No. 774,282. PATENTED NOV. 8, 1904.

D. E. SMITH.

EAR PHONE.

APPLICATION FILED JAN. 27, 1904.

NO MODEL.

Fig. 1.

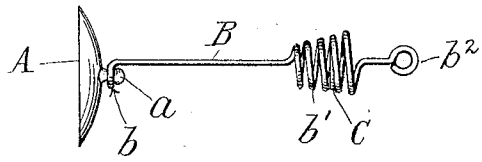


Fig. 2.

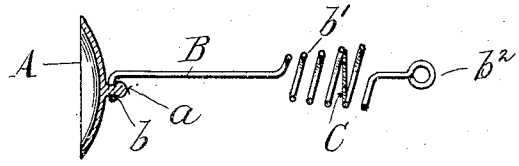


Fig. 3.



Fig. 4.

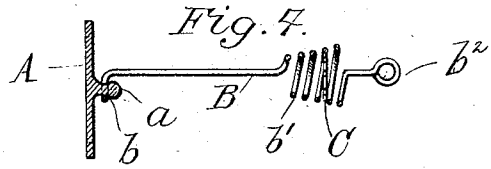
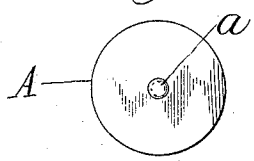


Fig. 5.



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PHOTO-LITHO. LITHO. & PTG. CO. NEW YORK.

No. 774,282. Patented November 8, 1904.

UNITED STATES PATENT OFFICE.

DOUGLAS E. SMITH, OF NEW YORK, N. Y., ASSIGNOR TO INVISIBLE EAR PHONE AND MEDICAL COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

EAR-PHONE.

SPECIFICATION forming part of Letters Patent No. 774,282, dated November 8, 1904.

Application filed January 27, 1904. Serial No. 190,796. (No model.)

To all whom it may concern:

Be it known that I, DOUGLAS E. SMITH, a citizen of the United States of America, and a resident of the borough of Manhattan, in the city, county, and State of New York, have invented certain new and useful Improvements in Ear-Phones, of which the following is a specification.

This invention relates to artificial ear-drums; and the particular purpose of my improvement is to provide a flexible diaphragm adapted to contact with the tympanic membrane of the ear and having means for locating and supporting said diaphragm in its operative position, together with means for collecting sound-waves and communicating them to said diaphragm.

In brief, my invention consists of a disk of flexible material, either flat or cup-shaped in cross-section, a stem supporting said disk, and means of removable attachment between said disk and one end of said stem, together with a spiral formation produced at the free end of said stem, a vibratory plate supported by said spiral, and a terminal holder.

In the drawings accompanying this application, Figure 1 is a side view of my improved artificial ear-drum apparatus. Fig. 2 is a sectional view thereof. Fig. 3 is a plan view of the receiver-plate. Fig. 4 is a sectional view of the apparatus, showing a modified form of the artificial tympanum. Fig. 5 is a detailed plan view of the modified tympanum.

The letter A indicates a flexible disk or diaphragm of thin sheet-rubber or other suitable material capable of vibratory action. As shown in Fig. 1, said disk or diaphragm is of concavo-convex form or cup-shaped, it being adapted to be introduced within the auditory channel in manner to present its concaved surface toward the natural tympanum or remains thereof. In some instances I may employ a flat disk or diaphragm, as indicated in Fig. 5; but I prefer the concavo-convex form, because that is more prone to retain its radial contour when passed into the auditory channel.

Upon the apex of the disk or diaphragm A or centrally thereof is placed an engaging member or knob, as *a*, the same being usually molded integrally with the disk or diaphragm when formed of rubber.

B indicates a stem or support for the disk or diaphragm and may be of gold or other non-corrodible material. At one end said stem is provided with a loop, as *b*, adapted to receive the knob *a* upon compression of the latter, and thereby to hold the disk or diaphragm securely, but removably attached to said stem. The stem B at a point distant from its loop *b* is formed into a spiral, as *b'*, comprising a series of graduated convolutions, resulting in a structure resembling the frustum of a cone, while a perforated plate C, of silver or other material suitable as a conductor of sound, is disposed within said spiral in manner to span the larger diameter thereof. The stem B is provided with an extension b^2, which is continued axially from the outermost convolution of the spiral and serves the purpose of a handle or hold to be grasped between the finger and thumb of the user in inserting the ear-drum within the ear or withdrawing it therefrom.

Because the auditory channel is of different lengths in different persons and it is desirable in using artificial ear-drums that the latter may be introduced so far into said channel as to be practically invisible, and it is important that such devices should be of an adjustable nature as regards their length, it is obvious that the spiral *b'*, being formed of a ductile substance, as gold, may be compressed to diminish the length of the apparatus or may be stretched out and its length thus extended to a desired degree. In this manner my improved ear-drum may be used in the ears of persons whose auditory channels are of different lengths. A further desideratum in appliances of this character is that the artificial tympanum used with the apparatus may be removed in a convenient manner when rendered unserviceable by long usage and a new one adjusted in its place. It being further desirable to provide means for adjusting artificial tympana to the stem in such manner that they may be interchangeable, whereby tympana of greater or less diameter may be applied to the stem, I have provided the knob *a*, which is adapted

to be compressed to enter the loop *b* at the end of the stem, in which it expands, to be thus firmly held upon the stem.

The perforated plate C being located in the spiral at a point near the outermost portion thereof is adapted as a vibratory receiver to collect the sound-waves, which it communicates to the spiral, causing the latter, with its stem, to vibrate in unison therewith, and thereby impart a corresponding vibratory action to the artificial tympanum.

The conical formation of the spiral referred to permits the convenient introduction of the device within the auditory channel, while the exterior convolution which is of the greatest diameter is adapted to fit approximately within said channel to support the stem in substantial parallelism in and centrally within said channel. It will thus be seen that the smaller convolutions of the spiral will hold away from contact with the wall of the auditory channel, whereby they are free to vibrate without interference through contact therewith.

I claim—

1. An artificial ear-drum comprising a stem having an integral vibratory coil whose convolutions are distended and a flexible diaphragm.

2. An artificial ear-drum comprising a stem having an integral vibratory coil whose convolutions may be distended more or less for the purpose of regulating the length of the apparatus, together with a flexible diaphragm.

3. An artificial ear-drum comprising a stem carrying a removable flexible diaphragm and an integral convolute enlargement for locating said stem centrally within the auditory channel of the ear.

4. An artificial ear-drum comprising a stem having an integral coil near one end thereof and a loop arranged at right angles at its opposite end, together with a flexible diaphragm bearing a central projection adapted to fit removably within said loop.

5. As a new article of manufacture a flexible diaphragm for artificial ear-drums having a concavo-convex formation, a supporting-stem, and means for removably attaching said diaphragm to said stem.

6. An artificial ear-drum comprising a stem having an integral coil and a flexible diaphragm, together with a vibratory receiving-plate supported within the coil.

7. An artificial ear-drum comprising a stem having an integral coil and a flexible diaphragm, said coil being shaped as the frustum of a cone, the larger convolution thereof being outwardly disposed and adapted to fit within the auditory channel of the ear.

8. An artificial ear-drum comprising a stem having an integral vibratory coil whose convolutions are distended and a flexible diaphragm, together with an axial extension of said stem beyond said coil, said extension serving as a handle for the device.

Signed at New York this 20th day of January, 1904.

DOUGLAS E. SMITH.

Witnesses:
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