(No Model.) 2 Sheets—Sheet 1.

J. H. WHITE.

PHONOGRAPH.

No. 467,530. Patented Jan. 26, 1892.

Fig. 1.

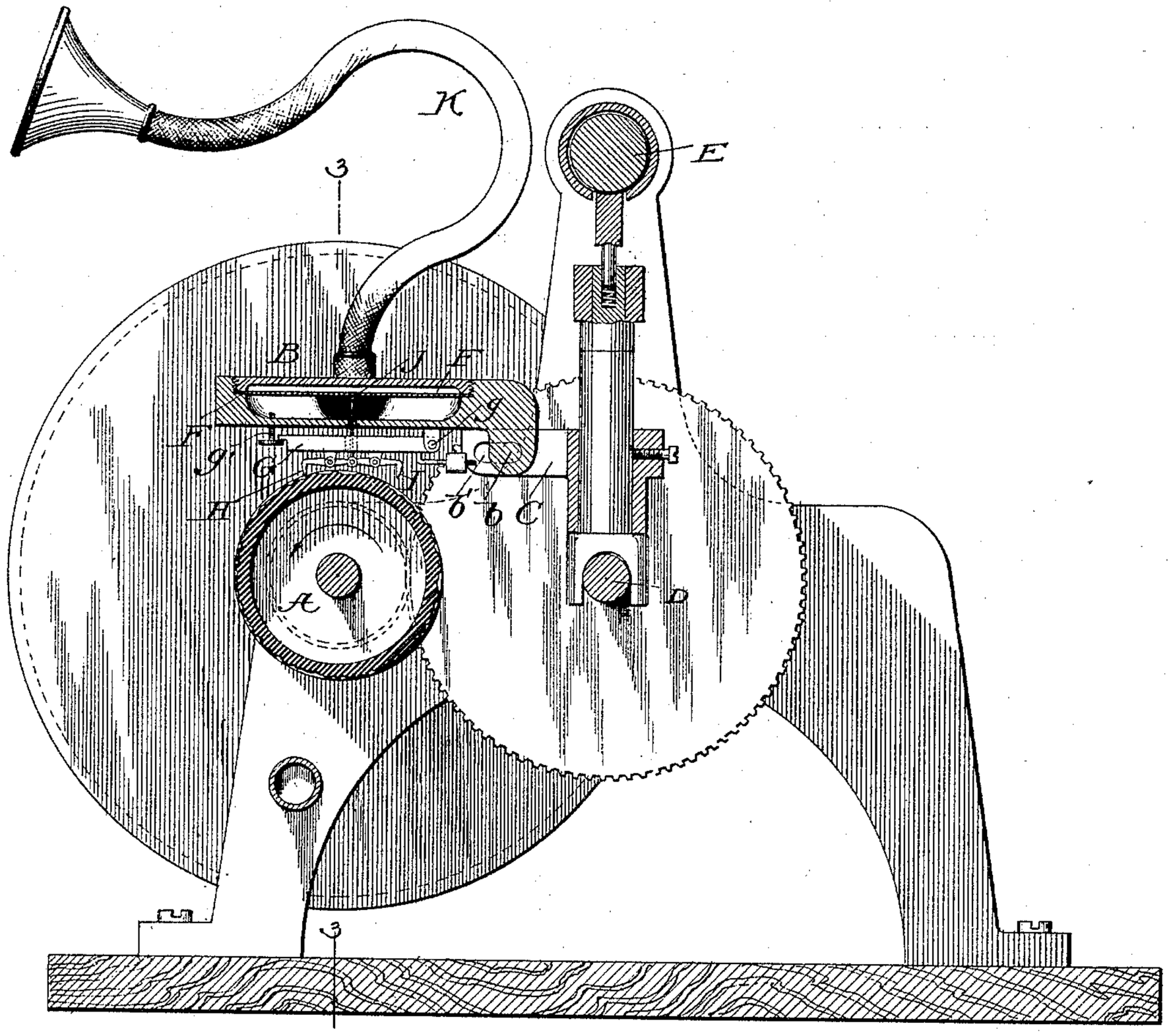


Fig. 2.

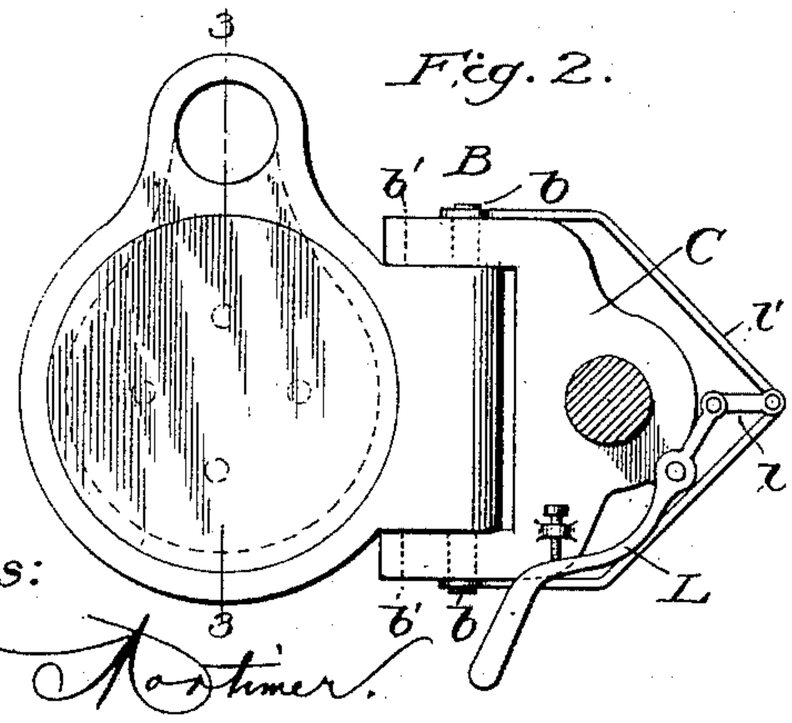
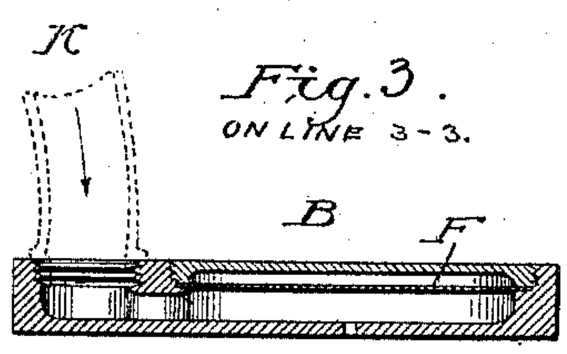


Fig. 3.
ON LINE 3-3.



Witnesses:
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W. R. Kennedy.

Inventor:
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By his Atty
Phil. T. Dodge.

(No Model.) 2 Sheets—Sheet 2.

J. H. WHITE.

PHONOGRAPH.

No. 467,530. Patented Jan. 26, 1892.

Fig. 5.

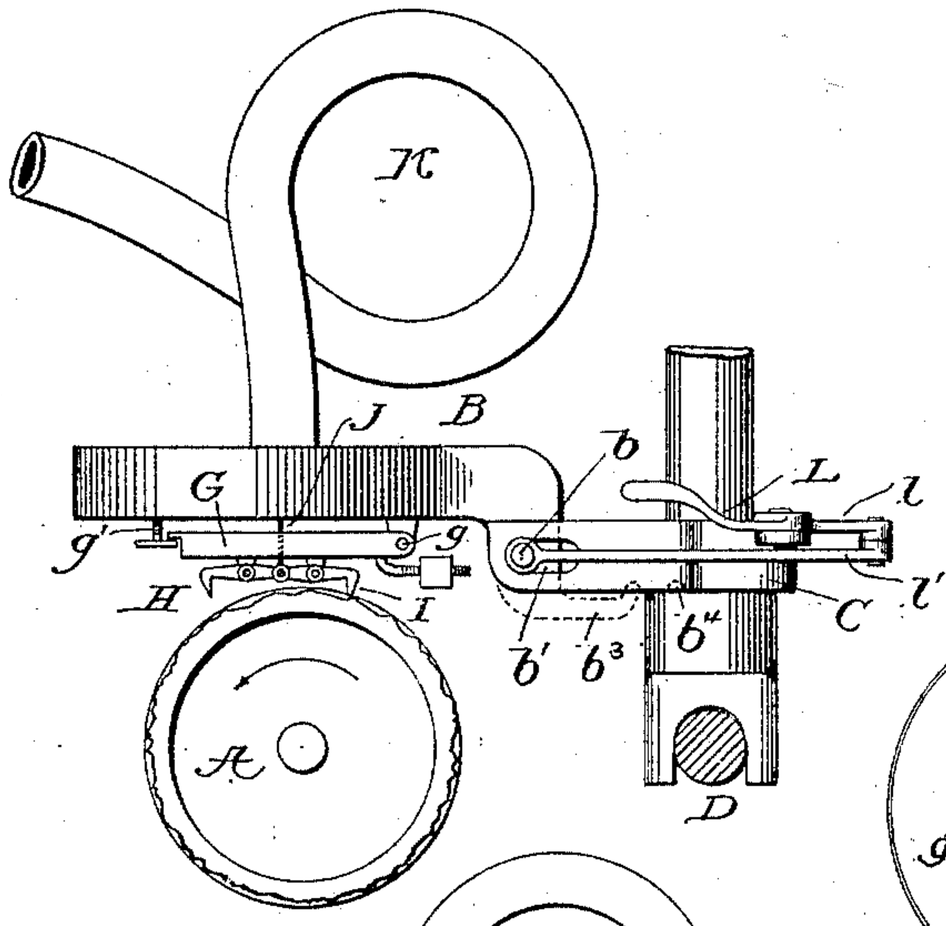


Fig. 4

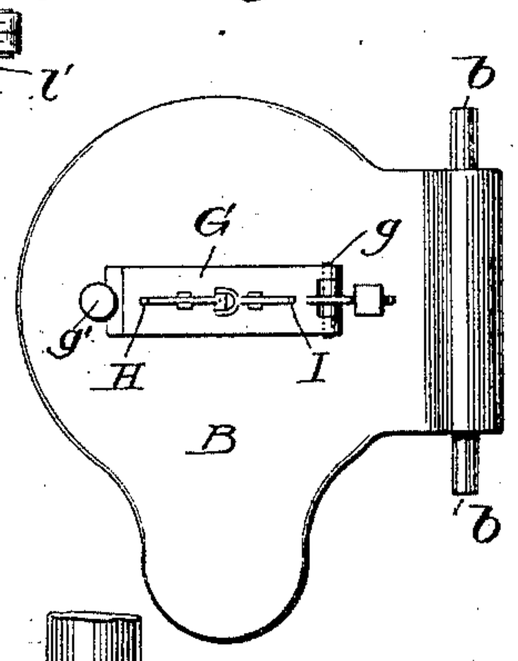
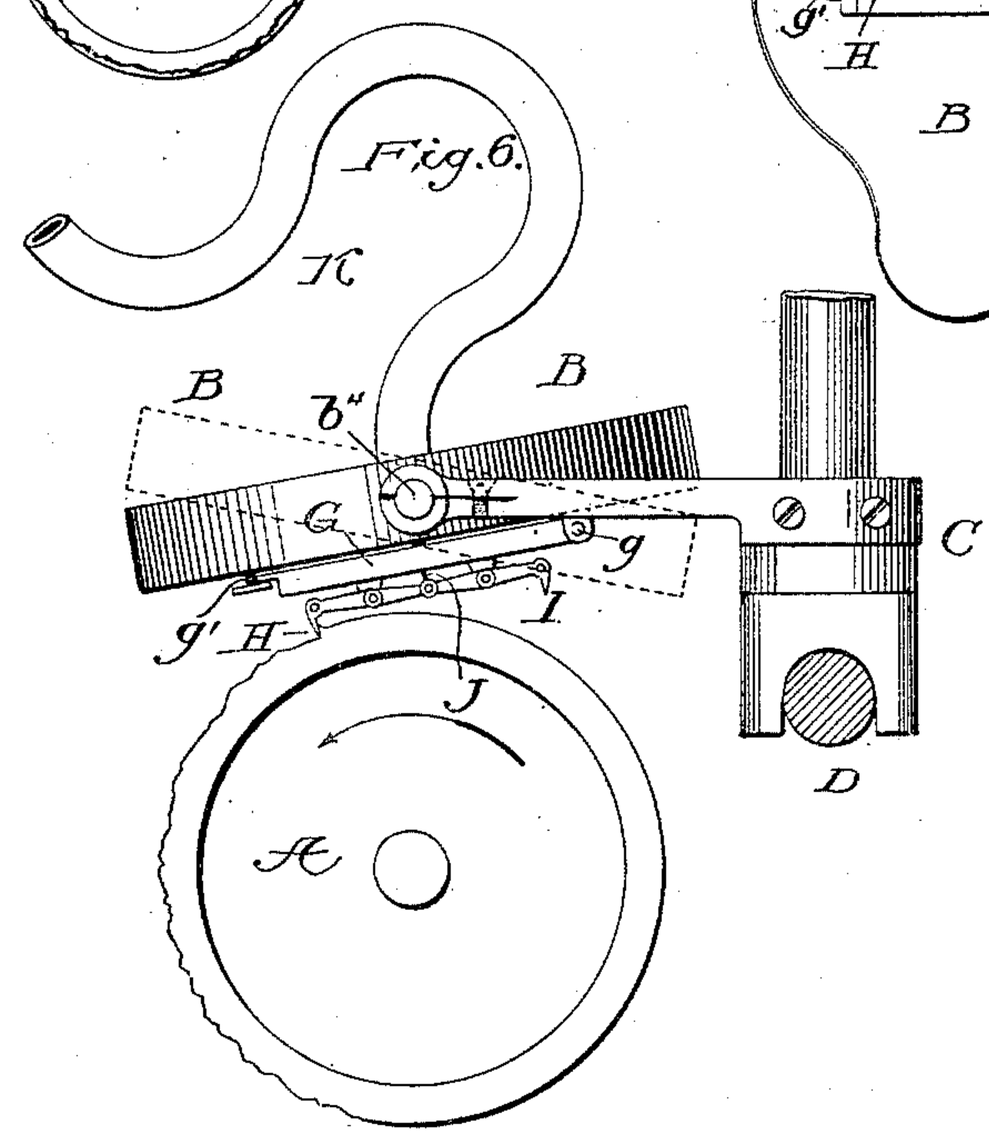


Fig. 6.



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UNITED STATES PATENT OFFICE.

JOHN H. WHITE, OF WASHINGTON, DISTRICT OF COLUMBIA.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 467,530, dated January 26, 1892.

Application filed June 4, 1891. Serial No. 395,065. (No model.)

To all whom it may concern:

Be it known that I, JOHN H. WHITE, of Washington, District of Columbia, have invented a new and useful Improvement in Phonographs, of which the following is a specification.

This invention relates to that class of instruments known as "phonographs" or "graphophones," wherein the sound-waves impinge upon and operate a vibratory diaphragm, which in turn operates a style acting to produce a record-groove of variable depth in a wax-like surface, the record thus produced being in turn used to set in motion a style or other equivalent device actuating a diaphragm, which reproduces the recorded sounds.

My first improvement has reference to the connections between the recording-style and the diaphragm, and is intended to secure the production of a more faithful record and a correspondingly accurate reproduction of the sounds free from the usual nasal and metallic tones. In most of the successful instruments now in use the lever or style acting at one end on the record-cylinder and connected at the other end with the overlying diaphragm is mounted at its middle on a pivot carried by a gravitating arm or weight, so that the style and its fulcrum may rise and fall bodily. The sound-waves impinge on the top of the diaphragm, depressing the same, and thereby lowering the heel end of the underlying style toward the cylinder in the same direction that the gravitating arm tends to carry the fulcrum. The result is that the fulcrum offers a diminishing resistance when loud or violent sounds suddenly depress the diaphragm, so that the style produces a record of less than the proper depth. In order to overcome this defect, I so arrange the parts that the sound-waves are directed against the inner or under side of the diaphragm and caused to urge the heel end of the style upward in opposition to the depressing influence of the gravitating arm, thus bringing the weight and inertia of the arm effectively into play to insure the cutting of the record by the style to the proper depth, while at the same time the capacity of the parts to yield under excessive strains is retained.

In the drawings I have shown my improvement embodied in the preferred form; but it is evident that the details may be varied, provided the essential feature—that of having the sound-waves act to move the heel end of the style in opposition to the tendency of the yielding support—is retained.

Another part of my invention consists in combining with the gravitating style-supporting arm an adjustable counter-weight, to the end that the downward pressure exerted upon the style may be modified as circumstances demand.

Another part of my invention relates, particularly, to those instruments in which a recording-style and a reproducing-style are connected with one diapragm and the parts so arranged as to admit of either style being brought into operative relation to the record-surface at will. Heretofore it has been the custom to arrange the styles in divergent lines and to throw them into and out of action by a lateral motion secured by rotating the diaphragm-support. I employ styles in the form of levers and arrange the two styles end to end—that is to say, in the same vertical plane transverse to the axis of the record-cylinder—and I throw one into and the other out of action by moving them in said plane either with a sliding or with a rocking movement, thus doing away with the necessity for a lateral adjustment and with the many evils attending the same.

My invention also includes various minor improvements, which will be hereinafter explained.

For purposes of illustration I have represented the several improvements as embodied in a graphophone of the construction represented in Letters Patent of the United States No. 429,827, issued to me on the 10th day of June, 1890.

With the exception of the improvements herein described and constituting the subject of the present invention the instrument may be constructed in all respects in accordance with said patent.

In the accompanying drawings, Figure 1 represents a vertical cross-section through the instrument with the recording-style in operative position. Fig. 2 is a top plan view of

the diaphragm-frame and attendant parts. Fig. 3 is a transverse section of the diaphragm and its supporting-frame on the line 3 3, Figs. 1 and 2. Fig. 4 is a bottom plan view of the diaphragm-frame and its adjuncts. Fig. 5 is a side elevation of the principal parts with the reproducing-style in operative position. Fig. 6 is a side view of a modification.

Referring to the drawings, A represents the horizontal record-cylinder, having a wax-like surface and mounted to revolve in the direction indicated by the arrows.

B is the diaphragm-supporting frame, jointed or otherwise attached to the supporting-carriage C, which is arranged to travel slowly under the influence of the operating-screw E along the guide D, lying parallel with the record-cylinder, whereby the recording and reproducing styles are caused to traverse the cylinder from one end to the other, as in existing instruments.

The diaphragm-frame B, as shown in the drawings, is connected to the carriage C by a horizontal pivot-pin *b*, extending through horizontal slots *b'*, so that the frame may be turned upward out of action or moved, when in operative position, forward and backward in a direction at right angles to the axis of the record-cylinder, and this in order to throw one or the other of the styles into operative relation to the cylinder, as will presently appear. The diaphragm-frame is supported and carried wholly by the carriage, so that its weight is not received to any extent upon the cylinder.

The diaphragm F, of sheet metal or other suitable material, is confined at its periphery within the frame, so that its central portion may vibrate freely, as usual. The frame is closed on the under side, so as to form a chamber beneath the diaphragm, this chamber being extended at one edge beyond the diaphragm and provided with an opening to receive the end of the sound-conducting tube K, so that the sound-waves are projected beneath and caused to act on the under side of the diaphragm with a lifting effect, urging the same from the record-cylinder instead of toward the cylinder, as usual.

To the under side of the diaphragm-frame there is connected by a horizontal pivot *g* a gravitating arm or plate G, the falling motion of which is limited at its free end by the adjustable stop-screw *g'*, seated in the frame. H represents the recording style or lever, mounted midway of its length on a horizontal pivot seated in ears depending from the plate G, one end of the style being turned downward and suitably fashioned to form the record in the surface of the cylinder, while the opposite or heel end is connected with the diaphragm by a thread or wire J. It will be observed that under this arrangement sound-waves directed through the tube into the chamber beneath the diaphragm tend to force the latter upward and that the rising diaphragm acts in turn to lift the heel end of the recording-style H and force its opposite end more deeply into the record-surface, so as to increase the depth of the record-groove. It is to be particularly noticed that this elevation of the heel end of the style to force its active end downward is in opposition to the downward pressure of the arm G, so that the sudden upward pull on the heel end of the style is in opposition to the weight of the arm, the diaphragm tending to move the arm in one direction, while the weight tends to move it in the other. Thus it is that I am enabled the more effectively to utilize the weight and inertia of the arm to keep the style down properly to its work.

The foregoing parts constitute a complete and operative recording apparatus, and may be used in an instrument having an entirely independent reproducing mechanism or used in connection with reproducing devices such as hereinafter described. It is to be understood, however, that so far as the action of the gravitating arm upon the recording-style is concerned it is not in any manner dependent upon the construction or operation of the reproducing devices.

It is to be noticed that under my arrangement the connection J between the diaphragm and the style is kept under tension. This permits the use of a thread or other flexible connection, which is found in practice to give better results than a wire or other rigid connection, although the latter may of course be employed.

I represents the reproducing-style in the form of a lever pivoted midway of its length to ears in the under side of the gravitating arm, one end being suitably adapted to traverse the record-groove, while the opposite end is attached to the thread or wire J, leading to the diaphragm, the one connection serving, as will be seen, to operate the two styles. I prefer to joint the heel ends of the two styles together, as represented in Fig. 4, one being forked and carrying a horizontal pivot, which passes through a slot in the end of the other. The two styles are arranged, as will be seen, end to end in line transversely of the cylinder—that is to say, in a vertical plane lying at right angles to the axis of the cylinder. Under this arrangement the horizontal sliding motion of the diaphragm-frame, before referred to, as allowed by the slots *b'*, serves to carry the end of one style out of contact with the record-cylinder as the other is brought into contact therewith.

When the frame is slid back, as shown in Fig. 1, the record-style is in operative position, and when it is moved forward, as in Fig. 5, the reproducing-style is in operative position. This movement of the frame to throw one or the other of the styles into action may be secured in any suitable manner.

In Figs. 2 and 5, L represents a shifting-lever pivoted on the carriage C and connected by link *l* to a stirrup *l'*, which engages the two ends of the pivot *b*, so that by moving the lever

L to and fro the diaphragm-frame is moved back and forth.

Another serviceable construction which avoids the necessity for using the lever and stirrup is indicated by dotted lines in Fig. 5, in which b^3 is a rigid arm extending downward and rearward from the diaphragm-frame, with an uprising lip at its extremity to engage in notches b^4 on the under side of the carriage C, so as to hold the frame in either its forward or backward position, as demanded, the frame being unlocked by lifting its forward edge so as to throw the arm b^3 out of engagement while the frame is being shifted.

Instead of sliding the frame to and fro to throw the respective styles into and out of action it may be connected to the carriage, as shown in Fig. 6, by horizontal journals b^4, which admit of its being given a rocking motion, as indicated by dotted lines, in order to throw the end of one style downward against the record-cylinder and at the same time carry the end of the other upward out of contact therewith.

Having thus described my invention, what I claim is—

1. In a sound-recording mechanism and in combination with a record-receiving body, a pivoted style acting on the record-body, a yielding style-supporting arm tending to move the style toward the record-surface, a diaphragm connected to the style, and means for directing the sound waves or impulses against the diaphragm in such direction that it tends to urge the style toward the record in opposition to the tendency of the yielding arm.

2. In a sound-recording mechanism and in combination with a record-receiving surface, the diaphragm, the gravitating arm, the style pivoted to said arm and connected at one end to the diaphragm, and means for directing the sound-waves against the under side of the diaphragm.

3. In a phonograph, the combination of a record-cylinder, a carriage movable in the direction of the length of the cylinder, a diaphragm-supporting frame connected to and sustained by the carriage and having an air-confining chamber beneath the diaphragm, means for directing the sound-waves into said chamber, and a recording-style connected with the diaphragm.

4. In a phonograph and in combination with the diaphragm, the pivoted style connected therewith, the gravitating style-supporting arm, and an adjustable weight or counterpoise.

5. In a phonograph, the combination of a record-surface, a diaphragm, and a recording and a reproducing style arranged end to end in the same vertical plane.

6. In a phonograph and in combination with a record-surface, a diaphragm-supporting frame movable in a vertical plane, and a recording and a reproducing style, both sustained from said frame and arranged to be thrown alternately into and out of action by said movement of the frame.

7. In a phonograph, the record-cylinder, in combination with the diaphragm, the recording and reproducing styles connected with the diaphragm, and means for moving said parts in a path transverse to the axis of the cylinder, whereby either style may be thrown into action and the other thrown out of action at will.

8. In a phonograph, the combination, with a diaphragm to actuate the same, of the two pivoted styles jointed together at one end, substantially as described and shown.

9. In a phonograph, the combination, with the carriage, of the diaphragm-supporting frame connected thereto by a sliding joint, and the lever and link mounted on the carriage for the purpose of adjusting the diaphragm-frame.

In testimony whereof I hereunto set my hand, this 19th day of May, 1891, in the presence of two attesting witnesses.

JNO. H. WHITE.

Witnesses:
W. R. KENNEDY,
P. T. DODGE.