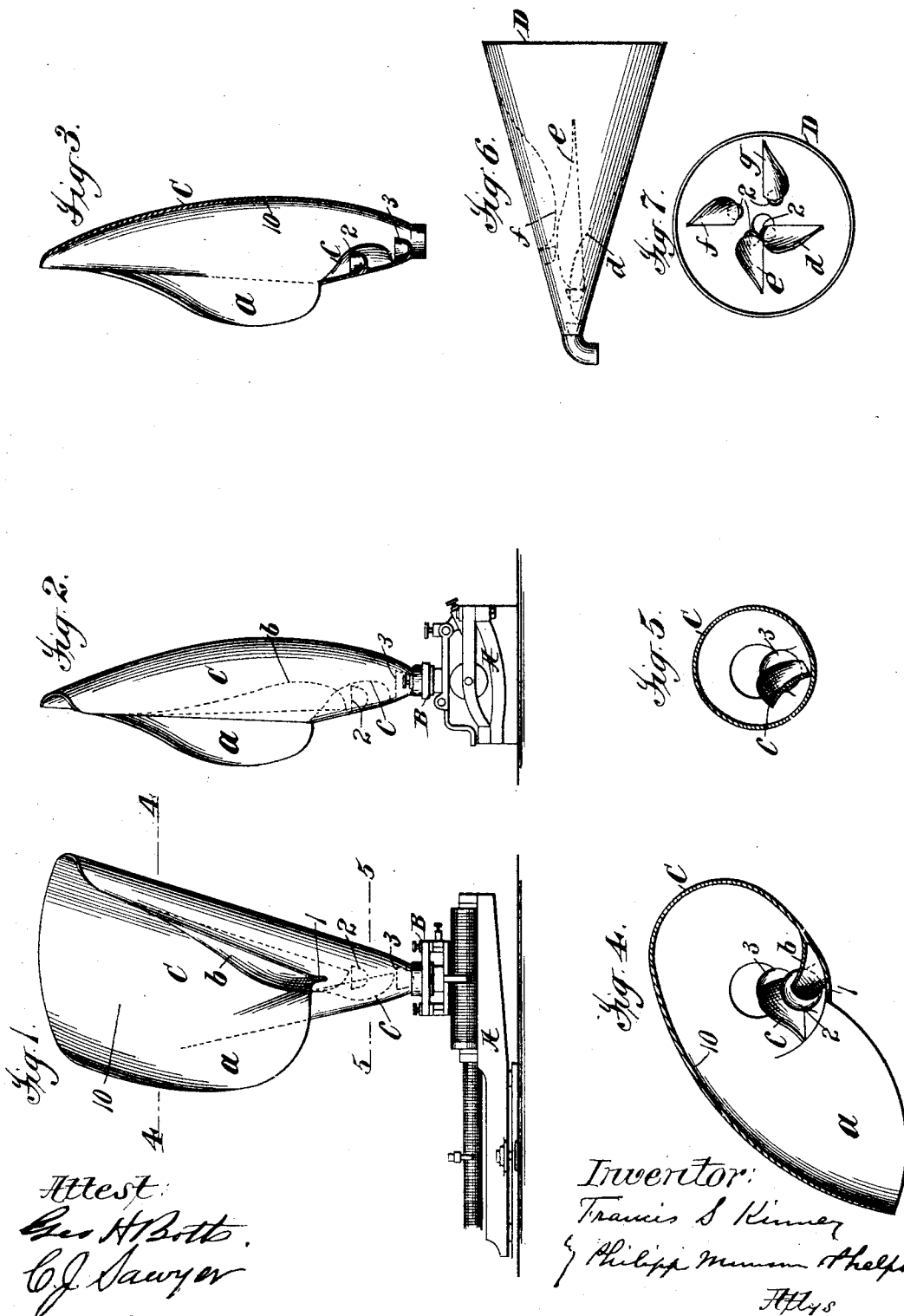


F. S. KINNEY.
PHONOGRAPH RECEIVER.

Patented Apr. 30, 1895.



UNITED STATES PATENT OFFICE.

FRANCIS S. KINNEY, OF PEQUANAC, NEW JERSEY.

PHONOGRAPH-RECEIVER.

SPECIFICATION forming part of Letters Patent No. 538,262, dated April 20, 1895.

Application filed December 13, 1894. Serial No. 531,679. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS S. KINNEY, a citizen of the United States, residing at Pequanae, county of Morris, and State of New Jersey, have invented certain new and useful Improvements in Phonograph-Receivers and other Sound-Conducting Tubes, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

The especial object of the present invention is to provide an improved recording apparatus of that class known as phonographs or graphophones, producing a record of sound waves by a style operated through a vibrating diaphragm by the sound waves to be recorded, the record thus produced being in turn used in the same or another machine to reproduce the recorded sounds, the present invention relating particularly to the receiver or sound conducting tube through which the sound waves are transmitted to the diaphragm. The improvements constituting the present invention, however, are applicable also to other classes of sound conducting tubes, such as speaking trumpets, telephone transmitters, &c., and the invention considered broadly includes such constructions embodying the improvements.

As the invention relates especially to and consists in part of an improved phonograph receiver, the improvements will be described especially in relation thereto and illustrated as embodied in such a construction.

In another application, Serial No. 509,791, filed May 2, 1894, I have described and claimed a phonograph receiver closed at the back of the opening for the sound waves and having its funnel extending from said opening transversely to the direction in which the sound waves enter, the general form of the receiver, therefore, corresponding to that of an animal's ear in that the sound waves enter against the wall at the back of the ear and pass from the receiver at its base.

The present invention consists in part of improvements in this class of receivers, and for a full understanding of the invention, a detailed description of a construction embodying the same as applied in its preferred form to a receiver such as above described and to another class of receivers, will now be

given in connection with the accompanying drawings forming a part of this specification, and the features forming the invention will then be specifically pointed out in the claims.

In the drawings, Figure 1 is a front view of a phonograph recording apparatus provided with a receiver of the preferred form embodying the invention. Fig. 2 is a side view. Fig. 3 is a longitudinal section of the receiver. Figs. 4 and 5 are cross sections on respectively the lines 4 and 5 of Fig. 1, on an enlarged scale. Fig. 6 is a side view of a receiver of another class embodying certain features of the invention. Fig. 7 is an end view of the same.

Referring to Figs. 1 to 5, A is the phonograph or graphophone, which may be of any form desired, that shown being the well known Edison phonograph. To the diaphragm frame B of this phonograph is attached the receiver C so that the sound waves entering the receiver are transmitted to the diaphragm which operates the style. This receiver has an opening at the front through which the sound waves enter and is closed at the back opposite the opening, which back is curved or inclined downward and curved in cross section, the receiver gradually contracting to form a funnel connected to the diaphragm frame at its smaller end, directly, or by a short tube. At the base of the opening, or top of the funnel, the receiver is preferably provided with a short slit 1, as shown.

The receiver, and especially its upper part, is preferably made of resonant or sonorous material, which may be of any suitable character, but I have secured good results with thin metal. It may be made thicker or otherwise strengthened at the lower part.

The receiver is shown quite large, such as is preferably used in recording singing, but it will be understood that the invention is applicable also to smaller receivers.

The particular curve or incline at the back of the receiver and the taper of the funnel shown are not absolutely essential, although excellent results have been secured with a receiver of the form shown in these figures, and this form is preferred, but it will be understood that variations in the form may be made.

The receiver, so far as above described, is

or may be substantially the same as shown and described in my application above referred to.

In accordance with the present invention, the receiver is provided with one or more lips for the purpose of securing an increased volume of sound by reinforcing and concentrating the sound waves, the lip or lips being placed in proper relation to the opening and funnel to receive the sound waves or some of them and transmit them into or through the receiver properly for effect upon the diaphragm. I have found that much improved effects are produced by the use of a single lip placed outside the opening at which the sound waves enter the receiver so as to guide or transmit into the receiver some of the sound waves. Better effects are produced, however, by the use inside the receiver of a lip or lips, so formed as to guide or transmit the sound waves into or through the funnel, and this effect is improved greatly by the addition of one or more lips within the funnel so formed as to guide or transmit the sound waves therefrom through the funnel properly for action on the diaphragm. The best results are secured by the combination of a lip outside the opening and two or more lips inside and arranged longitudinally of the receiver, so as to receive the sound waves successively and guide or transmit them through the receiver to the diaphragm. I have found, also, that an improvement in the result is secured by placing below each of the lips within the receiver a small pocket formed by a ledge projecting from the wall of the receiver within the funnel and provided with a slight depression.

The lips may be formed of any material suitable for use in the transmission of sound waves, as described, the material used being preferably of such resonance as to secure as largely as practicable the effect of fortifying or increasing the amplitude of the sound waves. I have secured excellent results with thin highly resonant metal, such as brass, and this is recommended. The pockets also are preferably made of the same material.

The position and form of the lips may be varied to some extent and satisfactory results be secured, and, as stated above, the number of lips used may be varied. It is preferable, however, that the lips should be curved so that each forms a part of a long spiral, thus acting to guide the sound waves through the funnel, and that the successive lips, where two or more are employed, be so arranged on opposite sides of the receiver and on such spiral curves, that the sound waves are guided by each lip to the next lip, and so on through the series of lips, this being found to secure a greatly improved result. It will be found an important feature, also, especially in receivers of the special class described and claimed in the application above referred to, to form the rear wall of the receiver on such a curve as to guide the sound waves in a

curved or spiral path to the first lip within the receiver by which the sound waves are transmitted onward. Where an outer lip is employed, this will preferably form a prolongation of said curve on one side of the receiver, this outside lip also being curved on a long spiral extending longitudinally of the receiver. This feature of spiral guides for the sound waves is an important part of the invention, broadly considered and independently of any special form of construction by which such guides for the sound waves may be provided.

The construction shown in Figs. 1 to 5 embodies all the features of invention above described in a form which I have found efficient and which will now be fully described.

The wall of the receiver C is curved outward at one side of the opening at which the sound waves enter, so as to form a curved lip *a* extending from the top of the receiver down nearly to the top of the funnel, this lip *a* being curved on a long spiral from its top downward and through its upper part forming a curve which is continuous with the curve 10 of the rear wall of the receiver, which, as shown in Fig. 4, is a curve of decreasing radius terminating at the opposite edge of the opening. The wall of the receiver on the opposite side of the opening is curved inwardly to form a lip *b* at the end of the curve 10 and which extends downwardly in a long spiral curve and terminates within the funnel a short distance below the slit 1, this lip being so formed and positioned as to receive the sound waves and guide them downward to the funnel. On the opposite side of the receiver from the lip *b* and preferably commencing a short distance above the funnel, as shown, is a third lip *c* of substantially the same form as lip *b* and extending nearly to the lower end of the funnel in the construction shown, this lip acting to guide or transmit sound waves received thereby through the funnel. Just below each of the lips *b*, *c* in the construction shown, is placed a pocket, these pockets 2, 3, being shown as formed by depressions in a small ledge projecting inwardly from the front wall of the receiver and formed integral therewith. These pockets, however, while desirable, are not essential, and may be omitted, or may be formed in any other suitable manner, as by securing a piece of suitable material to the inside of the receiver.

It will be understood that the lips *a*, *b* need not be formed by curving the edges of the receiver, as shown, although this forms a simple and efficient construction, but that they may be formed by attaching properly shaped pieces to the receiver, and that, as above stated, the number and position of the lips may be varied and will depend somewhat upon the size and form of the receiver to which the lips are applied.

In Figs. 6 and 7, I have shown a construction embodying the broad features of the invention as applied to phonograph receivers of the com-

mon form having a conical funnel in which the sound waves are received at the large end longitudinally of the funnel. As shown, this receiver D is provided with four lips *d, e, f, g* each formed on a spiral curve on the inside of the receiver and arranged in series longitudinally of the funnel so as to receive the sound waves successively, the successive lips being placed on opposite sides of the funnel. At the inner end of each of these lips is placed a pocket 2, substantially the same as previously described in connection with Figs. 1 to 5, but it will be understood, however, that, as in the construction previously described, these pockets may be omitted. It will be understood, also, that, in phonograph receivers of the form shown in Figs. 6 and 7, the number and position of the lips may be varied, but the form shown will be found to produce excellent results.

What is claimed is—

1. A sound conducting tube, having one or more lips extending longitudinally of the tube and arranged to receive and transmit the sound waves, substantially as described.
2. A sound conducting tube, having one or more lips within the tube extending into the passage for the sound waves and longitudinally of the tube and arranged to receive and transmit the sound waves, substantially as described.
3. A sound conducting tube having one or more spiral guides for the sound waves extending longitudinally of the tube, substantially as described.
4. A sound conducting tube having a series of spiral guides within and extending longitudinally of the tube, substantially as described.
5. A sound conducting tube, having one or more lips within the tube extending into the passage for the sound waves and curved in a spiral extending longitudinally of the tube and arranged to receive and transmit the sound waves, substantially as described.
6. A sound conducting tube having a series of lips extending longitudinally of the tube and arranged to receive the sound waves successively and transmit them through the tube, substantially as described.
7. A sound conducting tube having a series of lips curved in a spiral extending longitudinally of the tube and arranged to receive the sound waves successively and transmit them through the tube, the successive lips being arranged on opposite sides of the tube, substantially as described.
8. A sound conducting tube having one or more lips within the tube extending into the passage for the sound waves and longitudinally of the tube and arranged to receive and transmit the sound waves, and a pocket, as 2, at the end of the lip or lips, substantially as described.
9. A sound conducting tube having a series of lips curved in a spiral extending longitudinally of the tube and arranged to receive the

sound waves successively and transmit them through the tube, the successive lips being arranged on opposite sides of the tube, and a pocket, as 2, at the end of the lip or lips, substantially as described.

10. A sound conducting tube closed at the back of the opening for the sound waves and having its funnel extending from said opening transversely to the direction in which the sound waves enter, and having one or more lips extending longitudinally of the tube and arranged to receive and transmit the sound waves, substantially as described.

11. A sound conducting tube closed at the back of the opening for the sound waves and having its funnel extending from said opening transversely to the direction in which the sound waves enter, and having one or more lips inside the receiver extending longitudinally of the tube and arranged to receive and transmit the sound waves, substantially as described.

12. A sound conducting tube closed at the back of the opening for the sound waves and having its funnel extending from said opening transversely to the direction in which the sound waves enter, and having a lip at the side of and outside the opening and one or more lips inside the receiver extending longitudinally of the tube and arranged to receive and transmit the sound waves, substantially as described.

13. A sound conducting tube closed at the back of the opening for the sound waves and having its funnel extending from said opening transversely to the direction in which the sound waves enter, and having one or more lips inside the receiver extending longitudinally of the tube and arranged to receive and transmit the sound waves, and having a pocket, as 2, at the end of the lip or lips, substantially as described.

14. A sound conducting tube closed at the back of the opening for the sound waves and having its funnel extending from said opening transversely to the direction in which the sound waves enter, and having a series of lips curved in a spiral extending longitudinally of the tube and arranged to receive the sound waves successively and transmit them through the tube, the successive lips being arranged on opposite sides of the tube, substantially as described.

15. A sound conducting tube closed at the back of the opening for the sound waves and having a funnel extending transversely to the direction in which the sound waves enter, and having the back curved from one side to the other transversely to the funnel and on a curve of gradually decreasing radius, and a lip within the tube terminating said curve and curved in a spiral extending longitudinally of the tube, substantially as described.

16. A sound conducting tube closed at the back of the opening for the sound waves and having a funnel extending transversely to the direction in which the sound waves enter, and

having the back curved from one side to the other transversely to the funnel and on a curve of gradually decreasing radius, substantially as described.

- 5 17. A phonograph recording receiver closed at the back of the opening for the sound waves and having a funnel extending transversely to the direction in which the sound waves enter and having one or more lips inside the
10 opening extending longitudinally of the receiver and arranged to receive and transmit the sound waves, substantially as described.

- 15 18. A phonograph recording receiver closed at the back of the opening for the sound waves and having its funnel extending from said opening transversely to the direction in which the sound waves enter, and having one or more lips within the receiver curved in a spiral extending longitudinally of the receiver and
20 arranged to receive and transmit the sound waves, substantially as described.

19. A phonograph recording receiver closed at the back of the opening for the sound waves and having its funnel extending from said
25 opening transversely to the direction in which the sound waves enter, and having a lip *b* inside the opening arranged to transmit the sound waves therefrom into the funnel, and a lip *c* in the funnel arranged to transmit the
30 sound waves through the funnel, substantially as described.

20. A phonograph recording receiver closed

at the back of the opening for the sound waves and having its funnel extending from said opening transversely to the direction in which
35 the sound waves enter, and having a lip *a* at the side of the opening arranged to transmit the sound waves therefrom into the receiver, a lip *b* inside the opening arranged to transmit the sound waves therefrom into the fun-
40 nel, and a lip *c* in the funnel arranged to transmit the sound waves through the funnel, substantially as described.

21. A phonograph recording receiver closed at the back of the opening for the sound waves
45 and having its funnel extending from said opening transversely to the direction in which the sound waves enter, and having a lip *a* at the side of the opening arranged to transmit the sound waves therefrom into the receiver, 50
a lip *b* inside the opening arranged to transmit the sound waves therefrom into the funnel, a lip as *c* in the funnel arranged to transmit the sound waves through the funnel, and a pocket below each of the lips *b*, *c*, substan- 55
tially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

FRANCIS S. KINNEY.

Witnesses:

T. F. KEHOE,
C. J. SAWYER.