S. G. BROWN.

TELEPHONY.

APPLICATION FILED FEB. 18, 1913.

1,067,715. Patented July 15, 1913.

FIG. 1.

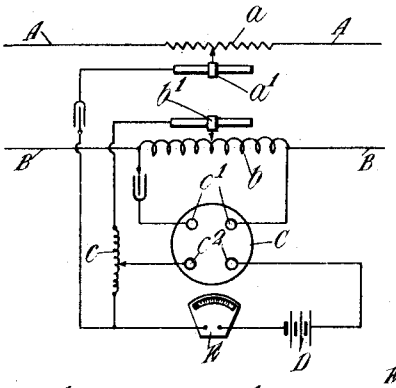


FIG. 2.

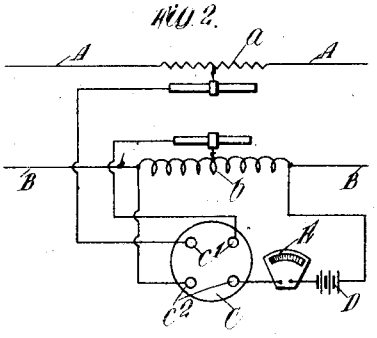


FIG. 4.

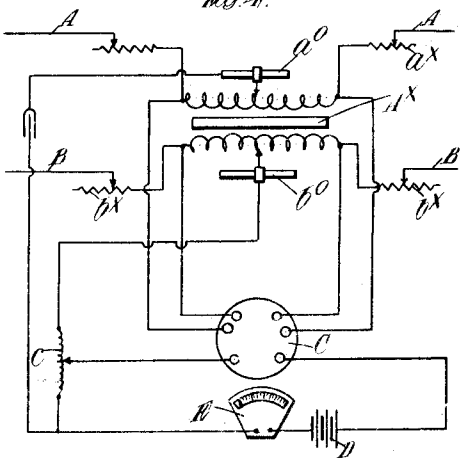


FIG. 3.

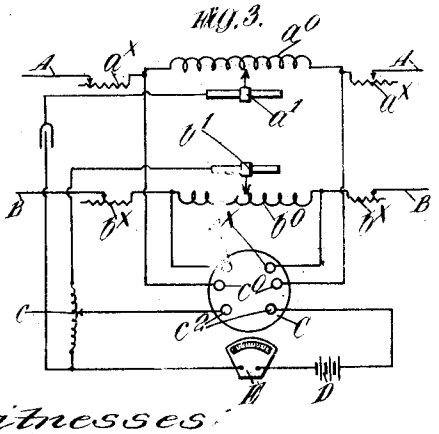
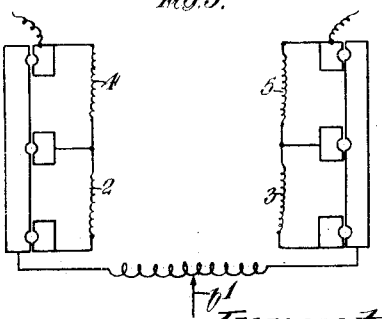


FIG. 5.



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TELEPHONY.

1,067,715. Specification of Letters Patent. Patented July 15, 1913.

Application filed February 18, 1913. Serial No. 749,263.

To all whom it may concern:

Be it known that I, SIDNEY GEORGE BROWN, a subject of the King of Great Britain, residing at 4 Great Winchester street, in the city of London, England, have invented certain new and useful Improvements Relating to Telephony, of which the following is a specification.

This invention relates to telephony and has reference to telephonic relay systems of the kind in which the association of relay apparatus with the line is made with a view to obtaining a balance of electrical conditions in the two parts of the system on opposite sides of the relay.

According to the present invention one terminal of a pair of terminals of the relay is directly connected electrically to a point midway or thereabout on a coil of high self induction placed midway or about midway in the line wire or the return wire between the two communicating stations, the other terminal of the pair being connected to a corresponding point on the other wire. The coil of high self-induction may for instance be placed about mid-way in the usual return wire, and one of two pairs of terminals of any appropriate form of relay be connected to the ends of the coil while the other pair of terminals is connected, preferably through an auto-transformer, to an intermediate point on the self-induction coil, and to the mid-point or thereabout of the line wire. The telephone system is thus divided into two parts and the points at which the one pair of relay terminals makes contact with the self-induction coil and with the line are preferably adjustable so that the electrical characteristics of the two parts of the system can be adjusted to correspond. In practice, it is preferable, for the sake of symmetry of electrical conditions, to place a coil of high self-induction in both the line wire and the return wire and to connect one pair of relay terminals to the ends of one of the coils and the other pair to intermediate points on the two coils. In the case of using two high self-induction coils, a relay with differential windings may be used, one winding being connected to the ends of one coil and the other winding to the ends of the other coil. A further modification in the use of two coils of which one coil is inserted midway in the line wire and the other in the return wire, is to arrange these coils inductively on the same core. In all cases the amount of inductance possessed by the above mentioned coil is preferably adjustable, as also is the point of connection of one of the relay terminals with an intermediate point on the said coil as above described.

In order that the invention may be clearly understood and readily carried into effect, I will now describe the same more fully with reference to the accompanying drawings, in which:—

Figure 1 represents diagrammatically one arrangement for carrying the invention into effect. Figs. 2–4 are diagrams illustrating various modifications of the arrangement shown in Fig. 1, and, Fig. 5 illustrates, in part diagrammatically, the construction of an adjustable coil of high self-induction adapted for use in the systems represented diagrammatically in Figs. 1–4.

In all the figures A represents the line wire of a telephone system, B the return wire, C a relay, D a battery and E a current indicator.

Referring first to Fig. 1, a is a resistance inserted midway in the line wire, b is a coil of high self-induction inserted midway in the return wire, c is an auto-transformer, and c' c^2 are the two pairs of terminals of the energizing winding and the local circuit winding respectively of the relay C. The terminals c' are connected to the ends of the coil b and the terminals c^2 are connected through the auto-transformer c to the adjustable contacts a' and b', which bear against the resistance a and the coil b respectively. It will be understood that, when speaking currents pass through the energizing winding of the relay, the latter becomes operative. The speaking currents are thus reproduced on an enlarged scale and traverse both parts of the line, which parts are balanced electrically by adjustment of the contacts a' b' so that the relay itself is not affected by the relay currents; those currents however that traverse the receiving instrument at the receiving station will of course render the same operative with the result that the message is heard by the receiving operator.

In the arrangement shown in Fig. 2 the connections of the two pairs of relay terminals are interchanged and the auto-transformer is dispensed with.

In the arrangement shown in Fig. 3 symmetry of electrical conditions is obtained by

inserting a coil of high self-induction in each wire; in this figure also a relay with differential windings is shown; one pair of terminals, namely c^0, of the differential windings is connected to the ends of the coil a^0 in the line wire A, and the other c^x to the ends of the coil b^0 in the return wire B. The terminals c^2 of the relay are connected as before to the auto-transformer c which in turn is connected to the adjustable contacts a', b'. Adjustable resistances a^x are connected to the two ends of the coil a^0 and similar resistances b^x to the ends of the coil b^0.

Fig. 4 differs from Fig. 3 only in the provision of a single core A^x on which the coils a^0, b^0 are wound inductively so as not to neutralize each other.

As hereinbefore stated, the amounts of resistance and inductance in the two parts of the line are adapted to be regulated, as by adjustable contacts bearing upon the resistance and inductance coils respectively. To provide for a considerable range of adjustment of the inductance coil or coils, the latter may comprise several layers of wire connected in series and wound one upon another and upon a soft iron core. A portion of the outer layer may be exposed so as to present a longitudinal strip against which the adjustable contact arm hereinbefore referred to presses. The ends of the successive underlying layers of wire may be brought out and connected to two sets of plug contacts alternately, the odd coils being connected to one set and the even coils to the other set, so that by adjusting the plugs of the one or the other set, more or less self-inductance may be included in the circuits; the adjustable contact arm constitutes a means of more delicate adjustment. When the two parts of the telephone system arranged as hereinbefore described are working, the self-induction coil causes the relay to emit a note if the adjustment is not correct, and by adjusting the plugs, if necessary, and by then moving the adjustable contact arm, the sound can be reduced to a minimum or caused to stop. The condition then established is the best for clear speech.

An adjustable inductance coil constructed as just described is shown, part diagrammatically, in Fig. 5, where for clearness of illustration the several coils are not shown wound concentrically upon a core but are shown separately and apart from a core. The contact arm b' is adjustable with respect to the outermost coil l, and the even coils, such as 2 and 4, are connected to one set of plug contacts while the odd coils, such as 3 and 5, are connected to another set of plug contacts. As an alternative to or in addition to adjusting the inductance in the two parts of the system by means of an adjustable arm or plugs, the balance of inductance in the said parts might obviously be effected by adjusting the position of the core relatively to the coils around it.

It will be understood that in long telephone lines there may be distortion of the transmission current through the relay and receiving instrument. By placing a condenser of suitable capacity in series with one or each of the relay windings this cause of defect in the transmission of speech may to a large extent be eliminated.

Although the invention has been described with reference to any appropriate form of relay, I prefer to employ the double wound relay described in the specification of my prior United States Patent No. 1048443.

What I claim and desire to secure by Letters Patent of the United States is:—

1. In a telephone relay system, the combination with the line wire, the return wire, and the relay, of a high self-induction coil placed midway or about midway in one of the wires, means adjustably connecting one terminal of one pair of terminals of the relay to an intermediate point on the aforesaid coil, means connecting the other terminal of the pair to a corresponding point on the other wire, and means connecting a second pair of terminals of the relay to the ends of the aforesaid coil.

2. In a telephone relay system, the combination with the line wire, the return wire, and the relay, of a high self-induction coil placed midway or about midway in one of the wires, means adjustably connecting one terminal of the local circuit winding of the relay to an intermediate point on the aforesaid coil, means connecting the other terminal of the local circuit winding to a corresponding point on the other wire, and means connecting the energizing winding of the relay to the ends of the aforesaid coil.

3. In a telephone relay system, the combination with the line wire, the return wire, and the relay, of a high self-induction coil placed midway or about midway in each wire, means connecting one terminal of a pair of terminals of the relay to an intermediate point on one coil, means connecting the other terminal of the pair of terminals to an intermediate point on the other coil, and means connecting a second pair of relay terminals to the ends of one of the aforesaid coils.

4. In a telephone relay system, the combination with the line wire, the return wire, and the relay, of a high self-induction coil placed midway or about midway in each wire, means adjustably connecting one terminal of the relay local circuit winding to an intermediate point on one coil, means adjustably connecting the other terminal of the said winding to an intermediate point on

the other coil, and means connecting the relay energizing winding to the ends of one of the coils.

5. In a telephone relay system, the combination with the line wire, the return wire, and a relay with two differential energizing windings, of a high self-induction coil placed midway or about midway in each wire, means adjustably connecting one terminal of the relay local circuit winding to an intermediate point on one coil, means adjustably connecting the other terminal of the said winding to an intermediate point on the other coil, means connecting one relay energizing winding to the ends of one coil, and means connecting the other relay energizing winding to the ends of the other coil.

6. In a telephone relay system, the combination with the line wire, the return wire, and the relay, of a high self-induction coil placed midway or about midway in one of the wires, a transformer, means connecting the latter on the one hand to the local circuit winding of the relay and on the other hand to an intermediate point on the aforesaid coil and to a corresponding point on the other wire, and means connecting the other pair of relay terminals to the ends of the aforesaid coil.

7. In a telephone relay system, the combination with the line wire, the return wire, and the relay, of a high self-induction coil placed midway or about midway in each wire, means connecting one terminal of the relay local circuit winding to an intermediate point on one coil, means connecting the other terminal of the said winding to an intermediate point on the other coil, means connecting the relay energizing winding to the ends of one of the coils, and means for effecting a coarse and also a fine adjustment of the amount of inductance on the two sides of each of the aforesaid intermediate points.

8. In a telephone relay system, the combination with the line wire, the return wire, and the relay, of a high self-induction coil placed midway or about midway in each wire, a transformer, means connecting the transformer on the one hand to the local circuit winding of the relay on the other hand to intermediate points on the two coils, means for effecting a coarse and also a fine adjustment of the amount of inductance on the two sides of each of the aforesaid intermediate points, and means connecting the energizing winding of the relay to the ends of one of the aforesaid coils.

9. In a telephone relay system, the combination with the line wire, the return wire, and a relay with two differential energizing windings, of a high self-induction coil placed midway or about midway in each wire, a transformer, means connecting the transformer on the one hand to the local circuit winding of the relay and on the other hand to intermediate points on the two coils, means for effecting a coarse and also a fine adjustment of the amount of inductance on the two sides of each of the aforesaid intermediate points, means connecting one relay energizing winding to the ends of one coil, and means connecting the other relay energizing winding to the ends of the other coil.

In testimony whereof I affix my signature in presence of two witnesses.

SIDNEY GEORGE BROWN.

Witnesses:
SIDNEY ARTHUR STANLEY,
O. J. WORTH.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."