No. 648,975. Patented May 8, 1900.

E. H. MOBLEY.

DIAPHRAGM FOR SOUND RECORDING, REPRODUCING, AND TRANSMITTING INSTRUMENTS.

(Application filed Jan. 8, 1899.)

(No Model.)

Fig. 1.

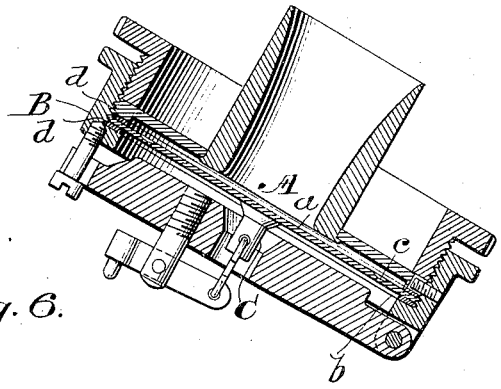


Fig. 6.

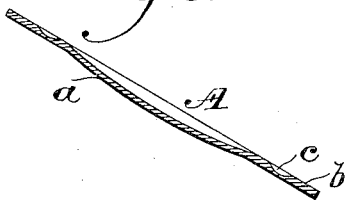


Fig. 2.

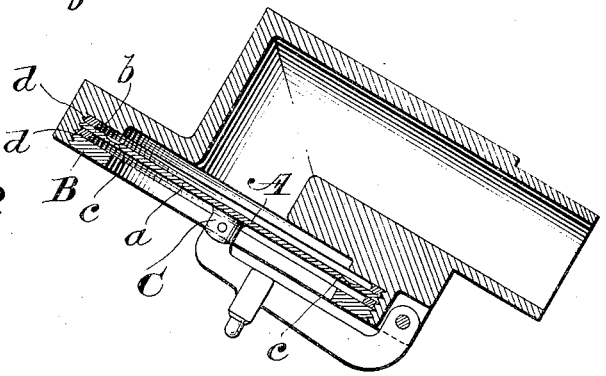


Fig. 3.

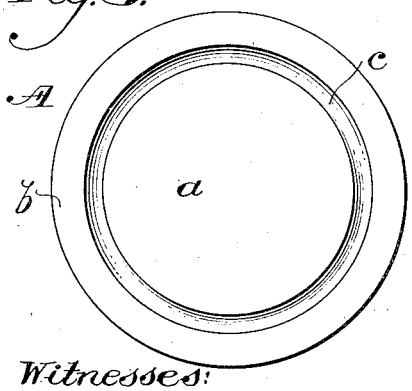


Fig. 4.

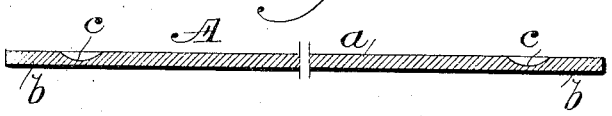
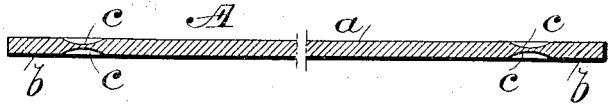


Fig. 5.



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UNITED STATES PATENT OFFICE.

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DIAPHRAGM FOR SOUND RECORDING, REPRODUCING, AND TRANSMITTING INSTRUMENTS.

SPECIFICATION forming part of Letters Patent No. 648,975, dated May 8, 1900.

Application filed June 8, 1899. Serial No. 719,762. (No model.)

To all whom it may concern:

Be it known that I, EDWIN H. MOBLEY, of the city and county of Philadelphia, State of Pennsylvania, have invented an Improvement in Diaphragms for Sound Recording, Reproducing, and Transmitting Instruments, of which the following is a specification.

My invention relates to diaphragms for sound recording, reproducing, and transmitting instruments; and it consists of the improvements which are fully set forth in the following specification and are shown in the accompanying drawings.

Many efforts have been made to improve the tone, volume, and quality of sounds transmitted by sound recording, reproducing, and transmitting instruments, and these efforts have been chiefly directed toward the improvement of the diaphragms, through the vibrations of which the sound-waves are transmitted. In most of the diaphragms used much of the sound is lost by the transmission of a part of the vibrations laterally through the diaphragm to the head or frame by which the diaphragm is carried, which has the effect not only of decreasing the effective vibrations, but also of imparting an artificial tone or "timbre" to the transmitted sounds by the vibrations of the substance of the head or frame. To overcome this difficulty, it has been proposed to form the central and outer portions of the diaphragm of distinct pieces united by strips between the central and outer portions. In such cases the openings formed in the diaphragm permit a portion of the sound-waves to pass through the openings without acting upon the diaphragm. Such sound-waves are lost and the passage of the air-currents through these openings tends to affect the sound-waves produced by the vibrations of the central portion of the diaphragm. It has also been proposed to form the central and outer portions of the diaphragm of separate pieces connected by an annulus or ring; but in such case the connecting annulus or ring has impeded rather than increased the vibration of the central plate and has not effectively prevented the lateral transmission of vibrations to the outer portion and thence to the frame or head.

It is the object of this invention to obtain the maximum effect of the vibration of the diaphragm with a minimum dissipation or loss by lateral transmission and at the same time to avoid the presence of openings or perforations in the body of the diaphragm.

In carrying out my invention I provide the diaphragm, which consists of a thin disk of metal or other suitable material, with a very thin or attenuated portion between the center of the disk to which the vibrations are imparted and the outer edge by which the diaphragm is clamped or secured in the frame.

In the accompanying drawings, Figure 1 is a vertical sectional view of a reproducer-head of a phonograph employing my improved diaphragm. Fig. 2 is a similar view of the reproducer-head of a graphophone. Fig. 3 is a plan view of the diaphragm. Fig. 4 is a cross-sectional view of one form thereof. Fig. 5 is a similar view of another form, and Fig. 6 is a cross-sectional view of a diaphragm embodying my invention and illustrating an additional feature thereof.

My improved diaphragm may be used in any sound recording and reproducing instrument. For purposes of illustration I have shown it applied to the reproducing-heads of a phonograph and graphophone. It may also be employed in gramophones and in the recording as well as in the reproducing heads and may be used in telephonic apparatus.

My invention is not concerned with the construction of the sound recording and reproducing instruments, and as the phonograph and graphophone reproducers shown are of well-known construction they will not be particularly described.

A is a diaphragm, which may be composed of a thin disk or plate of any suitable material, whether metallic, vegetable, or animal. I prefer, however, to employ metal, and have obtained most excellent results with forged steel. This diaphragm is composed of a central portion *a* and an outer portion *b*, surrounding the central portion and united therewith by a continuous and relatively-attenuated narrow part *c*. In my preferred construction the diaphragm may be produced by making a continuous annular groove in its

surface, forming the attenuated portion *c* and a relatively-thick central portion *a* and outer inclosing portion *b*, and this groove may be made upon one surface only, as shown in Fig. 4, or upon both surfaces, as shown in Fig. 5.

It will be understood that the thickness of the diaphragms shown in the drawings, and particularly in Figs. 4 and 5, is greatly exaggerated for purposes of illustration. In practice the diaphragm is a very thin sheet; but the central portion *a* and the outer inclosing portion *b* are relatively of substantially greater thickness than the connecting portion *c*. I find that the sound may be materially improved by making the front face of the diaphragm convex or by making the central portion *a* concavo-convex, as shown in Fig. 6. It is not necessary that the outer portion *b* should be of the same thickness as the inner central portion *a*. It may, if desired, be made heavier or thicker to form a more effective means of clamping the diaphragm in place. The diaphragm is clamped or secured in the head in the usual manner by the outer portion *b*, as by a clamping-ring B between washers *d*. The shank C of the stylus, needle, or point is connected with the central portion *a* in the usual manner. The advantages of this construction are that the attenuated connecting portion *c* by reason of its relatively-greater thinness permits a much greater resilience in the central or operative portion of the diaphragm, so that that portion is much more sensitive to the sound-waves and more accurately transmits the vibrations; also, that the vibrations of the central portion of the diaphragm are not transmitted laterally to so great an extent through the attenuated portion *c* to the outer portion *b*, and are consequently not dissipated or lost, and also that as the diaphragm is closed throughout and not provided with any openings or perforations there is consequently no passage of air currents or waves directly through it which would result in a loss of part of the effective vibrations and also objectionably affect those transmitted through the plate.

What I claim as new, and desire to secure by Letters Patent, is as follows:

1. A diaphragm for sound recording, reproducing and transmitting instruments, consisting of a thin plate or disk having its central portion connected with the outer portion or edge by a relatively thin or attenuated connecting part, said central portion and outer portion being of greater thickness than said connecting portion.

2. A diaphragm for sound recording, reproducing and transmitting instruments, consisting of a thin plate or disk having its central portion connected with the outer portion or edge by a relatively thin or attenuated connecting part said diaphragm being composed of a single integral piece.

3. A diaphragm for sound recording, reproducing and transmitting instruments consisting of a thin plate or disk having a continuous groove adjacent to its outer edge forming a relatively thin or attenuated portion *c* between the relatively-thick central portion and outer edge.

4. A diaphragm for sound recording, reproducing or transmitting instruments consisting of a thin plate or disk having its central portion provided with a convex front face and connected with the outer portion or edge by a relatively thin or attenuated connecting part.

5. A diaphragm for sound recording, reproducing or transmitting instruments, consisting of a thin plate or disk, having a concavo-convex central portion connected with the outer portion or edge by a relatively thin or attenuated connecting part.

In testimony of which invention I have hereunto set my hand.

EDWIN H. MOBLEY.

Witnesses:
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J. W. KENWORTHY.