(No Model.)

E. BAZZI & A. BIANCHI.

APPARATUS FOR RENDERING SMALL SOUNDS AUDIBLE.

No. 575,320. Patented Jan. 19, 1897.

Fig. 1.

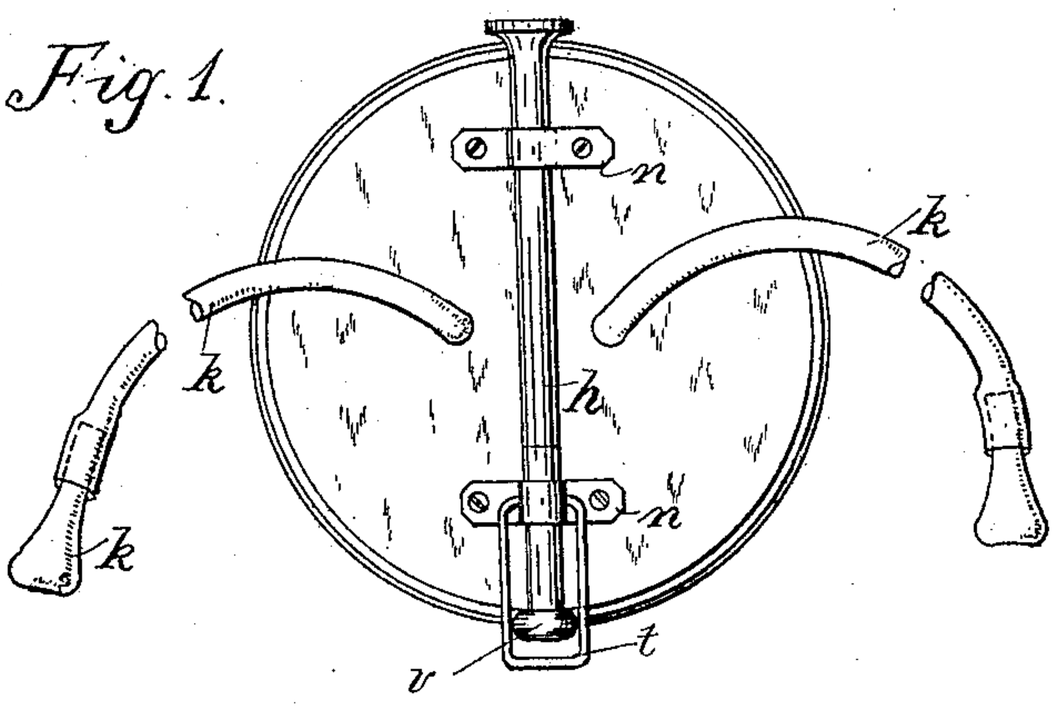


Fig. 2.

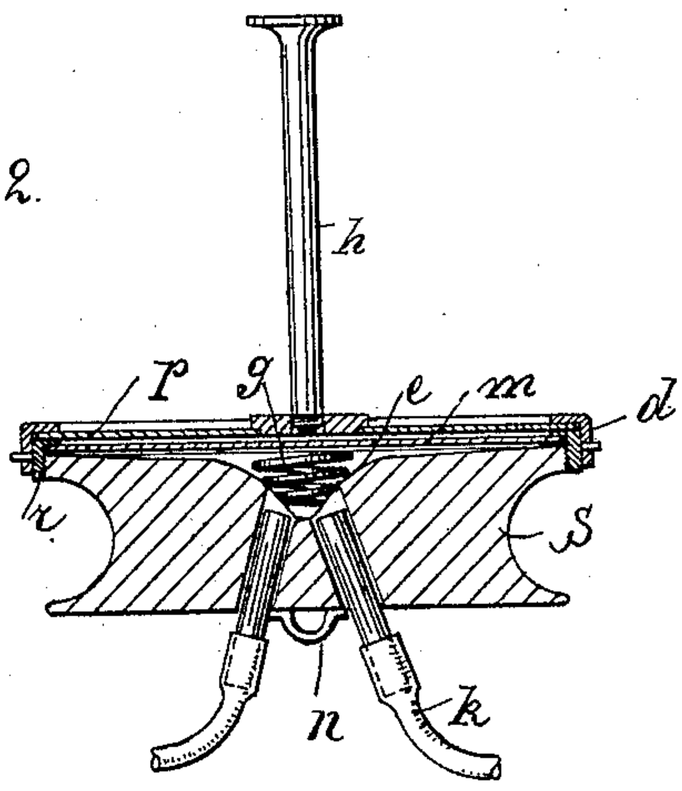
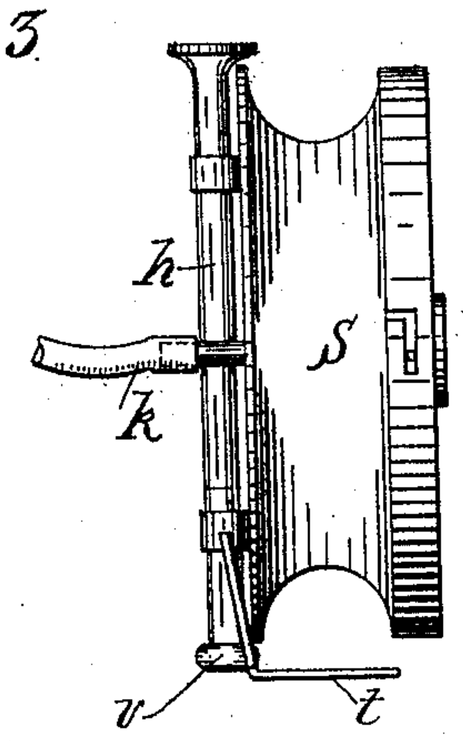


Fig. 3.



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UNITED STATES PATENT OFFICE.

EUGENIO BAZZI AND AURELIO BIANCHI, OF FLORENCE, ITALY, ASSIGNORS TO MARTIN WALLACH NACHFOLGER, OF CASSEL, GERMANY.

APPARATUS FOR RENDERING SMALL SOUNDS AUDIBLE.

SPECIFICATION forming part of Letters Patent No. 575,320, dated January 19, 1897.

Application filed September 22, 1896. Serial No. 606,647. (No model.) Patented in Italy March 19, 1895, No. 38,426; in Germany May 22, 1895, No. 85,784; in France May 27, 1895, No. 247,712; in England May 29, 1895, No. 10,223, and in Hungary June 22, 1895, No. 3,648.

To all whom it may concern:

Be it known that we, EUGENIO BAZZI and AURELIO BIANCHI, subjects of the King of Italy, residing at Florence, Italy, have invented new and useful Improvements in an Apparatus for Rendering Small Sounds Distinctly Audible on a Magnified Scale, of which the following is a specification.

Our invention relates to an apparatus which we call a "phonendoscope" and which renders small sounds in the human body, or in all bodies in general, distinctly audible on a magnified scale.

This invention has been patented to us in Italy, No. 38,426, dated March 19, 1895; in France, No. 247,712, dated May 27, 1895; in Hungary, No. 3,648, dated June 22, 1895, and to our assigns, Martin Wallach, successor, in Germany, No. 85,784, dated May 22, 1895, and in Great Britain, No. 10,223, dated May 29, 1895.

The improved apparatus is based essentially upon the fact that an elastic membrane or other body capable of vibrating is united to a body of a larger mass and consequently greater inertia. When such a body is laid upon another body in which small noises, rustlings, or murmurs occur, the membrane is set in vibratory motion in relation to the heavy solid body, while the large mass of the latter itself partakes not at all or very slightly and imperceptibly in that vibration.

The vibrations or oscillations of the membrane are made audible in any appropriate manner; *e. g.*, by means of a microphone or by propagation of the air vibrations created thereby.

In the accompanying drawings, Figure 1 is a view of the back of the apparatus. Fig. 2 is a central sectional view; and Fig. 3 is a side view, the hearing-tubes being broken away in Figs. 2 and 3.

The apparatus consists of a relatively inert disk or body S of heavy metal or other like material of considerable weight, for instance, like wood weighted with lead and the like. In the center of the disk is provided a hollow or cavity *e*, covered by a membrane *m*, of hard rubber or similar material, constituting a diaphragm. Inside this hollow space a weak spring *g* may be provided, so as to press upon the membrane or diaphragm. This membrane is packed tightly and securely against the edge of the disk by a clamping-ring *r*. Over this membrane is a somewhat thicker hard-rubber plate *p*, incased in or bordered by a ring and secured on the clamping-ring *r* by a bayonet-lock fastening or any similar means.

It will be found advantageous to provide this rubber plate with a central orifice, wherein may be secured a hard-rubber or metal rod *h*. This rod, when not in use, may be fastened on the rear side of the box by bands or staples *n* and secured in place by a small nut *v*, as shown in Figs. 1 and 3.

On the rear side of the disk or box S are bored two holes terminating in the central hollow. Two hearing trumpets or pipes *k* may be inserted in thtse holes, which tubes, whenever the apparatus is not in use, may be wound around the edge of the box, groove-shaped for the purpose, and there retained by a hook *t* or other suitable device.

If this phonendoscope be brought into contact with any solid body, either by the knob on the end of the rod or by the freely-exposed hard-rubber plate *p*, the tone-vibrations in that solid body will communicate themselves to the point of contact with the knob of the diaphragm, while the disk or body S, which is relatively inert, will remain practically motionless. Consequently the movements of the plate will show themselves in comparison with those of the box as enormously greater. These movements therefore generate strong changes of volume in the hollow space *e* and give rise to strong vibrations, which are communicated to the sense of hearing by means of the hearing-trumpets *k*.

The transmission of the vibrations of the diaphragm may also be effected with the aid of a microphone, and the disk or body S may be rectangular or of any other form.

Having thus fully set forth our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. An apparatus for rendering small sounds

audible on a magnified scale comprising a relatively inert and heavy disk or body, such as S, a light diaphragm *m* attached at its periphery to the edge of said disk, and means for transmitting the vibrations of the diaphragm, substantially as and for the purpose specified.

2. In an apparatus for rendering small sounds audible the combination with a relatively inert heavy disk or body, such as S, of a membrane attached at its periphery to said disk, a hollow space between said disk and membrane, a spring interposed between said disk and membrane, and means for transmitting the vibrations of a diaphragm, substantially as described.

3. In an apparatus for rendering small sounds audible the combination with a heavy disk or body, and a membrane, such as *m*, of a plate, such as *p*, secured over the membrane substantially as described.

4. In an apparatus for rendering small sounds audible the combination with a heavy disk or body, a membrane, such as *m*, and plate, such as *p*, of a rod *h* screwed into the plate, substantially as described.

5. In an apparatus for rendering small sounds audible the combination with a heavy disk or body and a membrane, of a plate having a central orifice, and a rod detachably inserted in said orifice, substantially as described.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

EUGENIO BAZZI.
AURELIO BIANCHI.

Witnesses as to the signature of Eugenio Bazzi:

FREMO GALLI,
GUIDO EURCHINO.

Witnesses as to the signature of Aurelio Bianchi:

EDWARD P. MACLEAN,
DAVID T. S. FULLER.

Corrections in Letters Patent No. 575,320.

It is hereby certified that in Letters Patent No. 575,320, granted January 19, 1897, upon the application of Eugenio Bazzi and Aurelio Bianchi, of Florence, Italy, for an improvement in "Apparatus for Rendering Small Sounds Audible," errors appear in the printed specification requiring correction as follows: In line 15, page 2, the article "a" should read *the*, and line 21, same page, a comma should be inserted before the word "substantially;" and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed, countersigned, and sealed this 26th day of January, A. D., 1897.

[SEAL.]

JNO. M. REYNOLDS,
Assistant Secretary of the Interior.

Countersigned:

JOHN S. SEYMOUR,
Commissioner of Patents.