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Patented Sept. 30, 1902.

F. I. GANO.

AURIPHONE.

Application filed May 9, 1902.

(No Model.)

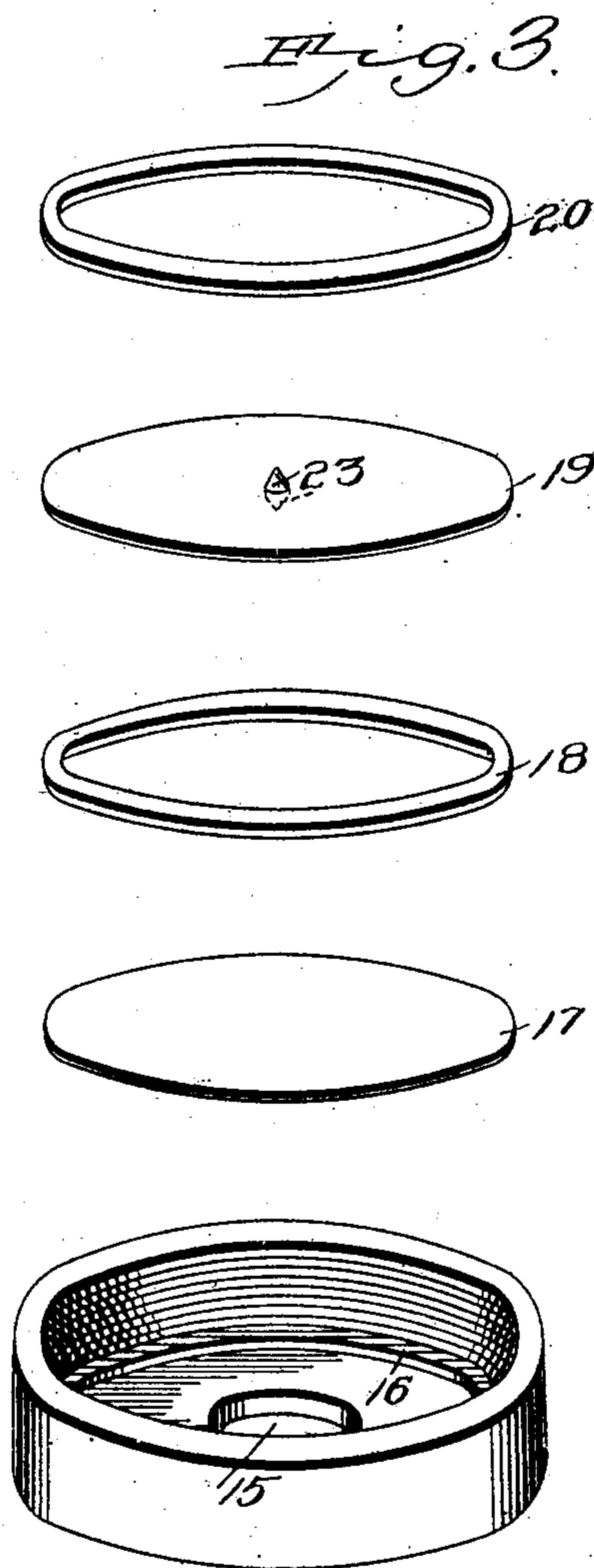
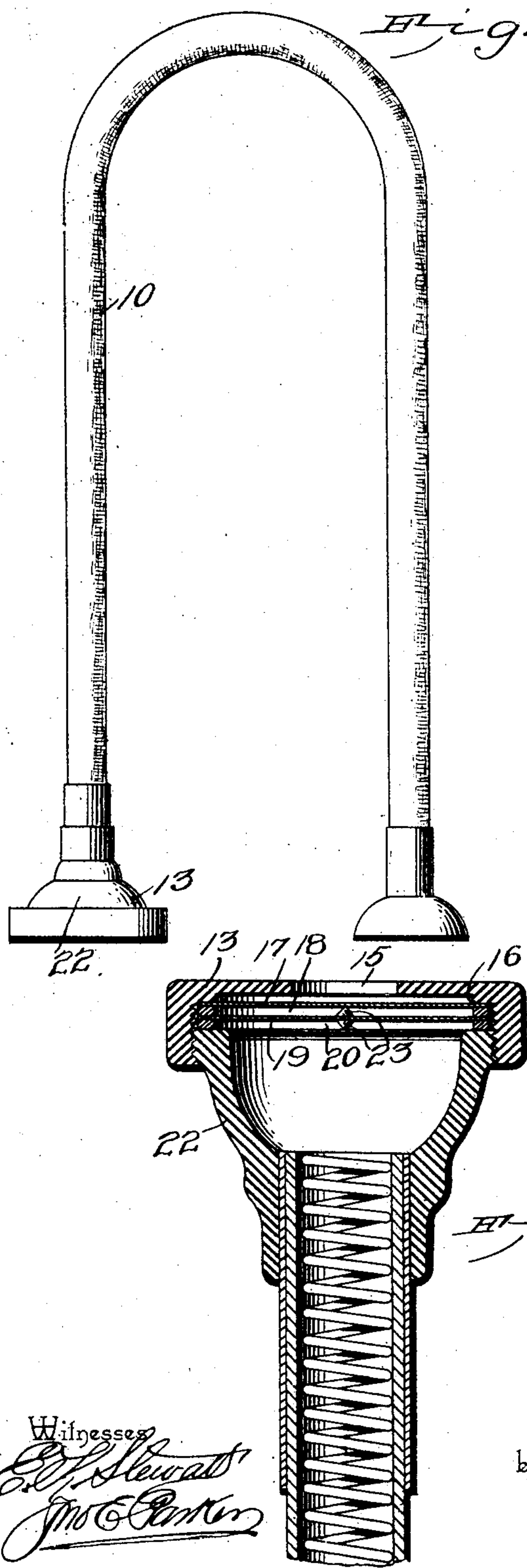


Fig. 1.

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AURIPHONE.

SPECIFICATION forming part of Letters Patent No. 709,978, dated September 30, 1902.

Application filed May 9, 1902. Serial No. 106,656. (No model.)

To all whom it may concern:

Be it known that I, FRANK I. GANO, a citizen of the United States, residing at Anaconda, in the county of Deerlodge and State of Montana, have invented a new and useful Auriphone, of which the following is a specification.

This invention relates to certain improvements in devices of that class employed for assisting the hearing and in which the sound-waves are transmitted through a tube or trumpet to a sound-box containing a vibratory diaphragm, which is held close to the ear in order to concentrate or increase the effect of the sound-waves on the tympanum.

The principal object of the invention is to so arrange a pair of disconnected diaphragms as to cause the vibration imparted to one diaphragm by the sound-waves to be imparted to the other by an air-cushion between the two and by direct mechanical contact with a view of increasing the sensitiveness of the diaphragms and amplifying the sound-waves to a considerable extent.

With these and other objects in view the invention consists in the novel construction and arrangement of parts hereinafter described, illustrated in the accompanying drawings, and particularly pointed out in the appended claims.

In the drawings, Figure 1 is a transverse sectional elevation of the receiving end of an auriphone, illustrating the sound-box containing a pair of diaphragms in accordance with my invention. Fig. 2 is an elevation of the complete instrument taking the form of a speaking-tube, having at one end a mouthpiece and at the opposite end a receiver or earpiece. Fig. 3 is a detail perspective view of a portion of the sound-box, together with the diaphragms and holding-rings detached.

Similar numerals of reference are employed to indicate corresponding parts throughout the several figures of the drawings.

10 indicates a flexible tube, which may be of any desired length, provided at one end with a mouthpiece and at the opposite end with a receiver.

The earpiece, which may be arranged at the end of a tube, trumpet, or other device through which sound-waves may be trans-

mitted, comprises a cup-like body 13, having an annular flange 14, provided with internal screw-threads, and at the center of the cup is an opening 15, which is held over the outer orifice of the ear to permit the transmission of the sound-waves to the tympanum. Within the cup is an annular flange or shoulder 16, on which is seated a diaphragm 17, preferably formed of mica or similar thin sheet material readily responsive to sound-waves, said diaphragm being held by the shoulder or flange at a slight distance from the inner face or bottom of the cup portion to form a small circular air-chamber. On the diaphragm 17 is placed a spacing-ring 18, preferably formed of hard rubber, having a surface area in contact with the diaphragm about equal to the surface area of the shoulder 16 in contact with the opposite face of the diaphragm and serving to firmly bind and hold the edge portion of the diaphragm in place, while the center is left free to respond to and transmit sound-waves. On the ring 18 is placed a second diaphragm 19, and on this is placed a ring 20 of a size equal to that of the ring 18. The outer face of the ring 20 is engaged by the edge of a substantially semi-globular casing 22, having a threaded periphery adapted to the threaded flange 14 and which may be screwed into place to firmly hold both the rings and diaphragms in proper position, an air-chamber being formed between the two diaphragms, in which air is very slightly compressed by the screwing of casing 22 into place. The casing 22 communicates with one end of the tube 10, or it may form the end of an ordinary form of ear-trumpet or other device capable of conserving transmitted sound-waves.

To the center of the diaphragm 19 are secured a pair of oppositely-facing cones 23, preferably formed of silver or other metal or material which will not tend to absorb sound-waves to any material extent. A single cone will in most cases be sufficient for the purpose; but it is preferred to employ two cones in order that the position of the diaphragms may be reversed when desired. The apex of one of the cones bears against the center of the diaphragm 17, and the height of the cone is preferably slightly greater than the thick-

ness of the ring 18, so that the diaphragms will be held apart at their centers for a distance slightly greater than at their edges or to an extent just about sufficient to insure the apex of the cone remaining constantly in contact with the center of the diaphragm 17.

In the operation of the device any vibratory movement imparted to the disk 19 by sound-waves will be transmitted through the body of air between the two diaphragms to the outer diaphragm 17, the movement of which will set up similar sound-waves to be transmitted to the ear through the air-chamber and the central opening 15. If the centrally-disposed cone 22 were omitted, the transmission of the sound-waves from one diaphragm to the other through the intervening cushion of air would result in a movement of the outer diaphragm similar to that received by the inner diaphragm, the movement being greatest at the center and gradually diminishing in degree as the tightly-held edges of the diaphragm are reached. Such a movement would be of little or no assistance in so far as the effect of the transmitted sound-waves are concerned and would to some extent lessen the intensity or force of the waves, owing to the absorption of a portion of the energy by the diaphragms and the slightly-compressed cushion of air.

By the employment of the metallic cone at the center of the inner diaphragm the first effect of the movement of the diaphragm will be to press the cone more firmly against the outer diaphragm, a movement which is resisted to some extent by the inertia of the diaphragm and the pressure of the outer air. Owing to the resistance, the inner diaphragm will not move so freely as it otherwise would, and to a certain extent a nodal point is established at the center of the inner diaphragm, the vibration set up being greatest at a point between the center of the diaphragm and its outer edge and the vibratory movement being thus transmitted to a larger surface and increasing the intensity, with possibly a small reduction in the volume of sound transmitted to the secondary or outer diaphragm and the vibratory movement imparted by the latter to the air in the outer air-chamber. The node established is not of that fixed and positive character resulting from the rigid holding or confining of a string or other vibrating body, as this would, owing to the small diameter of the diaphragm, reduce its effectiveness and render the device practically inoperative, nor is the result obtained similar to that which would result from the positive connection of the two diaphragms for simultaneous movement.

In practice the device is found very effective, the diaphragms being extremely sensitive and serving to transmit the sound-waves with increased intensity from the tube or trumpet to the outer orifice of the ear.

While the device is described as employed in connection with an auriphone, it is evi-

dent that it may also be employed to advantage in a variety of acoustic appliances, and while the construction herein described, and illustrated in the accompanying drawings, is the preferred form of the device it is obvious that various changes in the form, proportions, size, and minor details of the structure may be made without departing from the spirit or sacrificing any of the advantages of the invention.

Having thus described my invention, what I claim is—

1. A device for receiving and transmitting sound-waves, comprising a box or casing having inlet and outlet openings, a pair of rigidly-confined imperforate diaphragms spaced to form an air-chamber, and a centrally-disposed cone carried by one of said diaphragms and disconnected from but adapted for contact with the other diaphragm.

2. An acoustic appliance comprising a box or casing having inlet and outlet openings, a pair of separated imperforate diaphragms arranged to form an intervening air-space, and a centrally-disposed block carried by one diaphragm and disconnected from but disposed in contact with the other diaphragm.

3. An acoustic appliance comprising a box or casing having inlet and outlet openings, a pair of separated imperforate diaphragms, means for clamping and holding the edge portions of said diaphragms, and a block carried by one of the diaphragms, said block being of a height slightly greater than the space between the edge portions of the diaphragms.

4. An acoustic appliance comprising a box or casing having inlet and outlet openings and provided with a flange or shoulder, an outer imperforate diaphragm seated on the flange or shoulder and separated from the adjacent wall of the box or casing by an air-chamber, a clamping-ring for holding the diaphragm against the flange, a second imperforate diaphragm mounted on the ring and having a centrally-disposed cone disconnected from but adapted for contact with the central portion of the outer diaphragm, and means for confining the diaphragms and ring in place.

5. An acoustic appliance comprising a box or casing having inlet and outlet openings, a flange within the same, an outer diaphragm mounted on said flange, a spacing-ring engaging the opposite face of said diaphragm, a second diaphragm mounted on the spacing-ring, a clamping-ring mounted on the second diaphragm, means for engaging the clamping-ring to firmly hold the diaphragms and ring in position, and a pair of cones mounted centrally on the opposite faces of the second diaphragm, either of said cones being movable to a position in contact with the central portion of the outer diaphragm.

6. In an acoustic appliance, the combination of the sectional box or casing having a threaded connection between the sections, a flange or shoulder formed within one of said

sections, an outer imperforate diaphragm
mounted on said flange or shoulder, a spac-
ing-ring mounted on the imperforate dia-
phragm, a second diaphragm mounted on the
5 spacing-ring, a clamping-ring arranged in
contact with said diaphragm and adapted to
be engaged and clamped in place by a portion
of the box or casing, and a cone secured to
the central portion of the second diaphragm
10 and in engagement with the outer diaphragm,

the height of said cone being greater than the
thickness of the spacing-ring.

In testimony that I claim the foregoing as
my own I have hereto affixed my signature in
the presence of two witnesses.

FRANK I. GANO.

Witnesses:

J. S. HICKEY,

J. H. EGBERT.