

Feb. 10, 1925.

G. S. VERNAM

1,525,522

PRINTING TELEGRAPH SYSTEM

Filed Jan. 29, 1918

3 Sheets-Sheet 1

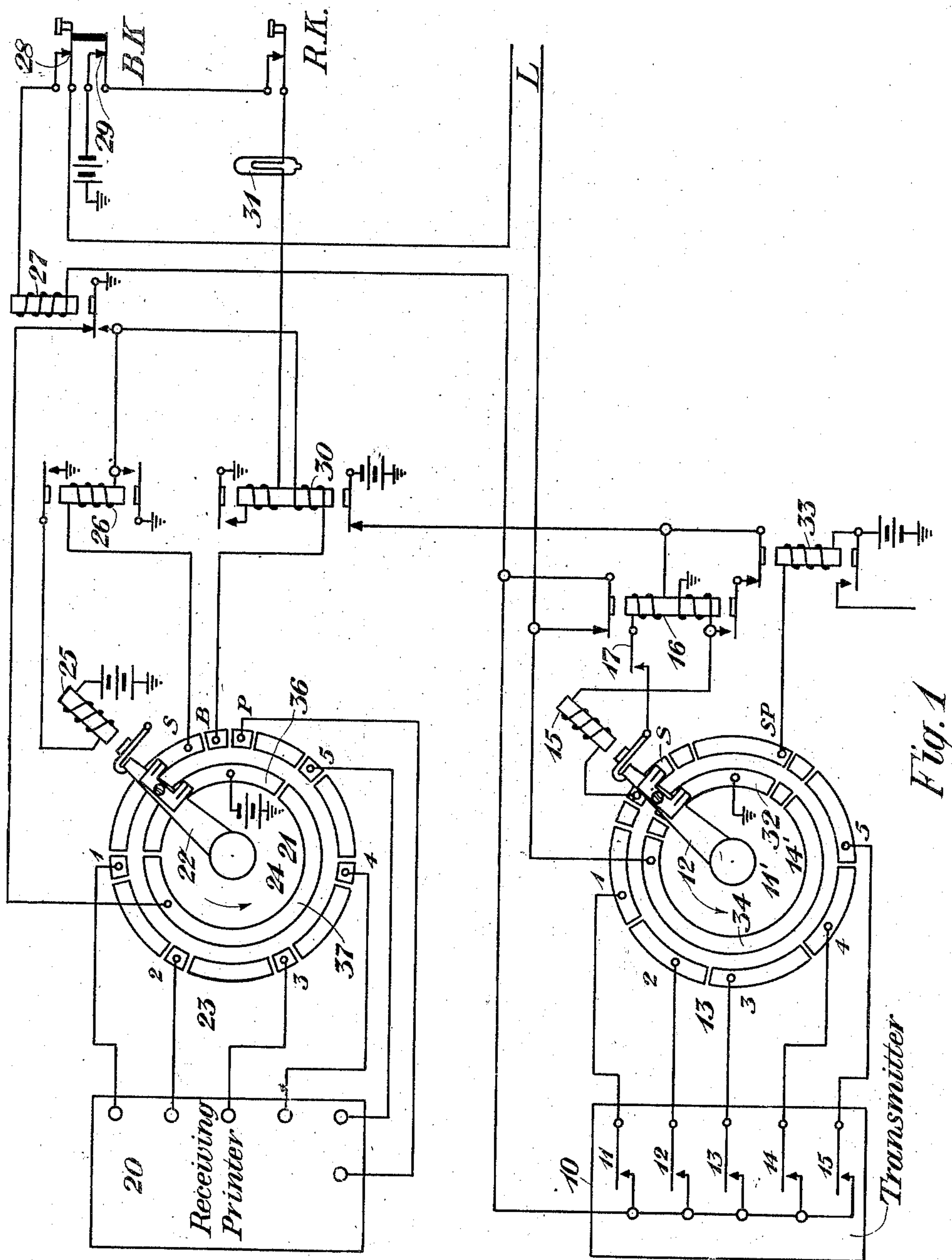


Fig. 1

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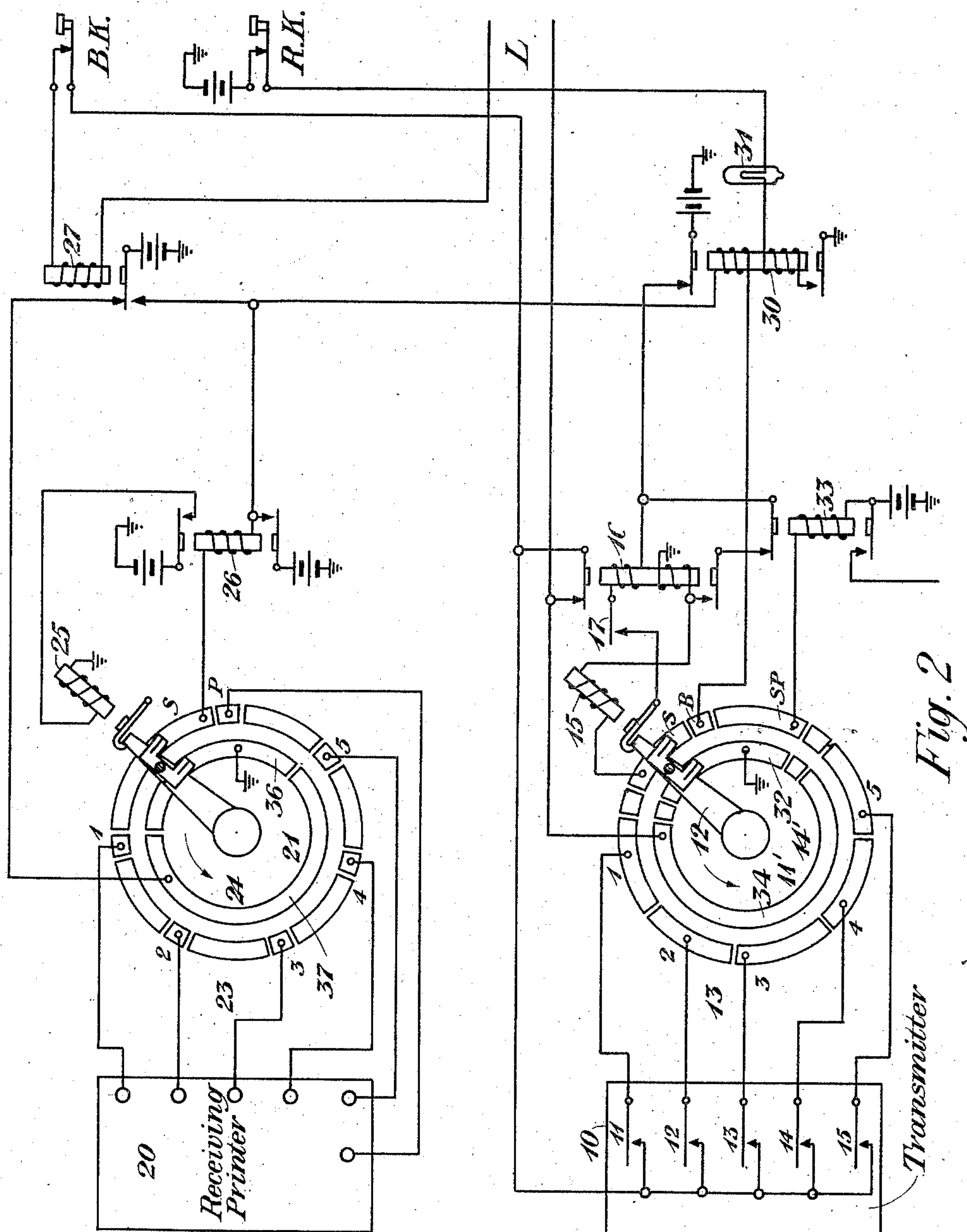
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PRINTING TELEGRAPH SYSTEM

Filed Jan. 29, 1918

3 Sheets-Sheet 2



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PRINTING TELEGRAPH SYSTEM

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3 Sheets-Sheet 3

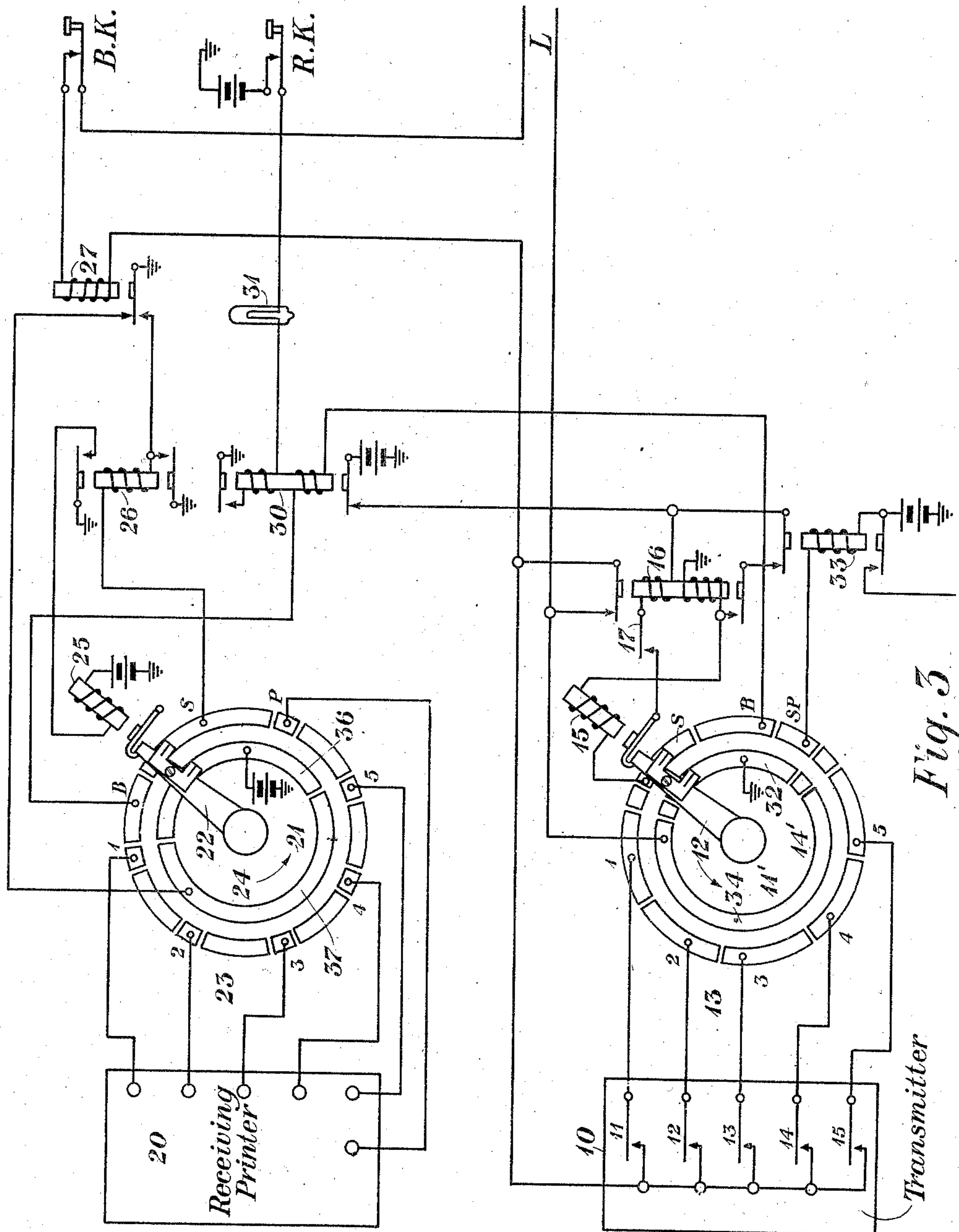


Fig. 3

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UNITED STATES PATENT OFFICE.

GILBERT SANFORD VERNAM, OF BROOKLYN, NEW YORK, ASSIGNOR TO AMERICAN TELEPHONE AND TELEGRAPH COMPANY, A CORPORATION OF NEW YORK.

PRINTING TELEGRAPH SYSTEM.

Application filed January 29, 1918. Serial No. 214,302.

To all whom it may concern:

Be it known that I, GILBERT S. VERNAM, residing at Brooklyn, in the county of Kings and State of New York, have invented certain Improvements in Printing Telegraph Systems, of which the following is a specification.

This invention relates to printing telegraph systems and more particularly to auxiliary or "break-in" signals for use in connection with such systems.

In printing telegraph systems it is desirable practice to arrange two or more stations upon a single line so that when one station is transmitting the other station or stations may all receive and print the message transmitted. In such organizations exigencies may arise rendering it desirable that a receiving station be able to interrupt transmission of a message from the sending station and transmit to the sending station a signal or message. For example: the transmitted message may not be properly received at one station. In such a case it is desirable that such a receiving station be able to stop the transmission of signals from the sending station and obtain control of the line for the purpose of sending to the transmitting station a message or signal indicating that a part or all of the transmitted message should be repeated. It is one of the objects of this invention to provide means whereby the above results may be attained although other and further objects will appear from the detailed description hereinafter given.

In accordance with this invention the above results may be obtained by providing at each station means whereby, while a message is being received, an operator at any receiving station may cause a change in the electrical condition of the line such that the transmitter at the transmitting station will stop sending and a special signal will be given to indicate that a receiving station desires to "break in" upon the line. At the cessation of the special signal the line will be restored to normal condition and the transmitter at the receiving station may be operated to transmit a message without any confusion of signals.

The invention may now be more fully understood from the following description when read in connection with the accompanying drawings, Figures 1, 2 and 3 of

which, respectively, constitute circuit diagrams of three different forms of the invention.

Referring to Figure 1, the transmitting and receiving apparatus of one station is shown. The transmitting apparatus comprises a transmitter 10 conventionally indicated as comprising five contacts 11, 12, 13, 14 and 15, which may be selectively operated to determine the code for the transmission of any character or signal. As the transmitter is well known, and forms no part of the present invention, the details thereof are not shown. Associated with the transmitter 10 is a sending distributor 11' comprising an arm 12 which intermittently rotates over a pair of rings 13 and 14'. Outer ring 13 comprises a plurality of segments, the segments numbered 1 to 5 being selective segments and corresponding respectively to the contacts of the transmitter. A starting segment S and a stopping segment SP are also included in the outer ring. The brush arm 12 is arranged to be released by a start magnet 15 under the control of a start relay 16 the circuit of which is controlled by a contact between the brush arm 12 and the armature of the start magnet 15 and a contact 17 actuated sequentially with the actuation of the contacts 11 to 15 of the transmitter.

The receiving arrangement comprises a receiving printer conventionally indicated at 20 which may be of any well known type, and as it forms no part of the present invention the details are not shown. The receiving printer is associated with a receiving distributor 21 comprising a brush arm 22 adapted to be intermittently rotated over a pair of rings 23 and 24. The outer ring 23 comprises a plurality of segments, five of which numbered 1 to 5 are selecting segments and correspond to the similarly numbered segments of the sending distributor 11'. The outer ring also includes a starting segment S, a printing segment P and a segment B for enabling the operator at any receiving station to operate the break-in signal and stop the sending transmitter. The brush arm 22 is arranged to be released by a starting magnet 25 under the control of a start relay 26; the start relay in turn is controlled by the line relay 27 which relays the transmitter impulses to the receiving apparatus. A break key BK comprising contacts

28 and 29 is associated with the receiving apparatus and is arranged to open the line L when operated, thereby causing the line relays of the various stations to be deenergized. The line relay being deenergized at the instant when the brush arm 22 is passing over the segment B, a circuit is closed through the break relay 30 which operates to cause a lamp or other indicating apparatus 31 to function and also operates to stop the operation of the sending apparatus by holding open the circuit of the start relay 16.

The sending and receiving apparatus are associated with a line L and it will be noted that the contact 28 of the break key BK, the line relay 27 and the contacts of the transmitting apparatus are in series with the line L. The line is normally closed through the upper contact of the start relay 16 of the sending apparatus, which contact is opened upon the actuation of the start relay 16 so that during the rotation of the brush arm 12 over the rings of the distributor the open or closed condition of the line is determined by the contacts of the transmitter 10. The apparatus so far described constitutes the apparatus of one station, but it will be understood that any desired number of other stations may be associated with the line L in the same manner as the station above described so that the normally closed line circuit will extend serially through the several stations.

The invention will now be clear from a description of the operation. Assuming that the station shown in Figure 1 is sending, the transmitter 10 will be actuated either by depressing a key or by means of a tape, thereby closing certain of the contacts 11 to 15 inclusive, depending on the code impulses to be transmitted, the contact 17 being also operated. The actuation of the contact 17 closes a circuit from battery over the lower back contact of break relay 30, through the upper winding of start relay 16 of the sending distributor, contact 17, armature of start magnet 15, brush arm 12 and segment 32 of the inner ring of the distributor 11' to ground. The start relay 16 is energized and at its lower front contact closes a locking circuit from battery over the lower back contact of break relay 30, upper back contact of stop relay 33, lower front contact and lower winding of start relay 16 to ground. At the same time a circuit is closed for the start magnet 15 from battery over the lower back contact of break relay 30, upper back contact of stop relay 33, lower front contact of start relay 16, winding of start magnet 15, start segment S of the outer ring, through the brush of the arm 12 and the segment 32 of the inner ring of the distributor to ground. The start magnet 15 is energized over this circuit and releases the brush arm 12 which begins to rotate over

the rings of the distributor. As soon as the arm passes from the start segment S, the circuit of the start magnet is opened and the armature of said magnet is released in order to stop the brush arm at the end of its rotation.

The energization of the start relay 16 at its upper contact opened the normally closed line circuit L thereby opening the circuit of the line relays such as 27, of all the stations associated with the line. This releases the brush arms of the receiving distributors of all the stations in a manner hereinafter described. As the brush arm 12 of the distributor 11' rotates over the selecting segments the opened or closed circuit condition of the line L will depend upon the condition of the contacts 11 to 15 inclusive of the transmitter 10. Assuming the contacts 11, 13 and 15 were actuated, as the brush 12 rotates over the first selecting segment, the line L will be closed over the contact 11, the first selecting segment of the outer ring 13, the brush of the arm 12 and segment 34 of the inner ring of the distributor, thereby transmitting a closed circuit impulse as the first selecting impulse. As the brush arm passes from the first selecting segment to the second selecting segment the control of the line L is transferred to the contact 12. As this contact is open no current will be transmitted over the line during the period corresponding to the second selecting impulse. The brush now rotates over the third selecting segment of the distributor and the line is closed over the contact 13, the third selecting segment, the brush of the arm 12 and the segment 34 to transmit a closed circuit impulse. This will be followed by an opening of the circuit as the brush passes over the fourth selecting segment and the last selecting impulse will be a closed circuit impulse as the brush passes over the fifth selecting segment, the line being at this time closed over the contact 15 of the transmitter, the fifth selecting segment, the brush of the arm 12 and the segment 34. As the brush passes from the fifth selecting segment to the stop segment SP a circuit is closed from ground over the segment 32, brush of the arm 12, stop segment SP, winding of the stop relay 33 to battery. The stop relay 33 is energized and at its upper contact opens the locking circuit previously traced through the lower winding of the start relay 16 thereby deenergizing the start relay. Upon the deenergization of the start relay the line is closed over the upper back contact of said relay thereby transmitting a closed circuit stopping impulse to the various line relays of the stations associated with the line. The transmitter is now ready to transmit a second series of code impulses for the next character.

Turning now to the receiving operation, the functioning of the receiving apparatus of the station of Figure 1 will be described, it being understood that the operation of the receiving apparatus of all of the stations along the line L will be identical. It will be recalled that during the period corresponding to first or starting impulse the line was open circuited due to the energization of the start relay 16. In response to this condition all of the line relays such as 27 at the various stations are deenergized. The deenergization of the line relay 27 closes a circuit from ground over the back contact of said relay, through the winding of the start relay 26, over start segment S of the outer ring of the receiving distributor, over the brush of the arm 22 and the segment 36 of the inner ring of the distributor to battery. The start relay is energized over this circuit and at its lower front contact closes a locking circuit from ground through its winding and over the start segment S, the brush of the arm 22 and segment 36 to battery. Start relay 26 at its upper front contact closes a circuit through the start magnet 25 which upon being energized attracts its armature and releases the brush arm 22 which begins to rotate over the segments of the distributor. As soon as the brush passes from the start segment S the locking circuit just traced through the winding of the start relay 26 is opened so that the start relay 26 and start magnet 25 are deenergized, and the armature of the latter is released to engage and stop the arm 22 at the completion of its rotation.

Upon leaving the segment S the arm passes over the first selecting segment of the receiving distributor. At this moment the first selecting impulse is being received from the line at each of the receiving stations. It will be remembered that the first selecting impulse was a closed circuit impulse and accordingly the line relay 27 and similar relays at other stations will be energized. This closes a circuit over the front contact of the line relay 27, segment 37 of the distributor, the brush of arm 22 and the first selecting segment through a selecting relay or other apparatus (not shown) in the receiving printer 20 and to a battery (not shown). As the arm continues in its rotation it passes over the second selecting segment at the moment corresponding to the second selecting impulse, during which, it will be remembered, the line was open circuited. The line relay is therefore deenergized at this moment and no circuit is completed over the second selecting segment of the receiving distributor to apparatus in the receiving printer. The armature of the line relay 27 is resting upon its back contact but no circuit changes are produced thereby. The arm 22 continues rotating,

passing in succession over the 3rd, 4th and 5th segments of the receiving distributor, thereby closing circuits over the 3rd and 5th segments to the apparatus of the receiving printer. The five selecting impulses which determine the character to be printed have now been received. As the brush passes over the segment P of the outer ring of the receiving distributor a circuit is completed from battery over segment 36, the brush of arm 22 and printing segment P of the distributor to start the printing operation so that the character determined by the five selecting impulses is printed. Before the brush reaches the segment B of the receiving distributor the seventh or stop impulse has been transmitted to the line L by the sending apparatus. This impulse, it will be remembered, was a closed circuit impulse, so that the line relay 27 and the similar line relays at other stations are energized thereby preventing the completion of a circuit through the lower winding of the break relay 30 over the segment B. After passing from the segment B the arm 22 is engaged by the retracted armature of the start magnet 25 and comes to rest with its brush upon the start segment S. The apparatus is now ready to respond to another series of code impulses.

Assuming now that the operator at some other station along the line L desires to "break in" for any purpose, such operator will operate the break key BK at his station. The contacts 28 of the break keys at the several stations are all serially connected in the line circuit L and the operation of the break key at any station consequently opens the line circuit. Therefore, the line relays such as 27 at all stations will be deenergized as long as the break key BK is held open at any station and as soon as the brush arms 22 of the receiving distributors at the various stations pass over the segments B a circuit is completed at the station shown in Figure 1 over back contact of the line relay 27, through the lower winding of the break relay 30, over segment B, the brush of the arm 22 and segment 36 to battery. Similar circuits are completed at all of the stations with the result that the break relay at each station is energized. The energization of the break relay 30 closes a locking circuit from ground over its upper front contact through its upper winding through lamp 31, contact of the release key RK and contact 29 of the break key BK to battery. Similar locking circuits are completed at all stations except the station at which the break key BK was operated. The locking circuit is not completed at such station since the contact 29 of the break key BK is open.

The locking circuit lights the signal lamp 31 at the station of Figure 1 and similar sig-

nal lamps at other stations with the exception of the station at which the break key BK was operated. The functioning of the lamp 31 at the signal station shown in Figure 1 indicates to the operator at that station that another operator desires to obtain control of the line. The energization of the break relay 30 opens, at its lower contact, the starting circuit of the start relay 16 thereby preventing further operation of the transmitting apparatus so that the brush arm 12 as soon as it comes to rest in engagement with the retracted armature of the start magnet 15 remains stationary, even though the transmitter itself be thereafter actuated. The operator at the station where the break key was operated is now able to transmit a message as soon as he releases the break key KB as the line is now in normal condition. The operators at all stations where the signal lamps, such as 31, are caused to glow, may operate their release keys RK thereby opening the locking circuit through the upper winding of the break relay and the signal lamp. The deenergization of the break relay 30 at the transmitting station of Figure 1 restores the starting circuit of the start relay 16 to normal by applying battery thereto over its lower back contact. The transmitting apparatus is now in normal condition and the operator at the station at Figure 1 may actuate the transmitter as soon as the station which is now transmitting ceases to send impulses.

It will be noted that in the arrangement just described the signal lamp corresponding to the lamp 31 of Figure 1 is actuated at all stations except the station where the break key BK is actuated. It is not necessary to operate the break-in signal at any station except the transmitting station. Accordingly, an arrangement is shown in Figure 2 whereby the break relay and the corresponding signal lamp are operated at the sending station only. The apparatus is substantially the same as that described in connection with Figure 1, except that the initial circuit of the break relay is completed over a segment B of the outer ring of the sending distributor instead of the receiving distributor. As the brush arm of the sending distributor of the transmitting station is the only sending brush arm that is rotating, the break relay will be operated at the sending station only.

The normal operation of sending and receiving in Figure 2 is the same as that already described in connection with Figure 1 and need not be further discussed. If, however, while the station shown in Figure 2 is transmitting, an operator at another station depresses the break key BK at that station the line circuit is held open and the line relays at the various stations remain deenergized. As the brush arm 12 of the sending

distributor passes over the segment B at the transmitting station, a circuit is completed at that station from battery over the back contact of the line relay 27 through the upper winding of the break relay 30 and over the segment B, brush of the arm 12 and segment 32 to ground. The break relay 30 is accordingly energized at the sending station of Figure 2 but the break relays of the other stations remain unactuated as the sending distributors at such stations are at rest. Relay 30 completes a locking circuit from ground over its lower front contact and through its lower winding, through the lamp 31 and over the contacts of release key RK to battery. The lamp 31 now glows to indicate to the operator at the transmitting station that another operator desires to obtain control of the line. The actuation of the break relay 30 at its upper contact opens the starting circuit of the start relay 16 so that the transmitting distributor cannot be released. As soon as the operator observes the signal of the lamp 31 the release key RK may be actuated to restore the lamp and the break relay 30 to normal.

Another modification is illustrated in Figure 3. The apparatus in Figure 3 is substantially the same as that already described but differs therefrom in that the circuit of the break relay 30 is controlled over a segment B of the sending distributor and a cooperating segment B of the receiving distributor which is angularly displaced relative to the segment B of the sending distributor. In the normal operation of the apparatus the brush arms 12 and 22, of the sending and receiving distributors respectively, rotate substantially in synchronism at the sending station so that they do not simultaneously pass over the segments B of the two distributors and consequently the circuit of the break relay 30 is not completed. If, however, while the station illustrated in Figure 3 is transmitting, the operator at another station should depress the break key at such station the line circuit would be held open and the line relays, such as 27, at the various stations will remain deenergized. The brush arm 22 is so arranged that it rotates at substantially the same speed as the brush arm 12, approximate synchronism being obtained by reason of the fact that the two brushes are released at such times that they will pass over corresponding segments of the sending and receiving distributor at the same instant. When, however, the line relay 27 remains deenergized due to the operation of the break key, each time the arm 22 of the receiving distributor engages with the start segment S upon nearing the completion of its rotation the start relay is energized over a circuit from the back contact of the line relay, through the winding of the start

relay 26 segment S, brush of arm 22 and segment 36 to battery. The start relay completes the circuit of the start magnet 25 thereby withdrawing the armature from the path of the arm 22 before the arm comes to rest. The arm 22 therefore rotates continuously so long as the break key remains depressed. Since the arm 22 is rotating continuously and the arm 12 stops for an instant at the end of each rotation, the arm 22 gains with respect to the arm 12 so that after a few revolutions the two arms will be rotating at such relative angles with respect to each other that the brushes pass over the segments B of the sending and receiving distributor at the same instant, thereby completing a circuit from ground over the segment 32, brush of arm 12, segment B, lower winding of the break relay 30, segment B of the receiving distributor, the brush of arm 22 and segment 36 to battery. This circuit is completed at the transmitting station only, as the brushes of the sending distributors at the other stations are not rotating. The actuation of the break relay 30 completes a locking circuit over its upper contact and through its upper winding, through the signal lamp 31 and over the contact of the release key RK to battery, indicating to the operator at the sending station that another operator desires to obtain control of the line. Break relay 30 at its lower contact opens the circuit of the starting relay 16, thereby preventing further actuation of the sending distributor.

It will be seen that by means of the arrangements of this invention a printing telegraph system has been produced which is very flexible in so far as its method of operation is concerned so that any operator at any station may at any time obtain control of the line for sending purposes without materially interfering with the normal operation of the system. It will also be obvious that the general principles herein disclosed may be used in many other organizations widely different from those illustrated without departing from the spirit of the invention as defined in the appended claims.

What is claimed is:

1. In a printing telegraph system, a line circuit, a plurality of printing telegraph stations, transmitting apparatus associated with said line circuit at one of said stations, receiving printing apparatus associated with said line circuit at another of said stations, a special signal at said first mentioned station, a relay in said line circuit at said first mentioned station for controlling said special signal, said relay being responsive to impulses transmitted to operate receiving printing apparatus, means at said last mentioned station to open the line circuit, and means whereby said special signal will be actuated in response to the opening of said

line circuit but will not be actuated by the response of said relay to said impulses transmitted to operate receiving printing apparatus.

2. In a printing telegraph system, a line circuit, a plurality of printing telegraph stations, transmitting apparatus and receiving printing apparatus associated with said line circuit at each station, the receiving printing apparatus at a receiving station being responsive to impulses transmitted by the transmitting apparatus at a transmitting station, a special signal associated with said line circuit, a relay associated with said line circuit for controlling said signal, said relay being responsive to impulses transmitted from a transmitting apparatus to operate a receiving printing apparatus, means whereby the line circuit may be opened while impulses are being transmitted, and means whereby said special signal will be actuated in response to the opening of said line circuit but will not be actuated by the response of said relay to said impulses transmitted to operate receiving printing apparatus.

3. In a printing telegraph system, a line circuit, a plurality of printing telegraph stations, transmitting apparatus associated with said line circuit at one of said stations, receiving printing apparatus associated with said line circuit at another of said stations, means at said last mentioned station to change the character of said line circuit, a relay at said first mentioned station responsive to impulses transmitted to operate a receiving printing apparatus, a special signal controlled by said relay and unoperated by the response of said relay to such transmitted impulses, but operated by said relay when the character of the line circuit is changed.

4. In a printing telegraph system, a line circuit, a plurality of printing telegraph stations, transmitting apparatus associated with said line circuit at one of said stations, receiving printing apparatus associated with said line circuit at another of said stations, means at said last mentioned station to open the line circuit, a relay at said first mentioned station responsive to impulses transmitted to operate a receiving printing apparatus, a special signal controlled by said relay and unoperated by the response of said relay to such transmitted impulses, said signal being operated by said relay when the line circuit is opened by said line circuit opening means.

5. In a printing telegraph system, a line circuit, a plurality of printing telegraph stations associated with said line circuit, a rotary distributor at each station comprising a brush rotatable over a plurality of segments, a transmitter associated with the distributor at one station, a receiving print-

er associated with the distributor at a second station, means responsive to the operation of the transmitter to transmit an impulse over the brush of the distributor at said first station to release the brush of the distributor at the second station, whereby the brushes rotate over corresponding segments at the two stations to transmit impulses from the transmitter to the receiving printer, a special signal at said first station unresponsive to said impulses, and means at the second station to operate said special signal.

6. In a printing telegraph system, a line circuit, a plurality of printing telegraph stations associated with said line circuit, a rotary distributor at each station comprising a brush rotatable over a plurality of segments, a transmitter associated with the distributor at one station, a receiving printer associated with the distributor at a second station, means responsive to the operation of the transmitter to transmit an impulse over the brush of the distributor at said first station to release the brush of the distributor at the second station, whereby the brushes rotate over corresponding segments at the two stations to transmit impulses from the transmitter to the receiving printer, a special signal at said first station unresponsive to said impulses, and means at the second station to so change the character of the line circuit during the transmission of impulses as to operate said special signal.

7. In a printing telegraph system, a line circuit, a plurality of printing telegraph stations associated with said line circuit, a rotary distributor at each station comprising a brush rotatable over a plurality of segments, a transmitter associated with the distributor at one station, a receiving printer associated with the distributor at a second station, means responsive to the operation of the transmitter to transmit an impulse over the brush of the distributor at said first station to release the brush of the distributor at the second station, whereby the brushes rotate over corresponding segments at the two stations to transmit impulses from the transmitter to the receiving printer, a special signal at said first station unresponsive to said impulses, and means at said second station to open the line circuit to operate said special signal.

8. In a printing telegraph system, a line circuit, a plurality of printing telegraph stations associated with said line circuit, a rotary distributor at each station comprising a brush rotatable over a plurality of segments, a transmitter associated with the distributor at one station, a receiving printer associated with the distributor at a second station, means responsible to the operation of the transmitter to transmit an impulse over the brush of the distributor

at said first station to release the brush of the distributor at the second station, whereby the brushes rotate over corresponding segments at the two stations to transmit impulses from the transmitter to the receiving printer, a special signal at said first station unresponsive to said impulses, and means at the second station to so change the character of the line circuit during the transmission of impulses as to operate said special signal and stop one of said distributors.

9. In a printing telegraph system, a line circuit, a plurality of printing telegraph stations associated with said line circuit, a rotary distributor at each station comprising a brush rotatable over a plurality of segments, a transmitter associated with the distributor at one station, a receiving printer associated with the distributor at a second station, means responsive to the operation of the transmitter to transmit an impulse over the brush of the distributor at said first station to release the brush of the distributor at the second station, whereby the brushes rotate over corresponding segments at the two stations to transmit impulses from the transmitter to the receiving printer, a special signal at said first station unresponsive to said impulses, and means at the second station to open the line circuit to operate said special signal and stop one of said distributors.

10. In a printing telegraph system, a line circuit, a plurality of printing telegraph stations associated with said line circuit, a rotary distributor at each station comprising a brush rotatable over a plurality of segments, a transmitter associated with the distributor at one station, a receiving printer associated with the distributor at a second station, means responsive to the operation of the transmitter to transmit a starting impulse over the brush of the distributor at said first station to release the brush of the distributor at the second station, whereby the brushes rotate over corresponding segments at the two stations to transmit character determining impulses from the transmitter to the receiving printer, said starting impulse taking no part in determining the character to be printed, and means at said second station to change the electrical character of the line to stop one of said distributors.

11. In a printing telegraph system, a line circuit, a plurality of printing telegraph stations associated with said line circuit, a rotary distributor at each station comprising a brush rotatable over a plurality of segments, a transmitter associated with the distributor at one station, a receiving printer associated with the distributor at a second station, means responsive to the operation of the transmitter to transmit a

starting impulse over the brush of the distributor at said first station to release the brush of the distributor at the second station, whereby the brushes rotate over corresponding segments at the two stations to transmit character determining impulses from the transmitter to the receiving printer, said starting impulse taking no part in determining the character to be printed, and means at said second station to open the line circuit to stop one of said distributors.

12. In a printing telegraph system, a line circuit, a plurality of printing telegraph stations associated with said line circuit, a rotary distributor at each station comprising a brush rotatable over a plurality of segments, a transmitter associated with the distributor at one station, a receiving printer associated with the distributor at a second station, means responsive to the operation of the transmitter to transmit a starting impulse over the brush of the distributor at said first station to release the brush of the distributor at the second station, whereby the brushes rotate over corresponding segments at the two stations to transmit character determining impulses from the transmitter to the receiving printer, said starting impulse taking no part in determining the character to be printed, and means at said second station to stop the distributor at said first station.

13. In a printing telegraph system, a line circuit, a plurality of printing telegraph stations associated with said line circuit, a rotary distributor at each station comprising a brush rotatable over a plurality of segments, a transmitter associated with the distributor at one station, a receiving printer associated with the distributor at a second station, means responsive to the operation of the transmitter to transmit a starting impulse over the brush of the distributor at said first station to release the brush of the distributor at the second station, whereby the brushes rotate over corresponding segments at the two stations to transmit character determining impulses from the transmitter to the receiving printer, said starting impulse taking no part in determining the character to be printed, and means to alter the electrical character of the line in such manner as to stop the distributor at said first station.

14. In a printing telegraph system, a line circuit, a plurality of printing telegraph stations associated with said line circuit, a rotary distributor at each station comprising a brush rotatable over a plurality of segments, a transmitter associated with the distributor at one station, a receiving printer associated with the distributor at a second station, means responsive to the operation of the transmitter to transmit a starting

impulse over the brush of the distributor at said first station to release the brush of the distributor at the second station, whereby the brushes rotate over corresponding segments at the two stations to transmit character determining impulses from the transmitter to the receiving printer, said starting impulse taking no part in determining the character to be printed, and means to open the line circuit to stop the distributor at said first station.

15. In a telegraph system, a line circuit, a plurality of telegraph stations associated with said line circuit, a rotary distributor at each station, a transmitting apparatus associated with the distributor at one station and a receiving apparatus associated with the distributor at a second station, means responsive to the operation of the transmitter to transmit a starting impulse from the distributor at said first station to set into operation the distributor at the second station, whereby signal determining impulses may be transmitted from the transmitting apparatus over the line and distributors to the receiving apparatus, said starting impulse taking no part in determining the signal transmitted, and means controllable from one station to stop the transmission from the distributor at the other station.

16. In a telegraph system, a line circuit, a plurality of telegraph stations associated with said line circuit, a rotary distributor at each station, a transmitting apparatus associated with the distributor at one station and a receiving apparatus associated with the distributor at a second station, means responsive to the operation of the transmitter to transmit a starting impulse from the distributor at said first station to set into operation the distributor at the second station, whereby signal determining impulses may be transmitted from the transmitting apparatus over the line and distributors to the receiving apparatus, said starting impulse taking no part in determining the signal transmitted, and means at the second station to stop the distributor at the first station.

17. In a telegraph system, a line circuit, a plurality of telegraph stations associated with said line circuit, a rotary distributor at each station adapted to make a complete revolution at a uniform rate of travel, a transmitting apparatus associated with the distributor at one station and a receiving apparatus associated with the distributor at a second station, means responsive to the operation of the transmitter to transmit a starting impulse from the distributor at said first station to set into operation the distributor at the second station, whereby signal determining impulses may be transmitted from the transmitting apparatus over the line and distributors to the receiving

ing apparatus, said starting impulse taking no part in determining the signal transmitted, and means to open the line circuit to stop one of said distributors.

18. In a printing telegraph system, a line circuit, a plurality of printing telegraph stations associated with said line circuit, a transmitting apparatus at one station, a receiving printing apparatus at a second station, means responsive to the operation of the transmitting apparatus for transmitting a starting impulse to condition said receiving apparatus for receiving signals, said impulse taking no part in determining the signals to be transmitted, and means at said second station to stop the transmitting apparatus at said first station.

19. In a printing telegraph system, a line circuit, a plurality of printing telegraph stations associated with said line circuit, a transmitting apparatus at one station, a receiving printing apparatus at a second station, a special signal at said first station, a relay associated with said line circuit for controlling said signal, said relay being responsive to impulses transmitted from a transmitting apparatus to operate receiving printing apparatus, means at said first station controlled by said relay to stop said transmitting apparatus at said first station and operate said special signal, said means being non-responsive to the actuation of said relay by impulses transmitted over the line to operate a receiving printing apparatus, and means at said second station whereby said last mentioned means may be controlled by said relay to stop the transmitting apparatus at said first station and operate said special signal.

20. In a printing telegraph system, a line circuit, a plurality of printing telegraph stations associated with said line circuit, a rotary distributor at each station comprising a brush rotatable over a plurality of segments, a transmitter associated with the distributor at one station, a receiving printer associated with the distributor at a second station, means responsive to the operation of the transmitter to transmit an impulse over the brush of the distributor at said first station to release the brush of the distributor at the second station, whereby the brushes rotate over corresponding segments at the two stations to transmit impulses from the transmitter to the receiving printer, a special signal at said first station, and means at said second station to stop the distributor at said first station and operate said signal.

21. In a printing telegraph system, a line circuit, a plurality of printing telegraph stations associated with said line circuit, a rotary distributor at each station comprising a brush rotatable over a plurality of segments, a transmitter associated with the

distributor at one station, a receiving printer associated with the distributor at a second station, means responsive to the operation of the transmitter to transmit an impulse over the brush of the distributor at said first station to release the brush of the distributor at the second station, whereby the brushes rotate over corresponding segments at the two stations to transmit impulses from the transmitter to the receiving printer, a special signal at said first station, and means to alter the electrical character of the line circuit in such manner as to stop the distributor at said first station and operate said signal.

22. In a printing telegraph system, a line circuit, a plurality of printing telegraph stations associated with said line circuit, a rotary distributor at each station comprising a brush rotatable over a plurality of segments, a transmitter associated with the distributor at one station, a receiving printer associated with the distributor at a second station, means responsive to the operation of the transmitter to transmit an impulse over the brush of the distributor at said first station to release the brush of the distributor at the second station, whereby the brushes rotate over corresponding segments at the two stations to transmit impulses from the transmitter to the receiving printer, a special signal at said first station, and means to open the line circuit to stop the distributor at said first station and operate said signal.

23. In a telegraph system, a line circuit, a plurality of telegraph stations associated with said line circuit, a rotary distributor at each station, a transmitting apparatus associated with the distributor at one station and a receiving apparatus associated with the distributor at a second station, whereby signals may be transmitted from the transmitting apparatus over the line and distributors to the receiving apparatus, a special signal at said first station, and means at the second station to stop the distributor at the first station and operate said signal.

24. In a telegraph system, a line circuit, a plurality of telegraph stations associated with said line circuit, a rotary distributor at each station, a transmitting apparatus associated with the distributor at one station and a receiving apparatus associated with the distributor at a second station, whereby signals may be transmitted from the transmitting apparatus over the line and distributors to the receiving apparatus, a special signal at said first station, and means to open the line circuit to stop one of said distributors and operate said signal.

25. In a printing telegraph system, a transmitting apparatus and a receiving printer associated with each other by means of a normally closed line circuit, a special

signal associated with said transmitting apparatus, said transmitting apparatus being adapted to transmit a code combination consisting of a plurality of open and closed circuit conditions corresponding to signaling impulses to operate said printer without operating said signal, and means whereby a circuit condition of the same character as one of said circuit conditions corresponding to signaling impulses may operate said signal.

26. In a printing telegraph system, a transmitting apparatus and a receiving printer associated with each other by means of a normally closed line circuit, a special signal associated with said transmitting apparatus, said transmitting apparatus being adapted to transmit a code combination consisting of a plurality of open and closed circuit conditions corresponding to signaling impulses to operate said printer without operating said signal, and means whereby a circuit condition of the same character as one of said circuit conditions corresponding to signaling impulses may operate said signal and stop said transmitting apparatus.

27. In a printing telegraph system, a transmitting apparatus and a receiving printer associated with each other by means of a normally closed line circuit, a special signal associated with said transmitting apparatus, said transmitting apparatus being adapted to transmit a code combination consisting of a plurality of open and closed circuit conditions corresponding to signaling impulses to operate said printer without operating said signal, and means whereby a circuit condition of the same character as one of said circuit conditions corresponding to signaling impulses may stop said transmitting apparatus.

28. In a printing telegraph system, a line circuit, a transmitting apparatus and a receiving printer associated with said line circuit, said transmitting apparatus being adapted to transmit a succession of groups of signals of varying characters to operate said receiving printer, one signal of each group being always of the same character, and means to change the character of said signal to stop the transmitter.

29. In a printing telegraph system, a line circuit, a transmitting apparatus and a receiving printer associated with said line circuit, said transmitting apparatus being adapted to transmit a succession of groups of signals of varying characters to operate said receiving printer, one signal of each group being always of the same character, a special signal indicator associated with the transmitter, and means to change the character of said signal to operate said signal indicator.

30. In a printing telegraph system, a line circuit, a transmitting apparatus and

a receiving printer associated with said line circuit, said transmitting apparatus being adapted to transmit a succession of groups of signals of varying character to operate said receiving printer, one signal of each group being always of the same character, a special signal indicator associated with the transmitter, and means to change the character of said signal to operate said signal indicator and stop the transmitter.

31. In a printing telegraph system, a line circuit, a plurality of printing telegraph stations associated with said line circuit, an intermittently operating distributor at each station, a transmitting apparatus associated with the distributor at one station, and a receiving printer associated with the distributor at a second station, means responsive to the actuation of said transmitting apparatus to transmit a starting signal to the line and release both distributors, means to transmit to the line a plurality of variable selecting signals followed by a stopping signal of uniform character, line relays at each station responsive to said signals, a special signal indicator so controlled by the line relay and distributor at the first station that said signal indicator will be actuated only when the character of the last or stopping signal is changed, and means for changing the character of said signal.

32. In a printing telegraph system, a line circuit, a plurality of printing telegraph stations associated with said line circuit, an intermittently operating distributor at each station, a transmitting apparatus associated with the distributor at one station, and a receiving printer associated with the distributor at a second station, means responsive to the actuation of said transmitting apparatus to transmit a starting signal to the line and release both distributors, means to transmit to the line a plurality of variable selecting signals followed by a stopping signal of uniform character, line relays at each station responsive to said signals, a special signal indicator at the first station, a relay for controlling said signal indicator, said relay being controlled by the line relay and distributor at the first station and so arranged as to operate said signal indicator only when the character of the last or stopping signal is changed, means for changing the character of the signal, and means controlled by said relay for preventing further actuation of the distributor when the character of said signal is changed.

33. An electric circuit controlling system comprising a translator, circuits to control the operation of said translator, and signal mechanism for said translator controlled by said circuits only upon the continuance of a signal in one of said circuits

for a time longer than required in the normal operations of the translator.

34. An electric circuit controlling system comprising a line, a translator controlled by signals on the line and having means to cause stoppage thereof substantially at the termination of a normal cycle of its operations regardless of the continuance of a signal of any character on the line.

35. An electric circuit controlling system comprising a line, a translator controlled by

signals on the line and having means to cause stoppage thereof substantially at the termination of a cycle of operations upon a change from normal operating conditions on the line, and signal mechanism associated with said translator and operative only upon such change of conditions on the line.

In testimony whereof, I have signed my name to this specification this 22nd day of 20 January, 1918.

GILBERT SANFORD VERNAM.