

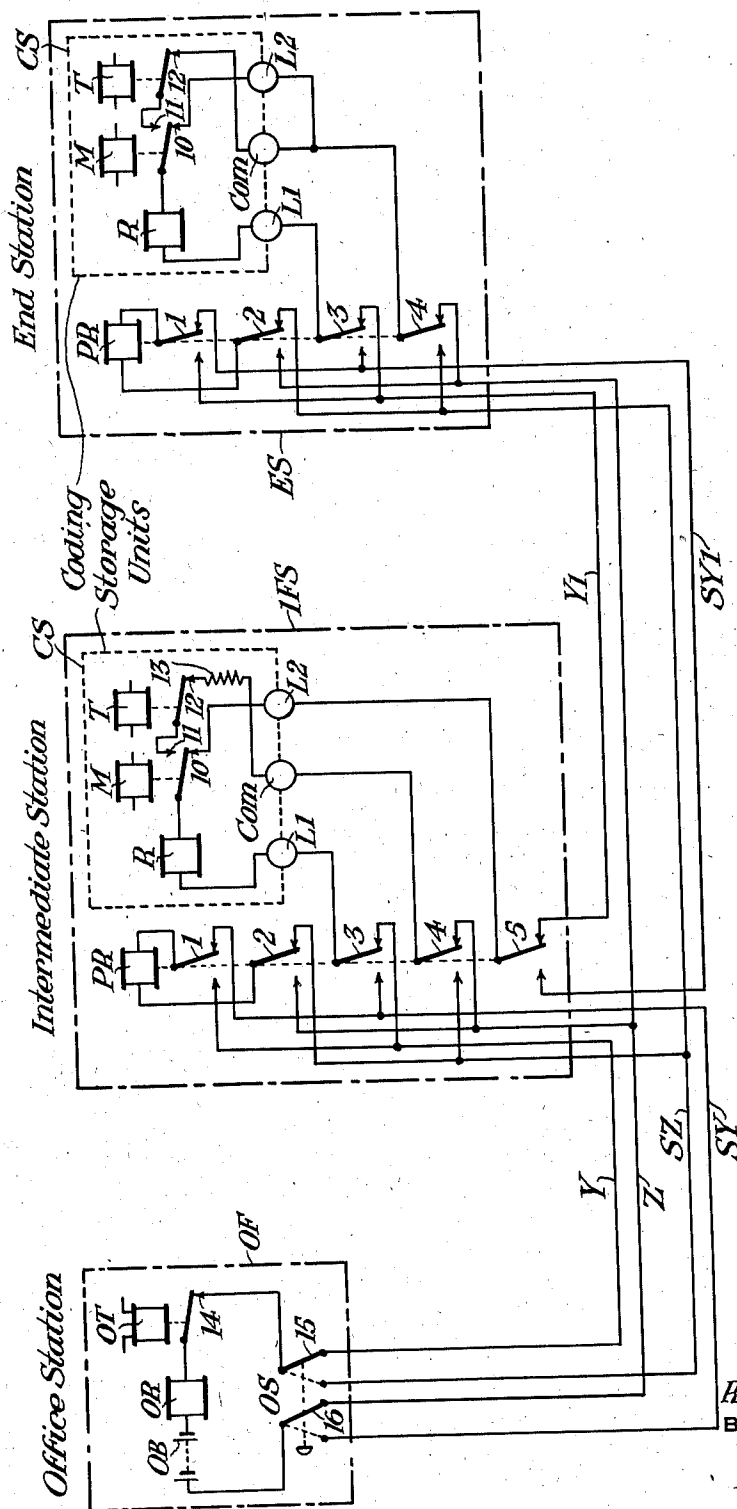
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RAILWAY TRAFFIC CONTROLLING APPARATUS

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RAILWAY TRAFFIC CONTROLLING
APPARATUS

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My invention relates to railway traffic controlling apparatus, and more particularly to apparatus for a remote control or a centralized traffic control system for railways.

In remote control or centralized traffic control systems for railways traffic governing devices located at one or more field stations along a railway are in part manually controlled from a central office station through the medium of a line circuit. Such line circuit usually comprises open line wires mounted on a pole line and exposed to storms and other hazards with the result that a line wire may fail.

The failure of a line wire results in the operator at the office station losing control over the field station devices and thereby serious delay to trains governed by such devices may occur.

Accordingly a feature of my invention is the provision of novel and improved means for switching a remote control or centralized traffic control system from a normal line circuit to a spare line circuit in case of a failure of the normal line circuit.

Another feature of my invention is the provision of novel and improved means for a remote control or centralized traffic control system wherewith the operator at the office station can unaided and without leaving the office station cause the apparatus at the different field stations of the system to be transferred from a normal line circuit to a spare line circuit or vice versa.

Still another feature of my invention is the provision of novel means for railway traffic controlling apparatus of the type here contemplated wherein an operator at an office station can elect to govern devices at a remote station over either one of two line circuits.

The above features as well as other advantages of my invention, which will become apparent as the specification progresses, are attained according to my invention by providing alternative line circuits, a two position switch at the office station and a polar relay at each of the field stations. The two position switch at one position connects the office station apparatus to a selected one of the line circuits and to the other line circuit at its other position. Each polar relay is of the type characterized by the fact that its armature remains in the position in which it was last moved when the relay becomes deenergized and further by the fact that the stroke of its armature is completed if energy is supplied to its windings for a long enough interval to open the polar contacts in the last position. In other words, when an impulse of current is supplied to the winding of

the relay for an interval long enough to move the polar armature from its last position, the armature moves to its other position although the energizing current ceases. A relay that can be made to operate in this manner is covered by United States Letters Patent No. 2,140,604, granted December 20, 1938, to C. S. Snavely for Electrical relays. The polar relay at each field station is connected to one of the two line circuits, say, for example, a spare line circuit, over its own normal contacts and to the other or normal line circuit over its own reverse contacts. The traffic governing devices of each field station are connected to the normal line circuit over normal polar contacts of the polar relay of the same station and to the spare line circuit over reverse polar contacts of the relay. The connections are such that when each polar relay is set at its normal position to connect the traffic governing devices of the associated field station to the normal line circuit and its own operating winding to the spare line circuit and the operator at the office station places the switch in the position to connect the office station apparatus to the spare line circuit, each polar relay is supplied with current as required to energize it at reverse polarity with the result that each such relay is operated to its reverse position to connect the associated traffic governing devices to the spare line circuit, leaving its own operating winding connected to the normal line circuit. If the operator later moves the switch to its other position to connect the office station apparatus to the normal line circuit the connections are such that the current supplied to the normal line circuit energizes the polar relays at normal polarity to operate each relay to the normal position and connect the traffic governing devices of the associated field station to the normal line circuit, leaving its own operating winding connected to the spare line circuit.

I shall describe one form of apparatus embodying my invention, and shall then point out the novel features thereof in claims.

The accompanying drawing is a diagrammatic view showing one form of apparatus embodying my invention when used with a centralized traffic control system for railways.

Although the present invention may be applied to any one of several different types of remote control and centralized traffic control systems the invention has been shown applied to a time code type of centralized traffic control systems as covered by the United States Letters Patent

No. 2,229,249, granted January 21, 1941, to L. V. Lewis for Remote control systems.

As explained in the aforesaid Lewis Patent No. 2,229,249, and particularly in connection with Fig. 10 of that patent, the line circuit is a simple series circuit with a repeater relay at the office station in series with a similar repeater relay at each field station. The line circuit serves as a means of relaying information from a transmitter to a receiver, and synchronizes the relay action at the receiving end with that at the transmitting end. The office station is provided with a line battery, a repeater relay and a transmitting relay, the repeater relay and battery being connected in series to the line circuit over a back contact of the transmitting relay. Hence the office station repeater relay is normally interposed in the line circuit to receive and a control code can be transmitted from the office station by operating the transmitting relay to periodically interrupt the line circuit in accordance with a predetermined time code pattern. Each field station is provided with a coding storage unit including a repeater relay, a master relay and a transmitting relay. Normally the master and transmitting relays are deenergized and the repeater relay is connected to the line circuit over a back contact of the master relay, so that, as stated hereinbefore, the repeater relays are included in the line circuit in series with the repeater relay at the office station and each repeater relay is therefore in a condition for receiving. Hence, when the office station transmitting relay is operated to interrupt the line circuit in accordance with a control code the repeater relays at the different stations are operated in step with such control code. When the master relay at a field station is picked up the line circuit is opened to the more distant field stations and the repeater relay of the same station is connected to the line circuit over a back contact of the respective transmitting relay and thus any field station can transmit an indication code to the office station by the master relay of that field station being first picked up and then the transmitting relay at that field station being operated to interrupt the line circuit in accordance with a predetermined time code pattern, such indication code operating the repeater relay at the office station in step therewith. The significant thing about such a centralized traffic controlling system as far as this application is concerned is the fact that the control and indication codes are transmitted over a line circuit comprising two line wires extending between the office station and the end station and looping through each intermediate field station, and that these line wires are ordinarily located on a pole line where they are exposed to storms and other hazards.

Referring to the drawing, an office station OF, an intermediate field station IFS and an end field station ES of a centralized traffic control system are shown, it being understood that other field stations may be located between intermediate station IFS and end station ES. Such other field stations are omitted from the drawing for the sake of simplicity, since they would be a duplication of the intermediate station IFS and are not required for a full understanding of my invention.

In accordance with the type of centralized traffic control system here involved, the office station OF is provided with a line battery OB, a repeater relay OR, and a transmitting relay

OT; and the intermediate station IFS and end station ES are each provided with a coding storage unit CS. Each such coding storage unit CS includes a repeater relay R, a master relay M and a transmitting relay T. Each repeater relay R is connected to terminals L1 and L2 of the associated coding storage unit over a back contact 10 of the master relay M of the same unit, and each master relay M when picked up closing front contact 11 transfers the connection of the associated repeater relay R from terminal L2 to a terminal Com of the unit, a back contact 12 of transmitting relay T of the same unit being interposed in the connection to terminal Com. At field station IFS as well as at any other intermediate field station that might be included in the system, a resistor 13 is also interposed in the connection to the terminal Com.

In accordance with my invention, the office station apparatus is connected to the coding storage units of the field stations over either a first or normal line circuit including line wires Y and Z, or over a second or spare line circuit including line wires SY and SZ. At the office station OF a manually operable two position switch OS is provided for selectively connecting the office station apparatus to one or the other of the two line circuits. At each field station a polar relay PR is provided for selectively connecting the respective coding storage unit CS to one or the other of the two line circuits.

The polar relays PR are preferably alike and each is of the type characterized by the fact that its polar armature remains in the position to which it was last moved when the relay is deenergized and also by the fact that the stroke of the polar armature is completed if current is applied to the winding of the relay for a long enough interval to open the contacts in the last position. To aid in understanding the invention I shall consider the contact members of each polar relay to occupy a normal position when set at the right-hand position as viewed in the drawing, and to occupy a reverse position when set at the left-hand position.

Normally switch OS at the office station is set at a normal or right-hand position and each polar relay PR occupies its normal position. Under these circumstances the first or normal line circuit can be traced from the positive terminal of battery OB over winding of office station repeater relay OR, back contact 14 of office station transmitting relay OT, contact member 15 of switch OS in its normal position, line wire Y to intermediate station IFS, normal position of contact member 3 of polar relay PR of station IFS, terminal L1 of the coding storage unit CS of station IFS, winding of the respective repeater relay R, back contact 10 of the master relay M of the same unit, terminal L2 of that unit, normal position of contact member 5 of polar relay PR of station IFS, line wire Y1 to end station ES, normal position of contact member 3 of polar relay PR of station ES, terminal L1 of the coding storage unit CS of station ES, winding of repeater relay R of that unit, back contact 10 of the associated master relay M, terminal L2 of the unit, normal position of contact member 4 of polar relay PR at station ES, line wire Z back to office station OF, normal position of contact member 16 of switch OS and to the negative terminal of battery OB. Hence repeater relay OR at the office station and repeater relay R at each of the stations IFS and ES are energized in series by the current supplied by line battery

OB over the first or normal line circuit. Whenever transmitting relay OT is operated to periodically interrupt this line circuit according to a predetermined time code pattern all three of the repeater relays are operated in accordance with such time code. As described fully in the aforementioned Lewis Patent No. 2,229,249, operation of the repeater relay R of a field station serves to select the station for which such control code is intended and in turn to govern corresponding traffic governing signaling devices. In the event master relay M at station IFS is picked up in response to some operation of the traffic governing devices associated with such station, the first line circuit is disconnected from the end station ES and is completed over front contact 11 of the master relay M, back contact 12 of transmitting relay T at station IFS, resistor 13, terminal Com, normal position of contact member 4 of relay PR at station IFS, line wire Z back to the office station, normal position of contact member 16 of switch OS and to negative terminal of battery OB. Under this condition of the apparatus, operation of transmitting relay T at station IFS to interrupt the line circuit in accordance with some predetermined time code pattern of an indication code causes relay OR at the office station to be operated in accordance with such indication code, and in turn effects corresponding indication devices for informing the operator at the office station of the position of some traffic governing device associated with the intermediate field station IFS.

In the event master relay M at the end station ES is picked up in response to operation of some traffic governing device associated with such station so that front contact 11 of master relay M of station CS is closed, the line circuit is completed over back contact 12 of transmitting relay T of station ES, terminal Com of the respective unit CS and hence as previously traced to the negative terminal of line battery OB, with the result that an indication code can be transmitted over this first line circuit from the end station ES by operation of the end station transmitting relay T. The foregoing line circuit and operation thereof is that explained in the aforementioned Lewis patent except for the fact that the circuit here includes contacts of the switch OS at the office station and contacts of the polar relay PR at each of the different field stations.

Looking at polar relay PR at stations IFS, the right-hand terminal of its winding is connected to wire SY of the second or spare line circuit over normal position of contact member 1 of the relay, and the left-hand terminal of its winding is connected to wire SZ of the second line circuit over the normal position of contact member 2 of the relay. In like manner, the right-hand terminal of the winding of polar relay PR at station ES is connected to line wire SY1 of the second or spare line circuit over the normal position of contact member 1 of that relay and the left-hand terminal of the winding of this relay is connected to line wire SZ1 of the second line circuit over the normal position of contact member 2 of the relay.

Assuming that the operator at the office station desires to make use of the spare or second line circuit including line wires SY and SZ, the switch OS is thrown to a second or left-hand position. In this second position of switch OS current flows from battery OB through winding of relay OR, back contact 14 of relay OT, contact member 15 of switch OS in the left-hand

position, line wire SZ to station IFS, normal position of contact member 2 of relay PR at station IFS, winding of that polar relay, normal position of contact member 1 of the relay, line wire SY back to the office station OF and contact member 16 of switch OS in its left-hand position to the other terminal of battery OB. The connections are such that relay PR at station IFS is energized as required to operate its contact members 1 to 5, inclusive, to the reverse or left-hand position, it being recalled that the stroke of the armature of this relay once moved far enough to open the normal contacts is completed although the flow of current to the relay ceases due to the opening of the circuit at the normal polar contacts of the relay. With polar relay PR at station IFS operated to its reverse position, current flows from battery OB over line wire SZ of the spare line circuit to end station ES, and thence over the normal position of contact member 2 of polar relay PR of station ES, winding of that relay, normal position of contact member 1 of the relay, line wire SY1 back to the intermediate station IFS, reverse position of contact member 5 of the relay PR of station IFS, terminal L2 of the associated coding storage unit CS, back contact 10 of the respective master relay M, winding of the respective repeater relay R, terminal L1 of the coding storage unit, reverse position of contact member 3 of relay PR at station IFS, line wire SY to office station OF and contact member 16 of switch OS to the other terminal of battery OB; and polar relay PR at the end station ES is energized to operate its contact members to the reverse position. With both polar relays PR reversed the connection of each respective coding storage unit is transferred from the first or normal line circuit to the second or spare line circuit. This spare line circuit for the centralized traffic control system can be traced from positive terminal of battery OB at the office station over winding of repeater relay OR, back contact 14 of relay OT, contact member 15 of switch OS at its left-hand position, line wire SZ to end station ES, reverse position of contact member 4 of relay PR at station ES, terminal L2 of the respective unit CS, back contact 10 of the master relay of that unit, repeater relay R of the unit, terminal L1, reverse position of contact member 3 of relay PR of station ES, line wire SY1 to station IFS, reverse position of contact member 5 of relay PR of station IFS, terminal L2 of the respective unit CS, back contact 10 of the master relay M of that unit, repeater relay R of the unit, terminal L1, reverse position of contact member 3 of relay PR of station IFS, line wire SY to office station OF and contact member 16 of switch OS to the negative terminal of battery OB.

It follows that the repeater relays are now all energized in series over the spare line circuit and that transmission of a control code from the office station will be received by the R relays of the field stations and transmission of an indication code for either field station IFS or ES will be received by the office station repeater relay OR in the same manner as described in connection with such transmission of control and indication codes over the normal or first line circuit. It is to be seen therefore that operation of switch OS at the office station causes the polar relay PR at station IFS to be reversed to transfer its respective coding storage unit to the spare line circuit, and that such operation of relay PR of a field station IFS is immediately followed by reversal

of polar relay PR at end station ES to transfer the respective coding storage unit to the spare line circuit and that the centralized traffic control system is then conditioned for operation over the spare line circuit.

In the event that the operator desires to use the normal line circuit again he shifts the switch OS back to its normal position. Current then flows from battery OB through repeater relay OR, back contact 14 of relay OT, contact member 15 of switch OS in the right-hand position, line wire Y, reverse position of contact member 1 of relay PR at station IFS, winding of that relay, reverse position of contact member 2 of the relay, line wire Z and contact member 16 of switch OS at its right-hand position to the negative terminal of battery OB; and polar relay PR at station IFS is energized as required to operate its contact members to the right-hand or normal position and in so doing the respective coding storage unit is transferred back to the normal line circuit. When polar relay PR at field station IFS is operated to its normal position current flows as before over line wire Y and thence over normal position of contact member 3 of relay PR at station IFS, terminal L1 of the associated coding storage unit, relay R of the unit, back contact 10 of the associated master relay M, terminal L2 of the unit, normal position of contact member 5 of relay PR at station IFS, line wire Y1, reverse position of contact member 1 of relay PR at station ES, winding of the relay, reverse position of contact member 2 of that relay, line wire Z back to the office station and contact member 16 of switch OS to negative terminal of battery OB; and polar relay PR at the end station ES is energized as required to operate its contact members to the normal position and thereby connect the associated coding storage unit to the normal line circuit. The apparatus is now conditioned for operation of the centralized traffic control system over the first or normal line circuit.

Consequently, operating of switch OS at the office station serves to cause operation of the polar relays at the different field stations and the different coding storage units to be connected to the same line circuit as that at which the office station is connected, the operator at the office station effecting such switching of the centralized traffic control system from one line circuit to the other unaided and without leaving the office station.

Although I have herein shown and described only one form of railway traffic controlling apparatus embodying my invention, it is understood that various changes and modifications may be made therein within the scope of the appended claims without departing from the spirit and scope of my invention.

Having thus described my invention, what I claim is:

1. In combination, an office station and a field station spaced apart, a first and a second line circuit extending between said stations, a relay at the field station, a current source and a two position switch at the office station, a polar relay at the field station characterized by the fact that the stroke of the polar armature is completed when current is supplied to the relay winding for an interval long enough to move the armature away from its last position, said polar relay winding connected to said first and second line circuits over reverse and normal contacts of said polar relay respectively, said first mentioned

relay connected to said first and second line circuits over normal and reverse contacts of said polar relay respectively, and said current source connected to said first line circuit over a preselected one of said two positions of said switch to supply current as required to energize said polar relay at normal polarity and said current source connected to said second line circuit over the other position of said two positions of said switch to supply current as required to energize said polar relay at reverse polarity.

2. In combination, an office station and a field station spaced apart, a first and a second line circuit extending between such stations for transmission of control influences between the two stations, a current source and a two position switch at the office station, a polar relay at the field station and characterized by the fact that the polar armature remains in the position to which it was last moved when the relay winding is deenergized and the stroke of the armature is completed when current is supplied to the winding for an interval long enough to move the armature away from its last position, said polar relay winding connected to said first and second line circuits over its own reverse and normal contacts respectively said current source connected to said first line circuit over a preselected one of the positions of said switch to supply current as required to energize said polar relay at normal polarity and said current source connected to said second line circuit over the other position of said switch to supply current as required to energize said polar relay at reverse polarity, and controlled means at the field station connected to said first and second line circuits over normal and reverse contacts of the polar relay respectively.

3. In combination, an office station and a field station spaced apart, a normal and a spare line circuit extending between such stations, a repeater relay at said field station, a current source and a two position switch at the office station, a polar relay at the field station characterized by the fact that the stroke of the polar armature is completed when current is supplied to the relay winding for an interval long enough to move the armature away from its last position, said polar relay winding connected to said normal and spare line circuits over reverse and normal contacts of the relay respectively, said repeater relay connected to said normal and spare line circuits over normal and reverse contacts of said polar relay respectively, means including a first position of said switch to connect said current source to said normal line circuit as required to energize the polar relay at normal polarity for operating the polar relay to its normal position to connect said repeater relay to the normal line circuit, and means including the other position of the switch to connect said current source to said spare line circuit as required to energize the polar relay at reverse polarity for operating the polar relay to its reverse position to connect said repeater relay to the spare line circuit.

4. In combination, an office station and a field station spaced apart, a normal and a spare line circuit extending between such stations, a repeater relay at said field station, a current source and a two position switch at the office station, a polar relay at the field station characterized by the fact that the stroke of the polar armature is completed when current is supplied to the relay winding for an interval long enough to move the armature away from its last position, said polar

relay winding connected to said normal and spare line circuits over reverse and normal contacts of the relay respectively, said repeater relay connected to said normal and spare line circuits over normal and reverse contacts of said polar relay respectively, means including a first position of said switch to connect said current source to said normal line circuit as required to energize the polar relay at normal polarity for operating the polar relay to its normal position to connect said repeater relay to the normal line circuit, means including the other position of the switch to connect said current source to said spare line circuit as required to energize the polar relay at reverse polarity for operating the polar relay to its reverse position to connect said repeater to the spare line circuit, and control means at the office station interposed in the connection of said current source to said switch for governing the energization of said repeater relay when connected to either of said line circuits.

5. In combination, an office station and a field station spaced apart, a normal and a spare line circuit extending between said stations, two neutral repeater relays one at each of said stations, a current source and a two position switch at said office station, a polar relay at said field station and having its winding connected to said normal line circuit over a reverse contact of the relay and to said spare line circuit over a normal contact of the relay, said field station repeater relay connected to said normal line circuit over a normal contact of the polar relay and to said spare line circuit over a reverse contact of the polar relay, means including one position of said switch to connect said current source and office station repeater relay in series to said normal line circuit to energize said polar relay at normal polarity for operating the polar relay to its normal position and subsequently energizing said repeater relays in series over the normal line circuit, and means including the other position of said switch to connect said current source and office station repeater relay in series to said spare line circuit to energize said polar relay at reverse polarity for operating the polar relay to its reverse position and subsequently energizing said repeater relays in series over the spare line circuit.

6. In combination, an office, an intermediate and an end station which are spaced apart in the order named, a normal and a spare line circuit extending between said stations, a current source and a two position switch at said office station, a polar relay at each of the intermediate and end stations, each of such polar relays characterized by the fact that when current is supplied to its winding for an interval long enough to move its

armature from the last position the armature moves to the other position although the current ceases, each polar relay having its winding connected to said normal and spare line circuits over its own reverse and normal contacts respectively, means including a normal contact of the polar relay at the intermediate station to loop the normal line circuit through that station and including a reverse contact of such polar relay to loop the spare line circuit through the intermediate station, means including said switch at a selected one of its positions to connect said current source to the normal line circuit as required to supply current of a polarity that energizes first the polar relay of the intermediate station and then the polar relay at the end station at normal polarity, and means including said switch at its other position to connect the current source to the spare line circuit as required to supply current that energizes first the polar relay at the intermediate station and then the polar relay at the end station at reverse polarity.

7. In combination, an office station, an intermediate station, an end station, a normal line circuit including a first pair of line wires extending between said stations, a spare line circuit including a second pair of line wires extending between said stations, a repeater relay at each of said stations, a source of current and a two position switch at said office station, two polar relays one at said intermediate station and the other at said end station, said intermediate and end stations each provided with means including a normal and a reverse polar contact of the respective polar relay to connect the repeater relay at the same station in series with said normal and spare line circuits respectively, said intermediate and end stations each provided with means including a normal and a reverse polar contact of the respective polar relay to connect a winding of the polar relay at the same station across the line wires of the spare and normal line circuits respectively, and means including the first position of said switch to connect the office station repeater relay and current source in series in said normal line circuit to apply to that line circuit current of a polarity as required to operate said polar relays to the normal position for energizing said repeater relays in series, and means including the second position of said switch to connect said office station repeater relay and current source in series in said spare line circuit to apply to that line circuit current of a polarity as required to operate said polar relays to the reverse position for energizing said repeater relays in series.

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