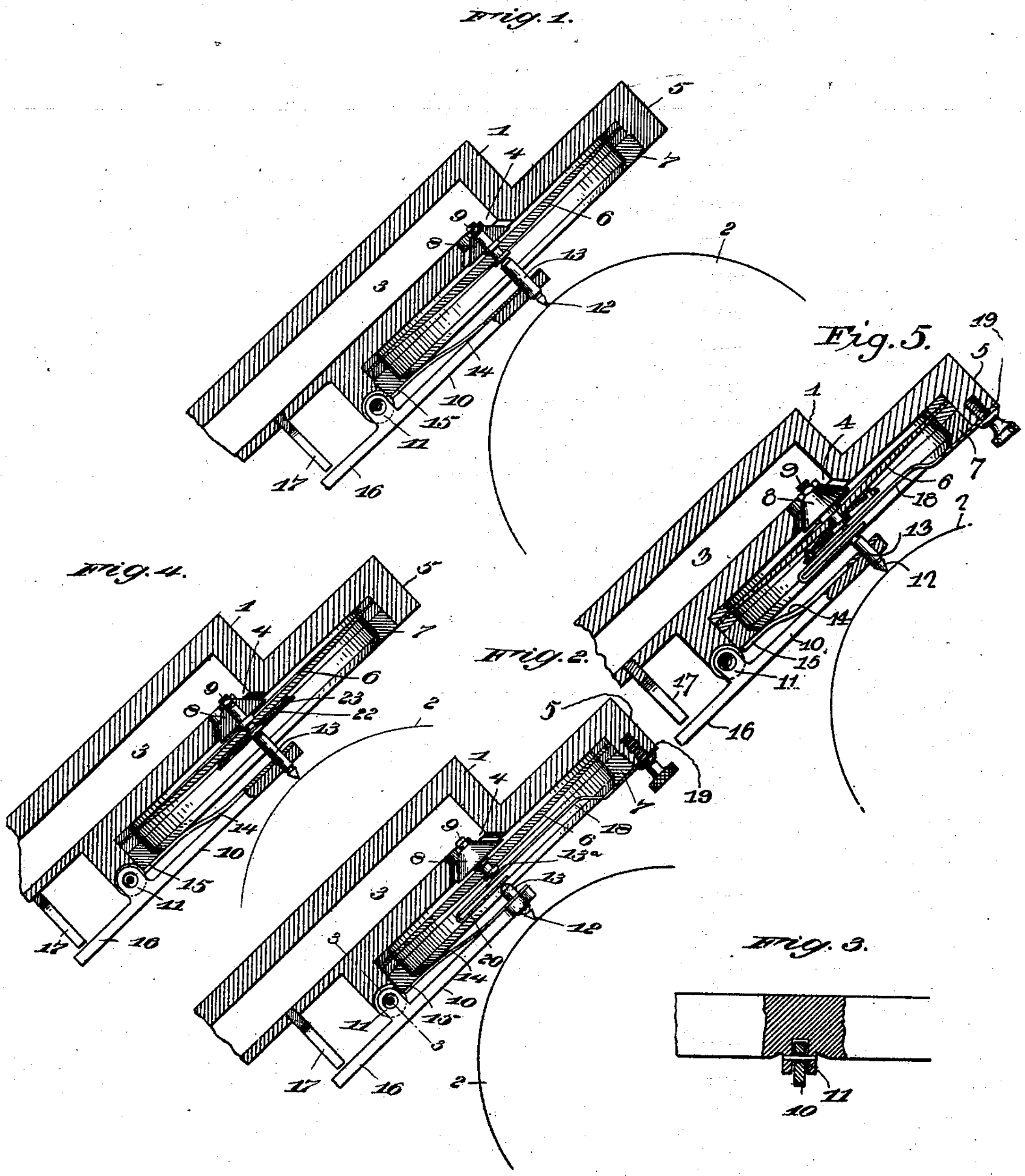
No. 648,406. Patented May 1, 1900.

W. HART.

GRAPHOPHONE REPRODUCER.

(Application filed June 14, 1898.)

(No Model.)



Witnesses

William Hart, Inventor

By his Attorneys,

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UNITED STATES PATENT OFFICE.

WILLIAM HART, OF KIRKSVILLE, MISSOURI.

GRAPHOPHONE-REPRODUCER.

SPECIFICATION forming part of Letters Patent No. 648,406, dated May 1, 1900.

Application filed June 14, 1898. Serial No. 683,419. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM HART, a citizen of the United States, residing at Kirksville, in the county of Adair and State of Missouri, have invented a new and useful Graphophone-Reproducer, of which the following is a specification.

This invention relates to reproducers for graphophones and similar instruments; and it has for its object to provide an improved form of diaphragm and novel means for transmitting the record of the phonogram or record-tablet to the diaphragm, whereby the said diaphragm will sensitively and accurately reproduce the record without the disagreeable sounds which are common to most of the reproducing devices now used in connection with graphophones, phonographs, and the like.

The invention also has for its object improved means which shall insure a greater amplitude of vibration and a louder sound than found in other types of reproducing devices or instruments.

With this object in view the invention consists in the novel construction, combination, and arrangement of parts hereinafter more fully described, illustrated, and claimed.

In the drawings, Figure 1 is a longitudinal sectional view of a reproducer for graphophones fitted with the improvements contemplated by the present invention and showing in diagram the phonogram or record-cylinder. Fig. 2 is a view similar to Fig. 1, showing a mute spring or plate interposed between the transmitting point or stud and the diaphragm. Fig. 3 is a detail sectional view showing the pivotal connection for the stylus-arm. Fig. 4 is a sectional view similar to Fig. 1, showing the use of a tension plate or disk in connection with the vibratory diaphragm. Fig. 5 is a sectional view showing a modification.

Referring to the accompanying drawings, the numeral 1 designates the tubular reproducing head or casing of the ordinary form and designed to be mounted in the usual manner in an operative position with relation to the phonogram or record-cylinder 2; but as these features form no part of the present invention the framework and supports for the head or casing and for the phonogram or record-cylinder are not shown in the drawings.

The tubular reproducing head or casing 1 is provided with the usual longitudinal sound-passage 3, which communicates at one end with the ordinary "horn" or "ear-tubes" and at its other end opens into the central orifice 4, formed at the center of the diaphragm-cup 5. The diaphragm-cup 5 is formed at one side of the head or casing 1 and receives therein the vibratory diaphragm 6, which is held in place within the cup by means of the usual clamping-ring 7, having a threaded engagement with the inner wall of the cup and binding on the peripheral edge of the diaphragm, whereby the major portion of said diaphragm is permitted to have a free and unobstructed vibration within the cup to provide for forcing the sound-waves through the orifice 4 and the passage 3, communicating therewith.

The diaphragm 6 is made of any material suitable for the purpose; but in the present invention the said diaphragm 6 tapers in thickness toward its periphery, whereby the same will be thickest at its center and thinnest at its periphery, and therefore most sensitive at the latter point. By reason of constructing the diaphragm of a tapering thickness a greater amplitude of vibration is produced than by the use of a diaphragm of uniform thickness throughout, and a greater volume of sound is necessarily caused to pass out of the reproducing head or casing.

In connection with the diaphragm 6 of tapering thickness there is preferably employed a separate weight 8, which is arranged at one side of the diaphragm, preferably the inner side, and centrally thereof, so as to lie within the orifice 4 of the head or casing. This weight is designed to move in unison with the diaphragm and is rigidly connected thereto by means of a bolt or similar fastening 9, and according to the size of the said weight 8 the amplitude of vibration of the diaphragm will be correspondingly increased or diminished.

To provide for transmitting the record to the diaphragm, there is employed a pivotal stylus-arm 10, which arm is pivoted intermediate its ends, as at 11, to one side of the diaphragm-cup 5, and the hole or opening in the said arm 10 which receives the pivot-pin is broached out slightly from each side with a tapering broach, thereby giving a slight lat-

eral play to the arm in either direction, so that the stylus or reproducing-point 12 can readily adjust itself to the irregularities of the record in the phonogram-blank or record-cylinder 2. The stylus or reproducing-point 12 is projected from the outer side of the arm 10 and one end thereof and is arranged directly opposite the inwardly-projecting transmitting point or stud 13, which in the construction shown in Fig. 1 works against the outer side of the diaphragm at the center thereof to provide for transmitting the record thereto. A pressure-spring 14 is secured fast at one end to the inner side of the arm 10 and has its free end bearing against a shoulder 15, adjacent to the pivot of the arm, to provide for exerting sufficient pressure on the stylus-arm to hold the stylus or reproducing-point in firm contact with the phonogram or record-cylinder and to prevent the same from jolting out of place while also easing up the weight on the diaphragm.

At one side of its pivot the stylus-arm 10 is extended, as at 16, and said extension is designed to pass into a holding or guiding fork 17, projected from one side of the head or casing 1 below the cup thereof. This movement of the arm extension 16 into the fork 17 occurs when the entire reproducing device is lifted from the phonogram or record-cylinder. The function of the fork 17 is to hold the arm 10 perfectly straight and in proper position for the stylus thereof to engage with the surface of the record when the device is again lowered to an operative position.

When the ear-tubes are employed instead of the horn, it is desirable to reduce the intensity of the sound, and to accomplish this result I employ a mute spring or plate 18. (See Fig. 2 of the drawings.) This mute spring or plate 18 is arranged at the outer side of the diaphragm and is fastened rigidly at one end, as at 19, to one end of the head or casing 1, the other end of said spring or plate being folded upon itself, as at 20, and interposed between the transmitting point or stud 13 and the central portion of the diaphragm, and on its inner face the said mute spring or plate is provided with a supplemental transmitting-point 13^a, which contacts with the diaphragm. The folded end 20 of the mute spring or plate serves to take up or ease the positive action of the stylus-arm, and thereby impart a gentle vibration to the diaphragm.

To provide for further increasing the distinctness and force of the sound, the central portion of the diaphragm 6 may be stiffened or tightened by the use of a supplemental tension plate or disk 22. (Shown in Fig. 4 of the drawings.) This tension plate or disk 22 is formed of a thin plate of spring metal and is provided at one side with a plurality of contact studs or projections 23, adapted to press against the adjacent face or side of the diaphragm 6. In using the tension plate or disk 22 as a part of the reproducer the diaphragm 6 may or may not be of a tapering thickness, and said plate or disk 22 is preferably held in place by means of the bolt or fastening 9 for the weight 8, although it will be understood that in the event of the plate or disk being used with the diaphragm without the weight a similar bolt or fastening may be utilized to provide connection between the plate or disk and the diaphragm. When the weight 8 is not used, the tension plate or disk may obviously be arranged at either side of the diaphragm 6; but the preferable arrangement of the plate or disk 22 is at the outer side of the diaphragm, as shown in Fig. 4 of the drawings, and it will further be observed that when the bolt or fastening 9, which passes through the center of the plate or disk 22 and the diaphragm, is tightened up the studs or projections 23 will cause both the diaphragm and the tension plate or disk to bulge slightly into a concavo-convex form, thereby stiffening or tightening up the central portion of the diaphragm, and necessarily increasing its sensitiveness and accuracy of reproduction. While the tension plate or disk 22 serves to stiffen or tighten the central portion of the diaphragm, the said plate or disk also places a tension on the entire diaphragm.

From the foregoing it is thought that the construction and use of the improvements herein described will be readily apparent to those skilled in the art without further description, and it will be understood that various changes in the form, proportion, and the minor details of construction may be resorted to without departing from the principle or sacrificing any of the advantages of this invention.

Fig. 5 shows a modification of structure in which the spring 18 is employed intermediate the stud 13 and the extension plate or disk 22 and for the same purpose as employed in the structure shown and described in Fig. 2 of the drawings.

Having thus described the invention, what is claimed as new, and desired to be secured by Letters Patent, is—

1. In a graphophone-reproducer, the combination of a casing, a vibratory diaphragm in the casing, a stylus-arm pivotally connected with the casing and carrying at one end a stylus in axial alinement with the diaphragm, a stud in axial alinement with the stylus and diaphragm and in operative relation with the latter and adapted to move radially thereof and to convey motion from the stylus to the diaphragm, and a spring adapted to normally exert an outward pressure on the stylus.

2. In a graphophone-reproducer, the head or casing, the diaphragm, a stylus-arm pivoted intermediate its ends on the head or casing and capable of a slight lateral play, said arm having an extension at one end and carrying at its other end a stylus, and an oppositely-extending transmitting point or stud in operative relation to the diaphragm, and a

holding or guiding fork arranged adjacent to and adapted to receive said arm extension, substantially as set forth.

3. In a graphophone-reproducer, the head or casing, the diaphragm, the stylus-arm carrying a transmitting-point having no positive connection with the diaphragm, and a mute spring or plate having a supplemental transmitting-point and interposed directly between the diaphragm and the active end of the point carried by the stylus-arm, substantially as set forth.

4. In a graphophone-reproducer, the head or casing, the diaphragm, the stylus-arm carrying a transmitting-point, and a mute spring or plate having a folded end interposed between said point and the diaphragm, substantially as set forth.

5. In a graphophone-reproducer, the head or casing, the diaphragm, a spring-metal tension plate or disk arranged at one side of the diaphragm and provided with a plurality of contact studs or projections adapted to press directly thereagainst, a fastening connection between the center of said plate or disk and the diaphragm and adapted to exert pressure between the diaphragm and the studs on the plate to dish the diaphragm and vary its tension, and the reproducing stylus or point, substantially as set forth.

6. In a graphophone-reproducer, the combination with the diaphragm, of a rigid tension-plate having portions extended beyond a face thereof, said portions having direct contact with the diaphragm at one side thereof, and means for dishing the diaphragm intermediate said projections to vary its tension.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

WILLIAM HART.

Witnesses:
CHAS. S. SANDS,
B. M. SANDS.