

(No Model.)

W. BRUENING.

APPARATUS FOR RECORDING SPEECH OR OTHER SOUNDS.

No. 486,608.

Patented Nov. 22, 1892.

Fig. 1.

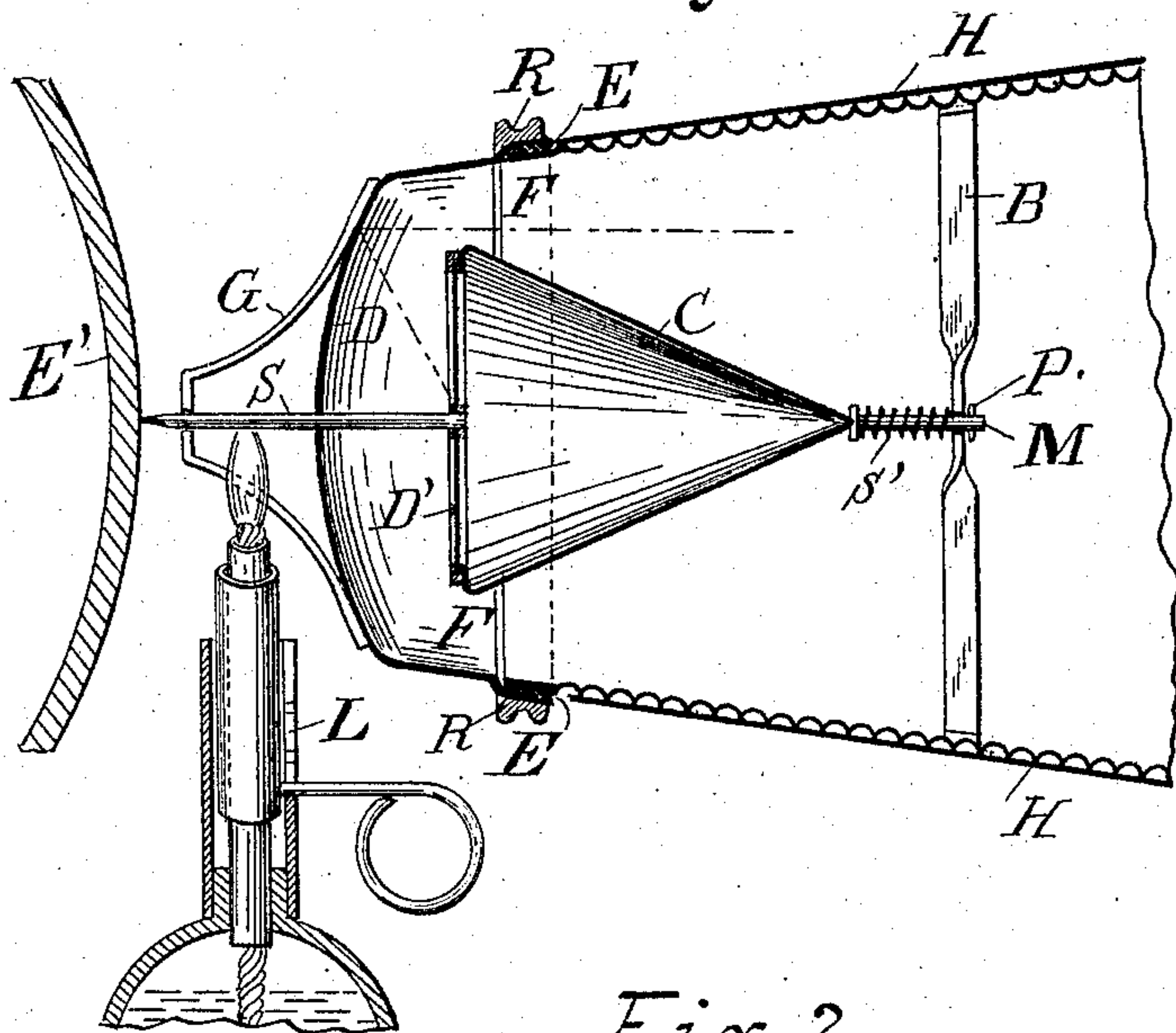
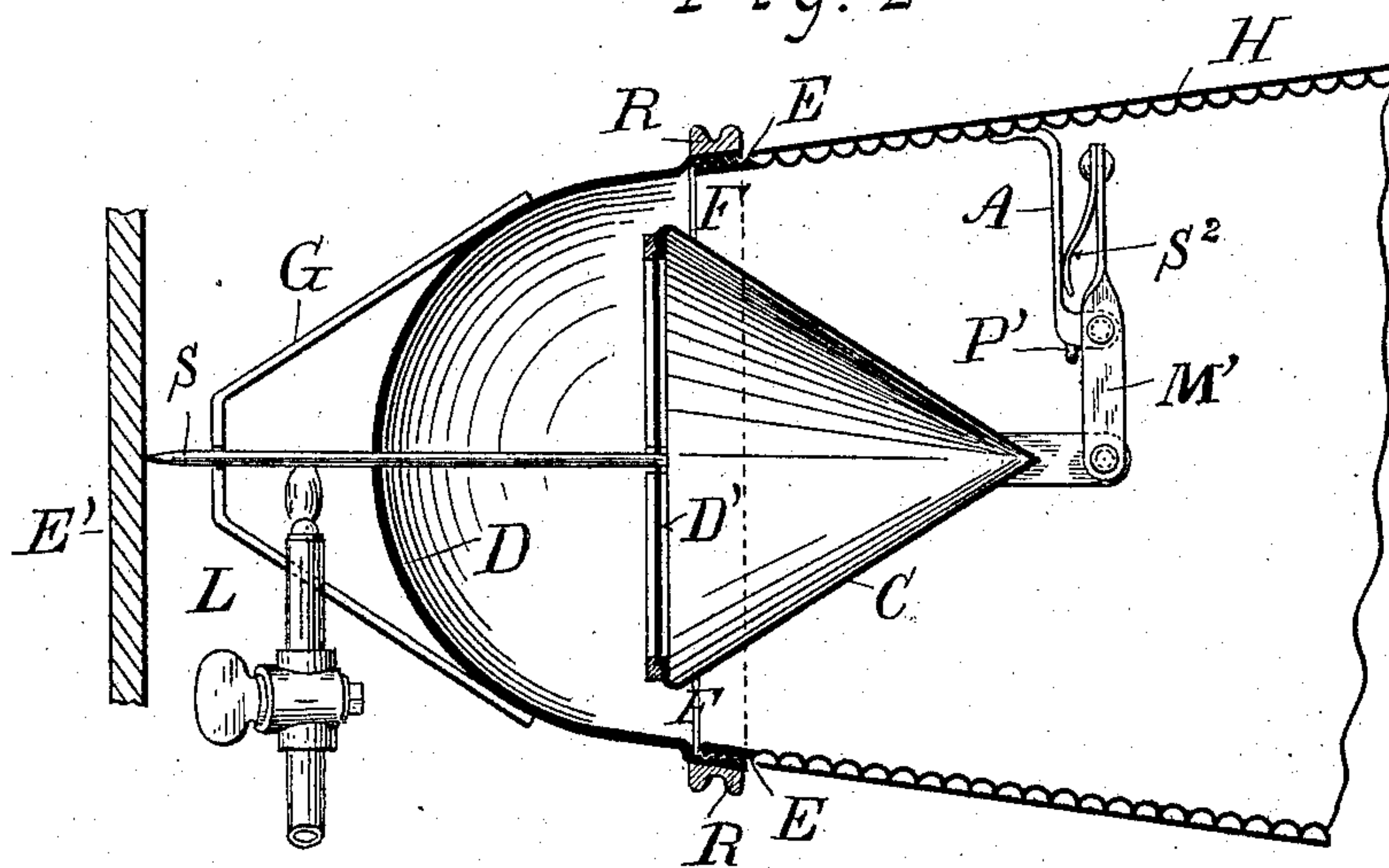


Fig. 2.



Witnesses
Chas. Hanemann
Edward S. Berrall

Inventor
William Bruening

UNITED STATES PATENT OFFICE.

WILLIAM BRUENING, OF EAST ORANGE, NEW JERSEY.

APPARATUS FOR RECORDING SPEECH OR OTHER SOUNDS.

SPECIFICATION forming part of Letters Patent No. 486,608, dated November 22, 1892.

Application filed July 23, 1891. Serial No. 400,450. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM BRUENING, a citizen of the United States, residing in the township of East Orange, in the county of Essex and State of New Jersey, have invented a new and useful Improvement in the Art of and in the Product of the Apparatus for Recording Speech or other Sounds, of which the following is a specification.

My invention relates to the apparatus for directing the sound-waves upon the diaphragm or other vibrating mechanism in a phonograph and the record produced thereby; to a damping device or method for damping the diaphragm; to the method of suspending the diaphragm in relation to the recording-body; to means for supporting the style in relation to the recording-body by, in, or through a sound-wave reflector; to the devices, means, method, and art whereby the record is made and whereby it is or becomes more permanent and durable when used to reproduce the sounds by reason of its increased hardness subsequent to the making of the record; to the record so made, and also to the combinations of these devices, means, methods, and arts.

My invention has for its objects to provide a durable sound-record from which sounds may be effectively reproduced and an efficient method and apparatus for recording sound; and it consists in improvements which will further sufficiently appear in connection with the further description of the apparatus and method or art and method of operation to follow, and in the claims annexed hereto.

I attain the objects of my invention by the means, mechanism, method, and art set forth and described in this specification and illustrated in the accompanying sheet of drawings, in which—

Figure 1 is a vertical sectional view of a part of the horn or sound-conveyer; of the diaphragm and style; of the sound-wave-reflecting surface; of the damping device, and of the means for supporting the diaphragm and style in relation to the recording-surface, together with a part sectional view of a lamp for heating the style. Fig. 2 is a vertical sectional view showing a different alternative method of supporting the diaphragm,

style, and damping device at one end, together with a gas-jet.

Similar letters represent similar parts throughout the figures.

H is the horn or part of the horn or sound-conveyer, which is preferably made of thin sheet metal or other hard substance, and has a continuous spiral thread or raised consecutive rings or corrugations, with the convex side placed inward, to be covered on its outer surface with felt, rubber, paper, or other suitable soft material to check or prevent waste of energy through vibration of the horn itself when in use. The object of the spiral thread, rings, or corrugations is to deflect the sound-waves developed within the horn.

D is a concave or dome-shaped sound-wave reflector, secured to the horn by screw-threads, as shown at E, or in any usual manner. A grooved annular ring or projection R on the outer side of the horn H or the reflector D serves the purpose of or is the means for holding the device in a proper relative position to the recording-body, whereby it may be sustained, as in a clamp, frame, or other suitable device.

D' is the vibrating diaphragm, and S is the style or recording-instrument secured to the center of the same, and may be of any required shape to make a groove of any required form in cross-section. As shown in Figs. 1 and 2, the diaphragm D' is secured to the front end of a cone C, which last is made of sheet metal, and is suspended at one end either by a stem M, supported in a cross-bar B, (see Fig. 1,) or by a spring-lever M', secured to an arm A, projecting from one side of the horn. (See Fig. 2.) I surround the stem M in the one case with a spiral spring S', which rests against the cross-bar B at one end and at the other end against a collar located at the apex of the cone, the object of which is to press the style S toward and into the recording body and material gently, but with sufficient force to keep it in proper relation thereto. This proper relation consists in keeping the point or end of the style constantly in the recording body and material—that is, below its surface. Fig. 1 shows the stem M with a button or collar P attached, and Fig. 2 a stop P' on the arm A, against which the lever M' abuts. The style S passes through the center of the

reflecting-dome and also through the guide G, which holds it in position primarily in relation to the recording body or material, and, secondarily, so as to check foreign vibrations.

5 E' is a section of a recording-body, which may be curved or plane.

L is the lamp or gas burner, the flame of which is brought in such relation to the style S as to heat the same when in use, and provision is made for regulating the dimensions of the flame and the amount of heat to be conveyed to the style by raising or lowering the cannula surrounding the wick-tube. I prefer to support the style S by means of a guide 10 between the flame and the recording body or material for obvious mechanical reasons; but if the guide G be omitted the style S may be supported and guided in and by the reflector D, through the center of which it passes, and 20 in that case it will be advisable to shorten the style in that part which projects beyond the reflecting-dome. When sound-waves are developed within the horn H, it is intended that they shall be guided between the inside 25 surface of the horn and the opposite conical surface C, all around, toward, and through the annular space F around the base of the cone against the inside of the dome D, to be reflected therefrom upon the diaphragm and 30 approximately focused to the greatest possible extent upon and around its center, to which the style is secured. In this way I concentrate or condense the sound-waves or their force and action on the diaphragm near 35 to and around the style, and thereby secure a stronger, quicker, and better vibratory action of the diaphragm and control of the style. Where the sound-waves are distributed and take effect equally on all parts of the diaphragm, as heretofore described and directed, 40 the active effects upon the style and upon the recording surface or body must be less than where the same amount of force is expended around the style near the center of the diaphragm. Behind the diaphragm D' is a conical air-chamber, the air of which is in contact with the rear side of the diaphragm D' and acts as a damper or as an elastic medium bearing upon the inside of the diaphragm in 45 such a way as to damp it, prevent false or foreign vibration, project its active center into its normal forward position, and thereby cause it to produce a more perfect record.

I do not desire to confine my invention to 55 the cone-shaped deflector and air-chamber, and recognize that those of other forms will to some extent perform the same functions.

I show two ways of producing a spring-pressure upon the cone C, carrying the diaphragm D' and style S, for the purpose of 60 maintaining the relations of the style to or in a recording-body. In one case I use the style-spring S', and in the other case (shown in Fig. 2) the alternative method in which the 65 spring S², reacting upon the lever which supports the end of the cone, produces a similar effect thereon.

The apparatus, as far as described, may be used in connection with any of the previously-known methods or mechanisms for recording 70 sounds, but I prefer to use a new method and recording material adapted thereto.

Heretofore sound-records, from which sound is directly reproduced, have been made by a style vibrated by sound-vibrations, indenting or impressing on the surface of yielding 75 material which is supported on a grooved cylinder or wheel or on other material. By the pressure exerted on the surface of such material the material under the style recedes 80 and causes the motion of the surrounding material. This has been found in practice to produce a defective record by changing the form of a recorded sound wave or waves by the action of the style and the movement of 85 the material in recording a succeeding wave. This defect has been obviated by cutting or engraving a groove containing a sound-record in solid resisting material with a vibrating cutting-style, whereby the material is re- 90 moved in small pieces, chips, or shavings, which, however, offer great resistance to the action of the style and diaphragm and give rise to annoyance by a part of such removed material clinging to the record and causing 95 imperfect reproduction. A more perfect record is obtained by causing resisting material which is in the path of a style to become non-resisting and by the driving action of the style urge it to flow, move, or drift from such 100 path, while the material which is not in the path of the style remains firm or in place. The displaced material is disposed on the edges of the path in a mass and becomes firm, and for this purpose I use in the tab- 105 let or blank recording material which is firm at ordinary temperatures and which may be fused by heat, and I fuse the material and form the record by means of a style acting and heated as herein further described. For 110 these purposes I use different kinds of wax, gum, soap, or asphaltum alone or in the form of compounds, and also varnishes, hard rubber, celluloid, gutta-percha, and any easily-fusible metals or their alloys or amalgams, or 115 any other substances or materials upon which heat has similar effects. The recording tablet or blank may be made wholly of or merely covered by the materials mentioned. Since these substances differ in their capacity to resist the action of heat in the respects mentioned, the temperature of the style is to be varied or graded to meet the corresponding characteristics and resistances of the particular one of the materials mentioned that may 125 be in use, and in each case the temperature must be co-ordinated with or accommodated to the speed of the mechanism and the rapidity with which the record is made or to be made. Of course with the same temperature 130 of the style the recording body or tablet may be moved more rapidly where the more easily-yielding materials are used than where hard rubber or most of the fusible metals are used.

Different kinds of wax even will require different temperatures; but the temperature must be sufficient and the speed sufficiently slow to produce the desired effect upon the recording material or tablet by removing the material from the path of the style and disposing it on each side thereof, but without in any way removing the material from the tablet.

10 In operation, when the tablet provided with solid fusible material is placed in the phonogram-holder of my phonograph shown in the application Serial No. 377,724, filed January 14, 1891, or of any other such mechanism, and
15 the recording apparatus is placed in position on the diaphragm-holder of such instrument, and the flame or other source of heat is applied to the style, the intensity of which may be regulated, as shown in Figs. 1 and 2, the
20 style is thereby heated to a sufficiently-high temperature to fuse or melt the recording material and is brought into contact with the substance of the tablet and fuses the material thereof by such contact, which allows the
25 style to be sunk therein to a desired depth by displacing the mass of fused or melted material, while the material beyond the contour of the style remains firm or in place. Having determined the depth of the intended
30 groove and secured the heated style in proper position, the style is vibrated by imparting sonorous vibrations thereto and is progressed in relation to the tablet, either by the movement of the tablet or of the style, or of both,
35 and it fuses or melts the material in its path, which is in the substance of the tablet through and beneath its surface, and causes the movement or drift of such fused or melted material by detaching it from the firm material
40 forming the margin of the path and driving it forward and outward upon the edges of material which remains in place there to form ridges which increase the depth of the groove. The record is formed, mainly, by the anterior
45 half of the surface of the style, which, so far as it makes contact, bears against the recording material directly in front of it and detaches it by fusion and drives it out of its path, whereby the greater part of the resistance of the material is borne by the progressive movement of the style, while but a minimum of resistance is offered to its vibratory movement. When the contact with the heated style has ceased, the material congeals and a
55 groove is thereby formed, the irregularities of which correspond in form to sound-vibrations, and the surface of its walls and of the ridges presents a glazed or semi-fused appearance. The action of the plowshare and its
60 mold-board in displacing and turning up the soil and molding it into ridges on the edges of the furrow is an action analogous to that of the heated style in this invention, except that here the fused or melted material flows,
65 moves, or drifts in a coherent or viscous mass. The advantages of this method of making a sound-record, which consists in applying heat

to that part of the recording material which is in the path of a style of a temperature corresponding to that of its melting-point by means of the style which is heated for that purpose and to that extent and thereby fusing and driving such material from that path, lie in the greatly-decreased resistance which such fused or melted material offers to the
75 action of the diaphragm and style and with the same force necessary to cut a sound-record in a solid body or to indent or impress such record on the surface of foil or of merely softened wax sound-waves of greater amplitude are recorded, and that as in this invention only such material is fused and moved which is directly in the path of the style every motion of the style is reproduced in the recording material without marring or de-
85 forming any part of the previously-made record, while in a record made by indenting or impressing on a yielding or softened surface the material directly under the style is pressed against the adjacent material and causing
90 movement thereof the shape of the surface previously traversed by the style is changed and the record caused to be defective, and as the contour of the heated style in this invention determines the shape of the walls and
95 surface of the record they are smooth and polished, while in cutting a record in more or less brittle material they are chipped and rough, and here no particles of recording material adhere to and clog the heated style as
100 they are fused or melted and flow therefrom. The displaced or detached material is herein utilized to serve a useful purpose in increasing the depth of the groove, and thereby guiding the reproducing-style more securely, where
105 in other records it causes disturbance. As sounds are more accurately recorded by this method, a more effective reproduction of sound results from such a record, which may be made in material particularly adapted to
110 make it durable. In speaking herein of the path of the style such part of the recording material is meant thereby which is traversed by the style in its vibratory movements, as well as in its progressive movement relative
115 to the tablet.

While I prefer to make the style with a rounded point, I do not limit this invention to any particular form or length of style; but the style may be of any usual construction
120 capable of being heated. I find it to be the simplest and cheapest way to heat the style by the use of the flame of some kind of lamp bearing directly upon the style, as shown in Fig. 1; but the style may be heated by elec-
125 tricity in several ways, two of which are shown in a companion application filed herewith at the same date, and with substantially the same effect or general results. While I contemplate the use of these devices in making the record by cutting, engraving, or indenting without heating the style, I prefer to use them in connection with the kind of record and method of action described, for the

reason that the effects of the heated style diminish to a minimum the demand made upon the diaphragm to make the record—that is to say, I can use the apparatus to advantage in making the record without heating the style.

The recording body, tablet, or material, the horn, diaphragm, air-chamber, reflectors, and deflectors, and the heated style herein described may all or any of them be used in connection with my phonographic apparatus and invention described in my application in phonographs already allowed and passed to issue, Serial No. 377,724, filed January 14, 1891.

I claim as my invention—

1. In a phonograph, a style supported at two or more points, in combination with an applied flame or other source of heat.
2. In a phonograph, a style supported at two or more points, in combination with a flame or other source of heat applied between the support that is adjacent to the record-surface and the diaphragm-support.
3. A phonographic diaphragm provided on the side presented to the mouth of the horn with a shield having a cone, convex or dome shape, which prevents contact of sound-waves with that side.
4. In combination, a phonographic diaphragm and a cone-shaped shield covering and protecting the diaphragm on the side presented to the mouth of the horn from the contact of the sound-waves, and the outside of which has a sound-wave-deflecting surface, arranged to deflect the same through an annular space around the diaphragm and into a chamber in front of the same.
5. A phonographic diaphragm provided on the side presented to the mouth of the horn with a cone-shaped shield against the contact of sound-waves, which on its outer side deflects sound-waves into and through an annular space around the diaphragm upon a dome-shaped reflector.
6. A phonographic diaphragm provided on the side presented to the mouth of the horn with a cone-shaped shield against the contact of sound-waves, which on its outer side deflects sound-waves into and through an annular space around the diaphragm upon a dome-shaped reflector and thence upon the diaphragm.
7. In combination with a diaphragm of a

phonograph, the concave or dome-shaped deflector placed between the diaphragm and the recording-surface so as to deflect sound-waves upon the front or adjacent face of the diaphragm.

8. A horn or cone shaped sound-conveyer closed at the small end by a concave or dome-shaped cap, in combination with a diaphragm provided with a style which passes through the cap toward the recording body or material, upon which diaphragm sound-waves are reflected from the concave surface.

9. A horn or cone shaped sound-conveyer terminated at the small end by a dome or concave cap, an inner cone-shaped shield covering and protecting one side of a phonographic diaphragm from the action of sound-waves, and the diaphragm provided with the style projecting through the cap toward the recording body or material, all in combination.

10. The diaphragm of a phonograph provided on the side presented to the mouth of the horn or sound-conveyer with a shield, which prevents the contact of sound-waves therewith, substantially as shown and described.

11. A diaphragm of a phonograph provided on the side presented to the mouth of the horn or sound-conveyer with a closed air-chamber, the front side of which consists of the diaphragm, substantially as shown and described.

12. A horn or cone shaped sound-conveyer provided at its small end with a concave or dome-shaped deflecting-cap, a phonographic diaphragm provided with an air-chamber on the side adjacent to the mouth of the horn or sound-conveyer, and with a style projecting through the deflecting-cap of the horn toward or into the recording body or material, all in combination.

13. A phonographic diaphragm provided with a frame and style, in combination with a horn or sound-conveyer, means for movably supporting said diaphragm and style in said horn, and a spring bearing on the frame of the diaphragm to press the style toward the tablet.

WILLIAM BRUENING.

Witnesses:

JAMES A. SKILTON,
EDWARD S. BERRALL.