June 8, 1943. A. W. KAUFMAN 2,321,392

TELEGRAPH STATION BREAK-IN SYSTEM

Filed Sept. 20, 1941 5 Sheets-Sheet 1

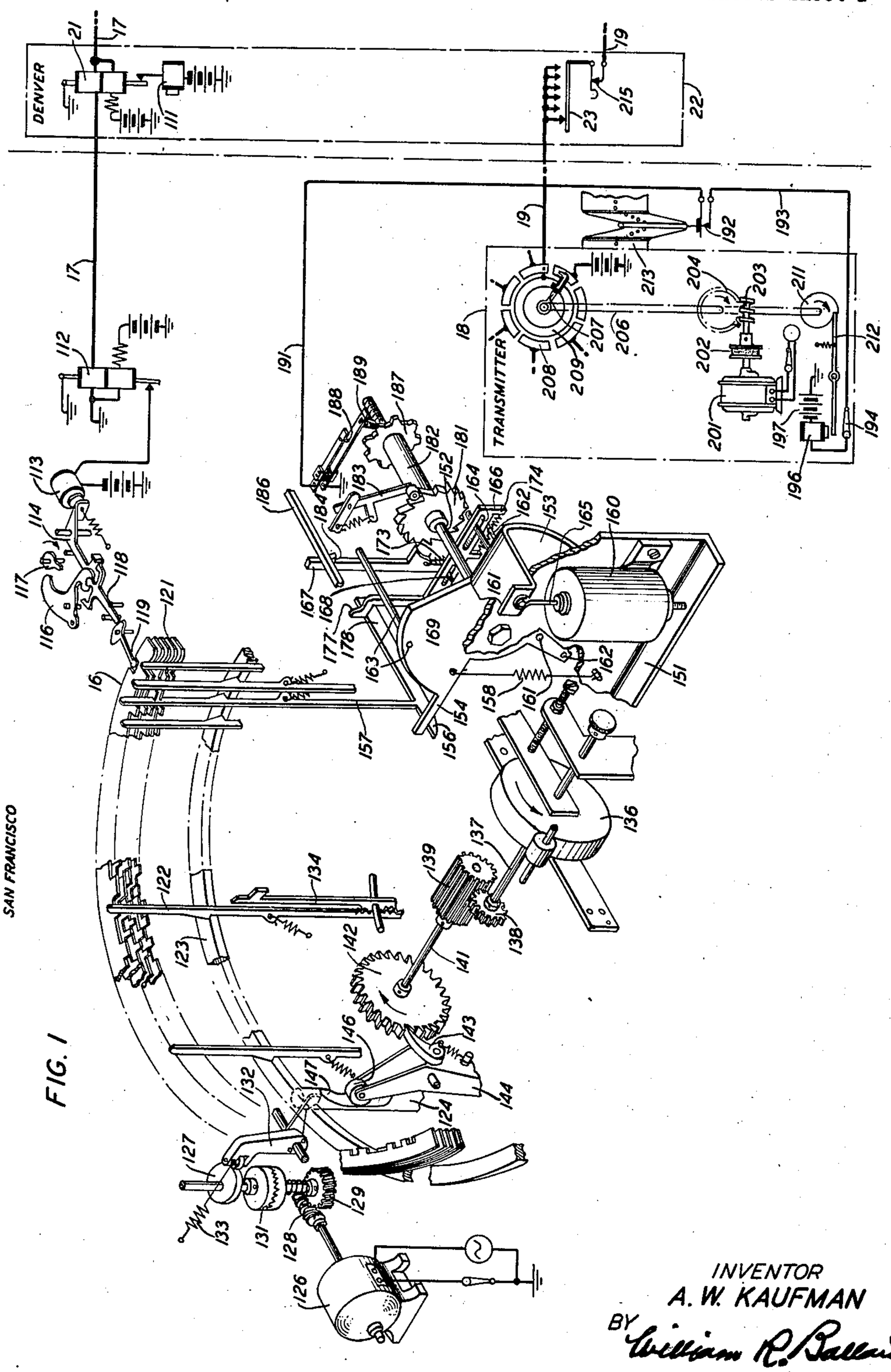

FIG. 1

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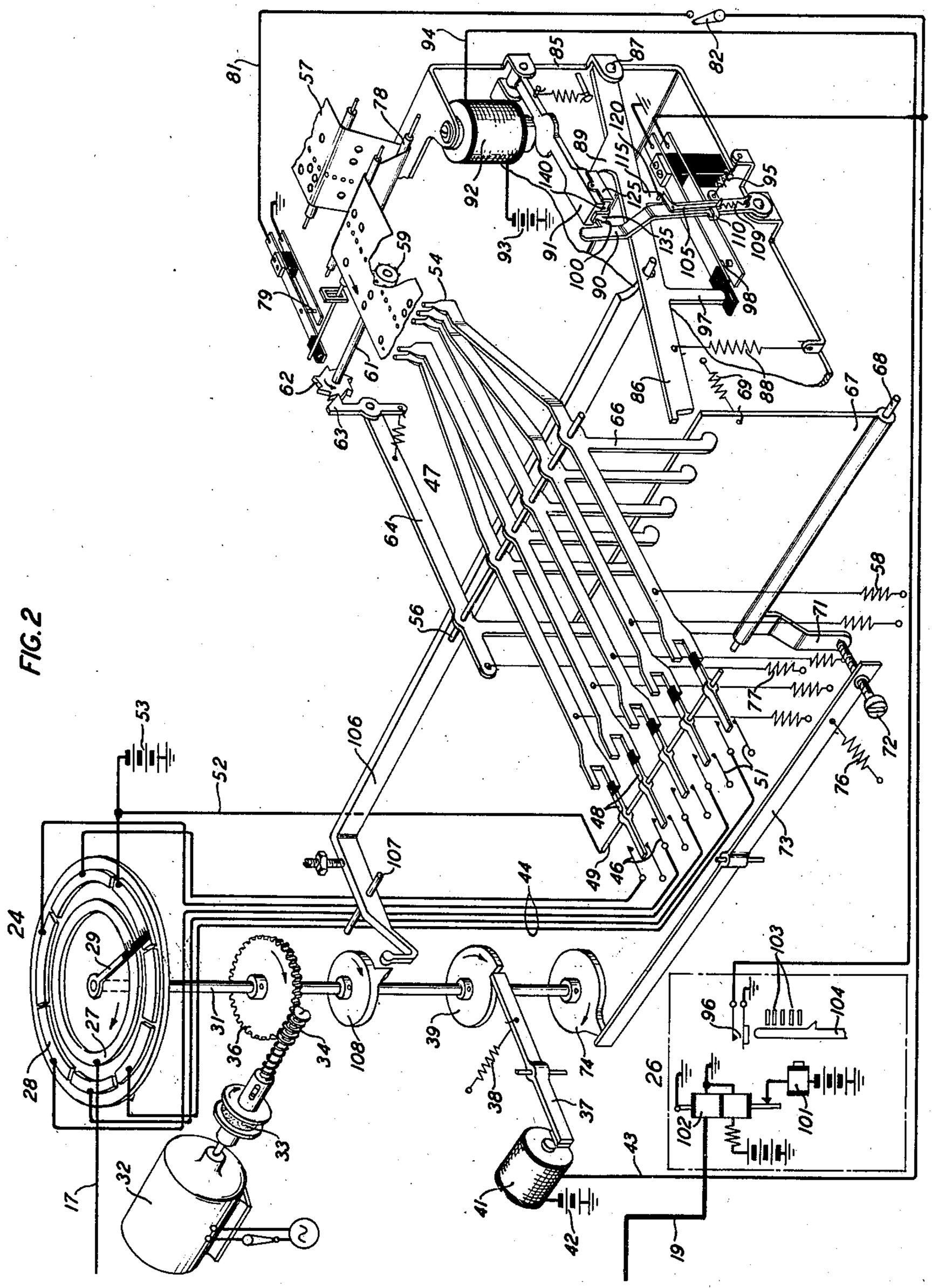
FIG. 2



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TELEGRAPH STATION BREAK-IN SYSTEM

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FIG 3

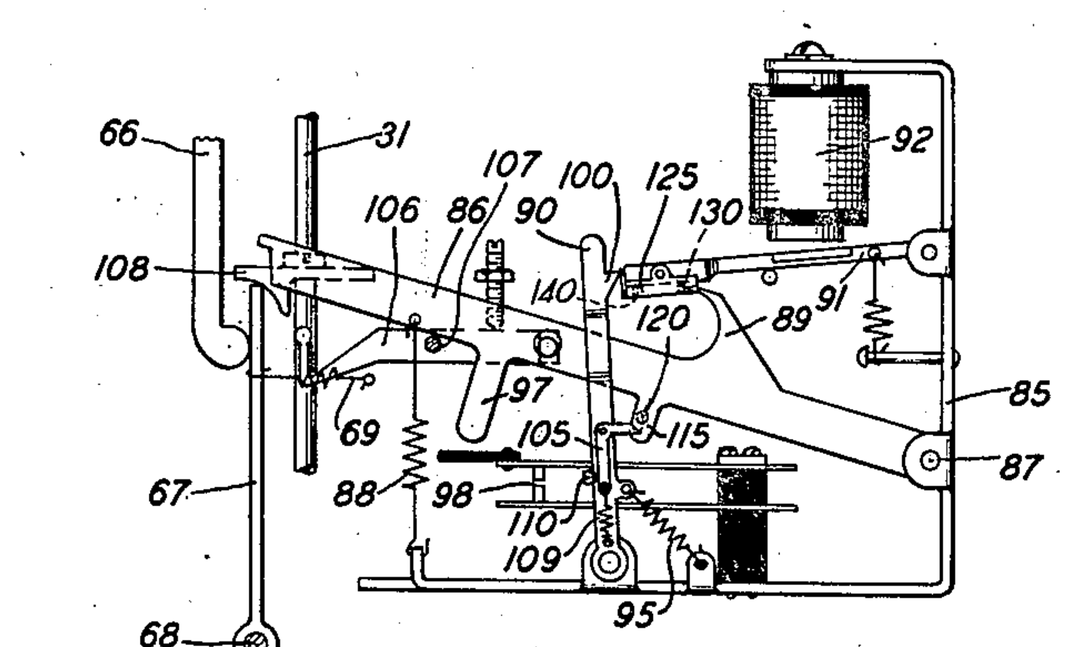

FIG. 4

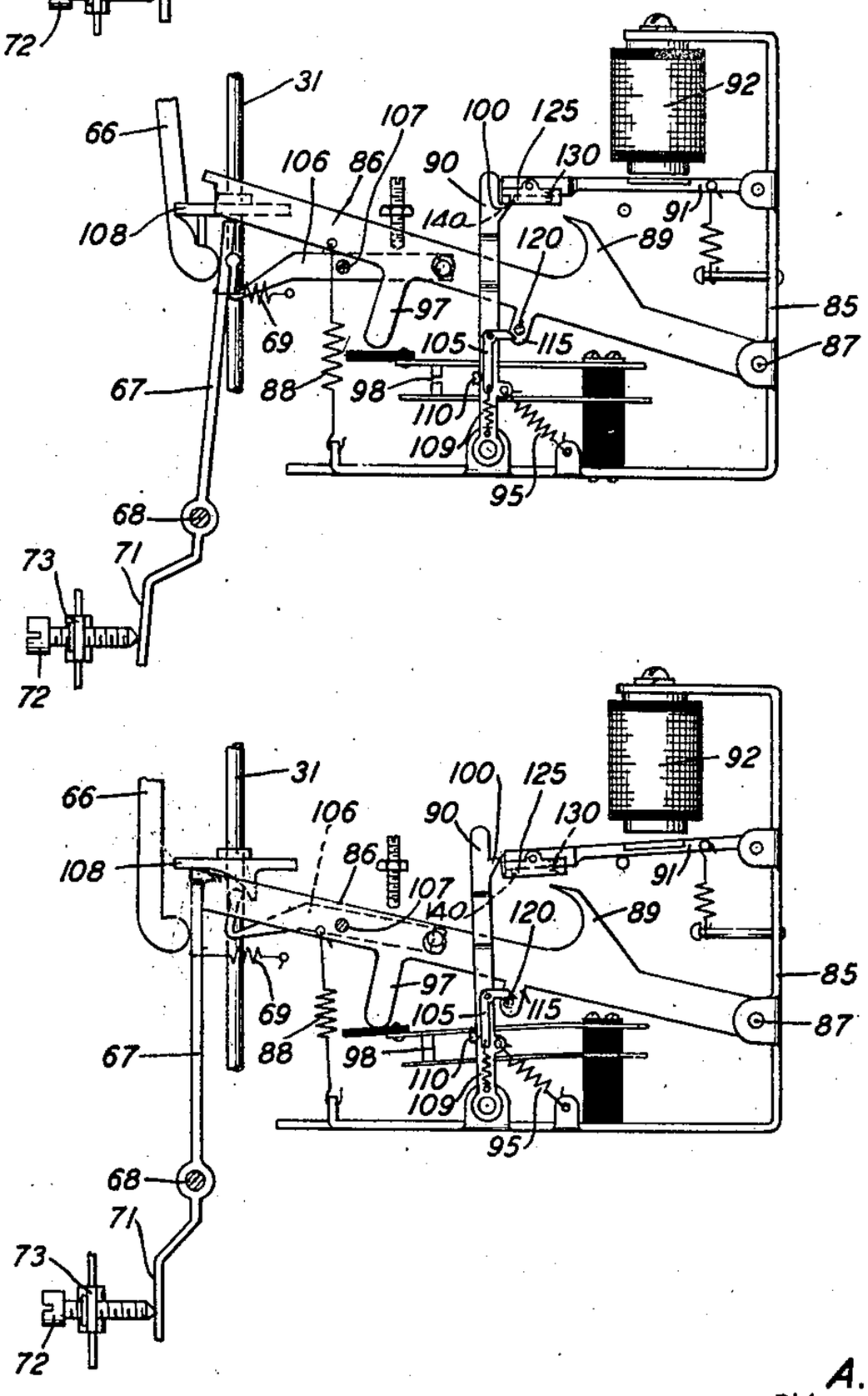

FIG. 5

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TELEGRAPH STATION BREAK-IN SYSTEM

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FIG. 6

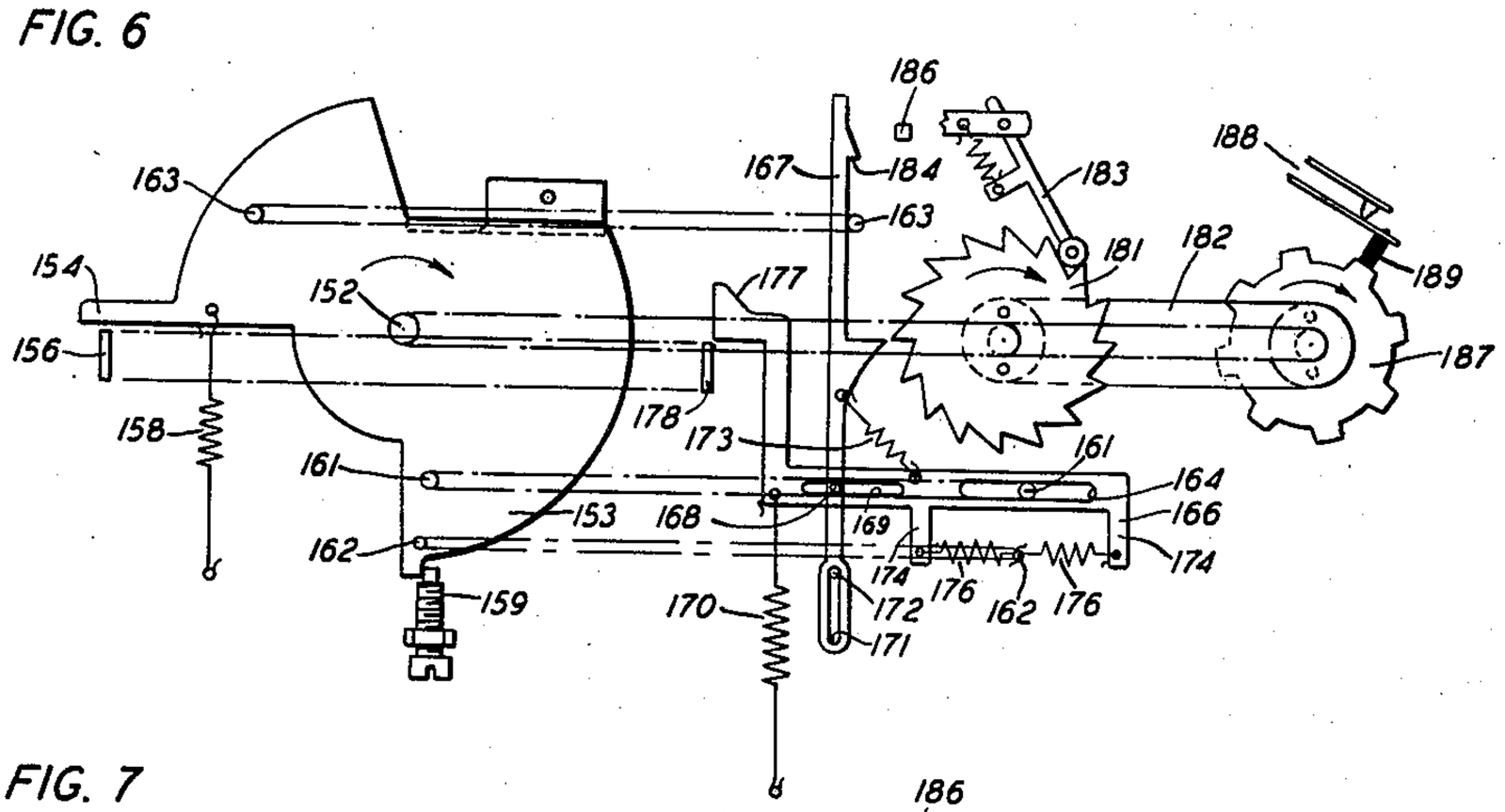


FIG. 7

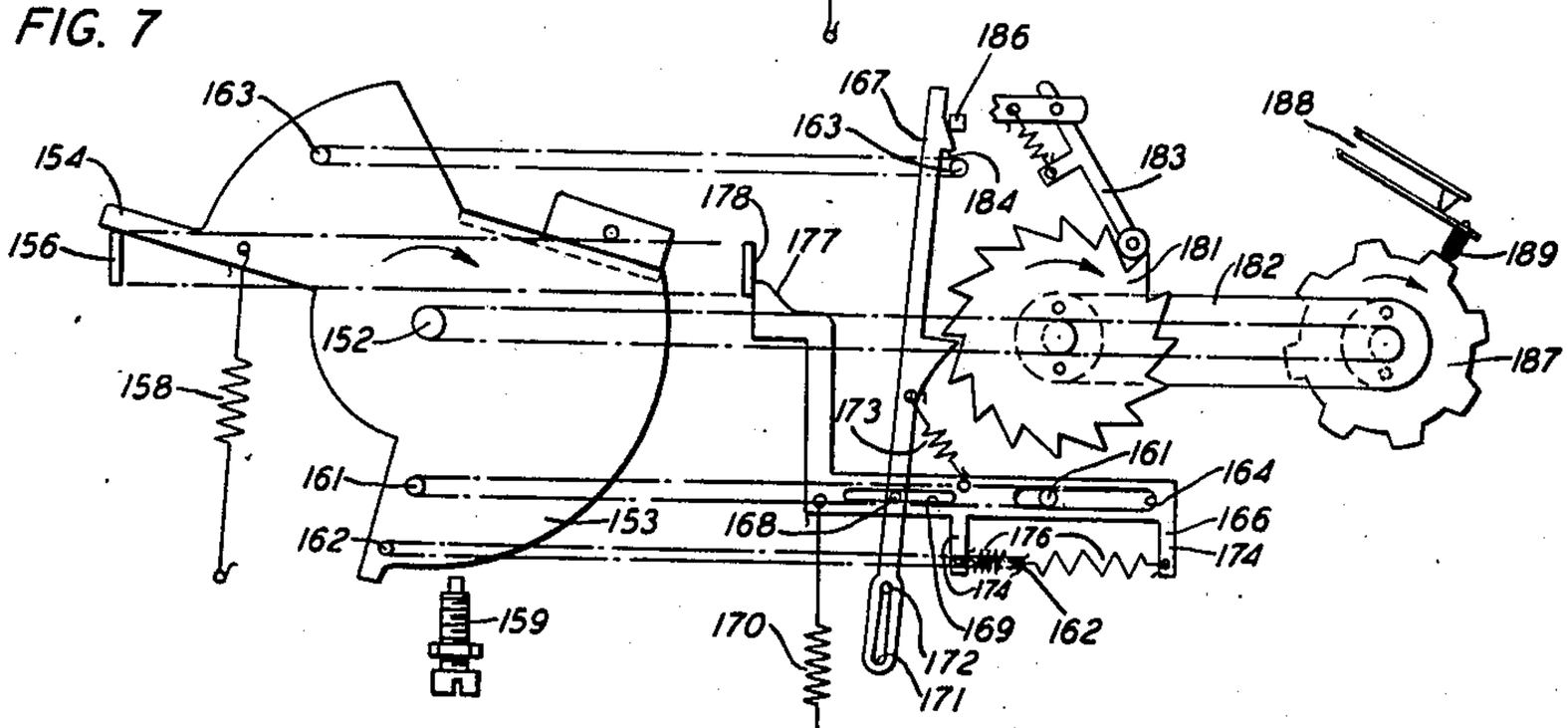
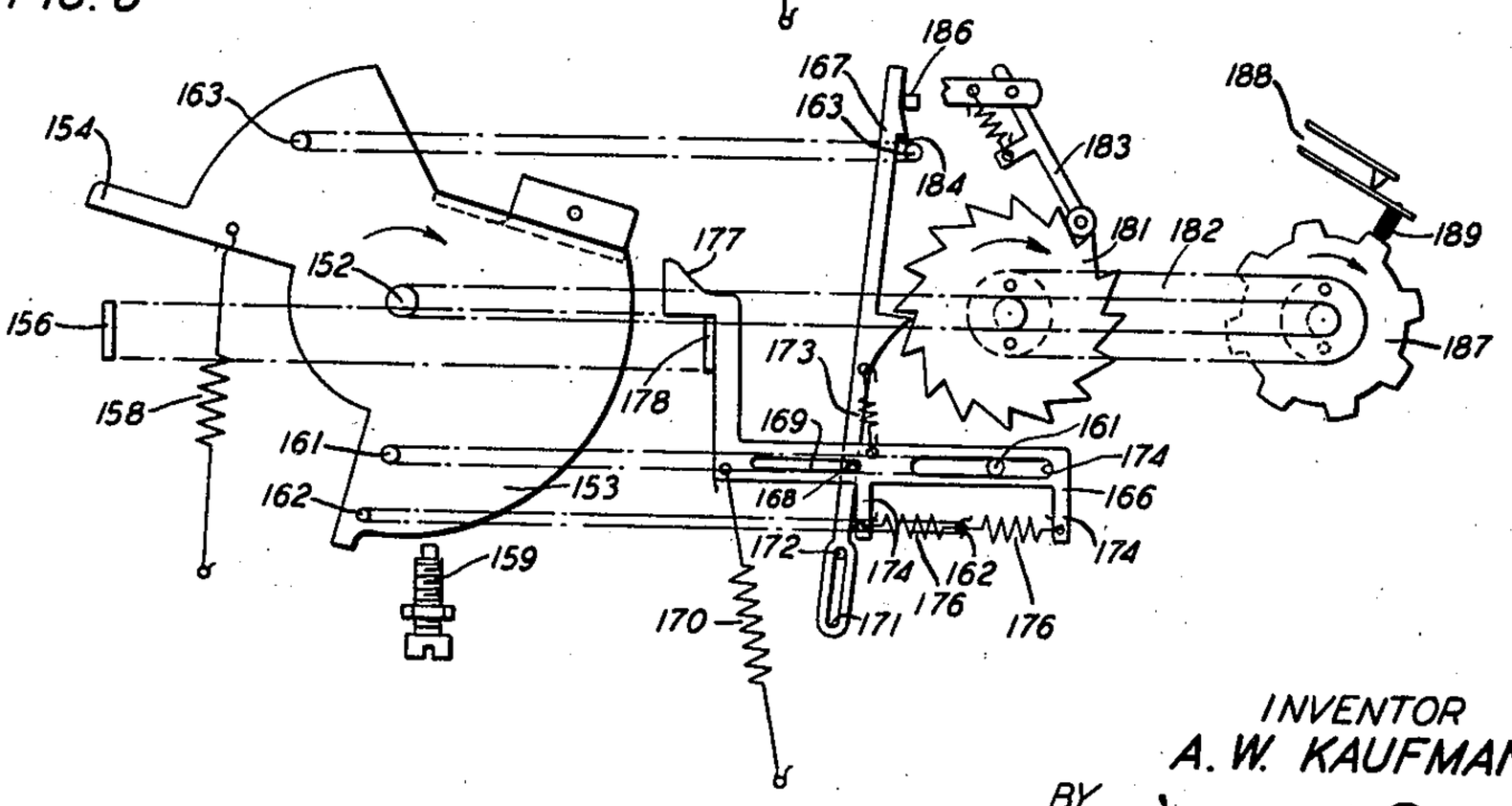


FIG. 8



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TELEGRAPH STATION BREAK-IN SYSTEM

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FIG. 9

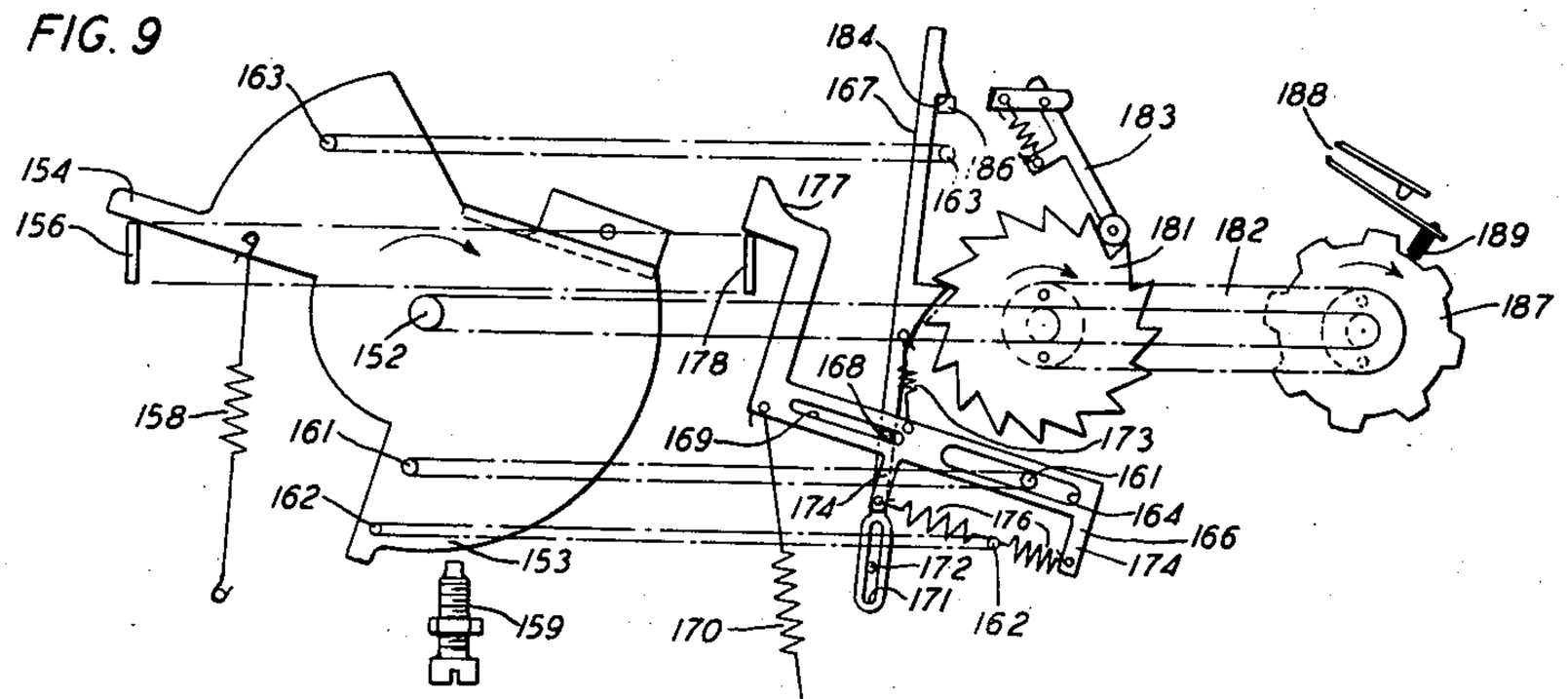
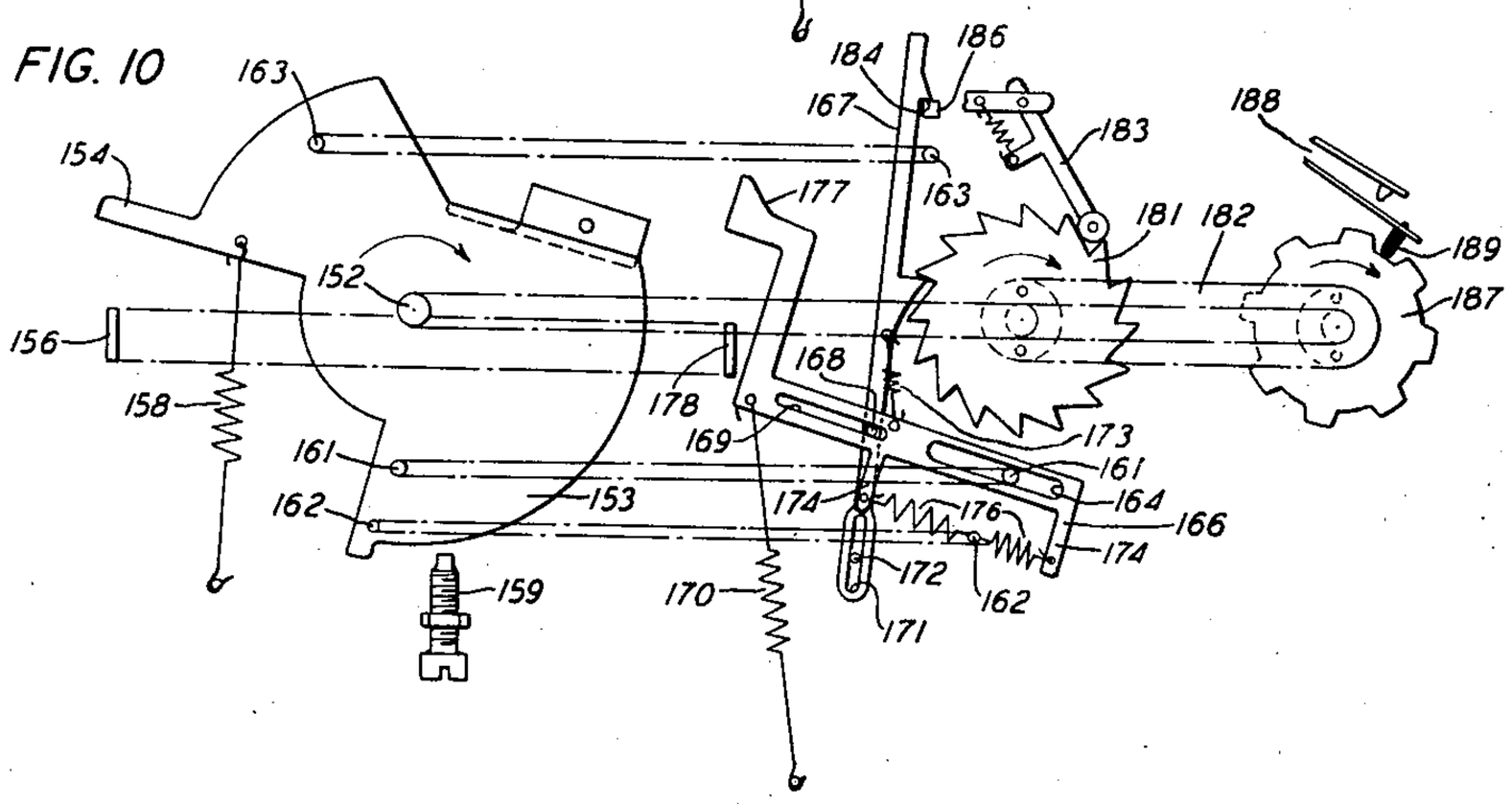


FIG. 10



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Patented June 8, 1943 2,321,392

UNITED STATES PATENT OFFICE

2,321,392

TELEGRAPH STATION BREAK-IN SYSTEM

Arthur William Kaufman, San Francisco, Calif., assignor to American Telephone and Telegraph Company, a corporation of New York

Application September 20, 1941, Serial No. 411,682

24 Claims. (Cl. 178—4)

This invention relates to telegraph systems and particularly to a system having provision for simultaneous two-way transmission of message material.

An object of the invention is to enable a station on a two-way communication channel intermediate to terminal stations to interrupt transmission of one of the terminal stations in order to permit message transmission from the intermediate station.

Another object of the invention is to enable the intermediate station to restart the interrupted transmitter at the conclusion of transmission from the intermediate station.

The invention features a device to interrupt normal transmission from the terminal station to which the intermediate desires to transmit and to cause the transmission from that terminal station of predetermined control signals, after which normal transmission therefrom is resumed.

The invention also features a device to cause the other terminal station to respond to the control signals to interrupt its transmitter and to respond to the next transmission of the control signals to restart its transmitter.

In accordance with the preferred embodiment of the invention two telegraph stations, presumably located at widely separated points, each consist of a transmitter and a receiver which preferably includes a printing telegraph recorder, and the two stations are interconnected by two communication lines, each of which connects the transmitter of one station to the receiver of the other station. The two communication lines extend through one or more intermediate stations and each such intermediate station includes as a minimum of equipment a transmitter associated with one of the communication lines for transmission to one of the terminal stations, and a receiver associated with the other communication line for reception from said one terminal station.

The receiver at the terminal station to which the one or more intermediate stations may transmit is arranged to respond to a predetermined line condition, such as the opening of the line at an intermediate station, to interrupt normal message transmission from that terminal station if its transmitter is then operating and to set up a special signal, such as the blank signal combination, which is transmitted as long as the predetermined line condition established by the intermediate station continues. The selectable element which responds to the special signal in the other terminal station, and which is preferably the blank pull bar, operates in response to the first blank signal combination to prepare a condition for the interruption of the transmitter associated therewith and responds to the next blank signal to operate the transmitter arresting mechanism, whereby transmission from the associated transmitter is interrupted and, upon reclosure of the line at the intermediate station which initiated the transmitter interrupting operation, the line will be idle and the intermediate station may proceed to transmit.

At the conclusion of the transmission from the intermediate station the same operations will be initiated by the opening of the line at that intermediate station to signify that transmission therefrom has been concluded. At the terminal station which is responsive to the intermediate station, normal message transmission will be interrupted and the special signal will be transmitted repetitiously on the other communication line as long as the line containing the transmitter at the intermediate station is open. The receiver at the other terminal station will, in response to the first special signal which is preferably the same blank signal combination, prepare for the restarting of the transmitter associated therewith and in response to the second special signal the transmitter will be restarted. The apparatus which is located at the terminal station that is responsive to the intermediate station is so arranged that in the event that the transmitter thereat is not transmitting message material at the time the intermediate station interrupts its transmitting line in order to gain possession of that line, the transmitter at the terminal station will be set in operation to transmit the special signal to the other terminal station in order to effect the arrestment of the transmitter at said other terminal station.

For a complete understanding of the invention, reference may be had to the following detailed description to be interpreted in connection with the accompanying drawings wherein:

Figure 1 is a diagrammatic view, partly in schematic perspective, showing the transmitter and receiver at one of the terminal stations with the transmitting and receiving line extending therefrom and also showing schematically the transmitter and receiver of one intermediate station associated with the lines;

Fig. 2 is a diagrammatic view, partly in schematic perspective, showing the transmitting and receiving apparatus at the other terminal station with the communication line extending thereto; and Fig. 2 may be placed at the right of Fig. 1

to show, by the combination of Figs. 1 and 2, a complete communication system as contemplated by the invention;

Figs. 3, 4 and 5 are schematic elevational views showing the transmitter controlling mechanism of Fig. 2 in the unoperated, partially operated and completely operated conditions, respectively;

Figs. 6, 7, 8, 9 and 10 are exploded schematic elevational views of the transmitter controlling apparatus in Fig. 1 in several operative conditions from the normal condition of Fig. 6 through the intermediate operative condition of Figs. 7, 8 and 9 to the fully operative condition of Fig. 10.

Referring now to the drawings, and particularly to Fig. 1, the reference numeral 16 indicates generally a receiving printer at a station which may be designated as the west station and which is arranged to receive telegraph signals from the east over communication line 17. The reference numeral 18 designates generally a transmitter at the west station which is arranged to transmit telegraph signals over the line 19. The line 17, in reaching the receiver 16, extends through the receiver 21 at an intermediate station indicated generally by the reference numeral 22, and the line 19 extends through a transmitter 23 at the station 22.

Referring now to Fig. 2, the line 17 has its origin at a transmitter indicated generally by the reference numeral 24 in a station which may be designated as the east terminal station and the line 19 has its terminus in the receiver designated generally by the reference numeral 26 in the same terminal station.

The impulse distributing portion of the transmitter 24 (Fig. 2) consists of a solid ring 27 and a segmented ring 28 traversed by brushes carried by brush arm 29, and the brushes are arranged to connect continuous ring 27 electrically to the segments of ring 28 in succession. Line 17 is connected to continuous ring 27. Distributor brush arm 29 is carried by distributor shaft 31 which is arranged to be driven by motor 32 through friction clutch 33, worm 34, and worm gear 36. Shaft 31 is normally restrained against rotation in the position for the distributor brushes to engage the stop segment by stop lever 37 which is presented by spring 38 in position to block stop cam 39 secured to shaft 31. Lever 37 carries an armature for the normally deenergized start magnet 41, one terminal of which is connected to battery 42 and the other terminal of which may be connected to ground over conductor 43 at either of two points as will presently be described.

The start segment of distributor 24 is electrically dead and the code impulse segments are individually connected by conductors 44 to the marking contacts 46 of a tape sensing mechanism indicated generally by the reference numeral 47. Rocker members 48 which are pivotally mounted on and electrically continuous with shaft 49, are movable into extreme clockwise or counterclockwise position to engage respectively marking contacts 46 or dead spacing contacts 51. Shaft 49 is connected by conductor 52 to grounded battery 53 which is also connected to the stop segment of distributor 24.

Transmitting contact rocker members 48 are controlled by tape sensing levers 54 pivoted on shaft 56 and individually biased in counterclockwise direction to seek signal sensing cooperation with perforated tape 57 by springs 58. In addition to the perforations representing code combinations tape 57 is provided with feed perforations that are engaged by sprocket 59 secured to rotatable shaft 61. Shaft 61 also has secured thereto tape feeding ratchet 62 which is engaged by a pawl 63 pivotally carried by bell crank 64 which is pivoted on shaft 56. Each of the tape sensing levers 54, is provided with a depending arm 66 which, together with the depending arm of bell crank 64, is engageable by a bail 67 pivoted at 68 and biased in clockwise direction by spring 69. When bail 67 is in extreme clockwise position tape sensing levers 54 are in extreme counterclockwise position to sense the perforations in tape 57 and bell crank 64 is in extreme counter-clockwise position preparatory to feeding tape 57. When bail 67 is moved into extreme counterclockwise position it moves tape sensing levers 54 and bell crank 64 into their extreme clockwise positions thus retracting the tape sensing levers from cooperation with tape 57 and rotating shaft 61 by means of pawl 63 and ratchet 62 one step in counterclockwise direction to effect advancement of the tape to bring the next set of code perforations into alignment with the right-hand ends of the sensing levers.

In order to be rocked into extreme counterclockwise position, bail 67 is provided with a depending arm 71, which is engaged by an adjustable abutment screw 72 carried by one end of pivoted lever 73. The other end of lever 73 engages a cam 74 which is secured to distributor shaft 31. When the single apex of cam 74 engages lever 73 the lever is rocked into extreme counterclockwise position as viewed in Fig. 2, thereby rocking bail 67 into extreme counterclockwise position to effect withdrawal of sensing levers 54 from cooperation with tape 57 and also to effect advancement of the tape. As soon as the apex of cam 74 passes out of range of lever 73 the lever is restored to extreme clockwise position by its biasing spring 76, spring 69 restores bail 67 to extreme clockwise position, spring 77 restores bell crank 64 to extreme counterclockwise position to pick up the next tooth on ratchet 62, springs 58 rock those of the sensing levers 54 which encounter perforations in the tape to their extreme counterclockwise position and those sensing levers in turn rock their associated transmitting contact rockers 49 into marking position.

Tape 57 passes under a liftable tape tension member 78 which controls contacts 79. One of the contacts 79 is connected to ground and the other is connected to conductor 81 which may become connected through manually operable switch 82 to conductor 43. When manually operable switch 82 is closed and there is sufficient slack tape to permit contacts 79 to be closed, the energizing circuit for start magnet 41 will be completed and the magnet will attract its armature and withdraw stop lever 37 from blocking relation to stop cam 39 whereby shaft 31 will be released for continuous rotation to effect the transmission of code combinations contained in tape 57 until tape tension member 78 opens contacts 79 or switch 82 is opened manually. As much of the tape transmitter mechanism shown in Fig. 2 as is described in the foregoing paragraphs is well known in the prior art and further detailed description of its operation is considered unnecessary.

In accordance with the present invention, the tape transmitter shown in Fig. 2 has added thereto a combined bail blocking and contact operating lever 86 which is pivoted at 87 on a bracket 85. The left-hand end of lever 86 is undercut to provide a finger which will rest on

the upper edge of bail 67 and limit the counter-clockwise movement of lever 86 under the influence of its biasing spring 88, and also to provide a shoulder which will block the bail 67 substantially in its extreme counterclockwise position. Lever 86 is provided with an obliquely upwardly extending finger 89 which is normally engaged by a pivoted latching lever 91 on which is mounted the armature of an electromagnet 92. One terminal of the winding of electromagnet 92 is connected to battery 93 and the other terminal is connected by conductor 94 to one of a pair of normally open contacts 96 associated with receiver 26. The other of the contacts 96 is connected to ground. Lever 86 is provided with a depending finger 97 which, when lever 86 is in extreme counterclockwise position in blocking relation to bail 67, closes the normally open contacts 98. One of the contacts 98 is connected to ground and the other is connected to conductor 43 of start magnet 41 whereby, upon the closure of contacts 98, an energizing circuit for start magnet 41 is completed even though either the tape tension contacts 79 or the manually operable switch 82, or both, may be open.

The bracket 85 which mounts electromagnet 92 and pivotally supports latching lever 91 and blocking lever 86, also pivotally supports a retaining lever 90 for latching lever 91. Retaining lever 90 is biased in clockwise direction by tension spring 95 and is provided on its right-hand side near the upper end with a latching projection 100 which comprises a generally horizontal flat upper surface and an oblique or sloping camming surface which slopes downwardly and inwardly from the right edge of the horizontal surface to the body of the retaining lever 90. When latching lever 91 is in released or extreme counter-clockwise position the right-hand edge of latching projection 100 of retaining lever 90 abuts the free end of the latching lever 91. Upon the energization of the electromagnet 92 latching lever 91 is rocked to its extreme clockwise position and its free end is lifted above the generally horizontal surface of the latching projection 100 of retaining lever 90. The retaining lever is thus permitted to be moved by its spring 95 in clockwise direction to present latching projection 100 underneath the free end of latching lever 91. Latching lever 91 is thus retained in its operated position and there is prolonged after the deenergization of electromagnet 92 a condition under which blocking lever 86 could not be relatched by latching lever 91. The reason for the prolongation of this condition will be set forth when the operation of the apparatus is described.

Retaining lever 90 has pivotally mounted thereon a releasing bell crank 105 which has one arm extending longitudinally of the retaining lever 90 and the free end of that arm has connected thereto one end of a tension spring 109, the other end of which is connected to a post carried by retaining lever 90 in such position as to distend the spring longitudinally of lever 90. Spring 109 thus causes releasing bell crank 105 to assume a position in which the arm to which spring 109 is connected extends toward the mounting post for the spring and the spring yieldably resists pivotal movement of bell crank 105 about its mounting. A block lug 110 carried by retaining lever 90 abuts the downwardly extending arm of bell crank 105 when the bell crank is in its normal position and prevents movement of bell crank 105 from the normal position in a direction other than counter-clockwise. The free end of the laterally extending arm of releasing bell crank 105 is in the form of an oblique camming surface sloping downwardly from left to right.

Blocking lever 86 is provided with a depending arm 115 which terminates slightly below the free end of the laterally extending arm of releasing bell crank 105 when blocking lever 86 is in extreme clockwise position. Arm 115 of lever 86 carries a pin 120 which extends outwardly (forwardly as viewed in Figs. 3, 4 and 5) from the arm 115 of lever 86 and it is disposed above the sloping end of the laterally extending arm of bell crank 105 when lever 86 is in extreme clockwise position. The purpose of pin 120 is to engage the sloping outer end of the laterally extending arm of releasing bell crank 105 as blocking lever 86 moves in counter-clockwise direction upon being released by latching lever 91 and since bell crank 105 cannot rock with respect to retaining lever 90 in clockwise direction from its normal position, the pin 120 shifts bell crank 105 leftwardly by the camming action of the sloping free end of the laterally extending arm, thus rocking retaining lever 90 in counter-clockwise direction to disengage latching projection 100 from latching lever 91 thereby permitting the lever 91 to be restored to extreme counter-clockwise position by its spring, in which position it is capable of relatching the blocking lever 86.

The portion of latching lever 91 which serves to engage arm 89 of blocking lever 86 and to retain the lever in extreme clockwise position is a channel-shaped member 125, the flanges of which are provided with ears by which member 125 is pivotally mounted on latching lever 91 with its web portion parallel and in spaced relation to the lower surface of latching lever 91 at its free end. A compression spring 130 is disposed between the lower surface of latching lever 91 and the web portion of channel member 125 to the right of the pivotal mounting of the channel member, as viewed in Figs. 3, 4, and 5, to bias the channel member in clockwise direction. At its left-hand end the web portion of the channel member 125 has a portion 135 bent upwardly to serve as a bearing surface for the right-hand edge of latching projection 100 of retaining lever 90 so that that edge cannot enter the space between the lower surface of latching lever 91 and the channel-shaped member 125. The upwardly extending portion 130 of channel member 125 has a tang 140 extending into the space between the lower surface of latching lever 91 and the web portion of channel member 125 to engage the lower surface of the lever and serve as a stop for preventing the channel-shaped member 125 from rotating in clockwise direction under the influence of its compression spring 130 beyond a position at which the web portion of the channel member 125 is substantially parallel with the lower surface of latching lever 91. The purpose of the pivoted latching member 125 carried by the latching lever 91 is to provide a yieldable latching element which the tip of arm 89 of blocking lever 86 can traverse to become relatched without materially changing the position of latching lever 91, as will presently be described.

As shown in the lower left-hand corner of Fig. 2, the receiver at the east terminal station is represented symbolically by a selector magnet 101 controlled by polarized line relay 102. The selector magnet 101 controls the permutational setting of code bars 103 to effect the selection of selectable elements or pull bars, one of which is

indicated in Fig. 2 by the reference numeral 104. Upon the permutational setting of code bars 103 in the proper positions to effect the selection of pull bar 104, the pull bar will be moved upwardly in a manner well known, but which will be described later in connection with Fig. 1, to effect the momentary closure of contacts 96.

Upon the closure of contacts 96 electromagnet 92 will be energized momentarily and will attract its armature, thus latching lever 91 clear of the upwardly extending finger 89 of bail blocking lever 86, and lever 91 will be retained in substantially its extreme clockwise position by retaining lever 90 after magnet 92 becomes deenergized, it being understood that contacts 96 are closed only momentarily. Lever 86 will then be rocked in counter-clockwise direction by its spring 88 to an extent which depends upon the instantaneous position of bail 67. There is nothing in the communication system herein disclosed to establish any particular phase relationship between the transmission of signals on the line 17 and the reception of signals on the line 19, and, accordingly, contacts 96 may be closed and magnet 92 energized at an instant when cam 74 and distributor brush arm 29 occupy any random angular position relative to the stop position of shaft 31. Accordingly, bail 67 may be in extreme clockwise position or in extreme counter-clockwise position or at any position in its travel in either direction at the instant that magnet 92 is energized and lever 86 is released. Lever 86 can drop into extreme counter-clockwise position in blocking relation to bail 67 only when the bail is in substantially its extreme counter-clockwise position.

Fig. 3 shows the relation of the parts when lever 86 is held latched by latching lever 91 and electromagnet 92 is deenergized. In this condition of the apparatus, bail 67 is free to rock into extreme clockwise position under the control of lever 73, but is shown held in extreme counter-clockwise position by lever 73 with arms 66 of tape sensing levers 54 held in extreme clockwise position to hold the tape sensing levers withdrawn from cooperation with tape 57. In this condition of the apparatus contacts 98 are open.

Fig. 4 shows an instantaneous condition of the apparatus in which electromagnet 92 has been energized and has lifted latching lever 91 to release blocking lever 86 and the latching lever has become held by retaining lever 90. This occurred at an instant when bail 67 was in or moving toward its extreme clockwise position, so that lever 86, although it has moved counter-clockwise slightly, has been unable to drop into blocking relation with bail 67 and the left-hand end of the lever is resting on top of the bail. This small amount of movement of lever 86 is insufficient to disturb releasing bell crank 105, and latching lever 91 remains held by retaining lever 90. Depending arm 66 of tape sensing levers 54 are at this time in or moving toward their extreme counter-clockwise positions, and those carried by tape sensing levers which encounter perforations in tape 57 may move into their full counter-clockwise positions. This condition obtains until the code combination then being sensed has been transmitted. As shown in Fig. 4, with the left-hand end of lever 86 resting on the top of bail 67, the lever has not moved far enough in counter-clockwise direction to close contacts 98 and, accordingly, the contacts remain open.

Fig. 5 shows the condition of the apparatus at the conclusion of the transmission of the signal combination which was in progress in the condition of the apparatus indicated in Fig. 4. Bail 67 has been restored by lever 73 to extreme counter-clockwise position to move the tape sensing levers into their spacing positions, and with the bail 67 moved into the position shown, lever 86 has dropped into its extreme counter-clockwise position to prevent movement of bail 67 in clockwise position even after cam 74 permits lever 73 to release bail 67, and contacts 98 have been closed. The lever 86 in moving to its extreme counter-clockwise position, cams releasing bell crank 105 leftwardly as viewed in Figs. 3 to 5, by means of pin 120, until the pin moves clear of the end of the laterally extending arm of the bell crank, by which time the retaining lever 90 will have been disengaged from latching lever 91. Lever 90 then moves into engagement with the end of the released latching lever 91, and the bell crank 105 moves rightwardly a proportional distance and presents its laterally extending arm above pin 120.

With the tape sensing levers 54 now held in their spacing positions by blocked bail 67, spacing conditions will be impressed upon the code segments of distributor ring 28 by rockers 48 and the blank signal combination or all spacing signal will be impressed upon communication line 17, since distributor shaft 31 continues to rotate due to the fact that contacts 98 are closed and have completed an energizing circuit for start magnet 42 regardless of the open or closed condititon of tape tension contacts 79 and manually operable switch 82. Until such time as lever 86 is restored to unoperated position and becomes relatched by latching lever 91, the transmission of blank signal combinations will continue. The manner in which lever 86 is restored to unoperated position will now be described.

A lever 106 for resetting blocking lever 86 is pivoted at 107. The foremost end of lever 106 as viewed in Fig. 2, is reduced in size, is cylindrical in contour and is fitted loosely into an aperture in lever 86. The other end of lever 106 is formed as a cam follower to be engaged by cam 108 fixed to distributor shaft 31. The apex of cam 108 extends downwardly of shaft 31 and is arranged to impart counterclockwise movement to resetting lever 106. The orientation of cam 108 with respect to shaft 31 is such that lever 106 will be reset immediately after the transmission of the last code impulse of a code combination, from which it follows that lever 106 will reset blocking lever 86 at about the beginning of the stop impulse or about the same time that cam 74 seeks to retract bail 67 to extreme counter-clockwise position. The relation of the cam follower portion of lever 106 to its cam 108 is such that the cam follower portion of the lever will be held below and out of the path of the apex of cam 108 when bail blocking lever 86 is held latched by latching lever 91, which is the condition shown in Fig. 3, and also will be held out of the path of the apex of the cam when lever 86 is resting upon but not blocking bail 67, which is the condition shown in Fig. 4. However, when lever 86 has dropped into position to block bail 67, which is the condition shown in Fig. 5, the cam follower portion of lever 106 will have been lifted into the path of the apex of cam 108, which has a steep slope for rocking reset lever 106 sharply in counter-clockwise direction. The movement imparted to lever 106 by cam 108 during actual travel of the cam follower portion of the lever along the slope of the apex of cam 108 to its peak is insufficient to reengage arm 89 of bail blocking lever

86 with latching lever 91, assuming that at the time of operation of reset lever 106, electromagnet 92 is not energized, nor is latching lever 91 held in ineffective position by retaining lever 90. In consequence of the sharpness of the movement imparted to lever 106, it overtravels, due to an inertia effect, sufficiently to reengage blocking lever 86 with latching lever 91. The pin 120, in moving upwardly as lever 86 is lifted by resetting lever 106, rocks bell crank lever 105 counter-clockwise in order to pass and move into position above the laterally extending arm of the bell crank, whereupon spring 109 restores the bell crank to normal and presents the laterally extending arm in the downward path of pin 120. With this arrangement the position of retaining lever is not disturbed by the upward movement of pin 120, whether lever 90 is in the position shown in Figs. 3 and 5 or is in the position shown in Fig. 4.

When the blocking lever 86 is rocked clockwise by resetting lever 106, the tip of arm 89 will strike the lower surface of pivoted channel-shaped member 125, assuming that latching lever 91 is then in extreme counter-clockwise position, and will rock it in counter-clockwise until arm 89 slides off the right-hand edge of the lower surface of member 125, whereupon compression spring 130 will restore member 125 to extreme clockwise position in latching relation to arm 89 of lever 86. Thus the position of latching lever 91 is not disturbed. If, instead of having the pivoted latching channel member 125, lever 91 had an integral or rigidly secured latching body, it would be necessary for arm 89 of lever 86 to lift latching lever 91 slightly in order to clear the right-hand edge of the latching body, and due to the fact that lever 86 is lifted sharply, it might in turn lift latching lever 91 sufficiently to permit latching projection 100 of retaining lever 90 to move into latching relation to lever 91, thus creating artificially a condition corresponding to energization of magnet 92, and lever 86 would not become relatched.

The line 17 over which signals are transmitted from transmitting distributor 24 extends through the operating winding of polarized line relay 21 which controls selector magnet 111 of the recording printer at intermediate station 22 and terminates at the polarized line relay 112 at the west terminal station (Fig. 1). Line relay 112 controls the selector magnet 113 of recording printer 16 by operating the selector lever 114. Under the control of selector lever 114 and of individual sword lever bell cranks 116 operated by cams 117 in a receiving selector cam assembly, individual sword levers 118 are set in extreme clockwise or counter-clockwise positions and through individual T-levers 119 the sword levers set individual permutation code bars 121. Code bars 121 individually select pull bars 122 by presenting individual alignment of notches thereto and upon selection of a pull bar 122 the alignment of notches presented thereto permits the pull bar to be moved by an associated biasing spring into engagement with the base of the alignment of notches, thereby bringing a shoulder of the pull bar into the path of an operating bail 123. Bail 123 is supported for oscillatory movement by a plurality of posts 124, one of which is shown in Fig. 1.

A driving motor 126 for the printer 16 is arranged to impart rotation to a cam 127 through worm 128, worm wheel 129 and jaw clutch 131. As is fully disclosed in Patent 1,745,633, granted February 4, 1930, to S. Morton et al., clutch 131 is normally disengaged and is of the single revolution variety. Immediately upon the reception of the last selecting impulse of a code combination, clutch 131 is engaged by means not shown in the present drawing, for rotating cam 127 through one revolution. Cam 127 controls a bell crank 132, permitting the bell crank to be rocked in counter-clockwise direction as viewed in Fig. 1, by its biasing spring 133 and then restoring the bell crank to normal or extreme clockwise position. Bell crank 132 is articulated to one of the posts 124 by which operating bail 123 is operated and when spring 133 rocks bell crank 132 in counter-clockwise direction under the control of cam 127, bail 123 is moved upwardly and imparts upward movement to any one of the pull bars 122 which has been selected and thus had its operating shoulder moved into the path of the bail.

Certain of the pull bars have rack and pinion engagement with individual type bars 134, and as a pull bar 122 is moved upwardly, its associated type bar 134 is rocked forwardly and downwardly to cause it to print by means of an inked ribbon (not shown) upon a paper tape (also not shown) against the backing of a printing platen 136.

Printing platen 136 is secured to rotatable shaft 137 to which step-by-step rotation is imparted through pinions 138 and 139 from a shaft 141 which has secured thereto a ratchet 142 which is engaged by a pawl 143 carried by a pivoted lever 144. Lever 144 is provided with a roller 146 which is normally presented in a cam recess 147 in bail supporting post 124. When post 124 is moved upwardly by bell crank 132 under the control of cam 127 lever 144 is rocked in clockwise direction as viewed in Fig. 1 by the cam depression in post 124 to move pawl 143 downwardly along the periphery of ratchet 142 to pick up the next tooth. When bail supporting post 124 is restored to normal position by cam 127, lever 144 returns to extreme counter-clockwise position and in being so restored lifts pawl 143 to effect rotation of ratchet 142 through a short angular distance. The rotation of ratchet 142 is transmitted through shaft 141, pinions 139 and 138, and shaft 137 to platen 136. Rotation is thus imparted to platen 136 through a corresponding angular distance to provide letter spacing advancement of the tape upon which printing is effected. The printer described briefly in the foregoing paragraphs is well known in the prior art and further detailed description of its structure and operation is considered unnecessary.

Apparatus for controlling the starting and stopping of a transmitter under the control of printer 16 is shown in expanded perspective in the foreground of Fig. 1 and will now be described with reference also to Fig. 6 which is an exploded elevational view of the apparatus in the normal condition thereof. A bracket 151 secured to the frame of printer 16 fixedly supports a stationary shaft 152 which has sleeved or journaled thereon a rocker member 153 which is in the form of a plate or partial disc. Rocker member 153 is provided with a radially extending finger 154 which is disposed above and in the path of the heel portion 156 of a special pull bar 157 in printer 16. Special pull bar 157 may have rack and pinion engagement with a type bar if it is desired to print a special character when special pull bar 157 is selected and

operated, but no such type bar has been shown in Fig. 1. It is to be understood however that the special attributes of pull bar 157 and the special function which it is arranged to perform do not preclude the addition thereto of a rack portion for operating a type bar. It will be apparent that when pull bar 157 is selected and is moved upwardly by bail 123, heel portion 156 of the pull bar will engage finger 154 of rocker member 153 and rock the member in clockwise direction as viewed in Figs. 1 and 6. A tension spring 158 biases rocker member 153 into normal position against a stop screw 159 (Fig. 6), and the plunger of a dashpot 160 connected to rocker member 153 by rod 165 has no effect upon the rocking of rocker member 153 clockwise but retards its return to normal under the influence of spring 158.

Rocker member 153 has secured thereto three rods designated by the reference numerals 161, 162 and 163 which extend parallel to shaft 152. Rod 161 extends through an elongated slot 164 in a slide member 166 and provides one point of support for the slide member. The other point of support for slide member 166 is provided by a pawl 167 which has a pin 168 disposed in another elongated slot 169 in slide member 166 and which, in turn, is supported by engagement of the upper end of an elongated slot 171 in pawl 167 with a fixed pin 172 which penetrates slot 171. Pawl 167 is biased by spring 173, which is distended between pawl 167 and slide member 166, into engagement with rod 163. Slide member 166 is biased by spring 170 in counterclockwise direction to seat the upper end of slot 171 in pawl 167 upon pin 172.

Rod 162 extends between spaced depending arms 174 of slide member 166 and similar tension springs 176 connect rod 162 to the two arms 174 of slide member 166. Since springs 176 are similar and preferably of equal tension they position arms 174 of slide member 176 at equal distances from rod 162 and thus determine a stationary normal position for slide member 166. It will be apparent that by virtue of slots 164 and 169, slide member 166 can move longitudinally without disturbing the position of pawl 167. Also, it will be apparent that pawl 167 can rock about its point of support on pin 172 without materially disturbing the elevational position of slide member 166.

Slide member 166 is provided with a lip portion 177 which is disposed adjacent to but normally out of the operating path of a toe portion 178 of special pull bar 157. Pawl 167 is aligned with but is normally held by rod 163 from engagement with a ratchet 181 secured to a sleeve 182 which is rotatably sleeved on stationary shaft 152. A jockey type of detent 183 indexes ratchet 181 into predetermined positions of arrestment and holds the ratchet stationary. Pawl 167 is provided with a retaining shoulder 184 which, when the pawl is rocked clockwise as viewed in Fig. 6, to engage ratchet 181, and is elevated in a manner which will be described hereinafter to effect rotation of the ratchet, hooks over a stationary bar 186 and holds pawl 167 elevated until the pawl is disengaged from bar 186, as will also be described hereinafter.

Sleeve 182 has secured thereto a cam 187 the periphery of which consists of alternate high and low portions, the total number of which is equal to the number of teeth on ratchet 181. Cam 187 controls a pair of contacts 188, closing the contacts when a cam follower lug 189 engages a high portion of the periphery of cam 187 and permitting the contacts to open when the follower lug 189 descends into one of the low portions in the periphery of the cam 187. In successive stepping operations of ratchet 181, contacts 188 are alternately opened and closed.

One of the contacts 188 is connected to ground and the other is connected to conductor 191 which extends to one of a pair of tape tension responsive contacts 192 in transmitter 18 associated with the printer 16 at the west station. The other of the contacts 192 is connected by conductor 193 to one side of a manually operable switch 194, the other side of which is connected to one end of the winding of start magnet 196 for the transmitter 18. The other side of the start magnet 196 is connected to grounded battery 197.

Transmitter 18 which has been shown diagrammatically in Fig. 1 may be similar to the transmitter shown in Fig. 2 and includes as its principal elements, driving motor 201, friction clutch 202, driving gears 203 and 204, distributor shaft 206, distributor brush arm 207, segmented ring 208, continuous ring 209, stop cam 211 and stop lever 212 controlled by start magnet 196. It will be understood that transmitter 18 is provided with tape sensing mechanism controlled by distributor shaft 206 for sensing code perforations in tape 213 and setting up the code combination on the segments of segmented ring 208.

Before proceeding with a general description of the operation of the entire system, the operation of the ratchet feed mechanism for operating cam 187 in Fig. 1 will be described. Upon the selection of special pull bar 157 followed by upward movement of the pull bar by bail 123, rocker member 153 will be rocked in clockwise direction, which brings it into the position shown in Fig. 7. The rocking of rocker member 153 is accompanied by displacement of rods 161, 162 and 163 about the axis of stationary shaft 152. Rod 161 is moved to the left in slot 164 of slide member 166 without imparting any movement to the slide member. Rod 162, in moving to the left, distends further the right hand of the springs 176, thereby increasing the tension, and correspondingly permits the left hand of the springs 176 to contract, thereby decreasing its tension. The springs 176 are thus unbalanced and the right-hand spring seeks to move slide member 166 leftwardly. However, the toe portion 178 of special pull bar 157, in moving upwardly to rock the rocker member 153 clockwise, has moved into blocking relation to the lip portion 177 of slide member 166, so that the slide member is at this time prevented from moving leftwardly. The rod 153 is shifted rightwardly from its original position, thereby moving away from pawl 167 and permitting the pawl to rock clockwise into effective relation to ratchet 181 and with its right side resting against retaining bar 186. Since the pawl has not been lifted, the retaining shoulder 184 of the pawl is below the retaining bar 186. This condition of the apparatus is shown in Fig. 7, and toe portion 178 of special pull bar 157 is at the upper limit of its travel blocking the slide member 166.

Since the operation of special pull bar 157 by bail 123 is only momentary, the pull bar immediately returns to its normal or lower position out of blocking relation to the lip portion 177 of slide member 166. Springs 176 thereupon undertake to restore to equality the forces which they exert between rod 162 and the de-

pending arms 174 of slide member 166, and they accomplish this by moving slide member 166 leftwardly to present its lip portion 177 above and in the path of toe portion 178 of special pull bar 157. The engagement of pawl 167 with ratchet 181 and with retaining bar 186 is not disturbed as a result of the leftward movement of slide member 166, because slot 169 accommodates the movement. Since the dashpot 160 retards the restoration of rocker member 153 to extreme counter-clockwise position by spring 158, the rods 161, 162 and 163 will have been shifted only slightly from their fully operated positions at the time that special pull bar 157 has returned to normal position. This condition of the apparatus is shown in Fig. 8.

In order for the ratchet feed mechanism thus conditioned for operation to be operated, special pull bar 157 must again be selected and operated before spring 158 has restored rocker member 153 to normal under the retarding influence of dashpot 160. Assuming that the next received signal also effects the selection of special pull bar 157, the pull bar will again be lifted to its uppermost position and since not only the arm 154 of rocker member 153 but also the lip portion 177 of slide member 166 are in the operating path of the heel portion 156 and toe portion 178, respectively, of the pull bar, the rocker member 153 will again be rocked to its extreme clockwise position and slide member 166 will be, for the first time, rocked to extreme clockwise position about the rod 161 in slot 164 as a pivot. Since there is no freedom of movement upwardly of slide member 166 independently of pawl 167, the pawl will be shifted upwardly in engagement with ratchet 181 to effect rotation of the ratchet one step, and this movement of the pawl will bring its retaining shoulder 184 above the upper surface of stationary retaining bar 186. At this time, rod 163 is held clear of pawl 167 because of the second rocking of rocker member 153 into extreme clockwise position, and, accordingly, spring 173 will rock pawl 167 in clockwise direction sufficiently to hook its retaining shoulder 184 over retaining bar 186.

With the advancement of ratchet 181 one step, cam 187 will be advanced one step to permit contacts 188 to open, if they were previously closed, or to close them if they were previously open. The operated condition of the ratchet feed mechanism is shown in Fig. 9 and the heel and toe portions 156 and 178, respectively, of pull bar 157 are shown in their fully operated positions.

Immediately after the condition of the apparatus shown in Fig. 9 is attained, the pull bar 157 returns to normal position, which is the condition shown in Fig. 10. The return of rocker member 153 to normal position is retarded by dashpot 160, as previously stated, and, accordingly, pawl 167 remains hooked on retaining bar 186 for a brief interval. As rocker member 153 returns to normal position, it carries its rods 161, 162 and 163 to their normal position. The rod 163 in moving leftwardly disengages shoulder 184 of pawl 167 from retaining bar 186 whereupon spring 170 restores slide member 166 and pawl 167 to their lowermost positions with the upper end of slot 171 of pawl 167 resting on pin 172. As rod 163 returns to normal it disengages pawl 167 from ratchet 181 and as rod 162 returns to normal it retracts slide member 166 to its extreme right-hand position with its lip portion 177 out of the operating path of toe portions 178 of pull bar 157. Thus the apparatus is restored from the condition shown in Fig. 10 to that shown in Fig. 6. The dashpot 160 is adjusted to prolong the restoration of rocker member 153 to normal postion so that the rocker member cannot restore pawl 167 and slide member 166 from the condition shown in Fig. 8 to that shown in Fig. 6 in the interval between two operations of pull bar 157 in successive cycles of operation of receiving printer 16 (Fig. 1). Preferably the restoration time for rocker member 153 as controlled by dashpot 160 is of the order of one second, and since telegram transmitters and printing recorders of the type shown herein are adapted to operate on a frequency of six permutation code combinations per second, the rocker member 153 will not return far enough toward normal position to disengage pawl 167 from ratchet 181 nor to disengage lip portion 177 of slide member 166 from toe portion 178 of pull bar 157 even if a code for selecting some other element than the special pull bar 157 should intervene two selective operations of the pull bar 157.

For a consideration of the operation of the system as a whole, it will be assumed that ratchet controlled contacts 183, tape tension controlled contacts 192 and the manually operable switch 194 in Fig. 1 are closed, from which it follows that transmitter brush arm 207 is rotating continuously to transmit signals under the control of perforated tape 213 over communication line 19 to the recording printer 26, which is shown in Fig. 2. It will also be assumed that at the east station in Fig. 2, tape tension contacts 79 and manually operable switch 82 are closed so that distributor brush arm 29 is operating continuously to transmit permutation code signals under the control of perforated tape 57 over communication line 17 to recording printer 16 shown in Fig. 1.

In order for intermediate station 22 to send a message, which may be of extreme urgency, to the east station in Fig. 2, it is necessary for the intermediate station to be able to interrupt the transmission on communication line 19 from transmitter 18 in order that the intermediate station can transmit over the communication line 19. Accordingly, intermediate station 22 is provided with a break key 215 in series with the transmitter 23, which may be opened and held for any desired period. Upon the opening of break key 215 communication line 19 is interrupted and the line relay 102 and recording printer 26 (Fig. 2) are placed in steady spacing condition. This causes printer 26 to run open or in the all-spacing condition, and pull bar 104 is selected and operated repeatedly as long as break key 215 is held open. The operation of contacts 96 causes magnet 92 to attract its armature and release bail blocking lever 86, which falls into engagement with the top of bail 67 if transmitter 24 is then in the midst of transmission of a code combination. Latching lever 91 is held in the ineffective position by retaining lever 90. At the end of the transmission of the code by transmitter 24, bail 67 is rocked to extreme counter-clockwise position by cam 74 and blocking lever 86 drops into blocking relation to bail 67, thus setting up an all-spacing signal on the segments of ring 28 of transmitter 24 and disengaging lever 90 from latching lever 91. Contacts 98 are also closed, thus short-circuiting tape

tension contacts 79 and manually operable switch 82. Therefore, distributor brush arm 29 continues to rotate and transmits a blank signal combination on communication line 17.

Printer 16 at the west station (Fig. 1) responds to the blank signal combination by the selection of special pull bar 157 which is operated by bail 123 to operate the rocker member 153 to establish the condition shown in Fig. 7 which, upon the return of pull bar 157 to normal position, changes to the condition shown in Fig. 8.

At some time during the transmission of the blank signal combination from transmitter 24, pull bar 104 in the printer 26 at the east station (Fig. 2) is again operated, since the communication line 19 remains open at key 215, to effect a second attraction of the armature of magnet 92, whereupon latching lever 91 again becomes retained in the ineffective position to prevent the bail blocking lever 86 from being relatched as a result of the resetting operation at the end of the first blank signal. Thus, although cam 108 operates resetting lever 106, the bail blocking lever 86 does not become latched by latch 91 but again drops into blocking relation to bail 67 before the bail is released by cam 74 and again retracts the retaining lever 90 to release latching lever 91. Accordingly, bail 67 remains held in its extreme counter-clockwise position and tape feed bell crank 64 is held stationary so that tape 57 is not advanced and none of the signals contained therein is lost. The transmitter 24 proceeds to transmit on communication line 17, the second blank signal combination.

At the west station, printer 16 (Fig. 1) responds to the second blank signal by again selecting special pull bar 157 which operates to change the condition of the ratchet feed mechanism from that shown in Fig. 8 to that shown in Fig. 9 thus effecting feeding of the ratchet 181 one step and latching pawl 167 on retaining bar 186. Advancement of the cam 187 one step accompanies advancement of the ratchet 181, and this advancement is sufficient to move a high portion of cam 187 out of registry with the cam follower lug 189 of contact 188 and to bring a low portion of the cam into registry with the cam follower. Thus the contacts 189 are permitted to open and the energizing circuit for start magnet 196 of transmitter 18 is interrupted. The start magnet 196 releases stop lever 212 which moves into the path of stop cam 211 and arrests distributor shaft 206 of transmitter 18. The transmission of signals from transmitter 18 on communication line 19 has thus been interrupted and the line can be used for transmission by the intermediate station 22.

The break key 215 need be held open only long enough for the transmitter 24 at the east station to effect the transmission of two blank code signal combinations on communication line 17. Should it be held open for a longer period so that latching lever 91 is repeatedly lifted and retained, bail blocking lever 86 is repeatedly prevented from being latched, and several blank code signals are transmitted by transmitter 24, the only effect of repeated operation of pull bar 157 (Fig. 1) beyond the second operation thereof will be to delay the restoration of rocker member 153 to normal, since pawl 167 remains held by retaining bar 186 and slide member 166 is also held in the position shown in Fig. 9.

Upon the reclosure of break key 215, the printer 26 will come to rest at the conclusion of the cycle which was in progress when key 215 was closed, because message transmission from the intermediate station 22 has not yet started. With printer 26 in the rest condition contacts 96 will remain open and magnet 92 will remain deenergized so that latch 91 will be in position to retain bail blocking lever 86 in unoperated position when the lever is restored to that position by resetting cam 108 operating through reset lever 106. Since it was originally assumed that tape tension contacts 79 and manually operable switch 82 are both closed, start magnet 41 for transmitter 42 will remain energized after contacts 98 are restored to open condition by the resetting of bail blocking lever 86, and distributor shaft 31 will continue to operate. When cam 74 releases bail 67 preparatory to transmission of the next signal the bail will not be blocked and will accordingly permit the tape sensing levers 54 and tape feed bell crank 64 to operate in the normal manner to resume the transmission of signals on communication line 17 under the control of perforated tape 57. The communication line 19 is now in condition for transmission of message material from intermediate station 22, since transmitter 18 has been disabled and station 22 may proceed with message transmission.

At the conclusion of message transmission from intermediate station 22, break key 215 is again opened, or blank signals may be transmitted either from a tape transmitter or by operation of the blank signal key of a keyboard transmitter. As previously described, this will cause contacts 96 in printer 26 to be operated and latch 91 to be operated by magnet 92 to release bail blocking lever 86. The effect of the release of bail blocking lever 86 upon transmitter 24 when the transmitter has been operating under the control of perforated tape 57 has been previously described, and the effect is the same on transmitter 24 whether break key 215 has been opened to initiate or conclude transmission from intermediate station 22. Accordingly, it will be assumed for the purposes of the following description that transmission on line 17 from transmitter 24 was concluded or interrupted at some time during the transmission of message material from intermediate station 22 to printer 26, by the opening of tape tension contacts 79 due to the taking up of slack in tape 57 or by the manual opening of switch 82. Thus, start magnet 41 will be assumed to be deenergized and stop lever 37 will be holding stop cam 39 arrested with cam 74 holding bail 67 in extreme counterclockwise position.

Upon the first operation of pull bar 104, latch 91 releases blocking lever 86 which immediately drops into blocking relation to bail 67, trips off the retaining lever 90 for the latching lever 91 and closes contacts 98. The contacts complete an energizing circuit for start magnet 41 shunting the contacts 79 and switch 82, one of which is assumed to be open, and brush arm 29 of distributor 24 is released for rotation to transmit the blank signal. At the west station (Fig. 1) printer 16 responds by operation of pull bar 157 to change the ratchet feed apparatus from the condition shown in Fig. 6 to that shown in Fig. 7, and on the return of the pull bar to normal position, the apparatus is changed to the condition shown in Fig. 8. At the end of the transmission of the blank signal combination, reset lever 106 is operated to attempt to reset blocking lever 86, but magnet 92 is again energized due to response of the pull bar 104 to the open line condition of

line 19 and blocking lever 86 is not reset but again drops into blocking relation to bail 67. Contacts 98 are again closed and distributor shaft 31 is released for the transmission of another blank signal combination. The printer 16 responds to this blank by operation of special pull bar 157 to change the ratchet feed mechanism from the condition shown in Fig. 8 to that shown in Fig. 9, in the course of which change pawl 167 operates ratchet 181 one step. Cam 187 is thus advanced one step to effect the reclosure of contacts 188, whereby the energizing circuit of start magnet 196 of transmitter 18 is completed and the magnet is energized to restart transmitter 18.

Upon the reclosure of break key 215, the cyclic operation of pull bar 104 in printer 26 (Fig. 2) ceases and blocking lever 86 is reset by reset lever 106 at the end of the transmitting cycle of transmitter 24 then in progress. With the resetting of lever 86, contacts 98 open and with contacts 79 or manually operable switch 82 open as previously assumed, the transmitter 24 will be stopped. Upon the reclosure of break key 215, the circuit of communication line 19 is completed and the signals generated in transmitter 18 will be received by printer 26.

Reference was previously made to the possibility of providing a type bar to be operated by the special pull bar 157 and the provision of such a type bar with a special type character to be printed may be advantageous. It will be apparent that upon the opening of break key 215 at station 22 for the purpose of interrupting transmission from transmitter 18, the transmitter will continue to operate until special pull bar 157 has been operated twice to effect the arrestment of transmitter 18. Also, when transmitter 18 is restarted due to the opening of break key 215 at the conclusion of transmission from station 22, if the operator at station 22 holds key 215 open longer than the time necessary for special pull bar 157 to be operated twice, any signals generated by transmitter 18 will be lost because of the open condition of line 19. The typing of the special character by a type bar associated with special pull bar 157 will serve as a warning to an operator at the west station to back space the tape 213 in transmitter 18 sufficiently to compensate for the loss of signals due to operation of the transmitter while break key 215 at the intermediate station 22 is open. The special pull bar 157 might also be arranged to operate an alarm such as a signal bell in accordance with well known practices to attract the attention of an operator to the fact that the transmitter is being interrupted and subsequently that the transmitter is being restarted so that any necessary readjustment of tape 213 in transmitter 18 may be made.

It will be noted that the system as shown includes no provision for transmission of messages from the west station to the intermediate station 22 nor for transmission of messages from the intermediate station 22 to the west station. The reason for this is that the west station and the intermediate station may be assumed to be subordinate to the east station and there is little or no occasion for transmission between the subordinate stations. This being the case, an operator at station 22 has no means for determining whether or not the west station is transmitting to the east station and therefore should always precede transmission which he desires to initiate by operating break key 215 to effect the arrestment of transmitter 18 if it should happen to be then operating. Similarly, the operator at station 22 should always operate break key 215 at the conclusion of transmission from station 22 to printer 26 as, otherwise, transmitter 18 would be left in disabled condition due to the fact that contacts 188 remain open.

If it should be desirable to provide for intercommunication between the west station and the intermediate station, this may be accomplished by adding at station 22, in series with line relay 21, a set of transmitting contacts to be controlled either by a keyboard mechanism or a tape transmitter mechanism and by adding in series with the transmitter 23 at station 22 the line relay of a printer. The transmitter added in series with line relay 21 could then be operated to transmit signals to printer 16 but could only be operated at a time when messages were not being transmitted over line 17 from the east station. By the addition to the printer represented symbolically by the selector magnet 111 at station 22 of a ratchet feed transmitter controlling mechanism similar to that associated with the printer 16, transmitter 24 at the east station, by the transmission of signals over line 17, could interrupt transmission from station 22 to the west station in order to permit transmitter 24 at the east station to transmit to both of the printers associated with line 17. The added transmitter controlling mechanism could be made responsive to some signal other than blank whereby transmission from intermediate station 22 to the west station could be interrupted under the control of the transmitter at the east station without interrupting transmission from the west station to the east station over communication line 19. The addition of a printer controlling line relay in series with transmitter 23 at station 22 would not only provide means for recording signals received from transmitter 18, but would also provide at station 22 a home record of signals transmitted from station 22 to the printer 26 at the east station.

Although a specific embodiment of the invention has been disclosed in the drawings and described in the foregoing specification, it is to be understood that the invention is not limited to such specific embodiment but is capable of modification, rearrangement and addition or substitution of parts and elements without departing from the spirit of the invention and within the scope of the appended claims.

What is claimed is:

1. In a telegraph system, a station having a telegraph receiver and a telegraph transmitter, another station having a telegraph receiver and a telegraph transmitter, a communication channel connecting the transmitter of each station to the receiver of the other station for simultaneous two-way transmission, a third station associated with said channel intermediate the first-mentioned stations having a telegraph transmitter for transmitting telegraph signals to the receiver at one of the stations and having a telegraph receiver for receiving telegraph signals from the transmitter at said one station, means at the intermediate station for interrupting transmission to the receiver at the station to which said intermediate station is arranged to transmit, means operated by said receiver in response to the interruption of transmission for conditioning its associated transmitter to transmit a predetermined signal repetitiously, and means controlled by the receiver at the other end of the channel responsive to the predeter-

mined signal for disabling the transmitter associated therewith.

2. In a telegraph system, a station having a telegraph receiver and a telegraph transmitter, another station having a telegraph receiver and a telegraph transmitter, a communication channel connecting the transmitter of each station to the receiver of the other station for simultaneous two-way transmission, a third station associated with said channel intermediate the first-mentioned stations having a telegraph transmitter for transmitting telegraph signals to the receiver at one of the stations and having a telegraph receiver for receiving telegraph signals from the transmitter at said one station, means at the intermediate station for interrupting transmission to the receiver at the station to which said intermediate station is arranged to transmit, means operated by said receiver in response to the interruption of transmission for conditioning its associated transmitter to transmit a predetermined signal repetitiously, and means controlled by the receiver at the other end of the channel responsive to a plurality of said predetermined signals for disabling the transmitter associated therewith.

3. In a telegraph system, a station having a telegraph receiver and a telegraph transmitter, another station having a telegraph receiver and a telegraph transmitter, a communication channel connecting the transmitter of each station to the receiver of the other station for simultaneous two-way transmission, a third station associated with said channel intermediate the first-mentioned stations having a telegraph transmitter for transmitting telegraph signals to the receiver at one of the stations and having a telegraph receiver for receiving telegraph signals from the transmitter at said one station, means at the intermediate station for opening the communication channel to interrupt transmission to the receiver at the station to which said intermediate station is arranged to transmit, means operated by said receiver in response to the opening of the communication channel for interrupting the transmission of message material from its associated transmitter and for conditioning said transmitter to transmit a predetermined signal repetitiously, means controlled by the receiver at the other end of the channel responsive to a plurality of the predetermined signals for disabling the transmitter associated therewith, and means operable in response to restoration of said communication channel to normal condition for restarting transmission of message material from the transmitter which transmitted the predetermined signals.

4. In a telegraph system, a station having a telegraph receiver and a telegraph transmitter, another station having a telegraph receiver and a telegraph transmitter, a communication channel connecting the transmitter of each station to the receiver of the other station for simultaneous two-way transmission, a third station associated with said channel intermediate the first-mentioned stations having a telegraph transmitter for transmitting telegraph signals to the receiver at one of the stations and having a telegraph receiver for receiving telegraph signals from the transmitter at said one station, means associated with the transmitter at the intermediate station for interrupting the porion of the communication circuit extending to the station to which said intermediate station is arranged to transmit, means operated by said receiver in response to the opening of the communication channel extending thereto for setting in operation its associated transmitter to transmit blank signals repetitiously, and means controlled by the receiver at the other end of the channel responsive to the blank signals for disabling the transmitter associated therewith.

5. In a telegraph system, a station having a telegraph receiver and a telegraph transmitter, another station having a telegraph receiver and a telegraph transmitter, a communication channel connecting the transmitter of each station to the receiver of the other station for simultaneous two-way transmission, a third station associated with said channel intermediate the first-mentioned stations having a telegraph transmitter for transmitting telegraph signals to the receiver at one of the stations and having a telegraph receiver for receiving telegraph signals from the transmitter at said one station, means at the intermediate station for interrupting transmission to the receiver at the station to which said intermediate station is arranged to transmit, means operated by said receiver in response to the interruption of transmission for initiating the transmission by its associated transmitter of a predetermined signal and for preventing the transmission therefrom of miscellaneous message material, and means controlled by the receiver at the other end of the channel responsive to the predetermined signal for estopping operation of the transmitter associated therewith

6. In a telegraph set including a receiver and a transmitter, said transmitter including means operable under the control of a message record storage medium for setting up signals and a distributor for transmitting said signals, means for operating said signal setting up means to set up a predetermined signal independently of said message record storage medium, means for retaining said setting up means operated to set up said predetermined signal, and means controlled by said receiver for rendering said retaining means effective.

7. In a telegraph set including a receiver and a transmitter, said transmitter including means operable under the control of a message record storage medium for setting up signals and a distributor for transmitting said signals, means for operating said signal setting-up means to set up a predetermined signal independently of said message record storage medium, means for retaining said setting -up means operated to set up said signal, means controlled by said receiver for rendering said retaining means effective, and cyclically operable means for disabling said retaining means.

8. In a telegraph set including a receiver and a transmitter, said transmitter including means operable under the control of a message record storage medium for setting up signals and a distributor for transmitting said signals, means for operating said signal setting-up means to set up a predetermined signal independently of said message record storage medium, means for retaining said setting-up means operated to set up said signal, means controlled by said receiver for rendering said retaining means effective, and means operable cyclically by said distributor for disabling said retaining means.

9. In a telegraph set including a receiver and a transmitter, said transmitter including means controlled by a signal storing instrumentality for setting up combinations of marking and spacing signals and a distributor for transmitting said

signals, means actuated by said distributor for cyclically operating said signal setting-up means to set up an all-spacing signal, means for retaining said setting-up means in the all-spacing signal condition, means controlled by said receiver for rendering said retaining means effective, and means operable cyclically by said distributor for disabling said retaining means.

10. In a telegraph set including a receiver and a transmitter, said transmitter including means for cooperating with a signal storing medium to set up combinations of marking and spacing signals and a distributor for transmitting said signals, means controlled cyclically by the distributor for retracting said setting-up means from cooperation with said signal storing medium and into position for setting up an all-spacing signal, means controlled by said receiver for retaining said setting-up means out of cooperation with said signal storing medium and in position to set up said all-spacing signal, and means actuated cyclically by said distributor for momentarily disabling said retaining means.

11. In a telegraph set including a receiver and a transmitter, said transmitter including means for setting up signals and a distributor for transmitting said signals, means for conditioning said signal setting-up means to set up a predetermined signal, means for retaining said setting-up means conditioned to set up said predetermined signal, means controlled by said receiver for rendering said retaining means effective, and means operable cyclically only when said retaining means has been in effective position for disabling said retaining means.

12. In a telegraph set including a receiver and a transmitter, said telegraph receiver including a signal responsive selector mechanism and a plurality of selectable elements, means responsive to a plurality of successive cyclic operations of one of said selectable elements for alternately stopping and starting said transmitter, means for limiting the operation of said stopping and starting means to one stopping or starting operation in response to a succession of cyclic operations of said one selectable element, and means for subsequently disabling said limiting means.

13. In a telegraph set including a receiver and a transmitter, said telegraph receiver including a signal responsive selector mechanism and a plurality of selectable elements, means responsive to a plurality of successive cyclic operations of one of said selectable elements for alternately stopping and starting said transmitter, means for limiting the operation of said stopping and starting means to one stopping or starting operation in response to a succession of cyclic operations of said one selectable element, means for restoring said stopping and starting means to normal position, means for retarding the restoration of said stopping and starting means to normal position, and means operable incident to the restoration of said stopping and starting means for disabling said limiting means.

14. In a telegraph set including a receiver and a transmitter, said telegraph receiver including a signal responsive selector mechanism and a plurality of selectable elements, conditioning means operable by one of said selectable elements, means for restoring said conditioning means to unoperated condition, means for retarding the restoration of said conditioning means, means conditioned by said conditioning means to be operated by said one selectable element in the next operation thereof, ratchet feed means operable by said conditioned means upon the operation thereof by said one selectable element, and means operated by said ratchet feed means for stopping or starting said transmitter alternately for each operation of said ratchet feed means.

15. In a telegraph set including a receiver and a transmitter, said telegraph receiver including a signal responsive selector mechanism and a plurality of selectable elements, conditioning means operable by one of said selectable elements, means for restoring said conditioning means to unoperated position, means for retarding the restoration of said conditioning means to normal position, means normally dissociated from said one selectable element to be conditioned by said conditioning means to be operated by said one selectable element if said selectable element is again selected and operated before the restoration of said conditioning means to normal position, ratchet feed means operable by said conditioned means, and means operable by said ratchet feed means for stopping and starting said transmitter alternately in response to successive operations of said ratchet feed means.

16. In a telegraph set including a receiver and a transmitter, said telegraph receiver including a signal responsive selector mechanism and a plurality of selectable elements, conditioning means operable by one of said selectable elements, means for restoring said conditioning means to normal position, means for retarding the restoration of said conditioning means to normal position, means conditioned by said conditioning means to be operated by said one selectable element, ratchet feed means operable by said conditioned means, means operable by said ratchet feed means for stopping and starting said transmitter alternately upon successive operations of said ratchet feed means, means for retaining said ratchet feed means in operated condition, and means operable by said conditioning means upon the return thereof to normal position for restoring said ratchet feed means to normal condition.

17. In a telegraph set including a receiver and a transmitter, said telegraph receiver including a signal responsive selector mechanism and a plurality of selectable elements, conditioning means operable by one of said selectable elements, means for restoring said conditioning members to unoperated position, means for retarding the restoration of said conditioning means to unoperated position, a pawl and ratchet mechanism operable by said conditioned means, means operable by said pawl and ratchet mechanism in one operation thereof for stopping said transmitter and in the next operation thereof for starting said transmitter, means for retaining said conditioned means and said pawl in operated position, and means operable by said conditioning means upon the restoration thereof to unoperated position for restoring said pawl and said conditioned means to unoperated condition.

18. In a telegraph set including a receiver and a transmitter, said telegraph receiver including a signal responsive selector mechanism and a plurality of selectable elements, a rocker member operable by one of said selectable elements, means for restoring said rocker member to unoperated position, means for retarding the restoration of said rocker member to unoperated position, a pawl and ratchet mechanism, a pawl operating member associated with said pawl and ratchet mechanism, means yieldably interconnecting said rocker member and said pawl operating member for moving said pawl

operating member into position to be operated by said one selectable element, means for retaining the pawl of said pawl and ratchet mechanism and through it said pawl operating member in operated condition, means operable by said pawl and ratchet mechanism in alternate operations for stopping said transmitter and in intervening operations for starting said transmitter, and means carried by said rocker member for releasing said pawl and said pawl operating member for restoration to unoperated position upon restoration of said rocker member to unoperated position.

19. In a telegraph signal transmitter, a signal storing medium, means for sensing the signals in said medium, a start-stop signal generating distributor having impulse segments, a start magnet energizable to cause said distributor to operate, means controlled by said sensing means for applying signaling potentials to said segments, means for advancing said storing medium, means controlled by said distributor for operating said sensing means and said advancing means, means for causing said distributor controlled means to withhold said sensing means and said advancing means, and means controlled by the last-mentioned means for completing the energizing circuit of said magnet.

20. In a telegraph signal transmitter, a signal storing medium, means for sensing the signals in said medium, a start-stop signal generating distributor having impulse segments, the start magnet energizable to cause said distributor to operate, means controlled by said sensing means for applying signaling potentials to said segments, means for advancing said storing medium, means controlled by said distributor for operating said sensing means and said advancing means, means for causing said distributor controlled means to withhold said sensing means and said advancing means, means responsive to the presence of signals in said storing medium for completing the energizing circuit of said magnet and responsive to depletion of signals in said medium for interrupting the energizing circuit of said magnet, and means responsive to withholding of said sensing means and said advancing means for completing the energizing circuit of said magnet independently of the first-mentioned circuit completing and interrupting means.

21. In a telegraph signal transmitter, a signal storing medium, means for sensing the signals in said medium, a start-stop signal generating distributor having impulse segments, a start magnet energizable to cause said distributor to operate, means controlled by said sensing means for applying signaling potentials to said segments, means for advancing said storing medium, means controlled by said distributor for operating said sensing means and said advancing means, means for causing said distributor controlled means to withhold said sensing means and said advancing means, means responsive to withholding of said sensing means for completing the energizing circuit of said magnet, and means also responsive to withholding of said sensing means for applying to said segments potentials representing a predetermined telegraph signal.

22. In a telegraph signal transmitter, a signal storing tape, a plurality of sensing levers for sensing the signals in said tape, a start-stop signal generating distributor having impulse segments, a start magnet energizable to cause said distributor to operate, transmitting contacts controlled by said sensing levers for applying signaling potentials to said segments, means for advancing said tape to present signals contained therein successively to said sensing levers, a cam associated with said distributor, means controlled by said cam for cyclically retracting said sensing levers and operating said tape advancing means, selectively operable means for blocking said cam controlled means in the operated condition thereof and for holding said cam controlled means in said condition independently of said cam, means controlled by said blocking means for completing the energizing circuit of said magnet to cause said distributor to continue to operate, and means for causing said transmitting contacts to impress on said segments a particular signal for repetitious transmission during the withholding of said sensing levers.

23. In a telegraph transmitter, a rotatable distributor having impulse segments, driving means for said distributor, an electromagnet energizable to permit operation of said distributor and releasable to arrest said distributor, a signal storage tape, a plurality of sensing levers for sensing the signals in said tape, means for advancing said tape to present successive signals therein to said sensing levers, signaling contacts associated with said sensing levers for applying signaling potentials to said segments, a cam associated with said distributor, a bail operable by said cam for retracting said sensing levers from signal sensing relation to said tape and for operating said tape advancing means, and releasable by said cam to restore said sensing levers and said tape advancing means, selectively operable means for blocking said bail in the operated position whereby to render said bail unresponsive to said cam, means controlled by said blocking means for completing the energizing circuit for said magnet, and means for causing said transmitting contacts to apply signaling potentials representing a predetermined signal to said segments for repetitious transmission by said distributor during blocking of said bail by said blocking means.

24. In a telegraph system, a pair of stations each having a start-stop telegraph signal transmitter and a start-stop telegraph signal recorder, a telegraph signal channel extending between said stations and accommodating simultaneous two-way transmission between said stations, at least one of said transmitters being of the storage type and including storage signal sensing mechanism, transmitting contact mechanism controlled by said sensing mechanism, storage medium advancing mechanism, a distributor having segments adapted to receive signaling potentials from said contact mechanism and having means for cyclically operating said sensing mechanism and said advancing mechanism, selectively operable means for withholding said signal sensing means and said storage medium advancing means against operation by said cyclically operable means, means for causing said distributor to continue in operation during said withholding, and means for causing said contact mechanism to impress on said segments potentials representing a predetermined signal for repetitious transmission during said withholding.

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