

(No Model.)

C. A. RANDALL.
Telephone Receiver.

No. 235,021.

Patented Nov. 30, 1880.

Fig. 1.

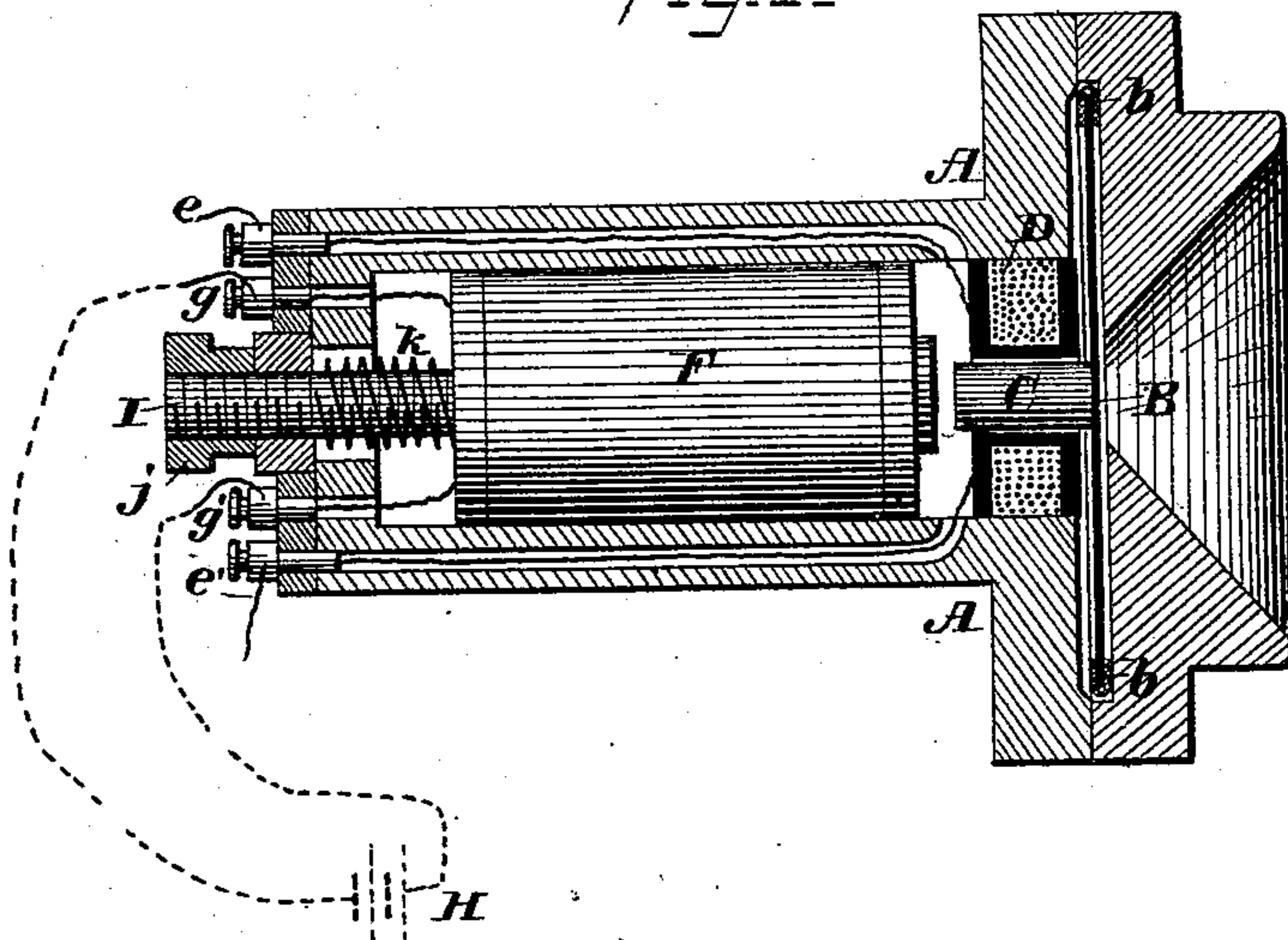
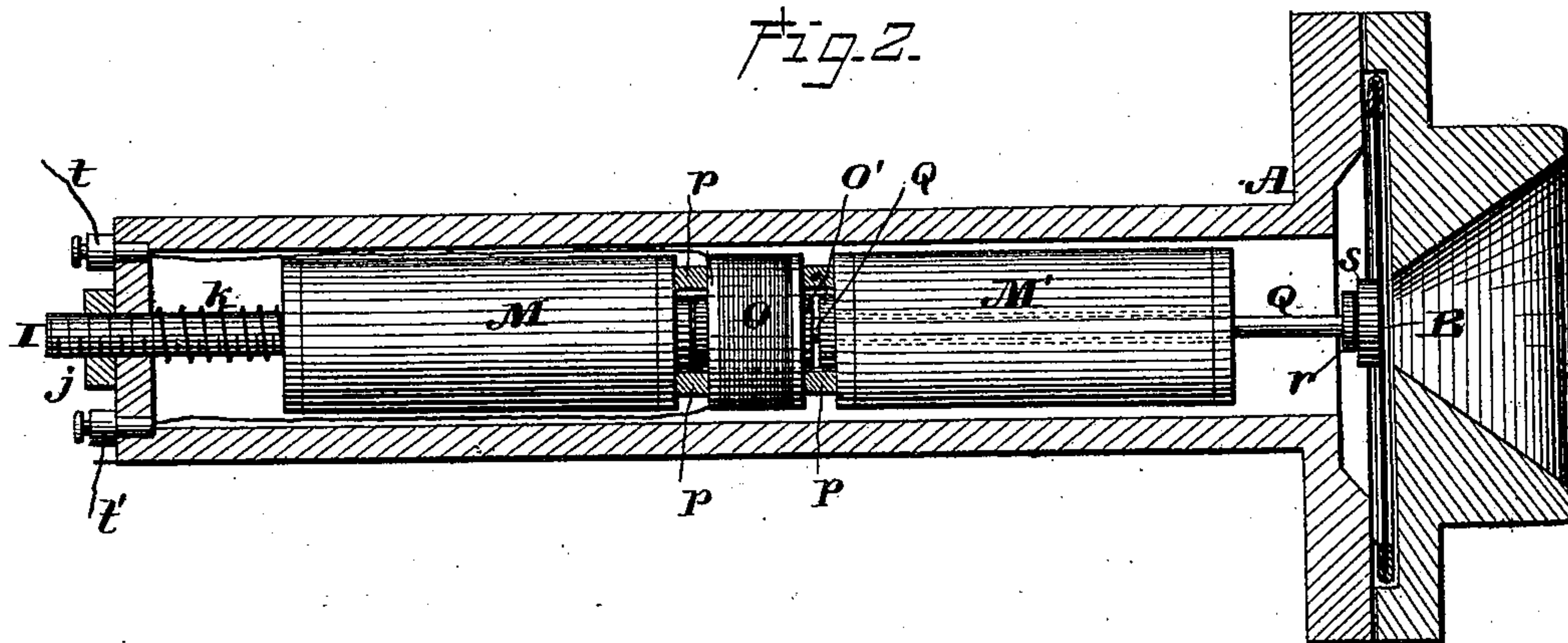


Fig. 2.



WITNESSES

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UNITED STATES PATENT OFFICE.

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TELEPHONE-RECEIVER.

SPECIFICATION forming part of Letters Patent No. 235,021, dated November 30, 1880.

Application filed April 5, 1880. (No model.)

To all whom it may concern:

Be it known that I, CHARLES A. RANDALL, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented new and useful Improvements in Telephonic Receivers, of which the following is a specification.

This invention relates to telephonic receivers especially adapted for operation by alternating electric currents of opposite polarity, its object being to provide a receiver which will secure the most effective results of the operation of a system and apparatus for telephonic transmission forming the subject of an application for Letters Patent filed by me on the 29th day of March, 1880.

It is well known that the extreme sensitiveness of the ordinary magnetic telephonic receivers is one of the main obstacles to distinct and clear communication, the slightest induction upon the line-wire or other interference with the line-current causing an aberration of variation in the magnetism of the permanent magnet as the current passes over the coil surrounding the pole of said magnet. In overcoming this difficulty I construct the receiver in such manner that its diaphragm is operated by the electro-motive force of battery-currents of alternately-opposite polarity instead of by induction, as heretofore, as will be hereinafter more fully described.

To this end my invention consists in the combination, with a telephonic-receiver diaphragm, of a helix having a detached and movable soft-iron core connected with said diaphragm, and a continuously-polarized magnet arranged adjacent to said core, whereby when electric currents of alternately-opposite polarity are passed over said helix its movable core will be polarized successively in opposite directions, and alternate attractions and repulsions will be set up between the soft-iron core and the continuously-polarized magnet, the force of said attractions and repulsions being commensurate with the electro-motive force of the battery which may be employed to generate the electrical currents passing over the helix.

In the accompanying drawings, Figure 1 is a view, partially in diametric section, of a receiver constructed according to my invention.

Fig. 2 is a similar view of a modification of the invention.

The letter A indicates a tubular flanged case, provided with a flaring ear-piece in an ordinary manner, and B is a non-magnetic diaphragm dampened by means of a rubber ring, *b*, embracing its edge. Said diaphragm is provided with a centrally-projecting stud, C, of soft iron or other magnetizable substance, which serves as a movable core for a fixed helix, D, the terminals of which are connected, respectively, with screw-posts *e e'* at the end of the tubular case. One of these screw-posts is intended to be connected with the line-wire and the other with the ground.

Within the main portion of the tubular case and behind the helix D is arranged an electro-magnet, F, the terminals of the helix of which are connected with screw-posts *g g'*, respectively, and these screw-posts are to be connected with the opposite poles of a local battery, as at H. The magnet F is adjustable to and from the helix D and its core by means of a screw-rod, I, secured to the rear end of the core of said magnet and passing through the head of the case, where a suitable adjusting-nut, *j*, is screwed upon it, and a spring, *k*, surrounding said rod and bearing against the helix and the inner surface of the head of the case.

The local electro-magnet is, of course, continuously polarized by the local-battery current, and as alternately positive and negative currents are sent over the line-wire and the helix D by my improved transmitter, the polarity of the movable core C is reversed, so that it is alternately attracted and repelled by the local magnet, thus causing the diaphragm of the receiver to vibrate in correspondence with the electric impulses over the line.

In lieu of the continuously-polarized local electro-magnet, a permanent steel magnet may be used, if found desirable.

In this receiver it will be observed that the diaphragm is operated by the electro-motive force of the line-battery rather than by simple induction, as heretofore, and therefore much more vigorous vibrations are produced, and the receiver-magnet is much less liable to be disturbed by induction.

In the modification shown in Fig. 2 the dia-

phragm is mounted as shown in Fig. 1 and in a similar case.

The letters M M' indicate two permanent steel magnets arranged longitudinally within the tubular portion of the casing, with similar poles toward each other. A coil or helix of wire, O, is arranged in an axial position between the two magnets M M', and is separated therefrom by rubber washers *p p*. This helix O is provided with a freely-movable soft-iron core, O', to one end of which is secured a light rod of wood or metal, Q, which passes through a central passage of the magnet M', as shown in dotted lines, and terminates in a head, *r*, which is in contact with an elastic pad, *s*, in contact with or attached to the diaphragm. The terminals of the helix O are respectively connected with the screw-posts *t t'* at the end of the case, and when the receiver is in use one of these screw-posts is to be connected with the line-wire and the other with the ground.

When the alternating battery-current transmitter is in operation at the other end of the line-wire and currents of alternately-opposite polarity pass over the line-wire and helix O, the core O' is polarized in alternately-opposite directions, and is therefore attracted by the magnets M and M' alternately, its movement communicating vibrations to the diaphragm B through the rod Q and elastic pad *s*, the rapidity of these vibrations depending on the rapidity of the alternations of the currents over the line-wire, and their force depending upon the strength of the line-currents, and consequent magnetism in the movable core.

It will be well understood that in lieu of the permanent magnets an electro-magnet properly wound and constantly charged by means of a battery may be used, the helix and movable core being arranged between the ends of said electro-magnet.

A telephone-receiver has been constructed in which one of the poles of a horseshoe-magnet is flattened to form a diaphragm, the other pole being provided with a soft-iron extension toward said diaphragm, said extension being surrounded by a helix arranged for connection with a line-wire. The soft-iron extension has an induced polarity, the attractive force of which is varied by an electrical current passed over the helix, and thus vibrations are caused in the diaphragm.

Were a battery used to generate alternate currents passing over the helix, it is obvious that a great portion of the electro-motive force of the currents in one direction would be expended in neutralizing the induced polarity of this soft-iron extension, and therefore but little if any direct force would be exerted upon the diaphragm. I do not claim this arrangement.

What I claim is—

In a telephonic receiver, the combination, with a diaphragm, of a helix having a detached and movable soft-iron core connected with said diaphragm, and a continuously-polarized magnet arranged adjacent to said core, whereby when electric currents of alternately-opposite polarity are passed over said helix its movable core will be alternately attracted and repelled by said continuously-polarized magnet, and thus communicate vibrations to the diaphragm, substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

CHARLES A. RANDALL.

Witnesses:

ALBERT DAY,
HENRY CONNETT.