

C. D. ENOCHS.
TELEPHONE RECEIVER.
APPLICATION FILED JAN. 13, 1908.

949,821.

Patented Feb. 22, 1910.

2 SHEETS—SHEET 1.

Fig. 1.

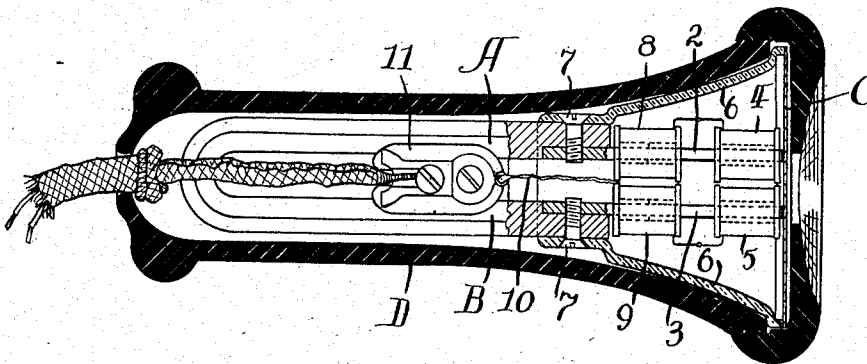


Fig. 2.

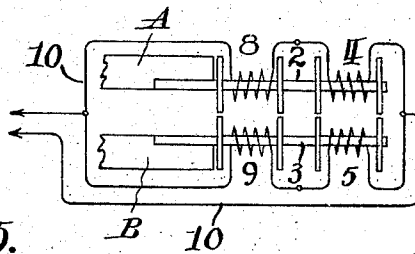


Fig. 5.

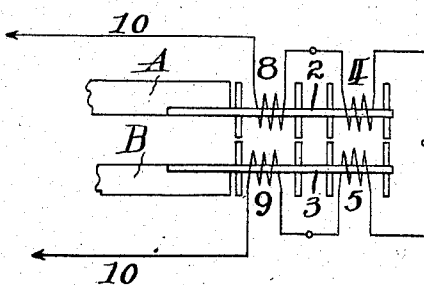
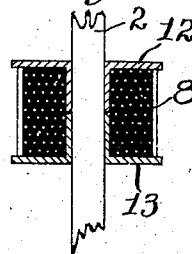


Fig. 3.

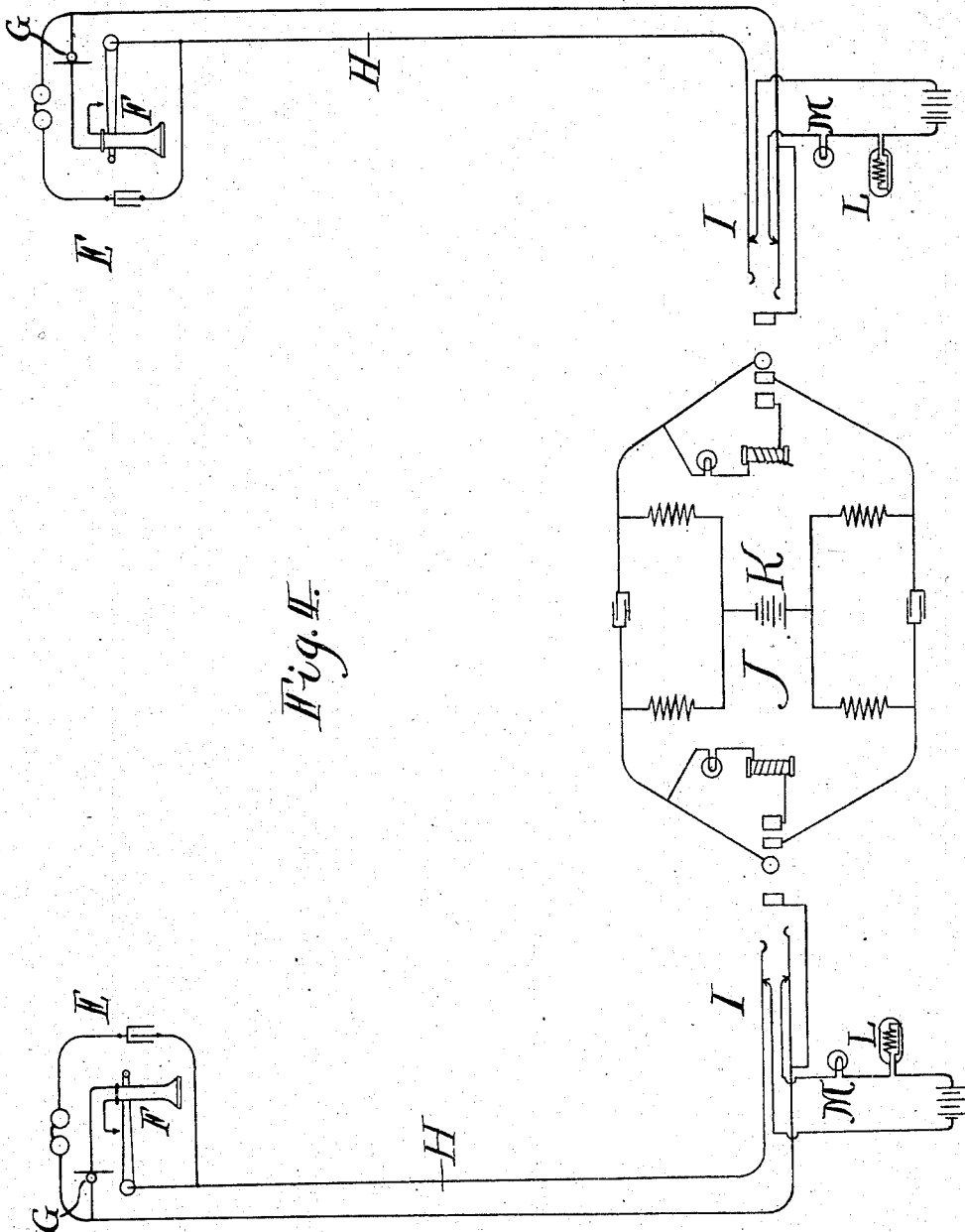


Witnesses:
H. Fischer.
R. C. Fischer.

Inventor:
Claude D. Enoch,
by: *W. S. Bradbury*
Attorney.

949,821.

2 SHEETS—SHEET 2.



Witnesses:
A. Fischer.
R. Fischer.

Inventor:
Claude D. Enoch,
by: J. G. Hadbury.
Attorney.

UNITED STATES PATENT OFFICE.

CLAUDE D. ENOCHS, OF LA CROSSE, WISCONSIN.

TELEPHONE-RECEIVER.

949,821.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, CLAUDE D. ENOCHS, a citizen of the United States, residing at La Crosse, in the county of La Crosse and State of Wisconsin, have invented a certain new and useful Improvement in Telephone-
5 Receivers, of which the following is a specification.

My invention relates to improvements in
10 telephone receivers and has for its object a device of its kind which is adapted to operate without the use of an induction coil.

Among further objects are simplicity of construction and greater effectiveness in operation.

Heretofore in common battery telephone practice there has been during conversation a source of current supply connected with each subscriber's line. If a telephone receiver were placed directly in the line the current flowed from the exchange through the coils of the receiver and either increased the magnetic effect of a permanent magnet to a greater extent than found satisfactory,
20 or, if current flowed through the winding in the opposite direction, it demagnetized the permanent magnet. In order to prevent the current from flowing through the coils of the magnet it has been customary, to either place an induction coil in the telephone in such manner that the receiver would be in a secondary circuit while the primary, in series with the transmitter, would be in series with the line circuit, an
30 impedance coil in the circuit in series with the transmitter, or a receiver and condenser in series with each other and in shunt around the impedance coil. The object of these constructions has been to keep the current from the receiver as the voltage on common battery systems has been sufficient for good transmission without any boosting effect.

In a general way this invention contemplates placing the auxiliary coil or coils in the receiver in such manner that their magnetism will oppose that of the coils nearest the diaphragm. With the proper proportion of number of turns, and direct current
45 flowing through the auxiliary and diaphragm coils, there will be no magnetism at the end of the cores of the diaphragm magnets due to this direct current. That is, the magnetism from the diaphragm magnets

will be substantially neutralized by the magnetism from the auxiliary magnets, the primary magnetism being furnished only by the permanent magnets ordinarily employed. To accomplish this, the auxiliary magnets oppose the diaphragm magnets by
60 placing the auxiliary magnets at some distance from the diaphragm. The diaphragm magnets operate as usual. This construction produces a receiver which can be placed directly in series with the transmitter without the use of an induction coil. Although the auxiliary magnets are in series with the diaphragm magnets, their impedance is reduced to a minimum by placing a copper sheath over the core and copper heads at the ends of the sheath before the wire comprising the coil is wound upon the core. The action then is for the copper to act as a short circuited secondary to the auxiliary coil, which, as is well known to those skilled
75 in the art, greatly reduces the impedance of the coil. This increases the transmission as the impedance in series with the transmitter is less than either that of an induction coil or an impedance coil. The receiving qualities also are better because there is no loss through a shunting of the current through an impedance coil, the only loss being the resistance of the auxiliary coils, and, as the impedance of these is low, it does not work
85 to a disadvantage in the instrument.

In the accompanying drawings, forming part of this specification, Figure 1 is a central, longitudinal section of my invention, part of the interior construction being shown in full; Fig. 2 is a diagrammatic view illustrating the wiring; Fig. 3 is a detail view, partly in section, of one of the auxiliary magnet coils; Fig. 4 is a diagrammatic view of a common battery telephone system
95 equipped with my invention, and Fig. 5 is a diagrammatic view showing an alternate construction of wiring in which all of the coils are connected in series instead of in parallel as illustrated in Fig. 2.

In the accompanying drawings A and B represent the limbs of a permanent horse shoe primary magnet, and D an ordinary receiver shell. Extending from the ends and between the inner walls of these limbs are
105 soft iron pole pieces or cores 2 and 3 around which coils 4 and 5 of diaphragm magnets are wound. In juxtaposition to the ends of

these cores is the usual receiver diaphragm C, of soft iron, which is clamped with the edge of a brass cup 6 between the cap and end of the receiver shell D, said cap and shell being threaded together in the usual manner. The magnet, pole pieces and cup are secured together by means of screws 7.

Spaced from the diaphragm magnet coils upon the pole pieces is a pair of auxiliary magnet coils 8 and 9, the windings of which surround the inner ends of pole pieces 2 and 3. The auxiliary and diaphragm coils on each core are connected in series and the pairs of coils on one core are connected in parallel with the pairs of coils on the second core (see Fig. 2). The terminal conductors 10 are fastened upon an insulating block 11 which is held between the limbs of the primary magnet. A thin copper spool made in two sections 12 and 13 between the winding of each auxiliary coil and its core serves to reduce the impedance of the auxiliary coils so that there will be no effect upon the diaphragm from said coils due to the talking current.

In operation, direct current flowing through the auxiliary coils and the diaphragm magnet coils will produce no magnetism at the end of the cores of the diaphragm magnet coils. That is, the magnetism from the diaphragm magnet coils will be automatically neutralized by the magnetism from the auxiliary magnet coils, the primary magnetism being furnished only by the permanent magnets ordinarily employed. This construction produces a receiver which can be placed directly in series with the transmitter without the use of an induction coil, and its impedance is reduced so that it offers practically no resistance to the talking current. This increases the transmission qualities of telephone lines as the impedance is less than that of an induction coil or an impedance coil and there is no loss through a shunting of the current through an impedance coil. Broadly the magnetism due to direct current passing through the diaphragm coil on one core is neutralized by the action of direct current which passes through the auxiliary coil on the other core. The wiring of the coils can obviously be varied to more perfectly accomplish this result.

The receiving properties of a telephone equipped with this receiver are increased because there is no loss through an induction coil or an impedance coil, the only loss being that due to the impedance of the auxiliary coils, which is reduced to a minimum. The effect of the diaphragm coils is the same as in an ordinary receiver. The effect of the auxiliary coils would be to neutralize the effect of the diaphragm coils were it not for the fact that the auxiliary coils have the copper sheaths over their cores, and copper heads at their ends. An additional means

of preventing the auxiliary coils from opposing the diaphragm coils, due to the talking current, is obtained by placing the auxiliary coils farther from the diaphragm than the diaphragm coils.

In Fig. 4 the use of my improved receiver is illustrated in connection with a simple, common battery telephone system in which E represents telephone sets having my improved receivers F connected with transmitters G in the lines H. I represents the line jacks, and J the cord plug circuit containing a common source of battery supply K. It will be noted that no induction coils or relays are used, ballasts L, in series with the line signal lamps M obviating the use of relays.

In the alternate construction shown in Fig. 5 the diaphragm and auxiliary coils are shown connected in series instead of in parallel as illustrated in Fig. 2.

It is obvious that the mode of application and construction of my invention may be variously modified without departing from the principles which I have applied, and in accordance with the patent statutes, I have described the principle of operation of my invention, together with the apparatus which I now consider to represent the best embodiment thereof, but I desire to have it understood that the apparatus shown is only illustrative and that the invention can be carried out by other means and applied to uses other than those above set forth, within the scope of the following claims.

Having described my invention, what I claim as new and desire to protect by Letters Patent, is:—

1. A telephone receiver, comprising, a diaphragm, a magnet influencing said diaphragm, a diaphragm coil, and an auxiliary coil associated with said magnet and adapted to oppose each other, one of said coils offering substantially no impedance to talking currents, for the purposes specified.

2. A telephone receiver, comprising, a diaphragm, a permanent magnet, a coil associated with said magnet adjacent to said diaphragm, auxiliary means associated with said coil and adapted to neutralize the effect of said coil on said diaphragm due to the action of direct current, means for minimizing the impedance of the auxiliary means to the action of talking currents, and a receiver shell inclosing said parts, for the purposes specified.

3. A telephone receiver, comprising, a diaphragm, a magnet associated with said diaphragm, a coil associated with said magnet adjacent to said diaphragm, auxiliary means associated with said coil for neutralizing the effect of said magnet on said diaphragm when said coil is subjected to the action of direct current, and means for reducing the impedance of said auxiliary means to the

action of talking current, for the purposes specified.

4. A telephone receiver, comprising, a magnet having a pair of cores, a diaphragm, diaphragm and auxiliary magnet coils and means associated with said magnet for reducing the impedance of the auxiliary coils, each of said cores carrying one of said diaphragm coils and one of said auxiliary coils, said coils being so arranged that the magnetic action of the diaphragm coil on one core will be substantially neutralized by the magnetic action of the auxiliary coil on the other core due to direct current.

5. A telephone receiver, comprising, a diaphragm, diaphragm and auxiliary coils, a pair of magnet cores adjacent to said diaphragm, and means associated with said magnet for reducing the impedance of the auxiliary coils, each of said cores carrying one of said diaphragm coils and one of said auxiliary coils, said coils being so arranged that the magnetic action of the diaphragm coil on one core will be substantially neutralized by the magnetic action of the auxiliary coil on the other core due to direct current.

6. A telephone receiver, comprising, a diaphragm, a magnet influencing said diaphragm, diaphragm and auxiliary coils associated with said magnet and opposing each other, and means for reducing the impedance effect of said auxiliary coils.

7. A telephone receiver, comprising, a diaphragm, a permanent magnet associated therewith, diaphragm and auxiliary coils associated with said magnet and opposing each other, and means for reducing the impedance effect of the auxiliary coils.

8. A telephone receiver, comprising, a primary magnet, a diaphragm associated therewith, diaphragm and auxiliary coils associated with said magnet, and means for reducing the impedance of said auxiliary coils.

9. A telephone receiver, comprising, a diaphragm, a magnet associated with said diaphragm, diaphragm and auxiliary coils associated with said magnet and opposing each other, and copper protection on said auxiliary coils to substantially prevent magnetic action in the auxiliary coils from talking currents, for the purposes specified.

10. A telephone receiver, comprising, a magnet, a diaphragm, diaphragm magnet coils, and means connected in series with said diaphragm coils and adapted to neutralize magnetism produced thereby, except that produced by alternating currents.

11. A telephone receiver, comprising, a diaphragm, a magnet associated with said diaphragm, diaphragm and auxiliary coils associated with said magnet and opposing each other, and means associated with said magnet for reducing the impedance of auxiliary coils, for the purposes specified.

12. A telephone receiver, comprising, a diaphragm, a magnet associated with said diaphragm, diaphragm and auxiliary coils associated with said magnet and opposing each other, and means tending to prevent impedance effect of said auxiliary coils.

13. A telephone receiver, comprising, a diaphragm, a magnet influencing said diaphragm, a core associated with said magnet and diaphragm, a diaphragm coil associated with said core, an auxiliary coil associated with said core, and means on said core to substantially prevent magnetic action in the auxiliary coil due to the influence of talking currents through said auxiliary coil.

14. A telephone receiver, comprising, a diaphragm, a magnet influencing said diaphragm, a core associated with said magnet and diaphragm, a copper sheath over said core, an auxiliary coil placed over said copper sheath, and a diaphragm coil placed over the other end of said core near said diaphragm.

15. A telephone receiver, comprising, a diaphragm, a magnet influencing said diaphragm, a core associated with said magnet and diaphragm, a copper sheath over said core, an auxiliary coil placed over said copper sheath, a diaphragm coil placed over the other end of said core, and a receiver shell inclosing said parts.

16. A telephone receiver, comprising, a diaphragm, a primary magnet, and a plurality of sets of diaphragm and auxiliary coils each set including a diaphragm coil and an auxiliary coil, the coils of each set being connected in series and the sets of coils connected in parallel.

17. A telephone receiver, comprising, a diaphragm, a primary magnet and a plurality of sets of diaphragm and auxiliary coils each set including a diaphragm coil and an auxiliary coil, said auxiliary coils substantially neutralizing the effect of direct current in the diaphragm coils and said coils of each set being connected in series and said sets of coils connected in parallel.

18. A telephone receiver, comprising, a diaphragm, a primary magnet and a plurality of sets of diaphragm and auxiliary coils connected in parallel each set including a diaphragm coil and an auxiliary coil, said auxiliary coils substantially neutralizing the effect of direct current in the diaphragm coils and having substantially no influence on the diaphragm due to the action of talking currents traversing said auxiliary coils.

19. A telephone receiver, comprising, a diaphragm, a primary magnet, a plurality of sets of diaphragm and auxiliary coils means for reducing the magnetic action due to talking currents traversing said auxiliary coils.

20. A telephone receiver, comprising, in combination, a magnet having a pair of

cores, a diaphragm, and diaphragm and
auxiliary coils so arranged that magnetism
due to the direct current which passes
through the diaphragm coil on one core is
5 neutralized by the action of direct current
passing through the auxiliary coil on the
other core.

In testimony whereof, I have signed my
name to this specification, in the presence
of two subscribing witnesses.

CLAUDE D. ENOCHS.

Witnesses:

JOHN N. WALLACE,
L. J. SHADBOLT.