A. BARRETT & W. CONDON.

ANTI-INDUCTION APPARATUS FOR TELEPHONE SYSTEMS.

APPLICATION FILED DEC. 28, 1908.

984,738. Patented Feb. 21, 1911.

2 SHEETS—SHEET 1.

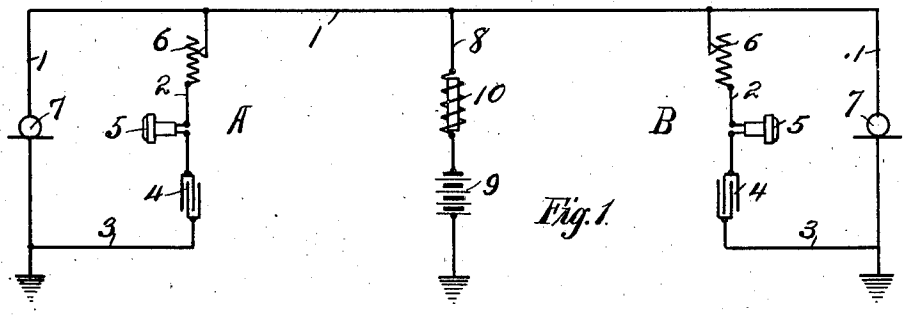

Fig. 1.

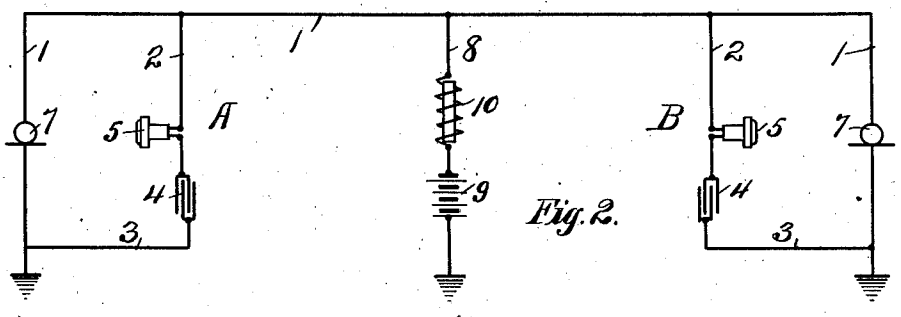

Fig. 2.

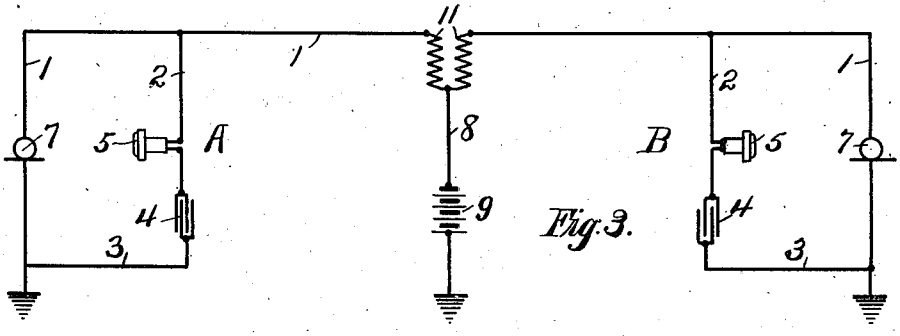

Fig. 3.

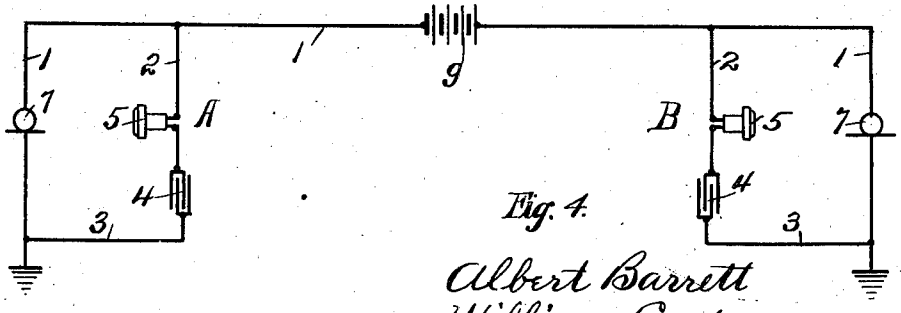

Fig. 4.

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2 SHEETS—SHEET 2.

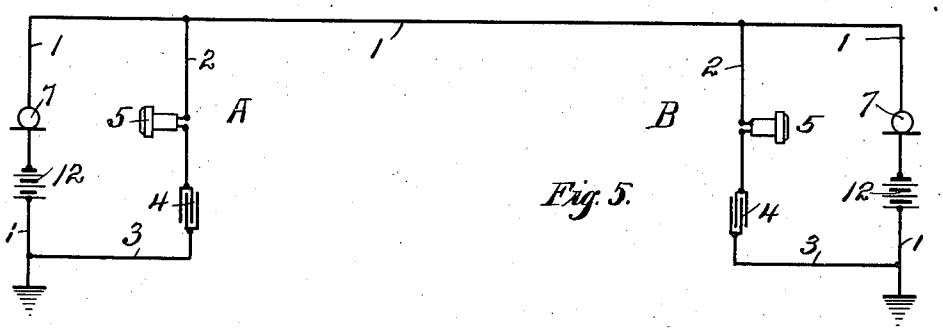

Fig. 5.

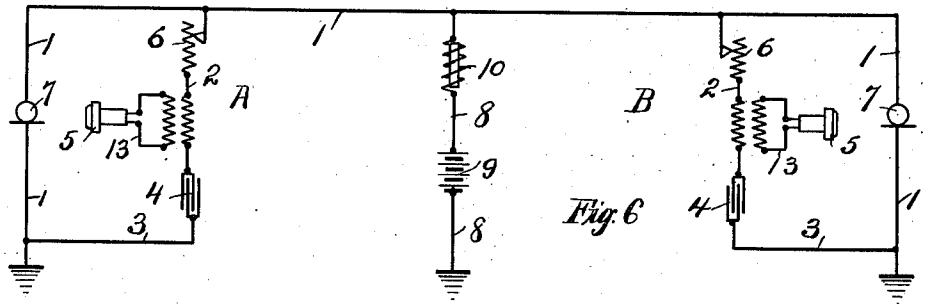

Fig. 6

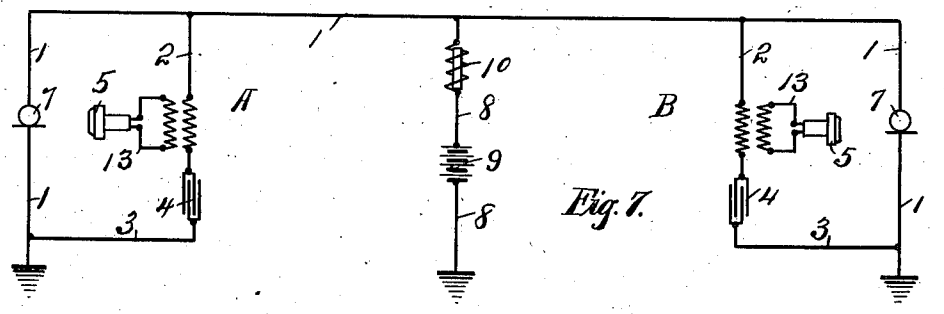

Fig. 7.

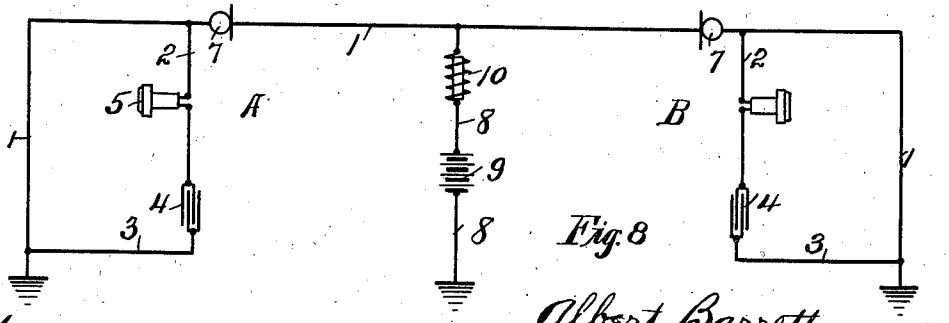

Fig. 8

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UNITED STATES PATENT OFFICE.

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ANTI-INDUCTION APPARATUS FOR TELEPHONE SYSTEMS.

984,738. Specification of Letters Patent. Patented Feb. 21, 1911.

Application filed December 28, 1908. Serial No. 469,595.

To all whom it may concern:

Be it known that we, ALBERT BARRETT and WILLIAM CONDON, citizens of the United States, residing at Kansas City, in the county of Jackson and State of Missouri, have invented certain new and useful Improvements in Anti-Induction Apparatus for Telephone Systems, of which the following is a specification.

Our invention relates to improvements in anti-induction apparatus for telephone systems.

The object of our invention is to provide a simple and effective apparatus for eliminating in telephone systems disturbances due to induction.

The novel features of our invention are hereinafter fully described and claimed.

In the accompanying drawings, Figure 1 is a diagrammatic view of the preferred form of our invention. In this form the two branches at each station are connected to a condenser, one branch having located in it a telephone receiver and a variable resistance, and the two transmitters being located in the main circuit intermediate the adjacent branches. The main conductor is connected to the ground intermediate the stations and at the stations, a battery and an inductant resistance being located in the intermediate ground connection. Fig. 2 is a modification similar to that shown in Fig. 1, the variable resistances in the branches being omitted, however. Fig. 3 is a modification similar to Fig. 2, the intermediate conductor at the central station being connected to two windings inductively related to each other and forming part of the main conductor connecting the stations. The inductant resistance in the intermediate conductor is omitted. Fig. 4 is a form similar to Fig. 2, the battery, however, being in the main line intermediate the stations. Fig. 5 is a modification similar to Fig. 2, excepting that two batteries are located respectively intermediate the branches at the two stations and in the main conductor. Fig. 6 is similar to Fig. 1 excepting that the telephones are located in secondary circuits inductively related to the branches. Fig. 7 is of a form similar to Fig. 6, excepting that the variable resistances in the branches are omitted. Fig. 8 is a modification similar to Fig. 2, the transmitters however being located in the main circuit intermediate the two stations and respectively adjacent thereto.

Similar characters of reference denote similar parts.

Referring to Fig. 1, the main circuit comprises conductor 1 and the ground to which the ends of the conductor are connected at stations A and B. Each station is provided with two branches 2 and 3 which are not inductively related to the main circuit, but are inductively related to each other by a condenser 4 to the poles of which the branches 2 and 3 are respectively connected. In branch 2 of each station is located a telephone receiver 5 and a variable resistance 6. Two variable resistance transmitters 7 are located in the main conductor respectively intermediate the branches 2 and 3 at stations A and B. A conductor 8 connects the conductor 1 to ground at the central office. In conductor 8 is a battery 9 and an inductant resistance 10. The current from battery 9 passing to conductor 1 will divide and reach the ground at A and B through transmitters 7. By talking into one transmitter 7 telephonic currents will be produced in conductor 1 and will be conveyed thereby to the other station where the telephonic currents due to the variation of the battery current will charge and discharge the condenser 4 through the branches 2 and 3 at that station. The charging and discharging of the condenser will produce alternating currents in the branches 2 and 3, which currents will be converted into sound waves by the receiver 5. The variable resistance transmitter at station A, when the transmitter at station B is talked into, will be actuated on by the telephonic currents to effect variations of resistance in the main conductor intermediate the branches 2 and 3. The stronger are the telephonic currents passing through the transmitter, the less will be the resistance offered to the current. As the telephonic currents weaken the resistance offered by the transmitter will increase. It will thus be seen that the variable transmitters increase the variation of the talking currents. By reason of the transmitters being located intermediate the branches 2 and 3 at their stations, the condensers are powerfully affected. The transmitters 7 being of relatively low resistance, the disturbing currents, which are always high tension currents of small quantity, will pass through the main conductor 1 to ground via the transmitters 7 instead of by way of the condensers 4. The direct battery currents being of large quantity will

operate to charge the condensers 4 so as to powerfully operate the receivers 5. The talk passing over the wire from the opposite station will thus be clear and without disturbing sounds accompanying the talk. When an exceedingly noisy line is to be operated the variable resistances 6 may be operated to reduce the currents entering branches 2 to a degree in which the disturbing sounds will be eliminated without materially affecting the loudness of talk.

On ordinary lines the resistances 6 may be dispensed with. In Fig. 2 the resistances 6 are eliminated but the operation otherwise is the same as the form shown in Fig. 1.

In the form shown in Fig. 3 the arrangement is similar to Fig. 2 excepting that conductor 8 is connected to conductor 1 intermediate two windings 11 forming a part of conductor 1 and inductively related to each other. This means of connecting the battery at the central office to the line wire is well known. The operation of the apparatus at stations A and B will be the same as in the form shown in Fig. 2.

In Fig. 4 the battery 9 is shown located directly in conductor 1 intermediate the two stations. Otherwise the construction and operation is the same as described with reference to Fig. 1, and also Fig. 2.

In Fig. 5 two batteries 12 are located in the conductor 1 intermediate the branches 2 and 3, respectively adjacent thereto. The operation is substantially the same as in the form shown in Fig. 2.

In Fig. 6 the construction is similar to Fig. 1 excepting the receivers 5 are located in secondary circuits 13, respectively inductively related to the branches 2. The operation is similar to the form shown in Fig. 1 excepting that the currents in branches 2 will induce currents in the secondary circuits 13 instead of passing directly through the receivers.

Fig. 7 is similar to Fig. 6 excepting that the variable resistances 6 are eliminated from branches 2. The operation is the same as in Fig. 6.

In Fig. 8 is a construction similar to Fig. 2 excepting that the transmitters 7 are intermediate the two stations and not respectively intermediate the adjacent branches 2 and 3. This form is not so efficient as that shown in Fig. 2 owing to the location of the transmitters 7. As located in Fig. 8, the condensers 4 are not so powerfully affected as they are in the form shown in Fig. 2, otherwise the operation of the form shown in Fig. 8 is similar to that of the form shown in Fig. 2.

By reason of the branches 2 and 3 not being inductively related to the main circuit, no currents will be formed in said branches which are due to induction from the main circuit, and as the resistance of each transmitter 7 is relatively small the disturbing currents will pass therethrough to ground and will, therefore, not affect the branches 2 and 3 excepting by a very trifling action occasioned by the employment of the condensers 4. This small amount of influence of the disturbing currents upon the branches 2 and 3 is due to their lack of quantity as compared with the battery currents which have quantity sufficient to exert a powerful influence on the condensers 4.

With the use of our invention metallic circuits may be dispensed with and the ground used as the return portion of a circuit, thereby eliminating a very large part of the cost of construction.

The talk produced with the apparatus hereinbefore described is very clear, of good volume and definition, and void of disturbing noises.

Modifications of our invention, within the scope of the appended claims, may be made without departing from its spirit.

Having thus described our invention, what we claim and desire to secure by Letters Patent, is:—

1. In telephony, the combination with a main circuit having two branches inductively related to each other but not to the main circuit, the main circuit intermediate of said branches having low resistance to all currents, of a telephone receiver in one of said branches.

2. In telephony, the combination with a main circuit having two branches inductively related to each other but not to the main circuit, of a variable low resistance transmitter in the main circuit intermediate said branches, and a telephone receiver in one of said branches.

3. In telephony, the combination with a main circuit having a ground return two branches inductively related to each other but not to the main circuit, of a variable low resistance transmitter in the main circuit, and a telephone receiver in one of said branches.

4. In telephony, the combination with a main circuit, having a ground return two branches inductively related to each other but not to the main circuit, the circuit intermediate of said branches having relatively low ohmic and impedance resistance, of a telephone receiver in one of said branches.

5. In telephony, the combination with a main circuit having two branches inductively related to each other but not to the main circuit, the main circuit intermediate of said branches having low resistance to all currents, of means actuated by the current for varying the resistance of the main circuit intermediate said branches, and means for converting into sound waves the currents traversing said branches.

6. In telephony, the combination with a

main circuit having two branches inductively related to each other but not to the main circuit, of a variable low resistance transmitter located in said main circuit, and means for converting into sound waves the currents traversing said branches.

7. In telephony, the combination with a main circuit having two branches inductively related to each other but not to the main circuit, of a variable low resistance transmitter in the main circuit intermediate said branches, and means for converting into sound waves the currents traversing said branches.

8. In telephony, the combination with a main circuit having two branches not inductively related to the main circuit, the main circuit intermediate of said branches having low resistance to all currents, of a condenser having its poles respectively connected with said branches, and means for converting into sound waves currents traversing one of said branches.

9. In telephony, the combination with a main circuit having two branches, not inductively related to the main circuit, of a condenser, a variable low resistance transmitter in the main circuit intermediate said branches, and means for converting into sound waves currents traversing one of said branches, the poles of the condenser being respectively connected with said branches.

10. In telephony, the combination with a main circuit having two branches not inductively related to the main circuit, of a condenser having its poles connected respectively with said branches, low resistance means actuated by the current for varying the resistance of the main circuit intermediate said branches, current regulating means in one of said branches, and means for converting into sound waves the currents traversing one of said branches.

11. In telephony, the combination with a main circuit having two branches not inductively related to the main circuit, and having intermediate of said branches a low resistance to all currents, of a condenser having its poles connected respectively to said branches, and a telephone receiver in one of said branches.

12. In telephony, the combination with a main circuit having two branches not inductively related to the main circuit, and having intermediate of said branches a low resistance to all currents, of a condenser having its poles connected respectively to said branches, means actuated by the current for varying the resistance of the main circuit, and a telephone receiver in one of said branches.

13. In telephony, the combination with a main circuit having a ground return two branches not inductively related to the main circuit, of a condenser having its poles respectively connected to said branches, low resistance means actuated by the current for varying the resistance of the main circuit, current regulating means in one of said branches, and a telephone receiver in one of said branches.

14. In telephony, the combination with a main circuit having two branches not inductively related to the main circuit, of a condenser having its poles connected respectively with said branches, a variable low resistance transmitter in the main circuit intermediate said branches, and a telephone receiver in one of said branches.

15. In telephony, the combination with a main circuit having two branches not inductively related to the main circuit, of a condenser having its poles connected respectively with said branches, a variable low resistance transmitter in the main circuit intermediate said branches, a telephone receiver in one of said branches, and means for regulating the current in one of said branches.

16. In telephony, the combination with a main circuit having two branches not inductively related to the main circuit, the main circuit intermediate of said branches having low resistance to all currents, of a condenser having its poles connected respectively with said branches, a telephone receiver in one of said branches, and means for generating telephonic currents in the main circuit.

17. In telephony, the combination with a main circuit having two branches not inductively related to the main circuit, of a condenser having poles connected respectively to said branches, means for generating direct telephonic currents in the main circuit, a variable low resistance transmitter in the main circuit, and a telephone receiver in one of said branches.

18. In telephony, the combination with a main circuit having two branches inductively related to each other but not to the main circuit, the circuit through said branches having a relatively high resistance and intermediate of said branches having relative low ohmic and impedance resistance, of a telephone receiver in one of said branches.

In testimony whereof we have signed our names to this specification in presence of two subscribing witnesses.

ALBERT BARRETT.
WILLIAM CONDON.

Witnesses:
E. B. HOUSE,
J. C. IRWIN.