Nov. 1, 1938. J. W. LONG ET AL 2,134,722

TELEGRAPH PRINTER

Filed July 31, 1935 13 Sheets-Sheet 1

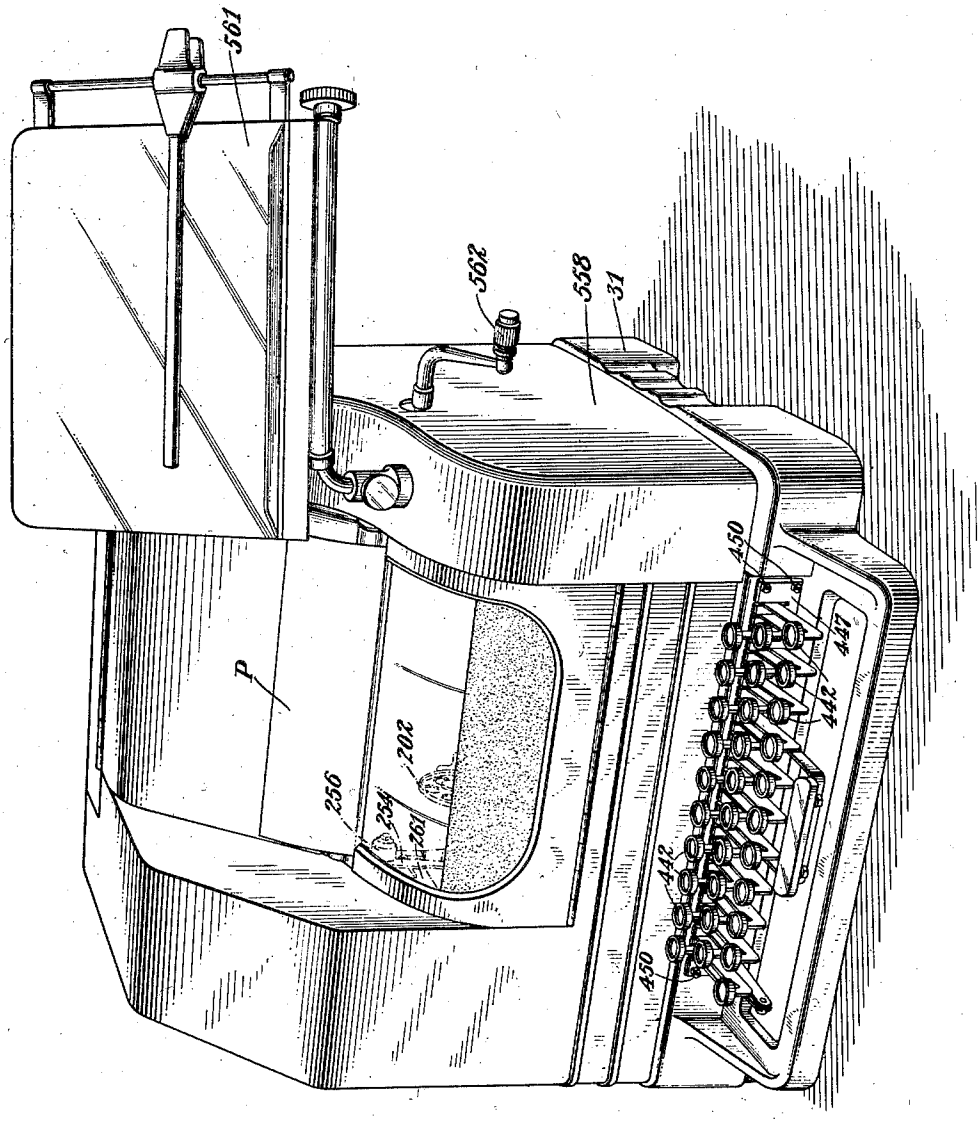


FIG. 1

INVENTORS
J.W. LONG
E.R. WHEELER
BY Eugene C. Brown
ATTORNEY

Nov. 1, 1938. J. W. LONG ET AL 2,134,722

TELEGRAPH PRINTER

Filed July 31, 1935 13 Sheets-Sheet 2

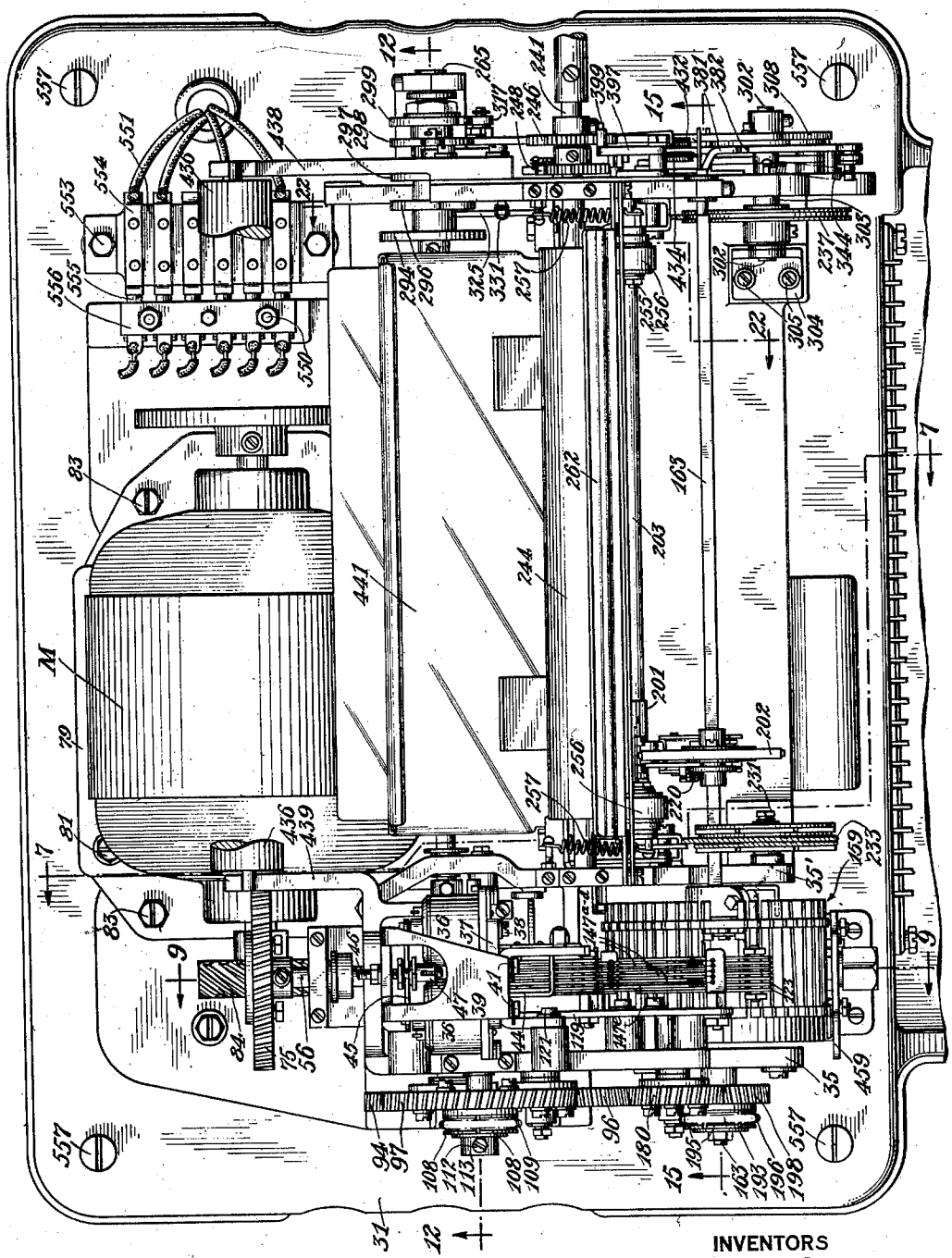


FIG. 2

INVENTORS
J.W. LONG
E.R.WHEELER
BY Eugene C. Brown
ATTORNEY

Nov. 1, 1938. J. W. LONG ET AL 2,134,722

TELEGRAPH PRINTER

Filed July 31, 1935 13 Sheets-Sheet 3

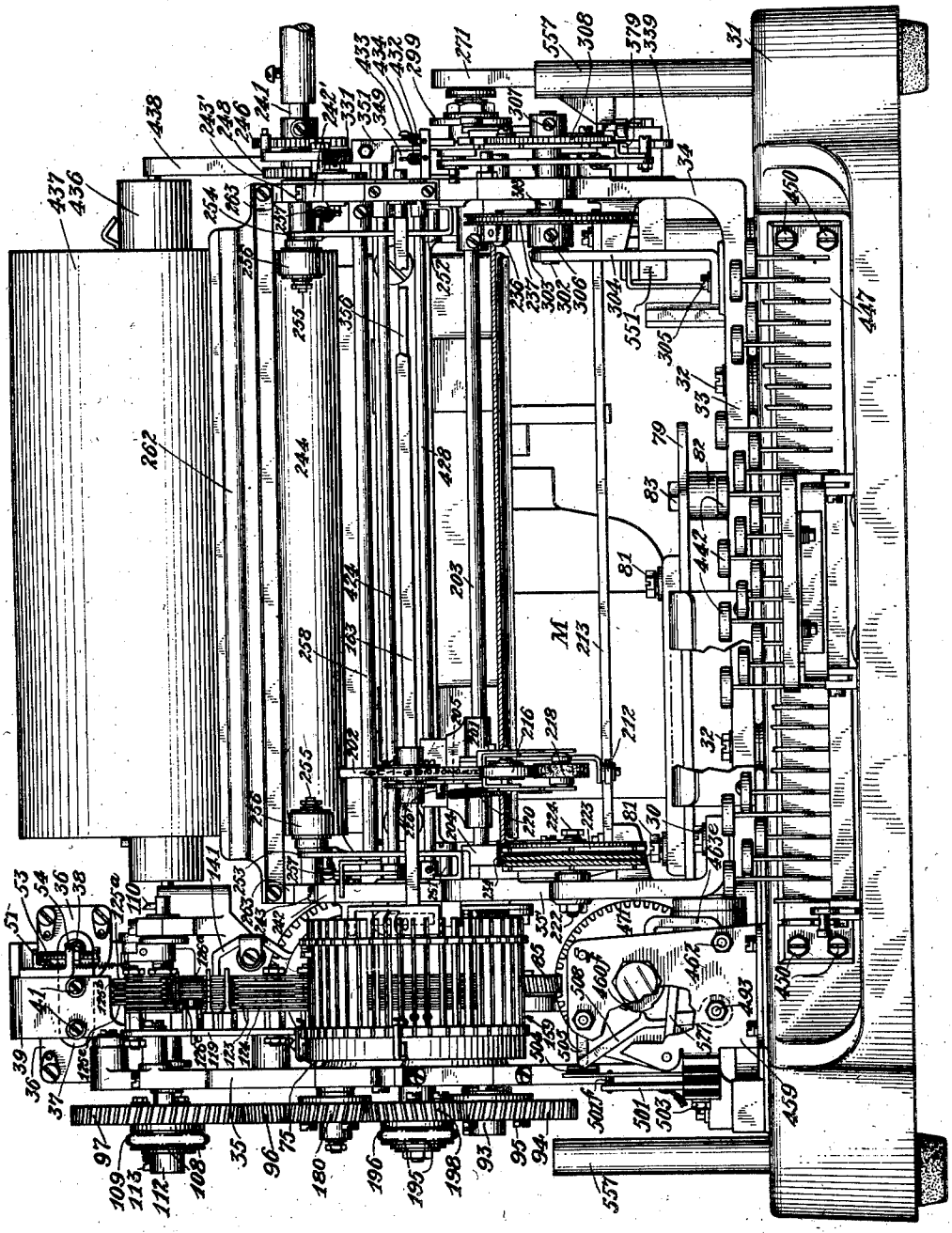


FIG. 3

INVENTORS
J.W. LONG
E.R.WHEELER
BY Eugene C. Brown
ATTORNEY

Nov. 1, 1938. J. W. LONG ET AL 2,134,722

TELEGRAPH PRINTER

Filed July 31, 1935 13 Sheets-Sheet 4

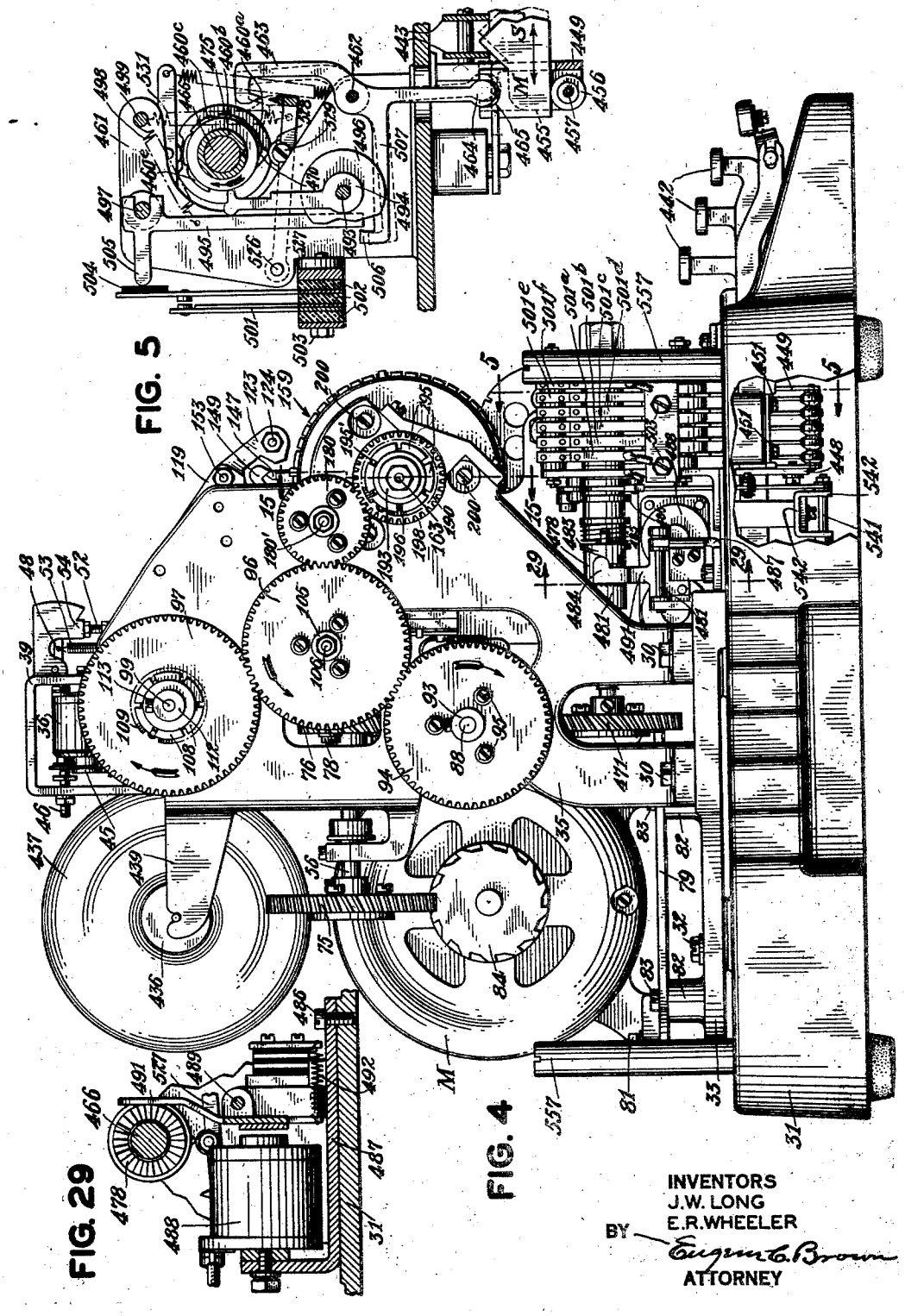


FIG. 5

FIG. 4

FIG. 29

INVENTORS
J.W. LONG
E.R.WHEELER
BY Eugene C. Brown
ATTORNEY

Nov. 1, 1938. J. W. LONG ET AL 2,134,722

TELEGRAPH PRINTER

Filed July 31, 1935 13 Sheets-Sheet 5

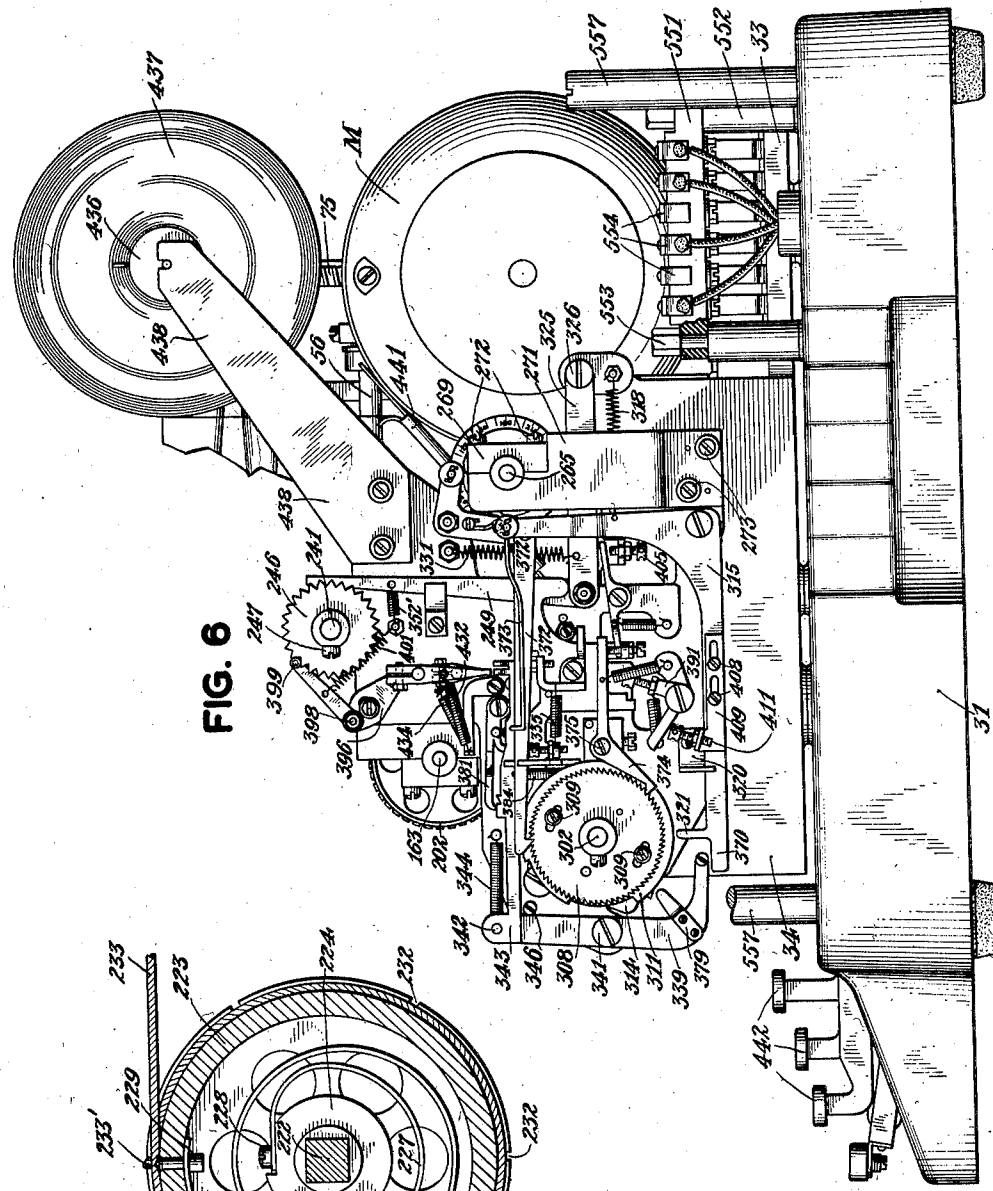


FIG. 6

FIG. 27

INVENTORS
J.W. LONG
E.R. WHEELER
BY Eugene C. Brown
ATTORNEY

Nov. 1, 1938. J. W. LONG ET AL 2,134,722

TELEGRAPH PRINTER

Filed July 31, 1935 13 Sheets-Sheet 6

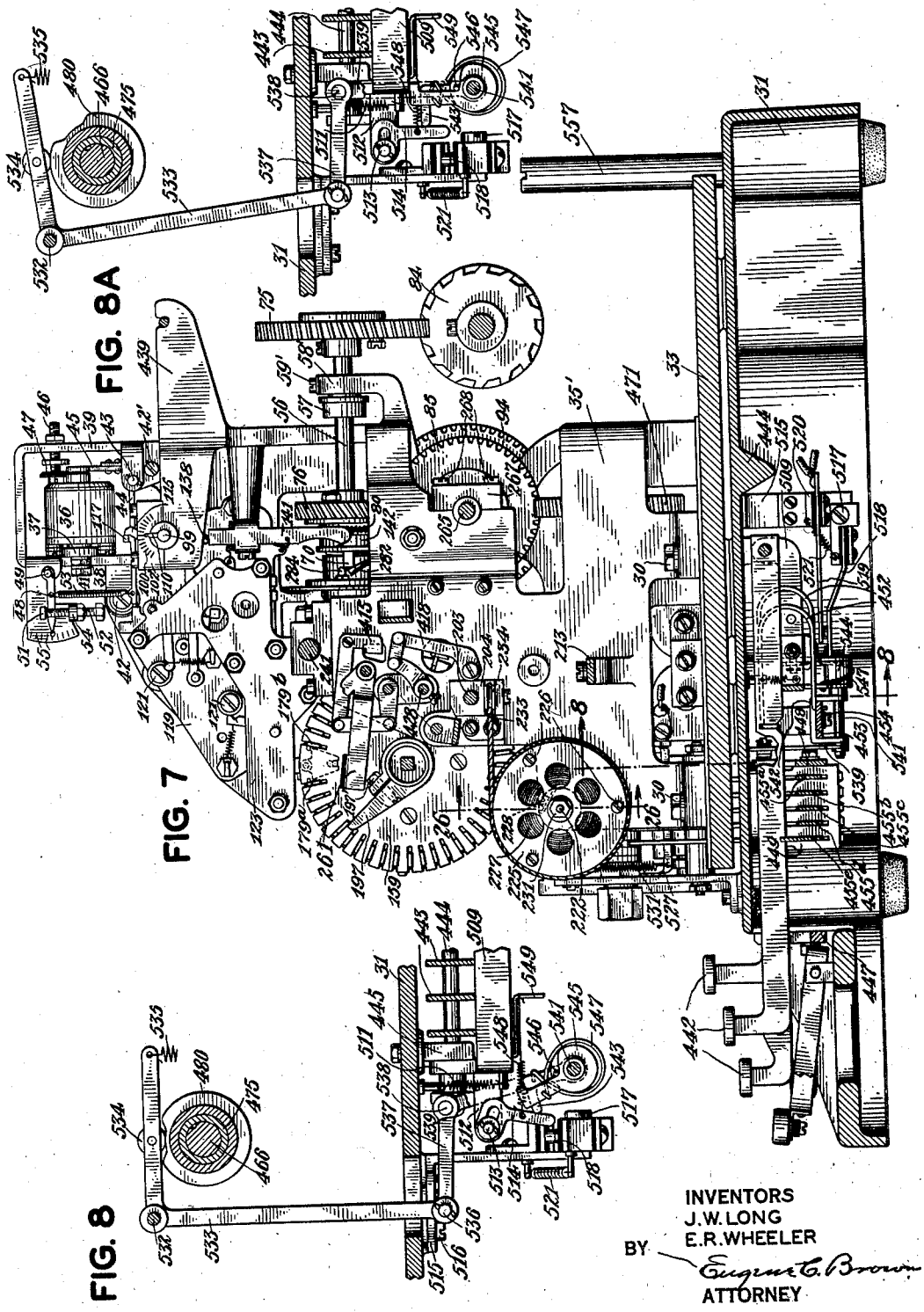


FIG. 8A

FIG. 7

FIG. 8

INVENTORS
J. W. LONG
E. R. WHEELER
BY Eugene C. Brown
ATTORNEY

Nov. 1, 1938. J. W. LONG ET AL 2,134,722

TELEGRAPH PRINTER

Filed July 31, 1935 13 Sheets-Sheet 7

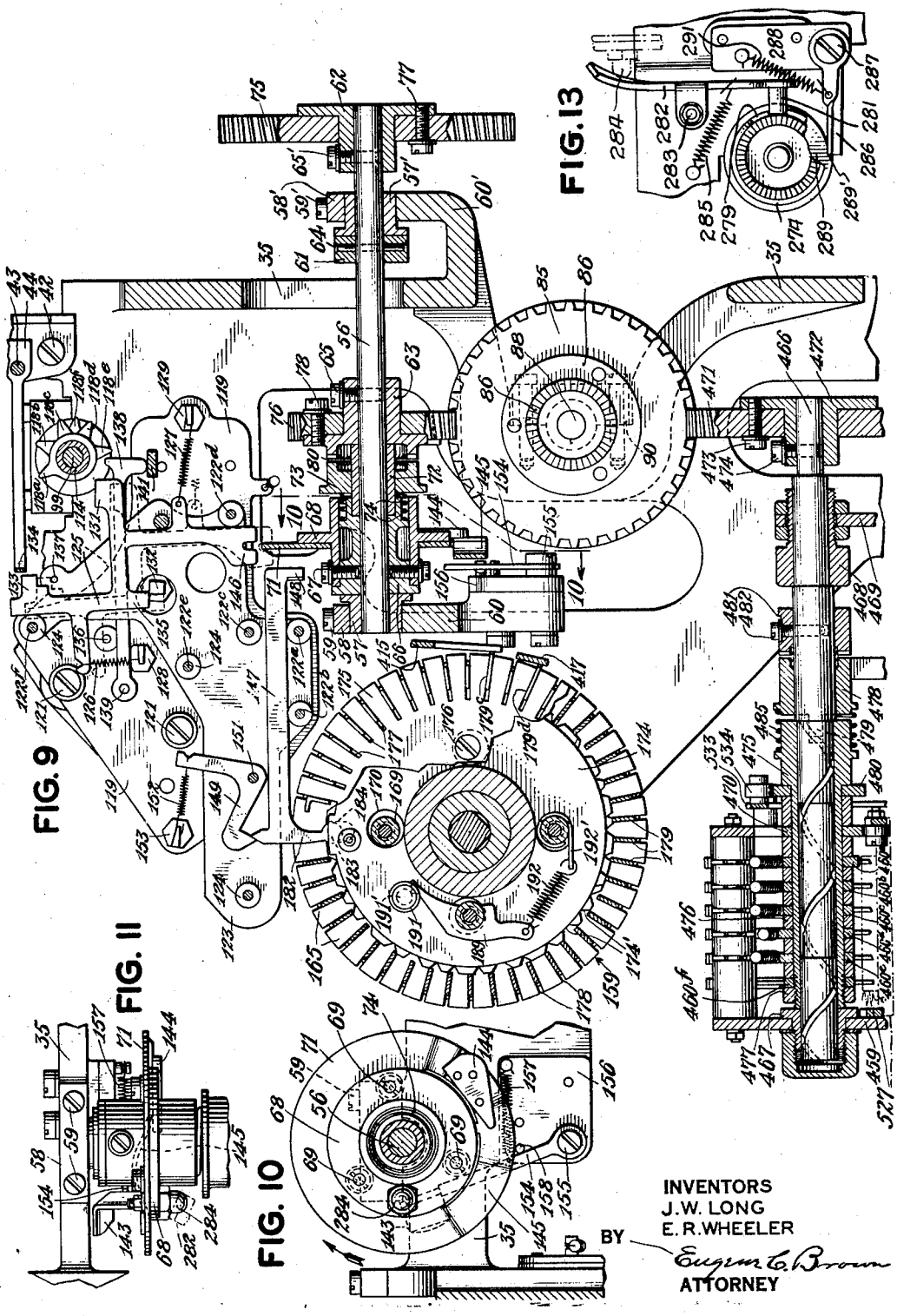


FIG. 9

FIG. 13

FIG. 11

FIG. 10

INVENTORS
J.W. LONG
E.R.WHEELER
BY Eugene C. Brown
ATTORNEY

Nov. 1, 1938. J. W. LONG ET AL 2,134,722

TELEGRAPH PRINTER

Filed July 31, 1935 13 Sheets-Sheet 8

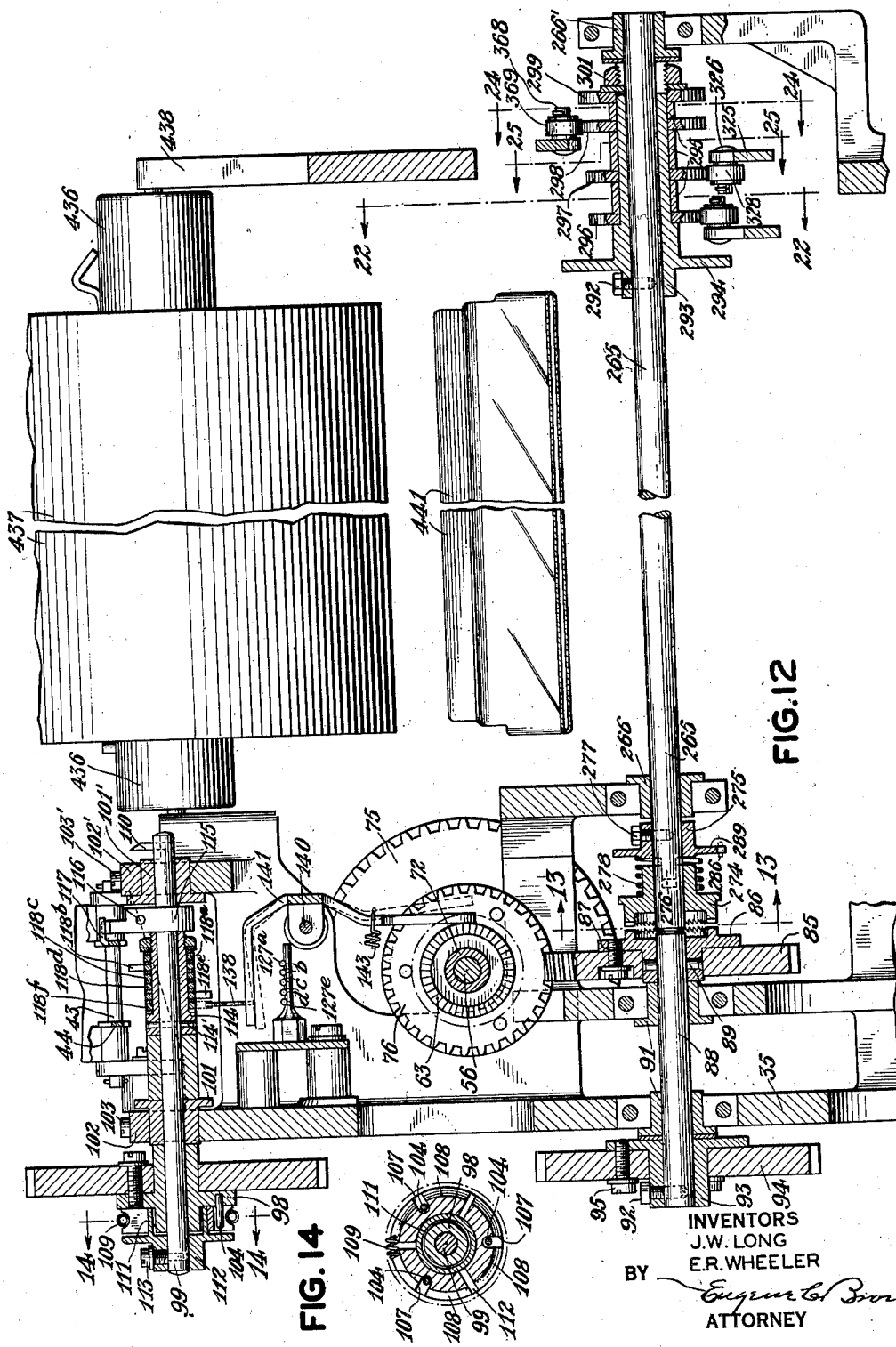


FIG. 12

FIG. 14

INVENTORS
J.W. LONG
E.R. WHEELER
BY Eugene C. Brown
ATTORNEY

Nov. 1, 1938. J. W. LONG ET AL 2,134,722

TELEGRAPH PRINTER

Filed July 31, 1935 13 Sheets-Sheet 9

FIG. 15

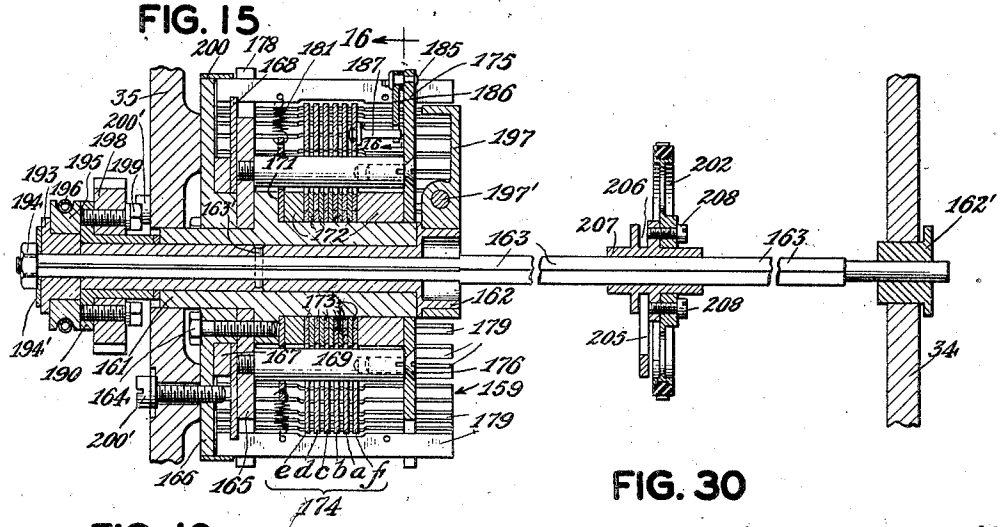


FIG. 16

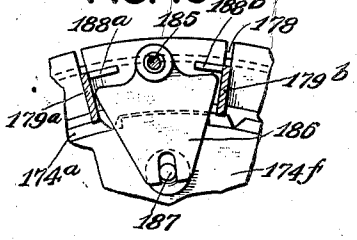


FIG. 30

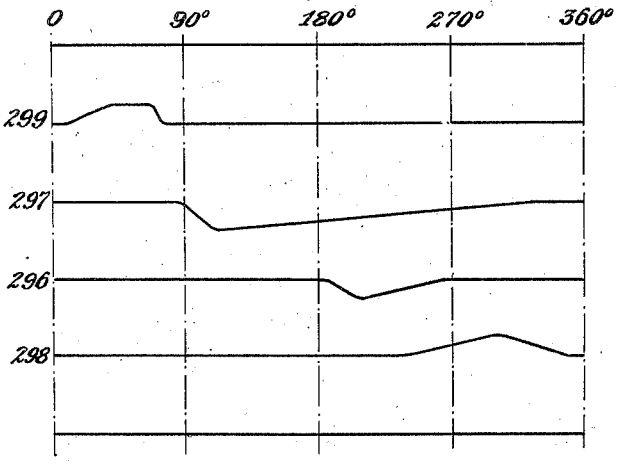


FIG. 26

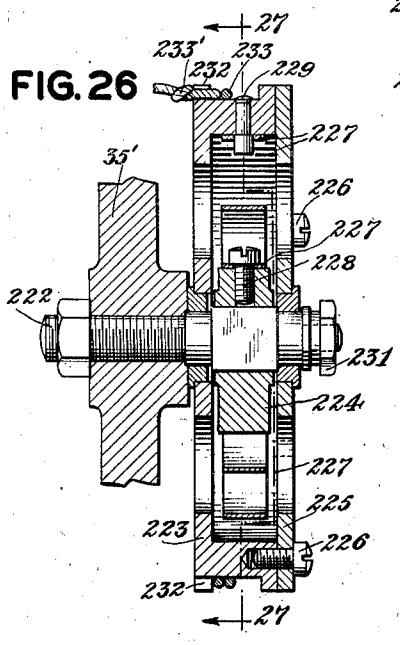
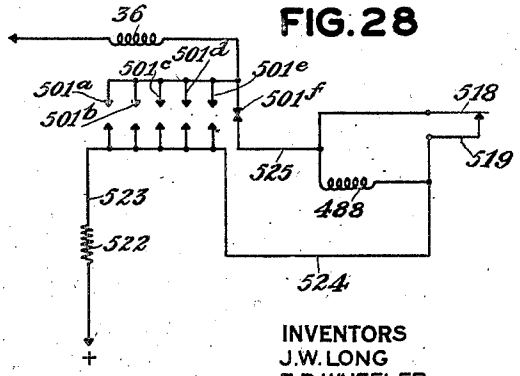


FIG. 28



INVENTORS
J.W. LONG
E.R.WHEELER

BY Eugene C. Brown

ATTORNEY

Nov. 1, 1938.

J. W. LONG ET AL

2,134,722

TELEGRAPH PRINTER

Filed July 31, 1935

13 Sheets-Sheet 10

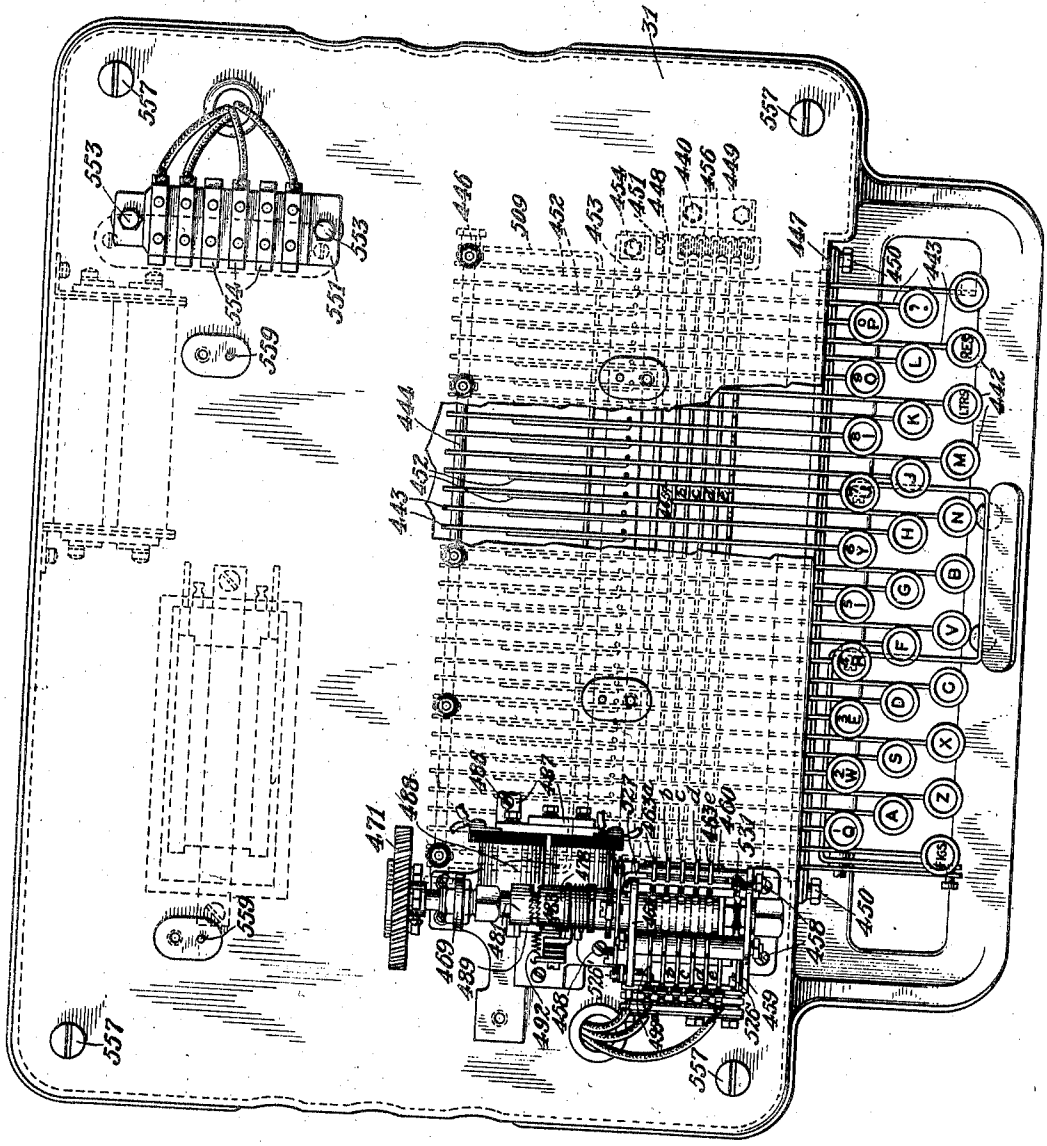


FIG. 17

INVENTORS
J.W. LONG
E.R.WHEELER

BY Eugene C. Brown
ATTORNEY

Nov. 1, 1938.

J. W. LONG ET AL

2,134,722

TELEGRAPH PRINTER

Filed July 31, 1935

13 Sheets-Sheet 11

FIG. 18

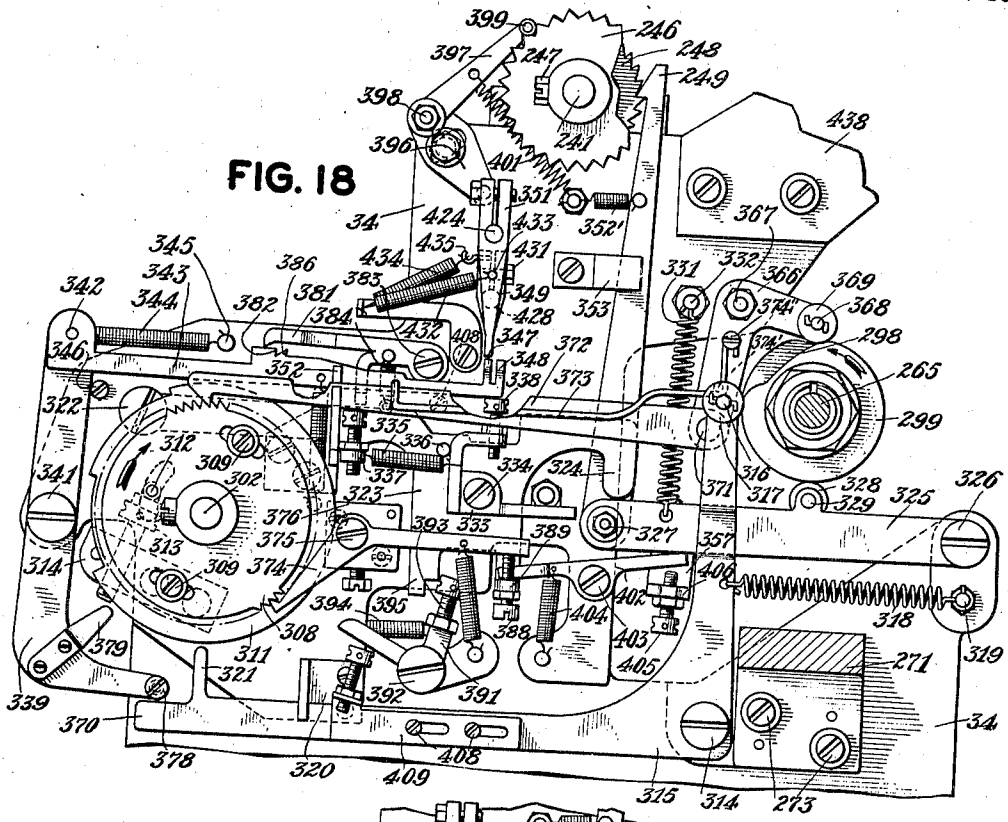
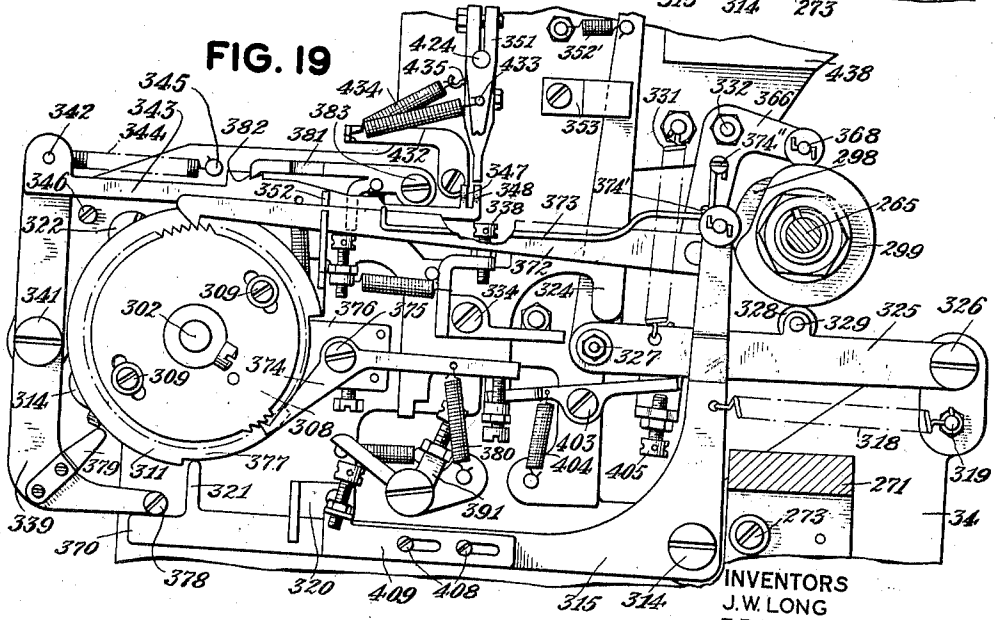


FIG. 19



INVENTORS
J. W. LONG
E. R. WHEELER
BY Eugene C. Brown
ATTORNEY

Nov. 1, 1938. J. W. LONG ET AL 2,134,722

TELEGRAPH PRINTER

Filed July 31, 1935 13 Sheets-Sheet 12

FIG. 20

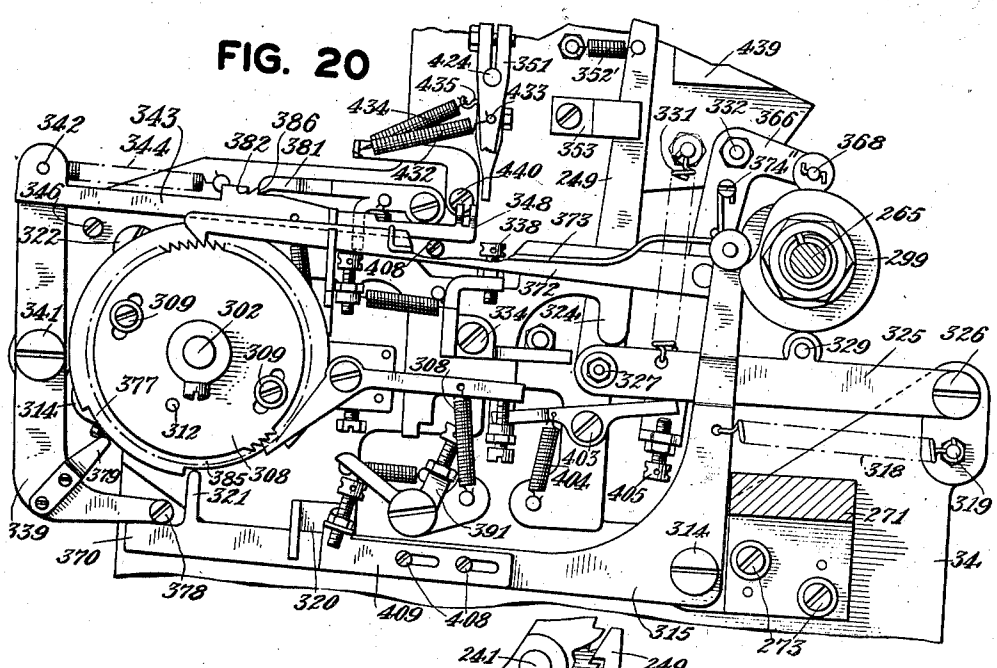
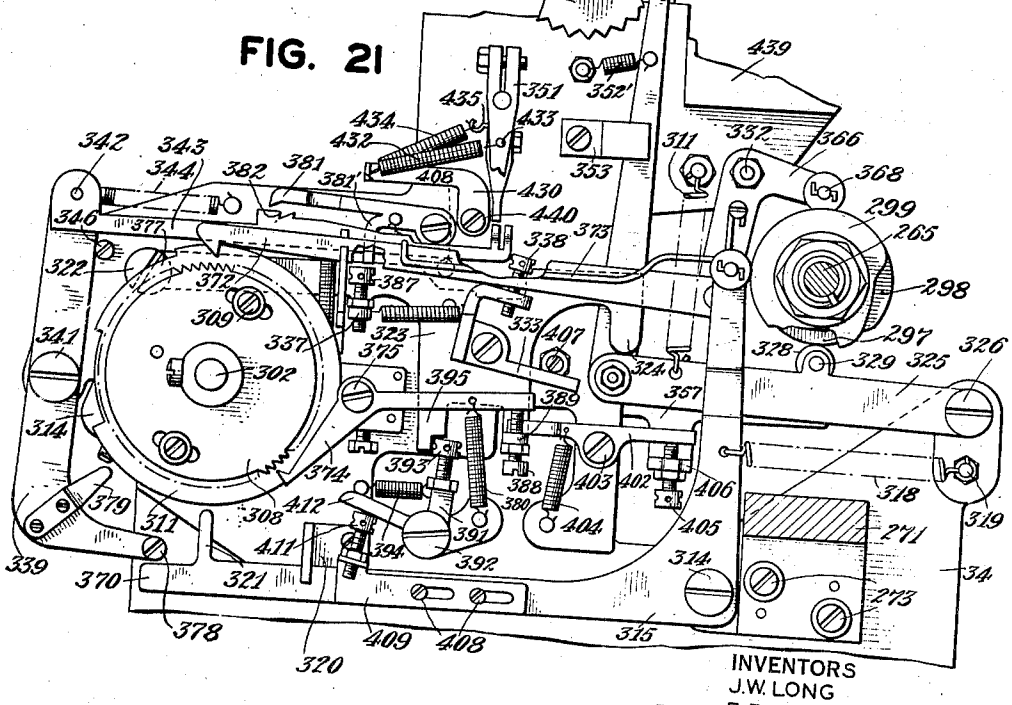


FIG. 21



INVENTORS
J.W. LONG
E.R. WHEELER
BY Eugene C. Brown
ATTORNEY

Nov. 1, 1938.

J. W. LONG ET AL

2,134,722

TELEGRAPH PRINTER

Filed July 31, 1935

13 Sheets-Sheet 13

FIG. 22

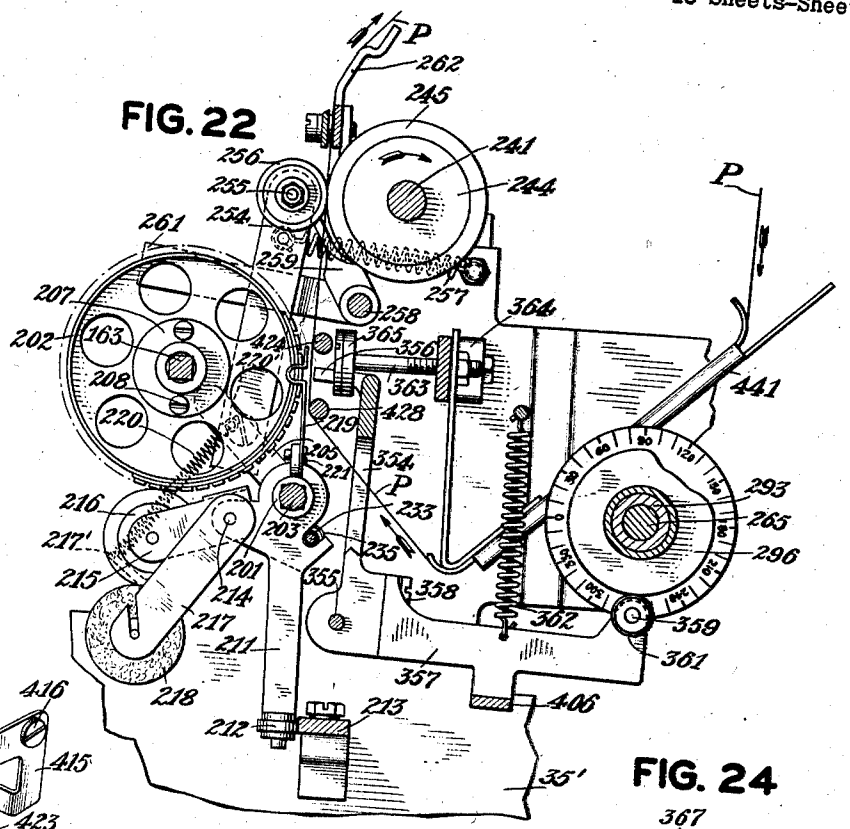


FIG. 23

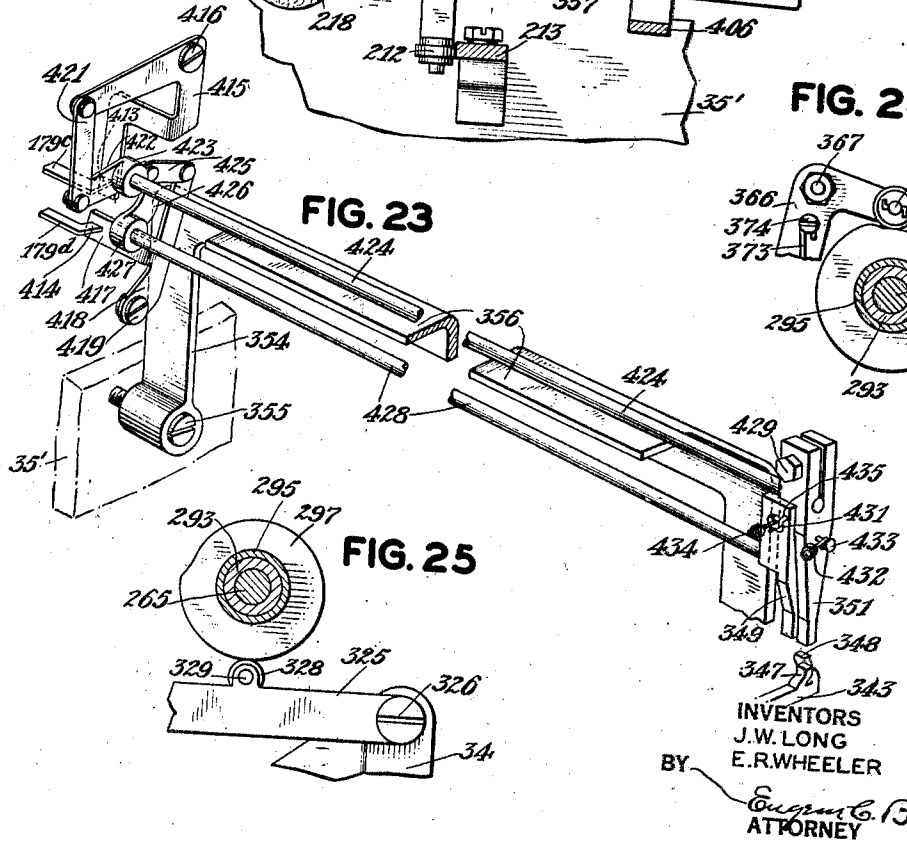


FIG. 24

FIG. 25

INVENTORS
J.W. LONG
E.R.WHEELER

BY Eugene C. Brown
ATTORNEY

Patented Nov. 1, 1938 2,134,722

UNITED STATES PATENT OFFICE

2,134,722

TELEGRAPH PRINTER

James W. Long and Evan R. Wheeler, Plainfield, N. J., assignors to The Western Union Telegraph Company, New York, N. Y., a corporation of New York

Application July 31, 1935, Serial No. 34,080

67 Claims. (Cl. 178—28)

This invention relates to signalling systems and apparatus therefor and more particularly to transmitting, selecting, and printing mechanisms. The transmitting mechanism relates to a keyboard controlled mechanism to selectively transmit signal code characters. The selector mechanism comprises an electroresponsive selector magnet which, in combination with a rotatable selector cam sleeve functions to variably control the operation of the remainder of the selector mechanism. The armature of the selector magnet is light, yet rigid and has a small amount of work to perform. It acts with respect to the selective mechanism to only control the selection, local power being furnished for moving the elements of the selector mechanism. Thus the selector mechanism is adapted for rapid and accurate selections. The printing mechanism relates to printing telegraph receiving printers of the class commonly referred to as page printers. The printer is designed for rapid printing and transmission of news and messages and a plurality of printers may be interconnected in an intercommunication system for alternate sending and receiving.

In accordance with the preferred form of the invention there is provided a receiving printer having a paper feed mechanism and a type carrying mechanism comprising a type wheel which is arranged to be moved transversely of the paper and rotatable to a selected position by means controlled by the selector mechanism. A keyboard is also provided to control, by means of permutation or selecting bars, an associated transmitter mechanism for transmitting to the selecting magnet of its associated printer or distant printers, the selection corresponding to the actuated key lever in the keyboard.

The signalling code employed in conjunction with the selector mechanism to transmit characters is known as the "start-stop" five unit code. If a given unit of time be divided into five intervals during each of which current may or may not be transmitted, it is possible to produce thirty-two different combinations of current and no-current intervals. Each character is composed of a start impulse followed by five selecting impulses used in various combinations of current and no-current and a stop impulse. The start and stop impulses are used to maintain synchronism between the several printers on the circuit. Impulses which operate the selector magnets are known as marking impulses and are therefore intervals of current. Impulses which do not operate the selector magnets are spacing impulses. The start impulse is therefore a spacing impulse and the stop impulse a marking impulse.

One of the principal objects of this invention is to provide a page printer with novel selecting, printing and type positioning mechanisms of improved efficiency and durability.

Another object of this invention is to provide means whereby after the type carrier has reached the end of a predetermined length of line and a space signal character is received by the printer, or a predetermined number of characters have been printed after said predetermined length of line is reached, none of said signals being a space signal character, the type carrier will be automatically returned to its initial start position. This precludes the harmful consequence that would result to the printer due to the failure to transmit a reset signal at the end of each line. This permits the operation of the page printer on the same signals that operate a printer of the tape printer class. Due to its light construction and speed of operation the type carrier is capable of being returned to its start position in a time interval equal to the time required to transmit one combination of character impulses.

A still further object of the invention is the design of the parts of a printer whereby such parts may be easily and cheaply manufactured and thus reduce the manufacturing and maintenance costs of the printer to a minimum.

Another still further object of the invention is the design of a typewheel stop and page mechanisms whereby they may be readily adapted for use with a multiplex selecting unit.

These and other objects effected by this invention will be apparent from the following description and claims.

In order that high speed operation may be obtained an overlap arrangement has been provided using two sets of selectors, the first or primary set being controlled by incoming line signals by means of a selector magnet and associated equipment and a second set being controlled by the first set. The two sets of selectors are so arranged that the selection of the first set is transferred in a very short interval of time to the second set and the first set thereafter restored to the normal position whereupon it is free to operate in response to the succeeding character code while the second set has nearly the entire interval of one character to operate the character selecting and printing mechanisms.

The individual sub-combinations of mechanisms that perform the related functions of the complete mechanism are arranged in units which

may be easily and readily removed and interchangeably replaced when requiring repairs or adjustments. Thus the replacement of the whole printer is not necessary.

The left end of the printer comprises an upright frame unit casting upon which are mounted the selector and typewheel stop mechanisms. In the framework are also journalled part of the various drive and operating shafts of the printer. The upright frame unit is mounted on a base plate, the right end of which comprises an upright plate which serves as journal points for the right ends of the shafts of the page operating mechanisms and mounting points for the various other mechanisms. On the rear of the base plate is mounted an electric motor which furnishes power for the various operations and functions through appropriate gearing and clutch mechanisms. The base plate with its attached mechanism is removably mounted on top of a keyboard housing. Locating pins and holes in the respective units locate the relative position of the units properly. The keyboard is similar to that of an ordinary typewriter and is to the front of the printer. The key levers actuate associated permutation bars in the keyboard housing which control a transmitting mechanism. The transmitting mechanism is mounted on the top of the keyboard housing and serves to transfer the mechanical selections of the permutation or selector bars into corresponding electrical impulses.

The electrical impulses are transferred to an out-going circuit and to the selector magnet of the selector unit of the associated printer. The selector magnet in conjunction with the selector cam sleeve controls the selection of a primary set of selectors and the release of an operating cam. The primary set of selectors control the selection of a secondary set of selectors which in turn control the positions of the associated code discs of the stop unit. The stop unit serves to stop the type wheel in a position so that the character corresponding to the selected character is in printing relation with the print hammer. The operating cam controls the release of the page operating cam shaft, which in turn controls the transverse movement of the type wheel, the printing and the paper feeding. Various other minor functions and operations are coordinated with the main operations with the proper timing relationship and a complete description will be given hereinafter in connection with the accompanying drawings forming a part of this application in which:

Figure 1 is a perspective view of a printer embodying the present invention, with a silencing cover thereon;

Figure 2 is a plan view of the printer, with parts broken away, in which the front of the machine is shown at the bottom of the drawings;

Figure 3 is a front elevational view thereof;

Figure 4 is a left end elevational view thereof;

Figure 5 is a sectional view taken on line **5**—**5** of Figure 4;

Figure 6 is a right end elevational view thereof;

Figure 7 is a sectional view taken on line **7**—**7** of Figure 2;

Figure 8 is a sectional view taken on line **8**—**8** of Figure 7, showing a safety device with the printer at rest;

Figure 8A is a sectional view taken on line **8**—**8** of Figure 7, showing the safety device with the printer in operation;

Figure 9 is a fragmentary sectional view taken on line **9**—**9** of Figure 2;

Figure 10 is a fragmentary sectional view taken on line **10**—**10** of Figure 9;

Figure 11 is a plan view of the mechanism shown in Figure 10;

Figure 12 is a fragmentary sectional view taken on line **12**—**12** of Figure 2;

Figure 13 is a fragmentary sectional view taken on line **13**—**13** of Figure 12;

Figure 14 is a fragmentary sectional view taken on line **14**—**14** of Figure 12;

Figure 15 is a sectional view of the type wheel shaft and stop mechanism taken on line **15**—**15** of Figures 2 and 4;

Figure 16 is an enlarged detail sectional view taken on line **16**—**16** of Figure 15;

Figure 17 is a plane view of the keyboard mechanism with a part of the keyboard housing broken away;

Figure 18 is an enlarged detail view of the right end of the page operating mechanisms;

Figures 19, 20 and 21 are views of the page operating mechanism shown in different operating positions.

Figure 22 is a section on line **22**—**22** of Figures 2 and 12;

Figure 23 is a fragmentary perspective view of reset and space stop members and following mechanisms controlled thereby;

Figure 24 is a sectional view taken on line **24**—**24** of Figure 12;

Figure 25 is a sectional view taken on line **25**—**25** of Figure 12;

Figure 26 is a sectional view taken on line **26**—**26** of Figure 7;

Figure 27 is a sectional view taken on line **27**—**27** of Figure 26;

Figure 28 is a circuit diagram showing electrical connections between the various elements of the printer;

Figure 29 is a sectional view taken on line **29**—**29** of Figure 4; and

Figure 30 shows diagrammatically, a developed view of the page mechanism operating cams.

Selecting mechanism

Referring first to Figs. 3 and 4, the keyboard base or housing **31** has attached to its top, by screws **32**, a casting comprising a horizontal plate portion **33** forming the printer base and, on the right end thereof, a vertical plate portion **34**. The base **33** provides mounting points for the various parts and mechanisms of the printer as will be described hereinafter. The end plate **34** provides journals and mounting points for a part of the page operating mechanisms. On the left end of the base plate **33** is mounted, by screws **30**, a left end frame casting comprising two vertical members **35** and **35'** extending toward the front of the printer and suitable connecting members therefor. These vertical members and their connecting members provide journals and mounting points for the selecting and stop unit mechanisms and various other associated mechanisms.

Referring to Figs. 2, 3 and 7, a selector magnet, comprising two electromagnets **36**, is mounted on magnet base **37** by screws **38**. The purpose of the magnet base **37** is to provide a path for the magnetic circuit when the electromagnets **36** are energized. The magnet base **37** is attached to the selector magnet mounting bracket **39** by means of screws **41**. The bracket **39** is mounted on the upper part of the left end casting plate **35** by screws **42** and **42'** (Fig. 7).

An armature pivot rod 43, best shown in Fig. 7, is located in the bracket 39, and pivotally mounted on the rod 43 is a U-shaped armature lever 44. The armature 45 of the selector magnet 36 is rigidly attached to the pivoted end of the armature lever 44. The stroke of the armature 45 is governed by the adjustment of the stud 46 and the self-locking nut 47 thereon in operative relation with the armature.

A spring tension indicator lever 48 pivotally mounted on a forward extension of the bracket 39 by pin 49 has on it a horizontal projection 51 which engages the upper end of an adjusting screw 52. A retractile spring 53 has one end attached to the lever 48 and the other end attached adjacent the end of the armature lever 44. The spring 53 returns the armature and armature lever to the unoperated position when the selector magnet 36 is not energized. The tension of the spring 53 is varied by the position of the spring indicator lever 48, as determined by the adjusting screw 52. This screw 52 is carried by a horizontal projection 54 of the bracket 39. By changing the adjustment of screw 52 the time and speed to which the armature and armature lever respond to line impulses in the selector magnet 36 are varied. The greater the tension on spring 53 the longer it will take the armature and armature lever to be positioned by the selector magnet 36, when the selector magnet is energized. Also the greater the tension exerted by the spring 53 the quicker the armature 45 will be returned to its backstop when the selector magnet is deenergized. The etchings 55 on the bracket 39 serve to indicate the relative tension of spring 53.

An operating cam shaft 56, best shown in Figs. 7 and 9, extends horizontally toward the front of the printer. The shaft 56 is journaled in flanged bushings 57 and 57' which are held in position by the bushing clamping members 58 and 58' attached by screws 59 and 59' to cross members 60 and 60', respectively, extending between the side plates 35 and 35'. Attached to the shaft 56 for rotation therewith is a collar 61 and two flanged gear hubs 62 and 63. These members are attached to the shaft by pin 64 and screws 65' and 65, respectively. A hub 66 loosely mounted on the shaft 56 has attached to it by screws 67 for rotation therewith an operating cam hub 68. Attached to the cam hub 68 by screws 69 (Fig. 10), for rotation therewith is an operating cam 71. A spacing sleeve 72 (Fig. 9), on the shaft between the loose hub 66 and the rigidly attached hub 63 keeps the operating cam 71 on the hub 66 properly aligned with its associated parts. A sleeve member 73 slidably mounted on the sleeve 72 is operatively connected to the hub 66 by means of interengaging tooth members 70 (Fig. 7). The sleeve member 73 comprises the sliding element of a ratchet clutch by means of which the independently rotatable cam 71 is rotated.

On the right face of a sleeve member 73 (Fig. 9) are ratchet teeth 80 engageable with similar teeth on the left face of hub 63. These teeth are normally disengaged by means which will be hereinafter described. A coil spring 74 surrounding the hub 66 tends to bring the teeth 80 on the respective members 63 and 73 into engagement. The function and operation of the cam and ratchet clutch will be described in detail later. Respectively attached to hubs 62 and 63 by screws 77 and 78 are gears 75 and 76 for rotation therewith.

A motor M (Figs. 2, 3 and 4) attached to a motor base 79 by screws 81, supplies local power for the various operations of the printer. The motor base 79 is mounted on bosses 82 of the printer base 33 by screws 83. A pinion 84 attached to the motor shaft meshes with gear 75 (Figs. 7 and 9) fixed on shaft 56. Gear 76 also fixed on shaft 56 meshes with gear 85 fixed to hub 86, (Fig. 12) by screws 87. Hub 86 is attached by means of pin 89 to an operating countershaft 88 for rotation therewith. The countershaft 88 is transversely journaled in flanged bushings 91, which in turn are held in the vertical plates of the left end frame 35 by bushing clamping members 90, shown dotted in Fig. 9. Fixed by screw 92 (Fig. 12) to the left end of shaft 88 for rotation therewith is a hub 93 which carries gear 94 by means of screws 95. Referring to Fig. 4, gear 94 meshes with an idler gear 96, which in turn meshes with a selector cam shaft gear 97. Idler gear 96 is carried by hub 105 which is rotatably mounted on a stud 106 in the frame member 35. Gear 97 is carried by a hub 98, (Fig. 12) rotatably mounted on a selector cam shaft 99.

The selector cam shaft 99 is transversely journaled in flanged bushings 101 and 101' which are held by the bushing clamping members 102 and 102' attached to the upper part of the left end frame 35 by screws 103 and 103'. Three pins 104 (Fig. 14) equally spaced around the sideface of hub 98 and carried by the same engage in radial slots 107 cut in three Bakelite segments 108. A groove on the outer edge of the segments 108 has therein a circular coiled radially contractible spring 109 which causes the members 108 to be frictionally engaged with a sleeve 111 on a hub 112. Hub 112 is fixed to shaft 99 by set screw 113 and rotates therewith. It can be seen from the above description that the gear 97 is frictionally attached to the selector cam shaft 99 by means of the slip friction clutch. The selector cam shaft 99 will therefore tend to rotate with the gear 97 by the action of the friction members 108 on the sleeve 111. A selector cam sleeve 114 is attached to the shaft 99 to be rotated therewith by a pin 114'. A selector cam shaft stop-arm 115 is secured to the shaft 99 for rotation therewith by means of a clamping screw 116 carried by said stop-arm. A pointer pin 110 (Fig. 7) is located in the right end of the selector cam shaft 99 for rotation therewith and a radial scale 100 is etched on the bushing clamping member 102'. This pointer 110 and scale 100 in conjunction with the adjustment of the stop-arm 115 on the selector cam shaft 99 determines the elapsed time between the release of the selector cam shaft and the engagement of a cam and selector lever as will be hereinafter described.

It will be assumed that a marking impulse is being received on the printer selector magnet 36, (Fig. 7) and therefore the armature 45 will be drawn toward the pole pieces of the magnet. It will also be assumed that the motor M is continuously rotating and through the progressive gear train comprising gears 84, 75, 76, 85, 94, 96 and 97, respectively, as shown in Figs. 4 and 7, the selector cam shaft 99 is tending to rotate by action of the power communicated thereto through the slip friction clutch on said shaft 99. The selector cam shaft 99, (Fig. 7) is restrained from rotation by the stop arm 115 rigidly secured thereto the end of which is engaged with a horizontal projection 117 on the armature lever 44. This projection 117 on the armature lever 44 is so arranged that it will be in the path of the end of the stop arm 115 when the armature 45 is pulled forward by the energization of the selector magnet 36. When the magnet is not en-

ergized, the spring **53** pulls the armature lever **44** up and disengages the stop arm **115** and projection **117**. The selector cam shaft **99** is thus free to rotate with the gear **97** through the action of the slip friction clutch thereon. When the selector magnet **36** is energized and the stop arm **115** comes into engagement with the projection on the armature lever, the selector cam shaft is stopped in a definite predetermined point in its rotation. A series of six disc cams **118***a* to **118***f* are fixed in a predetermined arrangement on the selector cam sleeve **114**, (Figs. 9 and 12) for rotation therewith. Five of these cams **118***a* to **118***e* are selector cams, the sixth, **118***f*, being a trip cam, the purpose of which will be described hereinafter.

Referring to Figs. 2, 3, 7 and 9, a selector unit mounting plate **119** is secured in a vertical position to the right side of the left end casting frame **35** by screws **121**. Studs **122***a* to **122***f* projecting horizontally from the right side of the plate **119** have arranged thereon a plurality of selector lever guide plates **123** and spacers **124**. Between the guide plates **123** are located five selector levers indicated in general at **125** (Fig. 9) and individually by reference characters **125***a* to **125***e* (Fig. 3). The spacers **124** are slightly wider than the selector levers **125** and therefore the selector levers are movable between the guide plates **123**. The selector levers **125** are not rigidly attached to the selecting unit or pivoted at any one point but slide between the guide plates **123** being restrained and guided in their movements and held in their actuated positions, by springs and guide pins. The springs attached to the selector levers are indicated in general at **126** and **127** (Fig. 9) and individually by reference characters **126***a* to **126***e* (Fig. 3), **126***a* and **126***e* only being shown and **127***a* to **127***e* in Fig. 12. The other ends of the springs **126** and **127** are attached to the spring posts **128** and **129** (Fig. 9) respectively, extending from the selector unit mounting plate **119**. Fig. 9 shows the location of selector lever **125** in its normal position with respect to its associated springs and guide members with some of the guide plates toward the right of the printer removed. The other four selector levers **125** are held in their normal position in substantially the same manner.

Assume that the printer is in its unoperated position and it is desired to select a character. The electrical impulses that make up the character code will be received on the selector magnet **36** in a predetermined order. The sequence of operation in setting up a selection in the selector levers will now be followed and described. The electrical impulses composing the code are transferred into mechanical selections of the selector levers by means of the selecting cam and the selecting levers acting in conjunction with the armature and armature lever of selecting magnet **36**. Assume that the character to be selected is represented by a code combination made up of the following five pulses: spacing, marking, spacing, marking, and marking. These five pulses are preceded by a spacing or start impulse and are followed by a marking or stop impulse. The spacing start impulse which is an interval of no current causes the release of the armature **45** (Fig. 7) and thus allows the armature lever **44** to rise by the action of the spring **53**, which in turn causes the selector cam shaft stop arm **115** and projection **117** to be disengaged. As the projection **117** on the armature lever **44** is no longer engaged with the stop arm **115**, the selector cam shaft **99** therefore starts to rotate with the gear **97** through the action of the heretofore described friction clutch thereon. As described above, the receiving of the start or spacing impulse on the selector magnet starts the selector cam shaft revolving. The speed of rotation of the selector cam shaft **99** 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 shaft will have 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 **44** to be pulled down and bring the projection **117** into the path of the end of the stop arm **115**. The two will thereupon engage and bring the selector cam shaft to a stop in its normal position.

To return now to the five impulses that comprise the signal character to be selected, the first impulse being spacing, the selector magnet therefore remains unoperated for the duration of this impulse. About the middle of the first impulse, while the spacing impulse is being received on the selector magnet **36**, a hump on the first disc cam **118***a* (Fig. 9) engages with a vertical projection **131** on a rearwardly extending arm of the first selector lever **125**a. As the cam disc **118***a* continues to rotate, this hump will rotate the selector lever **125***a* against the action of springs **126***a* and **127***a* about the tip of a downwardly extending portion **135** of the selector lever which is resting on a selector lever pivot stud **132** mounted on the selector unit mounting plate **119**. As the selector cam shaft **99** continues to rotate further, the hump on cam **118***a* passes off the projection **131** on the selector lever **125***a* and the selector lever snaps back into its original and normal position by the action of springs **126***a* and **127***a*.

The next impulse of the signal code being marking, the magnet **36** is therefore energized. This draws the armature **45** to its front stop and thus the front end **134** of the U-shaped armature lever **44** is lowered. About the middle of the second impulse, while the marking impulse is being received on the selector magnet, a hump on the second cam **118***b* of the selector cam assembly engages with the vertical projection **131** of the rearwardly extending arm of the second selector lever **125***b*. As the selector cam shaft continues to rotate, the hump on the second cam **118***b* starts to rotate the second selector lever **125***b* about the end **135** on the selector lever pivot stud **132**. The second selector lever is held on the square pivot stud **132** by springs **126***b* and **127***b* in the same manner as the first selector lever **125***a*. The three other selector levers **125***c*, **125***d* and **125***e*, are held in their normal position in the same manner by their associated springs. After the hump **118***b* on the selector cam starts to rotate the second selector lever **125***b* about the pivot stud **132**, a rearwardly extending projection **133** on the upper end of the selector lever **125***b* comes in contact with the front end **134** of the U-shaped armature lever **44**. The armature lever is in the path of the projection **133** of the selector lever because the magnet is energized, which causes the end of the armature lever to be in its lower position. The selector

lever projection 133 coming into contact with the end of the armature lever thus stops the movement of the selector lever 125b in that direction and also its rotation about the end 135 on the pivot stud 132. As the hump 118b on the cam continues to rotate, the selector lever 125b pivots about the point where the projection 133 on the top thereof comes in contact with the end of the armature lever 44. As the selector lever is rotated still further about its top pivot point by the cam 118b, the end 135 thereof slides off the pivot stud 132 and is pulled down by spring 126b. Spring 127b keeps the arm 135 against the pivot stud 132. The downward movement of the selector lever 125b is limited by the pins 136 and 137 upon which the arms of the selector lever rests, with the lever in its selected position. A selector lever is shown dotted in its selected position in Fig. 9.

The third impulse of the signal code being spacing, the third selector lever 125c will be left positioned in its normal position in the same manner as was the first selector lever 125a. The fourth and fifth impulses being marking, the fourth and fifth selector levers 125d and 125e will be actuated to their selected positions in the same manner as was the second selector lever 125b.

The speed of the selector cam shaft and the cams are so positioned that the various impulses are received on the selector magnet just before the humps on the cam start to actuate their respective selector levers.

At a predetermined point in the revolution of the selector cam shaft 99, a hump on the sixth cam 118f engages the top rear end of a T-shaped lever 138, the front end of which is pivoted on a stud 139 which in turn is rigidly secured to the selector unit mounting plate 119. The lower rear end of the lever 138 rests on the upper end of an operating cam trip lever 141, (Fig. 12). The operating cam trip lever is pivoted on screw 140 which is attached to the printer frame 35. Thus in conjunction with the sixth cam 118f and the T lever 138, the operating cam trip lever 141 will be tripped on every revolution of the selector cam shaft 99. The purpose of the trip lever 141 will be described later.

The five impulses which make up the character code having been received, the next impulse is the stop impulse. This impulse is a marking impulse and is received on the selector magnet 36, (Fig. 7) before the selector cam shaft 99 has made a complete revolution. The selector magnet 36 is energized by this marking impulse and therefore brings the projection 117 on the armature lever into the path of the selector cam shaft stop arm 115 and when the stop arm reaches the projection it will be stopped thereat. The selector cam shaft 99 is now positioned for the start impulse of the next character to be received in the selector magnet 36.

The above description shows how the electrical impulses which compose the signal are changed into mechanical selections by means of the selector magnet 36, the selector cams 118a to 118e and associated equipment. These mechanical selections are represented by the selector levers, the selector levers being either in their normal or selected positions, depending upon the impulse received on the selector magnet for the respective selector lever. The impulses which are marking are represented by their respective selector levers being in their lower or selected position and the spacing impulses are represented by their respective selector levers being in their normal or upper positions. As the character signal described was made up of the first and third impulses spacing, the first and third selector levers will, therefore, be in their upper or normal position. The second, fourth and fifth impulses being marking, their respective selector levers will be in their lower or selected position.

At the left end of the operating cam shaft 56, (Fig. 9) which is continuously driven through gear 75, is a positive action or ratchet clutch. As heretofore described, this clutch is composed of two parts, a driving member or ratchet 63 rigidly attached to the operating cam shaft 56 and a driven member or ratchet 73 normally tending to engage said driven member 63 by action of spring 74. The ratchets 63 and 73 are normally kept apart by the lower end of the operating cam trip lever 141, (Fig. 12) acting upon a side cam surface 142, (Fig. 7) on the hub of the driven ratchet 73, (Fig. 9). The driven ratchet 73 is loosely keyed to the hub 68 of the operating cam assembly and can slide along the axis of the operating cam shaft 56 into and out of engagement with the driving ratchet 63, but can only rotate with the operating cam assembly. At a certain point in the revolution of the cam sleeve 114, (Fig. 12) the hump 118f on the sixth cam engages the T lever 138 and causes the lower end of lever 141 to be disengaged from the side cam surface 142. After being tripped, the trip lever 141 is returned to its normal position by spring 143 attached near the lower end thereof. The trip lever 141 being tripped allows the driven ratchet 73, (Figs. 7 and 9) to slide along the axis of the operating cam shaft and into engagement with the driving ratchet 63. The driven ratchet 73 and the operating cam 71 will thus rotate with the operating cam shaft 56. As the driven ratchet 73 nears the end of one revolution, the side cam surface 142 on the hub of the driven ratchet 73 engages the side of the lower end of the operating cam trip lever 141 and as the ratchet 73 rotates further it is cammed out of engagement with the driven ratchet 63. A further projection of the side cam surface engages the end of the operating cam trip lever 141 and stops the rotation of the driven ratchet at a certain point in the rotation thereof.

The operation of the operating cam 71 will now be described. The operating cam assembly is so arranged on the operating cam shaft that the shaft can rotate without the cam assembly, but the cam assembly cannot move along the axis of the operating cam shaft. The operating cam 71 is rotated as previously described. The operating cam assembly is made up of an operating cam 71 (Figs. 9, 10 and 11), a gathering cam 143 and a selector lever reset cam 144, the latter two cams being rigidly attached to the front and rear sides respectively of the operating cam 71. The operating cam is a disc with a part 145 thereof shown dotted in Fig. 11, displaced to the front of the printer along the axis of the operating cam shaft. The lower ends 146 of the selector levers 125 are bifurcated and the operating cam 71 is so placed in relation to the selector levers 125 that when the selector levers are in their selected position, as placed by the marking impulses, the forks 146 on the selector levers straddle the disc of the operating cam 71. Directly in front of the bifurcated ends of the selected levers and in operative relation therewith are a series of five selecting code disc levers indicated in general at 147, in

Fig. 9 and individually by reference characters 147a to 147e, in Fig. 2.

Each selector lever has an associated code disc lever. These code disc levers 147 are so mounted that they can be slid forward and backward between the guide plates 123. They rest on spacers between the guide plates on the selector unit assembly screws 122a and 122b and are retained from upward movement by spacers on assembly screw 122c. The location of one lever is shown in Fig. 9, the others being similarly located.

As the operating cam assembly starts to rotate and has completed about a quarter of a revolution, the gathering cam 143, which is attached to the operating cam 71, passes in front of the downwardly extending projections 148 on the rear end of the code disc levers 147 and due to the shape of the cam and its rotating movement, slides all the disc levers 147 that may be in their front position to their rear position. Some or all or none of the disc levers 147 may be in a forward position depending on the previous character selected. Thus all the disc levers 147 are in position to have the selection that is set up in the selector levers transferred to the code disc levers. As the operating cam assembly rotates still further, the displaced part 145 of the operating cam disc 71 sliding in the forks 146 of the selected selector levers, namely, the second lever 125b, the fourth lever 125d and the fifth lever 125e, move said levers toward the front. The front side of the forks of these selector levers moving toward the front engage with the rear end 148 of their associated selector unit code disc levers 147 and slide said code disc levers toward the front. The marking position of the code disc levers is to the front and the spacing position to the rear. Thus, the second, fourth and fifth code disc levers 147b, 147d and 147e are slid to the front to their marking position. The first and third code disc levers are left in their spacing position because their associated selector levers 125a and 125c remained in their upper or normal position with their forks 146 out of engagement with the operating cam disc 71. Therefore, they will not be actuated by said disc as were the selected selector levers 125b, 125d and 125e.

The code disc levers 147 remain in either their spacing or marking position corresponding to the selection transferred to them from the selector levers until the first part of the subsequent revolution of the operating cam assembly whereupon all the levers in a marking position are moved to their spacing position by the gathering cam 143. Individual to each code disc lever 147 is a code disc lever detent pawl 149. These detent pawls 149 are pivoted on a common stud 151 attached to the selector unit mounting plate 119. Springs 152 are attached to an arm of each detent pawl and a spring post 153 to keep said pawls engaged with their respective code disc levers. The detent pawls in conjunction with their associated springs act as jockeys and tend to keep the code disc levers 147 in either their marking or spacing position as positioned by the operating or gathering cams respectively.

As the operating cam assembly rotates further the operating cam returns the forks of the selected selector levers to their rear position and then the reset cam 144 attached to the operating cam disc engages the bottom of the forks of the selected selector levers. Due to the shape of the reset cam 144 and its rotation with the operating cam, the selector levers are raised. When the arm 135 on the selector levers is high enough to clear the pivot stud 132, attached springs 127 pull the selector levers over onto the stud 132. The reset cam 144 then passes from beneath the ends of the selector levers 125 and the selector levers stay in their spacing position. Thus all the selector levers 125 that were positioned to their marking position by the selector cams 118 and armature lever 44 are returned to their spacing or normal position, and thus all the selector levers 125 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 action of the operating cam trip lever 141.

A latch lever 154 pivoted on a shoulder screw 155 is mounted on a plate 156 which in turn is secured to the frame 35. The end of this latch is engaged by the gathering cam 143 in the stop position of the operating cam assembly. The purpose of the latch is to prevent any rebound of the operating cam assembly that might occur due to the quick stop of the cam assembly by the operating cam trip lever 141. The latch 154 has a spring 157 attached to it which normally keeps the latch against the stop pin 158.

The 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 its selection to the code disc levers. As shaft 56 is geared to rotate substantially faster than the selector cam shaft 99, it will, therefore, complete its revolution and be stopped in its normal or rest position before the selector cam 118f is rotated a sufficient amount to trip the trip lever 141 on the following signal. Thus the operating cam assembly is always brought to rest at the completion of every revolution and starts its subsequent revolutions in the proper phase relationship with the selector cam shaft 99.

Type-wheel stop mechanism

The type-wheel stop assembly indicated in general by reference numeral 159 (Figs. 9 and 15) comprises a flanged bearing sleeve 161 surrounding a type-wheel shaft sleeve 162 and a type-wheel shaft 163 and associated parts. The type-wheel shaft sleeve 162 is attached to the type-wheel shaft 163 for rotation therewith by pin 163'. Attached to the bearing sleeve 161 by screws 164, only one of which is shown in Fig. 15, is a rear stop member guide plate 165 and a stop unit mounting plate 166. A clamping washer 167 between the plate 166 and a stop member pivot disc 168 keeps said pivot disc against the rear guide plate 165. Screwed into the right face of the rear guide plate 165 are a series of four posts 169. On the right side of the flange of sleeve 161 is a spring plate 171 and a series of spacers 172 and filler washers 173. Surrounding each filler washer are code discs indicated in general at 174 (Fig. 9) and individually by reference characters 174a to 174f (Fig. 15). The spring plate 171, spacers 172 and filler washers 173 are held fast and in position by a front stop member guide plate 175 attached to posts 169 by screws 176 in the right ends thereof. As the washers 173 are slightly thicker than the code discs 174 the discs are not clamped tight but are free to rotate on the filler washers 173. The discs are limited in their rotation by elongated holes 170 therein through which pass the posts 169. The code discs 174 are provided with V-shaped notches

174' cut along their circumferential edge in a manner well known in the art.

As will appear from the following each disc has two positions. For each combination of settings of these discs corresponding V-shaped notches 174' on each disc will be in alinement with each other. At right angles to and equally spaced around the circumference of the code discs and guided in radial slots 177 and 178 in the front and rear guide plates 175 and 165 respectively are a series of stop members indicated in general by reference numbers 179. Each stop member 179 is pivotally or otherwise carried on the periphery of the supporting and pivot member 168 adjacent the rear end thereof and is provided with a V-shaped edge on the section engageable with the circumferential edges of the code discs 174. Each stop member has one end of an individual coil spring 181 attached to it, the other end of the spring being attached to the spring plate 171. By the action of these springs the stop members 179 are pulled radially inward and are urged into engagement with the V-shaped notches in the code discs 174.

As stated above for each setting of the code discs 174 one of the stop members 179 will have six of the notches under it in the six discs in alinement 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 174 that only one such alinement of notches can exist at a time. The five code discs 174*a* to 174*e* are in operative relation with the five code discs levers 147*a* to 147*e* respectively. Each code disc lever 147 is provided on the front end thereof with a downwardly extending projection 182, the end 183 of which, is rounded and projects into a U-shaped slot 184 of its associated individually notched code disc 174, one such disc being provided for each of the five disc levers 147. The discs 174 are so mounted in relation to the disc levers 147 that a transverse motion of the levers imparts a rotary motion to the code discs about the bearing sleeve 161. The code discs remain as positioned by the code disc levers 147 until the following rotation of the gathering cam 143 (Fig. 11) whereupon all the discs 174 in a marking position are rotated a few degrees in a clockwise direction (Fig. 9) into spacing position by their associated code disc lever in conjunction with said gathering cam as heretofore described.

With a signaling code composed of five impulses there are 32 possible selections. In order to increase the number of possible selections without 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 174*f*. The notches on the code discs 174*a* to 174*e* are so arranged that for a predetermined code combination of settings two rows of notches therein are in alinement. Which one of the two stop members 179, associated with the alined notches will be operated toward the axis of the stop unit is determined by the position of the code disc 174*f*, called the shift disc. In one position of the shift disc 174*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 179*a* and 179*b* respectively to be actuated toward the axis of the stop unit. The disc 174*f* has no control of the selection of the stop members 179*a* and 179*b* (Fig. 16) as it is cut away beneath the stop members and therefore either of these stop members is selectable for either position of the shift disc.

Pivotally mounted on pin 185 in the top of the right stop member guide plate 175 is a shift disc lever 186. The lower end of the lever 186 is slotted and engages a pin 187 rigidly attached to the shift disc 174*f*. Stop members 179*a* and 179*b*, as shown in Fig. 16, have projections 188*a* and 188*b* thereon which are engageable with the left and right sides respectively of the shift disc lever 186. Assume that the shift disc 186 is in its unshift position as shown in Fig. 16. Now, when the alinement of the notches in the code discs 174*a* to 174*e* are such as to allow the shift stop member 179*b* to move inward the projection 188*b* thereon will engage the right side of the shift disc lever 186. The spring 181 attached to the stop member 179*b* actuating said stop member causes the shift lever 186 to rotate about its mounting point a few degrees. The shift lever in turn causes the shift disc 174*f* to be rotated a few degrees in a counter-clockwise direction to a position corresponding to its shift position whereinafter the stop members 179 associated with the shift signal are selectable. With the shift disc in its shift position a selection of the unshift stop member 179*a* will cause said disc to return to its unshift position whereinafter the stop members associated with unshift signal are selectable. It will be noted, therefore, that with the shift disc 174*f* in one position a certain stop member is allowed to be moved toward the center in response to a certain signal combination and a different stop member is allowed to be moved toward the center by the same signal combination when the shift disc is in its other position.

A shift disc detent lever 189 (Fig. 9) pivotally mounted on one of the studs 169 is engageable with a detent roller 191 pivotally mounted upon a pin 191' in the shift disc 174*f*. A spring 192, one end of which is attached to the detent lever 189 and the other end to a spring clip 192' keeps the end of the lever engaged with the detent roller 191. The purpose of the detent lever and associated parts is to keep the shift disc in either of its actuated positions. Thus on signals following the shift or unshift signal the shift disc is held in one of its two positions.

On the left end of the type-wheel shaft sleeve 162 (Fig. 15) a flanged gear hub 190 is placed for independent rotation. Attached to the gear hub for rotation therewith by screws 199 is a gear 198. A flanged hub 193 having a square opening, is mounted on the squared end of the type-wheel shaft 163 in abutting relation to the sleeve 162. The hub 193 is held on the shaft by the nut 194 and washer 194' and rotates therewith. On the periphery of the hub 193 are placed friction members 195 held by a radial contractible coiled spring 196. The friction members 195 are engaged by pins 195' (Fig. 4) carried in the left side face of the gear hub 190. Thus the members 195 are frictionally engaged with the periphery of the friction hub 193 and tend to rotate said hub therewith. The friction clutch is constructed to operate in substantially the same manner as the friction clutch on the selector cam shaft 99 shown in Fig. 12. The gear 198 (Fig. 4), meshes with an idler gear 180 pivotally mounted by means of its attached hub on a pivot stud 180' secured in the frame 35. Gear 180 in

turn meshes with idler gear 96. As the gear 96 is continuously rotating due to the power communicated thereto, as hereinbefore described, the type-wheel shaft 163 will normally tend to rotate by means of its attached friction clutch.

An index arm or type-wheel stop arm 197 (Figs. 7 and 15) is secured to the type-wheel shaft sleeve 162 for rotation therewith, by means of a clamping screw 197'. The stop arm 197 rotates in operative relation with the stop members 179. The right end of the typewheel shaft is journalled in a flanged bushing 162' in the right end plate 34.

The stop members are normally out of the path of the end of the stop arm 197 as it rotates with the typewheel shaft. When, however, one of the stop members is positioned in a row of aligned notches it moves into the path of the stop arm 197 and blocks the rotation thereof thus bringing the typewheel shaft to rest in a selected angular position. In this manner the typewheel shaft may be selectively stopped at various positions, in its rotation. With the typewheel shaft stopped in any selected position the friction members 195 will slide on the periphery of the friction hub 193. The complete typewheel stop mechanism is secured to the inside of the frame unit 35 by screws 200' in threaded engagement with the mounting plate 166. A stop ring 200 surrounding the left end of the stop members 179 keeps said stop members in the left guide plate 165.

Typewheel assembly

The typewheel assembly (Figs. 2, 3 and 22), comprises a typewheel 202 slidingly mounted on shaft 163 and inking means and guide members carried by a hub 201 slidably mounted on the transverse rod 203. The rod 203 has its left end secured in a bracket 204, attached to the plate 35', the right end being secured in the right end plate 34. An arm 205, extending from the hub 201, has an upper end thereof engageable in a groove 206 (Fig. 15) of the typewheel hub 207, which causes the typewheel hub to move transversely with the hub 201. The typewheel hub 207 is slidably mounted on a square typewheel shaft for rotation therewith by means of the squared hole through the center. Attached to the hub 207 by screws 208 for rotation therewith is the typewheel 202. The typewheel comprises a cylinder having a row of characters formed on the periphery thereof. The downwardly extending arm 211 (Fig. 22) secured to the hub 201 has a roller 212 on the lower end thereof, engageable with the transverse cross guide member 213. The cross guide member 213 is attached to the right plate 34 and to the left frame unit 35'. Pivoted on pin 214 is a U-shaped bracket 215, which pivotally carries an intermediate ink roller 216. Another U-shaped bracket 217, also journaled on pin 214, pivotally carries an absorbent ink roller 218. The intermediate roller 216 engages the typewheel 202 and ink roller 218 and thus serves to keep the typewheel inked. Attached to the hub 201 by screws 221 is a typewheel shield 219, which normally keeps the paper from the typewheel. A spring 220, attached to a pin 220' on arm 205 and a projection 217' on member 217, keeps the typewheel 202 and ink rollers engaged.

Referring to Figs. 3, 7, 26, and 27, a spring drum pivot stud 222 is screwed into the left frame plate 35' and projects horizontally therefrom. Pivotally mounted on the stud 222 is a spring drum 223. A spring anchor 224 is rigidly attached to the pivot stud between the spring drum 223 and a spring drum cover 225. The cover 225 is attached to the drum by screws 226. A clock spring 227, one end of which is attached to the anchor 224 by a screw 228, is coiled about the pivot stud and has the other end attached to the inside of the rotatable spring drum by a pin 229. The cover 225 is held on the stud by nut 231 in threaded engagement with the end thereof. From the above description it is apparent that if the drum is rotated in a clockwise direction, as viewed in Fig. 7, the clock spring 227 will wind up and tend to rotate the drum in a reverse direction. Attached in one of a series of notches 232 in the periphery of the drum is the end 233' of a flexible cord 233. The cord is arranged to be wound up around the circumference of the drum as the spring unwinds. The cord 233 passes from the drum over a guide roller 234, (Fig. 7) pivotally supported on bracket 204 and from there to the type wheel hub 201, (Fig. 3) where it is secured in a slot 235, (Fig. 22) in the hub. The cord then passes over the guide roller 236, (Fig. 3) pivotally supported on the inside of the right end plate 34. The right end of the cord is attached to the periphery of the winding drum 237, shown in Figs. 2 and 3. It can be seen from the above that, as the winding drum 237 is rotated, in a manner to be hereinafter described, the cord 233 winds about the periphery of the winding drum and causes the typewheel assembly to slide transversely toward the right. Also the left section of the cord will unwind from the circumference of the spring drum 223 (Figs. 26 and 27) causing the spring 227 to be further wound up. When the winding drum 237 is released, the spring will cause the cord to be rewound about the spring drum 223 and return the type wheel assembly to its initial or lefthand position.

Paper feed mechanism

A paper feed roller shaft 241, (Fig. 3) is transversely journaled in bearing blocks 242 and 242' secured respectively to a top portion of the left frame unit 35' and to the top of plate 34, by screws 243 and 243' respectively. Attached by suitable means to the shaft 241 for rotation therewith is a cylindrical roller 244, (Fig. 22). The circumference of the roller is covered by a rubber tube 245 attached thereto. Secured adjacent the right end of the paper feed shaft 241 for rotation therewith by set screw 247, is a star wheel 246, (Fig. 6). Also attached adjacent the right end of the shaft is a feed ratchet wheel 248, (Figs. 3 and 18). The feed ratchet 248 in conjunction with the feed ratchet pawl 249 causes the paper feed roller shaft to rotate and feed the paper blanks through the printer as will be hereinafter described.

Pivotally mounted on shoulder screws 251 and 252, (Fig. 3) in the left and right frame units respectively are pressure roller arms 253 and 254. Studs 255 in the upper end of each pressure roller arm 253 and 254 pivotally carry rubber covered pressure rollers 256. Springs 257 attached to pins in the pressure roller arms 253 and 254 keep the pressure rollers against the rubber tube 245, as shown in Figure 22. A thumb lever shaft 258 transversely pivoted in the frame units 34 and 35 has attached adjacent both ends thereof lifter arms 259. Also attached adjacent the left end of the shaft 258 is a thumb lever 261. When the thumb lever 261 is actuated downward the lifter arms 259 engage the rear sides of the pressure roller arms 253 and 254 and

cause the pressure rollers to be disengaged from the paper feed roller. This assists in the initial feeding of the paper blank P in the printer. When the pressure on the thumb lever is released the pressure rollers return to their normal position in contact with the paper feed roller by action of the attached springs **257**. A blank paper easel **262**, (Fig. 3) attached to brackets **263** assists in guiding the paper blank. The brackets **263** are attached to the top of the bearing blocks **242** and **242'**.

Page operating and type wheel positioning mechanism

A page operating mechanism cam shaft **265**, (Fig. 12) is transversely journaled in flange bushings **266** and **266'**. The left bushing **266** is held in position by the bushing clamping cap **267** attached to the left frame unit **35'** by screws **268**, best shown in Figure 7. The right bushing **266'** is held in position by the bushing clamping cap **269** attached to the bearing bracket **271**, (Fig. 6) by screws **272**. The bracket **271** is attached to the outside of plate **34** by screws **273**. The page operating cam shaft **265**, (Fig. 12) and the counter shaft **88** are on the same axis and the shaft **265** is arranged to be driven from the countershaft **88** by means of the hereinafter described ratchet clutch. This clutch comprises a driving ratchet which is integral with the hub **86** attached to the shaft **88**. Ratchet teeth are disposed on the right face of hub **86** engageable with similar teeth on the left face of a driven member **274**. The driven member **274** is slidable along the axis of shaft **265** which brings its teeth into or out of engagement with the teeth on hub **86**. The driven member **274** is operatively connected to a hub **275** by means of inter-engaging tooth members **276**. The hub **275** is fixed to the shaft **265** for rotation therewith by means of set screw **277**. Thus the driven member **274** is slidable along the shaft **265** but is keyed thereto for rotation therewith. A circular spring **278** about the sleeve of the driven member **274** nominally tends to keep the driven member engaged with the driving member **86**.

A side cam surface **279**, (Fig. 13) on the hub of the driven member is engageable with a cam follower **281** on the lower end of a page operating cam shaft trip lever **282**. The side cam surface **279** is similar in construction to the side cam surface **142** on the member **73**, (Figs. 7 and 9). The trip lever **282** is pivotally mounted on stud **283** in the frame **35**. A pin **284**, (Figs. 10, 11 and 13) secured to the hub **68** of the operating cam **71** is arranged to engage the upper end of lever **282** and cause the cam follower **281** on the lower end thereof to be withdrawn from engagement with the side cam surface **279**, whereupon the driven member **274** is free to slide to the left and engage the continuously rotative driving member **86**. The member **274** upon engagement with member **86** 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 **285** returns the trip lever **282** to its normal position, whereupon the cam follower rides on the hub member **274** and in the path of cam **279** until near the end of a revolution, at which time the cam follower **281** re-engages the side cam surface **279** to force the clutch members apart. The pin **284** on the operating cam assembly actuates the trip lever **282** during the last part of its revolution.

A latch arm **286** is mounted on a shoulder screw **287** in a plate **288** attached to frame **35**. The end of said latch is engageable with a radial shoulder **289'** on disk **289**, integral with hub **275**. A spring **291** attached to the latch arm **286** keeps said arm and disk **289** engaged. The purpose of the latch is to prevent rotation in a reverse direction or rebound of the driven member **274** due to the sudden stop of the page operating cam shaft by the cam **279** and cam follower **281**.

Shaft **88** is geared to rotate substantially faster than the selector cam shaft **99** and shaft **265** will therefore complete its revolution and be in its stop or normal position before the trip lever **282** is again actuated.

Attached adjacent the right end of the page operating cam shaft **265** by set screw **292** for rotation therewith is a page operating cam sleeve **293** with an extending flange **294**. Disposed on the cam sleeve **293** in a predetermined arrangement and separated by intermediate spacers **295** are four disc cams namely from left to right, a printing cam **296**, a reset and line feed cam **297**, a position cam **298** and an operating cam **299**. These cams are functionally secured to the cam sleeve for rotation therewith by means of a nut **301**, threaded on the end of the cam sleeve **293**. In the preferred embodiment of the invention the cams **296** to **299** are arranged to actuate their respective followers in accordance with the timing chart shown in Figure 30, as will appear more fully hereinafter.

Referring to Figs. 2 and 3, a winding drum feed ratchet shaft **302** is horizontally journaled in bushings **303** carried in the plate **34** and in a bracket **304**. Bracket **304** is secured to the base plate **33** by screws **305**. Attached to the shaft **302** by set screws **306** and **307** for rotation therewith in their respective hubs is the winding drum **237** and a feed ratchet **308**. Rigidly attached to the feed ratchet **308** by screws **309**, (Fig. 18) is a type wheel position disc **311**. Carried by the feed ratchet **308** is a pin **312** engageable with the top of adjusting screw **313**. The adjusting screw **313** is threaded in a block **314** attached to the plate **34**. Since the spring **227** in the spring drum **223**, (Fig. 26) is tending to wind the left part of the cord **233** about its circumference, and since the right part of the cord is wound around the periphery of the winding drum **237** (Fig. 3) the release of the feed ratchet wheel **308** will cause the shaft **302** to be rotated in a counterclockwise direction bringing the pin **312** into engagement with the top of adjusting screw **313**. The type-wheel guiding hub **201**, being attached to the cord **233** will slide to the left as the cord winds about the spring drum **223**. The adjustment of the screw **313** will therefore determine the proper position of the teeth of the ratchet wheel **308** relative to the pawls **372** and **374**.

The mechanism controlling the printing, paper or line feed and the transverse movement of the type wheel will now be described. The transverse movement of the type wheel is divided into two functions, namely, the step-by-step movement from left to right and its return to its initial or start position.

Figures 18 to 21 show enlarged detail views of the page operating mechanism in various operating positions. Referring to Figure 18, the page mechanisms are shown in their normal position ready to print a selected character and with the page operating cam shaft in its rest position. The type wheel will be in its left position

as the pin 312 is engaged with the top of screw 313.

A type wheel position bell-crank 315 is pivotally mounted at the vertex thereof on a shoulder screw 314 screwed into the right end plate 34. Pivotally carried on a pin 316 in the upper end of the vertically extending arm of the bell-crank is a roller cam follower 317. This follower is engageable with the periphery of the position cam 299. A spring 318 attached to the bell-crank 315 and to a spring post 319 in the plate 34 normally tends to keep the follower engaged with the cam.

As the page operating cam sleeve 293 begins to rotate by means of the hereinbefore described ratchet members 86 and 274 and has rotated about ten degrees from its rest position, the follower 317 starts to enter the depression in cam 299 but is prevented from entering to the full depth of the depression, as will be apparent from the following. The bell-crank 315 starts to rotate in a clockwise direction about its pivot point which raises a vertical finger 321 adjacent the front end of the horizontal arm of the bell-crank. The finger 321 is directly beneath the carriage position disc 311 and is in operative relation therewith. A slot in a guide bracket 320 attached to the plate 34 guides the horizontal arm of the bell-crank. The bell-crank rotating in a clockwise direction causes the finger to come in contact with the periphery of the disc 311 and it remains there until the cam sleeve has rotated about 70 degrees, whereupon the cam follower passing out of the depression in cam 299 causes the bell-crank 315 to rotate in a counterclockwise direction into its normal position.

Pivoted on a shoulder screw 322, which is secured to the upper front part of the plate 34, is a reset lever 323. The reset lever 323 is substantially T-shaped and carries on it various projections and adjusting screws the purpose of which will be described later in this specification. The rear or right end of the reset lever 323 (Figs. 18 to 21) has a downwardly extending arm 324 which normally rests on the front or left end of a substantially horizontal feed pawl lever 325. The right end of lever 325 is pivoted on shoulder screw 326 in the plate 34, the left end being pivotally connected to the lower end of the feed pawl 249 by pin 327. A roller follower 328 pivoted on pin 329 adjacent the center of lever 325 is directly beneath and in operative relation with the reset and line feed cam 297, best shown in Figs. 12 and 25. After the cam sleeve has rotated about 90 degrees the follower 328 starts to enter the depression in cam 297 by action of a spring 331 attached to the lever 325 and to the pin 332. The follower is prevented from rising to the full depth of the depression in the cam 297, as will be apparent from the following description.

The arm 324 resting on the top of lever 325 starts to rise with the lever by action of spring 331. A bell-crank 333 is pivoted on a shoulder screw 334 carried by the reset lever 323. A spring 335 attached to the vertical arm of the bell-crank 333 and to a horizontal projection 337 on the reset lever normally holds the vertical arm of the bell-crank 333 against a stop pin 336, also carried by the reset lever. The upper end of the vertical arm is bent horizontally and carries an adjusting screw 338 in threaded engagement therewith. A reset rocker lever 339 is pivoted on shoulder screw 341 located toward the front of plate 34. Pivotally attached to the upper end of lever 339 by a stud 342 therein is a slide arm 343 extending toward the rear of the printer. Spring 344 secured to the end of stud 342 and to the spring post 345 in the plate 34 tends to keep the slide arm 343 toward the rear. The upper part of rocker lever 339 engaging with the stud 346 limits the rearward movement of the arm 343. On the rear end of arm 343 are two spaced and offset vertical projections 347 and 348 adapted to be operatively engaged with the lower ends of members 349 and 351, respectively. As shown in Fig. 18, the projection 347 is directly beneath the end of member 349. The slide arm 343 is guided by a slot in a guide bracket 352 attached to the end plate 34. The rear end of the arm 343 rests on the top of the stud 408 carried by the plate 34. To return now to the reset and line feed cam and follower, the follower 328 starts to enter the depression in cam 297 and therefore the lever 325 will start to pivot about its mounting point by action of the spring 331. The left end of lever 325 in rising causes the right end of reset lever 323 to rise, which in turn will raise the bell-crank 333. The adjusting screw 338 will in turn raise the rear end of the slide arm 343 until the projection 347 thereon engages the end of member 351. This stops all upward movement of the reset lever and associated parts. The projection 347 engages the end of member 351 before the left end of lever 325 has risen high enough to allow the paper feed ratchet pawl 249 to engage another tooth on the ratchet 248. Therefore, the paper feed and roller will not be stepped as the cam 297 returns the follower and associated mechanisms to their normal position. The spring 352' attached to the feed pawl 249 and a guide member 353 keeps the upper end of the feed pawl 249 engaged and in alignment with the paper feed ratchet 248.

Printing

The printing of the selected character on a paper blank is the next function and will now be described with its associated mechanism. Referring to Figure 22, a print hammer 354 is shown. The print hammer 354 is substantially an inverted U-shaped member pivotally mounted at the ends thereof on pivot pins 355 in the frame 35' and plate 34, only the pin in the plate 35' being shown in Fig. 22. Only a part of the print hammer is shown in Fig. 22, the rest being broken away to show more clearly the path of the paper blank P through the printer. The cross member of the print hammer 354 has a horizontal projection 356 extending transversely the width of the paper blank. Attached to the lower end of the right arm of the print hammer by screws 358 is a print lever 357. The print lever has on the rear end thereof a pivot pin 359 which pivotally carries a roller cam follower 361. The roller follower is in operative relation with the periphery of the print cam 296 rotatively carried by the cam sleeve 293. A spring 362 normally keeps the cam follower and cam engaged. Referring to Fig. 30, it is evident that after the cam sleeve has rotated about two hundred degrees the cam follower 361 enters the depression in cam 296 and allows the print hammer to pivot about its pivot points in a counterclockwise direction. As the print hammer pivots the projection 356 strikes the paper blank P and pushes the paper against the type wheel. As the type wheel is dampened with ink, the paper, when coming in contact therewith, will have a character printed thereon. In operative relation with each end of the print

hammer are two adjusting screws **363** threaded in brackets **364** attached to the plate **34** and frame **35'**. Carried by these adjusting screws **363** are resilient members **365** which act as cushions for the print hammer and therefore, by adjusting the screws **363**, the hammer blow on the type wheel may be varied. The cam follower **361**, on passing out of the depression in the cam **296**, will return the print hammer to its normal position, as shown in Fig. 22. The printing function takes place while cam sleeve **293** is rotating from about two hundred to two hundred and forty degrees.

Type-wheel feed

After the printing of the character the type-wheel must be moved transversely toward the right, a distance equal to one letter space in order to present a fresh surface for printing. This is accomplished by the operating cam **298**, (Fig. 24) and associated mechanism. Referring to Fig. 18, a bell-crank **366** is pivoted on shoulder screw **367** in plate **34**. The bell-crank has a rearwardly extending arm which carries a pin **368** on which is pivoted a roller cam follower **369** in operative relation with the cam **298**. A substantially horizontal feed pawl **372** is pivoted on a pin **371** in the end of the downwardly extending arm of the bell-crank **366**. A spring **373** attached to a post **374''** engaging with a stud **374'** in the bell-crank and with the feed pawl **372** tends to keep the feed pawl and ratchet **308** engaged and also tends to keep the follower **369** engaged with the cam **298**. The feed pawl **372** is kept in alignment with the ratchet **308** by a slot in the guide bracket **352**. When the cam sleeve **293** has rotated about two hundred and fifty degrees the follower **369** starts to ride on the high part of cam **298** which rocks the bell-crank **369** in a counterclockwise direction. The bell-crank in turn causes the pawl **372** to slide to the right, (Fig. 18) and in so doing the left end thereof engages a tooth on the ratchet wheel **308**. The pawl **372** thus steps the ratchet wheel one notch and causes the type-wheel to be slid to the right, a distance equal to one letter space by means of the winding drum **237** and cord **233**. A retaining pawl **374** is pivoted on a screw **375** eccentrically mounted on bracket block **376**. The end of the pawl **374** engages a tooth on the ratchet wheel **308** and holds the ratchet wheel in its stepped position. A spring **380** normally tends to keep the retaining pawl **374** and ratchet wheel engaged. The feed pawl **372** is then returned to its normal position as the high part of the cam **298** passes from beneath the cam follower **369**. When the cam sleeve is rotated three hundred and sixty degrees it is brought to a stop as heretofore described in readiness to be released for another cycle of operation in conjunction with a subsequent signal code combination.

The cycle of operation of the described mechanisms is substantially the same for each following signal with the exception of certain cases as will be hereinafter described.

Type wheel return and paper feed

The return of the type-wheel to the beginning of another line and the associated feeding of the paper blank through the printer to present a fresh line surface for printing will now be described.

After a predetermined number of characters have been printed and the type wheel has approached within a predetermined number of characters of the right side of the paper blank, the ratchet wheel **308** and attached disc **311** will have been stepped, one step for each character, into the position shown in Fig. 19. With the disc **311** in this position a portion **377** thereon with a reduced radius is in operative relation with the finger **321** on the bell-crank **315**. Accordingly, on the following revolutions of the cam **299** the finger **321** is allowed to rise higher than it did previously, and in so doing the end **370** of the bell-crank engages a pin **378** carried in the lower end of lever **339**. As the spring **318** is substantially stronger than spring **344**, the lever **339** will be actuated about its pivot **341** and bring a finger **379** on the lever **339** into engagement with the periphery of disc **311**. The lever **339** in pivoting slides the slide lever **343** toward the left into its intermediate position, as shown in Fig. 19, which allows the end of a latch **381** to drop into a notch **382** in the slide lever and hold the slide lever **343** and lever **339** in their actuated position. The latch **381** is pivotally mounted on a shoulder screw **383** screwed into the plate **34** and is held engaged with the slide lever by a spring **384**. With the slide lever **343** in its intermediate position the projection **348** on the right end thereof is directly beneath the end of member **349**. Thus, for this cycle of operation of the cam sleeve **293**, the projection **348** on the lever **343** engaging the end of member **349** prevents the follower **328** of lever **325** from entering to the full depth of the cam **297** in the same manner as the projection **347** engaging the member **349** did for the previously described cycle. The disc **311** will be stepped into the position shown in Fig. 20 by the following cycles of operation of the cam sleeve **293**. In the embodiment shown ten characters are required to advance the disc **311** from the position shown in Fig. 19 to the position shown in Fig. 20. This brings a section **385** on the disc with a still further reduced radius into operative relation with the finger **321** and the section **377** into operative relation with the finger **379** on lever **339**. Thus during the following cycle of operation of the cam sleeve, the end **370** of the bell-crank **315** actuates the lever **339** into the position shown in Fig. 20. The lever **339** in turn actuates the slide lever **343** to its extreme left position and it is locked thereat, as shown by the latch **381** engaging a notch **386** in said slide lever. With the slide lever **343** in its left position both projections **347** and **348** are out from beneath their associated members **349** and **351**, respectively. Also the right end is disaligned with the top of adjusting screw **338** and rests on a stud **408** in the plate **34**. Now as the cam sleeve **293** continues its cycle of operation the cam follower **328** is urged into the depression of cam **297** by the spring **331** attached to lever **325**, whereupon the feed pawl **249** and the reset lever **323** are actuated into the positions shown in Fig. 21. The paper feed pawl **249** in this position is engagable with a higher tooth on the paper feed ratchet wheel **248**. As the reset lever **323** pivots to the position shown in Fig. 21 the top of an adjusting screw **387** carried by the horizontal projection **337** engages with the feed pawl **372** and disengages it from operative relation with the ratchet wheel **308**. Also the end of another adjusting screw **388** carried by the horizontal projection **389** of the reset lever **323** engages the right end of the retaining pawl **374** and causes the left end thereof to be disengaged from the teeth of the ratchet wheel **308**. Upon the release of ratchet wheel **308** it is free to be rotated in a counter-clockwise direction until the pin **312** thereon engages the top of adjusting screw **313**. The rotating force is derived from the spring

227 in the spring drum 223 in conjunction with the cord 233, as heretofore described. As the type-wheel assembly is attached to the cord it will be slid into its initial left position, ready to commence a new line.

Another bell crank 391 pivoted on the shoulder screw 392 secured to the plate 34 carries an adjusting screw 393. A spring 394 attached to the bell crank 391 normally tends to keep the adjusting screw 393 against the downwardly extending arm 395 of the reset lever 323 as shown in Fig. 18. With the reset lever in its high position, as shown in Fig. 21, the adjusting screw 393 is pulled under the arm 395 and thus locks the reset lever in its high position. As the reset lever 323 moves to its high position, it engages the downwardly extending arm 381' of the latch 381, shown dotted in Fig. 21, and causes the end of the latch to be disengaged from the slide lever 343. The spring 344 thereupon actuates the slide lever 343 and lever 339 to the position shown in Figs. 18 and 21. As the reset lever 323 rises, it also causes the horizontal arm of bell crank 333 to engage a stud 407 in the plate 34. This rotates the bell crank to a position shown in Fig. 21 where the screw 338 carried thereon is pulled out from beneath the right end of the slide lever 343.

As the cam follower 328 passes out of the depression in cam 297 it actuates the lever 325 and feed pawl 249 which steps the paper feed ratchet 248 one step and consequently brings a fresh line on the paper blank into a printing position.

Referring to Fig. 18, an adjustable plate 396 attached to the end plate 34 has pivoted thereon at 398 a jockey arm 397 which carries on the upper end thereof a roller 399 in operative relation with the star wheel 246 which in turn is secured to the paper feed shaft 241. The jockey arm and roller in conjunction with an attached spring 401 and the star wheel 246 keep the paper feed roller in its stepped position and prevents movement of the paper blank during and printing of a line.

It is preferable that while the type-wheel is being returned ready for the beginning of a new line that the print hammer will not function and also that the feed pawl 372 and retaining pawl 374 remain disengaged from the ratchet wheel 308 until the type-wheel is in its extreme left position. The above objects are accomplished by the reset lever and parts of its associated mechanism as will now be described. With the reset lever locked in its high position by bell crank lever 391, the adjusting screws 388 and 387 keep the retaining pawl 374 and feed pawl 372 respectively disengaged from the ratchet wheel 308. As the reset lever 323 is locked in its high position for nearly the entire interval of one character as will be apparent from the timing chart (Fig. 30) the type-wheel has sufficient time to return to its stop position. The print hammer is held inoperative during this operating cycle of the cam sleeve in which the typewheel is returning to its left position by a print lockout lever 402 (Fig. 21) and associated parts. The print lockout lever 402 is pivoted on a shoulder screw 403 in the plate 34 and has a spring 404 attached thereto which keeps the left end of the lever engaged with the projection 389 on the reset lever. With the reset lever 323 in its high position, the right end of the print lockout lever 402 engages with the top of an adjusting screw 405 carried by a horizontal projection 406 on the print hammer lever 357. Consequently, as the print lever cam follower attempts to enter the depression in the print cam 296, it is restrained from doing so because the lockout lever 402 holds the print lever inoperative for this cycle of the cam sleeve 293. Thus the print hammer will not function and the feed pawl 372 being disengaged from the ratchet wheel 308, the ratchet wheel will not be stepped for this cycle of operation of the cam sleeve.

Attached to the bell crank 315 by screws 408 is a bracket 409 which carries an adjusting screw 411 (Fig. 21). The screw 411 is in operative relation with an arm 412 of the bell crank 391. As the follower 317 on the bell crank 315 enters the depression on cam 298 for the following cycle of operation of the cam sleeve 293 to record the first character of the new line, the bell crank 315 will be rotated in a clockwise direction until the finger 321 engages the disc 311 in the same manner as it did for the first described cycle of operation. As the bell crank 315 rotates, the adjusting screw 411 will rock the bell crank 391 about its pivot and cause the adjusting screw 393 thereon to slide out from beneath the arm 395 of the reset lever 323. By the joint action of springs 373, 380 and 404 acting indirectly on shoulder screws and projections upon the reset lever, the lever is actuated into its lower or normal position. The spring 331 is substantially stronger than the above mentioned springs and therefore the reset lever may be actuated to its high position by spring 331 against the action of the other springs. The downward movement of the reset lever is stopped when the projection 324 engages the top of lever 325. Referring to Fig. 30 it is evident that at the release of the reset lever 323, the lever 325 will be in its low position. As the reset lever 323 is returning to its normal position, the bell crank 333 is actuated to the position shown in Fig. 18 and the adjusting screws 387 and 388 allow the operative pawl 372 and retaining pawl 374 to engage with teeth on the ratchet wheel 308. During the remainder of the cycle of operation the lever 325 is prevented from rising as it was during the first described cycle of operation of the cam sleeve 293 and therefore the printing and type-wheel feed functions are performed as normally.

From the above description it is apparent that after the type-wheel has reached a predetermined length of line it will be automatically returned to its start position, without the necessity of transmitting a special type-wheel return signal. At the same time the paper blank will be fed through the printer a distance equal to one line space. The automatic return of the type-wheel after printing a complete line has the disadvantage of improperly breaking up a word the end of which does not coincide with the end of the line. Moreover, it is evident that as the print hammer was held inoperative during the return of the type-wheel the next character selected at this time will not be printed. These two disadvantages are practically eliminated by the following mechanism.

Referring to Figures 9 and 23, stop members 179c and 179d have projections 413 and 414 respectively on the right ends thereof. The projection 413 is engageable with an end of a bell crank 415 pivotally mounted on a shoulder screw 416 in the frame 35'. The projection 414 engages a projection 417 on a lever 418 which is pivoted on a shoulder screw 419 in the frame 35'. Pivotally attached to an end of bell crank 415 is a link 421 which is in turn pivotally attached to the end of a link 422. The link 422 is secured to a hub 423 attached to a shaft 424 for rotation there-

with. The lever 418 has pivoted to its upper end a link 425 in turn pivoted to the end of a link 426, attached to hub 427, secured to shaft 428 for rotation therewith. Shafts 424 and 428 (also shown in Figure 3) are horizontally and transversely journaled in the frame 35' and plate 34 and clamped to the right ends thereof by screws 429 and 431 are the members 351 and 349 respectively. Referring to Fig. 22, it will be noted that the rods 424 and 428 also serve as paper blank guides.

The stop member 179c will be selected and moved toward the axis of the code drum when the impulses corresponding to a type-wheel return or reset signal are received on the selecting mechanism. A spring 432 (Figure 21) attached to a pin 433 in member 351 tends to keep the end of bell crank 415 (Figure 23) engaged with the projection 413 on stop member 179c and serves to rock the member 351 and shaft 424 a few degrees in a clockwise direction when the stop member 179c is selected.

The stop member 179d is selectable when the impulses corresponding to a space signal is received on the selecting mechanism. A spring 434 (Figure 21) attached to a hook 435 in member 349 tends to keep the projection 417 (Figure 23) of lever 418, engaged with the projection 414 of the stop member 179d and serves to rock the member 349 and shaft 428 a few degrees in a counter-clockwise direction when stop member 417 is selected. The other ends of the springs 434 and 432 are attached to a spring bracket 430 which in turn is attached to the plate 34 by a screw 440.

Assume that the type-wheel has approached the right side of the paper blank and the disk 311 is in the position shown in Figure 19: the slide lever 343 will be in its intermediate position with the projection 348 thereon engageable with the lower end of member 349. With the disk 311 and slide lever 343 positioned as shown in Figure 19, then on the reception of a space character, the member 349 will be rotated a few degrees counter-clockwise as described above so that the lower end thereof is no longer engageable with the projection 348. Thus, when the operating cam sleeve 293 is subsequently released for its cycle of operation the reset lever 323 is permitted to rise to its high position as shown in Figure 21. This releases the ratchet wheel 308 and the mechanism associated with the cam sleeve 293 functions in the same manner as it did for the cycle of operation following the position of the disk to the position corresponding to the extreme end of the line as shown in Figure 20 which was hereinbefore described. Thus, after a predetermined length of line has been reached, which in the embodiment shown is ten characters from the end of the line, the transmission of the space character signal as any of the following signals, will cause the typewheel to be returned to its start position and the paper blank to advance one line. A space character signal will be transmitted during the last nine characters of a line except where the last word of the line is exceptionally long. With the automatic return of the typewheel during the transmission of a long word one letter of the word will be omitted as is evident from the above description. The occasional omission of one letter of a long word at the end of a line is not as objectionable as the loss in line time which would result if a typewheel return signal was transmitted at the end of each line.

With the typewriter anywhere from its left position to a position one character space less than that represented by disc 311 in Fig. 19, that is up to the point where the space signal becomes effective to return the typewheel, it may be returned to its left position by the selection of a combination of impulses corresponding to a typewheel return or reset signal. Up to the time the space signal becomes effective to return the typewheel, the slide 343 will be in its extreme right hand position, as shown in Fig. 18, and when so positioned, upward movement thereof is prevented by the projection 347 engaging the lower end of member 351. If at this time a typewheel return signal is received to select the stop bar 179c, the baffle member 351 will be rocked clockwise as seen in Fig. 18 and thus permit the elevation of the slide 343 upon rotation of cam 297, thereby permitting the reset lever 323 to rise sufficiently to release the operating and holding pawls 372 and 374, respectively, and to permit the line feed pawl 249 to engage a new tooth of the line feed ratchet wheel 248. Therefore, for the cycle of operation of the cam sleeve associated with the typewheel return signal, the typewheel will be returned to its left position and the paper blank advanced one line.

At the end of a message it may be desirable to step out several blank lines of paper. This is accomplished by the transmission of several typewheel return signals and as is apparent from the above description, the paper will be stepped one line for each of such signals.

In the preferred form of the invention the paper blank is in the form of a continuous roll 437 supported on a bobbin 436, (Fig. 6), the bobbin being freely supported on pins in the ends thereof by grooves in brackets 438 and 439 (Fig. 7). A paper guide 441, (Fig. 22) attached to the frame 35' and plate 34 keeps the paper blank in proper alinement and guides the paper through the printer.

Keyboard

The keyboard contemplates the employment of mechanism selectively responsive to the actuation of keys and key levers for controlling a plurality of current controlling contacts in various combinations according to the signal character to be transmitted in conjunction with a distributor mechanism for distributing the current impulses to the line in proper sequential order. The keyboard is so arranged that when the selecting elements are actuated due to the depression of a character key, they will remain in actuated position until the subsequent depression of another character key.

The signaling code which this keyboard is designed to transmit is known as the five unit "Start-stop" signaling code. Each signal transmitted will be composed of a start impulse which is always of a uniform line condition followed by five intervals or pulses of two different line conditions in various combinations which in turn are followed by a stop impulse which is always the same and of the opposite line condition from that of the start impulse. The keyboard shown is so arranged that the start impulse is a no current interval and the stop impulse a current interval. As is well known to those versed in the art, the maximum number of possible selections available with a five unit code is thirty-two. In order to provide the requisite number of selections to transmit letters, figures, punctuation marks and printer functions, case grouping of characters

is employed. Accordingly, two case shift key levers are employed, a figures shift and a letters shift key lever also called shift and unshift key levers, respectively. The function of the letters shift key lever when depressed is to actuate the transmitting mechanism so that a signal is transmitted which will position the receiving printer to properly record the signals in the letter case group. The figures shift key lever on being actuated initiates the transmission of a signal which will position the receiving means to properly record the signals in the figures case group. Thus, two characters may be common to one key lever and which of these characters will be recorded is dependent on the last case shift signal transmitted. Some of the selections are common to both case groups such as the letter space signal and punctuation marks. The manner in which these signals are transmitted to the sending circuit will be described in following paragraphs.

In order to prevent the interference of signals which would result if two or more keys were depressed at the same time, the key levers are so arranged in conjunction with bevelled slots cut in selecting bars as to render it impossible to depress two keys at the same time.

A better understanding of the keyboard may be had from the following description when considered in conjunction with Figs. 3 to 9, and 17.

Referring to Fig. 17 in which some of the keyboard mechanism is shown dotted, there is provided a keyboard housing or base **31** on which rests the printing unit of the associated printer and to which is secured suitable supporting means for the various elements of the keyboard distributor mechanisms. The arrangement of the character signal keys is substantially the same as that of any well known typewriter. The keys **442** are mounted on suitable key levers **443** which are mounted at their rear ends on a rod **444**. The rod **444** is supported in five brackets **445**, one of which is shown in Fig. 8 attached to the underside of the keyboard base **31**. The rod **444** is prevented from moving longitudinally by nuts **446** (Fig. 17) in threaded engagement with the ends thereof. The key levers **443** are guided in their vertical movement and prevented from moving longitudinally by individual vertical slots in comb guide plates **447** and **448**. The guide plate **447** is attached to the front part of the base by screws **450**. Selecting bar guide brackets **449** are attached by screws **440** to the keyboard base. Attached to the side of brackets **449** by screws **451** is the rear guide plate **448**. Each key lever is provided with a single wire spring **452** (Fig. 7) which tends to elevate the outer end of the key lever. One end of each spring **452** is engaged in a notch in its associated key lever, the other end being located in an individual hole in a spring mounting bar **453** attached to the underside of the housing by screws **454**. Situated directly beneath and extending in a direction at right angles to the key levers are a group of five selecting bars indicated in general at **455** in Fig. 5, and individually by reference characters **455***a* to **455***e* in Figs. 7 and 17. The selecting bars **455** are guided in individual slots in the brackets **449** and slide on rollers **456** (Fig. 5) individual to each bar. The rollers are pivotally mounted on rods **457** in the brackets **449** and permit the selecting bars to slide transversely with a minimum amount of friction. Each of the selecting bars **455** has thereon a different arrangement of upwardly projecting bevelled edges so arranged that the bars will be moved transversely in varying combinations according to the key lever depressed. When any one of the key levers is depressed, the lower edge of the lever engages the bevelled projections of the selecting bars and actuates them transversely in accordance with a predetermined arrangement, as is well understood in the art.

Attached to the top of the keyboard base by screws **458**, Fig. 17, are brackets **459** and **461**. On a rod **462** (Fig. 5) secured in the brackets **459** and **461** are pivotally mounted a group of five selecting bar levers indicated in general at **463** (Fig. 5) and individually by reference characters **463***a* to **463***e* (Fig. 17). An arm **464** (Fig. 5) of each selecting bar lever extends downwardly through a hole in the base **31**, and is engaged in a U-shaped slot **465** in the left end of its associated selecting bar **455**. Thus with the transverse movements of the selecting bars **455**, the selecting bar levers **463** will be rocked about their mounting point. The levers are kept in alinement with their respective selecting bars by the left selecting bar mounting bracket **449** and spacers **460** (Fig. 17) on the lever pivot rod **462**. The transmitting mechanism of the preferred embodiment of the invention will now be described. Its principal function is to transfer the mechanical selections of the selecting bars into corresponding electrical impulses. It performs this function by means of a rotatable cam sleeve, contacts, contact levers, and associated parts.

A horizontal transmitting cam shaft **466** (Fig. 9) is longitudinally journaled in bushings **467** and **468** secured to the brackets **459** and **469**, respectively. It is arranged to be continuously rotated from the hereinbefore described continuously rotating gear **85** in mesh with a gear **471** secured by screws **473** to a hub **472** which in turn is secured to the shaft **466** for rotation therewith by screw **474**. An independently rotatable transmitting cam sleeve **475** on the shaft **466** has thereon a series of eight disc cams **460***a* to **460***f*, **470** and **480**. These cams are disposed on the cam sleeve in a predetermined arrangement between intermediate spacers **476** and are clamped for rotation therewith by a nut **477** in threaded engagement with the end of the cam sleeve. The cam sleeve **475** is adapted to be rotated by means of a ratchet or grab clutch. Slidably mounted upon the shaft **466** and to the right of the cam sleeve **475** is a sleeve member **478** operatively connected to the cam sleeve by means of interengaging tooth members **479**. The sleeve member **478** comprises a sliding element of the ratchet clutch, the fixed member **481** directly to the right of the sleeve member **478** being attached to the shaft **466** for rotation therewith by screw **482**. Ratchet teeth on the left face of member **481** when engaged with similar teeth on the right face of sleeve member **478** will cause the cam sleeve to rotate with the transmitting shaft **466**. On the edge of sleeve member **478**, best shown in Fig. 4, is a flange having a side cam surface **483** adapted to engage a cam follower **484**. In the normal or rest position of the cam sleeve, as shown in Fig. 4, the cam follower **484** is engaged with the wide part of the side cam surface **483** and thus holds the sleeve member **478** to the right as seen in Fig. 4, and its teeth out of engagement with the teeth on the fixed member **481**. A spring **485** coiled about the cam sleeve normally tends to keep the ratchet members engaged.

Attached to the top of the keyboard base **31** (Figs. 17 and 29) by screws **486** is a transmitter start magnet bracket **487**. Attached to this bracket **487** is a transmitter start magnet **488**

composed of two electromagnetic coils. Pivotally mounted on a pin **489** in the bracket **487**, as shown in Fig. 4, is the armature **491** of the start magnet **488**. When the magnet **488** is energized, the lower part of the armature will be pulled toward the magnet pole pieces and the upward extending arm of the armature will be moved away from the sleeve member **483**. The cam follower **484** is carried by the upper end of the armature **491** and therefore on the energization of the magnet **488**, the cam follower **484** and the side cam surface **483** will be disengaged. A spring **492** (Figs. 17 and 29) attached to the lower part of the armature **491** tends to keep the cam follower **484** in the path of the side cam surface **483**.

On a rod **493** secured in the brackets **459** and **461** (Fig. 5) are pivotally mounted at their lower ends five contact lever hammers **494** (one only of which is shown) in operative relation with associated cams **460***a* to **460***e* on the cam sleeve **475**. These hammers will be rocked about their pivot mounting point in the desired sequential order by their associated cams as the cam sleeve **475** revolves. The hammers are kept aligned with their associated cams by spacers **496** intermediate with each hammer. In operative relation with each hammer, as shown in Fig. 5, are T-shaped contact levers **495***a* to **495***e* which have the right top part thereof slotted to receive the rod **497** onto which they are urged by springs **498** individual to each lever. The rod **497** and the rod **499** to which the springs **498** are attached are secured in brackets **459** and **461**. A set of six spring contacts **501***a* to **501***f* (Figs. 4 and 5) tending to open by means of their spring tongues, are mounted between insulating bars **502** attached to the brackets **459** and **461** by screws **503**. Pieces of insulating material **504** attached to the upper end of each spring tongue press against the left top arm **505** of its associated contact lever **495**. The downwardly extending arm of each contact lever **495** is adapted to be operatively engaged with a vertical projection **506** on the left end of arm **507** of its associated selecting bar lever **463**. A rest contact lever **508** (Fig. 3) pivoted on the rod **493** is adapted to be actuated by its associated cam **460***f* to close a rest contact **501***f* when the transmitter cam sleeve **475** is in its rest position.

A U-shaped universal bar **509** (Figs. 7, 8, 8A and 17) pivoted at the ends on rod **444** normally has the top edge thereof in contact with the bottom edge of each key lever. A spring **511** holds the bar **509** against the key levers and whenever a key lever is actuated the universal bar **509** is rocked about its pivot point. A bracket **512** attached to the left side of the universal bar **509** carries a pivot pin **513** on which is loosely mounted a transmitter start magnet contact operating member **514**. Another bracket **515** fixed to the underside of base **31** by screws **516** has in its lower end a shoulder screw **517** upon which the tongue **518** of contact **519** is pivotally and insulatively mounted. The back-stop of contact **519** is insulatively mounted on a bracket **520** attached to the bracket **515**. A spring **521** tends to keep the tongue **518** in contact with its back-stop. With the cam sleeve in its rest position the contact operating member **514** is adapted to engage the tongue **518** and open contact **519**, when an actuated key lever nears the limit of its downward movement. Referring to the circuit diagram (Fig. 28) the contact **519** is shunted around the coils of the transmitter start magnet **488** (Fig. 4). Thus, when the contact **519** is opened, the magnet **488** will be energized, which as heretofore described, actuates its armature **491** and disengages the cam follower **484** and cam surface **483**.

The transmission of a signal character on the actuation of a key lever will now be described. Assume that the key lever corresponding to the letter A is to be depressed and according to a pre-arranged signaling code its respective five intelligence pulses are **1** and **2** marking, **3**, **4** and **5** spacing. In the preferred embodiment, the marking position of the selecting bars **455** is to the left, as seen in Fig. 5, and the spacing position to the right. Accordingly, the beveled edges on the selecting bars **455** are so arranged that when the A key lever is depressed the selecting bars **455***a* and **455***b* will be slid to the left into their marking positions, and the selecting bars **455***c* to **455***e* will be slid to the right into their spacing positions. With a selecting bar **455** (Fig. 5) in its marking or left position, its associated selecting bar lever **463** will be in its marking position, as shown by the full lines in Fig. 5. Similarly, when a selecting bar is in its spacing position, its associated selecting bar lever will be in its spacing position, as shown by the dotted lines in Fig. 5.

Assume that the "A" key lever is depressed, and after the selecting bars **455***a* to **455***e* have practically reached their respective positions the contact **519** is opened and as described causes the disengagement of the cam **483** and follower **484**. The sliding clutch member **478** (Fig. 9) is thus free to slide to the right by action of spring **485** and cause its teeth to engage the teeth on the clutch member **481**, whereupon the cam sleeve **475** will rotate with the shaft **466**. With the cam sleeve in its predetermined rest position the cam **460***f* actuates the rest contact lever **508**, (Fig. 3) to close its rest contact **501***f*, and as shown in the wiring diagram (Fig. 28) completes the circuit from battery to line. Referring again to Fig. 28, battery is connected through appropriate resistance **522** over conductor **523** to the tongues of contacts **501***a* to **501***e* and thence over conductor **524** to the contact **519** in parallel with the coil, of the transmitting start magnet **488**, then over conductor **525** to the tongue of contact **501***f*. The back-stops of the contacts **501***a* to **501***f* are connected through the coil of the selector magnet **36** to the line. Shortly after the cam sleeve **475** starts to rotate the cam **460***f* (Fig. 3) passes out of engagement with the rest contact lever **508** and allows the contact **501***f* to open. Before any of the other cams **460** (Fig. 5) engage their respective hammers **494**, there is an interval equal to about one-seventh the revolution of the cam sleeve when all the contacts **501** will be open. Thus, on the beginning of every revolution of the cam sleeve an interval in which no current goes to the line is transmitted which is the start pulse. As the cam sleeve rotates farther the cam **460***a* starts to engage its respective hammer **494** and rock it about its pivot. The hammer in turn starts to rock its respective contact lever **495***a* in a clockwise direction about the rod **497**. As will be remembered, the selecting bar **455***a* was positioned to a marking position, and consequently the selecting bar lever **463***a* will be in its marking position. With the selecting bar lever in this position the lower end of the contact lever **495***a* will engage the projection **506** on the right arm of the lever **463***a* as the cam **460***a* and associated hammer **494** rock the contact lever **495***a*. As the hammer **494** is rocked more, the contact lever will

rock in a counterclockwise direction about the lower end in contact with the projection 506, the slotted upper end sliding to the left on the rod 497 and closing contact 501a. The hammer 494 remains in contact with the high part of cam 460a for about one-seventh the revolution of the cam sleeve 475, after which the hammer and contact lever return to their normal positions and allow the contact 501a to open. As the high part of the cam 460a is passing out of engagement with its associated hammer 494, the high part of cam 460b starts to engage its associated hammer 494. The selecting bar lever 463b being in its marking position the contact 501b will be closed by its associated contact lever 495b in the same manner as contact 501a was closed. As described above, the selecting bars 455c to 455e in their spacing positions will position their associated selecting bar levers 463c to 463e to their spacing position. Now as the cam 460c engages its associated hammer 494 and rocks the hammer and contact lever 495c, the lower end of the contact lever will not engage with the projection 506 on the selecting bar lever 463c. Thus the contact lever 495c will pivot about the rod 497 with practically no horizontal movement of the top thereof and the contact 501c will remain open. In the same manner the contacts 501d and 501e are allowed to remain open as their cams engage their associated hammers. As the hammer 494 corresponding to cam 460e disengages with its cam, the cam 460f will actuate contact lever 508 to close again the rest contact 501f, whereupon the cam sleeve will be brought to rest in its predetermined rest position as will be hereinafter described. Referring to Fig. 28 in conjunction with the above description, it is evident that shortly after the cam sleeve started to revolve there was an interval when all the contacts 501a to 501f were open. Thus an interval of no current was transmitted which corresponds to the start impulse of the signal. On the following two intervals contacts 501a and 501b, respectively, were closed and consequently transmitted to the line two intervals of current. As no contacts were closed for the next three intervals, three intervals of no current were transmitted. On the last part of the revolution of the cam sleeve, contact 501f was closed and transmitted the rest pulse of the signal. Thus the five intelligence pulses corresponding to the letter A preceded by a start pulse and followed by a rest pulse were transmitted.

Pivotally mounted on pins 526 and 526' (Figs. 5 and 17) in brackets 459 and 461, respectively, is a U-shaped selecting bar lever locking lever 527. A roller cam follower 528 pivoted on screw 529 carried by an arm of the locking lever 527 is in operative relation with the cam 470 located on the cam sleeve 475. The cross member of the locking lever is wedge shaped and is engageable with the hooked upright arms of the selecting bar levers 463. With the cam sleeve in its rest position, the cam follower 528 is engaged with the high part of cam 470 and the cross member of the lever 527 is out of engagement with the hooked ends of the selecting bar levers. A spring 531 attached to the locking lever 527 tends to keep the cam follower 528 engaged with the cam 470. Shortly after the cam sleeve starts to revolve the high part of cam 470 passes out of engagement with the follower 528 and allows the cross member of the locking lever 527 to rise whereupon its wedge will engage with either the right or left side of the hooked ends of the selecting bar levers 463a to 463e. The locking lever 527 thus holds the selecting bar levers in their actuated position during the revolution of the cam sleeve 475. Near the end of the revolution of the cam sleeve, the high part of cam 470 engages the cam follower 528 and actuates the locking lever to disengage the hooked ends of the selecting bar levers.

A mechanism is provided whereby a subsequent key lever can not be depressed until the transmission of the signal corresponding to the previous depressed key lever has been completely transmitted, which prevents the subsequent signal from breaking in on the previous signal. This mechanism, called the safety device, also provides means whereby the signal transmitted will not be repeated if its associated key lever is depressed for a length of time longer than is necessary for the transmission of said signal. Thus if repeat signals are desired, the key lever must be returned to its normal position and depressed again at the end of the transmission of the first signal, as allowed by the safety device which will now be described. As heretofore described, the last part of the stroke of a key lever 443 (Fig. 8) actuates the universal bar and contact operating member 514 to open the contact 519 which causes the release of the cam sleeve 475. Pivoted on pin 532 in the bracket 461 is a bell crank 533 which carries on an arm thereof a roller cam follower 534 in operative relation with the cam 480. A spring 535 keeps the follower 534 engaged with the cam 480. The lower end of the bell crank 533 extends through a hole in the base 31 and carries a pin 536 on which is pivoted the left end of a link 537. The right end of the link 537 is pivoted on a pin 538 carried in the end of a lever 539. The lever 539 is fixed for rotation therewith to a rod 541 supported by a bracket 542 (Figs. 4 and 7) attached to the under side of the base 31. Also fixed to the rod 541, Fig. 7, for rotation therewith, is a collar 544 and a hammer 543 (Fig. 8) in operative relation with the contact operating member 514. Pivoted on the end of rod 541 is a universal bar stop arm 545. The stop arm 545 is limited in its pivoting with respect to the collar 544 by a notch in the stop arm and a pin 546 carried in the collar 544. A spring wire 547 coiled about the collar 544 one end of which is engaged by the stop arm 545, tends to rotate the stop arm in a clockwise direction (Fig. 8) and keep the left side of the notch against the pin 546. A retractile spring 548 attached to the contact operating member 514 and to a bracket 549 carried by the universal bar 509 keeps the hammer 543 and contact operating member 514 engaged. Fig. 8 shows the position of the safety mechanism when the transmitter cam sleeve is in its rest position and the actuation of a key lever will as heretofore described open contact 519 and initiate the rotation of cam sleeve 475. Shortly after the cam sleeve 475 starts rotating, the notch in cam 480 passes out of engagement with the follower 534 and consequently rocks the bell crank 533 to the position as shown in Fig. 8A. The bell crank 533 in turn by means of the link 537 and arm 539 rocks the rod 541 in a clockwise direction into the position shown in Fig. 8A. For this operating cycle it will be assumed that the actuated key lever was released immediately after being depressed, whereupon the key lever and universal bar will return to their normal position. Now as the hammer 543 and universal bar stop arm 545 rock with the rod 541, the hammer will allow the spring 548 to pull the contact operating member 514 out of operative relation with the tongue of contact 519 and the upper end of the

stop arm 545 will be beneath the universal bar 509. With the stop arm 545 beneath the universal bar 509, another key lever cannot be depressed an appreciable amount because the actuation of a key lever will bring the universal bar in contact with the top of the stop arm 545 and this stops all further downward movement of the key lever and universal bar 509. As is apparent from the shape of the cam 480, the stop arm 545 and hammer 543 will remain as shown in Fig. 8A for practically the complete cycle of the cam sleeve 475, returning to their normal position when the cam follower 534 drops into the notch in cam 480 as the cam sleeve 475 is brought to rest by means hereinafter described. When the contact operating member 514 disengages with the tongue 518, the spring 521 closes the contact 519. This provides a shunt circuit around the coil of the transmitter start magnet 488 whereupon the magnet will be deenergized. This in turn allows the armature 491 (Fig. 4) to return to its inoperative position where the cam follower 484, on the upper end thereof, will be in the path of the side cam surface 483. As the cam sleeve 475 nears the end of a revolution, the cam follower 484 engaging the side cam surface 483 disengages the two members 478 and 481 and brings the cam sleeve 475 to a stop in its predetermined stop position. From the above description it is apparent that a subsequent key lever can be operatively actuated only at the completion of the transmission of the signal corresponding to the preceding actuated key lever. This prevents the premature starting of transmission of a second signal before the complete transmission of a preceding signal.

The operation of the safety device will now be described when an actuated key lever is held down longer than is necessary for the transmission of a signal. The rotation of the cam sleeve 475 will be initiated on the actuation of a key lever as heretofore described and the universal bar 509 will be held in its operated position by the actuated key lever. Also the contact operating member 514 will remain engaged with the tongue of contact 519 unti the bell crank 533 has rotated the rod 541 to its operative position whereupon the hammer 543 allows the spring 548 to slide the lower end of the contact operating member 514 to the right and out of engagement with the tongue of contact 519. The contact 519 then closes and causes the cam sleeve 475 to be stopped when it reaches its predetermined rest position as heretofore described. As the rod 541 rotates, the spring 547 brings the top of the stop arm 545 against the side of the universal bar 509. At the end of a cycle when the cam follower 534 drops into the notch in cam 480, the rod 541 rotating into its unoperated position will disengage the stop arm 545 from the side of the universal bar 509. Also, the hammer 543 will bring the lower end of contact operating member 514 in contact with the side of the contact tongue 518 and as the hammer rotates more the upper end of member 514 will slide on pin 513 by virtue of the slot in the upper end thereof. Thus the contact 519 cannot be opened to initiate the rotation of the cam sleeve 475 for another cycle of operation until the actuated key lever has been returned to its normal position. The universal bar 509 finally rising will cause the side of the contact operating member 514 to disengage the side of tongue 518 and allow the spring 548 to return it to its normal position where it is in operative relation with the contact 519 as shown in Fig. 8. If in the above described cycle of operation the key lever had been released during the transmission of the signal, the spring 547 would have urged the stop arm 545 beneath the universal bar 509 and as described in the first cycle of operation prevented the actuation of another key lever until after the signal had been completely transmitted.

The selecting shaft 99 and the transmitting shaft 466 (Figs. 12 and 9) are geared to rotate at substantially the same speed and therefore complete their respective cycles of operation in the same length of time. The key levers controlling the release of the transmitter cam sleeve 475 are adapted to be actuated only when the cam sleeve has very nearly completed its revolution or it is in its predetermined rest position. As an appreciable length of time is required to actuate a key lever, the cam sleeve is sure to be brought to a stop in its rest position at the end of every revolution before it can again be released. This insures that the two cam sleeves 114 and 475 start with the same phase relationship for every cycle of operation.

A Bakelite block 551 (Fig. 6) mounted on posts 552 is attached to the base 31 by screws 553. Attached to the Bakelite block 551 are a series of spring clips 554 which engage and make electrical connections with similar clips 555 (Fig. 2) on a Bakelite block 556. The Bakelite block 556 is secured to the base plate 33 of the printer unit by screws 550. These clips serve to make electrical connections between the keyboard and printer units. Four posts 557 (Fig. 17) screwed into the keyboard base 31 serve as guides for a silencing cover 558 (Fig. 1). Locating pins 559 in the keyboard base 31 insure the proper location of the printing unit on the base 31. Ample space is provided in the rear of the keyboard housing 31 for attaching resistances and condensers used in conjunction with a motor governor.

Fig. 1 shows a perspective view of the complete printer and keyboard with the silencing cover 558 in place. The cover keeps dirt and dust out of the mechanism and materially reduces the operating noise of the printer. An adjustable message blank holder 561 attached to the cover 558 conveniently holds the messages or other papers for the keyboard operator. A crank 562 removably attached to the right end of the paper feed roller shaft 241 (Fig. 22) enables the operator to manually feed the paper blank through the printer.

It is obvious, of course, that various modifications of the apparatus shown herein may be made without departing from the spirit or essential attributes of the invention, and, therefore, we do not desire to be limited to the specific details shown and described.

What is claimed is:

1. In a page printing telegraph recorder, a selecting mechanism, a page supporting mechanism, a typewheel having a single row of characters thereon, a typewheel positioning mechanism having an independently and selectively operable positioning element individual to each character of said typewheel, means whereby said typewheel positioning mechanism is controlled by said selecting mechanism to position said typewheel in a continuous movement to place a selected character in printing position and means for moving said typewheel in a latter space direction.

2. In a page printing telegraph recorder, a selecting mechanism, a typewheel stop unit controlled thereby and comprising an annular group of stop elements, a typewheel having a single character or blank position corresponding to each

of said stop elements, a shaft upon which said typewheel is mounted for rotation therewith, means for moving said typewheel longitudinally of said shaft in a plurality of successive steps in a single direction from an initial position, means engageable with said stop elements selectively to position said typewheel, a page supporting mechanism, means for bringing a single character of said typewheel at a time in contact with said page and means independent of said shaft for returning said typewheel to its initial position in the line.

3. In a page printing telegraph recorder, a movable typewheel, means for rotating said typewheel, means tending to return said typewheel to an initial position in a line, means for effecting a printing operation, means for advancing said typewheel in a letter spacing direction sequentially with said printing operation, and means responsive to the reception of a predetermined code combination of impulses for rendering said typewheel returning means operable only during the advance of said typewheel through a predetermined first part of the length of a line.

4. In a page printing telegraph recorder, a selecting mechanism, a typewheel stop unit controlled thereby and comprising an annular group of stop elements, a typewheel, a shaft axially disposed with respect to said annular group of stop elements upon which said typewheel is mounted for rotation therewith, means for moving said typewheel longitudinally of said shaft in a plurality of successive steps in a single direction, a stop member fixed to said shaft and engageable with said stop elements to selectively position said typewheel, page supporting mechanism and means for bringing a single character of said typewheel at a time into contact with said page.

5. In a page printing telegraph recorder, a movable typewheel, means for rotating said typewheel, means tending to return said typewheel to an initial position in a line, means for effecting a printing operation, means for advancing said typewheel in a letter spacing direction sequentially with said printing operation, means responsive to the reception of a predetermined code combination of impulses for rendering said typewheel returning means operable only during the advance of said typewheel through a predetermined length of line and means for invariably rendering said typewheel returning means operable on reception of the next code combination of impulses after a second predetermined length of line has been reached.

6. In a page telegraph printer, a selecting mechanism, a typewheel, a typewheel stop mechanism, a page supporting mechanism, a shaft disposed horizontally along one side of said page upon which said typewheel is mounted for sliding movement therealong, a rotatable cam, a press member extending along the opposite side of said page parallel to said shaft and means comprising said rotatable cam for operating said press member in the direction of said shaft to press said page against the typewheel.

7. In a page printing telegraph recorder, a movable typewheel, means for rotating said typewheel, means tending to return said typewheel to an initial position in a line, means for effecting a printing operation, means for advancing said typewheel in a letter spacing direction sequentially with said printing operation, means responsive to the reception of a predetermined code combination of impulses for rendering said typewheel returning means operable only during the advance of said typewheel through a predetermined length of line and means responsive to the reception of another predetermined code combination of impulses for rendering said typewheel returning means operable during the advance of said typewheel from said predetermined length of line to another predetermined length of line.

8. In combination, a selector mechanism operated in response to received code combinations of a uniform number of impulses, a rotatable typewheel shaft, a typewheel slidably mounted on said typewheel shaft and rotatable therewith, means for stopping said typewheel shaft in predetermined positions in accordance with the operation of said selector mechanism, means for biasing said typewheel to one end of its travel, a cord for advancing said typewheel step-by-step from an initial position against the action of said biasing means, a drum about which said cord is wound, said drum having a circumference at least as great as the maximum linear sliding movement of said typewheel, a typewheel position indicating disc rotatable with said drum and means for releasing said drum to allow said biasing means to return said typewheel to said initial position.

9. In a page telegraph printer, a typewheel, a typewheel feeding mechanism, a typewheel return mechanism, a line feeding mechanism including a ratchet and a pawl, a cam for operating said pawl, means for rotating said cam in timed relation to each received code combination of impulses, means for normally rendering said pawl non-responsive to the movement of said cam and means controlled by said typewheel feeding mechanism for rendering said pawl responsive to the movement of said cam to actuate said line feeding mechanism.

10. In a page telegraph printer, a typewheel movable along the axis thereof to effect letter spacing, a typewheel positioning mechanism, a line feeding mechanism, a cam for operating said line feeding mechanism, means for rotating said cam in timed relation to each received code combination of impulses, means for normally rendering said line feeding mechanism non-responsive to the movement of said cam, and means controlled by said typewheel positioning mechanism for rendering said line feeding mechanism responsive to the movement of said cam to actuate said line feeding mechanism.

11. In a page telegraph printer, a typewheel, a typewheel positioning mechanism, a line feeding mechanism including a ratchet and a pawl, a cam for operating said pawl, means for rotating said cam in timed relation to each received code combination of impulses, means for normally rendering said pawl non-responsive to the movement of said cam and means controlled by said typewheel feeding mechanism and said typewheel positioning mechanism in coaction with each other for rendering said pawl responsive to the movement of said cam to actuate said line feeding mechanism.

12. In a page telegraph printer, a typewheel, a typewheel positioning mechanism, a typewheel feeding mechanism including a ratchet and a cooperating pawl, a cam for operating said pawl, means for rotating said cam in timed relation to each received code combination of impulses and means controlled solely by said typewheel feeding mechanism for retaining said pawl out of engagement with said ratchet during the rotation of said cam.

13. In a page telegraph printer, a typewheel, a typewheel positioning mechanism, a typewheel feeding mechanism including a ratchet and a

cooperating pawl, a cam for operating said pawl, means for rotating said cam in timed relation to each received code combination of impulses and means comprising said typewheel positioning mechanism for actuating said pawl out of engagement with said ratchet during a predetermined rotation of said cam and means for reengaging said pawl and ratchet during the subsequent rotation of said cam.

14. In a page telegraph printer, a typewheel, a typewheel positioning mechanism, means biasing said typewheel to an initial position, a typewheel letter space feeding mechanism comprising a ratchet and an operating pawl, a typewheel letter space holding means, means responsive to a predetermined code combination of impulses for rendering said letter space feeding and holding means ineffective and said biasing means operative to move said typewheel to said initial position and means responsive to a subsequent code combination of impulses following the movement of said typewheel to said initial position for again rendering said feeding and holding means effective on said typewheel.

15. A page telegraph printer comprising a selector mechanism, a stop unit controlled thereby and including a plurality of selectable stop elements, a typewheel, a typewheel control shaft selectively positionable by said stop elements, a line feed mechanism, means for selectively controlling said line feed mechanism and means whereby said last means is directly selected by predetermined ones of said stop elements independently of said typewheel control shaft.

16. A page telegraph printer comprising a selector mechanism, a stop unit controlled thereby and including a plurality of selectable stop elements, a typewheel selectively positioned by said stop elements, a typewheel returning means, means tending to actuate said typewheel return means concomitantly with the printing of each character, baffle means normally preventing actuation of said typewheel return means and means actuated directly by predetermined of said stop elements for actuating said baffle means to permit operation of said typewheel return means.

17. A page telegraph printer comprising a selector mechanism, a stop unit controlled thereby and including a plurality of selectable stop elements, a typewheel, a typewheel control shaft selectively positionable by said stop elements, a typewheel letter spacing mechanism, a typewheel return means, means for selectively controlling said typewheel return means and means whereby said last means is directly selected by predetermined ones of said stop elements independently of the typewheel control shaft.

18. A page telegraph printer comprising a selector mechanism, a stop unit controlled thereby and including a plurality of selectable stop elements, a typewheel selectively positioned by said stop elements, a typewheel returning means, means tending to actuate said typewheel return means concomitantly with the printing of each character, a plurality of baffle members one or the other of which normally prevents actuation of said typewheel return means and means actuated directly by predetermined of said stop elements for actuating one or the other of said baffle means to permit operation of said typewheel returning means.

19. In a page telegraph printer, a typewheel, letter space feeding means for said typewheel, a rotatable control member movable by said letter space feeding means and means engageable with said member in different angular positions thereof for controlling the return movement of said typewheel.

20. In a page telegraph printer, a typewheel, letter space feeding means for said typewheel, a rotatable control disc movable by said letter space feeding means, said disc having an irregular contour, a selectively controlled baffle member, an interponent member and means engageable with said disc in different angular positions thereof for positioning said interponent member relative to said baffle member whereby the return movement of said typewheel is controlled by said selected baffle member and said disc.

21. A page telegraph printer comprising a selector mechanism, a stop unit controlled thereby and including a plurality of selectable stop elements, a typewheel selectively positioned by said stop elements, a line feed mechanism, means actuated directly by predetermined of said stop elements for selectively controlling said line feed mechanism and means controlled by said typewheel letter spacing mechanism independently of said stop elements for permitting operation of said line feed mechanism.

22. In a page telegraph printer, a typewheel, a letter space feeding means for said typewheel comprising a ratchet and pawl, a control disc movable with said ratchet, said disc having an irregular contour, a selectively controlled baffle member, a feeler member operable in timed relation to each printing operation into engagement with said disc and an interponent member variably actuated by said feeler member in different angular positions of said disc for positioning said interponent member relative to said baffle member whereby the return movement of said typewheel is controlled jointly by said baffle member and said disc.

23. In combination, a selector mechanism operated in response to received code combinations of a uniform number of impulses, a rotatable typewheel shaft, a typewheel slidably mounted on said typewheel shaft and rotatable therewith, means for stopping said typewheel shaft in predetermined positions in accordance with the operation of said selector mechanism, means for biasing said typewheel to one end of its travel, means for advancing said typewheel step-by-step from an initial position against the action of said biasing means and means for releasing said advancing means to allow said biasing means to return said typewheel to said initial position.

24. In a page telegraph recorder, a movable type wheel, means tending to return said type wheel to an initial position, means for advancing said type wheel, printing means, paper feed means, means responsive to predetermined signals for releasing said type wheel from said advancing means to allow said type wheel returning means to return said type wheel to said initial position, and means comprising an independently rotatable cam sleeve with a plurality of cams thereon for controlling the operation of the last four above mentioned means.

25. In a printing telegraph machine employing a code comprising a uniform number of signaling conditions for each combination, a selectively rotatable stop shaft, a type wheel slidably mounted on said shaft and rotatable therewith, means for effecting letter-spacing of said type wheel, type wheel return mechanism, means for supporting a paper web in printing relation with said type wheel, line feed mechanism for said web,

means for taking impressions from said type wheel on-to said paper web, and means controlled by a single received code combination of impulses for simultaneously operating said type wheel return mechanism and said line feed mechanism.

26. In combination, a selector mechanism operated in response to groups of a definite number of received code combination of impulses, a typewheel, a shaft on which said typewheel is slidably mounted, means for selectively stopping said shaft, function elements, and means controlled by said selector mechanism coacting with means controlled by the transverse movement of said typewheel for rendering predetermined of said function elements operative or inoperative.

27. In a combined sender and receiver, a sending shaft, a receiving shaft, means including a common source of power for rotating said shafts at the same speed, means for manually releasing said sending shaft for one revolution at a time, means controlled by said sending shaft on its initial movement for a revolution for releasing said receiving shaft, means for stopping said receiving shaft at the end of each revolution and mechanical means operated by the rotation of said sending shaft for invariably bringing said shaft to rest for a predetermined length of time at the completion of every revolution thereof whereby said receiving shaft is invariably stopped and started in substantial synchronism with said sending shaft.

28. In a page printing telegraph recorder, a selecting mechanism, a typewheel positioning mechanism controlled thereby, a page supporting mechanism, a typewheel shaft disposed parallel to the plane of said page, a typewheel mounted directly on said shaft, means for moving said typewheel longitudinally of said shaft, comprising a flexible element operatively secured to said typewheel, a drum about which said flexible element passes and means for rotating said drum to wind the flexible element thereon and thereby to move said typewheel longitudinally on said shaft, a typewheel position indicating disc rotatable with said drum, said drum having a circumference not less than the maximum linear movement of said typewheel in a letter space direction.

29. In a page printing telegraph recorder, a selecting mechanism, a typewheel positioning mechanism controlled thereby, a page supporting mechanism, a typewheel shaft disposed parallel to the plane of said page, a typewheel mounted directly on said shaft, means for moving said typewheel longitudinally of said shaft comprising a flexible element operatively secured to said typewheel, a drum about which said flexible element passes, means for rotating said drum to wind the flexible element thereon and thereby to move said typewheel longitudinally on said shaft, a typewheel position indicating disc rotatable with said drum, said drum having a circumference not less than the maximum linear movement of said typewheel in a letter space direction, and means comprising said typewheel position indicating disc for controlling the automatic return of said typewheel to an initial position.

30. In a page printing telegraph recorder, a start-stop selecting mechanism, a typewheel positioning mechanism controlled thereby, a page supporting mechanism, a typewheel shaft disposed parallel to the plane of said page, a typewheel mounted directly on said shaft, means for moving said typewheel longitudinally of said shaft comprising a flexible element operatively secured to said typewheel, a drum about which said flexible element passes and means for rotating said drum to wind the flexible element thereon and thereby to move said typewheel longitudinally on said shaft, a typewheel position indicating disc rotatable with said drum, said drum having a circumference not less than the maximum linear movement of said typewheel in a letter space direction.

31. In a page telegraph printer, a selecting mechanism, a typewheel, a typewheel stop mechanism, a page supporting mechanism, means for moving said typewheel across said page in a letter space direction, a press member extending along the opposite side of said page from said typewheel, means for operating said press member in the direction of said typewheel to press the page thereagainst and means for regulating the stroke of said press member.

32. In a page telegraph printer, a selecting mechanism, a typewheel, a typewheel stop mechanism, a page supporting mechanism, means for moving said typewheel across said page in a letter space direction, a press member extending along the opposite side of said page from said typewheel, means for operating said press member in the direction of said typewheel to press the page thereagainst and independently adjustable means at each end of said press member for regulating the stroke thereof whereby said typewheel receives a substantially uniform blow throughout the length of its travel.

33. In a page telegraph printer, a selecting mechanism, a typewheel, a typewheel stop mechanism, a page supporting mechanism, means for moving said typewheel across said page in a letter space direction, a press member extending along the opposite side of said page from said typewheel, means for operating said press member in the direction of said typewheel to press the page thereagainst and means whereby the printing stroke of said press member is uniform throughout the entire length thereof.

34. In a page printing telegraph recorder, a movable typewheel, means for rotating said typewheel, means tending to return said typewheel to an initial position in a line, means for effecting a printing operation, means for advancing said typewheel in a letter spacing direction sequentially with said printing operation, means responsive to the reception of a predetermined code combination of impulses for rendering said typewheel returning means operable only during the advance of said typewheel through a predetermined length of line and other means for rendering said typewheel returning means operable during the advance of said typewheel from said predetermined length of line to another predetermined length of line.

35. In combination, a movable typewheel, a selector mechanism, page printing mechanism, a function control member for rendering predetermined paging operations effective or ineffective, a baffle member controlled by said selecting mechanism, an interponent member adapted to be interposed between said baffle member and said function control member to render said function control member inoperative and means controlled by said selector mechanism for rendering said baffle member inoperative with respect to said interponent member whereby said control member is operative to effect predetermined paging operation.

36. In a telegraph printer, a rotatable typewheel shaft, a typewheel slidably mounted on

said typewheel shaft and rotatable therewith, power driven means continually tending to rotate said typewheel shaft, means responsive to a receiving code combination of a uniform number of impulses for selectively stopping said shaft, a toothed ratchet wheel having a tooth individual to each letter space position of said typewheel, means comprising a single operating pawl for stepping said ratchet, means cooperating with the stepping of said ratchet for advancing said typewheel along said typewheel shaft, means tending to return said typewheel and ratchet wheel to an initial position, and means for releasing said ratchet wheel to allow said returning means to return said ratchet wheel and typewheel to said initial position.

37. In a page telegraph printer, a start-stop selecting mechanism, a typewheel, a typewheel stop mechanism, a page supporting mechanism, a shaft disposed horizontally along one side of said page upon which said typewheel is mounted for sliding movement therealong, a pivoted press bail extending substantially the full width of said page along the opposite side thereof and parallel to said shaft and means for rocking said press bail in the direction of said shaft to press the page against the typewheel.

38. In a telegraph printer, a rotatable typewheel shaft, a typewheel slidably mounted on said typewheel shaft and rotatable therewith, power driven means continually tending to rotate said typewheel shaft, means responsive to a received code combination of a uniform number of impulses for selectively stopping said shaft, a toothed ratchet wheel having a tooth individual to each slidable position of said typewheel, a pawl for stepping said ratchet, means cooperating with the stepping of said ratchet for advancing said typewheel along said shaft, means tending to return said typewheel and ratchet to an initial position, means for releasing said ratchet wheel and typewheel to said initial position and means for adjusting the initial position of said ratchet wheel relative to said pawl.

39. In combination, a movable typewheel, a selector mechanism, a page printing mechanism, a function control member for rendering predetermined paging operations effective or ineffective, a plurality of baffle members controlled by said selector mechanism, an interponent member adapted to be interposed between said baffle members and said function control member to render said function control member inoperative, means cooperating with a predetermined linear position of said typewheel for rendering said interponent member inoperative with respect to said function control member whereby said control member is operative to effect predetermined paging operations and means controlled by said selector mechanism in other linear positions of said typewheel for rendering said baffle members inoperative with respect to said interponent member whereby said control member is operative to effect said predetermined paging operations.

40. In a printing telegraph recorder, a typewheel, power driven means continually tending to rotate said typewheel, means for moving said typewheel step-by-step from an initial position to effect letter spacing, mechanism for returning said typewheel to said initial position, mechanism for effecting said letter spacing movement including a ratchet wheel and an operating and a holding pawl therefor, means for actuating said operating pawl to step said ratchet, means responsive to any one of a plurality of predetermined signals for disengaging said pawls from said ratchet wheel and allowing said typewheel returning means to function, and means controlled by the angular position of said ratchet wheel for determining a response of said disengaging means to said predetermined signals.

41. In a page telegraph printer, a typewheel, a typewheel positioning mechanism, a typewheel feeding mechanism, a typewheel returning mechanism, a line feeding mechanism, a cam for operating said typewheel feeding mechanism, a cam for operating said line feed mechanism, means for rotating said cams in timed relation to each received code combination of impuluses, means for normally rendering said line feeding mechanism non-responsive to the movement of its associated cam and means controlled by said typewheel positioning mechanism for rendering said line feeding mechanism responsive to the movement of its associated cam and for rendering said typewheel feeding mechanism non-responsive to its associated cam during actuation of said line feeding mechanism.

42. In a page telegraph printer, a selecting mechanism, a typewheel, a typewheel stop mechanism, a page supporting mechanism, means for moving said typewheel along the axis thereof across said page in a letter space direction, a press member extending along the opposite side of said page from said typewheel, a spring for operating said press member in the direction of said typewheel to press the page thereagainst and a cam operating in timed relation to the operation of said typewheel stop mechanism for storing energy in and releasing the energy from said spring.

43. In a page telegraph printer, a selecting mechanism, a typewheel, a typewheel stop mechanism, a page supporting mechanism, a line feed mechanism, means for moving said typewheel across said page in a letter space direction, a press mechanism comprising a member extending along the opposite side of said page from said typewheel, means for operating said press member in the direction of said typewheel to press the page thereagainst and means for rendering said press mechanism inactive during the operation of said line feed mechanism.

44. In a page telegraph printer, a typewheel, a typewheel positioning mechanism, a typewheel feeding mechanism, a typewheel return mechanism, a line feeding mechanism including a ratchet and a pawl, a cam for operating said typewheel feeding mechanism, a cam for operating said line feeding pawl, means for rotating said cams in timed relation to each received code combination of impulses, means for normally rendering said line fee ing pawl non-responsive to the movement of it associated cam and means controlled by said typewheel positioning mechanism for rendering said line feeding pawl responsive to the movement of its associated cam to actuate said line feeding mechanism and for rendering said typewheel feeding mechanism non-responsive to its associated cam during the actuation of said line feeding mechanism.

45. In a page telegraph printer, a typewheel, a typewheel positioning mechanism, a typewheel feeding mechanism, a line feeding mechanism including a ratchet and a pawl, a cam for operating said line feeding mechanism, a cam for operating said typewheel feeding mechanism, means for rotating said cams in timed relation to each received code combination of impulses, means for normally rendering said line feeding pawl non-

responsive to the movement of its associated cam, and means controlled by said typewheel feeding mechanism and said typewheel positioning mechanism in coaction with each other for rendering said line feeding pawl responsive to the movement of its associated cam to actuate said line feeding mechanism and for rendering said typewheel feeding mechanism non-responsive to its associated cam during the actuation of said line feeding mechanism.

46. In a page telegraph printer, a typewheel, a typewheel positioning mechanism, a typewheel feeding mechanism including a ratchet and a cooperating pawl, a cam for operating said pawl, means for rotating said cam in timed relation to each received code combination of impulses and means controlled jointly by said typewheel positioning mechanism and said typewheel feeding mechanism for retaining said pawl out of engagement with said ratchet during rotation of said cam.

47. In a page telegraph printer, a typewheel, a typewheel positioning mechanism, a line feeding mechanism, a cam for operating said line feeding mechanism, means for rotating said cam in timed relation to each received code combination of impulses, means for normally rendering said line feeding mechanism non-responsive to the movement of its associated cam and means controlled by said typewheel feeding mechanism and said typewheel positioning mechanism in coaction with each other for rendering said line feeding mechanism responsive to the movement of its associated cam to actuate said line feeding mechanism.

48. In a page telegraph printer, a typewheel, a typewheel positioning mechanism, a typewheel feeding mechanism including a ratchet and a cooperating pawl, a cam for operating said pawl, means for rotating said cam in timed relation to each received code combination of impulses and means responsive to a predetermined code combination of impulses for actuating said pawl out of engagement with said ratchet, means to effect the return of the typewheel to its initial position at the beginning of the line during said disengagement of the pawl and ratchet and means responsive to a subsequent code combination of impulses for reengaging said pawl and ratchet.

49. In a page telegraph printer, a typewheel, a typewheel positioning mechanism, a start-stop selector mechanism for operating said typewheel positioning mechanism, means biasing said typewheel to an initial position, a typewheel letter space feeding mechanism including a ratchet and an operating pawl, a typewheel letter space holding means, means for operating said operating pawl in timed relation to each received code combination of impulses to advance said typewheel, means for actuating said pawls out of engagement with said ratchet during a predetermined operation of said pawl operating means and means responsive to a subsequent code combination of impulses for reengaging said pawls and ratchet.

50. In a page telegraph printer, a typewheel, a typewheel positioning mechanism comprising a plurality of selectable stop elements, a typewheel feeding mechanism including a ratchet and a pawl, a typewheel return mechanism, a line feeding mechanism including a ratchet and a pawl, individual cams for operating said pawls, means for rotating said cams in timed relation to each received code combination of impulses, means acting on said line feed pawl for normally rendering said pawl non-responsive to the movement of its associated cam and means controlled directly by a predetermined one of said stop elements of said typewheel positioning mechanism for rendering said line feeding pawl responsive to the movement of its associated cam to actuate said line feeding mechanism and for acting on said typewheel feeding pawl for rendering said typewheel feeding mechanism non-responsive to its associated cam during the actuation of said line feeding mechanism.

51. In a page telegraph printer, a typewheel, means for biasing said typewheel to an initial position, a typewheel positioning mechanism, a typewheel line feeding mechanism including a ratchet and a cooperating pawl, a cam for operating said pawl, means for rotating said cam in timed relation to each received code combination of impulses, selective means for actuating said pawl out of engagement with said ratchet whereby to permit said typewheel to return to its initial position by said biasing means and means independent of said return movement of the typewheel for reengaging said pawl and ratchet.

52. A page telegraph printer comprising a selector mechanism, a stop unit controlled thereby and including a plurality of selectable stop elements, a typewheel selectively positioned by said stop elements, a line feed mechanism, means tending to actuate said line feed mechanism concomitantly with the printing of each character, baffle means normally preventing actuation of said line feed mechanism and means actuated directly by predetermined of said stop elements for actuating said baffle means to permit operation of said line feed mechanism.

53. A page telegraph printer comprising a selector mechanism, a stop unit controlled thereby and including a plurality of selectable stop elements, a typewheel selectively positioned by said stop elements, a typewheel letter spacing mechanism, a typewheel return means, a line feed mechanism, means actuated jointly by predetermined of said stop elements and said typewheel letter spacing mechanism for selectively controlling said line feed mechanism and said typewheel return means.

54. A page telegraph printer comprising a selector mechanism, a stop unit controlled thereby and including a plurality of selectable stop elements, a typewheel selectively positioned by said stop elements, a typewheel letter spacing mechanism, a typewheel return means, means tending to actuate said typewheel return means concomitantly with the printing of each character, a plurality of baffle members one or the other of which normally prevents actuation of said typewheel return means, means actuated directly by predetermined of said stop elements for actuating one or the other of said baffle members to permit operation of said typewheel return means and means controlled by said typewheel letter spacing mechanism independently of said stop elements for permitting operation of said typewheel return means.

55. A page telegraph printer comprising a selector mechanism, a stop unit controlled thereby and including a plurality of selectable stop elements, a typewheel selectively positioned by said stop elements, a typewheel letter spacing mechanism, a typewheel return means and means actuated jointly by predetermined of said stop elements and said typewheel spacing mechanism for

selectively controlling said typewheel return means.

56. A page telegraph printer comprising a selector mechanism, a stop unit controlled thereby and including a plurality of selectable stop elements, a typewheel selectively positioned by said stop elements, a typewheel letter spacing mechanism, a typewheel return means, means actuated directly by predetermined of said stop elements for selectively controlling said typewheel return means and means controlled by said typewheel letter spacing mechanism independently of said stop elements for permitting operation of said typewheel return mechanism.

57. In a page telegraph printer, a typewheel, letter space feeding means for said typewheel comprising a ratchet and pawl, a control disc rotatable with said ratchet and means engageable with said disc in different angular positions thereof for controlling the return movement of said typewheel.

58. In a page telegraph printer, a typewheel, letter space feeding means for said typewheel, a control disc movable by said letter space feeding means and means engageable with said disc in different angular positions thereof for controlling the return movement of said typewheel.

59. In a page telegraph printer, a typewheel, letter space feeding means for said typewheel comprising a ratchet and pawl, a rotatable control disc movable through not more than 360° by said ratchet during the movement of said typewheel through a complete line and means engageable with said disc in different angular positions thereof for controlling the return movement of said typewheel.

60. In a page telegraph printer, a typewheel, letter space feeding means for said typewheel comprising a ratchet and pawl, a rotatable control disc movable through not more than 360° by said ratchet during movement of said typewheel through a complete line, said disc having an irregular contour, a selectively controlled baffle member, an interponent member and means engageable with said disc in different angular positions thereof for positioning said interponent member relative to said baffle member whereby the return movement of said typewheel is controlled jointly by said baffle member and said disc.

61. In a page telegraph printer, a typewheel, letter space feeding means for said typewheel, a control member movable by said letter spacing feeding means, said member having an irregular contour, a plurality of selectively controlled baffle members, an interponent member and means engageable with said control member in different angular positions thereof for positioning said interponent member relative to said baffle members whereby the return movement of said typewheel is controlled jointly by one or the other of said selected baffle members and said control member or solely by said control member.

62. In a printing telegraph machine, a rotatable typewheel shaft, a typewheel slidably mounted on said shaft and rotatable therewith, power driven means continually tending to rotate said typewheel shaft, means for selectively stopping said shaft, mechanism for moving said typewheel step-by-step from an initial position to effect letter spacing, said mechanism including a ratchet and an actuating pawl, a power driven cam associated with said actuating pawl to operate the same, a holding pawl cooperating with said ratchet, mechanism for returning said typewheel to its initial position and means responsive to any one of a plurality of predetermined signals for disengaging said pawls from said ratchet to allow said returning mechanism to return said typewheel to said initial position.

63. In combination, a selector mechanism operated in response to received code combinations of impulses, a typewheel shaft, power driven means continually tending to rotate said shaft, means controlled by said selector mechanism for selectively stopping said shaft, a typewheel rotatable with said shaft and axially shiftable thereon to effect letter spacing, mechanism including a ratchet and an actuating pawl for shifting said typewheel, a holding pawl cooperating with said ratchet, an independently rotatable cam for operating said actuating pawl, means tensioned during the shifting of said typewheel for retracting the same and reversely rotating said ratchet when said pawls are disengaged therefrom, and means including a pivoted lever for causing the disengagement of said pawls and ratchet, a rotatable cam for controlling actuation of said pivoted lever and means controlled by said selector mechanism for determining the actuation of said lever under the control of said cam.

64. In a printing telegraph recorder, a typewheel shaft, power driven means continually tending to rotate said typewheel shaft, a typewheel on said shaft rotatable therewith and movable thereon step-by-step from an initial position to effect letter spacing, mechanism for returning said typewheel to said initial position, mechanism for effecting said letter spacing, including a ratchet and an operating and a holding pawl therefor, means for actuating said actuating pawl to step said ratchet, means responsive to any one of a plurality of predetermined signals for disengaging said pawls from said ratchet and allowing said typewheel returning means to function and means operated in accordance with the travel of said typewheel for determining the response of said disengaging means to said predetermined signals.

65. In combination, a movable typewheel, a selector mechanism, an independently rotatable member cooperating with said selector mechanism for effecting a printing operation, a paper feed operation, a typewheel advancing operation and a typewheel releasing operation, a function control member for rendering predetermined of said operations effective or ineffective, a plurality of baffle members controlled by said selector mechanism, a sliding member adapted to be interposed between said baffle members and said function control member to render said function control member inoperative, means cooperating with a predetermined linear position of said typewheel for rendering said sliding member inoperative with respect to said function control member whereby said control member is operative to effect predetermined paging operations and means controlled by said selector mechanism in other linear positions of said typewheel for rendering said baffle members inoperative with respect to said sliding member whereby said control member is operative to effect said predetermined paging operations.

66. In a page telegraph recorder, a movable typewheel, means for rotating said typewheel, means tending to return said typewheel to an initial position, means for effecting a printing operation, means for advancing said typewheel sequentially with said printing operation, means responsive to the receipt of a predetermined code

combination of impulses for rendering said typewheel returning means operable during the advance of said typewheel through a predetermined length of line, means responsive to the receipt of another predetermined code combination of impulses and non-responsive to said first mentioned code combination of impulses for rendering said typewheel returning means operable during the advance of said typewheel from said predetermined length of line to another predetermined length of line, means for rendering said typewheel returning means operable on the receipt of the next code combinations of impulses after the second predetermined length of line has been reached, means for effecting a paper feed operation, means for rendering said paper feed means inoperative during the advance of said typewheel and means for rendering said paper feed means operative during the return of said typewheel to its initial position.

67. In combination, a rotary transmitting member, a rotary receiving member, each of said rotary members being normally at rest and having a plurality of angularly spaced operating positions, the corresponding operating positions of said receiving member being angularly spaced equal to those of said transmitting member, means for rotating said rotary members, said means being operative to rotate said members at the same speed, manually controlled means for releasing said rotary transmitting member for one revolution at a time, a first means controlled by the rotation of said rotary transmitting member for invariably bringing said rotary member to rest for at least a predetermined length of time after each rotation thereof and a second means controlled by the initial rotation of said rotary transmitting member for releasing said rotary receiving member and stopping the same after each revolution thereof whereby said rotary transmitting and receiving members are successively and substantially synchronously advanced through their corresponding operating positions.

JAMES W. LONG.
EVAN R. WHEELER.