(No Model.) 3 Sheets—Sheet 1.

J. A. MALONEY.

AURIPHONE.

No. 362,099. Patented May 3, 1887.

Fig. 1.

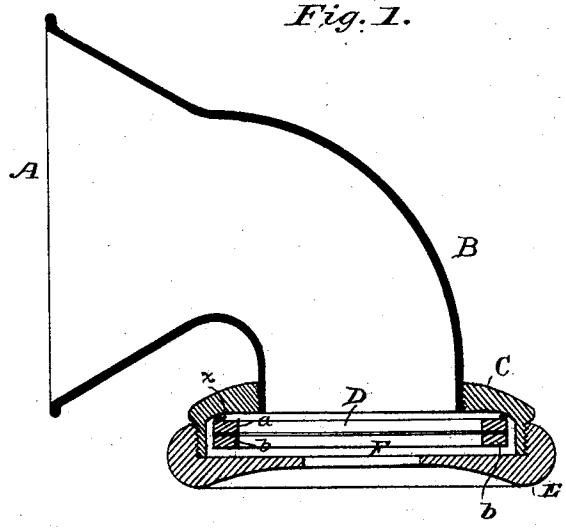
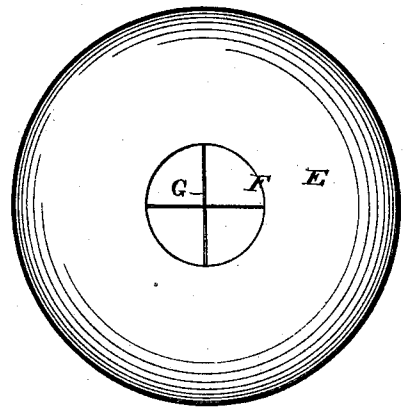


Fig. 2.



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Fig. 4.

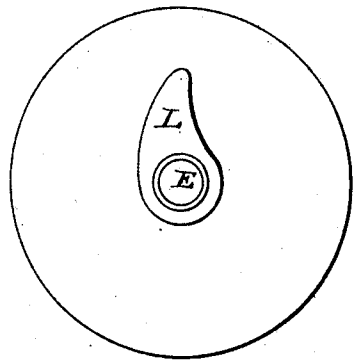


Fig. 3.

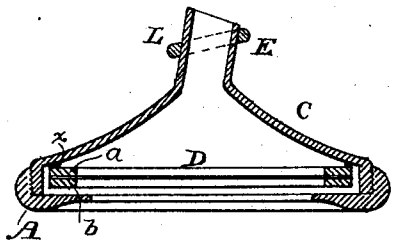
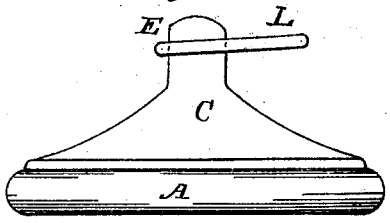


Fig. 5.



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Fig. 6.

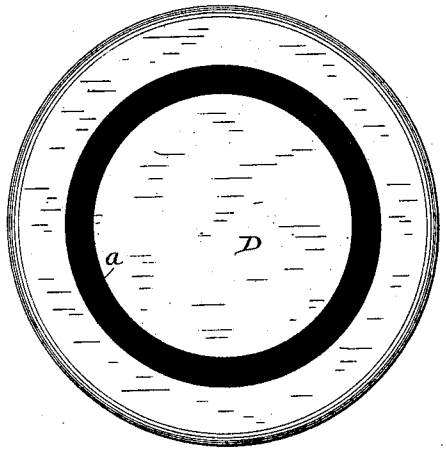
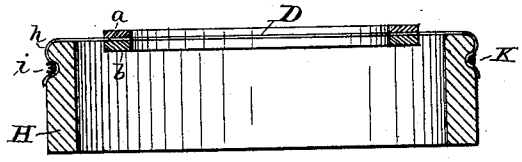


Fig. 7.



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UNITED STATES PATENT OFFICE.

JAMES A. MALONEY, OF WASHINGTON, DISTRICT OF COLUMBIA.

AURIPHONE.

SPECIFICATION forming part of Letters Patent No. 362,099, dated May 3, 1887.

Application filed December 16, 1886. Serial No. 221,761. (No model.)

To all whom it may concern:

Be it known that I, JAMES A. MALONEY, a citizen of the United States, residing at Washington, in the District of Columbia, have invented a new and useful Improvement in Auriphones, of which the following is a specification.

My invention relates to instruments destined for use by persons of defective hearing, which operate to collect sound-waves in greater volume than can be collected by the external ear, and to conduct the same after having been made to pass through interposed media to the tympanum of the ear. I have named such instruments "auriphones;" and my present invention has for its object the construction of an auriphone in which the medium interposed between the external air and the tympanum of the ear is a peculiarly-constructed diaphragm. This diaphragm, by reason of its peculiar construction and the mode of mounting the same, is exceedingly sensitive to sound-vibrations which it receives in large volume, and which it conducts with the least possible diminution of force to the tympanum. In furtherance of this object I sometimes provide a means for excluding from the ear all sounds which do not pass through the auriphone, and in the preferred form of my instrument I also provide a means for locking the instrument to the ear, so as to be supported entirely by the latter. The peculiar construction of the diaphragm employed involves a novel process of making the same, and several details of construction, more or less essential to the useful application of the main features of my invention, constitute the parts of said invention. All this will more fully appear from the following description, in which reference is made to the accompanying drawings, and in which—

Figure 1 is a sectional view of one form of my improved auriphone; Fig. 2, a face view of the ear-piece employed in this form. Fig. 3 is a sectional view of a preferred form of my invention. Figs. 4 and 5 are rear and side views, respectively, of the same; and Figs. 6 7 illustrate the process of making my improved diaphragm.

In Figs. 1 and 2 I have shown a flaring sound-collector, A, which connects by a curved tube, B, with a case, C, in which the diaphragm D is mounted, an ear-piece, E, with a suitable sound-opening, F, closes the case in front, and a cross wire or wires G, serving as a fender, prevent the ear from touching the diaphragm, and also protects the latter against injury from external objects.

The diaphragm D may be made of any suitable resonant material; but I prefer to make it of a thin, highly-elastic sheet of soft-rubber, which is stretched between two rings, *a b*, of thick paper, card-board, or other like material, one on each side of the diaphragm. I deem it important that there should be a ring on each side of the diaphragm, and that these rings be not merely attached to the diaphragm, but that the latter be in a state of tension when the rings are attached. In this manner both sides of the diaphragm, or the two opposite surfaces of the same, are under tension when the diaphragm is in place, and maintain the tension given to them proportionately during the operation of the apparatus. Figs. 6 and 7 illustrate the manner in which I secure this result.

I employ an annular block, H, of any suitable material—as wood or metal—having a bead, *h*, formed at its upper edge, and a groove, *i*, directly below the bead. Upon this block I place the sheet of soft rubber, D, or other membranous body, which may be selected, and stretch the same by passing its edges tightly over the bead *h*, and securing the turned edge or edges by a wrapping of silk or other thread, *k*. If bladder or other membranous substance is used in place of soft rubber, the same is moistened before it is stretched upon the block, and is then allowed to dry. I then take the two rings *a b*, of paper, card-board, wood, or any other suitable material, and glue or cement the same, one to each face of the membrane, as clearly shown in Fig. 7. The external diameters of the rings *a b* are smaller than the internal diameter of block H, and the two rings are equal as to diameter and thickness. They are both applied concentrically to the stretched membrane, as shown in Figs. 6 and and 7. The glue or cement employed is now allowed to dry, and the membrane is removed from the block H. A cut with a sharp tool around the outer edge of the rings removes the finished diaphragm, which has then the

shape shown in Fig. 1. The whole diaphragm is then varnished to render it non-hygroscopic, or it may be varnished before it is removed from the block.

By the process described the diaphragm is so stretched between two rings as to have both faces under very nearly equal tension, and I find that such diaphragms are specially sensitive to sound-vibrations. I ascribe this to be the fact that the fundamental notes of the two vibrating-surfaces are the same, and that there is no interference between the same.

The diaphragm constructed as above described is inserted into the case C. The external diameter of rings *a b* is smaller than the internal diameter of case C, so that there is a small space between the edges of the former and the inner side of the case, as shown. By one of its rings—as, for instance, by ring *a*—the diaphragm is glued or cemented to the curved portion of case C, which joins the inner cylindrical with the plane face of the same, as indicated at *x*, and in this position the diaphragm receives the impact of sound-waves through the collector A and tube B. It responds forcibly to these waves, and if the ear is applied to the ear-piece the sounds uttered toward A are heard much better than if the waves were directly received through the air.

In Figs 3, 4, and 5 the sound-collector A is shown to have the form of the ear-piece in Fig. 1, while the ear-piece E in this instance consists of a short tube extending from the case C and slightly inclined to the axis of the latter. This tube is cut off at an angle, and is destined to be inserted in the ear, whereby extraneous sounds, or such as do not pass through the diaphragm, are excluded. A cam-shaped structure, L, is secured to the ear-piece, and when the tube is inserted into the ear and the instrument is turned about the axis of said tube or ear-piece the cam engages one of the convolutions of the external ear or pinna, preferably the concha, and is thereby locked in position. In this form of instrument the listener is not obliged to employ his hand to support the same, it being carried by the ear with great comfort.

Having fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. An auriphone consisting of a sound-collector, an ear-piece, and an elastic diaphragm interposed between the two and stretched between two rings, substantially as described.

2. An auriphone consisting of a sound-collector, an ear-piece, and a diaphragm having its two surfaces held under the same degree of tension, substantially as described.

3. In an auriphone, the combination, with a sound-collector, ear-piece, and diaphragm, of a cam secured to the ear-piece, substantially as described, for locking the auriphone to the ear.

4. In an auriphone, the combination, with a sound-collector and ear-piece, of a cam secured to the ear-piece, substantially as described, for locking the auriphone to the ear.

5. In an auriphone, the combination, with a sound-collector and ear-piece, of a diaphragm composed of elastic, non-hygroscopic material, and two rings applied concentrically upon the opposite sides of said diaphragm, as described, for holding both faces under equal tension.

6. A diaphragm for auriphones, consisting of a stretched membrane and two concentric rings cemented to said membrane, as described, for maintaining the tension of both faces.

7. The process of making diaphragms for auriphones, which consists in first stretching a membrane, and then clamping the same on both sides concentrically, substantially as described.

8. The process of making diaphragms for auriphones, which consists in first stretching both faces of a membrane, and then framing the same by concentric clamps, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JAMES A. MALONEY.

Witnesses:
JOHN C. ATHEY,
O. M. BALL.