O. BOLTE.

STETHOSCOPE, HEARING TRUMPET, EAR TRUMPET, AND LIKE SOUND CONDUCTING INSTRUMENTS.

APPLICATION FILED SEPT. 18, 1911.

1,044,858. Patented Nov. 19, 1912.

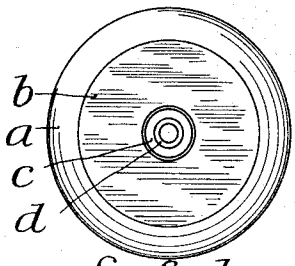

Fig. 1.

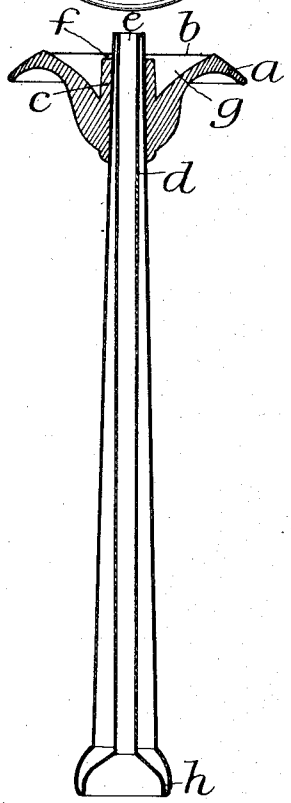

Fig. 2.

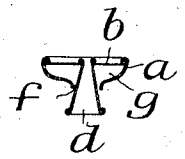

Fig. 3.

Witnesses

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STETHOSCOPE, HEARING-TRUMPET, EAR-TRUMPET, AND LIKE SOUND-CONDUCTING INSTRUMENTS.

1,044,858. Specification of Letters Patent. Patented Nov. 19, 1912.

Application filed September 18, 1911. Serial No. 650,029.

To all whom it may concern:

Be it known that I, OTTO BOLTE, a citizen of Hamburg, and resident of No. 50 Bismarckstrasse, Hamburg, in the Empire of Germany, have invented new and useful Improvements in Stethoscopes, Hearing-Trumpets, Ear-Trumpets, and Like Sound-Conducting Instruments, of which the following is a specification.

The present invention relates to sound conducting instruments, such as stethoscopes, hearing trumpets, ear trumpets or the like and aims at rendering more efficient and serviceable instruments of the class referred to. This is attained by improving the conductivity so that scarcely any diminution in the intensity of sound is noticeable.

I will now proceed to describe my invention more fully, reference being had to the accompanying drawings, in which by way of example, a stethoscope is shown in Figure 1 in an end view, in Fig. 2 in a longitudinal section. Fig. 3 illustrates the application of my invention to an ear trumpet.

Referring to Figs. 1 and 2 *a* denotes a funnel of any suitable external shape, *b* a diaphragm or membrane, *c* a tubular stem in the cavity of the funnel *a* around the hole therein and *d* the sound conducting tube passing through the funnel *a* and through the tubular stem *c* contained therein. The tubular stem *c* terminates a short distance from the diaphragm or membrane *b*, so that an annular air channel *f* is produced. The mouth *e* of the tube *d* extends through the diaphragm or membrane *b* in a central hole of the latter. In the example illustrated the shell of the tube *d* is hollow, it is however to be understood that I may fill the hollow shell with any suitable substance or chose a solid shell in the first place.

In using the stethoscope, the tube *d* is placed with its suitably shaped extremity *h* on the body to be examined or tested, whereas the ear is closed against the tube *d* so that the diaphragm or membrane *b* fits tight against the auricula while the mouth end *e* of the tube enters the meatus auditorius externus. The waves of the sound to be tested partly reach the ear directly through the mouth end *e* of the tube *d* and partly they enter the chamber *g* of the funnel *a*, where they encounter the diaphragm or membrane *b*. In causing the diaphragm or membrane *b* to vibrate the sound waves are transmitted to the ear without any diminution in the intensity, the waves reflected by the diaphragm or membrane *b* leaving the chamber *g* through the annular channel *f* and being conducted through the tube *d* to the ear. Thus a circuit of the sound waves is produced, which directs the sound waves practically undiminished to the ear. The efficiency of the sound transmission can be materially enhanced by suitably coating or impregnating the diaphragm or membrane *b* and the reflecting surfaces of the tube *d* and funnel *a*.

In Fig. 3 is shown by way of example an ear trumpet, which may be formed at the end carrying the diaphragm or membrane *b* in conformity with the shape of the auricula. In this ear trumpet the action is reverse to that described with regard to the stethoscope of Figs. 1 and 2, *i. e.* the sound waves enter from the end holding the diaphragm or membrane *b* and are transmitted partly directly through the tube *d*, which widens toward the ear, and partly through the diaphragm or membrane *b*, the air space *g* of the funnel *a* and the annular channel *f*.

Owing to its extraordinary capacity for sound transmission my improved hearing instrument by using a suitably long tube can be advantageously employed for testing the noise of working machines of various kinds, of water and gas conduits and the like.

While I have shown in the accompanying drawings the preferred form of my invention, it will be understood that I do not limit myself to the precise form shown, for many of the details may be changed in form or position without affecting the operativeness or utility of my invention, and I therefore reserve the right to make all such modifications as are included within the scope of the following claims, or of mechanical equivalents to the structure set forth.

What I do claim as my invention, and desire to secure by Letters Patent, is:

1. A hearing instrument comprising a tube, a funnel at one end of said tube and a diaphragm or membrane in the funnel for increasing the sound, the tube extending through the funnel and through the diaphragm or membrane in a central hole of

the latter, substantially as and for the purposes set forth.

2. A hearing instrument comprising a tube, a funnel at one end of said tube and a diaphragm or membrane in the funnel for increasing the sound, the tube extending through the funnel and through the diaphragm or membrane in a central hole of the latter and widening toward the transmission end, substantially as and for the purposes set forth.

3. In a hearing instrument comprising a tube, a funnel at one end of said tube and a diaphragm or membrane in the funnel for increasing the sound, the tube extending through the funnel and through the diaphragm or membrane in a central hole of the latter, a tubular stem in the cavity of the funnel around the hole therein, said stem encircling the sound transmission tube and terminating a short distance from the diaphragm or membrane, substantially as and for the purposes set forth.

5. A hearing instrument comprising a tube, a funnel at one end of said tube and a diaphragm or membrane in the funnel for increasing the sound, the tube extending through the funnel and through the diaphragm or membrane in a central hole of the latter having a hollow shell, substantially as and for the purposes set forth.

5. A hearing instrument comprising a tube, a funnel at one end of said tube and a diaphragm or membrane in the funnel for increasing the sound, the tube extending through the funnel and through the diaphragm or membrane in a central hole of the latter having a hollow shell, filled with sound transmitting substance, substantially as and for the purposes set forth.

6. A hearing instrument comprising a tube, a funnel at one end of said tube and a diaphragm or membrane in the funnel for increasing the sound, the tube extending through the funnel and through the diaphragm or membrane in a central hole of the latter, leaving an annular air channel open at the converging end of the funnel, substantially as and for the purposes set forth.

In witness whereof I have hereunto signed my name this 4th day of Sept. 1911, in the presence of two subscribing witnesses.

OTTO BOLTE.

Witnesses:
ERNEST H. L. MUMMENHOFF,
IDA CHRIST. HAFERMAN.