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W. CONDON & A. BARRETT.

ANTI-INDUCTION METHOD FOR TELEPHONE SYSTEMS.

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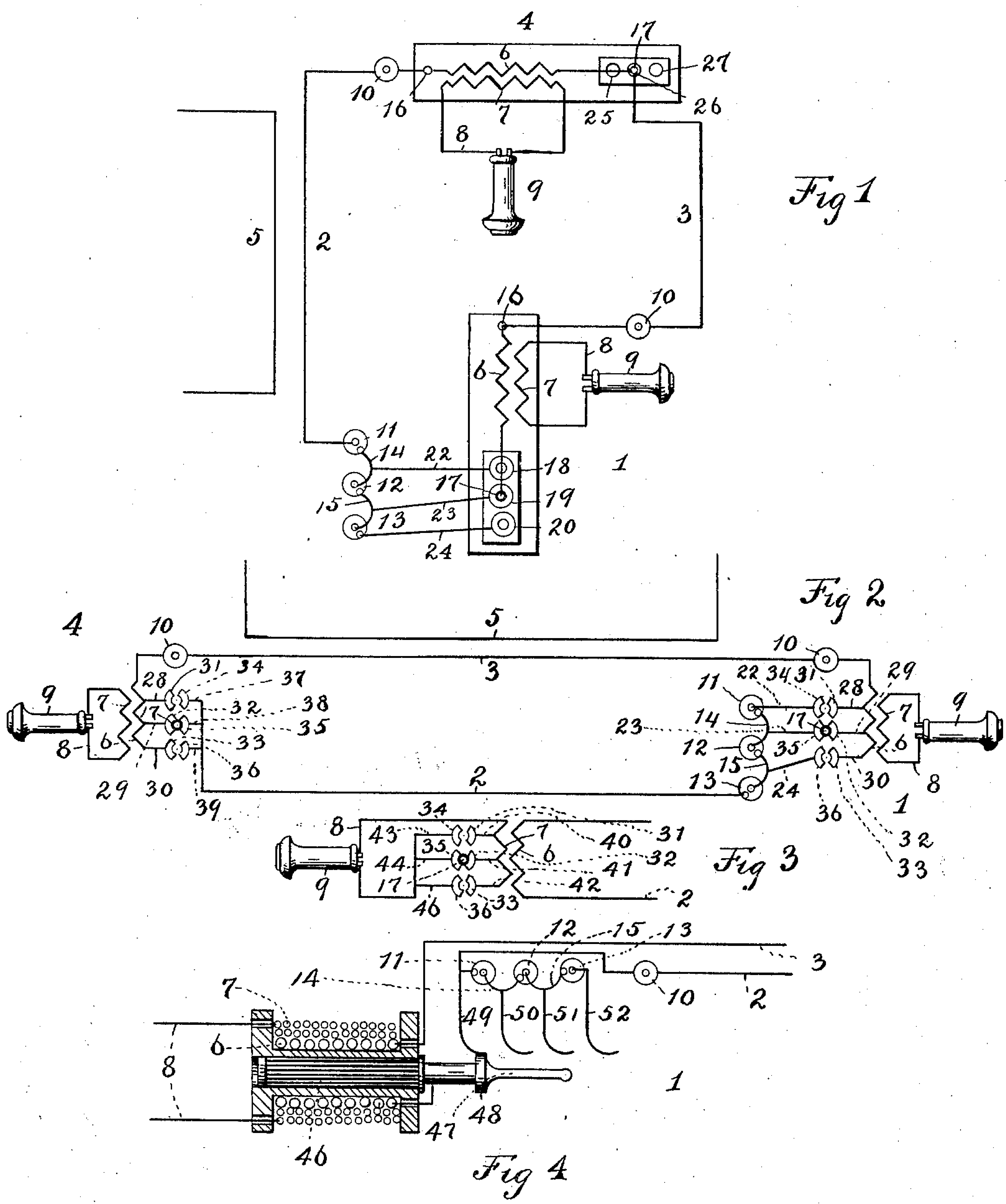

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UNITED STATES PATENT OFFICE.

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ANTI-INDUCTION METHOD FOR TELEPHONE SYSTEMS.

SPECIFICATION forming part of Letters Patent No. 737,710, dated September 1, 1903.

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To all whom it may concern:

Be it known that we, WILLIAM CONDON and ALBERT BARRETT, citizens of the United States, residing in Kansas City, county of Jackson, and State of Missouri, have invented a new and useful Improvement in Anti-Induction Methods for Telephone Systems, of which the following is a specification, reference being had therein to the accompanying drawings, forming a part thereof.

Our invention relates to an improved method of preventing in telephone systems disturbances due to induction.

Our method provides a transmitting primary circuit and a secondary receiving-circuit operated by induction therefrom.

In a telephone system having a primary transmitting-circuit and a secondary receiving-circuit stray induced currents traversing the primary circuit produce in the receiving-circuit disturbances which materially interfere with and at times wholly prevent the use of the secondary circuit for telephonic purposes.

The object of our invention is to eliminate these disturbances from the secondary circuit.

Our invention consists in varying the inductive efficiency between the primary and the secondary circuits by increase or decrease and compensating for such variation by varying the strength of the telephonic currents traversing the primary circuit.

Our invention comprises, further, in a telephone system having a primary transmitting-circuit and a plurality of secondary receiving-circuits operated by induction therefrom, the anti-induction method, consisting in varying the inductive efficiency between the primary and the secondary circuits and compensating for such variation by varying the strength of the telephonic currents traversing the primary circuit.

In practicing our method of anti-induction as the disturbances in the secondary circuit increase, owing to an increase in the strength or number of stray currents traversing the primary circuit, the inductive efficiency between the two circuits is reduced until the disturbing effects are no longer perceptible in the receiving-circuit, and to compensate for the weakened telephonic currents induced in the secondary circuit the strength of the telephonic currents traversing the primary circuit is increased. As the disturbing effects due to the stray currents in the primary circuit decrease the inductive efficiency between the two circuits is increased, thus permitting a decrease in the strength of the telephonic currents traversing the primary circuit.

Other features of our invention are hereinafter fully described and claimed.

In the accompanying drawings we have illustrated different means by which our invention is carried into effect.

Figure 1 is a diagrammatic view of a telephone system embodying the features of our invention in which the inductive efficiency is varied by movement of a portion of one circuit in the inductive field toward or from the other circuit. Fig. 2 is a similar view showing a modification of our method in which the inductive efficiency is varied by cutting in or out from the inductive field certain portions of the transmitting-circuit. Fig. 3 is a view similar to Fig. 1, showing another modification of our method in which the inductive efficiency between the two circuits is varied by cutting in or out from inductive influence certain portions of the secondary circuit. Fig. 4 is a diagrammatic view of still another modification in which the inductive efficiency between the two circuits is varied by changing the position relative to the transmitting and receiving circuits of a magnetic reinforcing agent, such as the iron core of an induction-coil. In Figs. 1, 2, and 4 means are shown by which the variation of the strength of the transmitting telephonic currents and the variation of inductive efficiency between the transmitting and receiving circuits may be simultaneously accomplished.

Similar characters of reference indicate similar parts throughout the different views.

Referring to the drawings, 1 indicates one station connected by means of a transmitting-wire 2 and the return-wire 3 with another station 4.

5 indicates a wire carrying currents from which the stray currents traversing the wires 2 and 3 are induced.

6 indicates the primary wire of an induction-coil, and 7 the secondary wire thereof. The primary wires of the induction-coils at the stations 1 and 4, respectively, are disposed in series with the transmitting-wires 2 and 3 in the primary circuit, of which they form a part thereof. At each station 1 and 4 are located the secondary circuits 8, in each of which is a telephone 9, disposed in series with the secondary wire 7 of the induction-coil. In series in the primary circuit are located the transmitters 10, one at each station.

11, 12, and 13 indicate a source of electric generation, comprising in the form shown in the drawings a plurality of battery-cells, such as are ordinarily used for telephonic purposes. The cells 11, 12, and 13 are connected, preferably, in series by means of the wires 14 and 15, respectively.

In the form of our invention shown in Fig. 1 the primary wire of the induction-coil at each station 1 and 4 is secured at one end to a stationary post 16 and connected at its other end to a contact-plug 17. At the station 1 are provided the sockets 18, 19, and 20, insulated from each other and connected by the wires 22, 23, and 24 with the wires 14 and 15 and one pole of the cell 13, respectively. The said sockets are adapted to have inserted therein the plug 17, thus making the circuit complete therethrough. At the station 4 are provided also a series of sockets 25, 26, and 27, adapted to receive the plug 17, attached to one end of the primary wire of the induction-coil at said station. The primary wire of each induction-coil is preferably in the form of a resilient coiled wire which can be extended or contracted so as to present more or less coils in proximity to the coils of the stationary coiled wire of the secondary of the induction-coil. By drawing out the primary coiled wire 6 of the induction-coil there are less coils adjacent to the secondary wire and the inductive efficiency between the primary and secondary wires becomes decreased. If the plug 17 at station 1 is inserted in the socket 18, but one cell 11 is in the circuit, the other cells 12 and 13 being cut out. If the plug 17 is inserted, as shown in Fig. 1, in the socket 19, the two cells 11 and 12 are cut into the primary circuit, the third cell being cut out. If the plug 17 be inserted in the socket 20, all the cells are cut into the primary circuit and the full power of the battery is thus thrown on the transmitting-circuit. In operating this form of our invention the primary wire of the induction-coil at station 1 is withdrawn with the plug 17 until the inductive efficiency between the primary wire and the secondary wire of the induction-coil at that station is decreased to a degree in which the disturbing effects of stray currents traversing the primary circuit are no longer perceptible in the telephone 9 at station 1. The plug 17 will then have been inserted in a socket corresponding to the degree of extension of the primary wire, and thus cutting into the primary circuit a number of cells of the battery, the strength of which will compensate for the loss of efficiency due to the moving of the wire 6 relative to the secondary wire 7. To eliminate the disturbing effects in the secondary circuit at station 4, the operator at that station extends the primary wire in a like manner and retains it in position by inserting the plug 17 in the proper socket at that station. As the disturbance on the primary circuit decreases the primary wires 6 at each station may be contracted and the inductive efficiency between the circuits thus increased, while the strength of the battery-current on the line is correspondingly diminished.

In the form of our invention shown in Fig. 2 the primary wires of the induction-coils are stationary relative to the secondary wires thereof. The primary winding of the induction-coil at each station 1 and 4 is divided into sections by leading at intervals therefrom the wires 28, 29, and 30. The other ends of these wires are connected, respectively, to the members 31, 32, and 33 of a series of sockets composed of the said parts 31, 32, and 33 and the other members insulated therefrom, (indicated by 34, 35, and 36.) The last-named members of the said sockets at station 4 are connected by the wires 37, 38, and 39 with the side 2 of the transmitting or primary line-wire. The socket members 34, 35, and 36 at station 1 are connected, respectively, to the wires 22, 23, and 24, which are in turn connected to the battery-cells 11, 12, and 13 in the manner shown in Fig. 1. The line-wire 2 is also connected to the battery, as described with reference to the form shown in Fig. 1. The line-wire 3 is connected at one end with the primary wire of the induction-coil at station 1 and at the other end with the primary wire of the induction-coil at station 4. The transmitters 10 are located in the primary circuit, one at station 1 and the other at station 4. The secondary wires of the induction-coils and the telephone-receivers 9 are disposed in a manner similar to that described with reference to the form shown in Fig. 1. Plugs 17 are provided one at each station for insertion in the proper sockets to complete the primary or transmitting circuit. In operating this form of our invention the inductive efficiency between the circuits is varied by cutting in or cutting out portions of the transmitting and the secondary circuits from inductive action upon each other. This is accomplished by inserting the plugs 17 in different sockets. With the plugs, as shown in Fig. 2, located in the sockets composed of the members 32 and 35 the circuit will be completed between the line-wire 2 and the primary wires of the induction-coils by the wires 29, 38, and 23, the plugs 17, and the socket members 32 and 35, the battery being connected as already described when referring to Fig. 1. In this position of the plugs 17 that portion of the primary wire of each induction-coil which is connected to the socket member 33 will be cut out of the primary circuit, thus cutting out also from the inductive field that portion of the secondary wire adjacent to such cutout portion of the primary, and the secondary wire at each station will be acted inductively upon by only that portion of the primary wire of each coil located between the wire 29 and the wire 3. In this condition of the transmitting-circuit the batteries 11 and 12 are cut into the primary circuit. If now the plugs 17 were inserted in the sockets at each station composed of the members 31 and 34, the current would flow from the wire 2 to the wire 3, or in the reverse direction, as might be, through the wires 28, 37, and 22, the plugs 17, and socket members 31 and 34. Only that portion of each primary wire 6 of the induction-coils would receive the current which is located between the wire 29 and the line-wire 3, and all of the battery would be in circuit. If the plugs 17 were inserted then in the socket comprising the members 33 and 36 at each station, all of the primary wire of the induction-coil at each station would be cut into the circuit and all the secondary wire of each induction-coil would be cut into the inductive field, while but one battery-cell 13 would be cut into the circuit. It will be seen, therefore, that as the inductive efficiency between the primary and the secondary circuits is increased or decreased by varying the positions of the plugs 17 with reference to the socket members the telephonic currents are oppositely varied in strength.

In the form of our invention shown in Fig. 3 instead of cutting in or cutting out the primary wire of the induction-coil from the circuit the inductive efficiency between the primary and secondary circuits is varied by cutting in or cutting out sections of the secondary wire of the induction-coil from the secondary circuit. In this form the different sections of the secondary winding of the induction-coil are connected by the wires 40, 41, and 42 with the socket members 31, 32, and 33, respectively, and the socket members 34, 35, and 36 are connected with the secondary circuit 8 at each station by the wires 43, 44, and 45, respectively. One end of the secondary wire of the induction-coil is connected to the wire 42 and the other end to the circuit-wire 8. By varying the position of the plugs 17 with relation to socket members it will be obvious that different portions of the secondary circuit will be thrown or cut into or out of the inductive action of the primary circuit at each station, thus varying the inductive efficiency between the primary and secondary circuits. The telephonic currents traversing the primary circuit may be then varied oppositely by any suitable means.

In the form of our invention illustrated in Fig. 4 the inductive efficiency between the transmitting and secondary circuits is varied by varying the action of a reinforcing agent. The reinforcing agent illustrated in this figure is a magnetic core, with which each induction-coil is to be provided. This core is indicated by the reference character 46. In practicing this form of our method the core 46 is provided with a handle 47, having a contact-flange 48, adapted to make contact and complete the primary circuit through a series of contacts 49, 50, 51, and 52. The cells of the battery are connected in series, as already described with reference to Fig. 1, one pole being connected to the contact 49, which is also connected to the line-wire 2. The contact 52 is connected to the other pole of the battery, and the contacts 50 and 51 are connected, respectively, to 14 and 15, respectively. One end of the primary winding of each induction-coil is connected to the line-wire and the other end to the handle 47, which forms, with the flange 48, part of the primary circuit. By drawing out the core 46 the flange 48 can be made to complete the primary circuit through any one of the contacts 49, 50, 51, or 52. If it is in the position shown in Fig. 4, the entire battery will be cut out; but if drawn out until the flange makes contact with contact 50 one cell will be cut into the circuit, if on contact 51 two cells will be cut in, and if on contact 52 the entire battery-power will be cut in. It will be noted that as the battery-power is increased the core is drawn farther out of the coil and its reinforcing influence will be correspondingly decreased, while a reduction of the battery-power will be accompanied by an increased reinforcing influence of the core on the two circuits. The inductive efficiency between the primary and secondary circuits is thus varied and the strength of the telephonic currents in the transmitting-circuit are oppositely varied.

In operating any of the various forms of our invention the inductive efficiency between the primary and secondary circuits is reduced until the disturbing effects of the stray currents traversing the primary circuit are eliminated and the strength of the telephonic currents is correspondingly increased. As the disturbing currents in the primary circuit decrease in strength the inductive efficiency between the primary and secondary circuits can be correspondingly increased, thus permitting a reduction in the strength of the telephonic currents traversing the primary circuit.

It is not essential to the operation of our method that the variation in the strength of the telephonic currents be made simultaneously with the variation of the inductive efficiency between the circuits. In the drawings we have shown in the battery single cells or units. These of course can be of any desired strength, and the number of each unit can be increased to suit the occasion. In operating our invention the operator at one station controls the strength of the telephonic currents, which can be produced by any suitable source of generation of electrical force, such as primary batteries, secondary batteries, or other means. The variation in inductive efficiency at each station between the primary circuit and the secondary circuit at that station is controlled by the operator at that particular station.

Other modifications or means for carrying our invention into effect may be resorted to while remaining within the scope of our invention.

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

1. The method of eliminating disturbances in telephone systems due to inductance, consisting in reducing the inductive efficiency between two circuits inductively related and correspondingly increasing the strength of telephone-currents traversing one of the circuits, substantially as described.

2. The method of eliminating disturbances in telephone systems due to inductance, consisting in varying the inductive efficiency between two circuits inductively related and oppositely varying telephone-currents traversing one of the circuits, substantially as described.

3. The method of eliminating disturbances in telephone systems due to inductance, consisting in reducing the inductive efficiency between a primary circuit and other circuits inductively related thereto and correspondingly increasing the strength of telephone-currents traversing the primary circuit, substantially as described.

4. The method of eliminating disturbances in telephone systems due to inductance, consisting in varying the inductive efficiency between a primary circuit and other circuits inductively related thereto and oppositely varying the strength of the telephone-currents traversing the primary circuit.

5. The method of eliminating disturbances in telephone systems due to inductance, consisting in varying the inductive efficiency between two circuits inductively related to each other and simultaneously and oppositely varying the strength of telephone-currents traversing one of the circuits, substantially as described.

6. The method of eliminating disturbances in telephone systems due to inductance, consisting in varying the strength of the field of inductance between two circuits inductively related to each other and compensating for such variation by oppositely varying the strength of telephone-currents traversing one of the circuits, substantially as described.

7. The method of eliminating disturbances in telephone systems due to inductance, consisting in varying the strength of the field of induction between a primary circuit and other circuits inductively related thereto, and compensating for such variation by oppositely varying the strength of the telephone-currents traversing the primary circuit, substantially as described.

8. The method of eliminating disturbances in telephone systems due to inductance, consisting in varying the position of one circuit relative to another circuit inductively related thereto and compensating for such variation of position by varying the strength of telephone-currents traversing one of the circuits, substantially as described.

9. The method of eliminating disturbances in telephone systems due to inductance, consisting in varying inductive action between two circuits related to each other as primary and secondary by cutting in or out a portion of one circuit from the inductive field of the other circuit and compensating for such variation by varying the strength of the telephone-currents traversing the primary circuit, substantially as described.

10. The method of eliminating disturbances in telephone systems due to inductance, consisting in varying inductive action between a transmitting-circuit and a plurality of receiving-circuits related inductively to the transmitting-circuit by cutting in or out portions of the receiving-circuits from the full inductive field of the transmitting-circuit and compensating for such variation by varying the strength of the telephone-currents traversing the transmitting-circuit, substantially as described.

11. The method of eliminating disturbances in telephone systems due to inductance, consisting in varying the extent of the inductive field between two circuits inductively related to each other and varying oppositely the strength of telephone-currents traversing one of the circuits, substantially as described.

12. The method of eliminating disturbances in telephone systems due to inductance, consisting in varying the extent of the inductive field between a transmitting-current and a plurality of receiving-circuits inductively related thereto, and oppositely varying the strength of telephone-currents traversing the transmitting-circuit, substantially as described.

13. The method of eliminating disturbances in telephone systems due to inductance, consisting in varying the inductive efficiency between two circuits inductively related to each other by cutting in or out a portion of one circuit from the inductive field of the other circuit and compensating for such variation by varying the strength of telephone-currents traversing one of said circuits, substantially as described.

14. The method of eliminating disturbances in telephone systems due to inductance, consisting in varying the inductive efficiency between a transmitting-circuit and a plurality

of receiving-circuits related each inductively to the transmitting-circuit by cutting in or from the inductive field between each of said circuits and the transmitting-circuits portions of the transmitting-circuit and compensating for such variation by oppositely varying the strength of the telephone-currents traversing the transmitting-circuit, substantially as described.

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

WILLIAM CONDON.
ALBERT BARRETT.

Witnesses:
WARREN D. HOUSE,
G. W. DUVALL.