

No. 671,144.

Patented Apr. 2, 1901.

W. B. OUTTEN.
DEVICE FOR TRANSMITTING SOUND.

(Application filed Aug. 4, 1899.)

(No Model.)

Fig. 1.

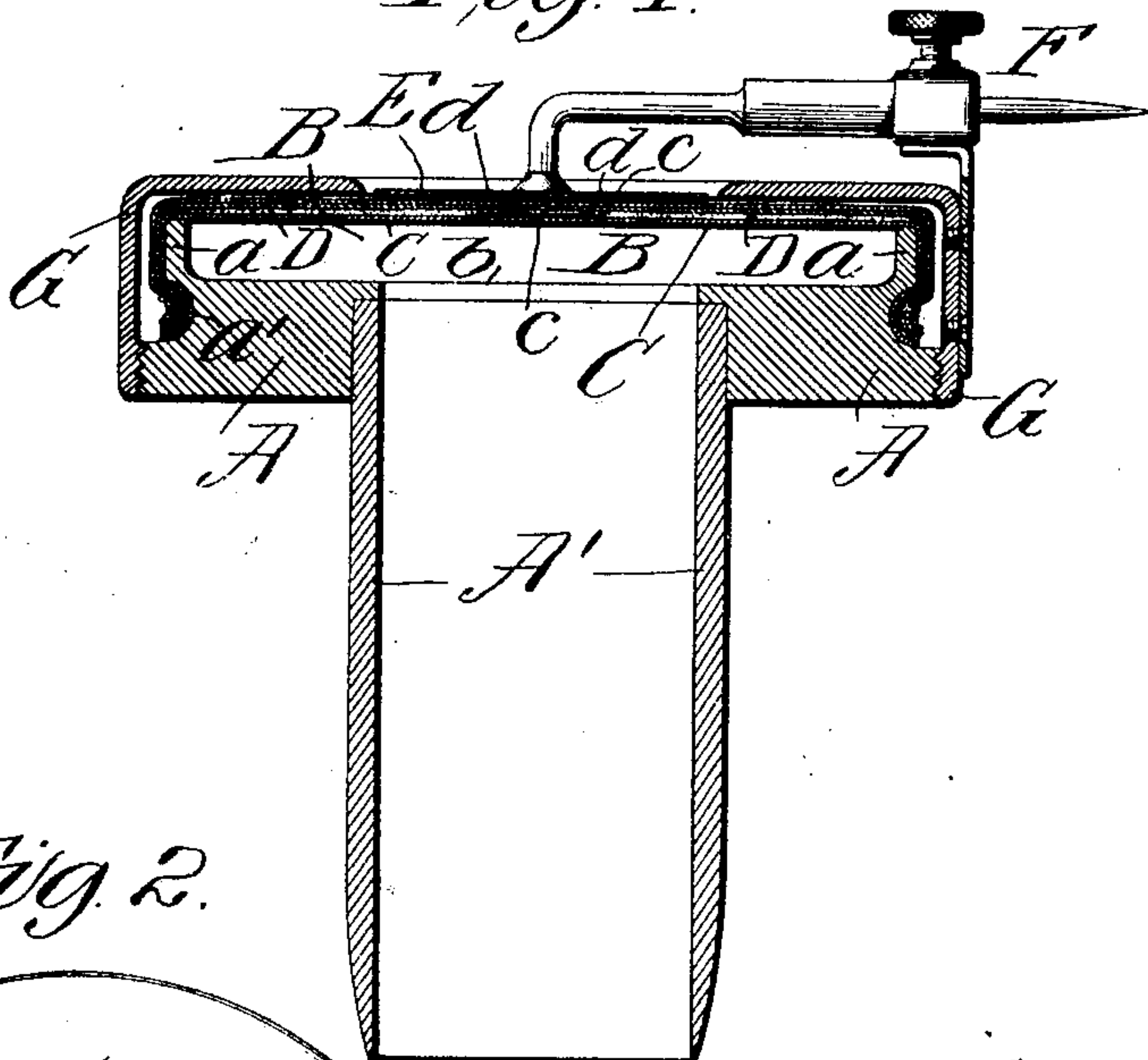


Fig. 2.

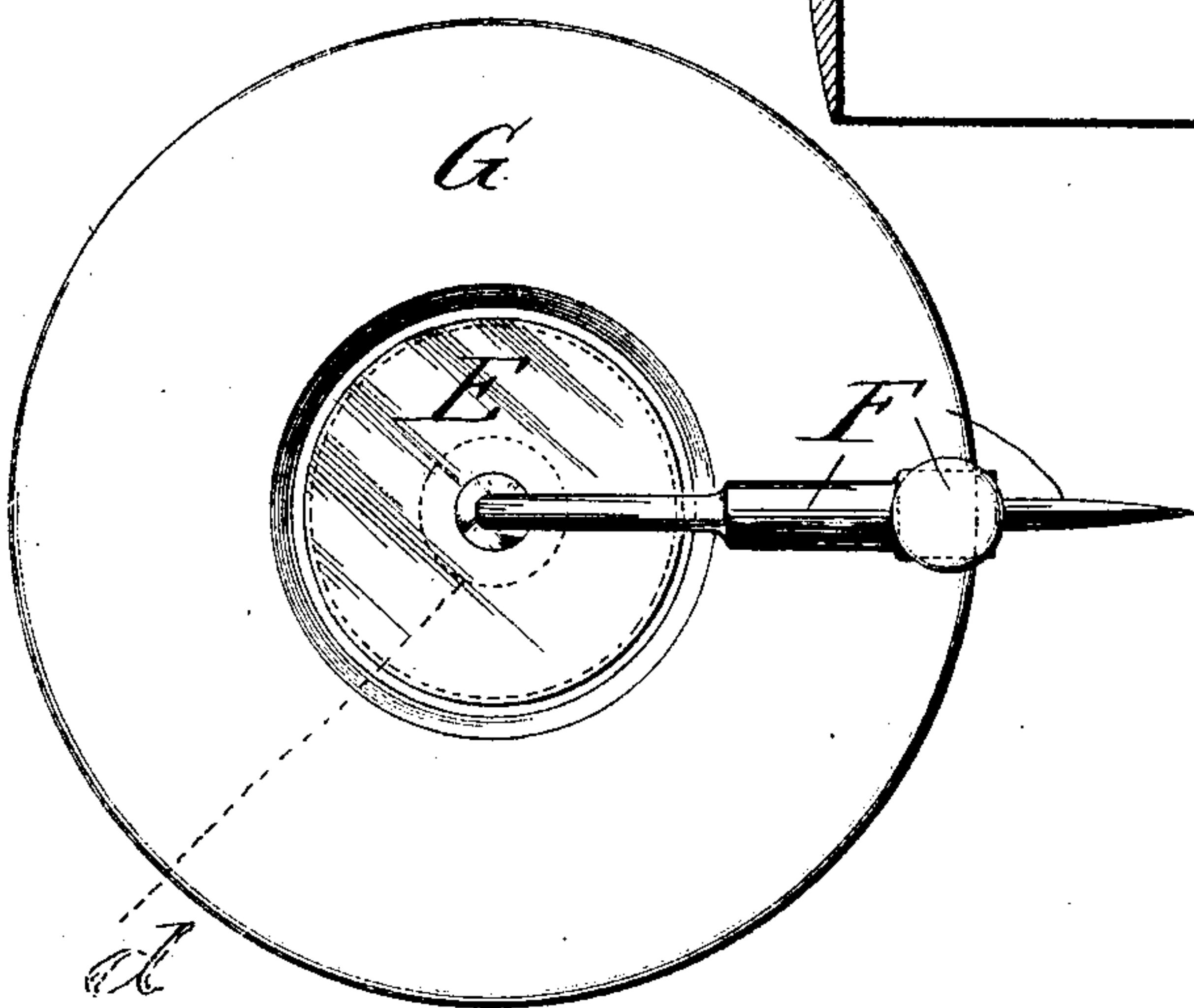


Fig. 3.

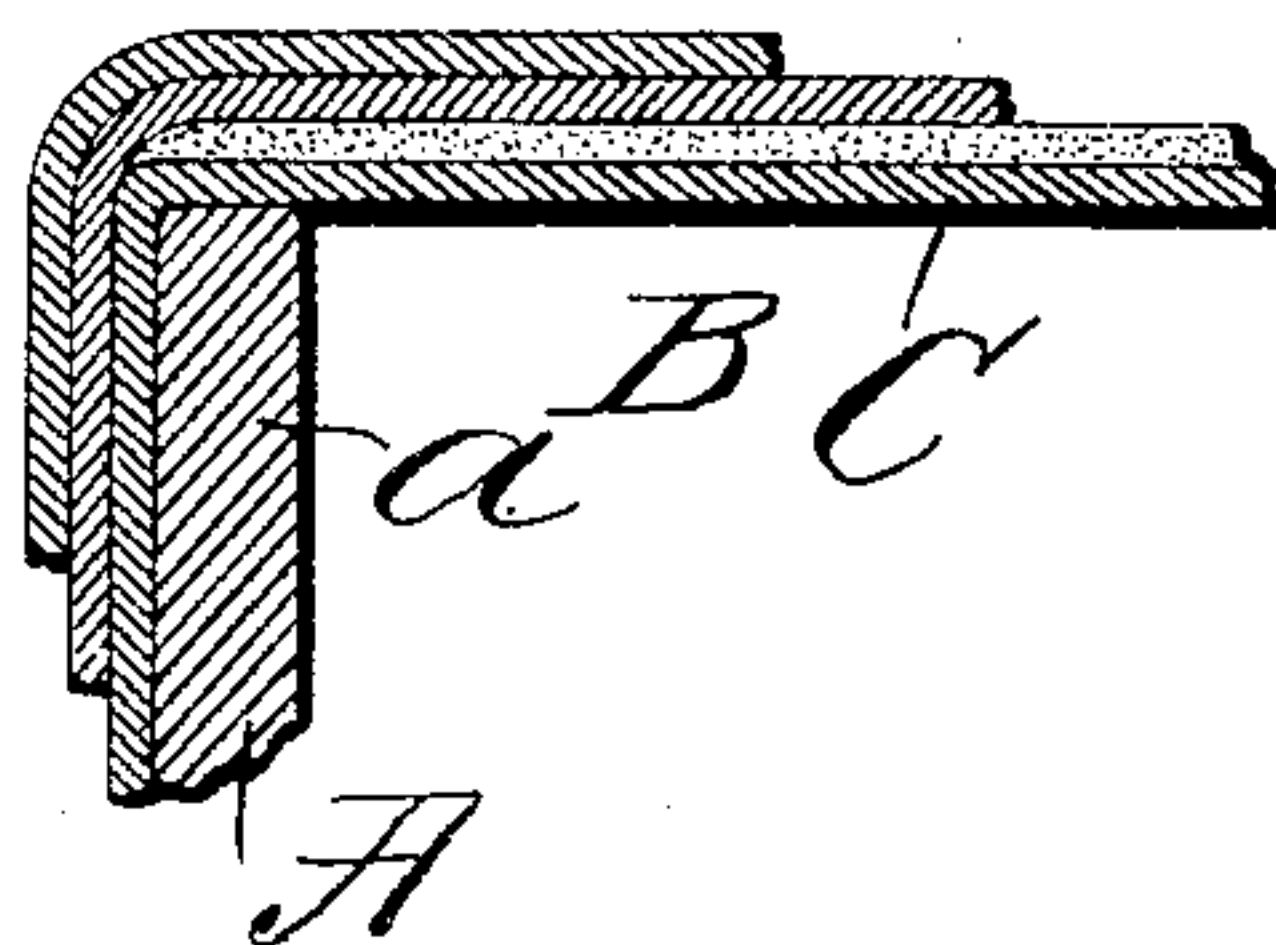


Fig. 4.

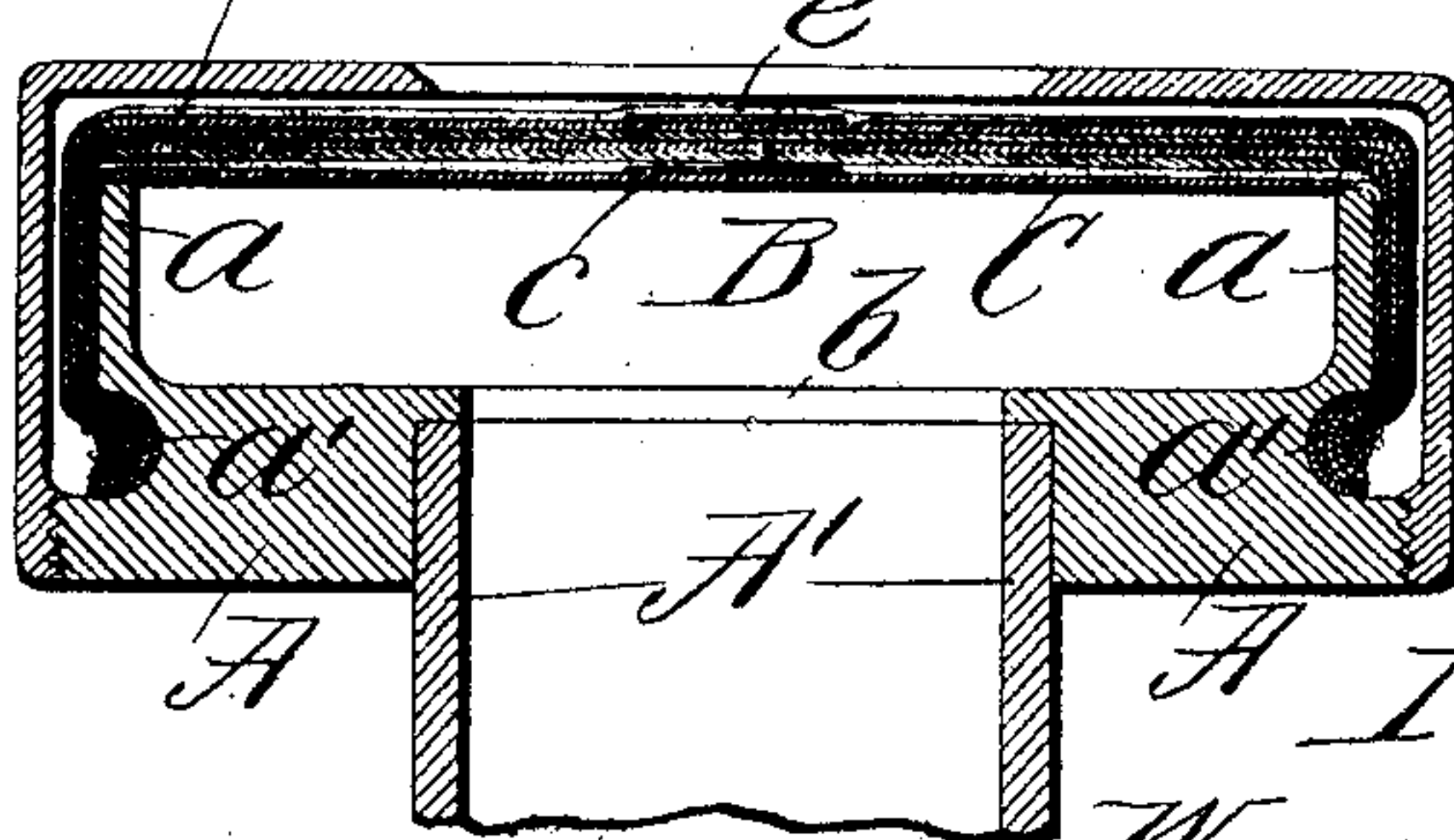
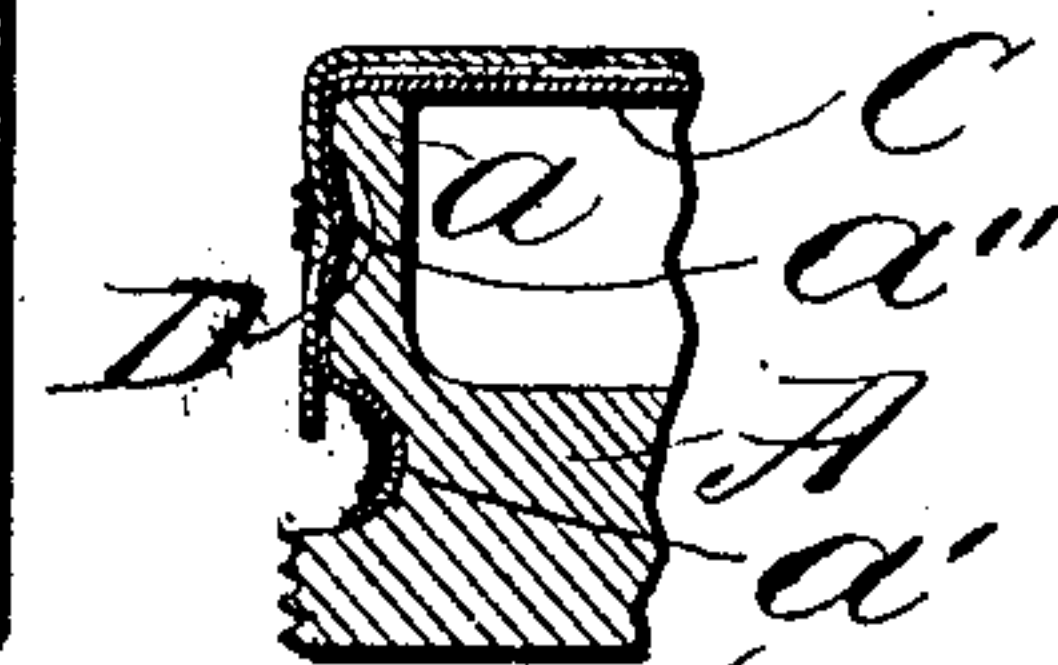


Fig. 5.



Attest:
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UNITED STATES PATENT OFFICE.

WARREN B. OUTTEN, OF ST. LOUIS, MISSOURI.

DEVICE FOR TRANSMITTING SOUND.

SPECIFICATION forming part of Letters Patent No. 671,144, dated April 2, 1901.

Application filed August 4, 1899. Serial No. 726,100. (No model.)

To all whom it may concern:

Be it known that I, WARREN B. OUTTEN, a citizen of the United States, residing at the city of St. Louis, State of Missouri, have invented a certain new and useful Improvement in Devices for Transmitting Sound, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a vertical sectional view through my improved sound-transmitting device. Fig. 2 is a top plan view thereof. Fig. 3 is an enlarged detail sectional view. Fig. 4 is a modified form thereof, and Fig. 5 is a detail view illustrating a modified form of attaching the diaphragms to their support.

This invention relates to a new and useful improvement in devices for transmitting sound and is adapted to be used in connection with phonographs, graphophones, gramophones, telephones, stethoscopes, auscultators, or other devices wherein diaphragms are vibrated to transmit sound-waves.

The object of the invention is to produce a device of the character described which will transmit sound-waves approximating in volume more nearly the original sound-waves than in instruments of similar character heretofore made and with which I am familiar.

Being useful in connection with so many sound-wave transmitters, it will be obvious that slight modifications can and undoubtedly will be made to accommodate invention to the various uses for which it may be employed.

The invention consists, essentially, in the arrangement of the diaphragms, which diaphragms are preferably composed of animal membrane wherein muscular tissues or fibers are present in order to approximate the muscular structure of the ear-drum, wherein the tissues or fibers are matted to secure the uniform tension throughout. While I have employed animal membrane in devices of this character which I have constructed and obtained excellent results, yet it may be that there are other materials which can be employed with good results, and therefore I do not wish to be understood as limiting myself

specifically to the materials hereinafter mentioned, nor to the treatment thereof by any particular ingredients, as it is obvious that there are numerous ingredients which can be used in connection with the diaphragms without in the least departing from the nature and principle of my invention.

In the drawings, A indicates a box or housing provided with a flange *a*, forming, with the diaphragm stretched thereover, an internal sounding-chamber B, connecting with the exterior or other place by an opening *b* in the stem or tube A', extending rearwardly from the body portion A.

C indicates a diaphragm of some principal or foundation membrane, such as gold-beater's skin, which is stretched over the flange *a* and secured in position while tense in some suitable manner—such, for instance, as a cord or wire engaging the edges thereof and burying said edges in a groove in the side walls of the flange *a*. This diaphragm may be stretched while wet or green, so that upon drying it will become tense or taut. In the center of this diaphragm and preferably on the outer surface thereof I secure, by means of a suitable mucilaginous substance, a disk *c*, which disk is preferably of animal membrane, such as a fish-scale. In using a fish-scale I prefer to trim the edges, so that the radiating lines will locate the center of the scale in the center of the disk, the margin of the scale being concentric with the center thereof. By applying this disk or scale in the center of the diaphragm of membrane after the diaphragm has been placed in position still greater tension is placed on the diaphragm due to the drawing or pulling action of the securing medium for the disk and also create what I will term "tense radiating lines" from the disk, which serve to concentrate the vibration of the diaphragm to a central point. This, in my opinion, is very essential, in that the liability to the formation of dormant areas which might exist in the diaphragm is lessened, which dormant areas tend to neutralize the vibration of the diaphragm, said areas, which might otherwise be dormant, being in my construction made active by the pull of the central disk in forming these tense radiating lines. For these reasons the flange *a* is preferably cir-

cular in order that this pull may be evenly distributed throughout the surface of the diaphragm, and the disk is centrally located relative to the attachment of the edges of the
5 diaphragm.

After the diaphragm above described is attached and made tense or taut by the arrangement of the central disk thereon said diaphragm and disk are painted or coated with
10 some one of the essential oils—such as lanoline, oil of wintergreen, sassafras, or cloves, &c.—and then a second diaphragm (marked D in the drawings) is stretched into position over the first and secured in place. This second
15 diaphragm may consist of one or more layers of material, preferably animal membrane, such as bladder or gold-beater's skin. Where there are a plurality of layers in this second diaphragm they are first preferably damp-
20 ened, stretched, and pressed together, so as to act practically as one diaphragm. The oil coating on the first diaphragm serves to separate the two diaphragms and practically entirely fills the narrow space between. This
25 filling of oil or other liquid being interposed between the receiving-diaphragm and the delivering-diaphragm makes each of said diaphragms sensitive and capable of slight independent vibration, yet serving as a trans-
30 mitting medium, having such properties that sound-waves communicated to one of said diaphragms—for instance, the receiving-diaphragm—are transmitted accurately and positively to the other or delivering diaphragm.
35 When this second diaphragm is placed in position, a central disk *d* is arranged on the external surface thereof in substantially the same manner and for the same purpose as that heretofore described with reference to
40 the disk *c*. In fact, I prefer to use a fish-scale as the disk *d* the same as that applied to the first diaphragm.

E indicates a metallic disk secured to the external diaphragm by the use of some suitable mucilaginous substance, which metallic
45 disk is of greater diameter than the fish-scale, so that its peripheral margins extend beyond and are secured directly to the diaphragm. This metallic disk also serves to place the external diaphragm under further tension and
50 enables the attachment of any mechanical device designed to be secured to the external diaphragm—as, for instance, the reproducing or recording needle or stylus of a gramophone, &c.
55

In Fig. 1 I have shown a common form of reproducing-stylus in use on gramophones, and have marked same *F*, although I do not claim this feature as any part of my invention.

60 As shown in Fig. 5, the flange *a* may be formed with a plurality of grooves, into the lowermost of which, as at *a'*, may be secured the diaphragm *C*, while into the upper *a''* may be secured the diaphragm *D*, whereby the act
65 of securing the diaphragm *D* will serve to draw the diaphragm *C* tighter, and, if desired, an elastic band may be used for this

purpose for taking up any slack in either of the two diaphragms.

I have also discovered in experiments made 70 with different metals used as disks (marked in the drawings as *E*) that different tones may be developed in the device by the substitution of one disk made of one material for another made of a different material. For in- 75 stance, a disk made of gold will reproduce the bass or low tones with considerable volume, while disks made of nickel or aluminium attached to the same diaphragm will bring out the higher tones—such as alto, soprano, 80 &c.—more distinctly. These disks of different metal thus enable me to give a key or several keys to the device, and by making these disks removable and exchangeable it is possible to develop the greatest volume of sound, 85 depending upon the tone or nature of the sound transmitted. In furtherance of this discovery I have employed chlorids of the different metals and obtained the same result—as, for instance, painting the external dia- 90 phragm with chlorid of gold will cause the device so treated to transmit the tense or deep tones in heavy volume, while using chlorid of aluminium, nickel, &c., will render the device capable of transmitting the higher tones 95 with greater effect.

In Fig. 1 I have shown a metal disk *E*, which, as stated before, may be removable, so that the key may be changed, depending upon the nature of the tone to be reproduced, 100 while in Fig. 4 I have indicated at *e* a coating of chlorid on the external diaphragm for the same purpose. Also in Fig. 4 the external diaphragm *D* is made up of four layers; but I wish to be understood as not limiting 105 myself to any number of layers, as I have found that a plurality of layers in the external diaphragm can be used to some extent to determine the key or tone of the device—that is, a less number of thin layers, such as gold- 110 beater's skin, and a shallow sound-box, such as shown in Fig. 1, will give a high tone to the instrument, while a greater number of layers, say ten or twelve of gold-beater's skin or four or six of bladder-skin and a deep 115 sound-box, such as shown in Fig. 4, will give a deep tone to the instrument.

G indicates a casing or shell which is employed to protect the diaphragm for well-understood purposes. In using the words “re- 120 ceiving” and “delivering” diaphragms I do not wish to be understood as confining such description either to the internal or external diaphragm, as in some instances, such as that shown in the drawings, the external 125 diaphragm can properly be termed the “receiving-diaphragm” and the internal diaphragm the “delivering-diaphragm,” while in other uses the internal diaphragm might be the receiving-diaphragm and the external 130 the delivering-diaphragm.

I am aware that minor changes in the arrangement, construction, and combination of several parts of my device can be made and

substituted for those herein shown and described without in the least departing from the nature and principle of my invention.

By the term "membrane" as used in this description and the following claims in definition of the diaphragm I wish it understood that I do not mean to limit myself to membrane as technically employed, but desire to distinguish a natural animal or vegetable membrane or an artificial or manufactured membranous diaphragm from a mineral or metallic diaphragm.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. The herein-described diaphragm, consisting of two layers or thicknesses with an interposed film of liquid; substantially as described.

2. A diaphragm formed of two layers, between which is a film of liquid, and a central disk secured to at least one of said layers; substantially as described.

3. A diaphragm composed of two layers, of animal membrane and having an interposed space occupied by a film or body of oil; substantially as described.

4. A diaphragm formed of two layers of animal membrane, having a space between, and a disk of animal tissue secured to the center of at least one of said layers; substantially as described.

5. A diaphragm formed of internal and external layers, a film of oil between said layers, said external diaphragm consisting of a number of thicknesses of material pressed together; substantially as described.

6. A diaphragm composed of internal and external layers, said internal layer being provided with a central disk on its outer face, a film of oil between said two layers, said external layer consisting of a number of thicknesses of material pressed together, and a central disk secured to the outer face of said external layer; substantially as described.

7. The combination with a diaphragm composed of animal membrane, of a disk secured to the center thereof, in substantially the manner specified, by some adhesive substance, whereby said diaphragm is rendered taut or tense; substantially as described.

8. The combination with a diaphragm of animal membrane, of a disk of animal tissue secured to the center thereof by an adhesive substance, whereby said diaphragm is drawn from all points toward the center so as to form tense, radiating lines; substantially as described.

9. The combination with a diaphragm composed of animal membrane, of a circular support therefor, a disk of animal tissue which is secured to the center of said diaphragm by adhesive substance, whereby said disk draws the diaphragm toward a central point to form tense, radiating lines and overcome dormant areas in said diaphragm; substantially as described.

10. A diaphragm consisting of a plurality of flexible layers superimposed one directly upon the other, and a separating medium in the form of a liquid between said layers.

11. The combination with a sound-box having securing-flanges, of a plurality of layers stretched over said flanges and secured in position, said layers being superimposed directly one upon the other, and a film of liquid between the layers.

12. The combination with a sound-box having a circular flange, of a plurality of layers stretched thereover and secured in position, said layers being superimposed directly upon each other, film of liquid interposed between said layers, and a central disk on one of said layers.

13. The combination with a diaphragm of animal membrane, of a metallic chlorid secured thereto, substantially as and for the purpose described.

14. The combination with a support, of a diaphragm stretched thereover, a disk secured to the center of said diaphragm in substantially the manner specified, and a chlorid coating for developing high or low tones; substantially as described.

15. The combination with a support formed with a plurality of grooves, of a plurality of diaphragms secured to said support by suitable fastening devices, whereby the attachment of the outer diaphragm serves to render more tense the inner diaphragm; substantially as described.

16. The combination with a suitable support formed with a plurality of grooves, of a diaphragm stretched over said support and over at least one of said grooves, means for securing said diaphragm in the lower groove, a second diaphragm, which is stretched over the first-mentioned diaphragm, and securing devices for forcing the edges of said second diaphragm into the upper groove, whereby the diaphragm first applied is tightened; substantially as described.

17. The combination with a support formed with a plurality of grooves, of a diaphragm stretched thereover and secured in the lowermost of said grooves, and another diaphragm stretched over the first-mentioned diaphragm, which second diaphragm is designed to be secured in the upper groove, and an elastic band for securing said second diaphragm into the upper groove, whereby the first-mentioned diaphragm is pressed into said upper groove; substantially as described.

18. A diaphragm for the purpose described—treated with a chlorid, substantially as described.

In testimony whereof I hereunto affix my signature, in the presence of two witnesses, this 31st day of July, 1899.

WARREN B. OUTTEN.

Witnesses:

F. R. CORNWALL,
A. S. GRAY.