W. H. THOMPSON & H. R. STUART.

TELEPHONE RECEIVER.

APPLICATION FILED JUNE 11, 1909.

980,024.

Patented Dec. 27, 1910.

2 SHEETS—SHEET 1.

Fig. 1.

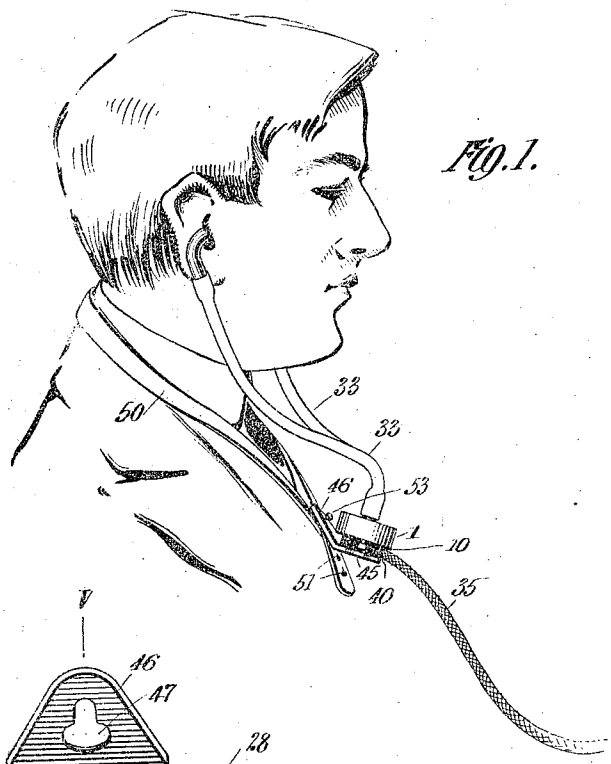


Fig. 2.

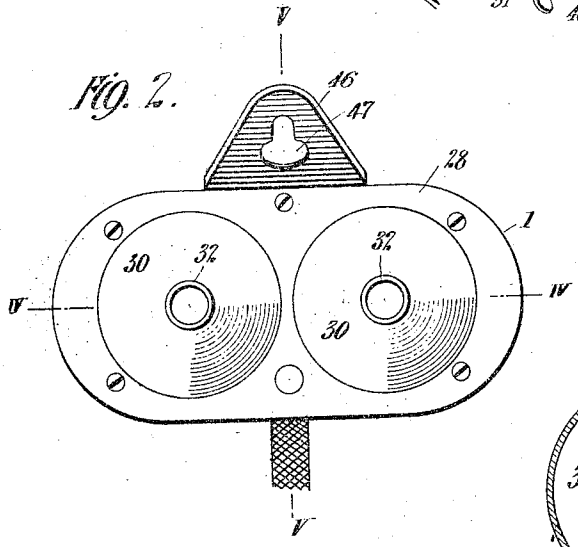


Fig. 3.

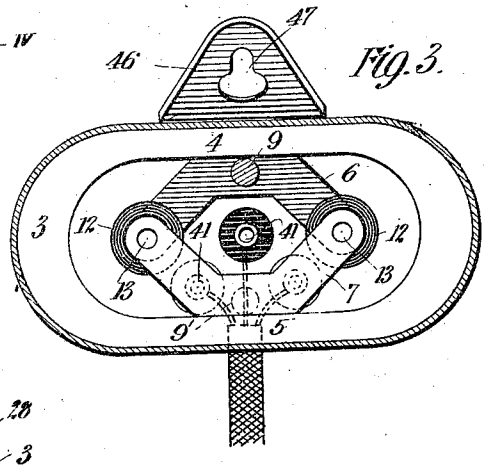
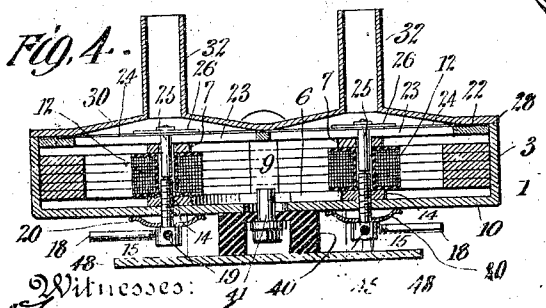


Fig. 4.



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2 SHEETS—SHEET 2.

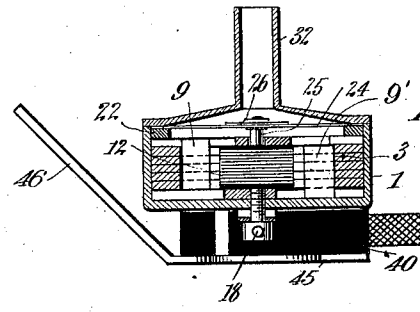


Fig. 5.

Fig. 6.

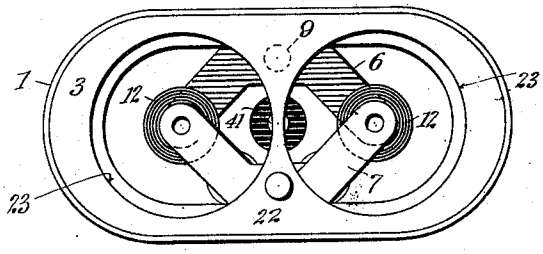


Fig. 8.

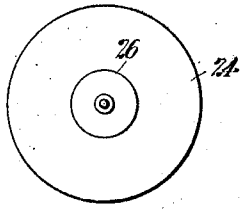


Fig. 7.

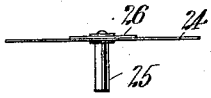
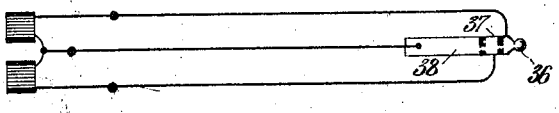


Fig. 9.



Witnesses:

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By their Attorneys
Rosenbaum & Stockbridge

UNITED STATES PATENT OFFICE.

WILBUR H. THOMPSON, OF WHEELING, WEST VIRGINIA, AND HARVE R. STUART, OF MILWAUKEE, WISCONSIN.

TELEPHONE-RECEIVER.

980,024. Specification of Letters Patent. Patented Dec. 27, 1910.

Application filed June 11, 1909. Serial No. 501,493.

To all whom it may concern:

Be it known that we, WILBUR H. THOMPSON and HARVE R. STUART, citizens of the United States, residing, respectively, at Wheeling, county of Ohio, and State of West Virginia, and Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Telephone-Receivers, of which the following is a full, clear, and exact description.

This invention relates to telephone receivers, particularly for use in telegraphones, where only light operating currents are available, and where a clear sound reproduction is important.

A type of receiver has hitherto been proposed making use of a solenoid coil in place of a magnet bobbin, the solenoid coil acting to vary the intensity of a pair of juxtaposed magnetic poles which are caused to be produced within the interior of the solenoid.

The present invention relates to this general type of apparatus and includes a variety of features by which a more simple and efficient construction is provided, and in which all of the parts are very strongly and compactly arranged and organized together.

Among other features the present invention makes use of two receivers compounded into one, and which are joined in separate circuits from the separate magnets of a telegraphone, so as to operate entirely independently of one another. The result is that any slight differences in phase between the voice or telephonic currents from the separate telegraphone magnets cannot act at any time to neutralize or interfere with one another. Each is independently transformed into sound waves, and if these vary slightly in phase it is immaterial, especially as they are led through separate tubes to the separate ears of the operator by our present invention. As will later appear we provide for an easy and separate adjustment of the diaphragms of the separate receivers.

A further feature of the present invention consists in a means for varying the air gap in the magnetic circuit of the receiver, which we accomplish by means of levers working between extreme positions, the original setting of the levers being however variable or adjustable independently of such limits.

Another aspect of the invention relates to the provision of a single field magnet cooperating with two separate solenoids with separate diaphragms, thereby providing in effect a double receiver.

With these various and other objects in view our invention consists in the features of construction and combination as hereinafter set forth and claimed.

In the drawings: Figure 1 is a perspective view illustrating the appearance and use of a telegraphone receiver embodying the principles of our invention; Fig. 2 is a plan view of the receiver; Fig. 3 is a similar view with some of the parts removed; Fig. 4 is a transverse sectional view on the line IV—IV of Fig. 2, and Fig. 5 is a sectional view on the line V—V of Fig. 2; Fig. 6 is a view similar to Fig. 3 showing the diaphragm support in place; Fig. 7 is a side elevation of the diaphragm; Fig. 8 is a front view of the same; Fig. 9 is a diagram of the circuits.

Referring to the drawings in which like parts are designated by the same reference sign, 1 denotes a box or casing forming the frame of the receiver. We make this box of oval or elongated outline with flat top and bottom faces.

3 denotes a permanent magnet within the box or casing 1 and which is also of oval outline, closely fitting the interior of the box around its entire inner wall. This magnet is preferably of the compound type built up of the superposed plates, each magnetized to produce consequent poles on a middle diameter of the oval outline, corresponding to the points 4 and 5 of Fig. 3.

6 denotes a forked soft iron stamping which is secured to the magnet 3 on the underside thereof at the point 4, and 7 denotes a similar forked soft iron stamping which is attached to the other pole 5 on the upper face of the magnet 3. These forked pieces 6 and 7, respectively constitute bifurcated poles or pole pieces of the magnet 3. Any convenient means may be employed for securing these bifurcated poles in place, but we prefer to make use of rigid studs 9, 9′ which are fixed to the bottom wall 10 of the casing 1. These studs are best made of soft iron so as to lead the magnetic flux as efficiently as possible from the various layers of the magnet 3 to the bifurcated poles 6, 7. The bifurcated pole pieces 6, 7, project so that their respective extremities lie over one another centrally in the round open spaces at the ends of the interior oval outline of the magnet 3. At these locations there are also

arranged the solenoid magnets 12. The extremities of both the bifurcated poles 6 and 7, are perforated in alinement with the axes of the coils 12, the perforations 13 of the upper bifurcated pole 7 being larger than the perforations 14 of the lower bifurcated pole.

15 denotes soft iron screws which are threaded into the openings 14 so as to project into the interiors of the coils 12.

18 denotes arms projecting from the screws 15 by which these screws are turned and adjusted through about half a turn corresponding to a minute longitudinal displacement. The arms or handles 18 can be screwed into various holes 19 in the heads of the screws 15 whereby the screws can be initially set at any location desired, and thereafter made adjustable through a limited distance corresponding to the half turn movements of the arms 18.

20 denotes spring clips or washers which are fixed beneath the heads of the screws 15 and which bear against the bottom face 10 of the box 1, so as to take up any back lash or looseness in the screws. These screws constitute extensions of the lower pole piece 6. As will later appear we also provide what are virtually corresponding extremities of the upper pole piece 7.

At the front or open face of the box 1, we provide a plate 22 constituting a diaphragm support. This plate has two large perforations or openings 23 coaxial with the solenoids 12.

24 denotes diaphragms supported over the openings 23 and each having a central soft iron stud 25 which projects into the interior of the corresponding solenoids 12. Each of these studs 25 is small enough to enter loosely through the aperture 13 of the upper bifurcated pole 7, and is long enough to reach into very close proximity to the inner end of the corresponding screw 15. These studs therefore constitute the extensions of the upper pole piece 7 which have been previously referred to. As a practical feature of construction we make the diaphragms 24 of very thin metal with a thickened portion or strengthening washer 26 at the middle thereof, which not only establishes a firm anchorage for the stud 25, but also transmits the movement of the stud to a wider area of the diaphragm, thereby obtaining a more efficient sound reproduction from a given degree of movement of said stud. The diaphragms 24 are clamped against their supporting plate 22 by a cover 28 which has outwardly coned or embossed portions 30 over the area of the working or vibrating portions of the diaphragms to permit their free movement. 32 denotes tubes extending outward from the centers of these embossed areas 30 and to which the usual rubber or flexible tubes 33 may be connected.

The electrical connections are made by a flexible cord 35 having three conductors which may be joined to the tip, ring and sleeve contacts 36, 37 and 38 respectively, of an ordinary telephone plug. These conductors enter an insulating block 40 on the underside of the bottom plate 10 from which they are extended to terminal screws or posts 41 within the box 1. The circuits are made in the manner shown in Fig. 9, that is to say, the separate coils are put in entirely separate circuits. Inasmuch as there are two sound reproducing magnets in an ordinary telegraphone, it is evident that entirely separate circuit connections may be made therefrom to the separate coils 12 by the use of this simple three wire circuit.

The foregoing receiver is designed to be supported by a neck strap or band designed to be placed around the neck of the operator and bearing suitable means for engaging the key-hole slot 47 of the receiver.

45 denotes a plate fixed to the block 40 on the underside of the receiver and having an angularly bent ear 46 with an inverted key-hole slot 47 therein. The plate 45 has rounded extremities 48 coaxial in their curvature to the movement of the arms 18. In this way only the tip of the arm 18 is exposed for manipulation, and the interior parts are protected from exposure and from being tampered with. The receiver tubes 32 project upward and are conveniently exposed for the attachment of the flexible tubes 33.

The operation of the receiver is as follows: The magnet 3 impels a strong field or flux through the interiors of both the solenoids 12, this field being led in this manner by the bifurcated poles 6 and 7, and the screws and studs 14 and 25. The only appreciable air gap in the circuit is that between the adjacent ends of these screws and studs, and this gap is adapted to be adjusted as already described. The variations in the magnetization of the solenoids due to telephonic currents produce corresponding variations in the attraction between the proximate poles which are formed at the adjacent extremities of said screws and said studs. These variations are directly transmitted to the diaphragms 24 and produce a sound reproduction which has almost all the energy that is available in the telephonic currents supplied.

What we claim, is:—

1. A telephone receiver and connections therefor, said receiver comprising a permanent magnet, a pair of separate coils and diaphragms associated therewith, separate sound receiving and carrying tubes for said diaphragms, said tubes being extended to permit the free ends thereof to be positioned one adjacent each ear of the person using the receiver, and said connections com-

prising separate circuits for energizing said coils, such circuits being independently energizable, the aforesaid elements coöperating to obviate the neutralizing effect of slight differences in phase between telephonic currents in said separate circuits.

2. In a telephone receiver, an oval permanent magnet having consequent poles, a pair of bifurcated pole pieces projecting from said poles, a pair of solenoids joining the extremities of the respective pole pieces, extensions from said pole pieces entering said solenoids into close proximity to one another, and diaphragms actuated by the varying attraction between said extensions.

3. In a telephone receiver, a permanent magnet, a pair of solenoids, pole piece extensions projecting from said magnet into close proximity to each other, said extensions being inwardly directed into said solenoids, means for independently adjusting extensions in separate solenoids, and separate diaphragms actuated by the varying attraction between said extensions.

4. In a telephone receiver, an oval permanent magnet having consequent poles, a pair of bifurcated pole pieces projecting from said poles, a pair of solenoids joining the extremities of the respective pole pieces, extensions from said pole pieces entering said solenoids into close proximity to one another, diaphragms actuated by the varying attraction between said extensions, and separate circuits for said coils.

5. In a telephone receiver, an oval permanent magnet having consequent poles, a pair of bifurcated pole pieces projecting from said poles, a pair of solenoids joining the extremities of the respective pole pieces, extensions from said pole pieces entering said solenoids into close proximity to one another, diaphragms actuated by the varying attraction between said extensions, and separate means for adjusting the separation of said extensions within the respective solenoids.

6. In a telephone receiver, a permanent magnet, a pair of bifurcated pole pieces projecting from the poles thereof, a pair of solenoids disposed adjacent the respective pole pieces, pole piece extensions in said solenoids, and diaphragm parts actuated by the varying magnetic flux in said extensions.

7. In a telephone receiver, a magnet, a plurality of bifurcated pole pieces projecting from the poles thereof, a plurality of solenoids disposed adjacent the respective pole pieces, pole piece extensions coöperating with said solenoids, and diaphragm parts actuated by the varying magnetic flux in said extensions.

8. In a telephone receiver, a magnet, a plurality of solenoids, pole piece extensions projecting from said magnet into proximity to each other and coöperating with said solenoids, means for independently adjusting said extensions and diaphragms actuated by the varying magnetic flux in said extensions.

In witness whereof, we subscribe our signatures, in the presence of two witnesses.

WILBUR H. THOMPSON.
HARVE R. STUART.

Witnesses to signature of Wilbur H. Thompson:
LOUIS WALTERS,
W. E. BOWERS.

Witnesses to signature of Harve R. Stuart:
HERMINE DECKERT,
WALTER REITMAN.