

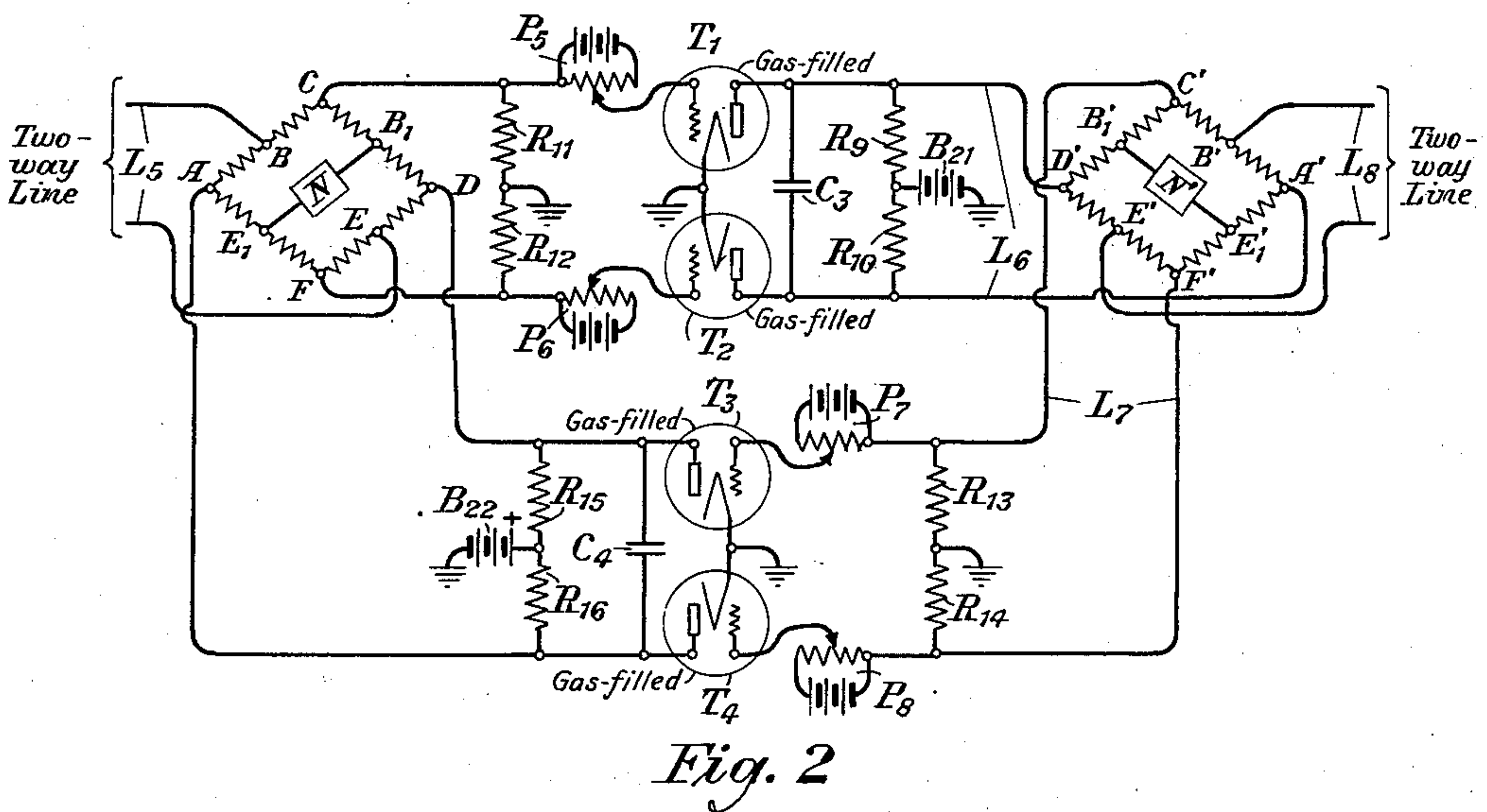
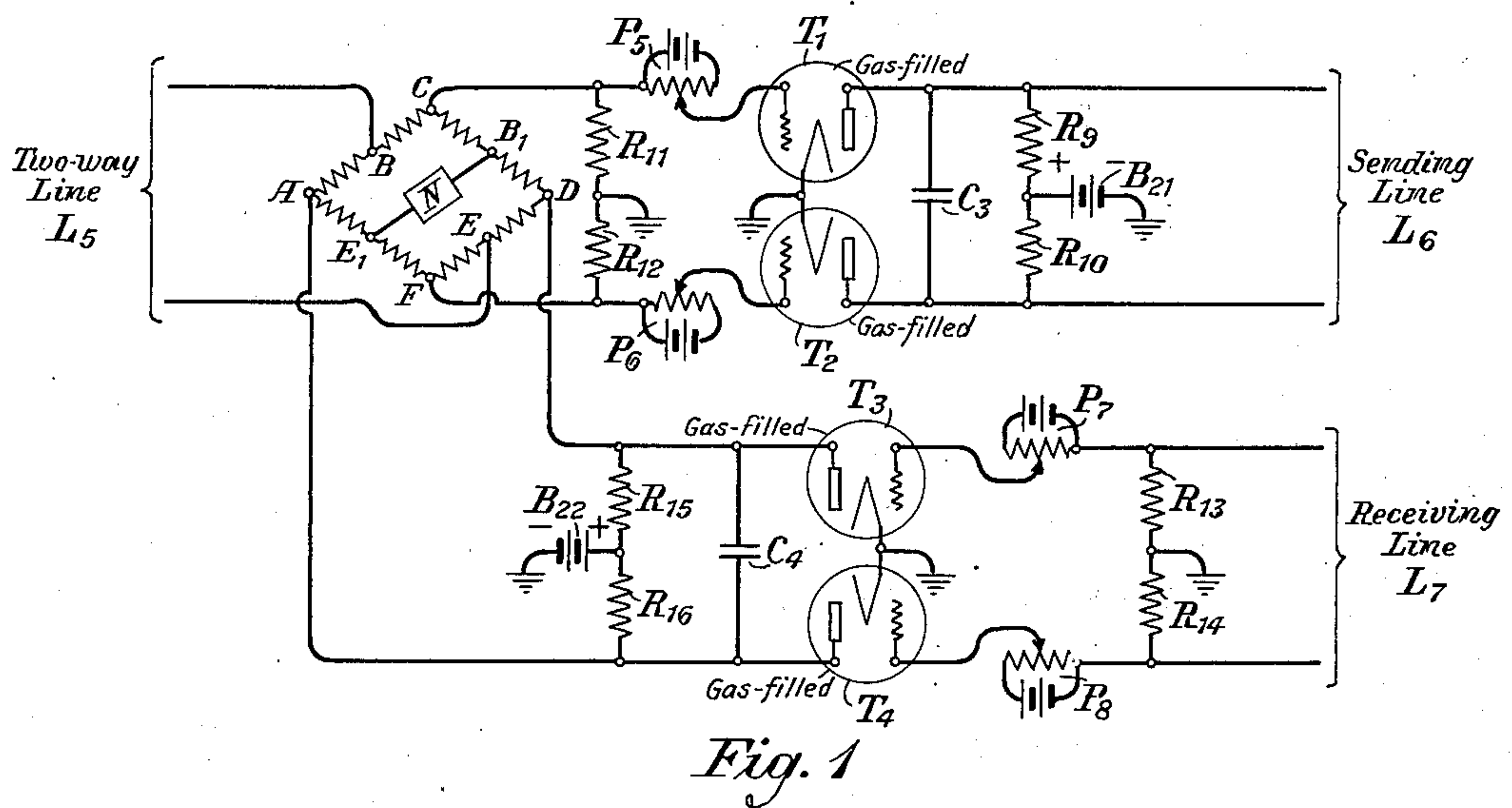
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D. E. BRANSON ET AL

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TELEGRAPH SYSTEM

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TELEGRAPH SYSTEM

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2 Claims. (Cl. 178—71)

This invention relates to telegraph systems and more particularly to improved repeater arrangements utilized in such systems.

This application is a continuation in part of a copending application, Serial No. 14,714, filed in our names on April 4, 1935.

In the arrangements of this invention the telegraph repeater comprises a plurality of gas-filled discharge tubes and circuit arrangements therefor whereby the usual magnetic relay arrangements may be eliminated. The arrangements of the invention accordingly, provide a means for eliminating the expensive maintenance of the electromagnetic type of relay. The arrangements of the invention furthermore provide a repeater which is more reliable at high speeds than prior arrangements. The repeater arrangements of the invention provide a novel means for interconnecting a two-way line of the polar duplex type to two one-way lines and also for interconnecting two two-way lines of the polar duplex type together. Other objects and features of the invention will appear more fully from the detailed description thereof hereinafter given.

The invention may be more fully understood from the following description together with the accompanying drawing, in Figures 1 and 2 of which are shown circuit diagrams illustrating an embodiment of the invention and a modification thereof.

In Fig. 1, the repeater arrangements of the invention are shown interconnecting the two-way line L_5 with two one-way lines L_6 and L_7 . The two-way line L_5 may be of the polar duplex type and may be connected at its other end to a repeater similar to the one shown or the line may be the open or closed type of loop without a repeater as desired. The two-way line L_5 and the two one-way lines L_6 and L_7 are connected together by the double Wheatstone bridge ACDF in a manner similar to a hybrid connection for voice frequency circuits. The sending line L_6 and the receiving line L_7 are connected at conjugate points AD and CF so as to prevent signals coming in over line L_7 from being repeated back over line L_6 . The two-way line L_5 is connected to intermediate points BE on the bridge and a balancing network N is connected to the intermediate points B₁ E₁ in order to preserve the balance of the bridge. The type of Wheatstone bridge arrangement shown is substantially similar to that illustrated in United States Patent No. 1,681,216, issued August 21, 1928, to D. E. Branson et al.

The operation of the arrangements shown in Fig. 1 is as follows: Marking or spacing signals coming in over line L_7 will be received over resistances R_{13} or R_{14} . A marking signal received over resistance R_{13} will cause the grid of the gas-filled discharge tube T_3 to be made more positive through potentiometer P_7 . This will cause the tube T_3 to operate and become conductive, thus permitting a direct current to flow over the following path; from battery B_{22} , resistance R_{15} , plate of tube T_3 to filament of tube T_3 , to ground. When the tube T_3 becomes conductive, the potential on the plate drops from the full battery potential of battery B_{22} to the normal sustaining voltage needed to maintain the tube conductive. When this takes place, the plate of tube T_4 , which tube was previously conductive, is made sufficiently negative with respect to its cathode to cause the tube T_4 to be extinguished. This is due to the connection of the condenser C_4 between the plates of the tubes T_3 and T_4 . This condenser arrangement, whereby the operation of either of the tubes T_3 or T_4 will cause the release of the other tube, is an arrangement well known in the art. The flow of current over the previously traced circuit including battery B_{22} and resistance R_{15} will apply a marking signal to the line and through the Wheatstone bridge ACDF to the two-way line L_5 . In a similar manner a spacing signal received over line L_7 and resistance R_{14} will cause the operation of tube T_4 , the release of tube T_3 , and the application by means of the circuit including battery B_{22} and resistance R_{16} of a spacing signal to the line and then through the Wheatstone bridge ACDF to the two-way line L_5 .

Marking or spacing signals coming in over the two-way line L_5 will be transmitted over the Wheatstone bridge and will be received over the resistance R_{11} and R_{12} . A marking signal will be received over resistance R_{11} and will operate tube T_1 . This will cause current to flow from battery B_{21} , through resistance R_9 , plate and filament of tube T_1 , to ground. Due to condenser C_3 , tube T_2 will be extinguished. The flow of current through resistance R_9 will apply a marking signal to the one-way line L_6 . A spacing signal will be received over resistance R_{12} and will cause the operation of the tube T_2 , the release of tube T_1 , the completion of a circuit from battery B_{21} through resistance R_{10} and hence the application of a spacing signal to line L_6 . As the operation of tubes T_1 and T_2 is similar to that of tubes T_3 and T_4 , no further description thereof will be given.

In Fig. 2 the repeater arrangements of the invention are shown interconnecting two one-way lines L_5 and L_8 . As Fig. 2 is in large part similar to Fig. 1 similar reference characters have to be used to denote like parts in both figures. Fig. 2 is identical with Fig. 1 except that the two one-way lines L_6 and L_7 are shown connected to the conjugate points D' and A' and C' and F' , respectively of another Wheatstone bridge $A'C'D'F'$. The second two-way line L_8 is shown connected to the intermediate points B' and E' of the bridge. A balancing network N' is connected to the intermediate points B'_1 and E'_1 . The bridge $A'C'D'F'$ is identical with the bridge $ACDF$. As the details of operation of the arrangements are the same as those heretofore given with respect to Fig. 1 no further description thereof will be given.

While the invention has been described as embodied in certain specific arrangements which are deemed desirable it is understood that it is 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 two-way line and two one-way lines, a Wheatstone bridge device, said two one-way lines being connected to conjugate points of said bridge and said two-way line being connected to intermediate points of said bridge whereby signals coming in over the receiving first of said one-way lines will not be applied to the sending second of said one-way lines, two gas-filled discharge tubes each connected in different sides of said first one-way line, means for causing said tubes to respond alternately to marking and spacing signals coming in over said line and to repeat said signals to said two-way line, two gas-filled discharge tubes each connected in different sides of the second of said one-way lines, means for causing said two last mentioned tubes to respond alternately to marking and spacing signals coming in over said two-way line and to repeat such signals over said second one-way line, a second Wheatstone bridge, said two one-way lines being connected to conjugate points of said bridge, and a second two-way line connected to intermediate points of said second bridge.

nately to marking and spacing signals coming in over said line and to repeat said signals to said two-way line, two gas-filled discharge tubes each connected in different sides of the second of said one-way lines, and means for causing said two last mentioned tubes to respond alternately to marking and spacing signals coming in over said two-way line and to repeat such signals over said second one-way line.

2. A telegraph system comprising a two-way line and two one-way lines, a Wheatstone bridge device, said two one-way lines being connected to conjugate points of said bridge and said two-way line being connected to intermediate points of said bridge whereby signals coming in over the receiving first of said one-way lines will not be applied to the sending second of said one-way lines, two gas-filled discharge tubes each connected in different sides of said first one-way line, means for causing said tubes to respond alternately to marking and spacing signals coming in over said line and to repeat said signals to said two-way line, two gas-filled discharge tubes each connected in different sides of the second of said one-way lines, means for causing said two last mentioned tubes to respond alternately to marking and spacing signals coming in over said two-way line and to repeat such signals over said second one-way line, a second Wheatstone bridge, said two one-way lines being connected to conjugate points of said bridge, and a second two-way line connected to intermediate points of said second bridge.

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