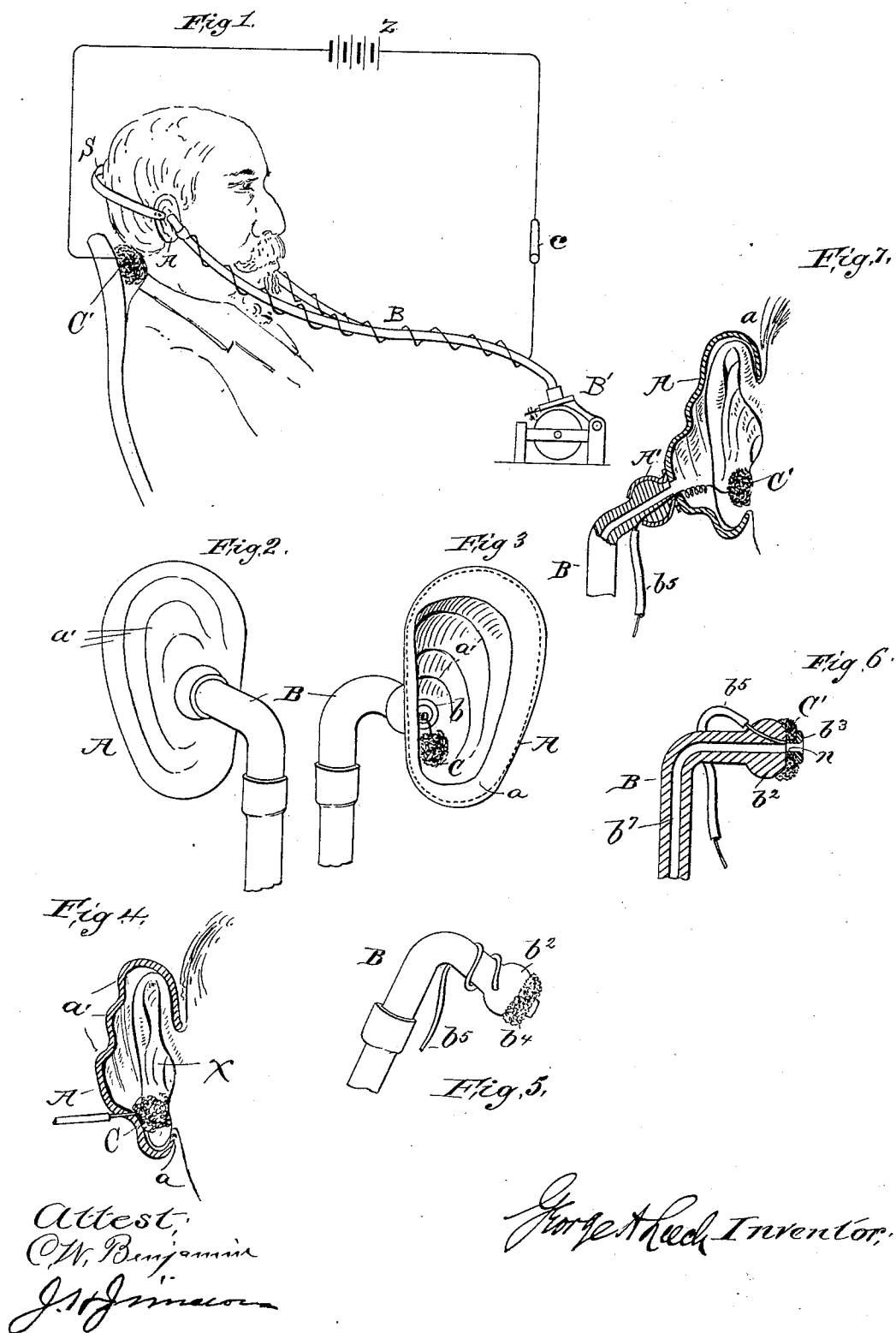


(No Model.)

G. A. LEECH.
SOUND CONDUCTING APPARATUS.

No. 521,800.

Patented June 26, 1894.



UNITED STATES PATENT OFFICE.

GEORGE A. LEECH, OF NEW YORK, N. Y.

SOUND-CONDUCTING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 521,800, dated June 26, 1894.

Application filed August 19, 1893. Serial No. 483,571. (No model.)

To all whom it may concern:

Be it known that I, GEORGE A. LEECH, a citizen of the United States, and a resident of New York, in the county of New York and State of New York, have invented certain new and useful Sound-Conducting Apparatus, of which the following is a specification.

My invention relates to sound conducting apparatus used in the cure of deafness, and has for its object to increase the efficiency of such apparatus, and to provide means whereby the electric current may be employed as an auxiliary to my system of mechanical massage.

In the treatment of deafness I have perfected a system depending upon stimulation of the middle ear, in a manner analogous to what is known as mechanical massage when applied to other portions of the body. I proceed upon the theory that a large percentage of the cases of deafness are caused among other things by a stiffening of the delicately connected chain of bones of the middle ear, constituting a species of ankylosis. In the same way that an ankylosed knee joint needs constant working and bending to restore it to its normal flexibility and cause re-absorption of all except the normal synovial fluid, so the joints of the malleus, the incus and the stapes, of the middle ear, need a constant, strong, steady vibration or movement to restore them to their normal flexibility and cause re-absorption of the inflammatory deposits. In causing the desired agitation of the aforesaid parts of the ear, I use the Edison phonograph with specially constructed cylinders adapted to produce a succession of sounds, varying in their character from actual air suction to the sharpest staccato taps. I rely entirely upon nature to perform the cure; absorption alone being capable of entirely destroying the false tissues and deposits when they have once been broken up by the agitation of the parts affected. But nature is sometimes slow, especially in absorption, and I propose now to quicken the process by the use of electric currents, obtaining thereby a double result. In the first place electrolysis takes place at the same time that

mechanical stimulation is going on, and secondly the auditory nerve receives a gentle stimulation which tends to restore it to its normal tone. For this double purpose I find it expedient to use what electro-therapists term the galvanic current, and my invention herein described contemplates the use of means whereby the said current may be successively applied while using the sound stimulation.

In using the phonograph for medical purposes, I find the usual tube connections rather awkward, and that they do not convey sound to the ear in the best manner. I have therefore devised means whereby to render the attachment of the tube to the ear simple, automatic and effective, and to allow the sound waves to strike the concha before entering the meatus.

For a full description of my invention reference may be had to the accompanying drawings, wherein the same letters of reference point out the same parts.

Figure 1, is a view of a patient under treatment with the phonograph, with my devices attached. Fig. 2, is an outside view of my resonator or ear cover. Fig. 3, is an inside view of the same. Fig. 4, is a section of the same attached to an ear. Fig. 5, is a side view of my ear piece with sponge electrode attached. Fig. 6, is a section of the same; and Fig. 7, is a sectional view showing a modification of the resonator.

Referring to Figs. 1, 2 and 3, it is noted that I use an ear attachment which completely covers the lobe, or external organ. This cover is of a peculiar shape and has a marked function. The highest authorities are agreed that in all animals the external ear is appropriately shaped to act as a resonator to the sounds peculiarly necessary for the animals to hear. In man the curves of the ear lobe are delicately designed to reinforce the vibrations superimposed upon vibrations which go to make up the complex sounds of speech, while they still serve to receive all ordinary sounds as well.

In another application of even date herewith (Serial No. 483,572), I have shown and

described a resonator modeled after the ear and placed over the diaphragm of the phonograph. In the present case I place a similar resonator over the patient's ear.

5 A, is the resonator, shaped like a hollow reverse impression of the ear, and having an elastic flange, or rim, a , which encircles the lobe of the ear, and secures the resonator in place.

10 B, is the ear tube of the phonograph, the phonograph being indicated at B'. Ordinarily I prefer this to terminate at, b , as shown in Fig. 3, in order that the sound waves may be directed to the meatus in the natural way, but it may extend into the meatus if preferred. The resonator is curved and indented, as indicated at, a' , to reproduce the helix, anti-helix, and fossas, of the natural ear; and as it is laid upon the ear lobe in use, each of
20 these curves acts as the complement of its prototype. The tube B, enters the resonator at the same relative angle and the same place occupied by the meatus or canal of the natural ear. The sounds then enter at, b , are reverberated and strengthened by curved surfaces, a' , are transferred to the complementary surfaces of the natural ear, and finally reach the meatus. It may also be advantageous to have the resonator made separate from the tubes and to connect them together by a spring as at S, which shall pass back of the head from one resonator to the other to hold them in place. Then at the opening b , in the resonator a short elastic tube A', (see Fig. 7.)
35 would project outwardly into which the ends of the usual ear tubes B, could be readily inserted with the sponge electrode attached thereto as indicated at C'.

At C, Fig. 3, I have shown a sponge electrode secured at the bottom of the concha. This forms one terminal of a circuit through a battery Z, (Fig. 1.) The other terminal may be applied to an indifferent portion of the body—as the hand. I prefer, however, to apply it as shown at C', Fig. 1, to the nape of the neck, this electrode being attached to the back of the patient's chair, making a very convenient form of apparatus; c , is a switch by which the current may be turned off or on
45 at will. The battery Z, should be one of the medical sets now on the market, and supplied with proper regulating instruments. The currents I prefer to use range in amount from three to ten millampères of the galvanic kind. The arrangement of the electrode at the nape of the neck, produces what is termed "transverse" stimulation, which I consider preferable on account of the range of the parts affected.

In Figs. 5 and 6, I have shown a form of electrode which I use when the resonator is not necessary or is inconvenient. This has the form of the ordinary ear-tube, B, with a head b^2 , adapted to fit the meatus properly,
65 and provided with a platinum tip, b^3 , with a

neck, n , allowing of the attachment of the sponge C'. This may be by sewing or tying in the usual way. Passing into the head b^2 , at back of where it enters the meatus, is the conducting wire b^5 , the end of which is soldered to the platinum tip. The usual aperture b^7 , of the tube is extended through the platinum tip, so that the sound channel is uninterrupted.

Fig. 4, shows the resonator in section, applied to an ear X, the ear tube being omitted. This clearly shows the rim a , folded back of the lobe of the ear.

What I claim as my invention is—

1. The combination, with a phonograph or other variable sound producing instrument, of ear tubes leading therefrom, an electric circuit, an electrode thereof connected to one of the ear pieces of said tubes and the other electrode connected to a suitable support, whereby the sound effect may be augmented by the simultaneous effect of the electric current, as and for the purpose described.

2. The combination with a phonograph or other variable sound producing instrument, of ear tubes leading therefrom, and terminating in resonators fitted to the ears, and an electric circuit the electrodes of which are attached to the resonators and to a suitable support respectively, as and for the purpose set forth.

3. The combination with a variable sound producing instrument, of a resonator constructed to fit over the ear and consisting of a hollow body curved to correspond with a reverse impression of the human ear, and a tube leading into said resonator at the same relative location and angle as that of the external meatus of the ear, as and for the purpose set forth.

4. In apparatus for the treatment of the deaf, the resonator having curves complementary to those of the ear, and adapted to be secured thereto, of an electrode attached thereto, substantially as described.

5. The process of treatment for deafness, consisting in mechanically agitating the parts of the tympanum, and simultaneously stimulating the vibratory connections of said parts, by the passage of an electric current, as and for the purpose described.

6. In the treatment of the deaf, the process of removing false tissues consisting in mechanically stimulating the vibratory connections of the middle ear, and simultaneously producing electrolysis therein, substantially as described.

7. In apparatus for treatment of the deaf, the combination of the following instrumentalities, the sound producer, the sound conducting tubes, the ear resonator, the ear electrode, a battery, and the chair or other support carrying another electrode, said electrodes being connected to the terminals of said battery, substantially as described.

8. The combination, with a variable sound
producing instrument, of resonators con-
structed to fit over the ears, a spring connect-
ing them to hold them in place, short flexible
5 tubes leading from the resonators, and adapt-
ed to receive the ordinary ear pieces, substan-
tially as shown and described.

Signed at New York, in the county of New

York and State of New York, this 17th day of
August, A. D. 1893.

GEORGE A. LEECH.

Witnesses:

WM. H. CAPEL,

EDWARD N. DEAN,

WALTER D. JOHNSON.