

E. S. PRIDHAM & P. L. JENSEN.

TELEPHONE.

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1,105,924.

Patented Aug. 4, 1914.

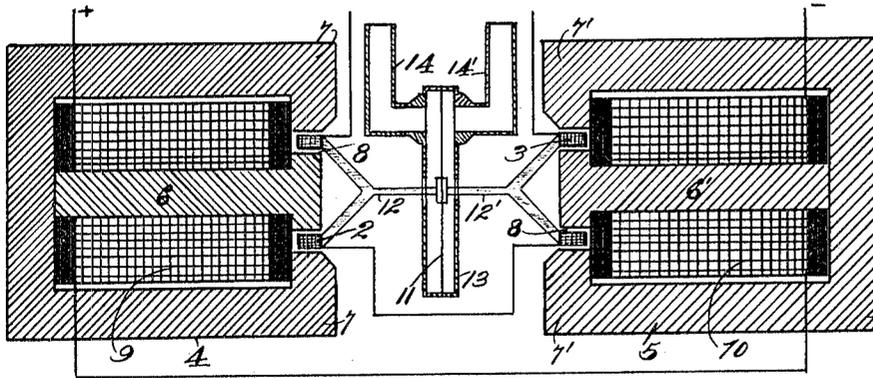


Fig. 1.

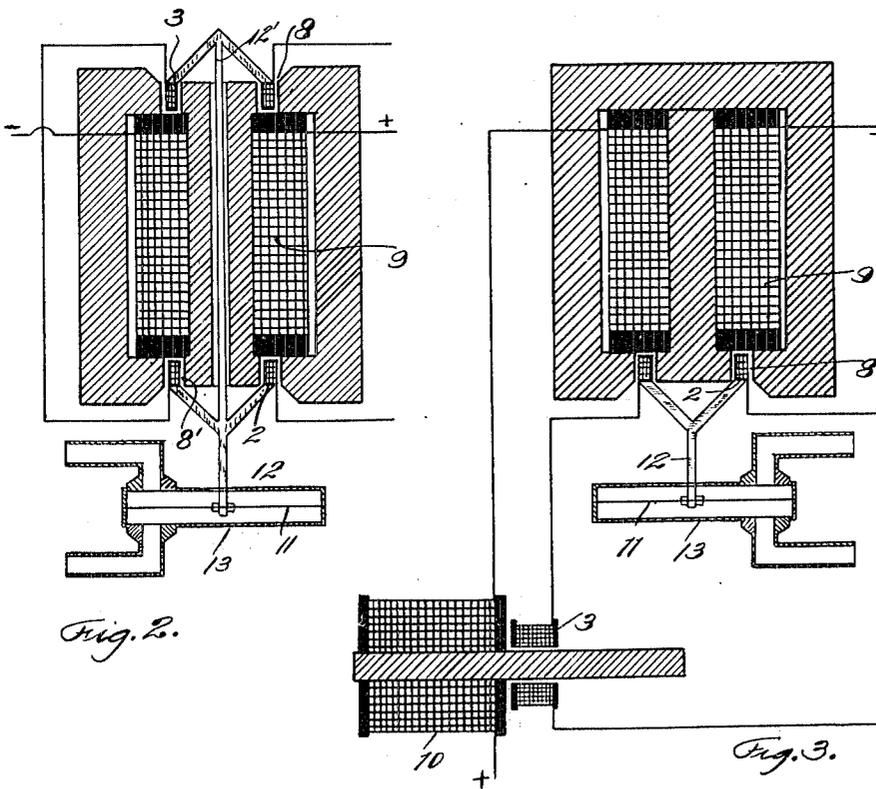


Fig. 2.

Fig. 3.

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# UNITED STATES PATENT OFFICE.

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COMMERCIAL WIRELESS & DEVELOPMENT COMPANY, OF SAN FRANCISCO, CALI-  
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TELEPHONE.

1,105,924.

Specification of Letters Patent.

Patented Aug. 4, 1914.

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To all whom it may concern:

Be it known that we, EDWIN S. PRIDHAM, a citizen of the United States, and PETER L. JENSEN, a subject of the King of Denmark, residing at Napa, in the county of Napa and State of California, have invented new and useful Improvements in Telephones, of which the following is a specification.

This invention relates to telephones, and particularly to receiving apparatus.

The object of the present invention is to provide a telephonic receiving instrument of the moving annular coil type, so constructed that fluctuations of field strength acting upon the telephonic conductor will have no effect upon the diaphragm of the device.

Types of receiving instruments employing magnetic fields in which are disposed freely movable coils are known and have been used with a high degree of success.

In our invention we employ a combination of magnetic structures with central poles and circumferential surrounding poles; between the central poles and surrounding poles are air-gaps of substantially annular form. In these air-gaps are respectively disposed portions of a telephonic conductor. These portions of conductor take the form of annular coils which are freely movable in the air-gaps of the magnetic circuits. Either one or both of the coils may be connected to the diaphragm of the instrument. When both coils are connected to the diaphragm the electrical connections must be such that the effects are additive upon the diaphragm. In any case the sections of the telephonic conductor are connected together so that telephonic currents may act throughout the entire length of the conductor.

In instruments of the class wherein an annular movable coil has been employed it has heretofore been necessary to use direct current from either a primary or secondary battery when electro-magnets produce the magnetic field. When direct current from a dynamo has been used a strong reaction takes place owing to fluctuations of the current due to the commutator action. This reaction is caused by variations of the field strength which induces currents in the telephonic coil. These currents reacting upon the normal field strength produce the vibra-

tion which greatly interferes with the action of the instrument. Concerning the development of these induced currents in the telephonic coil, it can be shown that a decreasing field strength will produce an induced current in the same direction as the energizing current while an increasing field strength produces an induced current in the opposite direction to the energizing current.

In the instrument under consideration we have used direct current with a high degree of success even when the fluctuations of current were strong. The desired results in this instrument being obtained by dividing the telephonic conductor in two sections, each section being subjected to the influence of a magnetic field energized by the fluctuating current. The sections of the telephonic conductor are then so connected together that the induced currents generated in either section neutralize each other while the telephonic current from the working source is free to flow throughout the entire conductor and accomplish its purpose.

As will be seen from the drawings, both sections of the conductor may be made to act upon the diaphragm or only one section used for that purpose, the other section being used to neutralize the induced currents in the acting section.

Our invention simply comprehends the use of a divided telephonic conductor each section of which is subjected to a magnetic field energized from a source of fluctuating direct current the sections being so connected together that the induced currents can have no effect in actuating the diaphragm of the instrument. It is of course necessary so to design the instrument that the value of the induced currents in either section are equal.

The invention consists of the parts and the construction and combination of parts as hereinafter more fully described and claimed, having reference to the accompanying drawings, in which:

Figure 1 is a diagrammatic view of the instrument in cross section. Fig. 2 is a diagrammatic view in cross section of a variation. Fig. 3 shows in diagrammatic view a further variation in the application of the principle.

Referring to Fig. 1, we have shown the telephonic conductor wound in two sections 2 and 3, each of said sections consisting of substantially annular coils of many turns of insulated wire. Each of the annular coils is disposed to be freely movable in the respective air-gaps of the magnets 4 and 5. These magnets consist respectively of the central poles 6 and 6', substantially surrounded by the poles 7 and 7'; the center poles being separated from the outer poles by the substantially annular air-gaps 8 and 8'.

The magnets are energized by current flowing through the magnet coils 9 and 10. These magnet coils are properly connected together and energized from the same source of current.

The magnets 4 and 5 with their respective telephonic coils 2 and 3 are disposed on opposite sides of the diaphragm 11 to which the telephonic coils are rigidly connected by the arms 12 and 12'. The diaphragm 11 is contained in the sound-box 13 from which listening tubes 14 and 14' extend, one from either side of the diaphragm 11.

The telephonic coils 2 and 3 are so connected together electrically that when telephonic current passes through them, and the magnets 4 and 5 are energized, the effect upon the diaphragm 11 will be additive. Now, if the coils 2 and 3 are properly connected together to produce an additive effect upon the diaphragm, it can be shown that induced currents formed in the coils 2 and 3 by any variation of the lines of force in the air-gaps 8 and 8', due to fluctuations of the energizing current, will be neutralized by their mutual action, as hereinbefore described.

Referring to Fig. 2, we show a form of the instrument in which only one energizing coil 9 is used to produce the magnetic fields in the air-gaps 8 and 8'. The telephonic coils 2 and 3 are disposed respectively in the air-gaps 8 and 8' and are connected to the diaphragm 11 by the rigid arms 12 and 12'. In this form of the invention one of the coils is connected to the diaphragm 11 by the arm 12' which extends through the central pole piece 6. The coils 2 and 3 are connected together electrically to produce an additive effect upon the diaphragm when telephonic current passes through them. When so connected together it will be found that any fluctuation of the lines of force in the air-gaps 8 and 8' will produce induced currents in the coils 2 and 3, which will neutralize each other.

Referring to Fig. 3, we have shown the telephonic conductor in two sections 2 and 3, each of which is subjected to the effect of magnetic fields energized by the same current. The coil 2 consists of a substantially annular coil disposed to be freely movable

in the air-gap 8 and is connected by the rigid arm 12 to the diaphragm 11. Coil 3 of the telephonic conductor is subjected to the influence of the magnetic field produced by the energizing coil 10. The lines of force in the air-gap 8 are produced by the energizing coil 9. Current from the same source is used to energize both coils 9 and 10.

The inductive relation between the coil 3 and the magnetic field produced by coil 10 is variable by movement of the coil 3 in relation with the magnetic coil 10. Since the two energizing coils are fed by the same source of current, the magnetic fields produced by them will be subjected to the same variations.

The telephonic coil 2 is connected electrically to coil 3 so that induced currents formed by any variation of the field strength of their respective magnetic fields will neutralize each other. The strength of the induced current in coil 3 may be varied to exactly balance the induced current formed in the coil 2, by changing the inductive relation of coil 3 with respect to the magnetic field produced by the energizing coil 10.

Having described our invention and the manner in which the same is to be used, we claim and desire to secure by Letters Patent:

1. In a telephone receiver of the moving coil type including magnetic fields energized by direct current, means for eliminating the disturbing effect of fluctuations of said direct current, said means comprising a conductor, of which said moving coil forms a part, said conductor adapted to be included in the telephone circuit, said conductor being wound in two separate sections, said sections of conductor being respectively subjected to the influence of magnetic fields energized from the same source of current, said two sections of conductor being so electrically connected together that fluctuations of said energizing current are rendered negligible throughout the conductor as a whole.

2. In a telephone receiver of the moving coil type, said receiver including a magnet provided with a substantially annular air gap in which is maintained an intense magnetic field, said magnetic field being produced by direct current flowing through an energizing coil on said magnet, a substantially annular coil disposed to be freely movable in said air gap, said coil attached by a rigid arm to a diaphragm, and means for eliminating the disturbing effect of fluctuations of the direct current energizing said magnet, said means comprising a compensating conductor wound as a coil, said coil being connected electrically in series with said annular coil, and so disposed in a separate magnetic field energized by said direct current that induced electro-motive forces formed in said annular coil by variations of the energizing current are at any instant of

time opposed by equal and opposite electromotive forces in said compensating conductor as hereinbefore described.

3. In a telephone receiver employing magnets energized by direct current, means for eliminating the disturbances in said receiver due to fluctuations of strength of said direct current, said means comprising a conductor wound in two separate sections, said sections being subjected respectively to magnetic fields energized from the same source of current, at least one of said sections being in operative relation with the receiver, and said sections being so electrically connected together that the effects of fluctuations of the energizing direct current are rendered negligible throughout the conductor as a whole.

4. In a telephone receiving instrument, the combination with magnetic fields energized

by direct current, of a conductor, said conductor adapted to be included in a telephone circuit, said conductor consisting of more than one section, said sections of conductor respectively subjected to the influence of said magnetic fields, said sections of conductor being so connected together electrically that effects of fluctuations of strength of said magnetic fields are rendered negligible in said conductor, a portion of said conductor being connected by a rigid arm to a diaphragm as hereinbefore described.

In testimony whereof we have hereunto set our hands in the presence of two subscribing witnesses.

EDWIN S. PRIDHAM.

PETER L. JENSEN.

Witnesses:

JOHN H. HERRING,

CHARLES PICKLES.