

July 14, 1925.

1,545,718

C. E. WILLIAMS
AMPLIFYING MICROPHONE RECEIVER

Filed March 5, 1923

Fig. 1

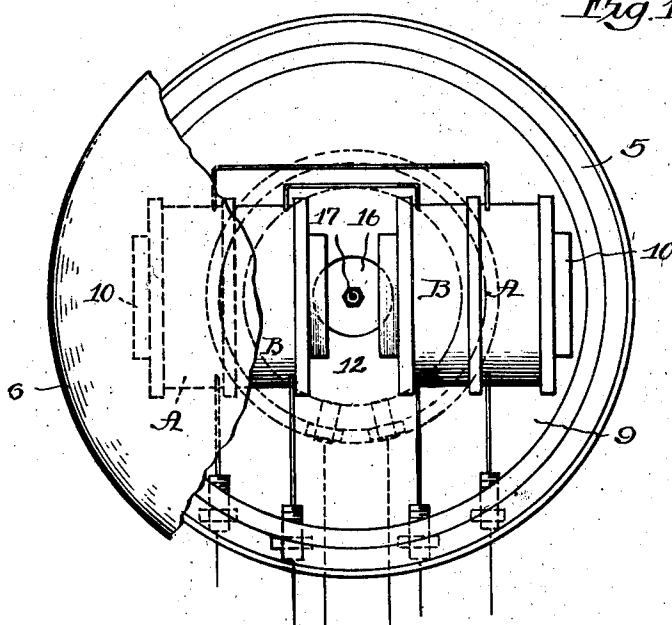


Fig. 2

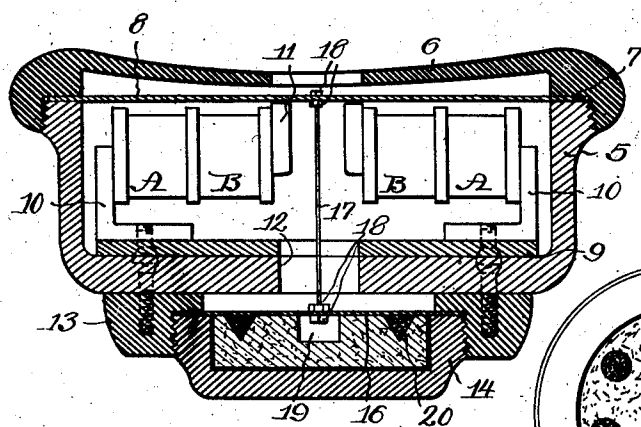


Fig. 3

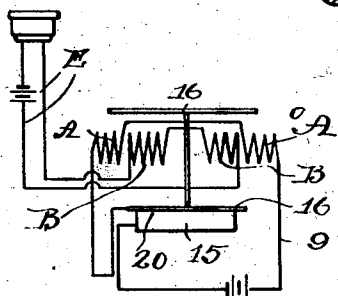
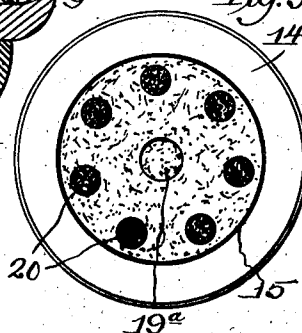


Fig. 4

Inventor,
Charles E. Williams

Witness
Chas. L. Koursh

Benjamin Roodhouse Lundy Hays

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UNITED STATES PATENT OFFICE.

CHARLES E. WILLIAMS, OF CHICAGO, ILLINOIS.

AMPLIFYING-MICROPHONE RECEIVER.

Application filed March 5, 1923. Serial No. 622,883.

To all whom it may concern:

Be it known that I, CHARLES E. WILLIAMS, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in an Amplifying-Microphone Receiver, of which the following is a specification.

My present invention relates to the provision of an amplifying microphone receiver, and has special reference to the provision of an ear-piece or receiver for use in apparatus for assisting persons with impaired hearing, although the principles herein disclosed may be applied to any telephone receiver or instrumentalities for converting a fluctuating electric current into sound in cases where it is advantageous to increase the audibility of the signals.

The object of my present invention is the provision of instrumentalities whereby the vibrations of a diaphragm caused by a fluctuating electric current are employed to cause amplifying of the vibrations of the diaphragm. I prefer to carry out the before-mentioned object by means of the structure illustrated in the accompanying drawings, in which—

Fig. 1 is a front view of a microphone ear-piece or receiver with the cap or cover and diaphragm largely broken away to disclose the interior mechanism.

Fig. 2 is a transverse central section on line 2—2, Fig. 1.

Fig. 3 is an interior plan of the fibre cup and carbon electrode removed from the casing.

Fig. 4 is a diagram of the circuits employed.

The mechanism consists of a cup-shaped or cylindrical casing 5, the lip end thereof is exteriorly threaded to receive an interiorly threaded flange of a centrally apertured cap or closure 6. The flange of the cap or closure is thickened at its base to provide the annular shoulder 7 which comes opposite the edge of casing 5, and between which edge and said shoulder is interposed and secured a diaphragm 8. Upon the interior face of the bottom of casing 5 is secured a plate 9 to diametrically opposite portions of which are secured brackets 10 of magnetically permeable material, the outer portions of which latter are extended toward each other substantially in alinement and terminate in lateral projections 11 extending

in parallel relation toward diaphragm 8. The alining portions of these brackets are each provided with a plurality of coils A, A, and B, B, of magnet wire, the respective pairs, as hereinafter described, being electrically connected in series.

The plate 9 and the bottom of casing 5 are centrally bored or apertured, at 12, and secured to the exterior surface of the bottom of the casing, preferably concentrically with bore 12, is an annulus 13 formed of aluminum or other suitable metal. The outer part of the interior of the annulus is cut-away and interiorly threaded to receive an exteriorly threaded block of closure 14 of fibre or other suitable insulating material, the inner surface whereof is cut-away to provide a cylindrical cavity 15. Between the portion of the inner face of block 14 and cavity 15 and the shoulder formed by the enlargement of the central opening in annulus 13 is secured a diaphragm 16 which is connected by the rod 17 with the first mentioned diaphragm 8. I have shown nuts 18 as means for connecting the ends of rod 17 with the respective diaphragms, but this connection may be satisfactorily attained by the use of cement, or in any desired manner.

In cavity 15 of block 14 is placed the usual carbon electrode of a microphone transmitter which consists of a disk 19 of compressed carbon having a plurality of conical cavities 20 on the face thereof which is adjacent diaphragm 16. These cavities are filled with the usual carbon granules 21 which act as the conductor of the current between the diaphragm and carbon block 19, and the variation of the compression of which, resulting from the vibrations of the diaphragm 16, changes the conductivity of the granules and causes the modification of the current to correspond to the fluctuations of said diaphragm. When nuts 18 are employed for securing rod 17 to the respective diaphragms, a centrally located recess 19^a is provided in the upper face of block 19 to accommodate the lower end of rod 17 and the nut attached thereto.

As seen in Fig. 4 of the drawings, the current originating in battery C is modified in the usual way by the sounds received in transmitter D and passes through conductors E and coils B, B, which, as usual, causes the fluctuation of diaphragm 16. A steady current is meanwhile passing from battery F, coils A, A, diaphragm 16, granules 20 and

carbon block or electrode 15. This current is normally steady and produces an even pull on diaphragm 16, but when diaphragm 16 is set in vibration through the action of transmitter D this vibration is transmitted through rod 17 to diaphragm 16 and the granules 21 are subject to intermittent compression corresponding to the impulses received at transmitter D, thereby causing the current flowing from battery F through coils A, A, to fluctuate and add the effect of their changing magnetic field to the corresponding changes of the magnet field in coils B, B, thereby increasing the variations in the power applied to diaphragm 8 and the amplitude of the vibrations thereof. In this manner, with extremely simple instrumentalities, the sound produced by diaphragm 8 may be effectively amplified.

What I claim is:

1. A telephone ear-piece or receiver comprising a pair of diaphragms, a mechanical connection therebetween, an electro-magnet in co-operative relation with one of said diaphragms, a plurality of conductor coils in co-operative relation with said magnet, a pressure variable resistance in co-operative relation with the other of said diaphragms, a signaling circuit including a coil of said magnet, and an auxiliary circuit including the other of said diaphragms, said pressure variable resistance and another of said coils.

2. An instrument for converting a fluctuating current into mechanical vibrations comprising a pair of diaphragms, a mechanical connection therebetween, a plurality of conductor coils in magnetic relation with one of said diaphragms, a pressure variable resistance in co-operative relation with the other of said diaphragms, a signaling circuit including certain of said coils, and an auxiliary circuit including the other of said diaphragms, said pressure variable resistance and certain other of said coils.

3. An amplifying telephone receiver comprising a pair of diaphragms disposed in opposing parallel relation, a rod connecting said diaphragms, an electro-magnet in co-operative relation with one of said diaphragms, a plurality of conductor coils in magnetic relation with said magnet, a pressure variable resistance in co-operative relation with the other of said diaphragms, a signaling circuit including certain of said coils, and a second circuit including the other of said coils, said pressure variable resistance and the diaphragm with which it is in co-operative relation.

Signed at Chicago, county of Cook and State of Illinois, this 27th day of February 1923.

CHARLES E. WILLIAMS.

Witnesses:

R. M. BELL,

BENJ. T. ROODHOUSE.