

S. S. SONNEBORN.
 TELEPHONE RECEIVER.
 APPLICATION FILED MAY 18, 1908.

963,954.

Patented July 12, 1910.

Fig. 1.

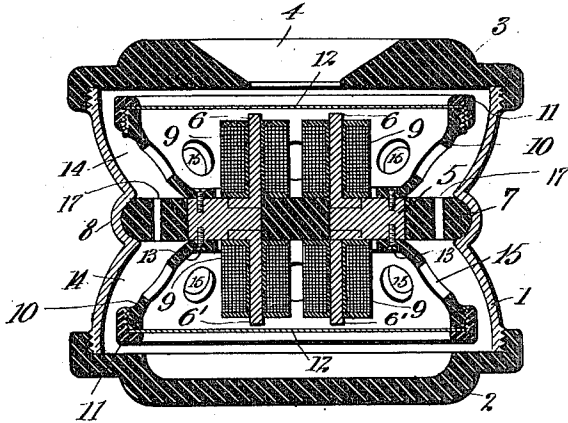


Fig. 2.

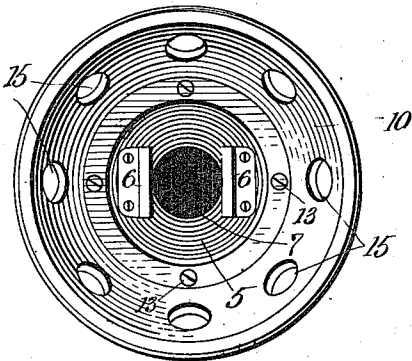


Fig. 3.

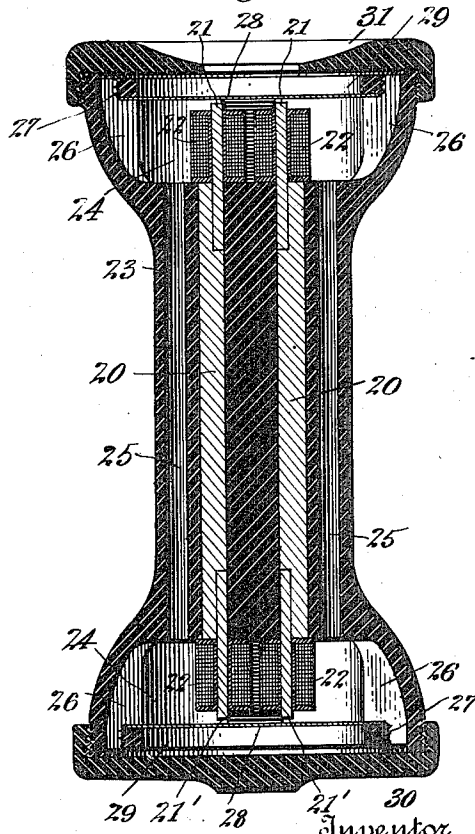
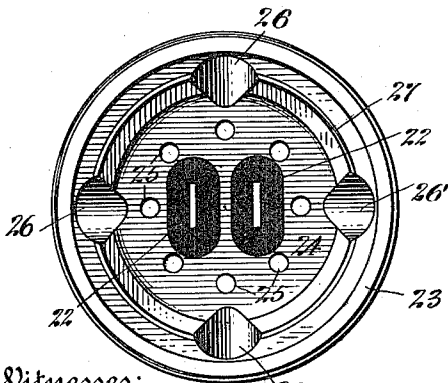


Fig. 4.



Witnesses:
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TELEPHONE-RECEIVER.

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963,954.

To all whom it may concern:

Be it known that I, SOL S. SONNEBORN, a citizen of the United States, residing at the city of New York, in the borough of Brooklyn and State of New York, 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, the principal object being to improve the sensitiveness and efficiency of instruments of this class, whereby better results can be attained with telephone systems, telegraphones, and other apparatus where telephone receivers are used.

The ordinary telephone receiver makes use of a single diaphragm of magnetic material which is vibrated by an electro-magnet in the telephone circuit. It is found in practice that diaphragms of more than a certain size and thickness cannot be efficiently employed, but it frequently happens that a diaphragm of this size with its corresponding magnet does not utilize all the electrical energy of the telephone circuit. Moreover, in an ordinary instrument, the sound is taken from only one side of the diaphragm and the vibration transmitted to the air on the under side of the diaphragm is practically wasted.

It is the purpose of my present invention to overcome these drawbacks and provide a receiver in which diaphragms of the standard size and thickness may be employed, but in which the full energy of the electrical circuit is utilized. With this object in view, I provide two separate diaphragms which vibrate in synchronism under the influence of magnets in the telephone circuit, and which are so arranged that the air vibrations on both sides of both diaphragms are combined into a single volume of sound at the ear-piece of the instrument.

My invention further consists in the features of construction and combination as hereinafter set forth and finally particularly pointed out in the appended claims.

In the drawings: Figure 1 is a vertical sectional view of a telephone receiver embodying the principles of my invention; Fig. 2 is an end view of certain of the interior parts; Fig. 3 is a vertical sectional view of a modified form of the invention, and Fig. 4

is an end view of the same with the cap and diaphragm removed.

Referring to the drawings, in which like parts are designated by the same reference sign, 1 indicates a casing which may be of metal or insulating material and which may form part of a fixed frame or support, or which may be the housing of a watch-form type of receiver, as in Fig. 1.

2 designates an imperforate cap screwed on one open end of the casing 1, and 3 is a cap having a central perforation 4 and adapted to constitute an ear-piece. Within the casing 1 there is supported in any suitable manner a magnet 5 having one or more pole pieces 6 and 6' projecting in opposite directions axially of the casing 1. I have shown a convenient method of mounting the magnet 5, and consisting in a plate or body 7 of insulating material in which the magnet 5 is embedded, and which is molded into the casing 1, the latter being beaded at 8 to afford a firm supporting engagement. 9 designates magnet bobbins or windings which may be included in series or multiple arrangement in a telephone circuit.

The diaphragms are supported within the casing 1 in a special manner, constituting an important feature of my invention. In place of securing the diaphragms closely within the casing, I provide cups or shells 10 with screw caps 11 adapted to clamp and hold diaphragms 12 of the ordinary ferrotype construction. Two of these cups or shells are provided, and are assembled upon opposite sides of the plate or body 7 so as to surround and inclose the magnet bobbins 9. For this purpose the cups are cut away at their lower faces and are assembled upon the magnet by fastening screws 13. In this relation the diaphragms 12 are held in close but properly spaced-apart relation from the magnet poles 6, 6', so as to be in operative or telephonic relation therewith. The cups or shells 10 are not closely contained in the casing 1, but fit therein so as to leave a considerable annular space or passage 14 between their outside surfaces and the adjacent wall of the casing 1. 15 designate a series of perforations in the cups or shells 10 by which a free communication is established between their interiors and the space

or passage 14. In addition to these perforations, there are provided a plurality of holes or openings 17 through the plate or body 7, and which put the passages 14 at the upper and lower parts of the chamber in free communication with one another.

The use and operation are as follows:

Assuming that the bobbins 9 are in a telephone circuit, it is evident that the diaphragms 12 are vibrated equally and synchronously each in the ordinary manner of telephone receivers. The upper diaphragm, adjacent to the magnet poles 6, transmits its vibrations directly to the ear of the operator, from its upper face, and, at the same time, the vibrations of the air beneath this diaphragm are transmitted through the openings 15 of this chamber and around through the adjacent annular passage 14 to assist the vibrations from the upper side of this diaphragm. I am aware of the fact that there may be a phase difference in the vibrations from the two sources, but I find in practice that, notwithstanding this theoretical consideration, the practical effect is to augment the sound which finally issues through the orifice 4. In exactly the same way the sound waves are taken from the lower and the upper faces of the lower diaphragm 12 which is adjacent to the poles 6'. This sound passes through the adjacent openings 15 and the adjacent annular passage 14, upward through the holes 17 and into the cavities already described, where it becomes merged into the sound from the upper diaphragm 12. In this way the sound received by the operator is compounded from four different sources, the waves from which are merged together into a single volume of sound. It is found in practice that, not only is the sound of greater intensity, but of much greater purity, by virtue of this arrangement.

In Figs. 3 and 4 I have shown a slightly modified form of the invention embodied in a bi-polar receiver of substantially standard form, instead of the watch-form type of Figs. 1 and 2. In this case bar magnets 20 are employed with soft iron polar extensions 21 and 21' at their respective ends. 22 designates the magnet bobbins or windings which surround the poles 21 in the usual manner. I form the magnets 20 permanently embedded in the casing or housing 23 of insulating material, and which has a chamber or cavity 24 at each end in which the diaphragm and the magnet bobbins are received. 25 designates holes or passages extending from end to end of the body or housing 23 and which serve to put the cavities 24 at the respective ends in free communication with one another. The interior walls of the cavities 24 are not made round and

continuous, but are deeply notched or otherwise recessed or mutilated, as designated at 26, at a plurality of points spaced thereabout. Between the notches 26 there is formed an annular internally-threaded cavity 27 in which is received a diaphragm 28. 29 designates a clamping ring screwed into the threaded portion of the cavity 27 to engage and hold the diaphragm. The construction of the parts at each end of the receiver is identical in all respects, except that at the lower end there is provided an imperforate cap 30 to completely inclose the chamber 24 at this end, while at the other end of the receiver there is provided a centrally apertured cap 31 of substantially the ordinary form in a telephone receiver.

The operation will be sufficiently understood from that of the modification previously described. It is evident that the sound from both sides of both diaphragms is combined and issues in a single volume through the opening of the upper cap 31. The notches 26 in this case serve in place of the holes 15 and the surrounding annular passages 14 of the modification previously described.

What I claim is:—

1. A telephone receiver comprising a diaphragm, a magnet, a ring supporting said diaphragm, and a casing surrounding said ring and adapted to establish an annular space around the same, said space establishing communication between opposite sides of the diaphragm.

2. A telephone receiver comprising a permanent magnet having a plurality of poles, a plurality of diaphragms cooperating therewith, a casing having a single ear-piece orifice, and a cup-shaped part having perforations whereby the sound vibrations from all of said diaphragms are combined to issue through said orifice.

3. A watch-form type of receiver comprising a casing, a permanent magnet embodied therein and having poles, a plurality of diaphragms transversely disposed to the axis of said casing, and members having perforations to permit the sound waves from both sides of both of said diaphragms to be combined.

4. A telephone receiver comprising a magnet having poles, perforated cups surrounding said poles, a casing surrounding said cups and providing an annular space in conjunction therewith, and diaphragms supported by said cups in proximity to said magnet poles.

5. A telephone receiver comprising a permanent magnet having a plurality of poles, a plurality of diaphragms cooperating therewith, a casing having a single ear-piece orifice, and means whereby the sound vibra-

tions from both sides of all of said diaphragms are combined to issue through said orifice.

5 6. A watch-form type of receiver comprising a casing, a permanent magnet embodied therein and having poles, a plurality of diaphragms transversely disposed to the axis of said casing, and means whereby the sound

waves from both sides of all of said diaphragms are combined.

In witness whereof, I subscribe my signature, in the presence of two witnesses.

SOL S. SONNEBORN.

Witnesses:

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MICHAEL DOCKTER, Jr.

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