

E. H. LONG.
SIGNALING APPARATUS.

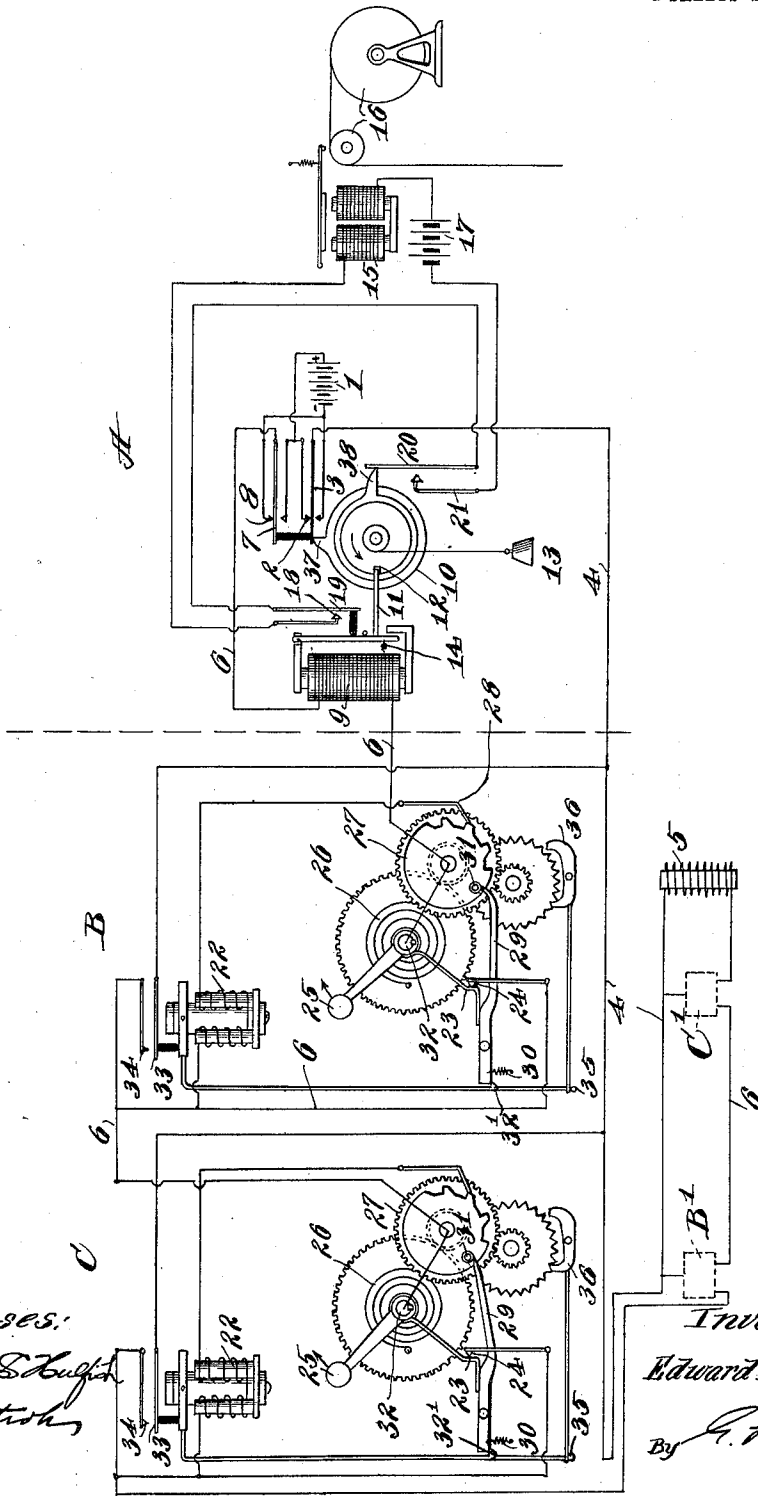
APPLICATION FILED MAY 24, 1909. RENEWED MAR. 19, 1912.

1,029,811.

Patented June 18, 1912.

2 SHEETS-SHEET 1.

Fig. 1.



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2 SHEETS-SHEET 2.

Fig. 3.

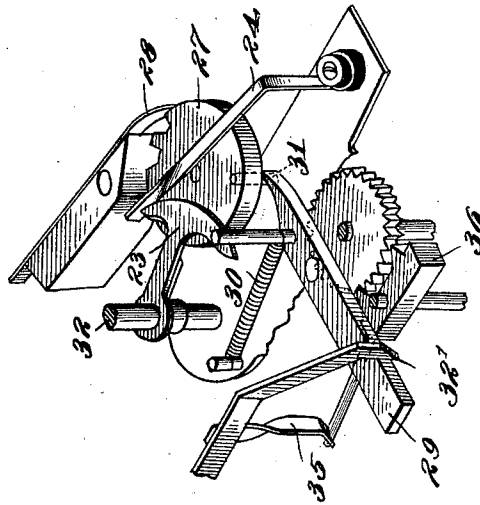
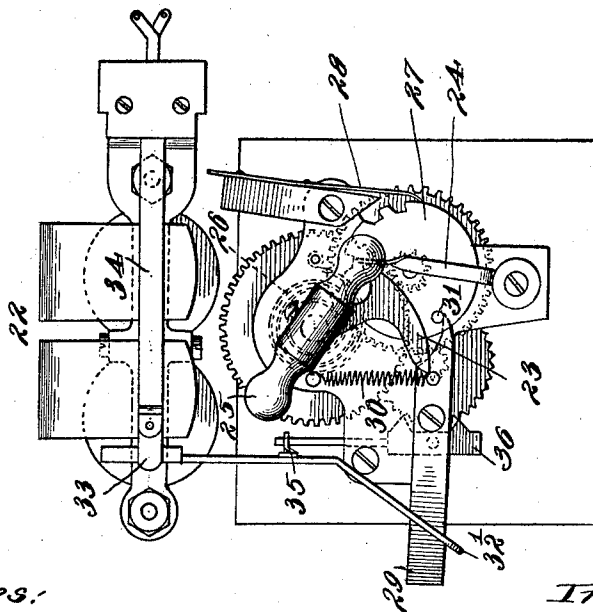


Fig. 2.



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UNITED STATES PATENT OFFICE.

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SIGNALING APPARATUS.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, EDWARD H. LONG, citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented a certain new and useful Improvement in Signaling Apparatus, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to signaling apparatus, and particularly to that general class of signaling apparatus in which a plurality of signal-transmitting devices are associated with a given circuit having a signal-receiving apparatus common thereto.

It is one of the general objects of my invention so to improve the apparatus at the receiving station that it may properly and very effectively cooperate with any operating signal-transmitting apparatus at a transmitting station.

Another general object of my invention is to provide an improved construction of the transmitting apparatus and the inter-relation thereof with the transmission line, so that the transmitting apparatus at each of the transmitting stations may operate to the exclusion of the transmitting apparatus at any of the other transmitting stations, so that an operating transmitting apparatus may appropriate the transmission line, and thereby occasion signals at the signal-receiving station that are characteristic to the transmitting station, it being understood that the transmitting apparatus at the different transmitting stations are adapted to convey characteristic signals that will distinguish the transmitting stations from each other.

It is one of the main objects of my invention so to construct the transmitting devices at the transmitting stations that they will not require manual attention except on the part of one who desires to transmit a signal, it being possible by means of my invention to have the apparatus at the transmitting stations restored to normal after their operation, and in condition again to be operated.

It is another object of my invention so to construct and inter-relate the apparatus at the transmitting stations that but one transmitting station can be operatively associated with a transmission line at a time, so that there will be no confusion of signals at the receiving station.

There are advantages and characteristics of construction which will more fully appear by a description of the preferred embodiment of my invention, shown in the accompanying drawings, in which—

Figure 1 is a diagrammatic view of a signaling system equipped in accordance with the invention. Fig. 2 is a plan view of mechanical apparatus employed at a transmitting station. Fig. 3 is a perspective view of part of the apparatus shown in Fig. 2.

Like parts are indicated by similar characters of reference throughout the different figures.

The mechanical equipment being so well shown in the diagram, and there being so few parts shown in the other views that are not shown in the diagram, the different views will not be separately described.

I employ a closed line circuit, which extends from the signal-receiving station A to the signal-transmitting stations B, C, etc., any suitable and convenient number of transmitting stations being employed, two only being shown in detail for sake of clearness and because of insufficient space to show more. In order that the invention may be more fully understood, other stations equipped similarly to stations B C are diagrammatically suggested at B¹ C¹. The closed circuit that normally exists may be traced from the positive pole of a suitable source of unidirectional current 1, which preferably constitutes a line battery, to the normal contact 2 engaging a spring 3, the side 4 of the closed transmission signal circuit, the conductor 5 uniting the side 4 of the signal-transmission circuit with the side 6 of said circuit, the spring 7, the normal contact 8, to the negative pole of the source of unidirectional current 1, which is preferably a battery, the winding of a non-polarized electro-magnet or relay 9 being serially included in the side 6 of the transmission circuit at the signal-receiving station, the winding of this magnet 9 being located between the spring 7 and the transmitting stations. The conductor 5 which conductively unites the sides 4 and 6 of the transmission circuit, is desirably of impedance, in order that telephones may be bridged between the sides of the line if it should be desired so to do, the impedance preventing shunting of the voice currents, which would otherwise be shunted if the conductor 5 were merely a path of no appreciable ohmic or inductive resistance. If it

were not desired to use a transmission line for telephonic purposes, the impedance at 5 could be omitted. I have not indicated any telephone connections, as the manner of connecting telephonic apparatus between the sides of metallic circuits is so well known to those skilled in the art. The winding of the relay 9 is thus normally included in closed circuit and the armature of said relay or magnet 9 is, therefore, normally magnetically attracted to hold a wheel 10 normally in an inactive position, the armature of the magnet 9 being provided with a stop 11 for this purpose, this stop engaging a notch 12 in a portion of the wheel structure 10. A weight 13, or its equivalent, a spring, is employed to rotate the wheel structure 10 whenever the detent 11 is disengaged from said wheel structure, which disengagement occurs whenever the normally closed transmission circuit is opened at any transmitting station, whereupon the spring 14 is permitted to act to withdraw the detent 11 from engagement with the wheel structure 10.

One of the objects of my invention relates to means for governing the operation of the signal receiver located at the signal-receiving station, and while I prefer, as a signal-receiver, the use of the familiar tape recorder including an operating electro-magnet 15 and the tape apparatus 16, I do not wish to be limited to this form of signal-receiver, as it is obvious that other forms of signal-receivers may be employed to advantage in the system of my invention. The signal-receiver illustrated is included in a local circuit at the signal-receiving station, this local circuit including a source of suitable current, such as a battery 17, and which local circuit may be traced from the right-hand pole of said battery through the winding of the electro-magnet 15, the contact 18, the contact spring 19 normally in separated relation with the contact 18, the contact spring 20 and the contact 21 normally in separated relation with the contact spring 20, to the remaining pole of the local battery 17.

Character wheels, hereinafter to be more particularly mentioned, and each of which is peculiar to its station, are located at the different transmitting stations, so that the signal sender will, by bringing his character wheel into operation, cause successive breaks in the line circuit, occasioning as many deenergizations of the magnet 9, and, consequently, permitting as many operations of the spring 14 at the signal-receiving station, and thereby causing as many closures of the contacts 18 and 19 as there are openings caused in the line circuit at the signal-transmitting station, it being apparent that the spring 14 each time it is free to act, will bring the contact spring 19 into engagement with the contact 18, whereby the signal-re-

ceiver 15 16 is caused to convey a signal which corresponds in character to the operated character wheel, the elements 20 and 21 having been closed upon the disengagement of the detent 11 from the wheel structure 10, the elements 20 and 21 being provided for a purpose which will hereinafter be more particularly set forth.

I have described, in outline, the circuit which normally exists. I will now describe, in some detail, the apparatus shown at the signal-transmitting stations, and will thereafter describe some of the remaining features of the apparatus shown at the signal-receiving station.

At each of the signal-transmitting stations I have shown a polarized magnet 22 which is preferred and whose winding is looped into the side 6 of the transmission circuit, but which winding is preferably normally shunted by a shunt conductor which normally is in parallel relation with the winding of magnet 22 and is normally looped into the side 6 of the transmission line, said shunt conductor thereby normally protecting the magnet 22. This protecting shunt conductor may be traced through the movable contact 23, to the stationarily mounted contact 24, the contacts 23 24 being normally in engagement. When the operating lever or handle 25 is turned against the force of the clock spring 26, the contact elements 23 24 are disengaged, whereby the shunt about the associate magnet 22 is broken, for a purpose presently to be mentioned. When the operating lever 25 is released, the spring 26 which had been placed under increased tension as a result of the operation of the lever 25, effects the rotation of the character wheel 27, whereby said character wheel is caused to open the circuit including the line battery 1 as many times as there are breaks in the character wheel to cause as many closures of the contacts 18 and 19 and as many operations of the signal device 15 16, as has been explained. I have not deemed it important to illustrate and describe fully the mechanism for effecting the operation of the character wheel, as such is well known to those skilled in the art. The character wheel is enabled to perform the function of opening the line circuit, because the loop conductor at the transmitting station including the magnet 22 also includes the associate character wheel and the brush 28 engaging the same. When the signal is initiated at a signal-transmitting station, the polarized magnet 22 is operated, first, because the contacts 23 and 24 included in the shunt about the same are separated when the signal is initiated, and, second, because the battery 1 then has its normal connection with the line, which is such that the polarized magnet 22 will respond to current therefrom as soon as the shunt about said

magnet is opened at 23 24. Inasmuch as the line circuit is opened by the character wheel and the connection of the battery 1 with the line is thereafter reversed, for a purpose which will be stated, I provide means whereby the attracted armature of the polarized relay 22 is mechanically held in the position to which it has been actuated until the signal-transmitting apparatus at the signaling station has been restored to normal. This mechanical means for holding the armature of magnet 22 in its attracted position desirably resides in a lever 29 pivoted between its ends and brought by a spring 30 to rest against a rotating stop 31 carried by the character wheel, the character wheel, when operated, removing the stop 31 from engagement with the arm 29, thereby permitting the spring 30 to rotate the lever 29 when the detent 32¹, governed by the magnet 22, has been disengaged from the lever 29, which disengagement occurs when the magnet 22 is energized and when the signal is first initiated, that is, just as soon as the contacts 23 24 are separated. When the spring 30 has thus rocked the lever 29, the nose of the detent 32¹ will ride upon the lever 29 until the contact arm 23 is brought to normal to cause rotation of the lever 29, and thereby reengagement of the detent 32¹ with the lever 29 and the reengagement of said lever 29 with the pin 31, it being understood that the spring 33 effects the restoration of the armature of the magnet 22, this armature being free to be restored by the spring, inasmuch as the magnet 22 is still unsubject to the current from the battery 1, whose normal connection with the transmission line is timed to occur a few seconds after the character wheel at the transmitting station has been brought to rest. From all which has been described and illustrated, it is very apparent that a number of signal-sending devices along the transmission line may be operated during the time that another transmitting station has control of the line, and that the stations at which the apparatus was later manually operated will assume control of the line in the order of their succession, the station nearest the receiving station first assuming control of the line, the station next nearest the signal-receiving station next assuming control of the line, and so on throughout the waiting stations in succession. While I prefer to use the shunts controlled by the switches 33 34 for temporarily excluding the stations beyond the signaling station that has control of the line, I do not wish to be limited to the shunt switches for this purpose in all embodiments of my invention. The armature of the electro-magnet 22 is held in the position to which it has been momentarily attracted, in order that the contacts 33 and 34 governed by the magnet 22, may be main-

tained closed during the time that signals are being transmitted to the signal-receiving station, the switch 33 34, when closed, establishing a shunt or short circuit across the transmission line beyond the station from which signals are being transmitted, whereby the signal-transmitting apparatus at any stations beyond the stations from which signals are being transmitted, will interfere in no way with the operation of the signal-transmitting apparatus that has acquired possession of the transmission line. Obviously, the station at which transmitting apparatus is first used, irrespective of its location along the transmission line, is the station that has appropriated the line, for at that station the shunt across the line has been established at 33 34, as stated.

It has been shown that current from the line battery 1 must flow through the polarized magnet 22 in a particular direction, in order to establish the shunt at 33 34 across the transmission line to prevent the transmitting apparatus at other stations from operating. In order, therefore, to prevent the magnet 22 at any other transmitting station between the transmitting station that has appropriated the line and the signal-receiving station from being subsequently operated, the connection of the line battery 1 with the line must be reversed, it being permissible to reverse the connection of this battery with the line, inasmuch as the armature of the polarized magnet 22 at the station which has appropriated the line is being mechanically held after its attraction at the signal-transmitting station. In order that the connection of the battery 1 with the line may be reversed immediately after said battery has operated the polarized relay 22, I preferably employ a pole-changing switch, of which the elements 2 3 7 8, that have been mentioned, form parts, the springs 3 and 7 having alternate contacts that are connected with terminals of the battery that are opposite to the terminals with which the normal contacts 2 and 8 are connected, the pole-changing switch being operated by the wheel 10 when the detent 11 releases said wheel 10, which disengagement of said detent from said wheel occurs after the armature of the polarized magnet at the transmitting station which has appropriated the line, has operated, whereby it will be impossible for anyone to operate the signal-transmitting apparatus at any station intervening between the station which has appropriated the line and the signal-receiving station, because at any such intermediate signal-transmitting station that is futilely endeavoring to use the line, the detent 35 carried by the armature of the magnet 22, engages the escapement 36, owing to the fact that the magnet 22 at such station that is endeavoring to use the line is

not energized and can not be energized, because of the fact that the battery 1 has previously had its connection with the line reversed. At the transmitting station which
 5 has secured possession of the line, however, the detent 35 is disengaged from the escapement 36, owing to the attraction of the armature of the magnet 22 and the subsequent mechanical retention of said armature in its attracted position, the escapement 36, through the intermediation of suitable gearing, as is well understood by those
 10 skilled in the art, governing the rotation of the character wheel 27. Thus, in the preferred embodiment of the invention, the lever 25, through electrical means, releases the character wheel 27, but I do not wish to be limited in all embodiments of my invention to electrical mechanism for releasing the character wheel 27.

In the preferred embodiment of the invention, the wheel structure 10 includes a lug 37 upon which the spring structure 3, 7 rests, the springs 3 and 7 being mechanically united by a block of insulating material, as illustrated, whereby said springs may be simultaneously operated. The lug 37 maintains the springs 3 and 7 under slight tension.

Referring again to the receiving station apparatus, when the wheel structure 10 is released by the disengagement of the detent 11 therefrom, the springs 3 and 7 are permitted to move toward their alternate contacts, whereby the normal connection of the line battery 1 with the line is reversed, for the purposes which have been stated. For reasons which will be apparent, it will not do to have the springs 3 and 7 engage their alternate contacts before leaving their normal contacts, and inasmuch as the circuit for the battery 1 will be broken each time the connection of the battery with the line is reversed, the signal-receiver 15 16 would
 45 be operated, unless the precaution of my invention were employed, because the magnet 9 would be deenergized.

I include the contacts 20 21 in serial relation with the local battery 17 and cause
 50 the contacts 20 21 to be closed just after the connection of the battery 1 with the line has been reversed, the engagement of the contacts 20 21 occurring after the contacts 18 19 have been engaged, which latter contacts are engaged upon the release of the wheel structure or during the release of such wheel structure, whereby the contacts 20 21 are, in effect, the contacts which directly occasion the first signal at the signal-receiver 15 16,
 60 but inasmuch as the contacts 20 and 21 remain in engagement until the wheel structure 10 is again arrested in its normal position, the contacts 18 and 19 occasion the further signals at 15 16. In the preferred embodiment of the invention, the wheel struc-

ture 10 includes another lug 38, which normally engages the spring 20, and whose normal position is such with respect to said spring 20 that the lug 38 escapes the spring 20 to permit said spring to engage its contact 21, preferably just shortly after the connection of the battery 1 with the line has been reversed. Conversely, when the normal connection of the battery 1 with the line is restored, the line circuit again will be opened and a false signal again will be occasioned, unless the precaution of my invention were employed, the switch 20 21 again preferably being employed to prevent this false signal, the local circuit including the local battery 17 being opened at 20 21 when the wheel structure 10 is being restored to normal before the normal connection of the battery 1 with the line is brought about, so that the subsequent opening of the line circuit will not be followed by the manifestation of a signal at 15 16, though the contacts 18 and 19 are brought together when the normal connection of the battery 1 with the line is resumed, the circuit including the contacts 18 and 19 having previously been opened at 20 21, as has been stated.

It is apparent that it is only necessary, under certain circumstances, to maintain the switch contacts 33 34 at a transmitting station from which signals are being sent, closed long enough to permit the reversal of the connections of the source of unidirectional current 1 with the line, for after such connections have been reversed, it will be impossible for electro-magnets 22 at other stations to be operated to release the character wheels 27 thereat, owing to the polarization of said other magnets and the change of the direction of the current passing through the same.

While I prefer to employ but one set of battery as a source of unidirectional current at the signal-receiving station, and, therefore, prefer to employ pole-changing mechanism, I do not wish to be limited to the use of one set of battery, nor to the use of pole-changing mechanism for such battery.

The apparatus of my invention may have a variety of uses. It is of particular use in connection with fire alarm service, but I do not wish to be limited to such use.

It will be seen that I have provided a signaling system including a transmission line extending from a signal-receiving station to a plurality of signal-transmitting stations, a source of current in closed circuit with the line, signal-transmitting mechanisms at the signal-transmitting stations for operating the signal-receiving apparatus at the signal-receiving station, electro-magnetic mechanisms at the transmitting stations serving to control the relation of the signal-transmitting mechanisms with the line, means governed by the signal-sending mechanisms at the transmitting stations serving normally

to exclude the electro-magnetic mechanisms from operative relation with the line, and serving, upon the transmission of signals to bring the electro-magnetic mechanism at a sending station into circuit relation with the line to establish coöperative relation of the signal-transmitting mechanism at the sending station with the line, an electro-magnet at the receiving station normally in circuit relation with the line, and mechanism governed by the latter electro-magnet and serving, when circuit is altered at a transmitting station, to impress current upon the line which is not adapted to operate said electro-magnetic mechanisms but which is adapted to coöperate with the signal-transmitting mechanisms to occasion signals at the receiving station.

While I have herein shown and particularly described the preferred embodiment of my invention, it is obvious that many changes may be made in the preferred embodiment of the invention without departing from the spirit of the invention, and I do not, therefore, wish to be limited to the precise details of construction shown and specifically described, but,

Having thus described my invention, I claim as new and desire to secure by Letters Patent:—

1. A signaling system including a transmission line extending from a signal-receiving station to a plurality of signal-transmitting stations, a source of unidirectional current in closed circuit with the line, signal-transmitting mechanisms at the signal-transmitting stations for operating the signal-receiving apparatus at the signal-receiving station, switching devices at the transmitting stations, each serving to exclude other transmitting stations from the line, polarized electro-magnets at the transmitting stations for operating said switching devices, means governed by the signal-sending mechanisms at the transmitting stations serving normally to exclude the polarized electro-magnets from operative relation with the line and serving, upon the transmission of signals, to bring the polarized electro-magnet at a sending station into circuit relation with the line to operate the associate switching device, the normal connection of the source of unidirectional current with the line being such that current from said source of unidirectional current will operate the electro-magnet at a transmitting station whose signal-sending mechanism has brought said electro-magnet into circuit relation with the line, an electro-magnet at the receiving station normally in circuit relation with the line, mechanism governed by the latter electro-magnet and serving, when the circuit is altered at a transmitting station, to connect unidirectional current in reverse direction with the line, means for holding the armature of the po-

larized electro-magnet at the transmitting station from which signals are being sent, in order to maintain the switching mechanism governed by the armature of said polarized electro-magnet in the condition in which said armature has placed said switching mechanism, and means whereby the signal-sending mechanism may release the armature of said polarized electro-magnet when said signal-sending mechanism has been restored to normal.

2. A signaling system including a transmission line extending from a signal-receiving station to a plurality of signal-transmitting stations, a source of unidirectional current in closed circuit with the line, signal-transmitting mechanisms at the signal-transmitting stations for operating the signal-receiving apparatus at the signal-receiving station, switching devices at the transmitting stations, each serving to exclude other transmitting stations from the line, polarized electro-magnets at the transmitting stations for operating said switching devices, means governed by the signal-sending mechanisms at the transmitting stations serving normally to exclude the polarized electro-magnets from operative relation with the line and serving, upon the transmission of signals, to bring the polarized electro-magnet at a sending station into circuit relation with the line to operate the associate switching device, the normal connection of the source of unidirectional current with the line being such that current from said source of unidirectional current will operate the electro-magnet at a transmitting station whose signal-sending mechanism has brought said electro-magnet into circuit relation with the line, an electro-magnet at the receiving station normally in circuit relation with the line, and mechanism governed by the latter electro-magnet and serving, when the circuit is altered at a transmitting station, to connect unidirectional current in reverse direction with the line.

3. A signaling system including a transmission line extending from a signal-receiving station to a plurality of signal-transmitting stations, a source of unidirectional current in closed circuit with the line, signal-transmitting mechanisms at the signal-transmitting stations for operating the signal-receiving apparatus at the signal-receiving station, switching devices at the transmitting stations, each serving to exclude other transmitting stations from the line, polarized electro-magnetic mechanisms at the transmitting stations for operating said switching devices and serving to control the relation of the signal-transmitting mechanisms with the line, and serving, when energized, to cause operative association of said signal-transmitting mechanisms with the

line, means governed by the signal-sending mechanisms at the transmitting stations serving normally to exclude the polarized electro-magnetic mechanisms from operative relation with the line and serving, upon the transmission of signals, to bring the polarized electro-magnetic mechanism at a sending station into circuit relation with the line to operate the associate switching device, the normal connection of the source of unidirectional current with the line being such that current from said source of unidirectional current will operate the electro-magnet at a transmitting station whose signal-sending mechanism has brought said electro-magnet into circuit relation with the line, an electro-magnet at the receiving station normally in circuit relation with the line, mechanism governed by the latter electro-magnet and serving, when the circuit is altered at a transmitting station, to connect unidirectional current in reverse direction with the line, means for holding the armature of the polarized electro-magnet at the transmitting station from which signals are being sent, in order to maintain the switching mechanism governed by the armature of said polarized electro-magnetic mechanism in the condition in which said armature has placed said switching mechanism, and means whereby the signal-sending mechanism may release the armature of said polarized electro-magnetic mechanism when said signal-sending mechanism has been restored to normal.

4. A signaling system including a transmission line extending from a signal-receiving station to a plurality of signal-transmitting stations, a source of unidirectional current in closed circuit with the line, signal-transmitting mechanisms at the signal-transmitting stations for operating the signal-receiving apparatus at the signal-receiving station, switching devices at the transmitting stations, each serving to exclude other transmitting stations from the line, polarized electro-magnetic mechanisms at the transmitting stations for operating said switching devices and serving to control the relation of the signal-transmitting mechanisms with the line, and serving, when energized, to cause operative association of said signal-transmitting mechanisms with the line, means governed by the signal-sending mechanisms at the transmitting stations serving normally to exclude the polarized electro-magnetic mechanisms from operative relation with the line and serving, upon the transmission of signals, to bring the polarized electro-magnetic mechanism at a sending station into circuit relation with the line to operate the associate switching device, the normal connection of the source of unidirectional current with the line being such that current from said source of uni-

directional current will operate the electro-magnet at a transmitting station whose signal-sending mechanism has brought said electro-magnet into circuit relation with the line, an electro-magnet at the receiving station normally in circuit relation with the line, and mechanism governed by the latter electro-magnet and serving, when the circuit is altered at a transmitting station, to connect unidirectional current in reverse direction with the line.

5. A signaling system including a transmission line extending from a signal-receiving station to a plurality of signal-transmitting stations, a source of unidirectional current in closed circuit with the line, signal-transmitting mechanisms at the signal-transmitting stations for operating the signal-receiving apparatus at the signal-receiving station, polarized electro-magnets at the transmitting stations, means governed by the signal-sending mechanisms at the transmitting stations serving normally to exclude the polarized electro-magnets from operative relation with the line and serving, upon the transmission of signals, to bring the polarized electro-magnet at a sending station into circuit relation with the line, the normal connection of the source of unidirectional current with the line being such that current from said source of unidirectional current will operate the electro-magnet at a transmitting station whose signal-sending mechanism has brought said electro-magnet into circuit relation with the line, an electro-magnet at the receiving station normally in circuit relation with the line, and mechanism governed by the latter electro-magnet and serving, when the circuit is altered at a transmitting station, to connect unidirectional current in reverse direction with the line.

6. A signaling system including a transmission line extending from a signal-receiving station to a plurality of signal-transmitting stations, a source of unidirectional current in closed circuit with the line, signal-transmitting mechanisms at the signal-transmitting stations for operating the signal-receiving apparatus at the signal-receiving station, polarized electro-magnetic mechanisms at the transmitting stations serving to control the relation of the signal-transmitting mechanisms with the line, means governed by the signal-sending mechanisms at the transmitting stations serving normally to exclude the polarized electro-magnetic mechanisms from operative relation with the line and serving, upon the transmission of signals, to bring the polarized electro-magnetic mechanism at a sending station into circuit relation with the line, the normal connection of the source of unidirectional current with the line being such that current from said source of uni-

rectional current will operate the electro-magnet at a transmitting station whose signal-sending mechanism has brought said electro-magnet into circuit relation with the line, an electro-magnet at the receiving station normally in circuit relation with the line, and mechanism governed by the latter electro-magnet and serving, when the circuit is altered at a transmitting station, to connect unidirectional current in reverse direction with the line.

7. A signaling system including a transmission line extending from a signal-receiving station to a plurality of signal-transmitting stations, a source of unidirectional current in circuit relation with the line, signal-transmitting mechanisms at the signal-transmitting stations for operating the signal-receiving apparatus at the signal-receiving station, switching devices at the transmitting stations, each serving to exclude other transmitting stations from the line, polarized electro-magnets at the transmitting stations for operating said switching devices, means governed by the signal-sending mechanisms at the transmitting stations serving normally to exclude the polarized electro-magnets from operative relation with the line and serving, upon the transmission of signals, to bring the polarized electro-magnet at a sending station into circuit relation with the line to operate the associate switching device, the normal connection of the source of unidirectional current with the line being such that current from said source of unidirectional current will operate the electro-magnet at a transmitting station whose signal-sending mechanism has brought said electro-magnet into circuit relation with the line, an electro-magnet at the receiving station normally in circuit relation with the line, mechanism governed by the latter electro-magnet and serving, when the circuit is altered at a transmitting station, to connect unidirectional current in reverse direction with the line, means for holding the armature of the polarized electro-magnet at the transmitting station from which signals are being sent, in order to maintain the switching mechanism governed by the armature of said polarized electro-magnet in the condition in which said armature has placed said switching mechanism, and means whereby the signal-sending mechanism may release the armature of said polarized electro-magnet when said signal-sending mechanism has been restored to normal.

8. A signaling system including a transmission line extending from a signal-receiving station to a plurality of signal-transmitting stations, a source of unidirectional current in circuit relation with the line, signal-transmitting mechanisms at the signal-transmitting stations for operating the sig-

nal-receiving apparatus at the signal-receiving station, switching devices at the transmitting stations, each serving to exclude other transmitting stations from the line, polarized electro-magnets at the transmitting stations for operating said switching devices, means governed by the signal-sending mechanisms at the transmitting stations serving normally to exclude the polarized electro-magnets from operative relation with the line and serving, upon the transmission of signals, to bring the polarized electro-magnet at a sending station into circuit relation with the line to operate the associate switching device, the normal connection of the source of unidirectional current with the line being such that current from said source of unidirectional current will operate the electro-magnet at a transmitting station whose signal-sending mechanism has brought said electro-magnet into circuit relation with the line, an electro-magnet at the receiving station normally in circuit relation with the line, and mechanism governed by the latter electro-magnet and serving, when the circuit is altered at a transmitting station, to connect unidirectional current in reverse direction with the line.

9. A signaling system including a transmission line extending from a signal-receiving station to a plurality of signal-transmitting stations, a source of unidirectional current in circuit relation with the line, signal-transmitting mechanisms at the signal-transmitting stations for operating the signal-receiving apparatus at the signal-receiving station, switching devices at the transmitting stations, each serving to exclude other transmitting stations from the line, polarized electro-magnetic mechanisms at the transmitting stations for operating said switching devices and serving to control the relation of the signal-transmitting mechanisms with the line, and serving, when energized, to cause operative association of said signal-transmitting mechanisms with the line, means governed by the signal-sending mechanisms at the transmitting stations serving normally to exclude the polarized electro-magnetic mechanisms from operative relation with the line and serving, upon the transmission of signals, to bring the polarized electro-magnetic mechanism at a sending station into circuit relation with the line to operate the associate switching device, the normal connection of the source of unidirectional current with the line being such that current from said source of unidirectional current will operate the electro-magnet at a transmitting station whose signal-sending mechanism has brought said electro-magnet into circuit relation with the line, an electro-magnet at the receiving station normally in circuit relation

with the line, mechanism governed by the latter electro-magnet and serving, when the circuit is altered at a transmitting station, to connect unidirectional current in reverse direction with the line, means for holding the armature of the polarized electro-magnet at the transmitting station from which signals are being sent, in order to maintain the switching mechanism governed by the armature of said polarized electro-magnetic mechanism in the condition in which said armature has placed said switching mechanism, and means whereby the signal-sending mechanism may release the armature of said polarized electro-magnetic mechanism when said signal-sending mechanism has been restored to normal.

10. A signaling system including a transmission line extending from a signal-receiving station to a plurality of signal-transmitting stations, a source of unidirectional current in circuit relation with the line, signal-transmitting mechanisms at the signal-transmitting stations for operating the signal-receiving apparatus at the signal-receiving station, switching devices at the transmitting stations, each serving to exclude other transmitting stations from the line, polarized electro-magnetic mechanisms at the transmitting stations for operating said switching devices and serving to control the relation of the signal-transmitting mechanisms with the line, and serving, when energized, to cause operative association of said signal-transmitting mechanisms with the line, means governed by the signal-sending mechanisms at the transmitting stations serving normally to exclude the polarized electro-magnetic mechanisms from operative relation with the line and serving, upon the transmission of signals, to bring the polarized electro-magnetic mechanism at a sending station into circuit relation with the line to operate the associate switching device, the normal connection of the source of unidirectional current with the line being such that current from said source of unidirectional current will operate the electro-magnet at a transmitting station whose signal-sending mechanism has brought said electro-magnet into circuit relation with the line, an electro-magnet at the receiving station normally in circuit relation with the line, and mechanism governed by the latter electro-magnet and serving, when the circuit is altered at a transmitting station, to connect unidirectional current in reverse direction with the line.

11. A signaling system including a transmission line extending from a signal-receiving station to a plurality of signal-transmitting stations, a source of unidirectional current in circuit relation with the line, signal-transmitting mechanisms at the signal-transmitting stations for operating the

signal-receiving apparatus at the signal-receiving station, polarized electro-magnets at the transmitting stations, means governed by the signal-sending mechanisms at the transmitting stations serving normally to exclude the polarized electro-magnets from operative relation with the line and serving, upon the transmission of signals, to bring the polarized electro-magnet at a sending station into circuit relation with the line, the normal connection of the source of unidirectional current with the line being such that current from said source of unidirectional current will operate the electro-magnet at a transmitting station whose signal-sending mechanism has brought said electro-magnet into circuit relation with the line, an electro-magnet at the receiving station normally in circuit relation with the line, and mechanism governed by the latter electro-magnet and serving, when the circuit is altered at a transmitting station, to connect unidirectional current in reverse direction with the line.

12. A signaling system including a transmission line extending from a signal-receiving station to a plurality of signal-transmitting stations, a source of unidirectional current in circuit relation with the line, signal-transmitting mechanisms at the signal-transmitting stations for operating the signal-receiving apparatus at the signal-receiving station, polarized electro-magnetic mechanisms at the transmitting stations serving to control the relation of the signal-transmitting mechanisms with the line, means governed by the signal-sending mechanisms at the transmitting stations serving normally to exclude the polarized electro-magnetic mechanisms from operative relation with the line and serving, upon the transmission of signals, to bring the polarized electro-magnetic mechanism at a sending station into circuit relation with the line, the normal connection of the source of unidirectional current with the line being such that current from said source of unidirectional current will operate the electro-magnet at a transmitting station whose signal-sending mechanism has brought said electro-magnet into circuit relation with the line, an electro-magnet at the receiving station normally in circuit relation with the line, and mechanism governed by the latter electro-magnet and serving, when the circuit is altered at a transmitting station, to connect unidirectional current in reverse direction with the line.

13. A signaling system including a transmission line extending from a signal-receiving station to a plurality of signal-transmitting stations, a source of unidirectional current in closed circuit with the line, signal-transmitting mechanisms at the signal-transmitting stations for operating the signal-re-

ceiving apparatus at the signal-receiving station, switching devices at the transmitting stations, each serving to exclude other transmitting stations from the line, polarized electro-magnets adapted to be looped into the line at the transmitting stations for operating said switching devices, means governed by the signal-sending mechanisms at the transmitting stations serving normally to exclude the polarized electro-magnets from operative relation with the line and serving, upon the transmission of signals, to bring the polarized electro-magnet at a sending station into circuit relation with the line to operate the associate switching device, the normal connection of the source of unidirectional current with the line being such that current from said source of unidirectional current will operate the electro-magnet at a transmitting station whose signal-sending mechanism has brought said electro-magnet into circuit relation with the line, an electro-magnet at the receiving station normally in circuit relation with the line, mechanism governed by the latter electro-magnet and serving, when the circuit is altered at a transmitting station, to connect unidirectional current in reverse direction with the line, means for holding the armature of the polarized electro-magnet at the transmitting station from which signals are being sent, in order to maintain the switching mechanism governed by the armature of said polarized electro-magnet in the condition in which said armature has placed said switching mechanism, and means whereby the signal-sending mechanism may release the armature of said polarized electro-magnet when said signal-sending mechanism has been restored to normal.

14. A signaling system including a transmission line extending from a signal-receiving station to a plurality of signal-transmitting stations, a source of unidirectional current in closed circuit with the line, signal-transmitting mechanisms at the signal-transmitting stations for operating the signal-receiving apparatus at the signal-receiving station, switching devices at the transmitting stations, each serving to exclude other transmitting stations from the line, polarized electro-magnets adapted to be looped into the line at the transmitting stations for operating said switching devices, means governed by the signal-sending mechanisms at the transmitting stations serving normally to exclude the polarized electro-magnets from operative relation with the line and serving, upon the transmission of signals, to bring the polarized electro-magnet at a sending station into circuit relation with the line to operate the associate switching device, the normal connection of the source of unidirectional current with the line being such that current from said source of unidirectional

current will operate the electro-magnet at a transmitting station whose signal-sending mechanism has brought said electro-magnet into circuit relation with the line, an electro-magnet at the receiving station normally in circuit relation with the line, and mechanism governed by the latter electro-magnet and serving, when the circuit is altered at a transmitting station, to connect unidirectional current in reverse direction with the line.

15. A signaling system including a transmission line extending from a signal-receiving station to a plurality of signal-transmitting stations, a source of unidirectional current in closed circuit with the line, signal-transmitting mechanisms at the signal-transmitting stations for operating the signal-receiving apparatus at the signal-receiving station, switching devices at the transmitting stations, each serving to exclude other transmitting stations from the line, polarized electro-magnetic mechanisms adapted to be looped into the line at the transmitting stations for operating said switching devices and serving to control the relation of the signal-transmitting mechanisms with the line, and serving, when energized, to cause operative association of said signal-transmitting mechanisms with the line, means governed by the signal-sending mechanisms at the transmitting stations serving normally to exclude the polarized electro-magnetic mechanisms from operative relation with the line and serving, upon the transmission of signals, to bring the polarized electro-magnetic mechanism at a sending station into circuit relation with the line to operate the associate switching device, the normal connection of the source of unidirectional current with the line being such that current from said source of unidirectional current will operate the electro-magnet at a transmitting station whose signal-sending mechanism has brought said electro-magnet into circuit relation with the line, an electro-magnet at the receiving station normally in circuit relation with the line, mechanism governed by the latter electro-magnet and serving, when the circuit is altered at a transmitting station, to connect unidirectional current in reverse direction with the line, means for holding the armature of the polarized electro-magnet at the transmitting station from which signals are being sent, in order to maintain the switching mechanism governed by the armature of said polarized electro-magnetic mechanism in the condition in which said armature has placed said switching mechanism, and means whereby the signal-sending mechanism may release the armature of said polarized electro-magnetic mechanism when said signal-sending mechanism has been restored to normal.

16. A signaling system including a transmission line extending from a signal-receiving station to a plurality of signal-transmitting stations, a source of unidirectional current in closed circuit with the line, signal-transmitting mechanisms at the signal-transmitting stations for operating the signal-receiving apparatus at the signal-receiving station, switching devices at the transmitting stations, each serving to exclude other transmitting stations from the line, polarized electro-magnetic mechanisms adapted to be looped into the line at the transmitting stations for operating said switching devices and serving to control the relation of the signal-transmitting mechanisms with the line, and serving, when energized, to cause operative association of said signal-transmitting mechanisms with the line, means governed by the signal-sending mechanisms at the transmitting stations serving normally to exclude the polarized electro-magnetic mechanisms from operative relation with the line and serving, upon the transmission of signals, to bring the polarized electro-magnetic mechanism at a sending station into circuit relation with the line to operate the associate switching device, the normal connection of the source of unidirectional current with the line being such that current from said source of unidirectional current will operate the electro-magnet at a transmitting station whose signal-sending mechanism has brought said electro-magnet into circuit relation with the line, an electro-magnet at the receiving station normally in circuit relation with the line, and mechanism governed by the latter electro-magnet and serving, when the circuit is altered at a transmitting station, to connect unidirectional current in reverse direction with the line.

17. A signaling system including a transmission line extending from a signal-receiving station to a plurality of signal-transmitting stations, a source of unidirectional current in closed circuit with the line, signal-transmitting mechanisms at the signal-transmitting stations for operating the signal-receiving apparatus at the signal-receiving station, polarized electro-magnets adapted to be looped into the line at the transmitting stations, means governed by the signal-sending mechanisms at the transmitting stations serving normally to exclude the polarized electro-magnets from operative relation with the line and serving, upon the transmission of signals, to bring the polarized electro-magnet at a sending station into circuit relation with the line, the normal connection of the source of unidirectional current with the line being such that current from said source of unidirectional current will operate the electro-magnet at a transmitting station whose signal-sending

mechanism has brought said electro-magnet into circuit relation with the line, an electro-magnet at the receiving station normally in circuit relation with the line, and mechanism governed by the latter electro-magnet and serving, when the circuit is altered at a transmitting station, to connect unidirectional current in reverse direction with the line.

18. A signaling system including a transmission line extending from a signal-receiving station to a plurality of signal-transmitting stations, a source of unidirectional current in closed circuit with the line, signal-transmitting mechanisms at the signal-transmitting stations for operating the signal-receiving apparatus at the signal-receiving station, polarized electro-magnetic mechanisms adapted to be looped into the line at the transmitting stations serving to control the relation of the signal-transmitting mechanisms with the line, means governed by the signal-sending mechanisms at the transmitting stations serving normally to exclude the polarized electro-magnetic mechanisms from operative relation with the line and serving, upon the transmission of signals, to bring the polarized electro-magnetic mechanism at a sending station into circuit relation with the line, the normal connection of the source of unidirectional current with the line being such that current from said source of unidirectional current will operate the electro-magnet at a transmitting station whose signal-sending mechanism has brought said electro-magnet into circuit relation with the line, an electro-magnet at the receiving station normally in circuit relation with the line, and mechanism governed by the latter electro-magnet and serving, when the circuit is altered at a transmitting station, to connect unidirectional current in reverse direction with the line.

19. A signaling system including a transmission line extending from a signal-receiving station to a plurality of signal-transmitting stations, a source of unidirectional current in closed circuit with the line, signal-transmitting mechanisms at the signal-transmitting stations for operating the signal-receiving apparatus at the signal-receiving station, polarized electro-magnetic mechanisms adapted to be looped into the line at the transmitting stations serving to control the relation of the signal-transmitting mechanisms with the line, the normal connection of the source of unidirectional current with the line being such that current from said source of unidirectional current will operate the electro-magnet at a transmitting station from which signals are being sent, an electro-magnet at the receiving station normally in circuit relation with the line, and mechanism governed by the latter

electro-magnet and serving, when the circuit is altered at a transmitting station, to connect unidirectional current in reverse direction with the line.

5 20. A signaling system including a transmission line extending from a signal-receiving station to a plurality of signal-transmitting stations, a source of unidirectional current in circuit relation with the line, signal-transmitting mechanisms at the signal-receiving apparatus at the signal-receiving station, switching devices at the transmitting stations, each serving to exclude other transmitting stations from the line, polarized electro-magnets adapted to be looped into the line at the transmitting stations for operating said switching devices, means governed by the signal-sending mechanisms at the transmitting stations serving normally to exclude the polarized electro-magnets from operative relation with the line and serving, upon the transmission of signals, to bring the polarized electro-magnet at a sending station into circuit relation with the line to operate the associate switching device, the normal connection of the source of unidirectional current with the line being such that current from said source of unidirectional current will operate the electro-magnet at a transmitting station whose signal-sending mechanism has brought said electro-magnet into circuit relation with the line, an electro-magnet at the receiving station normally in circuit relation with the line, mechanism governed by the latter electro-magnet and serving, when the circuit is altered at a transmitting station, to connect unidirectional current in reverse direction with the line, means for holding the armature of the polarized electro-magnet at the transmitting station from which signals are being sent, in order to maintain the switching mechanism governed by the armature of said polarized electro-magnet in the condition in which said armature has placed said switching mechanism, and means whereby the signal-sending mechanism may release the armature of said polarized electro-magnet when said signal-sending mechanism has been restored to normal.

21. A signaling system including a transmission line extending from a signal-receiving station to a plurality of signal-transmitting stations, a source of unidirectional current in circuit relation with the line, signal-transmitting mechanisms at the signal-transmitting stations for operating the signal-receiving apparatus at the signal-receiving station, switching devices at the transmitting stations, each serving to exclude other transmitting stations from the line, polarized electro-magnets adapted to be looped into the line at the transmitting sta-

tions for operating said switching devices, means governed by the signal-sending mechanisms at the transmitting stations serving normally to exclude the polarized electro-magnets from operative relation with the line and serving, upon the transmission of signals, to bring the polarized electro-magnet at a sending station into circuit relation with the line to operate the associate switching device, the normal connection of the source of unidirectional current with the line being such that current from said source of unidirectional current will operate the electro-magnet at a transmitting station whose signal-sending mechanism has brought said electro-magnet into circuit relation with the line, an electro-magnet at the receiving station normally in circuit relation with the line, and mechanism governed by the latter electro-magnet and serving, when the circuit is altered at a transmitting station, to connect unidirectional current in reverse direction with the line.

22. A signaling system including a transmission line extending from a signal-receiving station to a plurality of signal-transmitting stations, a source of unidirectional current in circuit relation with the line, signal-transmitting mechanisms at the signal-transmitting stations for operating the signal-receiving apparatus at the signal-receiving station, switching devices at the transmitting stations, each serving to exclude other transmitting stations from the line, polarized electro-magnetic mechanisms adapted to be looped into the line at the transmitting stations for operating said switching devices and serving to control the relation of the signal-transmitting mechanisms with the line, and serving, when energized, to cause operative association of said signal-transmitting mechanisms with the line, means governed by the signal-sending mechanisms at the transmitting stations serving normally to exclude the polarized electro-magnetic mechanisms from operative relation with the line and serving, upon the transmission of signals, to bring the polarized electro-magnetic mechanism at a sending station into circuit relation with the line to operate the associate switching device, the normal connection of the source of unidirectional current with the line being such that current from said source of unidirectional current will operate the electro-magnet at a transmitting station whose signal-sending mechanism has brought said electro-magnet into circuit relation with the line, an electro-magnet at the receiving station normally in circuit relation with the line, mechanism governed by the latter electro-magnet and serving, when the circuit is altered at a transmitting station, to connect unidirectional current in reverse direction with the

line, means for holding the armature of the polarized electro-magnet at the transmitting station from which signals are being sent, in order to maintain the switching mechanism 5 governed by the armature of said polarized electro-magnetic mechanism in the condition in which said armature has placed said switching mechanism, and means whereby the signal-sending mechanism may release 10 the armature of said polarized electro-magnetic mechanism when said signal-sending mechanism has been restored to normal.

23. A signaling system including a transmission line extending from a signal-receiving station to a plurality of signal-transmitting stations, a source of unidirectional current in circuit relation with the line, signal-transmitting mechanisms at the signal-transmitting stations for operating the signal-receiving apparatus at the signal-receiving station, switching devices at the transmitting stations, each serving to exclude other transmitting stations from the line, polarized electro-magnetic mechanisms adapted 25 to be looped into the line at the transmitting stations for operating said switching devices and serving to control the relation of the signal-transmitting mechanisms with the line, and serving, when energized, to cause operative association of said signal-transmitting mechanisms with the line, means 30 governed by the signal-sending mechanisms at the transmitting stations serving normally to exclude the polarized electro-magnetic mechanisms from operative relation with the line and serving, upon the transmission of signals, to bring the polarized electro-magnetic mechanism at a sending station into circuit relation with the line to 40 operate the associate switching device, the normal connection of the source of unidirectional current with the line being such that current from said source of unidirectional current will operate the electro-magnet at a transmitting station whose signal-sending mechanism has brought said electro-magnet into circuit relation with the line, an electro-magnet at the receiving station normally in circuit relation with the line, and mechanism 50 governed by the latter electro-magnet and serving, when the circuit is altered at a transmitting station, to connect unidirectional current in reverse direction with the line.

24. A signaling system including a transmission line extending from a signal-receiving station to a plurality of signal-transmitting stations, a source of unidirectional current in circuit relation with the line, signal-transmitting mechanisms at the signal-transmitting stations for operating the signal-receiving apparatus at the signal-receiving station, polarized electro-magnets adapted to be looped into the line at the transmitting 65 stations, means governed by the signal-sending

mechanisms at the transmitting stations serving normally to exclude the polarized electro-magnets from operative relation with the line and serving, upon the transmission of signals, to bring the polarized electro-magnet at a sending station into circuit relation with the line, the normal connection of the source of unidirectional current with the line being such that current from said source of unidirectional current will operate 75 the electro-magnet at a transmitting station whose signal-sending mechanism has brought said electro-magnet into circuit relation with the line, an electro-magnet at the receiving station normally in circuit relation with the line, and mechanism governed by the latter electro-magnet and serving, when the circuit is altered at a transmitting station, to connect unidirectional current in reverse direction with the line. 85

25. A signaling system including a transmission line extending from a signal-receiving station to a plurality of signal-transmitting stations, a source of unidirectional current in circuit relation with the line, signal-transmitting mechanisms at the signal-transmitting stations for operating the signal-receiving apparatus at the signal-receiving station, polarized electro-magnetic mechanisms adapted to be looped into the line at 95 the transmitting stations serving to control the relation of the signal-transmitting mechanisms with the line, means governed by the signal-sending mechanisms at the transmitting stations serving normally to exclude 100 the polarized electro-magnetic mechanisms from operative relation with the line and serving, upon the transmission of signals, to bring the polarized electro-magnetic mechanism at a sending station into circuit relation with the line, the normal connection of the source of unidirectional current with the line being such that current from said source of unidirectional current will operate the electro-magnet at a transmitting station whose signal-sending mechanism has brought said electro-magnet into circuit relation with the line, an electro-magnet at the receiving station normally in circuit relation with the line, and mechanism 115 governed by the latter electro-magnet and serving, when the circuit is altered at a transmitting station, to connect unidirectional current in reverse direction with the line.

26. A signaling system including a transmission line extending from a signal-receiving station to a plurality of signal-transmitting stations, a source of unidirectional current in circuit relation with the line, signal-transmitting mechanisms at the signal-transmitting stations for operating the signal-receiving apparatus at the signal-receiving station, polarized electro-magnetic mechanisms adapted to be looped into the line at the transmitting stations serving to 125

control the relation of the signal-transmitting mechanisms with the line, the normal connection of the source of unidirectional current with the line being such that current from said source of unidirectional current will operate the electro-magnet at a transmitting station from which signals are being sent, an electro-magnet at the receiving station normally in circuit relation with the line, and mechanism governed by the latter electro-magnet and serving, when the circuit is altered at a transmitting station, to connect unidirectional current in reverse direction with the line.

27. A signaling system including a transmission line extending from a signal-receiving station to a plurality of signal-transmitting stations, a source of current in closed circuit with the line, signal-transmitting mechanisms at the signal-transmitting stations for operating the signal-receiving apparatus at the signal-receiving station, electro-magnetic mechanisms at the transmitting stations serving to control the relation of the signal-transmitting mechanisms with the line, means governed by the signal-sending mechanisms at the transmitting stations serving normally to exclude the electro-magnetic mechanisms from operative relation with the line, and serving, upon the transmission of signals to bring the electro-magnetic mechanism at a sending station into circuit relation with the line to establish co-operative relation of the signal-transmitting mechanism at the sending station with the line, an electro-magnet at the receiving station normally in circuit relation with the line, and mechanism governed by the latter electro-magnet and serving, when circuit is altered at a transmitting station, to impress current upon the line which is not adapted to operate said electro-magnetic mechanisms but which is adapted to cooperate with the signal-transmitting mechanisms to occasion signals at the receiving station.

28. A signaling system including a transmission line extending from a signal-receiving station to a plurality of signal-transmitting stations, a source of current in closed circuit with the line, signal-transmitting mechanisms at the signal-transmitting stations for operating the signal-receiving apparatus at the signal-receiving station, electro-magnetic mechanisms at the transmitting stations serving to control the relation of the signal-transmitting mechanisms with the line, the signal-transmitting apparatus at a sending station serving to bring the electro-magnetic mechanism at the sending station into circuit relation with the line to establish co-operative relation of the signal-transmitting mechanism at the sending station with the line, an electro-magnet at the receiving station normally in circuit relation with the line, and mechanism gov-

erned by the latter electro-magnet and serving, when circuit is altered at a transmitting station, to impress current upon the line which is not adapted to operate said electro-magnetic mechanisms but which is adapted to cooperate with the signal-transmitting mechanisms to occasion signals at the receiving station.

29. A signaling system including a transmission line extending from a signal-receiving station to a plurality of signal-transmitting stations, a source of current in closed circuit with the line, signal-transmitting mechanisms at the signal-transmitting stations for operating the signal-receiving apparatus at the signal-receiving station, switching devices at the transmitting stations, each serving to exclude other transmitting stations from the line, electro-magnetic mechanisms at the transmitting stations for operating said switching devices, electro-magnetic mechanism at a sending station operating the switching device thereat to exclude the remaining transmitting stations from the line, an electro-magnet at the receiving station normally in circuit relation with the line, and mechanism governed by the latter electro-magnet and serving, when circuit is altered at a transmitting station, to impress current upon the line which is not adapted to operate said electro-magnetic mechanisms but which is adapted to cooperate with the signal-transmitting mechanisms to occasion signals at the receiving station.

30. A signaling system including a transmission line extending from a signal-receiving station to a plurality of signal-transmitting stations, a source of current in closed circuit with the line, signal-transmitting mechanisms at the signal-transmitting stations for operating the signal-receiving apparatus at the signal-receiving station, switching devices at the transmitting stations, each serving to exclude other transmitting stations from the line, electro-magnetic mechanisms at the transmitting stations and serving to control the relation of the signal-transmitting mechanisms with the line, means governed by the signal-sending mechanisms at the transmitting stations serving normally to exclude the electro-magnetic mechanisms from operative relation with the line, and serving, upon the transmission of signals to bring the electro-magnetic mechanism at a sending station into circuit relation with the line to operate the associate switching device, an electro-magnet at the receiving station normally in circuit relation with the line, and mechanism governed by the latter electro-magnet and serving, when circuit is altered at a transmitting station, to impress current upon the line which is not adapted to operate said

electro-magnetic mechanisms but which is adapted to cooperate with the signal-transmitting mechanisms to occasion signals at the receiving station.

5 31. A signaling system including a transmission line extending from a signal-receiving station to a plurality of signal-transmitting stations, a source of current in circuit relation with the line, signal-transmitting mechanisms at the signal-transmitting stations for operating the signal-receiving apparatus at the signal-receiving station, electro-magnetic mechanisms at the transmitting stations serving to control the relation of the signal-transmitting mechanisms with the line, means governed by the signal-sending mechanisms at the transmitting stations serving normally to exclude the electro-magnetic mechanisms from operative relation with the line, and serving, upon the transmission of signals to bring the electro-magnetic mechanism at a sending station into circuit relation with the line to establish cooperative relation of the signal-transmitting mechanism at the sending station with the line, an electro-magnet at the receiving station normally in circuit relation with the line, and mechanism governed by the latter electro-magnet and serving, when circuit is altered at a transmitting station, to impress current upon the line which is not adapted to operate said electro-magnetic mechanisms but which is adapted to cooperate with the signal-transmitting mechanisms to occasion signals at the receiving station.

32. A signaling system including a transmission line extending from a signal-receiving station to a plurality of signal-transmitting stations, a source of current in circuit relation with the line, signal-transmitting mechanisms at the signal-transmitting stations for operating the signal-receiving apparatus at the signal-receiving station, electro-magnetic mechanisms at the transmitting stations serving to control the relation of the signal-transmitting mechanisms with the line, the signal-transmitting apparatus at a sending station serving to bring the electro-magnetic mechanism at the sending station into circuit relation with the line to establish cooperative relation of the signal-transmitting mechanism at the sending station with the line, an electro-magnet at the receiving station normally in circuit relation with the line, and mechanism governed by the latter electro-magnet and serving, when circuit is altered at a transmitting station, to impress current upon the line which is not adapted to operate said electro-magnetic mechanisms but which is adapted to cooperate with the signal-transmitting mechanisms to occasion signals at the receiving station.

33. A signaling system including a trans-

mission line extending from a signal-receiving station to a plurality of signal-transmitting stations, a source of current in circuit relation with the line, signal-transmitting mechanisms at the signal-transmitting stations for operating the signal-receiving apparatus at the signal-receiving station, switching devices at the transmitting stations, each serving to exclude other transmitting stations from the line, electro-magnetic mechanisms at the transmitting stations for operating said switching devices, electro-magnetic mechanism at a sending station operating the switching device thereat to exclude the remaining transmitting stations from the line, an electro-magnet at the receiving station normally in circuit relation with the line, and mechanism governed by the latter electro-magnet and serving, when circuit is altered at a transmitting station, to impress current upon the line which is not adapted to operate said electro-magnetic mechanisms but which is adapted to cooperate with the signal-transmitting mechanisms to occasion signals at the receiving station.

34. A signaling system including a transmission line extending from a signal-receiving station to a plurality of signal-transmitting stations, a source of current in circuit relation with the line, signal-transmitting mechanisms at the signal-transmitting stations for operating the signal-receiving apparatus at the signal-receiving station, switching devices at the transmitting stations, each serving to exclude other transmitting stations from the line, electro-magnetic mechanisms at the transmitting stations for operating said switching devices and serving to control the relation of the signal-transmitting mechanisms with the line, means governed by the signal-sending mechanisms at the transmitting stations serving normally to exclude the electro-magnetic mechanisms from operative relation with the line, and serving, upon the transmission of signals to bring the electro-magnetic mechanism at a sending station into circuit relation with the line to operate the associate switching device, an electro-magnet at the receiving station normally in circuit relation with the line, and mechanism governed by the latter electro-magnet and serving, when circuit is altered at a transmitting station, to impress current upon the line which is not adapted to operate said electro-magnetic mechanisms but which is adapted to cooperate with the signal-transmitting mechanisms to occasion signals at the receiving station.

35. A signaling system including a transmission line extending from a signal-receiving station to a plurality of signal-transmitting stations, a source of current in closed

circuit with the line, signal-transmitting mechanisms at the signal-transmitting stations for operating the signal-receiving apparatus at the signal-receiving station, electro-magnetic mechanisms adapted for loop connection in the line at the transmitting stations serving to control the relation of the signal-transmitting mechanisms with the line, means governed by the signal-sending mechanisms at the transmitting stations serving normally to exclude the electro-magnetic mechanisms from operative relation with the line, and serving, upon the transmission of signals to bring the electro-magnetic mechanism at a sending station into circuit relation with the line to establish coöperative relation of the signal-transmitting mechanism at the sending station with the line, an electro-magnet at the receiving station normally in circuit relation with the line, and mechanism governed by the latter electro-magnet and serving, when circuit is altered at a transmitting station, to impress current upon the line which is not adapted to operate said electro-magnetic mechanisms but which is adapted to coöperate with the signal-transmitting mechanisms to occasion signals at the receiving station.

36. A signaling system including a transmission line extending from a signal-receiving station to a plurality of signal-transmitting stations, a source of current in closed circuit with the line, signal-transmitting mechanisms at the signal-transmitting stations for operating the signal-receiving apparatus at the signal-receiving station, electro-magnetic mechanisms adapted for loop connection in the line at the transmitting stations serving to control the relation of the signal-transmitting mechanisms with the line, the signal-transmitting apparatus at a sending station serving to bring the electro-magnetic mechanism at the sending station into circuit relation with the line to establish coöperative relation of the signal-transmitting mechanism at the sending station with the line, an electro-magnet at the receiving station normally in circuit relation with the line, and mechanism governed by the latter electro-magnet and serving, when circuit is altered at a transmitting station, to impress current upon the line which is not adapted to operate said electro-magnetic mechanisms but which is adapted to coöperate with the signal-transmitting mechanisms to occasion signals at the receiving station.

37. A signaling system including a transmission line extending from a signal-receiving station to a plurality of signal-transmitting stations, a source of current in closed circuit with the line, signal-transmitting mechanisms at the signal-transmitting stations for operating the signal-receiving ap-

paratus at the signal-receiving station, switching devices at the transmitting stations, each serving to exclude other transmitting stations from the line, electro-magnetic mechanisms adapted for loop connection in the line at the transmitting stations for operating said switching devices, electro-magnetic mechanism at a sending station operating the switch device thereat to exclude the remaining transmitting stations from the line, an electro-magnet at the receiving station normally in circuit relation with the line, and mechanism governed by the latter electro-magnet and serving, when circuit is altered at a transmitting station, to impress current upon the line which is not adapted to operate said electro-magnetic mechanisms but which is adapted to coöperate with the signal-transmitting mechanisms to occasion signals at the receiving station.

38. A signaling system including a transmission line extending from a signal-receiving station to a plurality of signal-transmitting stations, a source of current in closed circuit with the line, signal-transmitting mechanisms at the signal-transmitting stations for operating the signal-receiving apparatus at the signal-receiving station, switching devices at the transmitting stations, each serving to exclude other transmitting stations from the line, electro-magnetic mechanisms adapted for loop connection in the line at the transmitting stations, for operating said switching devices and serving to control the relation of the signal-transmitting mechanisms with the line, means governed by the signal-sending mechanisms at the transmitting stations serving normally to exclude the electro-magnetic mechanisms from operative relation with the line, and serving, upon the transmission of signals to bring the electro-magnetic mechanism at a sending station into circuit relation with the line to operate the associate switching device, an electro-magnet at the receiving station normally in circuit relation with the line, and mechanism governed by the latter electro-magnet and serving, when circuit is altered at a transmitting station, to impress current upon the line which is not adapted to operate said electro-magnetic mechanisms but which is adapted to coöperate with the signal-transmitting mechanisms to occasion signals at the receiving station.

39. A signaling system including a transmission line extending from a signal-receiving station to a plurality of signal-transmitting stations, a source of current in circuit relation with the line, signal-transmitting mechanisms at the signal-transmitting stations for operating the signal-receiving apparatus at the signal-receiving station, elec-

tro-magnetic mechanisms adapted for loop connection in the line at the transmitting stations serving to control the relation of the signal-transmitting mechanisms with the line, means governed by the signal-sending mechanisms at the transmitting stations serving normally to exclude the electro-magnetic mechanisms from operative relation with the line, and serving, upon the transmission of signals to bring the electro-magnetic mechanism at a sending station into circuit relation with the line to establish co-operative relation of the signal-transmitting mechanism at the sending station with the line, an electro-magnet at the receiving station normally in circuit relation with the line, and mechanism governed by the latter electro-magnet and serving, when circuit is altered at a transmitting station, to impress current upon the line which is not adapted to operate said electro-magnetic mechanisms but which is adapted to coöperate with the signal-transmitting mechanisms to occasion signals at the receiving station.

40. A signaling system including a transmission line extending from a signal-receiving station to a plurality of signal-transmitting stations, a source of current in circuit relation with the line, signal-transmitting mechanisms at the signal-transmitting stations for operating the signal-receiving apparatus at the signal-receiving station, electro-magnetic mechanisms adapted for loop connection in the line at the transmitting stations serving to control the relation of the signal-transmitting mechanisms with the line, the signal-transmitting apparatus at a sending station serving to bring the electro-magnetic mechanism at the sending station into circuit relation with the line to establish coöperative relation of the signal-transmitting mechanism at the sending station with the line, an electro-magnet at the receiving station normally in circuit relation with the line, and mechanism governed by the latter electro-magnet and serving, when circuit is altered at a transmitting station, to impress current upon the line which is not adapted to operate said electro-magnetic mechanisms but which is adapted to coöperate with the signal-transmitting mechanisms to occasion signals at the receiving station.

41. A signaling system including a transmission line extending from a signal-receiving station to a plurality of signal-transmitting stations, a source of current in circuit relation with the line, signal-transmitting mechanisms at the signal-transmitting stations for operating the signal-receiving apparatus at the signal-receiving station, switching devices at the transmitting stations, each serving to exclude other transmitting stations from the line, electro-mag-

netic mechanisms adapted for loop connection in the line at the transmitting stations for operating said switching devices, electro-magnetic mechanism at a sending station operating the switching device thereat to exclude the remaining transmitting stations from the line, an electro-magnet at the receiving station normally in circuit relation with the line, and mechanism governed by the latter electro-magnet and serving, when circuit is altered at a transmitting station, to impress current upon the line which is not adapted to operate said electro-magnetic mechanisms but which is adapted to coöperate with the signal-transmitting mechanisms to occasion signals at the receiving station.

42. A signaling system including a transmission line extending from a signal-receiving station to a plurality of signal-transmitting stations, a source of current in circuit relation with the line, signal-transmitting mechanisms at the signal-transmitting stations for operating the signal-receiving apparatus at the signal-receiving station, switching devices at the transmitting stations, each serving to exclude other transmitting stations from the line, electro-magnetic mechanisms adapted for loop connection in the line at the transmitting stations for operating said switching devices and serving to control the relation of the signal-transmitting mechanisms with the line, means governed by the signal-sending mechanisms at the transmitting stations serving normally to exclude the electro-magnetic mechanisms from operative relation with the line, and serving, upon the transmission of signals to bring the electro-magnetic mechanism at a sending station into circuit relation with the line to operate the associate switching device, an electro-magnet at the receiving station normally in circuit relation with the line, and mechanism governed by the latter electro-magnet and serving, when circuit is altered at a transmitting station, to impress current upon the line which is not adapted to operate said electro-magnetic mechanisms but which is adapted to coöperate with the signal-transmitting mechanisms to occasion signals at the receiving station.

43. A signaling system including a transmission line extending from transmitting stations to a receiving station, a source of current in closed circuit with the line, means for changing the connection of said source of current with the line for operative purposes, a local circuit at the receiving station including the signal-receiver thereat, switching mechanisms entering into the control of said local circuit and operated subsequent to the change of connection of said source of current with the line and prior

to the restoration of the normal connection
of said source of current with the line, a
second switching device associated with the
local circuit at the receiving station and co-
5 operating with the former switching device
to effect control over the local receiving cir-
cuit, and electro-magnetic mechanism in the
line for operating said switching devices

and the means for governing the association
of said source of current with the line. 10

In witness whereof, I hereunto subscribe
my name this 21st day of May A. D. 1909.

EDWARD H. LONG.

Witnesses:

G. L. CRAGG,
L. G. STROH.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents,
Washington, D. C."
