code signals and means for progressively transferring the selection set up in said primary selectors to both said code members and said punch pin interponents.

44. In a telegraph printer, a set of primary selectors a transfer member corresponding to each selector, a notched code disc corresponding to each transfer member and operable thereby, a punch pin interponent corresponding to each transfer member and operable thereby, means for setting said selectors in response to received code combinations of impulses, means initiated after the start of the setting of said selectors and before the completion thereof for sequentially transferring the setting of said selectors to said transfer members whereby said discs and said interponents are set in accordance with received signals, a type-wheel, positioning means therefor controlled by said discs, a punch pin corresponding to each punch pin interponent, a press mechanism, means operative immediately following the positioning of said typewheel for operating said press mechanism, a recording tape and means operating concurrently with said last mentioned means whereby said punch pins are selectively actuated to form perforations in said tape, said perforation conforming to a predetermined code arrangement of received impulses.

45. In a telegraph printer, a single row typewheel having a plurality of characters thereon, a press mechanism, means for positioning said typewheel to bring characters representing received code combinations of impulses into operative relation with said press mechanism, a recording tape, means for operating said press mechanism to record selected characters from said typewheel on said tape, and means operative concurrently with the operation of said press mechanism for recording selected characters in a perforated form on said tape.

46. In a telegraph reperforator for recording code combinations of impulses in a perforated form, a recording tape, a set of primary selectors having a normal and an operated position, means for positioning said primary selectors in accordance with a received signal, a set of associated punch pin interponents, solely mechanical means for transferring the setting of said primary selectors to said interponents, a set of associated punch pins and mechanical means operating in timed relation to received impulses for actuating said interponents whereby said punch pins are selectively actuated to form perforations in said tape representing the received code combination of impulses.

47. 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 received signals, a group of punch pins equal in number to said selecting elements, a paper tape and solely mechanical means operated by said selecting elements in one position wherby associated punch pins are actuated to punch code forms in said tape.

48. In a telegraph receiver, a plurality of selectors having normal and operating positions, means for positioning said selectors in operated position in accordance with the reecived line signaling conditions, a plurality of punch pin interponents having normal and operated positions, a group of transfer members, an operating cam member cooperating with said operated selectors to operatively position associated punch pin interponents, a plurality of punch pins and cam operated means for actuating said interponents whereby those in an operated position operatively actuate associated punch pins.

49. A telegraph receiver comprising a perforating mechanism, a series of selector elements having a variety of motions but normally restrained from movement by unequal pressures at two points, means operating to move said elements in succession, 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 combinations 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 operation of said perforating mechanism.

50. 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, 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 punch lever, a plurality of interponent members carried by said lever, a plurality of punch pins, means for setting said interponent members in accordance with the setting of said selecting

members and means for rocking said punch lever after the setting of said interponent members whereby said punch pins are actuated in a combination representative of the setting of said selecting members.

51. In a combined perforating and printing mechanism, the combination of a permutation selector, a printing mechanism and a perforating mechanism jointly controlled by said selector mechanism, a tape, means for supporting said tape with a common transverse section thereof in operative relation with said printing and perforating mechanism, means for effecting printing and perforating on said common transverse section and means for advancing the tape in only one direction following such printing and perforating operations.

52. In a combined code punching and printing mechanism, the combination of a permutation selector, a printing mechanism and a punching mechanism jointly controlled thereby, a tape, means for supporting said tape in operative relation with both said printing and perforating mechanism, means for recording on said tape the same characters in printed and punched code form and means for advancing the tape in only one direction following the recording operations.

53. In a combined code punching and printing machine, the combination of a permutation selector, a printing mechanism and a punching mechanism jointly controlled thereby, a tape, means for actuating said printing mechanism and punching mechanism to produce a record on said tape in printed form and in punched code form and means for advancing the tape in the direction of its length following each recording operation.

54. In a combined perforating and printing mechanism, the combination of a permutation selector, a printing mechanism and a perforating mechanism jointly controlled thereby, a tape, means for effecting printing from said printing mechanism and for producing code perforations and feed hole perforations in the tape by said perforating mechanism and means cooperating with said feed hole perforations for advancing the tape following each recording operation.

55. In a combined perforating and printing machine, the combination of a selector responsive to signals received over a single conductor, a printing mechanism and a perforating mechanism controlled by said selector, a tape, means for recording on said tape in printed form the characters corresponding to the signals received over said conductor and means for moving said tape in the direction of its length folowing each recording operation.

56. In a combined perforating and printing machine, the combination of a selector responsive to signals received over a single conductor, a recording medium, means for effecting printing and code perforating of common characters on said medium with the printed characters in registry with only the corresponding code perforations.

57. In a combined perforating and printing machine, the combination of a permutation selector, a recording medium, means responsive to said selector mechanism for recording printed characters on said medium and other means controlled by said selector for producing code perforations corresponding to said characters, said code perforations being in a single row and only in registry with representative of said printed characters.

58. In a combined perforating and printing machine, the combination of a printing mechanism, a perforating mechanism disposed adjacent said printing mechanism, a recording medium upon which both perforations and printed characters are recorded and means for directing the punchings incident to the perforating operation away from the printing mechanism.

59. In a combined perforating and printing machine, the combination of a typewheel, a perforating mechanism comprising a series of punch pins disposed closely adjacent the printing position of said typewheel, means for producing a printed record by said typewheel and a perforated record by said punch pins, and means for preventing the punchings incident to the perforating operation from engaging said typewheel.

60. In combination, a combined printing and perforating mechanism responsive to telegraph code signals comprising a selector mechanism, a rotary distributor associated with the line for controlling said selector mechanism, a printing mechanism and a perforating mechanism pointly controlled by said selector mechanism, means for recording from said printing mechanism and said perforating mechanism on a common tape, and means for advancing said tape in the direction of its length following each recording operation.

61. In a combined printing and perforating mechanism, the combination of a permutation selector comprising selectors having normal and selected positions, a printing mechanism comprising a set of notched discs, a perforating mechanism comprising a set of punch pin interponents, means for positively returning said notched discs and said punch pin interponents to a normal position, means operative thereafter for positively transferring the setting of said selectors to said notched discs and resilient means operative with said last mentioned means for transferring the setting of said selectors to said punch pin interponents.

62. In a combined printing and perforating mechanism, the combination of a permutation selector comprising a plurality of selectors selectively positionable in response to received permutation signals, a printing mechanism comprising a typewheel and a plurality of notched discs movable into one or the other of two positions to selectively control the rotative position of said typewheel, a perforating mechanism comprising a plurality of punch pins, a plurality of punch pin interponents and a punch hammer, said punch pin interponents being movable into and out of operative relation with said punch pins, a plurality of transfer levers each having a normal and an operated position, means for moving said transfer levers to a normal position, means operative thereafter for transferring the setting of said selectors to said transfer levers, means for positively moving said notched discs with said transfer levers in two directions, means for positively moving said punch pin interponents with said transfer levers in one direction of movement, and resilient means for moving said punch pin interponents with said transfer levers in an opposite direction of movement.

63. In a combined printing and perforating mechanism, the combination of a permutation selector comprising a plurality of selectors selectively positionable in response to received permutation signals, a printing mechanism comprising a typewheel and a plurality of notched discs movable into one or the other of two posi-

tions to selectively control the rotative position of said typewheel, a perforating mechanism comprising a plurality of punch pins, a plurality of punch pin interponents and a punch hammer, said punch pin interponents being movable into and out of operative relation with said punch pins, a plurality of transfer levers each having a normal and an operated position, power operated means for moving said transfer levers in one direction to a normal position, means for transferring the settings of said selectors to said transfer levers whereby they are moved in an opposite direction to said operated position, said power operated means through said transfer levers moving said notched discs in both directions with said transfer levers, said power operated means moving said punch pin interponents with said transfer levers only out of operative relation with said punch pins and resilient means for moving said punch pin interponents with said transfer levers into operative relation with said punch pins.

64. In a combined cyclically operable printing and perforating mechanism, the combination of a permutation selector comprising a plurality of selectors selectively positionable in response to received permutation signals, a printing mechanism comprising a typewheel and a plurality of notched discs movable into one or the other of two positions to selectively control the rotative position of said typewheel, a perforating mechanism comprising a plurality of punch pins, a plurality of punch pin interponents and a punch hammer; said punch pin interponents being movable into and out of operative relation with said punch pins, a plurality of transfer levers each having a normal and an operated position, power operated means operative during a portion of each cycle for moving said transfer levers in one direction to said normal position, a second power operated means during another portion of each cycle for moving said transfer levers in an opposite direction to selectively position the same in accordance with the setting of said selectors, means for biasing said transfer levers in both of said positions, said notched discs being articulated to said transfer levers and adapted to positively move therewith in both of said directions, said punch pin interponents being adapted to positively move with said transfer levers in one direction to move the same out of operative relation with said punch pins and resilient means adapted to move said punch pin interponents in the opposite direction to move the same into operative relation with said punch pins, said transfer lever biasing means being sufficiently strong to overcome said last mentioned resilient means.

65. In a combined printing and perforating mechanism, the combination of a printing mechanism comprising a typewheel shaft and a typewheel selectively rotatable to bring selected characters thereon into printing position, perforating mechanism comprising a plurality of punch pins movable in the plane of said typewheel shaft, a recording medium upon which printed characters from said typewheel are recorded and in which said punch pins record said characters in a perforated form and means for advancing said recording medium in the direction of its length and at right angles to the axis of said typewheel shaft concomitantly with each conjoined printing and perforating operation.

66. In a typewheel printer, a recording tape, a typewheel having a single row comprising both upper and lower case characters formed on the periphery thereof, selector means responsive to a common code representative of both upper and lower case characters, shift means operated by said selector means in response to the last received one of two predetermined signals for determining in which of said cases succeeding signals are to be recorded, means for printing on said tape from said typewheel and means for recording by perforations in said tape all signals received by said printer.

67. In a permutation code device, a single row typewheel having upper and lower case characters and a plurality of blank spaces formed thereon, a selector means responsive to a code representative of both upper and lower case characters and shift signals, a recording tape, means for selectively positioning said typewheel in response to received signals, said means acting to bring a blank thereon into printing position on receipt of a case shift signal, means for printing from said typewheel onto said tape, means for also recording received signals in a perforated form on said tape and means whereby case shift signals are represented by representative perforations in said tape and by blanks in the section of said tape in operative relation with said typewheel.

ROBERT F. DIRKES.
EVAN R. WHEELER.