

May 12, 1925.

1,537,126

W. H. MARTIN

LOUD SPEAKER CIRCUIT

Filed June 24, 1922

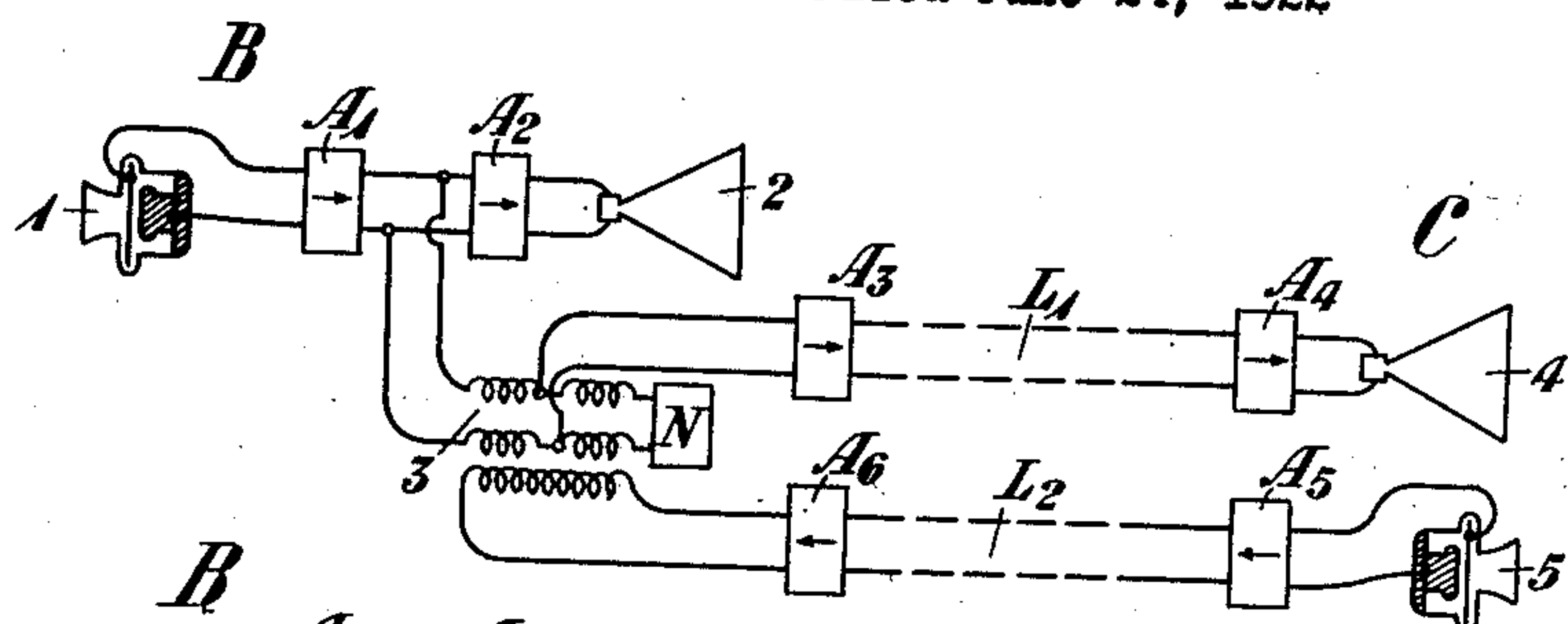


Fig. 1

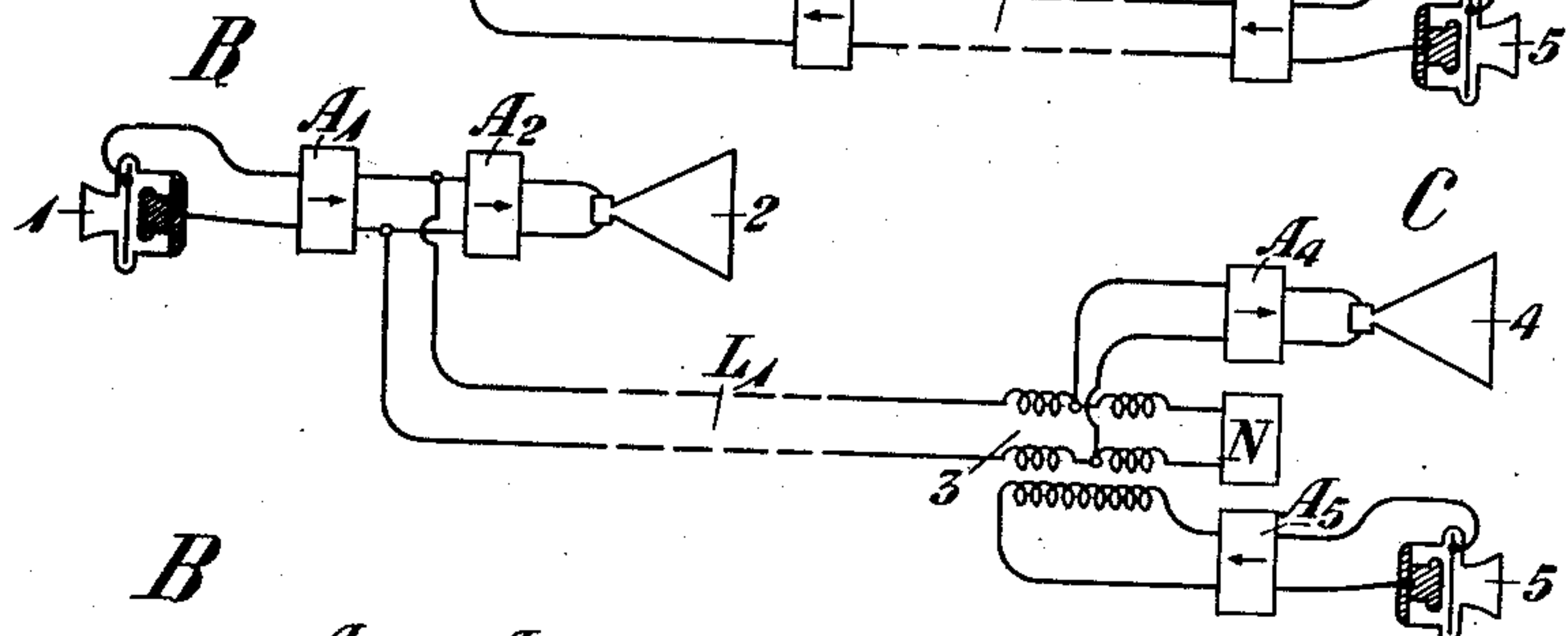


Fig. 2

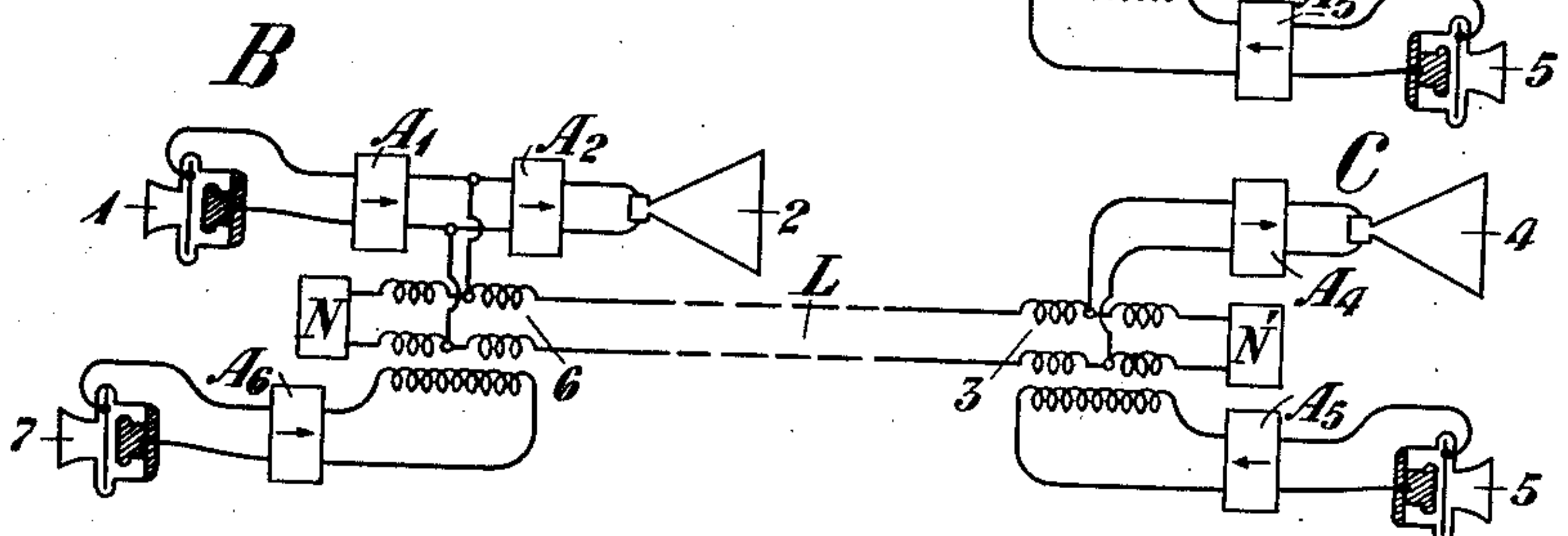


Fig. 3

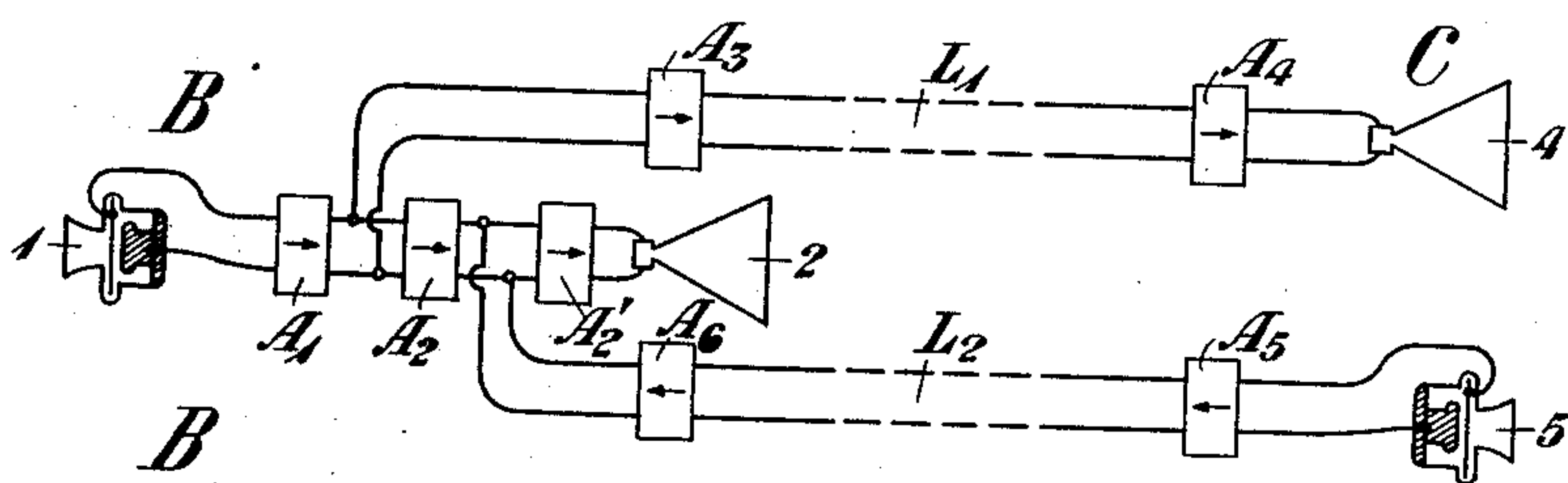


Fig. 4

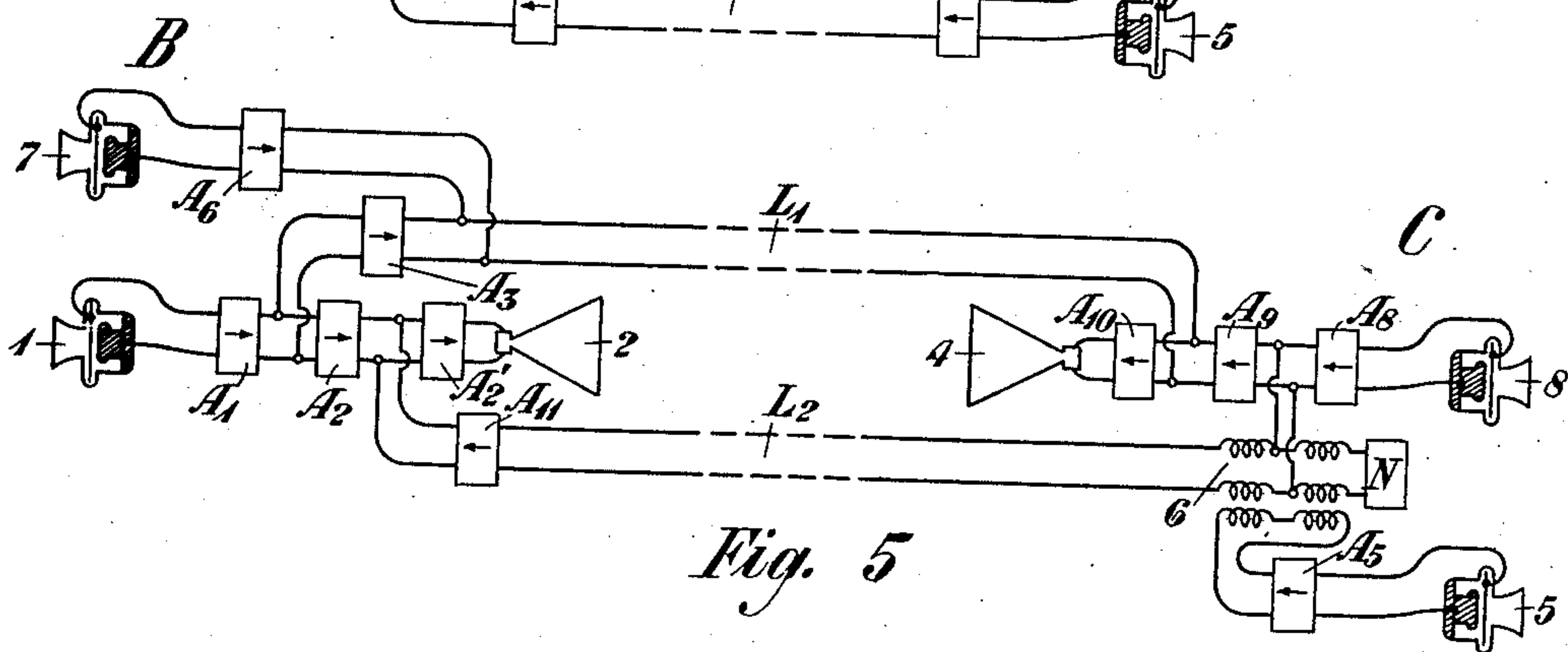


Fig. 5

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UNITED STATES PATENT OFFICE.

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LOUD-SPEAKER CIRCUIT.

Application filed June 24, 1922. Serial No. 570,552.

To all whom it may concern:

Be it known that I, WILLIAM H. MARTIN, residing at New York, in the county of Bronx and State of New York, have invented certain Improvements in Loud-Speaker Circuits, of which the following is a specification.

This invention relates to improvements in telephone circuits and particularly to the types of circuits suitable for use with loud speaker apparatus.

The field of use for the loud speaking telephone receiver is found to extend, among other things, to announcing systems, phonograph reproduction, intercommunication, and the giving of public address or other performance. Of all of these uses that of public address is one of the most important, as it will permit a speaker to deliver an address to an audience of a number of people greater than he can reach with his own voice, or to address simultaneously audiences located in different places by means of telephone circuits connected into the loud speaker system. In general it is the object of this invention to provide improved circuit arrangements suitable for loud speaker systems and particularly those designed for purposes of public address. One of the features of the circuit arrangements of the invention consists in the provision of an applause circuit, whereby, when a speaker is addressing an audience at a distant point as well as locally, the applause at the distant point may be transmitted back to the point of speaking. Other features and objects of the invention will appear more fully from the detailed description of the invention hereinafter given.

The invention may be more fully understood from the accompanying drawing in the Figures 1, 2, 3, 4, and 5 of which are illustrated a preferred form and modification of the invention. Similar reference characters have been used to denote like parts in all of the figures of the drawing.

In Fig. 1 is shown a loud speaker circuit interconnecting two stations B and C and designed so that a speaker at station B may address audiences at both stations. There is also provided an applause circuit so that the applause at the distant station C may be transmitted back to station B. The loud speaker circuit at station B consists of a transmitter 1 connected through the ampli-

fying elements A_1 and A_2 to a loud speaking receiver 2. The loud speaking receiver may be of any desirable type well known in the art. The amplifiers A_1 and A_2 are shown schematically and may be of the well known vacuum tube type. A desirable form of transmitter to use in this connection would be a condenser transmitter although other types might be utilized. Bridged across the loud speaker circuit at station B is a circuit terminating in a balancing network N and the hybrid coil, or three winding transformer, 3. Connected across the midpoints of two of the windings of this transformer is the circuit L_1 extending to station C and terminating thereat in the loud speaking receiver 4. Amplifiers A_3 and A_4 may be included in line L_1 if desired. With this arrangement the speaker may talk into transmitter 1 at station B and his words be transmitted to the audiences at B and C by the loud speakers 2 and 4 respectively. Connected to the other winding of transformer 3 is the circuit L_2 terminating at station C in the transmitter 5. Circuit L_2 may include the amplifiers A_5 and A_6 if desired. The transmitter 5 will be so located as to be effected by the applause from the audience at C. With this arrangement the applause from C will be transmitted back to station B and will be reproduced by the loud speaker 2. In placing the transmitter 5 at C so as to be suitably exposed to the applause of the audience, it will in many cases be also exposed to the loud speaker at C. Due to the manner in which circuits L_1 and L_2 are associated with the three winding transformer 3 the applause circuit L_2 will be neutral with respect to the circuit L_1 and will not effect the loud speaker at C, thus avoiding "singing" around the circuit formed by 4, 5, L_1 and L_2 . With this arrangement the speaker at B may address audiences at both stations and the applause from the distant station may be reproduced at the speaker's station. It is pointed out that if the transmitter 1 were sufficiently exposed to the audience at station B, the applause thereat would be reproduced at station C as well as the speaker's address.

The arrangements illustrated in Fig. 2 are substantially the same as those of Fig. 1, except that the three winding transformer 3 is located at station C instead of at sta-

tion B. With this arrangement only one two wire connection between stations is needed.

In the arrangements of Fig. 3 an additional applause transmitter is provided at station B so that the applause at each station may be transmitted to the audiences at the other stations. Two transmitters are shown at B, one for speaking and one for applause, speaking or singing from the audience, since in many cases the arrangement of the speaker and audience is such that it is desirable for best results to have separate transmitters for the two purposes. In the modification of Fig. 3 the arrangements at station C are the same as heretofore described. At station B the line L terminates in a balancing network N and the three winding transformer 6. The local loud speaker circuit is bridged across two of the windings of this transformer. The applause transmitter 7 is connected to the other winding of the transformer 6 so as to be neutral with respect to the local loud speaker circuit.

In Fig. 4 is shown another modification of the invention in which provision is made for the speaker to address audiences at two stations and for the applause at the distant station to be reproduced at the local station. In this figure the local loud speaker circuit at station B is shown as comprising the transmitter 1, amplifiers A_1 , A_2 and A_2' , and the loud speaking receiver 2. Bridged across the local loud speaker circuit between amplifiers A_1 and A_2 is the circuit L_1 extending to station C and terminating thereat in the loud speaker 4. The circuit L_1 may include the amplifiers A_3 and A_4 . At station C is provided an applause transmitter 5 connected to a circuit L_2 , which may include amplifiers such as A_5 and A_6 . Circuit L_2 is bridged across the local loud speaker circuit at B between the amplifiers A_2 and A_2' . As amplifier A_2 is a unidirectional device the transmitter 5 will be neutral with respect to the loud speaking receiver 4, but will effect the loud speaker 2.

In the arrangements of Fig. 5 complete two-way loud speaker service is provided between two stations by means of the well known type of four-wire circuit. This circuit is made non-singing by utilizing the unidirectional properties of the vacuum tube amplifiers. Applause amplifiers are added at each end of the circuit and made neutral with respect to the loud speaking receivers at the end at which they are located by means of the unidirectional properties of the vacuum tube amplifier on one end and by means of a balance arrangement on the other. Obviously either means may be employed at both ends. This arrangement would permit of the audiences at either end of the circuit hearing what is said by

both the speaker and audience at the distant end of the circuit and also of the speaker at their own end of the circuit. In this arrangement the local loud speaker circuit at station B comprises the transmitter 1, amplifiers A_1 , A_2 , and A_2' , and the loud speaking receiver 2. Bridged across this local loud speaker circuit between amplifiers A_1 and A_2 is the circuit L_1 which extends to the distant station C. Included in circuit L_1 at station B is the amplifier A_3 . Bridged across circuit L_1 on the output of amplifier A_3 is a circuit including amplifying means A_6 and the applause transmitter 7. The applause transmitter 7 can not effect the local loud speaker 2 because of the unidirectional properties of vacuum tube A_3 . At station C the local loud speaker circuit includes the transmitter 8, amplifiers A_8 , A_9 and A_{10} , and the loud speaking receiver 4. Bridged across the local loud speaker circuit at B between amplifiers A_8 and A_9 is the circuit L_2 extending to station B. Circuit L_1 is connected to the local loud speaker circuit at C being bridged across said circuit between amplifiers A_9 and A_{10} , and circuit L_2 is connected to the local loud speaker circuit at B by being bridged across said circuit between amplifiers A_2 and A_2' . By thus utilizing the unidirectional properties of the vacuum tube amplifiers A_2 and A_9 , energy from line L_2 cannot be repeated into line L_1 and energy from line L_1 cannot be repeated into line L_2 and the singing in the circuit may be avoided. At station C there is also provided an applause transmitter 5 which is associated with line L_2 through a three winding transformer 6 whereby it will be neutral with respect to the loud speaking receiver 4.

While the circuit arrangements of the invention have been referred to herein for the specific use of public address, it is understood that they may be employed in many of the other uses to which loud speakers are applicable. Accordingly while the arrangements have been illustrated in certain specific forms which are deemed desirable, it is understood that they are 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 communication system comprising a station, a circuit at said first station including a transmitter and a loud speaking receiver; a second circuit associated with said first circuit and extending to a second station, a loud speaking receiver associated with said second circuit at said second station; a transmitter at said second station, and a circuit for said transmitter, said circuit being operatively associated with said first circuit and neutral with respect to said second circuit.

2. A communication system comprising a station, a circuit at said first station including a transmitter and a loud speaking receiver; a second circuit associated with said first circuit and extending to a second station, a loud speaking receiver associated with said second circuit at said second station; a transmitter at said second station, and a circuit for said transmitter, said circuit being associated with said first and second circuits by means of a hybrid coil whereby said transmitter at said second station will effect the loud speaking receiver at the first station and will not effect the loud speaking receiver at the second station.

3. A communication system comprising a station, a circuit at said station including a transmitter and a loud speaking receiver; a second circuit associated with said first circuit and terminating at a second station in a three winding transformer; a loud speaking receiver bridged across the midpoints of two of the windings of said transformer, and a transmitter connected to the other winding of said transformer.

4. A transmission line interconnecting a first and a second station, three winding transformers associated with said line at each of said stations, a circuit bridged across the midpoints of two of the windings of said transformer at said first station, said circuit

including a transmitter and a loud speaking receiver, a circuit associated with the other winding of said transformer at said first station, said circuit including a transmitter, a circuit including a loud speaking receiver bridged across the midpoints of two of the windings of the transformer at said second station, and a transmitter connected to the other winding of said transformer at said second station.

5. A communication system comprising two stations, a transmitter and a loud speaking receiver at one of said stations, a circuit interconnecting said transmitter and receiver so that the latter responds to currents generated by the transmitter; a second loud speaking receiver at the second station, a circuit connecting said second receiver with the transmitter at said first station so that it will respond to currents generated by said transmitter, a second transmitter at said second station, connections whereby said first receiver will respond to currents generated by said second transmitter, and means to prevent said second receiver from responding to currents generated by said second transmitter.

In testimony whereof, I have signed my name to this specification this 23rd day of June, 1922.

WILLIAM H. MARTIN.