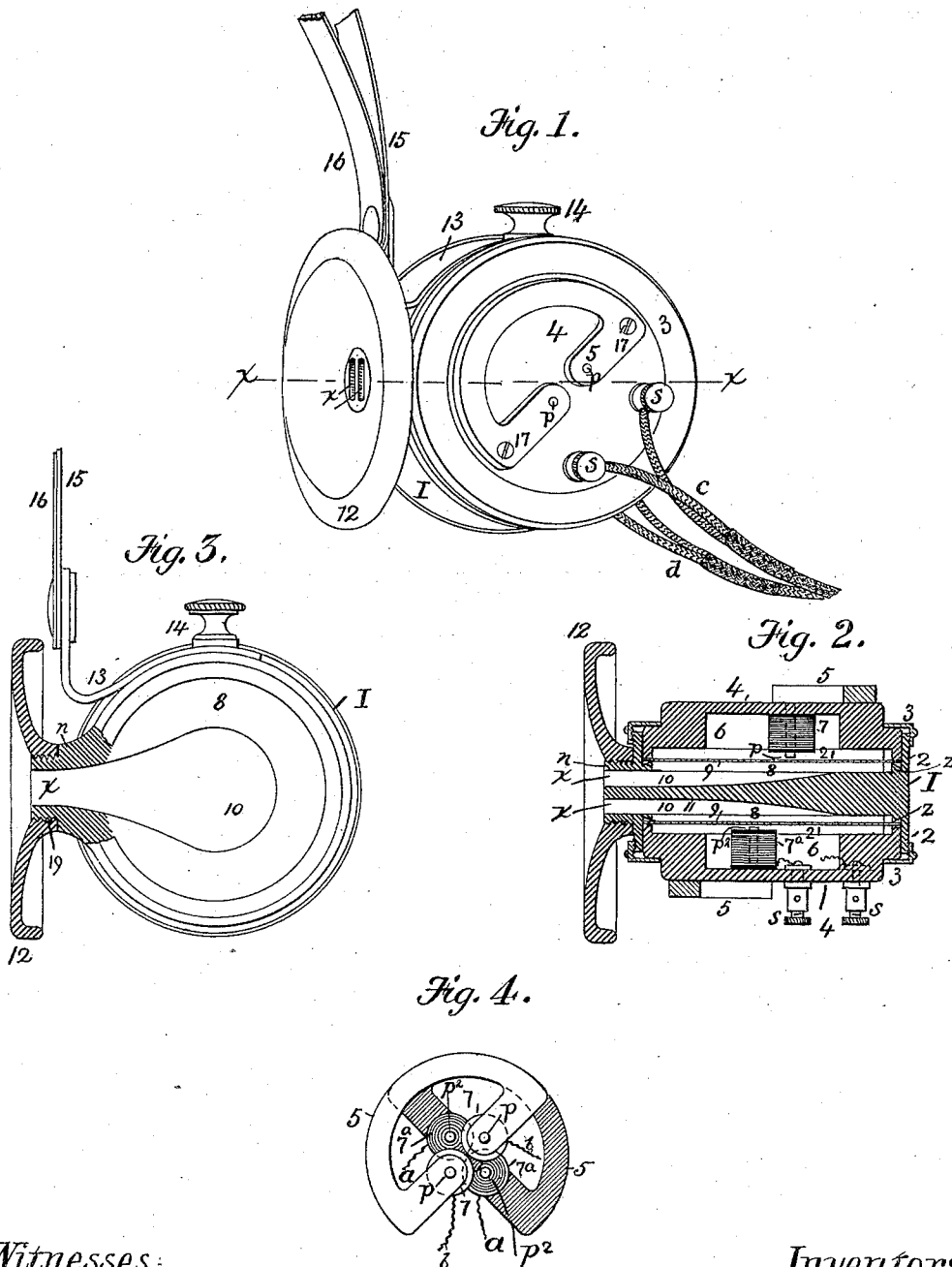


(No Model.)

H. V. HAYES & W. L. RICHARDS.
TELEPHONE.

No. 487,219.

Patented Nov. 29, 1892.



Witnesses:
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UNITED STATES PATENT OFFICE.

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TELEPHONE.

SPECIFICATION forming part of Letters Patent No. 487,219, dated November 29, 1892.

Application filed September 10, 1892. Serial No. 445,553. (No model.)

To all whom it may concern:

Be it known that we, HAMMOND V. HAYES, residing at Cambridge, and WILTON L. RICHARDS, residing at Malden, in the county of Middlesex, State of Massachusetts, have invented certain Improvements in Telephones, of which the following is a specification.

This invention relates to electric telephones; and its object is to provide a receiving-telephone capable of being connected with two circuits at the same time and adapted to receive messages from either without introducing or facilitating any reciprocal interference between said circuits. Attempts have from time to time been made to devise such compound receiving-telephones and have taken the form either of inclosing in a common case two or more bar-magnets, each separately provided with an inducing-helix for its own circuit and adapted to act upon a common diaphragm, or of providing a single-bar magnet with a plurality of helices, each helix being in a different operating circuit. The results of these attempts have not been satisfactory, for the reason that in all such cases it has in practice been found that the apparatus has had a constant and strong tendency to act as a repeating induction-coil. In other words, the voice-currents coming over one of the circuits and through the telephone-coil of such circuit have exercised an inductive influence over the coil of the other circuit, and have thereby caused similar voice-currents to circulate through the said other circuit, so that messages transmitted over either circuit are repeated over the other, a result which is extremely undesirable; yet there is a considerable call for an instrument which will enable an operator to receive messages or transact business over one circuit while he is listening also over another.

By our invention we are enabled to construct such an instrument; and it mainly consists in providing a double-pole magnet for each circuit and in relatively arranging such magnets that they are inductively neutral with respect to one another, such an arrangement being effectuated by mounting the two magnets, each with its poles on a plane sub-

stantially at a right angle to the center of the plane of those of the other, the two poles of each being practically equidistant from each of the poles of the other—that is to say, if a straight line be supposed to pass between the centers of the poles of one magnet, it will be perpendicular to a similar line passing between the centers of the poles of the other.

It further consists in mounting these magnets so relatively disposed in such a way that they face one another, each being furnished with its own diaphragm in mounting them on opposite sides of a common central support, recessed on each side to form a vocalizing-chamber for each diaphragm and in providing the said support with a single earpiece having two independent sound-channels, one leading to each vocalizing-chamber.

In the drawings which illustrate and are a part of this specification, Figure 1 is a perspective view of my compound or double-circuit telephone. Fig. 2 is a section on the line xx of Fig. 1. Fig. 3 is a side view of the telephone as it has been made, with one of its cap-pieces or magnet-disks and the screw-retaining ring thereof removed; and Fig. 4 is a detail drawing indicating the relative position of the two magnets.

The construction of an instrument - case which is suitable and convenient can readily be understood by first considering Figs. 2 and 3. A nucleus or central disk 1, of non-conducting material—such as hard rubber, vulcanized fiber, or hard wood—is provided, which is hollowed out on both sides to form a circular recess or chamber 8, having a peripheral boundary flange 2, and within this flange on both sides a shoulder or diaphragm-seat z . A deeper space 10 of any suitable form (the circular form being convenient) is further made in the bottom of each chamber, as shown in plan in Fig. 3 and in cross-section by Fig. 2; and from a point in the side of each of these deeper recesses a sound-channel x leads through the peripheral wall of the central disk below the diaphragm-seat, whereby the air vibrations, acting to reproduce sounds find egress, the two sound-channels being separated by the partition 11. A suitable neck-

piece n , similarly perforated with continuation channels x , is affixed to the exterior of the disk 1 at the point where it is pierced by the said sound-channels, and, if desired, this neck n may be formed integral with the central disk; or an additional piece may be secured thereto by screws or in any preferred way. The neck is externally threaded at 19, as shown, and an earpiece 12, of ordinary construction and form, is screwed thereon. The diaphragms 9 are, as usual, made of ferrotype-iron, loosely fit within the flanges 2, and are placed upon the shoulders or diaphragm-seats z . When in place, they of course inclose flat vocalizing-chambers 8 on their front side, which chambers connect with the outer air only through the spaces 10 and sound-channels x .

Fig. 4 shows the relative arrangement of the magnets 5, their pole-pieces $p p^2$, and helices 7 7^a. The magnets 5 may be mounted behind their respective diaphragms in any preferred way, so that their coil-surrounded pole-pieces are fixed in close proximity to the central portion of the said diaphragms in a manner well understood, provided that their relative arrangement is such that the two poles of each are on a plane which is substantially perpendicular to that on which are the two poles of the other, as shown. This may be otherwise stated by saying that a straight line drawn through the centers of the poles of one of the magnets, and forming a diameter of the diaphragm thereof, must be at right angles with and substantially perpendicular to the center of a similar straight line drawn through the centers of the poles of the other magnet and forming a diameter of the other diaphragm.

As already pointed out, in former attempts to construct a compound-circuit telephone it has been found that the operation of one circuit has inductively acted within the instrument upon the other. In our improved instrument, in which the poles of the two magnets and their helices are placed at substantially a right angle to each other, this difficulty is overcome and there is no interference between the circuits, inductive neutrality being fully achieved. This of course will be understood by considering that a given pole and helix of each of the magnets is so placed with respect to both poles of the other that any induction exercised upon it by either one of the poles of the other is balanced and neutralized by an equal but opposite induction exercised upon it by the opposite pole of the other, each pole of either being substantially equidistant from both poles of the other.

In the drawings, the two magnets 5 are of semicircular form, each having polar projections projecting diametrically toward the center of the circle, the diametrical polar projections of one being perpendicular to and bisecting a line drawn through those of the

other. The telephone-coils 7, connected in series, surround the pole-pieces p of one magnet, of which the wires b are the terminals, and the coils 7^a, having terminal wires a , surround the pole-pieces p^2 of the other magnet. In telephones which have been actually made embodying these principles, the construction shown in the drawings has been adopted. Inclosing caps or magnet-supporting disks 4, of hard rubber or like material, are provided of such size as to fit snugly within the recesses of the central disk 1, and to rest upon the diaphragm edges, as shown, so that when they are secured they hold the said diaphragms in place. The inner side of the disks 4 are in turn recessed, first, with a wide but shallow recess 21, which may serve as a rear vocalizing-chamber, and, secondly, with a narrower but deeper central recess 6, which serves to inclose and protect the telephone-circuit helices 7 7^a, as hereinafter explained. The inclosing disks 4 are secured to the central disk by means of clamping-rings 3, which screw over the threaded edge of the flange 2 thereof and overlap the said inclosing disks. The magnets 5 are secured by screws 17 to the outside surface of the disks 4 and their pole-pieces $p p^2$ project through holes prepared for them into the deep recess 6, being sufficiently long to reach to the proper distance from the diaphragm. Their helices 7 7^a are slipped over the pole-pieces and properly connected. The binding-screws s form a convenient means for bringing the terminal conductors through the casing, the said terminals being connected therewith in a manner well understood; or, if desired, a flexible conductor c or d may pass directly into the casing through an aperture in the disk 4 and connect directly with the helix-terminals.

The clamping-ring attachment affords a ready means of adjusting the magnets into the desired position of neutrality, and in securing the magnet-holding disks in position they may first be placed by observation in a position where the polar projections are at a right angle with each other, after which the clamping-ring may be partly screwed up and the instrument operated. If it be found that the position of neutrality has not been fully attained, one of the disks can then be slightly moved in either direction until a point is found where the operation of one of the circuits does not induce upon the other, when the clamping-ring should finally be tightened up.

Our compound telephone is well adapted for use as an operator's head-telephone, being light and portable. Such use is indicated in the drawings, where a portion of springs 15 16, organized for head-wear, are shown as being jointed to a metal strap 13, secured to the case by the thumb-screw 14.

Having now fully described our invention, we claim—

1. A magneto-telephone for two circuits, comprising a double-pole magnet and helices

therefor for each circuit, the poles and helices of each magnet being arranged in a position inductively neutral to those of the other.

2. A compound or double-circuit telephone having for each circuit an independent diaphragm and inducing helices and magnet, the poles and helices of each magnet being arranged substantially perpendicular or at right angles to the poles of the other, whereby reciprocal inductive neutrality is secured, substantially as described.

3. A compound or double-circuit magneto-telephone provided with an independent magnet and inducing-coils, and diaphragm for each circuit and having a single and common case and earpiece, each magnet having its poles and helices so relatively arranged that a straight line uniting its said poles will be substantially perpendicular to a straight line similarly uniting the poles of the other, whereby the two telephone-circuits are made relatively neutral, substantially as described.

4. In a telephone, two double-pole magnets, the poles of each being fitted with inducing-helices adapted for connection, respectively, in independent circuits, and each magnet being secured in such a position that each of its poles is substantially equidistant from the two poles of the other.

5. In a compound or double-circuit telephone, the combination of a central non-conducting disk having a shouldered recess on each side to form a vocalizing-chamber and diaphragm-seat, an earpiece secured to the

periphery of said disk and connecting with the vocalizing-chambers on the two sides thereof by independent sound-channels, a diaphragm for each recess resting by its edges upon the shoulder thereof, closing-caps or magnet-holding disks for the side recesses of the said central disk adapted to inclose and clamp the edges of the diaphragms, and an independent bipolar magnet and its inducing-coils for each circuit, secured upon and supported by the said caps or disks, respectively, the two magnets being arranged with their poles in close proximity to their respective diaphragms, and substantially at right angles to the poles of the other, substantially as described.

6. In a compound telephone, the combination of two separate bipolar magnets provided with pole-surrounding helices, the respective helices of each being adapted for inclusion in a circuit independent of the other, with means, as indicated, for the angular displacement and adjustment of either magnet relatively to the other, for the purpose of preventing reciprocal inductive effects, as described herein.

In testimony whereof we have signed our names to this specification, in the presence of two subscribing witnesses, this 7th day of September, A. D. 1892.

HAMMOND V. HAYES.
WILTON L. RICHARDS.

Witnesses:

THOS. D. LOCKWOOD,
GEO. WILLIS PIERCE.