

(No Model.)

2 Sheets—Sheet 1.

W. SUESS.
GRAMOPHONE.

No. 427,279.

Patented May 6, 1890.

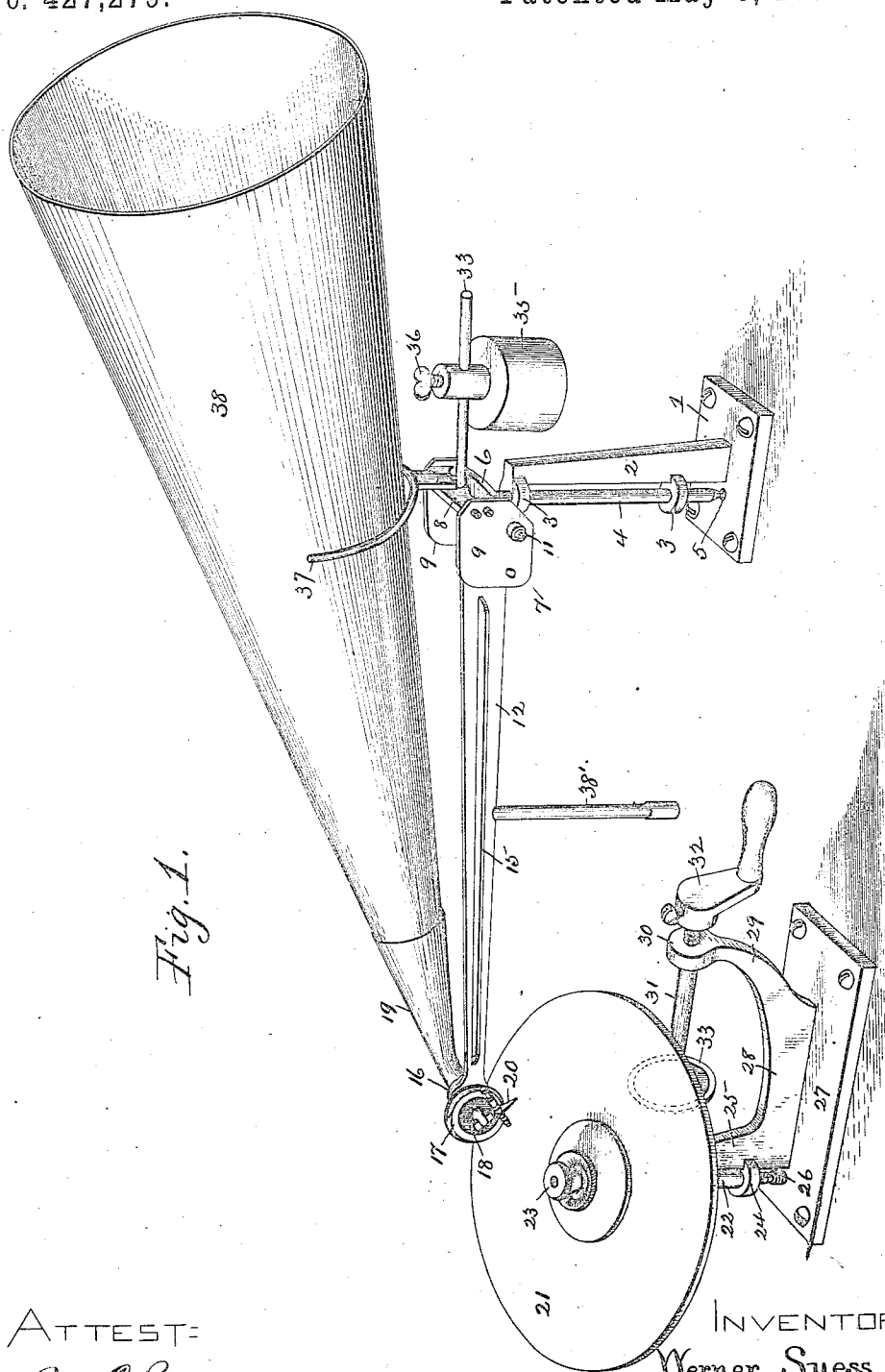


Fig. 1.

ATTEST:

Reverend C. Bowen,
F. T. Chapman

INVENTOR:

Werner Suess,
By Joseph Lyons,
his Attorney.

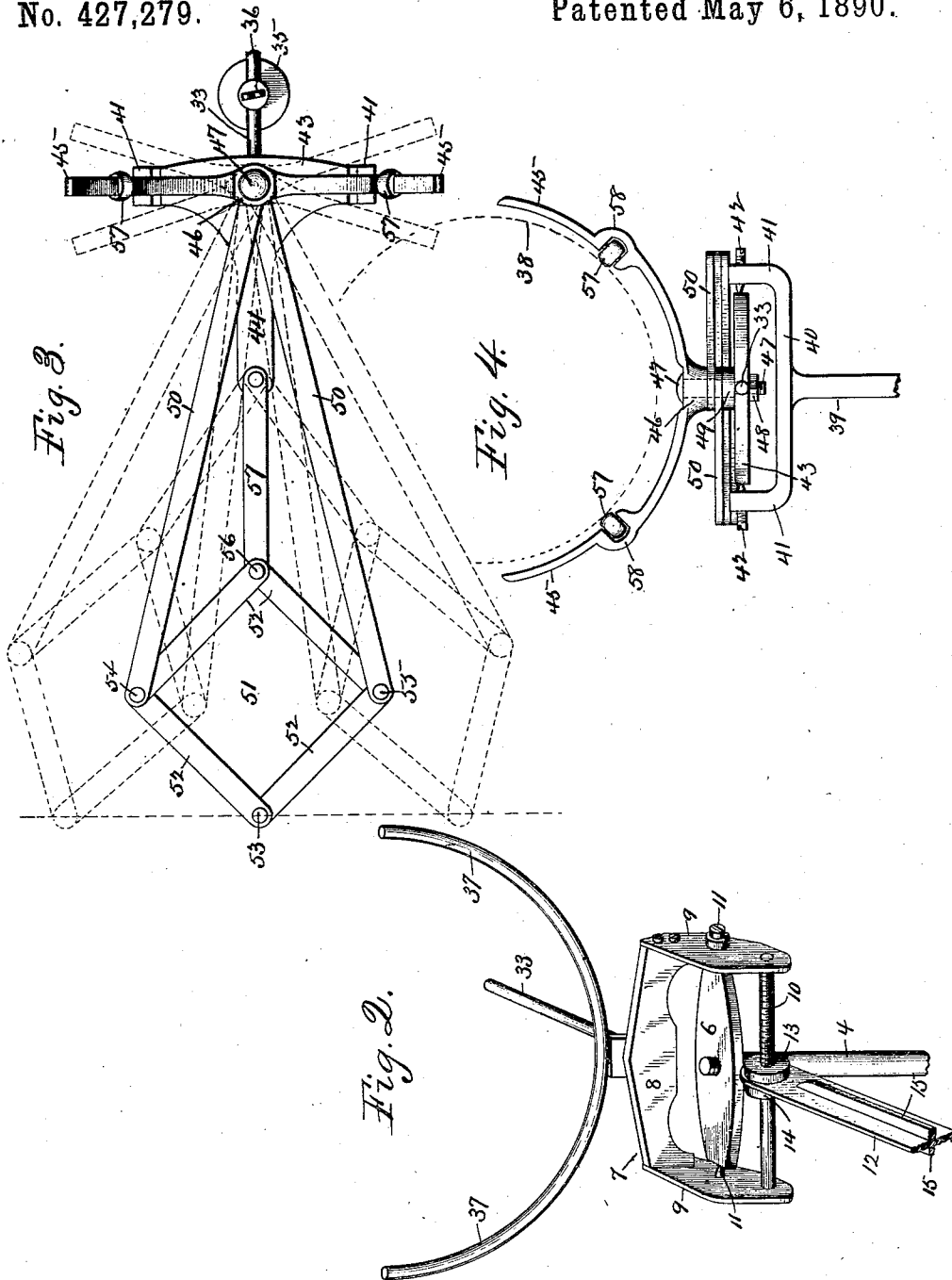
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2 Sheets—Sheet 2.

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Witnesses

Reed C. Brown.
F. T. Chapman.

Inventor,

Werner Suess.

By his Attorney

Joseph Lyons.

UNITED STATES PATENT OFFICE.

WERNER SUESS, OF WASHINGTON, DISTRICT OF COLUMBIA, ASSIGNOR TO
EMILE BERLINER, OF SAME PLACE.

GRAMOPHONE.

SPECIFICATION forming part of Letters Patent No. 427,279, dated May 6, 1890.

Application filed August 6, 1889. Serial No. 319,866. (No model.)

To all whom it may concern:

Be it known that I, WERNER SUESS, 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, of which the following is a specification.

My invention has reference to improvements in the reproducing apparatus adapted for use in the method of recording and reproducing sounds set forth in Letters Patents No. 372,786, of November 8, 1887, and No. 382,790, of May 15, 1888, both granted to Emile Berliner. The whole apparatus used for the practice of the said method has been called the "gramophone," and in this class of sound recording and reproducing apparatus the record is ordinarily produced on the face of a rotating disk as a volute band consisting of a sinuous or undulating groove of even depth. In the production of this record a recording-stylus is made to travel over the face of the rotating disk from the outer circumference toward the center in a straight radial path. The reproduction of the recorded sounds is effected by giving to a reproducing-stylus vibratory movement by and in accordance with the sinuosities of the record-groove, and, these vibratory movements being transmitted to a diaphragm, vibrations of the latter give rise to sounds which are copies of the sounds originally uttered against the recording apparatus.

With the view of intensifying the sound emitted by the reproducer, and more especially of directing the same to the listener or listeners, I use a funnel-shaped tube, on the contracted end of which the reproducing stylus and diaphragm are mounted, while the open flaring end of the tube is directed toward the listener or listeners. This flaring sound-conveyer, thus becoming an integral part of the reproducer, must have all the mass movements of the stylus and diaphragm, and being of considerable weight it must be so supported, and balanced that the recording-stylus will bear with light but sufficient pressure upon the record-tablet. The best results are obtained if the reproducing-stylus is made to travel in a straight radial

line across the face of the record-tablet, substantially in the manner in which the recording-stylus has traveled in producing the record. The main features of my present invention therefore have reference to the means for supporting and counterbalancing the sound-conveying tube with its attached diaphragm and reproducing-stylus and for making the path of the stylus across the face of the record-disk as nearly as practicable a straight radial line. The stylus engaging with its point the record-groove is controlled by the walls of the latter, and, as will be hereinafter more fully shown, I rely upon this control of the stylus by the walls of the record-groove for the movement of the stylus across the face of the disk, there being no positive feeding mechanism for thus moving the stylus. All this will more fully appear from the following detailed description, in which reference is made to the accompanying drawings, which form a part of this specification, and in which I have shown, in—

Figure 1, a perspective view of one form of reproducer, shown in the supporting frame with a sound-conveying tube, with the diaphragm and stylus in operative relation to the record-disk. Fig. 2 is a perspective view of the pivotal bearing of the frame with parts removed and broken away. Fig. 3 is a plan view of another form of supporting-frame for the reproducer, by which the stylus is caused to travel in a straight line across the record-tablet. Fig. 4 is an end view of the same with the counter-weight removed.

Like numerals of reference indicate like parts all throughout the drawings.

Referring now to Fig. 1, there is shown a base-plate 1, which may be secured by screws or otherwise to any suitable support—such, for instance, as a table. Erected on this base-plate is a standard 2, on one edge of which are laterally-projecting eyes 3, forming guides in which turns a vertical shaft or pivot 4. This shaft is stepped at the lower end in a bearing 5 in the base-plate, and at the upper end has secured to or formed on it a head 6, which, as shown more clearly in Fig. 2, consists of a flat plate, to the center of which the shaft 4 is attached. This head 6 serves

as a support for a frame 7, consisting of an end piece 8, two parallel side pieces 9, secured at one end to the end piece by screws, as shown, or otherwise, and a rod 10, joining the other ends of the side pieces 9. Mounted in the side pieces 9 are pointed screws 11, projecting through nuts therein and entering oppositely-arranged seats (not shown) in the ends of the head 6, and forming a pivotal bearing for the frame 7, around which it may turn in a vertical plane at right angles to the axis of the shaft 4. It will now be understood that the frame 7 may be moved in any direction, the shaft 4 and pivot-screws 11 constituting a universal joint for the same. The rod 10 carries one end of an arm 12, secured rigidly thereon by a jam-nut 13, which clamps the said arm firmly against a flange 14 on the rod, which latter is screw-threaded, as shown, for the reception of the nut 13. The arm 12 is stiffened by longitudinal side ribs 15 and terminates at the free end in a head 16, on one side of which is secured a diaphragm-holder 17, carrying a diaphragm 18, and on the other side of the head there is secured a flaring socket 19, communicating at its reduced end with a chamber (not shown) at the rear of the diaphragm.

Attached to the diaphragm is a stylus 20, mounted for lateral vibration, and, together with the said diaphragm, forming a sound-reproducer. The construction of the stylus and the mounting therefor form no part of the present invention, and are therefore not specifically described herein. The point of the stylus rests normally in the record-groove produced on the face of a disk-tablet 21, which is mounted for rotation upon a disk carried by a vertical shaft 22, similar to the shaft 4, before described. As shown in Fig. 1, the shaft 22 has at its upper end a thumb-nut 23, by means of which the tablet is clamped thereon, and the said shaft is passed through eyes 24 (one only being shown) on a standard 25 and stepped in a bearing 26 in a base-plate 27, on which the standard is erected. The lower end of the standard is extended laterally on the plate 27, as shown at 28, and terminates in an upturned end 29, carrying at its upper end and below the level of the tablet a bearing 30 for a horizontal shaft 31, which latter is provided with a crank 32 at the outer end and a friction-wheel 33 at the inner end, which wheel engages the under side of the tablet-supporting disk, which is not visible in the drawings. It will now be understood that when the shaft 31 is rotated by means of the crank 32 the friction-wheel 33, engaging the tablet-support, will cause the latter to rotate and carry successive portions of the record under the stylus to reproduce the sounds in a manner described in the aforesaid Letters Patent.

The mechanism for supporting and rotating the tablet may be of any suitable construction and entirely different from that shown, such construction being by no means an essential feature of my invention.

Secured to the end piece 8 of the frame 7 is a rod or arm 33', extending in a direction opposite to that of the arm 12, and carries a weight or block 35. This weight may be adjusted upon rod 33' and clamped in any desired position on a thumb-screw 36.

Attached to a short stem erected on the end piece 8 and over the shaft 4 is a semicircular bracket 37, on which rests the funnel-shaped sound-conveyer 38, the smaller end of which enters the socket 19. It will be readily understood that the sound-conveyer supported in the manner described, together with the diaphragm and stylus carried in the mounting attached to the arm 12, may be moved laterally around the axis of the pivot-shaft 4 and vertically around the axis of the frame 7. By reason of these two movements the stylus may be made to approach toward or recede from the axis of the rotating tablet, and in this manner traverse every portion of the surface of the said tablet, or it may be swung aside and entirely removed therefrom.

The operation of an apparatus so constructed is as follows: The tablet 21, containing a sound-record in the form of a convolute, sinuous, or wavy groove produced in the manner set forth in my aforesaid Letters Patents, is mounted on the supporting-disk carried by the shaft or spindle 22. The weight 35 is adjusted to nearly counterbalance the arm 12 and parts carried thereby, so that the stylus rests lightly, but with sufficient pressure, on the tablet with its point in the record-groove. The tablet is now rotated and the sinuous groove thereon vibrates the stylus, which in turn vibrates the diaphragm in accordance therewith, and thus produces sound-waves, which latter are directed toward the listener by the sound-conveyer 38. As the rotation of the tablet is continued the convolutions of the record-groove will cause the stylus to be slowly drawn across the tablet, turning the entire support of the reproducing apparatus on its pivot-bearing, the said stylus moving along a slightly-curved path over the said tablet. When placing a tablet in position, or on removing it therefrom, it is necessary to move the reproducer out of operative relation thereto, and for this purpose the supporting-frame is swung on the horizontal and vertical pivots to some position away from the tablet, when it may be lowered until a leg 38', which depends from the arm 12, rests upon the table on which the apparatus is secured. It will be understood that the counter-weight may be adjusted to cause the stylus to bear with any desired degree of pressure on the tablet.

Referring now more particularly to Figs. 3 and 4, there is shown a standard or post 39, which is fixed to a table or other support and terminates at the upper end in a yoke 40, having two upturned parallel ends 41, each carrying an inwardly-projecting pointed screw 42, extending through a suitable nut formed therein. The pointed ends of these screws enter suitable seats on opposite sides of a

plate 43 and constitute a horizontal pivotal bearing on which the said plate may be rocked. The plate 43 has an arm 44 formed on it and extending centrally from one side at right angles to its axis, and it also has another arm 33', similar to that shown in Figs. 1 and 2, extending in a direction opposite to the arm 44, being on the other side of the axis of the plate. The arm 33' carries a sliding weight 35, similar in construction to that before described, and in a like manner serving as a counter-weight. Above the center of the plate 43 there is a semicircular bracket consisting of two curved branching arms 45, rising from a block 46. Through this block there is a perforation for a pivot-bolt 47, which extends downwardly through the plate 43 and there receives a nut 48, by means of which the bolt is secured to the said plate, and the head of the bolt engages the upper face of the said block 46. This bolt 47 also passes through a washer 49, resting directly on the upper surface of the plate 43, and through eyes formed in the ends of links 50, the said ends being interposed between the lower end of the block 46 and the washer 49. Thus it will be seen that the bolt forms a vertical pivot around which the bracket 45 46 and the links 50 may move, and also secures them to the said plate. The outer ends of the links 50 are pivoted to opposing corners of an articulated frame 51, composed of links 52, of equal length, connected together at the ends by pivot-pins 53, 54, 55, and 56, respectively, the pins 54 and 55 also connecting the links 50 to the frame at the points before mentioned. The pin 56 also pivotally connects one end of a link 57 to the corresponding corner of the frame 51, the other end of the said link being pivoted to the outer end of the arm 44.

The frame 51, together with the links 50 and 57, constitutes a well-known mechanical movement by which a curvilinear movement is converted into a rectilinear movement, provided the various links have the proper relative lengths, which is supposed to be the case in this instance, and therefore no detailed description of the operation thereof is deemed necessary.

In the apparatus shown in Figs. 3 and 4 the arm 12 is replaced by the link movement or system, and in this case the stylus and diaphragm will be mounted on the outer or free end of the said link system—namely, at 53—and the sound-conveyer 38 (indicated by dotted lines in Fig. 4) will rest on friction-rollers 57, mounted in bearings formed in cut-away or recessed portions 58 of the bracket-arms 45. In the operation of this apparatus the counter-weight 35 is adjusted in the manner before described and the entire reproducer mechanism is moved to a position in which the stylus rests on the tablet at the beginning of the record to be produced. Such position is indicated in Fig. 3 by the upper series of

dotted lines, from which it will be seen that the frame 51 is of greater length than breadth. As the record-tablet is rotated the volute record-groove acting on the stylus slowly draws it across the face of the tablet, as before explained, and turns the entire reproducing apparatus on its vertical axis or pivot 47. As the apparatus approaches the position coinciding with the vertical plane of the arm 44 of the plate 43 the link 57, moving through an arc of shorter radius than that of the links 50, tends to force the frame 51 outward, which tendency is resisted by the said links 50, and the consequent action of these two opposing forces is to shorten the length and increase the breadth of the said frame 51 until it assumes the square form shown in full lines, Fig. 3. As the movement of the stylus is continued beyond the central plane of the arm 44 the frame 51 will be again lengthened, as indicated by the lower series of dotted lines. It will be understood that the length of the frame 51 decreases as the latter approaches a central position and increases as it recedes therefrom, and in accordance with this change of shape of the said frame its outer end (and the stylus thereon) will be carried to a constantly-increasing distance from the pivot or axis of the apparatus, and the resultant of this constant longitudinal movement of the outer end of the frame while the apparatus moves in an arc around its pivot is to move the said end in a straight line. When the reproducer-stylus is moved over the record-tablet in the manner stated, its path will coincide with the radius of such tablet, and the point of the said reproducer-stylus will be at all times in the same relation to the record-grooves as was the recorder-stylus in producing such record. In this operation the sound-conveyer must participate in the movement of the stylus toward and from the pivot 47, and it will therefore slide upon the arms 45 of the supporting-bracket, and with a view of reducing the friction the rollers 57 are provided.

Having now fully described my invention, I claim and desire to secure by Letters Patent—

1. In an apparatus for reproducing sounds from a record-tablet, the combination, with a reproducer mechanism consisting of a sound-conveying tube and a diaphragm and stylus mounted at one end of the tube, of a freely swinging supporting-frame for the said reproducer mechanism and a weight adjustable on the said frame to counterbalance the reproducer mechanism, substantially as described.

2. In an apparatus for reproducing sounds from a record-tablet, the combination, with a reproducer mechanism consisting of a sound-conveyer and a diaphragm and stylus mounted at one end thereof, of a supporting-frame for the said reproducer, loosely pivoted to swing freely both laterally and vertically, and

an adjustable counter-weight on the said frame for determining the pressure of the stylus on the record-tablet, substantially as described.

- 5 3. In an apparatus for reproducing sounds from a record-tablet, the combination, with a reproducer mechanism consisting of a sound-conveyer and a diaphragm and stylus at one end of the said conveyer, of a counterweighted
 10 pivoted frame for supporting the reproducer mechanism and provided with a system of laterally-movable pivoted links connected at one end to the said reproducer mechanism and at the other to a portion of the support-
 15 ing-frame fixed against lateral movement, substantially as described.

4. In an apparatus for reproducing sounds from a record-tablet, the combination, with a reproducer mechanism consisting of a sound-
 20 conveyer and a diaphragm and stylus at one end of the said conveyer, of a system of links supporting the stylus end of the reproducer and proportioned and arranged, as described,

for moving the stylus in a straight path across the record-surface, substantially as described. 25

5. In an apparatus for reproducing sounds from a record-tablet, the combination, with a reproducer mechanism consisting of a sound-conveyer and a diaphragm and stylus at one end of the said conveyer, of a system of links
 30 supporting the stylus end of the reproducer and constructed, as described, for moving the stylus in a straight path across the record-surface, and a pivoted bracket on which the sound-conveyer rests, provided with anti-fric-
 35 tion rollers on which the said conveyer travels longitudinally to participate in the movement of the stylus end of the reproducer, substantially as described.

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

WERNER SUESS.

Witnesses:

F. T. CHAPMAN,

J. B. MACAULEY.