

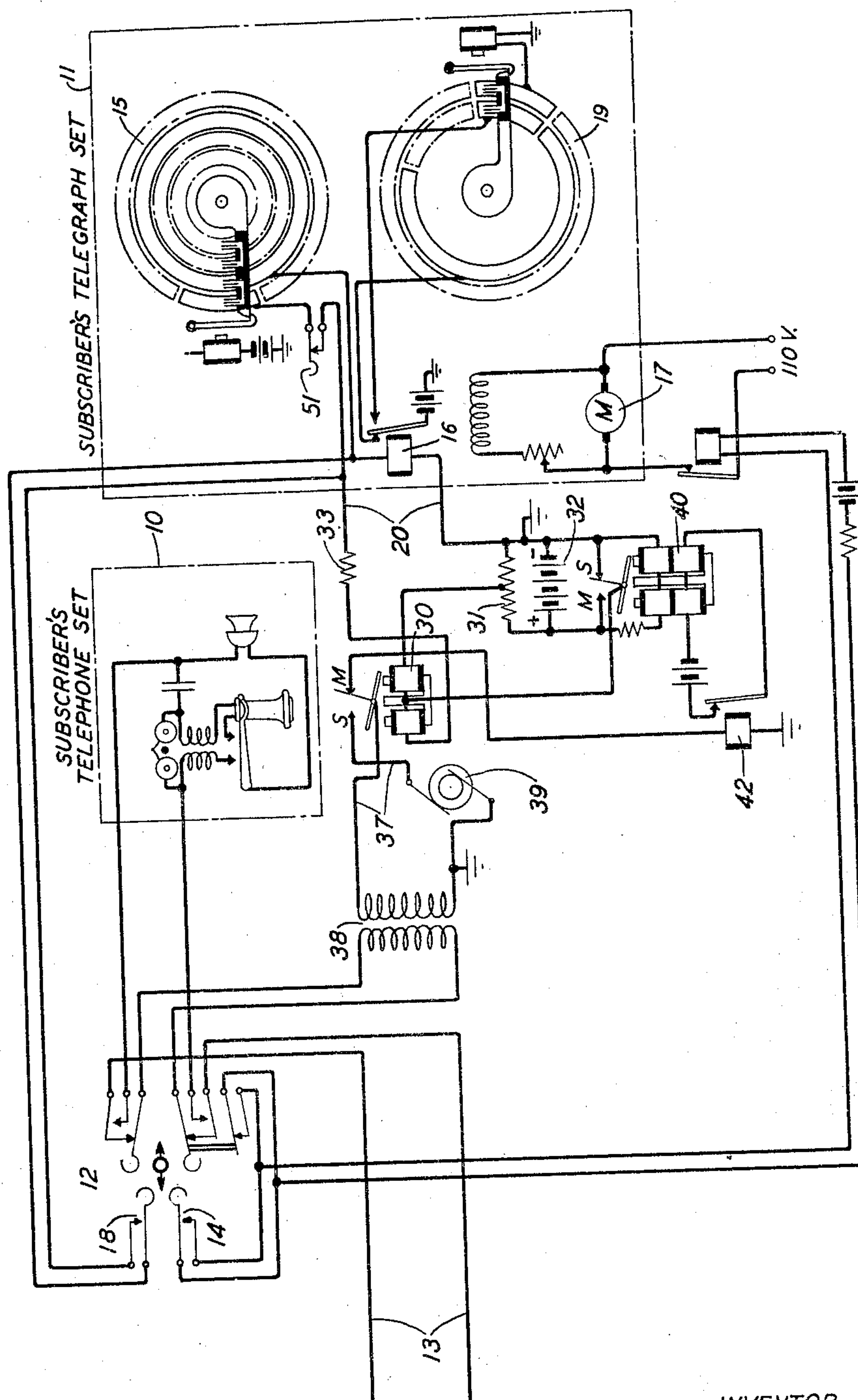
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A. WEAVER

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COMBINED TELEGRAPHY AND TELEPHONY

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INVENTOR
A. WEAVER
BY *g r f o r*
ATTORNEY

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ALLAN WEAVER, OF PORT WASHINGTON, NEW YORK, ASSIGNOR TO AMERICAN TELEPHONE AND TELEGRAPH COMPANY, A CORPORATION OF NEW YORK

COMBINED TELEGRAPHY AND TELEPHONY

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This invention relates to signaling or telegraph systems and particularly to those employed in connection with telephone lines.

An object of this invention is to enable a subscriber who has a telephone set and a printer set connectible to the same line to switch from the telephone set to the printer set without substantial loss of time incidental to the starting of the motor for the printer set.

The usual start-stop distributor employed in printing telegraphy is driven by a direct current motor operating through a friction clutch. Although the motor is stopped once for each revolution, it is necessary that the speed of the motor during a cycle of operation be the same as the speed of the corresponding motor at the other end of the line. In case a printing telegraph set is employed in connection with a telephone circuit, a loss of time may ensue between the instant that the subscriber discontinues using the telephone set and the instant that the motor in the printer set has attained its normal speed. The starting of this motor may consume several seconds.

In accordance with this invention the subscribers may start their motors while they are still using the telephone set and without thereby interrupting their telephone conversation. A feature of this invention is a three position key. In one position of the key the printer set is completely disconnected from the line and the printer motor is at rest. In the second position the transmitting and receiving apparatus of the printer set remain disconnected from the line while a circuit is closed for driving the printer motor. In this position of the key the transmitting contacts of the printer set are closed. During the time that the key is in either the first or the second position the telephone set is connected to the line. In the third position of the key the telephone set is disconnected from the line just after the printing telegraph set is connected.

Another object of this invention is to provide a half duplex signaling system in which a subscriber at the receiving end of the line

may "cut in" or interrupt the transmitting subscriber.

This invention relates to a system in which the transmitted currents are of the same frequency as employed in telephony. Telegraph impulses are characterized by discontinuities in the transmitted wave.

The apparatus at each station is identical. Each comprises a receiving apparatus connected in series with a transmitting apparatus which is adapted to open and close a circuit which passes through the receiving apparatus, transmitting apparatus and a sending relay. Included in this circuit is the armature of a receiving relay. The transmitting apparatus comprises a rotary distributor of the start-stop type which is started from rest for each revolution by the transmission or reception of an open or spacing impulse. In order that current may flow in the circuit including the sending relay, transmitting apparatus and receiving apparatus, it is necessary that the armature of the receiving relay remain upon its marking contact.

Should the receiving subscriber desire to interrupt a message, he presses a key which opens the circuit through his sending relay, transmitter and receiver. This is effective to operate the receiving relay at the transmitting station thereby opening the circuit through the receiver at that station. The opening of this circuit is effective to permit the distributor to rotate continuously, thereby notifying the transmitting subscriber that the other subscriber wants to cut in.

Other objects and features of this invention will be understood more clearly from the following description taken in connection with the accompanying drawing and claims.

In the figure of the drawing is shown a subscriber's station adapted for both telephone and telegraph service. The subscriber's station is provided with a telephone set 10 and a telegraph set 11 adapted to be connected alternatively by means of a key 12 to an ordinary telephone line 13 which extends to a central office (not shown). The telegraph set comprises a transmitting device 15 shown as a distributor, a receiving magnet 16 and

a motor 17. The receiving magnet 16 controls the distributor 19. A telegraph set of this type is shown in the patent issued to G. S. Vernam 1,509,886, September 30, 1924.

5 The distributors include brushes adapted to be driven by the motor 17. The revolving brushes stop once for each revolution and are released upon the transmission or receipt of a spacing impulse over the loop 20 connecting

10 the transmitting device 15 and receiving magnet 16 in series. The loop 20 operates on a half duplex basis and the spacing and marking impulses transmitted across the loop are characterized by open and closed circuit con-

15 ditions respectively.

Included also in the loop circuit 20 is a sending relay 30, a portion of a resistance 31 connected across a battery 32, and another resistance 33. The latter resistance should

20 preferably be of smaller value than resistance 31. The sending relay 30 is polarized and has two windings. The armature of the sending relay 30 is adapted to open and close an oscillator circuit 37 when the telegraph

25 set 11 is transmitting.

The oscillator circuit includes the primary winding of transformer 38 and an oscillator 39 connected in series. The secondary

30 winding of transformer 38 is connected to the line 13 by means of the key 12. The oscillator circuit is adapted to be closed through the spacing contact of sending relay 30, whereby an alternating current is transmitted through the transformer 38 whenever the

35 loop circuit 20 is opened to transmit a spacing impulse. The oscillator circuit 37 is open when the loop 20 is closed, and hence there is no current transmitted to the line 13 while the loop circuit 20 is transmitting a marking

40 impulse.

The line 13 connects the subscriber's station, either directly or through one or more central offices to another subscriber's station similar to the one shown in the accompanying drawing. The frequency of the current

45 generated by the oscillator 39 is preferably within the voice range so that the current may be transmitted over an ordinary telephone line.

50 Assuming that signals are being transmitted from another subscriber's station similar to the one shown, the receiving operation will now be described. The incoming impulses, which it must be remembered, are

55 in the form of an alternating current discontinued at intervals representing marking impulses, pass through the transformer 38. As will be explained subsequently, the armature of the sending relay 30 rests on its marking

60 contact during the reception of impulses. The secondary winding of the transformer is connected through the armature and marking contact of sending relay 30 to the winding of a receiving relay 42 of the alternating

65 current type. Relay 42 is shown as being

energized in response to a received spacing signal. An auxiliary receiving relay 40 of the direct current type is connected to the relay 42 in such manner that the armature of relay 40 rests on its spacing contact only

70 when relay 42 is energized. The armature of relay 40 is connected to the midpoint of the differentially wound sending relay 30, and is adapted to connect the midpoint of that relay with one of the terminals of

75 battery 32.

When the subscriber is receiving, the armature of relay 40, in moving from its spacing to its marking contact, connects battery

80 32 to send an impulse through the left-hand winding of relay 30 and the subscriber's set 11, which then records a marking impulse. The making and breaking, by relay 40, of the circuit just traced does not affect the position

85 of the armature of sending relay 30.

The theory by which the sending relay 30 responds to the transmitted impulses but not to the receiving impulses may now be explained. The position of the armature of

90 either relay 30 or 40 corresponds to the direction of the current flow from negative to positive through the respective windings of the relay. The armature of relay 40, for example, rests against its right-hand or spacing

95 contact whenever there is a (negative to positive) current flow from left to right in the lower winding of relay 40, which overcomes the biasing current from right to left in the upper winding, tending to move the

100 armature toward its left or marking contact.

When the subscriber is receiving, and the loop 20 is closed through the set 11, there is always a current from left to right through

105 one winding or the other of the relay 30, and the field set up by this current maintains the armature against its right-hand or marking contact, irrespective of whether the received impulses happen to be marking or spacing.

Assume that the loop 20 is closed at the

110 transmitter 15 and key 51. When the armature of relay 40 is on spacing, as shown, there will be current flowing through the right-hand winding of relay 30 from left to right with a value which may be designated as

115 being A milliamperes, and at the same time there will be no current flowing through the left-hand winding of relay 30. This current will produce a magnetic effect to hold the

120 armature of relay 30 on its right-hand or marking contact as shown. Now, if the armature of relay 40 be operated to the marking contact, the current through the

125 right-hand winding of relay 30 will be reversed but will have the same value in milliamperes as before, which may be called -A. The left-hand winding of relay 30 will now

130 have a current from left to right and of a value approximately 2A milliamperes, this value being obtained by properly choosing

the values of resistances 33 and 31. The resultant effect of the opposing currents on the relay may be represented as $2A - A$ or A milliamperes in a direction from left to right whereby the armature of relay 30 is held on its marking contact. It is thus evident that as long as the loop 20 is closed the sending relay will remain on its marking contact irrespective of the character of the received impulses.

The following chart indicates the direction of current flow and the consequent position of the armature of relay 30 corresponding to varying conditions of the receiving relay 40 and the loop circuit 20. The arrows indicate the direction and relative magnitude of current flow from negative to positive. By the description "closed", referring to the loop 20, it is meant that the contacts of key 51 and transmitter 15 are closed, and not necessarily that there is a current flowing in the loop 20.

25	Armature of relay 40	Loop 20	Effect on relay 30			
			Left winding	Right winding	Net effect	Armature
30	Spacing	Closed	-----	-----	-----	Marking
	Spacing	Open	-----	-----	-----	Marking
	Marking	Closed	-----	-----	-----	Marking
	Marking	Open	-----	-----	-----	Spacing

From the above it will be seen that the armature of relay 30 rests on its spacing contact only when two conditions concur: first, that the loop 20 is open; and second, that the armature of relay 40 rests upon its marking contact. As explained above, the armature of relay 40 rests upon its marking contact only while no signals are being received from the line 13.

Should a subscriber desire to interrupt a message which he is receiving, he merely opens the loop circuit 20 by means of the key 51. As soon as the next marking impulse is received from the line 13, the transmitting relay 30 moves to its spacing contact, for reasons explained by the above chart. This closes the oscillator circuit 37 which transmits an alternating current denoting a spacing impulse. At the distant end, this spacing impulse is received and causes the receiving relay 40 to move to its spacing contact, thereby applying ground to the midpoint of the differentially wound relay 30. The received spacing impulse interrupts current in the loop circuit 20 open just as long as the alternating current continues. During this time the distributor brushes revolve continuously, thus notifying the transmitting operator that the receiving subscriber desires to cut in.

The arrangement for disconnecting the telephone set 10 from the line 13 and substituting the telegraph set 11 will now be described. The key 12 has three positions. In

its neutral position the line 13 is connected to the telephone set 10. This is the position that the key occupies when a subscriber is engaged in a telephone conversation. Just before the subscriber disconnects his telephone set he advises the other subscriber to prepare his telegraph set, so as to save time incidental to the starting of the motor 17.

While the subscribers are still conversing, each subscriber moves his key 12 to the left. In this position the key does not disconnect the telephone set from the line 13 and the subscribers may continue to converse. While the key is in this position, the motor 17 is started from rest by means of its power circuit which is closed responsive to the closing of contact 14. At the same time a set of contacts 18 short-circuits the transmitting device 15. The purpose of this short circuit is to insure that the loop circuit 20 is closed when the motor starts. Otherwise the distributors might revolve continuously instead of stopping once per revolution.

The key 12 may be held to the left as long as desired, and when the subscribers are through talking, the key 12 at each station is moved to the right. In the latter position of the key, the telegraph set 11 is connected through the transformer 38 and key 12 to the line 13, and the telephone set 10 is disconnected from the line. The telegraph contacts are arranged to make before the telephone contacts break, to prevent giving the operator a false disconnect signal. The subscribers may begin transmitting immediately after moving the key 12 to the right for the reason that the motors are at full speed the instant that the telegraph set is connected to the line 13.

While one form only of the invention has been described and shown, it is obvious that many variations may be made to the present invention without departing from the spirit of the appended claims. For example, the half duplex line 20 need not be connected to a carrier line 13 but may be connected to another half duplex line.

What is claimed is:

1. In a system for the communication of intelligence, a line, a signal receiver comprising a rotary distributor of the start-stop type, a motor for driving said distributor, instrumentalities responsive to a flow of current for preventing rotation of the distributor said instrumentalities including a switch having manually selectable means for energizing the motor and current responsive means, and other instrumentalities for connecting the receiver to the line, whereby the motor may be started independently of the distributor before the receiver is connected to the line.

2. In a communication system, a transmission line, two communication mechanisms connectible alternatively to said line, one of

said mechanisms being a printing telegraph set having a motor, instrumentalities whereby the motor may be started from rest while the other communication mechanism is still
5 connected to the line, and instrumentalities for disconnecting said other mechanism from and connecting the telegraph set to the line without interrupting the rotation of the motor.

10 3. In a communication system, a transmission line, signal receiving means, and a transmitting relay having two pairs of alternately closed contacts, one pair adapted to connect a source of current in series with the line, and
15 the other pair adapted to connect the line with the receiving means.

4. In a signaling system, a loop circuit including a telegraph set, a transmission line, and instrumentalities for connecting the loop
20 circuit to the transmission line, said instrumentalities comprising a sending relay responsive to the opening and closing of said loop circuit and having an armature adapted to open and close the transmission line, and a
25 receiving relay for controlling the electromotive force applied to the loop circuit, said receiving relay being responsive to currents received from the transmission line.

5. In a signaling system, a loop circuit
30 comprising a telegraph set and a sending relay, said sending relay being differential and having an apex connected to a receiving relay, whereby the received signals are ineffective to actuate the sending relay, said sending
35 relay having an armature adapted to open and close a transmission line, and said receiving relay being connected to the transmission line through the armature of the sending relay, whereby the receiving relay
40 does not respond to transmitted signals.

6. In a signaling system, a loop circuit for direct current impulses, a transmission line including a source of alternating current, a
45 sending relay controlled by the direct current impulses and having an armature adapted to interrupt the alternating current in accordance with the direct current impulses, and receiving apparatus connectible to the transmission line through the sending relay armature when said alternating current source is
50 disconnected from the line, whereby the signals transmitted by the sending relay do not affect the receiving relay.

7. In a signaling system, a rotatable distributor, a motor for driving said distributor, a circuit adapted to be successively opened and closed by said distributor, and a device
55 for starting said motor and connecting said circuit to a transmission line, said device being adapted to start the motor before connecting the circuit to the transmission line.
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In testimony whereof, I have signed my name to this specification this 7th day of November 1930.