A. FISCHER.
SOUND CONDUIT AND AMPLIFYING DEVICE.
APPLICATION FILED JULY 24, 1911.

1,046,454.

Patented Dec. 10, 1912.

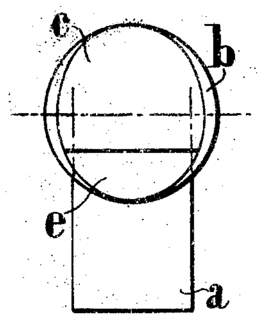

Fig.2.

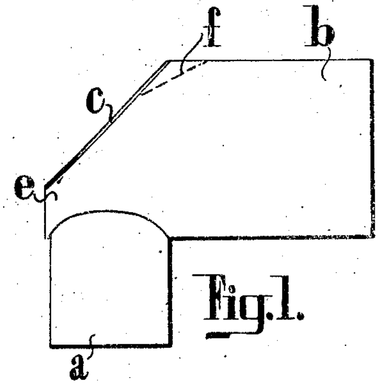

Fig.1.

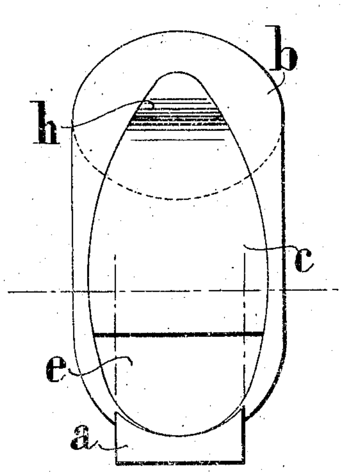

Fig.4.

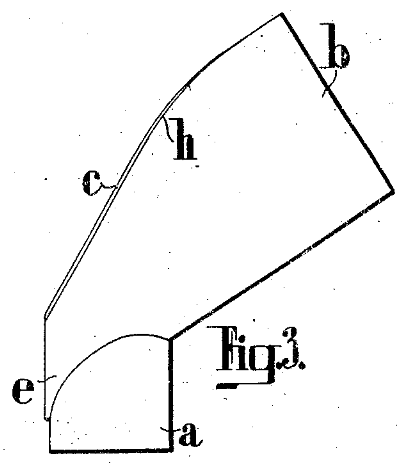

Fig.3.

Witnesses.
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UNITED STATES PATENT OFFICE.

ALEX FISCHER, OF KENSINGTON, LONDON, ENGLAND.

SOUND CONDUIT AND AMPLIFYING DEVICE.

1,046,454. Specification of Letters Patent. Patented Dec. 10, 1912.

Application filed July 24, 1911. Serial No. 640,259.

To all whom it may concern:

Be it known that I, ALEX FISCHER, a subject of the King of England, residing at 8 Maelise road, Kensington, London, England, have invented certain new and useful Improvements in Sound Conduits and Amplifying Devices; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to sound conduits and amplifying devices and refers to that class of such conduits and amplifying devices as are constructed with reflecting surfaces after the manner described in my application for Letters Patent Serial Number 555776, filed April 16, 1910, and more particularly to those in which no sectional area at right angles to the reflector is less than the area of the smaller tube, or in the case of circular tubes the vertical distance from the reflecting surface to the inner angular point where the two tubes join is approximately equal to the diameter of the smaller tube.

In applying the principle of my former aforesaid patent application to certain cases, in adapting it for instance to the receivers and transmitters of telephones, to speaking tubes, as well as to sound conduits of talking machines, certain phenomena became apparent. It was observed that when two tubes or sound conduits met at an angle and a reflector was provided, as described in the aforesaid application, if the reflector was only of sufficient size to include on its surface the projection of the smaller tube the sound waves were too much confined, while on the other hand if the reflector was of sufficient size to include on its surface the projection of the larger tube, the sound waves were allowed to spread out to an undesirable extent, and in each case the result was not so perfect as it can be made by carrying into effect the principle of my present invention.

According to the present invention, in place of making the reflector of sufficient size to include only the projection of the smaller tube or large enough to include that of the larger tube I make it intermediate in size. Then supposing we have the tubes which are to be used as sound conduits and one of these tubes has a diameter of x millimeters, while the other has a diameter of $(x+2y)$ mm. When these are connected together at a certain angle and a reflector is provided the projection of the smaller tube on the plane of the reflector is an ellipse with a minor axis x mm. in length. Again the projection of the larger tube on the same plane would give an ellipse with a minor axis of $(x+2y)$ mm.

According to my present invention I select for the minor axis a length intermediate between the two, say $(x+y)$ mm. This construction enables the waves to spread to a certain extent without giving them too much freedom, and produces surprisingly good results. It will be understood that the major axis of the ellipse and the general dimensions of the reflecting surface are correspondingly and suitably proportioned, and the end portions of the reflector, that is the portions representing the amounts by which the reflector exceeds toward the ends the ellipse forming the projection of the smaller tube, may be adjacent to one of the tubes or part may be adjacent to each of these tubes. These portions may be formed of one or more small plane reflectors set at suitable angles to catch and reflect the spreading waves, or, especially in the case of the larger tube, the auxiliary reflector may be curved in one direction so that the spreading waves impinging at slightly varying angles, due to their having emerged from the smaller tube, may nevertheless be reflected straight along the larger tube. And in order that this invention may be better understood, I will now proceed to describe the same with reference to the drawing accompanying this specification, which shows by way of example two methods of carrying my invention into effect.

Figure 1 is a side elevation of the junction of two sound conducting tubes. Fig. 2 is a back elevation of same. Fig. 3 is a similar view to Fig. 1 of another form. Fig. 4 is a similar view to Fig. 2.

The same letters of reference are employed to denote the same parts in all the views.

a is the smaller tube the diameter of which is x mm.

b is the larger tube the diameter of which is $x+2y$ mm.

c is the reflecting surface which is disposed so as to be equally inclined to the axis of each of the tubes a and b after the manner described in my application above mentioned.

It will be observed that the minor axis of the reflector c is of such size that it comes between the diameters of the smaller and larger tubes that is between x and $(x+2y)$ mm. in this case about $(x+y)$ mm. As the diameter of the larger tube is $(x+2y)$ mm. and the minor axis of the reflector is only $x+y$ it is clear that the surface of the larger tube must be curved inward somewhat in the neighborhood of the reflector in order to make a proper joint, and this may be done by cutting one or more small V-shaped pieces out of the larger tube where the joint is to be effected and bending the ends in so that a suitable joint is made with the elliptical section in the neighborhood of the minor axis, or the same result may be obtained by spinning or stamping up the metal. The reflector c may be carried right back so that the elliptical section is complete or it may be turned down as shown at f which prevents the sound from spreading backward.

When the device is in use the sound passing up the smaller tube a after leaving such tube tends to spread outward. The size of the reflector c is calculated so as to be just sufficient to receive the impinging sound waves and to reflect them along the conduit b without there being any tendency for the sound waves to be compressed at the bend.

In some cases I prefer to make the construction such that a small extra plane reflector f shown dotted at Fig. 1 is placed between the reflector c and the top of the tube b. The object of this construction is that the waves or a portion of the waves which are proceeding up the right hand side of the tube a into the tube b not being confined by any walls tend to spread and therefore it is necessary to provide an extended surface for them to impinge upon which surface must be at a suitable angle for reflecting them along the tube b.

Referring to the modified form shown at Figs. 3 and 4 in this case the general construction is the same, but in place of providing a plane reflector at f, I extend the main reflector c so as to form a curved reflecting portion h substantially as shown in the drawing.

It will be understood that I may apply the principle of this invention to bends of all kinds of sound conduits, for instance to transmitters of telephones, to megaphones, to speaking tubes, ear trumpets, sound conduits of talking machines and to all classes of musical and acoustic instruments, and that the methods of carrying out the invention may be varied to suit requirements of particular cases.

What I claim as my invention and desire to secure by Letters Patent of the United States of America is:—

1. A sound conduit or amplifying device comprising two tubes of different cross sectional areas meeting at an angle and a plane reflecting surface located at the junction of the tubes and equally inclined to the axes of the two tubes and in which no sectional area at right angles to the reflector is less than the area of the smaller tube, said reflecting surface being of such area that if the dimension of the small tube at right angles to the plane passing through the axes of the two tubes be x and the corresponding dimension of the large tube be y then the corresponding dimension of the plane reflecting surface shall be intermediate between x and y.

2. A sound conduit or amplifying device comprising two circular tubes of different diameters meeting at an angle and a plane reflecting surface located at the junction of the tubes and equally inclined to the axis of each tube and in which the vertical distance from the reflecting surface to the inner angular point where the two tubes join is approximately equal to the diameter of the smaller tube, said reflecting surface being of such area that the minor axis of the figure formed by the reflecting surface is intermediate in length between the diameters of the smaller and larger tubes for the purpose set forth.

3. A sound conduit or amplifying device, comprising two tubes of different cross sectional areas meeting at an angle and a reflecting surface located at the junction of the tubes and equally inclined to the axes of the two tubes and in which no sectional area at right angles to the reflector is less than the area of the smaller tube, said reflecting surface being of such area that if the dimension of the small tube at right angles to the plane passing through the axes of the two tubes be x and the corresponding dimension of the large tube be y, then the corresponding dimension of the reflecting surface shall be intermediate between x and y, said reflector having a relatively small reflecting surface set at an angle to it at that end next the larger tube.

In testimony whereof, I affix my signature, in presence of two witnesses.

ALEX FISCHER.

Witnesses:

LILY SIMMONDS,
A. E. VIDAL.