

C. S. DEMAREST AND O. H. LOYNES.

REPEATER APPARATUS.

APPLICATION FILED OCT. 2, 1919.

1,410,003.

Patented Mar. 21, 1922.

2 SHEETS--SHEET 1.

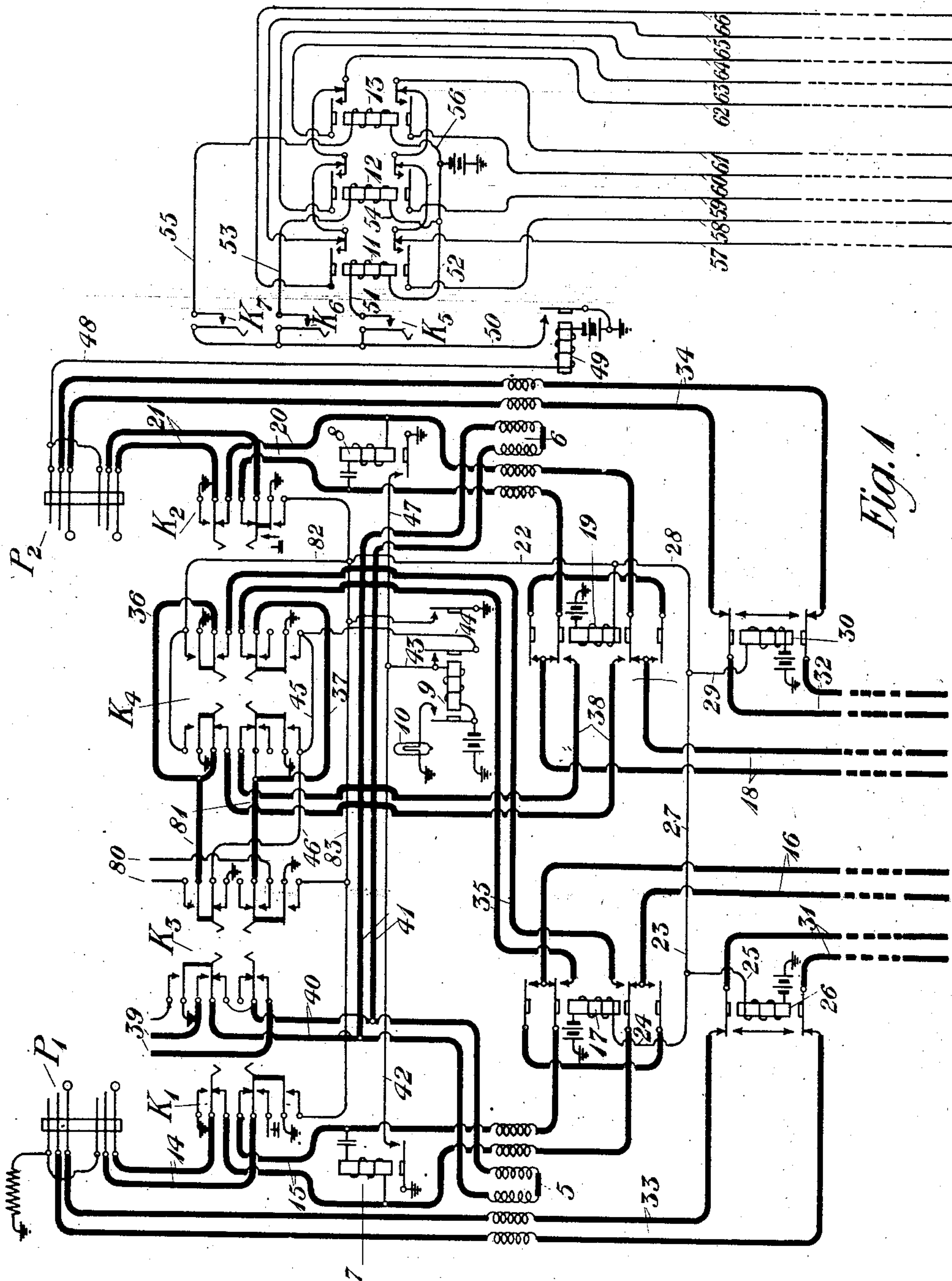


Fig. 1

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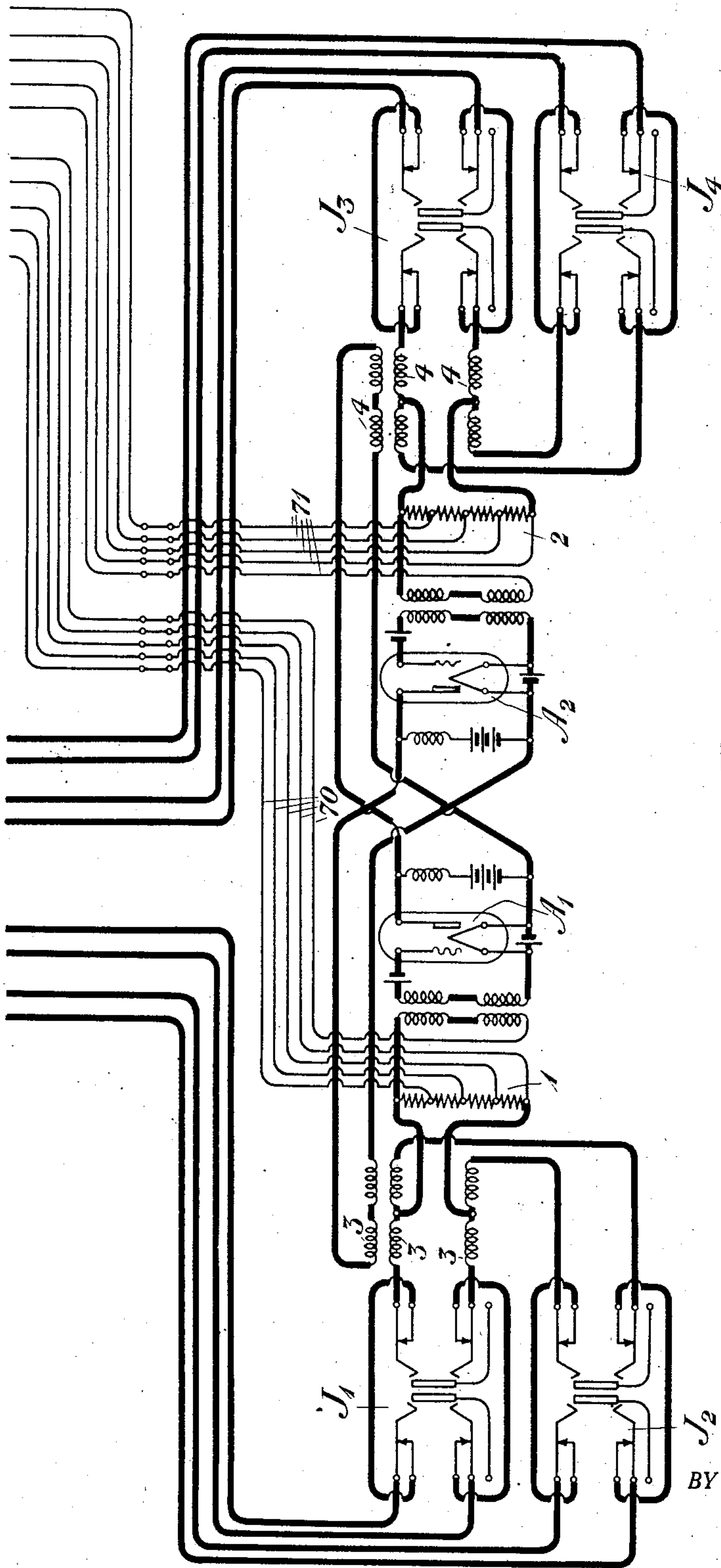


Fig. 2

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UNITED STATES PATENT OFFICE.

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REPEATER APPARATUS.

1,410,003.

Specification of Letters Patent. Patented Mar. 21, 1922.

Application filed October 2, 1919. Serial No. 327,973.

To all whom it may concern:

Be it known that we, CHARLES S. DEMAREST and OWEN H. LOYNES, residing at Brooklyn and Wood Ridge, in the counties of Kings and Bergen and States of New York and New Jersey, respectively, have invented certain Improvements in Repeater Apparatus, of which the following is a specification.

This invention relates to telephone systems and more particularly to repeater apparatus and circuits included in such systems.

It has heretofore been the practice in designing and manufacturing repeater sets for use in telephone systems to provide different types of repeater sets for different types of installations. Accordingly, special features would be taken into consideration when a repeater set was to be used with cord circuit apparatus, which might render such a repeater set unsuitable for use in through line operation and vice versa. In view of the above, it is one of the cardinal features of this invention to provide a repeater set which will be of simple design and capable of use with different types of installations. Other and further features of the invention will be clear from the detailed description hereinafter given.

In providing the repeater set of this invention, it has been the general plan to dissociate from the repeater set all apparatus not essentially a part of the basic repeater unit; that is, all associated apparatus such as that used for signaling, testing, switching, supervision, and other purposes which might be required to have special features adapted to different types of installations and suited only for specific uses of the repeater. All such associated and non-essential apparatus would be included as a part of the circuit connected with the repeater set, such as a cord circuit, or through line apparatus.

The invention may be more fully understood from the following description taken in connection with the accompanying drawing in the Figures 1 and 2 of which, when taken together, is illustrated a circuit diagram of a preferred form of the invention.

In the Fig. 2 is illustrated the repeater set of this invention associated with the cord circuit illustrated in Fig. 1. The repeater

set includes the vacuum bulb amplifiers A_1 and A_2 , the potentiometers 1 and 2, the usual three-winding transformers 3 and 4, and the switching means J_1 , J_2 , J_3 and J_4 . The cord circuit of Fig. 1 terminates in the plugs P_1 and P_2 . Included in the cord circuit are the ringing keys K_1 and K_2 , whereby ringing current may be transmitted over lines with which connections are made with the plugs P_1 and P_2 . Associated with the line and network conductors of the cord circuit are the supervisory or monitory windings 5 and 6, which are associated with the contacts of key K_3 , which in turn is associated with an operator's supervisory apparatus. The cord circuit also includes the splitting key K_4 , which permits the operator to talk in either direction. Bridged across the line conductors of the cord circuit are the ringing responsive relays 7 and 8, which are actuated by ringing current transmitted over lines with which connections are established by the plugs P_1 and P_2 . The relays 7 and 8 control the relay 9 and the supervisory signaling lamp 10. Associated with the cord circuit are the keys K_5 , K_6 and K_7 , and the relays 11, 12 and 13, which serve to control potentiometers 1 and 2, and thus regulate and set the gain of the repeater at a desired value.

The operation of the invention is as follows: If a connection is established with the cord circuit between two long distance lines by inserting the plugs P_1 and P_2 in the jacks of such lines and the key K_4 is not operated, a talking circuit will be completed through the cord circuit and the repeater set over the following circuit: from the line contacts of plug P_1 , over conductors 14, normal contacts of key K_1 , over conductors 15, armatures and normal contacts of relay 17, conductors 16, contacts of jack J_1 , and through the repeater set in the usual manner, over the contacts of jack J_3 , over conductors 18, normal contacts and armatures of relay 19, conductors 20, normal contacts of key K_2 , conductors 21, line contacts of plug P_2 . On the above traced connections it will be possible to obtain supervision by operating the key K_3 and connecting the conductors 39 leading to the operator's supervisory apparatus, to the conductors 40 and 41, which in turn are connected to the

monitoring coils 5 and 6, respectively. If, when the above traced connection is established, ringing current should be transmitted back over one of the connected lines, either of the relays 7 or 8 will be operated and operate the supervisory signal lamp 10 in the following manner. Ringing current transmitted back over the line connected with plug P_1 will be transmitted over the line contacts of plug P_1 , over conductors 14, normal contacts of key K_1 , conductors 15, and through the winding of relay 7. As the relay 7 is responsive to ringing currents, it will pull up its armature and close the following circuit: from ground, armature and contact of relay 7, conductor 42, conductor 43, winding of relay 9, to battery and ground. This will operate the relay 9 and close a circuit through the filament of supervisory signal lamp 10. At the same time the following locking circuit will be closed for relay 9: from ground and battery, winding of relay 9, right hand contact and armature of relay 9, conductor 44, conductor 45, conductor 46, normal contact of key K_3 , to ground. If the ringing current were transmitted back over the line connected with the plug P_2 , the ringing current would be transmitted over conductors 21, normal contacts of key K_2 , conductors 20, and through the winding of relay 8. As the relay 8 is responsive to ringing current, it would pull up its armature and close the following circuit: from ground, armature and contact of relay 8, over conductors 47 and 43, winding of relay 9, to battery and ground. In the same manner as formerly pointed out, the closing of this circuit will operate relay 9 and the supervisory signal lamp 10.

By operating the splitting key K_4 and the key K_3 the operator may connect her telephone set with the cord circuit for transmission in either direction in the following manner. If the operator desires to talk over the line with which a connection is made with plug P_1 , the splitting key K_4 will be thrown to the left and the key K_3 will be thrown to the right. This will close the following circuit: from ground, upper left hand make contact of key K_4 , conductors 22 and 23, and thence over conductors 24 and 25, about the windings of relays 17 and 26, to battery and ground and also about the windings of relays 19 and 30 to battery and ground. This will operate relays 17 and 26 and disconnect the repeater set from the cord circuit and connect the operator's telephone set with the line associated with plug P_1 in the following manner: from conductors 80 associated with the operator's telephone set, right hand make contacts of key K_3 , conductors 81, conductors 36 and 37, right hand normal contacts of key K_4 , conductors 35, make contacts and armatures of relay 17, conductors 15, contacts of key K_1 , conductors 14, contacts of plug P_1 ,

and thence to the line connected to plug P_1 . If the operator desires to talk over the line connected to plug P_2 the splitting key K_4 is thrown to the right and key K_2 is thrown to the right. This will close the following circuit: from ground, upper right hand make contact of key K_4 , conductor 82, 83, 22, 27, and thence over conductors 28 and 29, about the windings of relays 19 and 30, to battery and ground and also about the windings of relays 17 and 26 to battery and ground. The operation of relays 19 and 30 will disconnect the repeater set from the cord circuit and will connect the operator's telephone set with the line connected to plug P_2 in the following manner: from conductors 80 associated with the operator's telephone set, make contacts of key K_2 , conductors 81, left hand normal contacts of key K_4 , conductors 38, make contacts and armatures of relay 19, conductors 20, contacts of key K_2 , conductors 21, contacts of plug P_2 , and thence to the line connected with plug P_2 .

The gain of the amplifiers A_1 and A_2 of the repeater set is effected by adjustments of the potentiometers 1 and 2, which adjustment is in turn regulated by the keys K_5 , K_6 and K_7 , in the following manner: When the plug P_2 is connected with the jack of a line ground will be applied from the sleeve contacts of the jack of said line to the sleeve contacts of plug P_2 , and a circuit will be completed from the sleeve contacts of plug P_2 , over conductor 48, winding of relay 49, to battery and ground. The closing of this circuit will operate relay 49, which will apply ground over its armature and contact to conductor 50, and thence to the contacts of the keys K_5 , K_6 and K_7 . The operation of key K_5 will operate relay 11 by closing the following circuit: from ground applied to contacts of key K_5 , over conductor 51, winding of relay 11, conductor 52, to battery and ground. The operation of key K_6 will operate relay 12 by closing the following circuit: from ground applied to contacts of key K_6 , over conductor 53, winding of relay 12, conductor 54, to battery and ground. The operation of key K_7 will operate relay 13 by closing the following circuit: from ground applied to contacts of key K_7 , over conductor 55, winding of relay 13, conductor 56, to battery and ground. The relays 11, 12 and 13 serve to select various taps on the potentiometers over conductors 57, 58, 59, 60, 61, and over conductors 62, 63, 64, 65 and 66, thereby regulating the gain of the repeaters associated therewith.

By means of the jacks J_1 , J_2 , J_3 and J_4 , and patching cords (not shown) the repeater set may be connected for through line operation in a long distance line without any further change in equipment other than to disconnect the potentiometer leads at terminals 70 and 71 from their controlling apparatus

and permanently adjusting the repeater gain by connecting together at said terminals such of the leads as desired.

While the invention has been illustrated with a specific cord circuit arrangement, it is pointed out that it is capable of use with other types of cord circuits and long distance lines. Accordingly, while the invention has been disclosed in certain specific arrangements which have been deemed desirable, it is understood that it is capable of embodiment in many and widely varied forms without departing from the spirit of the invention as defined in the appended claims.

What is claimed is:

1. A two-way two-element repeater having line conductors and network conductors, said conductors terminating in the line and network plugs respectively of a link circuit, supervisory windings in all of said conductors, a supervisory circuit inductively related to said windings, switching means, and relay means controlled by said switching means whereby said repeater may be disconnected

from said line and network conductors, said supervisory arrangements being operative when said switching means are operated.

2. A two-way two-element repeater having line conductors and network conductors, said conductors terminating in the line and network plugs respectively of a link circuit, supervisory windings in all of said conductors, a supervisory circuit inductively related to said windings, an operator's telephone set, a splitting key, and relay means controlled by said splitting key whereby said repeater may be disconnected from said line and network conductors and said operator's telephone set may be connected to a pair of said line conductors, said supervisory arrangements being operative when said splitting key is operated.

In testimony whereof, we have signed our names to this specification this 30th day of September, 1919.

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OWEN H. LOYNES.