

No. 637,197.

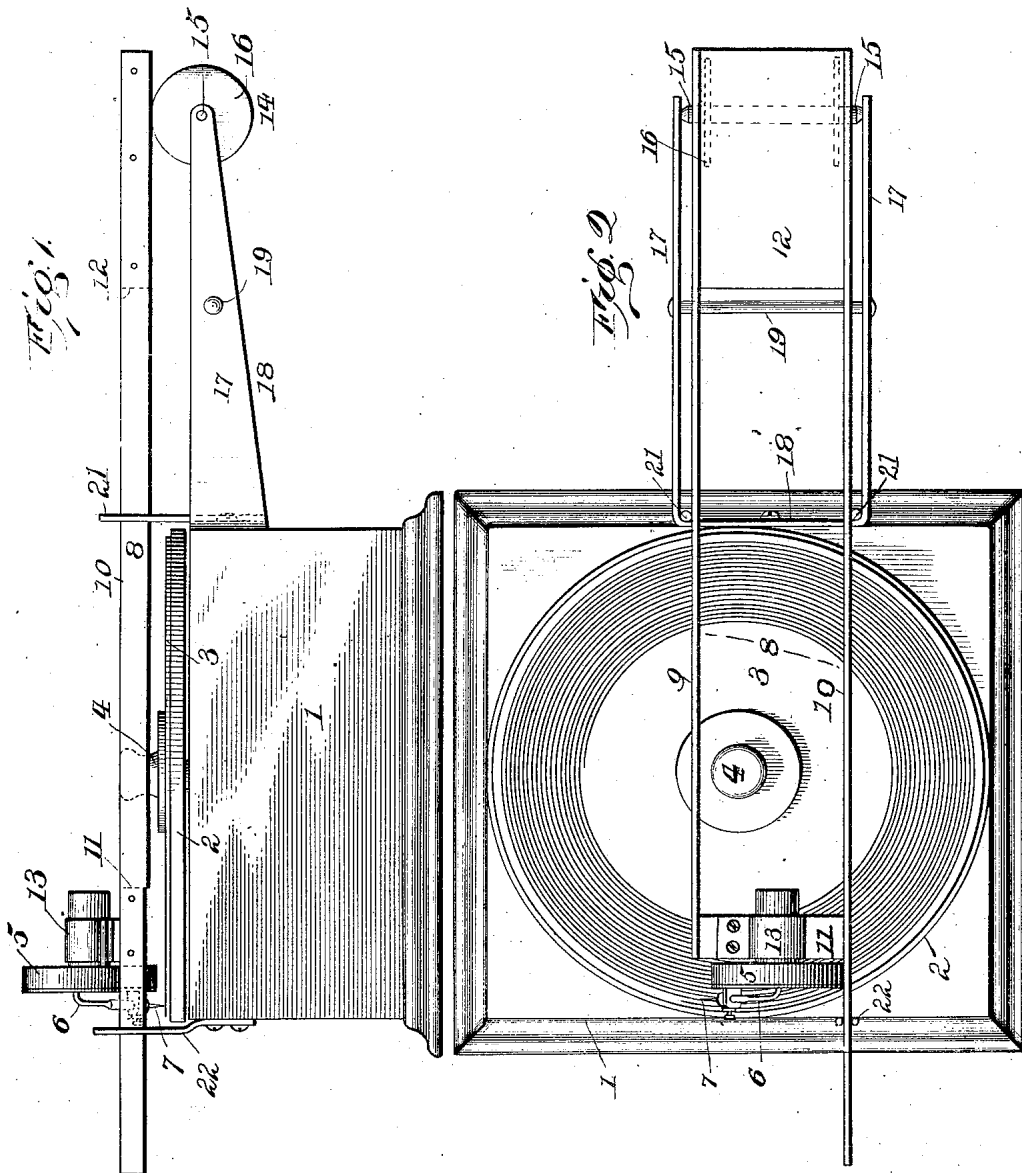
Patented Nov. 14, 1899.

E. BERLINER.
GRAMOPHONE, &c.

(Application filed Jan. 25, 1899.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses:
J. M. Fowler Jr.
F. J. Chapman

Inventor:
Emile Berliner,
By Lyons & Bisping,
Attorneys.

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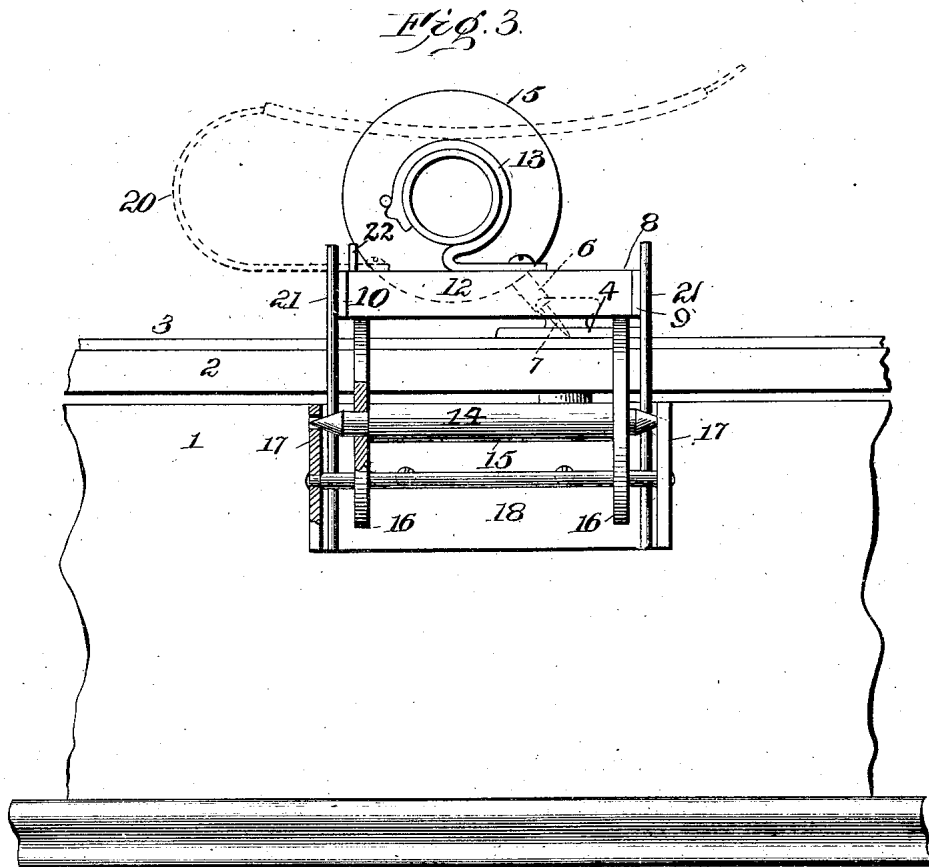
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UNITED STATES PATENT OFFICE.

EMILE BERLINER, OF WASHINGTON, DISTRICT OF COLUMBIA, ASSIGNOR
TO THE UNITED STATES GRAMOPHONE COMPANY, OF SAME PLACE.

GRAMOPHONE, &c.

SPECIFICATION forming part of Letters Patent No. 637,197, dated November 14, 1899.

Application filed January 25, 1899. Serial No. 703,347. (No model.)

To all whom it may concern:

Be it known that I, EMILE BERLINER, a citizen of the United States, and a resident of Washington, in the District of Columbia, have invented certain new and useful Improvements in Gramophones or other Sound-Reproducing Machines, of which the following is a specification.

This invention has reference to improvements in sound-reproducing machines, and especially to the gramophone-reproducers using a flat record-disk with the record thereon in the form of a sinuous spiral groove of even depth having the sound-waves represented by the sinuosities of the groove.

It is a characteristic feature of the gramophone-reproducer that all special mechanism for feeding the sound-box (comprising the diaphragm or other resonant body and reproducing-stylus) across the record-disk is dispensed with; and the record-groove itself is utilized as a feed-screw of great delicacy, and since the feed-screw and the record-groove are one and the same no justifying devices of any kind for inaccuracies between the feeding mechanism and the record-groove are required. However, since in the commercial gramophone-reproducer the sound-box is carried at the outer end of a simple hinged arm which is free to be swung around its hinge, so as to be fed by the groove across the record-disk, the sound-box is necessarily carried thereby through an arc of more or less curvature, according to the length of the arm. For commercial use this arm must be of limited length to make the reproducing-machine as compact as possible, and consequently the curvature of the path of the reproducing-stylus across the record-tablet is quite pronounced and varies considerably from the path of the recording-stylus, which is fed in a straight line radially across the disk upon which the record is first produced.

While it is practical to have the reproducer-stylus travel through a curved path over the record-disk, still the reproduction is not as perfect as when the path of the reproducer-stylus conforms with the path of the recorder-stylus, for when the reproducer-stylus travels through a curved path it has a

more or less distorted relation to the sound-record.

I have heretofore provided means for feeding the reproducer sound-box in a radial line across the record-tablet by the action of the record-groove as a feed-screw upon the stylus, as shown in my Letters Patent No. 564,586, dated July 28, 1896, and the same purpose was sought to be achieved by a system of interconnected links constituting a lever, as shown in the patent to W. Suess, No. 427,279, dated May 6, 1890; but both of these means for propelling the reproducer sound-box in a radial line across the record-tablet are inconvenient in some respects for commercial purposes; and it is the object of the present invention to achieve the same purpose by a construction that is free of the inconvenience inherent in those heretofore used, as suggested, for the same purpose. For this purpose I so mount the sound-box carrier that it is free to be propelled across the record-tablet in a straight line by the engagement of the reproducer-stylus with the record-groove, and at the same time it is free to be moved in a direction perpendicular or approximately perpendicular to the surface of the record-tablet; but both movements are always in the same perpendicular plane relative to the surface of the record-tablet.

When I speak of a plane whose direction is perpendicular to the surface of the record-tablet, I naturally mean to include planes which are nearly or substantially perpendicular to the surface of the record-tablet.

For the practical embodiment of my invention I am not confined to any special mechanism, since I have devised a number of different forms of sound-box carriers and supports therefor that will operate in accordance with my invention; but in order to simplify both the illustration and description of the invention I have shown in the accompanying drawings but one embodiment of the invention, which in practice has been found to give excellent results.

In the drawings, Figure 1 is a side elevation of a gramophone-reproducer embodying the present invention. Fig. 2 is a plan view thereof; and Fig. 3 is an end view, on a larger

scale, of the sound-box carrier and its support and adjacent parts.

Referring to the drawings, there is shown a motor-case 1, containing the usual spring-motor (not shown) for actuating a horizontal rotary table 2 on top the motor-case. The table 2 supports a flat record tablet or disk 3, secured thereto by a clamp-nut 4. The record-disk is of the usual circular type, having on its face a sinuous spiral groove of even depth, with the sound-waves represented by the sinuosities of the groove. The sound-box 5 is of the ordinary construction used in the gramophone-reproducer—that is, it contains a suitable diaphragm, (not shown,) to which a lever-like arm 6 is attached, and the latter carries a stylus 7, shaped for engagement by the record groove on the face of the tablet. As thus far described the structure shown in the drawings is the same in all respects as the ordinary commercial gramophone, and consequently no detail description of the construction and operation of these parts is deemed necessary.

The sound-box 5 is carried by an arm 8, composed of two narrow, preferably metallic, strips 9 10 and two spacing-blocks 11 12, preferably of wood or other light material. The two strips 9 10 are secured at the outer end of the arm 8 to the spacing-block 12, which is as long as or longer than the greatest width of a record upon the record-tablet, for a purpose that will hereinafter appear. The other spacing-block 11, as shown, is shorter than the spacing-block 12 and need only be long enough in the direction of the length of the arm 8 to hold a spring-clip 13, which receives the neck of and holds the sound-box in place in such manner that the stylus will rest in a record-groove in the usual manner.

The spacing-block 11 is secured to the strips 9 10 at the inner end of the arm 8; but the strip 10 is longer than the strip 9 and projects beyond the end of the arm 8, in line with the same, a distance equal to or longer than the greatest width of a record upon the record-tablet, the purpose of which will also appear farther on.

The outer end of the arm 8, by the spacing-block 12, is supported upon a roller 14 in such manner as to be freely movable lengthwise and also to be freely rocked up and down on the roller, the surface of which thus forms a shifting fulcrum. The roller is composed of an axle 15, having two disks 16 16 fast on it near its two ends, which are so spaced as to afford a broad bearing for the spacing-block 12. The ends of the axle 15 project beyond the disks and are there pointed, as shown, or are otherwise shaped to fit in suitable bearings in the ends of two parallel side arms 17 17 of a bracket 18, secured to the motor-box 1. At an intermediate point in the side arms 17 there is secured a stiffening-rod 19, as shown.

When the ordinary sound-amplifying horn (not shown) is placed upon the machine, one

end is attached to and supported by the neck of the sound-box and the other end rests upon a bracket 20 on the outer end of the arm 8.

Fast on the inner corners of the bracket 18 and rising therefrom above the arm 8 are two rods 21 21, so arranged as to embrace the arm 8 about midway of its length, but in such manner as to not impede the lengthwise movement of the said arm, and rising from the motor-case 1, beyond the inner end of the arm 8, is a forked guide 22, through which the extension of the strip 10 passes.

The purpose of the rods 21 and forked guide 22 is to resist the drag of the rotating record-tablet on the stylus and through the latter on the sound-box and inner end of the arm 8, which drag acts at right angles to the length of the arm and tends to move the same laterally on the roller; but neither the rods 21 nor the guide 22 prevents the arm 8 from being propelled lengthwise by the record-groove across the face of the record-tablet or from being moved on the roller in a direction perpendicular or approximately perpendicular to the surface of the record-tablet. Consequently all movements of the arm 8 and of the sound-box carried thereby are confined to a single plane that is perpendicular to the face of the record-tablet, since it is evident that all other movements are effectually prevented by the rods 21 and forked guide 22. The stylus must therefore move across the face of the record-tablet in a straight line, and as this line is made to coincide with a radius of the tablet the path of the reproducing-stylus will agree in all respects with the path of the recording-stylus across the face of the tablet when the record is first produced, thereby preventing all distortion of the reproduced sound due to the stylus having a curved path across the record-tablet.

The foregoing description is confined to the particular structure shown in the drawings, since the principle of the invention is apparent therefrom; but it will be understood that any structure in which the stylus and sound-box are fed across the record-tablet by the record-groove and at the same time are free to be moved in a direction perpendicular or approximately perpendicular to the surface of the record-tablet, but in the same plane as the movement across the tablet, I consider as embodying my invention. It will also be understood that the invention is equally applicable to sound-reproducers using cylindrical tablets as well as flat tablets and to tablets with the record in the form of a groove of varying depth instead of in the form of a sinuous groove of even depth. It will also be understood that I consider a sound-record in the form of or formed in a ridge as the equivalent of a sound-record in the form of or formed in a groove.

Having thus fully described the invention, what I claim is—

1. In a gramophone or other device for reproducing sound from a record of the same,

a sound-box and stylus free to be fed across the record-tablet by the record-groove and mounted to freely move toward and from, but restrained to move solely in a plane perpendicular to, the surface of the record-tablet, substantially as described.

2. In a gramophone or other sound-reproducing machine, the combination of a rotatable record-tablet, with a reproducing sound-box mounted to be propelled across the tablet, by the record-groove, in a straight line and mounted to freely move toward and from, but restrained to move solely in a plane perpendicular to, the surface of the record-tablet substantially as described.

3. In a gramophone or other sound-reproducing machine, the combination of a rotatable record-tablet, a reproducing sound-box, and a mounting therefor free to be propelled by the record, comprising an arm carrying the sound-box, a bearing or support for the arm permitting the latter to move freely toward and from, but restraining it to move solely in a plane perpendicular to, the surface of the record-tablet, substantially as described.

4. In a gramophone or other sound-reproducing machine, the combination of a rotatable record-tablet, a reproducing sound box, and a mounting therefor free to be propelled by the record, comprising an arm carrying the sound-box, a bearing or support for the arm, and guides or stops for the arm permitting free motion of the arm toward and from, but restraining it to move solely in a plane perpendicular to, the surface of the record-tablet, substantially as described.

5. In a gramophone or other sound-reproducing machine, the combination of a rotatable record-tablet, a reproducing sound-box, and a mounting therefor comprising an arm carrying the sound-box, a roller or antifriction bearing or support for the arm, and means permitting free motion of the arm toward and from, but restraining it solely to a plane perpendicular to, the surface of the record-tablet, substantially as described.

6. In a gramophone or other sound-reproducing machine, the combination of a rotatable record-tablet, a reproducing sound-box, and a mounting therefor comprising an arm carrying the sound-box at one end, a roller supporting the arm at the other end, and guides or stops permitting free motion of the arm toward and from, but restraining it to a

plane perpendicular to, the surface of the record-tablet, substantially as described.

7. In a gramophone or other sound-reproducing machine, the combination of a horizontally-rotatable record-disk, a reproducing sound-box, and a mounting therefor comprising an arm carrying the sound-box, a bearing or support for the arm permitting the same to be moved lengthwise in a straight line and also up and down, and guides or stops restraining all movements of the arm to a single vertical plane, substantially as described.

8. In a gramophone or other sound-reproducing machine, the combination of a horizontally-rotatable record-disk, a reproducing sound-box, a mounting therefor comprising an arm carrying the sound-box, a roller-bearing for the arm on which the latter may be moved lengthwise and up and down, and guides or stops for the arm confining or restraining all movements of the latter to a single vertical plane, substantially as described.

9. In a gramophone or other sound-reproducing machine, the combination of a rotatable record-tablet, a reproducing sound-box and a mounting therefor, free to be propelled by the record, comprising an arm, carrying the sound-box, a bearing or support for the arm permitting the latter to move toward and from the record-tablet in a plane perpendicular thereto and the stylus to rest by gravity against the record-tablet, and means for preventing the movement of the arm in any other plane, substantially as described.

10. In a gramophone or other sound-reproducing machine, the combination of a rotatable record-tablet, with a reproducing sound-box mounted to be propelled across the tablet, by the record-groove, in a straight line, and mounted to have its movements confined to a single plane, passing through that line perpendicular to the surface of the record-tablet and to have the stylus and sound-box rest by gravity against the record-tablet, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses:

EMILE BERLINER.

Witnesses:

F. T. CHAPMAN,
HUGH M. STERLING.