

April 5, 1932.

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1,852,050

TELEGRAPH SYSTEM

Filed June 12, 1931

2 Sheets-Sheet 1

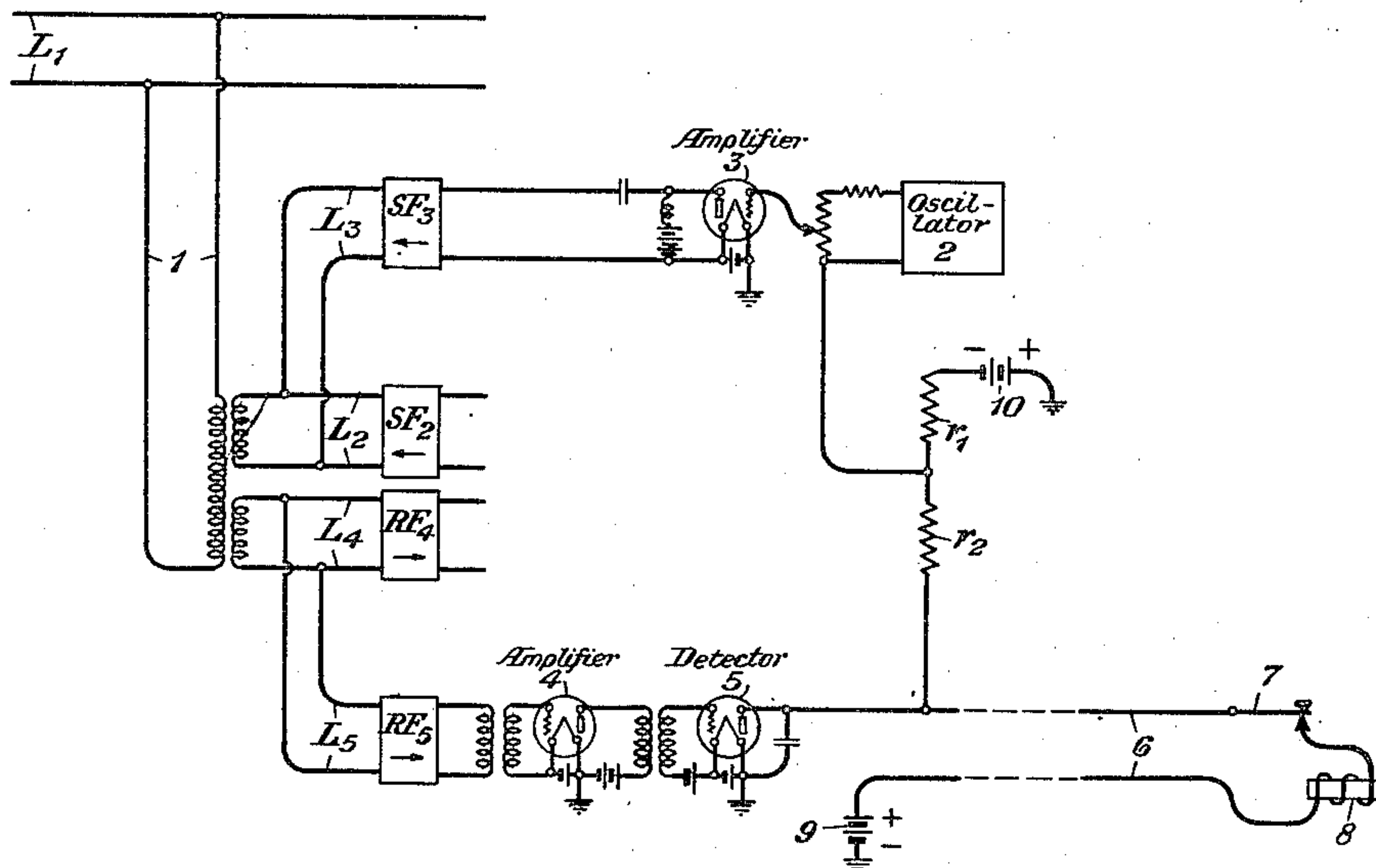


Fig. 1

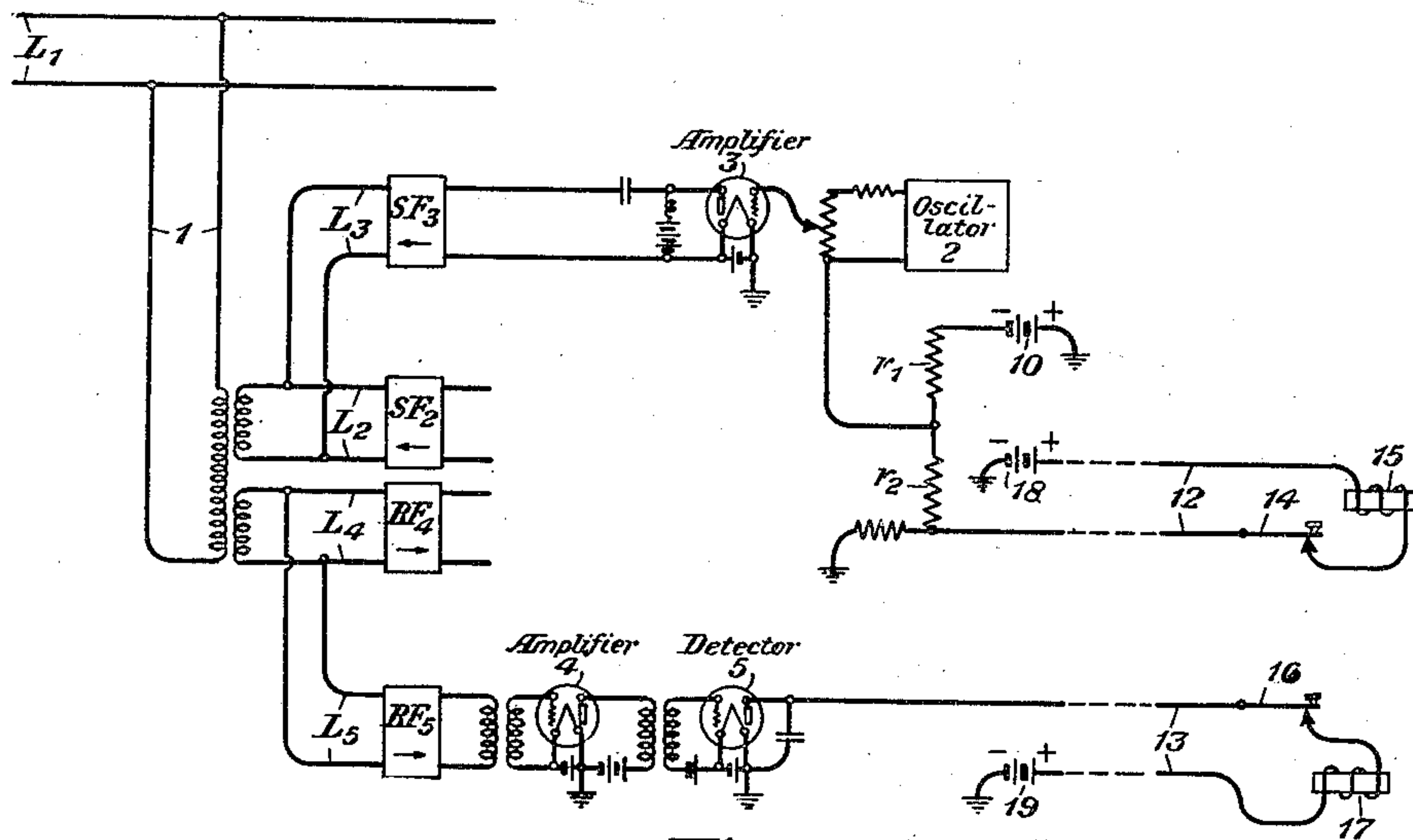


Fig. 2

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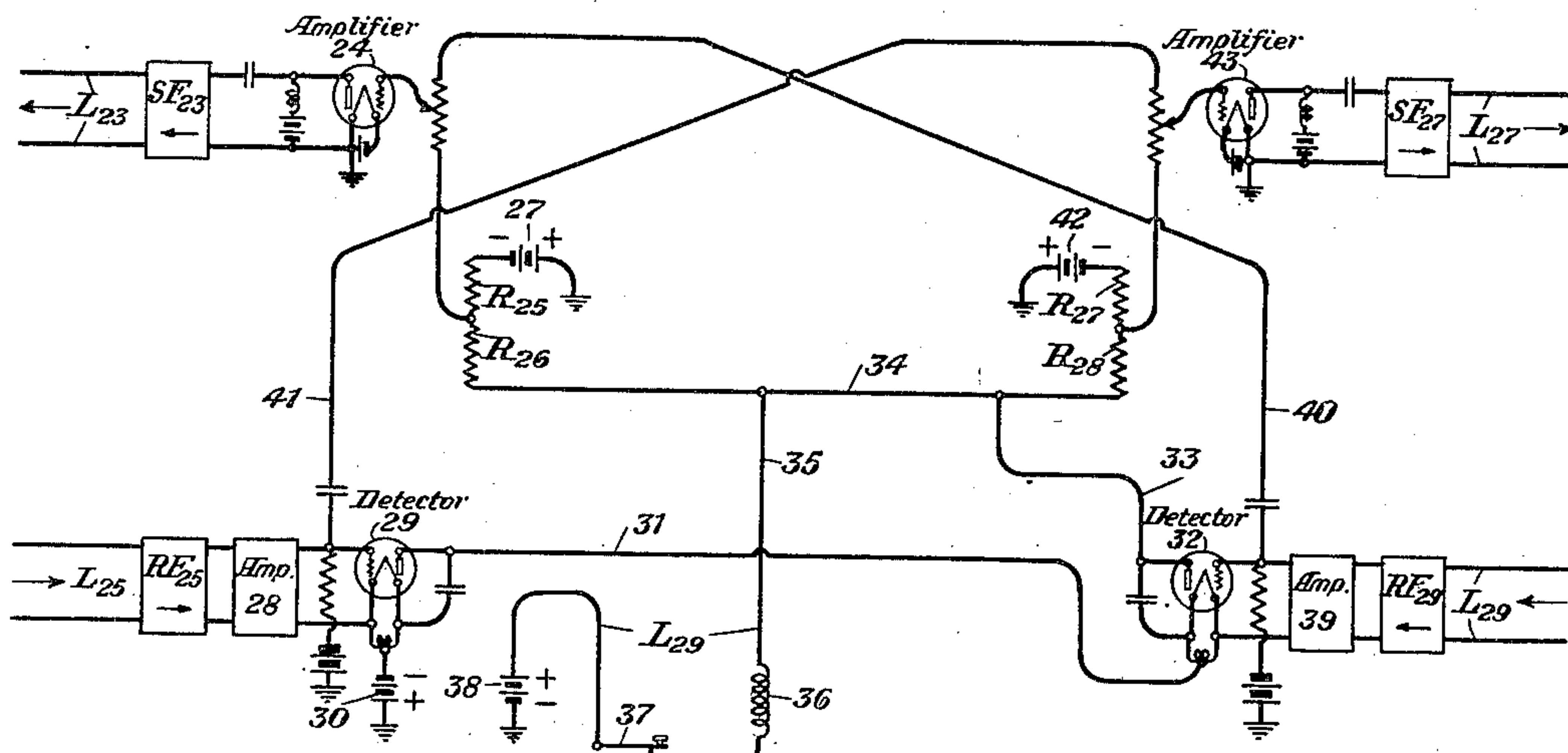


Fig. 3

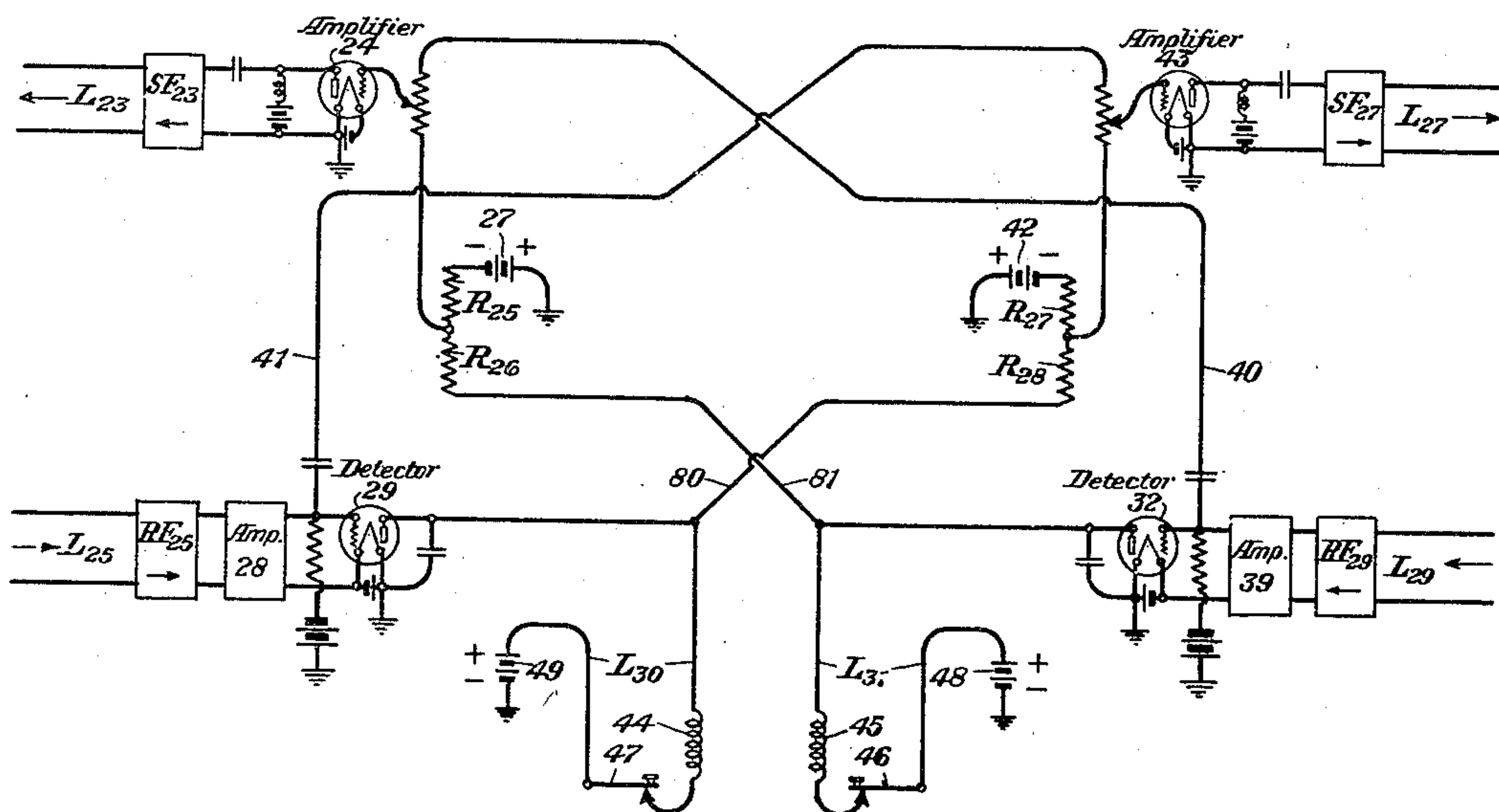


Fig. 4

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TELEGRAPH SYSTEM

Application filed June 12, 1931. Serial No. 543,916.

This invention relates to telegraph systems, and more particularly to improvements in the terminal arrangements of telegraph systems utilizing a plurality of carrier or radio frequency channels for the transmission of messages.

Telegraph systems utilizing either radio or wired facilities usually terminate in loop circuits at each end of the line or at intermediate repeater points and these loop circuits contain sending relays, receiving relays, and break relays. It is one of the primary objects of the arrangements of this invention to provide a telegraph system in the loop circuits of which no sending, receiving or break relays will be needed. The elimination of a large number of telegraph relays from a telegraph system would result in reduced expense and maintainence and improved transmission. For example, in certain types of carrier telegraph systems there would be employed three relays at each terminal and six at each intermediate repeating point so that in a three-section telegraph circuit of this type there might be a total of eighteen relays. The arrangements of the invention might eliminate all of such relays. Other objects and features of the invention will appear more fully from the detailed description thereof hereinafter given.

In the arrangements of the invention the output of a carrier telegraph detector is passed directly to the loop circuit and operates sensitive relay at the subscriber's office. This eliminates the need for the receiving relay now used at the channel terminal for repeating signals from the line to the subscriber's loop circuit. For sending purposes a resistance network is provided so that when the telegraph key or printer transmitter at the subscriber's office is open a comparatively high negative potential is applied to the grid of the sending amplifier tube and this stops the flow of carrier current to the line. When the telegraph key closes the loop circuit positive battery from the loop is applied to the resistance network so as to bring the grid potential of the tube to the proper value as an amplifier and carrier current is transmitted to that line. This arrangement eliminates the

sending relay now used at the channel terminal for repeating signals from the subscriber's loop to the line. It also eliminates the break relay heretofore provided as it provides an automatic break circuit due to the fact that opening the key in the loop circuit will send a steady spacing signal to the line regardless of any incoming signals from the line.

The invention may be more fully understood from the following description together with the accompanying drawings in the Figures 1-4 of which the invention is illustrated. Figs. 1 and 2 illustrate the invention as applied to terminal loop circuits for half and full duplex systems, respectively. Similar reference characters have been used to denote like parts in both of these figures. Figs. 3 and 4 illustrate the invention as applied to intermediate repeater arrangements for half and full duplex systems. Similar reference characters have been used to denote like parts in Figs. 3 to 4.

In Fig. 1 the arrangements of the invention are shown as applied to a half duplex carrier telegraph system. The telegraph line is shown as L_1 . Connected thereto would be a circuit 1 terminating in a transformer to which might be connected a plurality of incoming and outgoing carrier telegraph circuits. The outgoing circuits are shown as L_2 and L_3 and would include therein selective circuits, such as filters or tuned circuits SF_2 and SF_3 , respectively. The incoming circuits are shown as L_4 and L_5 and would include therein selective circuits, such as filters or tuned circuits RF_4 and RF_5 , respectively. The incoming circuits, such as L_5 , are connected to amplifiers and detectors, such as 4 and 5. The output of detector 5 is passed directly to a sensitive relay, such as 8, at the subscriber's office by way of the loop circuit 6 and operates such relay. This eliminates the receiving relay heretofore used at the carrier channel terminal for repeating signals from the line to the subscriber's loop circuit. The relay 8 may control printer apparatus if desired. For sending purposes a resistance network $r_1 r_2$ is provided connected to the loop circuit 7 and the outgoing circuit L_3 . The

outgoing circuit L_s would comprise an oscillator 2 and an amplifier 3, as shown. When the telegraph key 7, or printer transmitter, at the subscriber's office is open a comparatively high negative potential is applied from battery 10 through the resistance network to the grid of the amplifier 3 and this stops the flow of carrier telegraph current from oscillator 2 to the line L_1 . When the telegraph key 7, or printer, is closed positive potential from battery 9 in the loop circuit is applied to the resistance network so as to bring the grid potential of the amplifier tube 3 to the proper value as an amplifier and carrier telegraph current from oscillator 2 will be applied to the line L_1 . This arrangement eliminates the sending relay heretofore used at the carrier channel terminal for repeating signals from the subscriber's loop to the line. The break relay usually provided may also be eliminated as the arrangements of the invention provide an automatic break circuit due to the fact that opening key 7 in the loop circuit will send a steady spacing signal to the line regardless of any incoming signals from the line.

In Fig. 2 the arrangements of the invention are shown as applied to a full duplex carrier telegraph system. These arrangements are substantially similar to those of Fig. 1 and similar reference characters have been used to denote like parts in both figures. In the full duplex system two separate loop circuits are provided. The receiving loop 13 includes the key 16, relay 17, and battery 19. The sending loop 12 includes the key 14, relay 15 and positive battery 18. The loop 12 is connected to the resistance network r_1 r_2 as in Fig. 1. As the operation would be substantially the same as hereto described, no further description thereof will be given.

In Fig. 3 the arrangements of the invention are shown as applied to an intermediate repeater for a half duplex telegraph system. An incoming line L_{29} is shown including a receiving filter RF_{29} and an amplifier 39. The output of amplifier 39 is connected to the detector 32 and is also connected by conductor 40 to the grid of amplifier 24. The output of amplifier 24 is connected to a filter SF_{23} and thence to the outgoing line L_{23} . The grid of amplifier 24 is connected to the resistance network R_{25} R_{26} , which in turn is connected to the loop circuit L_{29} and the output of detector 32 in a manner to be hereinafter described. An incoming line L_{25} is shown including a filter RF_{25} and an amplifier 28. The output of amplifier 28 is connected to a detector 29. The output of amplifier 28 is also connected by a conductor 41 to the grid of amplifier 43, the output of which is connected to the filter SF_{27} and thence to line L_{27} . The grid of amplifier 43 is also connected to the resistance network R_{27} R_{28} , which is connected to the loop circuit

circuit L_{29} and to the output of detectors 29 and 32 which are connected in series.

The operation of the arrangements of Fig. 3 is as follows: When a marking signal is sent over line L_{29} a carrier current flows over the line and through the amplifier 39. This carrier current will be applied to conductor 40 and thence to the grid of amplifier 24 and thence out over line L_{23} . The incoming carrier from line L_{29} will also be detected by detector 32 and transmitted over conductors 33, 34 and 35, winding of relay 36, to battery 38. This will operate the relay or sounder 36 in the loop L_{29} . The amplifier 24 will function because positive potential from battery 38 is applied over loop L_{29} to the resistance network R_{25} R_{26} and neutralizes the blocking potential of battery 27. If the key 37 in the loop L_{29} is opened positive potential from battery 38 will be removed from both resistance networks R_{25} R_{26} and R_{27} R_{28} and both amplifiers 24 and 43 will be blocked. Thus a break signal may be sent over lines L_{23} and L_{27} . A marking signal sent over line L_{25} will be transmitted through amplifier 28 and applied over conductor 41 to the grid of amplifier tube 43 and thence transmitted out over line L_{27} . The signal coming in over line L_{25} will also be detected by detector 29 and transmitted over conductor 31, through detector 32, conductors 33, 34 and 35, winding of sounder 36 to battery 38 and will thus operate sounder 36. The circuit of loop L_{29} is traced as follows: from negative battery 30, detector 29, conductor 31, detector 32, conductors 33, 34 and 35, relay 36, key 37 to positive battery 38.

In Fig. 4 the arrangements of the invention are shown as applied to an intermediate repeater for a full duplex telegraph system. As these arrangements are in many ways similar to those of Fig. 3 similar reference characters have been used to denote like parts with respect to Fig. 3. In Fig. 4 separate loop circuits are provided, such as L_{30} and L_{31} , instead of a single loop circuit completed through both detector tubes in series as in Fig. 3. The loop L_{30} is completed as follows: from ground and battery 49, loop L_{30} , key 47, sounder 44, loop L_{30} , through detector 29 to ground. Positive potential may be applied from battery 49 and loop L_{30} , when 47 is closed, over conductor 80 to the resistance network R_{27} R_{28} . This will neutralize or reduce the blocking potential from battery 42 and cause the amplifier 43 to function as such. The loop L_{31} is completed as follows: from ground and battery 48, loop L_{31} , key 46, sounder 45, loop L_{31} , through detector 32 to ground. Positive potential may be applied from battery 48 and loop L_{31} , when 46 is closed, over conductor 81 to the resistance network R_{25} R_{26} . This will neutralize or reduce the blocking potential from battery 27 and cause the amplifier 24 to function as such.

The operation of the arrangements in other respects is substantially similar to that already described and no further description thereof will be given.

5 It is pointed out that the arrangements of the invention are applicable to telegraph systems employing radio facilities or wired facilities or combinations of both such facilities.

10 While the arrangements of the invention have been disclosed as embodied in certain specific arrangements which are deemed desirable, it is understood that they are capable of embodiment in many and other widely varied forms without departing from the spirit of the invention as defined by the appended claims.

What is claimed is:

1. A telegraph system comprising a transmission channel, an incoming circuit connected to said channel and including a detector, an outgoing circuit connected to said channel and including an amplifier and a source of signaling current connected to the input of said amplifier, a subscriber's loop circuit directly connected to the output of said detector, means in said loop circuit responsive to the incoming detected signals, a resistance network connected to the grid of said amplifier, means for applying to said network a negative potential sufficient to block said amplifier, means for connecting said resistance network to said loop circuit, and a source of positive potential applied to said loop circuit sufficient to reduce the negative potential applied to the grid of said amplifier so as to unblock said amplifier.

2. A telegraph system comprising a transmission channel, an incoming circuit connected to said channel and including a detector, an outgoing circuit connected to said channel and including an amplifier and a source of signaling current connected to the input of said amplifier, a subscriber's loop circuit directly connected to the output of said detector, means in said loop circuit responsive to the incoming detected signals, a resistance network connected to the grid of said amplifier, means for applying to said grid a negative potential sufficient to block said amplifier, means for connecting said resistance network to said loop circuit, means for applying a source of positive potential to said loop circuit sufficient to reduce the negative potential applied to the grid of said amplifier so as to unblock said amplifier, and switching means for opening and closing said loop circuit between the connection to said resistance network and the point of application to said loop circuit of said source of positive potential.

3. In a telegraph system a repeater arrangement comprising incoming and outgoing transmission channels for transmission in one direction, incoming and outgoing

transmission channels for transmission in the other direction, each of said incoming channels including receiving amplifiers and detectors, each of said outgoing channels including sending amplifiers, means for connecting the output of each receiving amplifier to the grids of corresponding sending amplifiers, a subscriber's loop circuit connected to the output of said detectors, and means controlled by the operation of said loop circuit for controlling the operation of said sending amplifiers.

4. In a telegraph system a repeater arrangement comprising incoming and outgoing line sections for transmission in one direction, incoming and outgoing line sections for transmission in the other direction, each of said incoming line sections including receiving amplifiers and detectors, each of said outgoing line sections including sending amplifiers, means for connecting the output of each receiving amplifier to the grids of corresponding sending amplifiers, a subscriber's loop circuit connected to the output of said detectors, and means for applying different potentials to the grids of said sending amplifiers to render them operative or inoperative, said last mentioned means being controlled by the operation of said loop circuit.

5. In a telegraph system a repeater arrangement comprising incoming and outgoing transmission channels for transmission in one direction, incoming and outgoing transmission channels for transmission in the other direction, each of said incoming channels including receiving amplifiers and detectors, each of said outgoing channels including sending amplifiers, means for connecting the output of each receiving amplifier to the grids of corresponding sending amplifiers, a subscriber's loop circuit connected in series with both of said detectors, means in said loop circuit responsive to the detected signals from either of said incoming lines, resistance networks connected to the grids of each of said sending amplifiers, means for applying a relatively high negative potential to each of said networks to block said sending amplifiers, means for connecting said networks to said loop circuit, and means for applying to said loop circuit and said networks, a positive potential sufficient to reduce the negative potential applied to said networks to unblock said sending amplifiers.

6. In a telegraph system a repeater arrangement comprising incoming and outgoing transmission channels for transmission in one direction, incoming and outgoing transmission channels for transmission in the other direction, each of said incoming channels including receiving amplifiers and detectors, each of said outgoing channels including sending amplifiers, means for connecting the output of each receiving amplifier to the grids of corresponding sending am-

plifiers, subscriber's loop circuits individual to each incoming line and connected to the detectors associated therewith, means in each loop circuit responsive to the detected signals coming in over its corresponding line section, and separate means for applying different potentials to the grids of said sending amplifiers to control their operativeness, each of said last mentioned means being under the control of different ones of said loop circuits.

In testimony whereof, I have signed my name to this specification this 10th day of June, 1931.

BAXTER P. HAMILTON.

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