

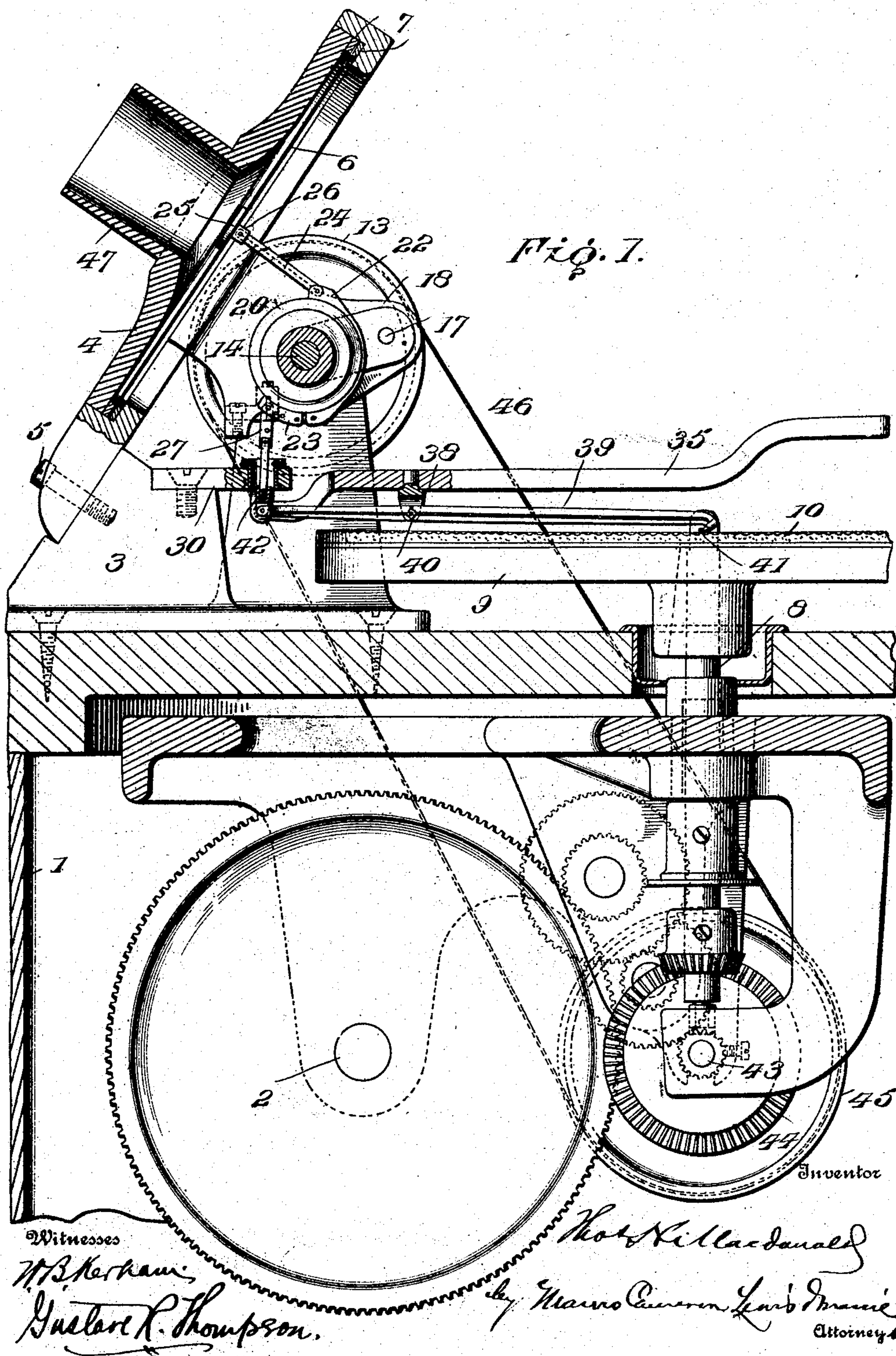
No. 877,207.

T. H. MACDONALD.  
GRAPHOPHONE.

PATENTED JAN. 21, 1908.

APPLICATION FILED JAN. 16, 1908.

2 SHEETS—SHEET 1.





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2 SHEETS—SHEET 2.

Fig. 2.

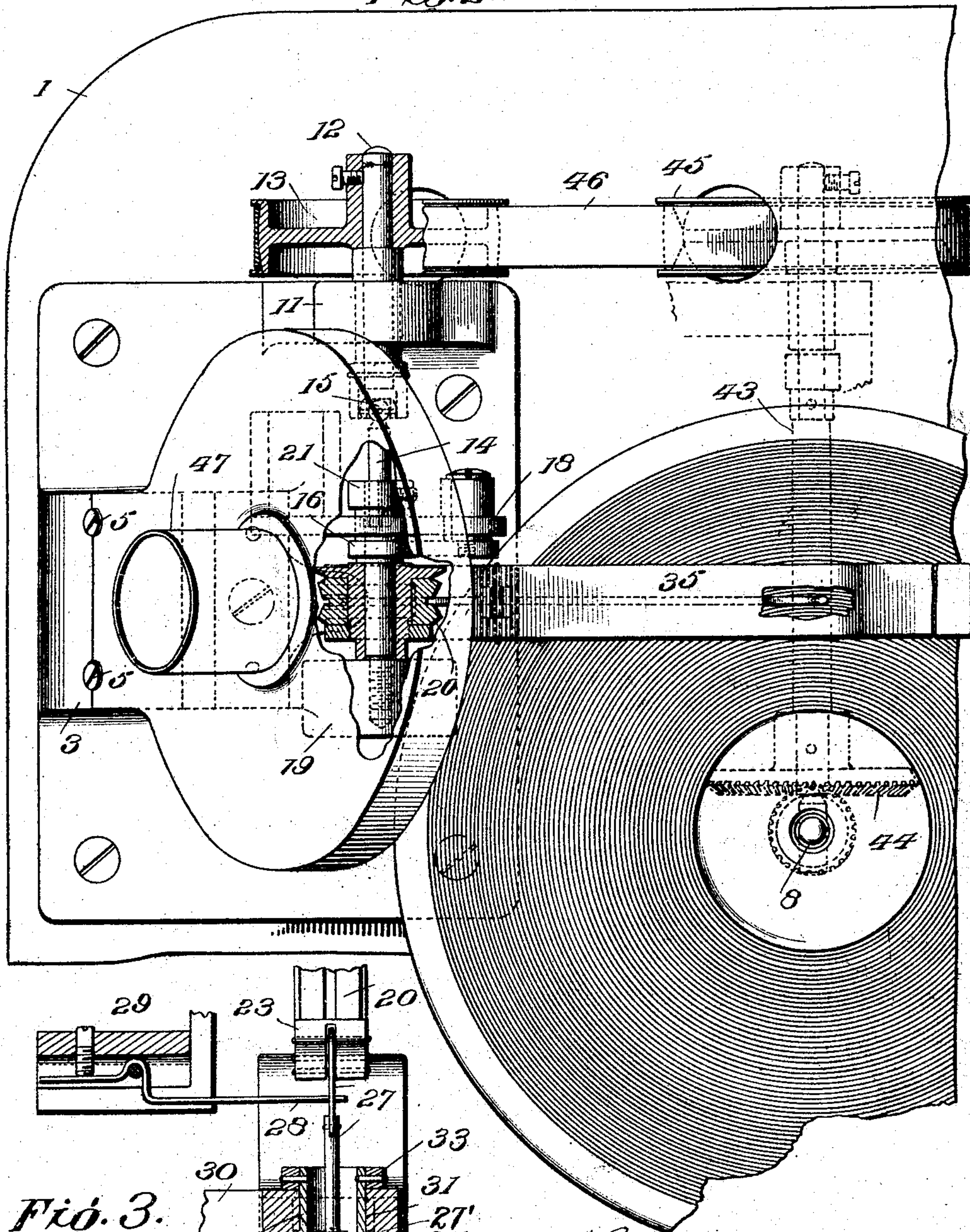
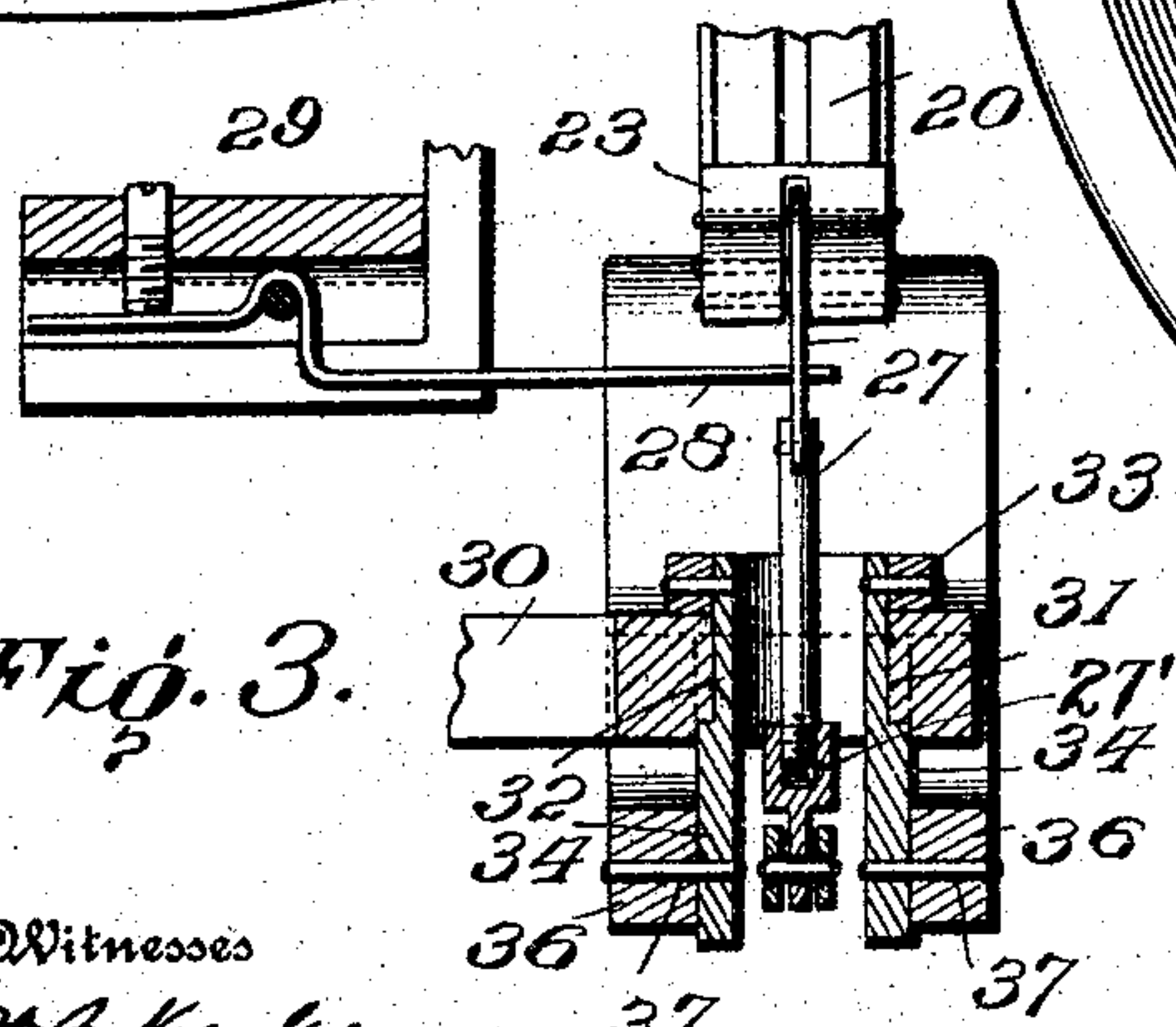


Fig. 3.



Witnesses

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# UNITED STATES PATENT OFFICE.

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## GRAPHOPHONE.

No. 877,207.

Specification of Letters Patent.

Patented Jan. 21, 1908.

Application filed January 16, 1906. Serial No. 296,366.

*To all whom it may concern:*

Be it known that I, THOMAS H. MACDONALD, of Bridgeport, Connecticut, have invented a new and useful Improvement in Graphophones, which invention is fully set forth in the following specification.

This invention relates to talking machines and more particularly to machines of this character in which the reproduction of sound is obtained from a disk-shaped or flat record tablet having a record groove thereon in the shape of a spiral upon the flat surface of the tablet, though certain features of the invention are applicable in connection with other forms of record.

In talking machines of the disk type the reproducer has heretofore been carried on the end of a hollow swinging arm, with the stylus of the reproducer resting in the record groove and the reproducer being moved bodily with the arm across the face of the record during the act of reproduction, the reproduced sound waves being conveyed to a suitable horn through the hollow arm. Furthermore, it has heretofore been proposed to employ in talking machines a relay device in the form of a friction roll and shoe between the stylus and diaphragm of the reproducer, the undulations of the record groove being utilized to govern the application of power for imparting vibrations to the diaphragm of the reproducer. So far as I am aware relay devices of this character have only been applied to machines employing cylindrical records and provided with means for moving the reproducer in a right line past the record during the act of reproduction.

One of the main objects of the present invention is to provide means whereby a relay device may be introduced between the stylus and diaphragm of the reproducer in connection with machines employing the flat or disk form of record, as distinguished from the cylindrical record.

A further object is to provide a disk machine wherein the reproducing diaphragm and its casing shall be fixed in position, thus doing away with the mechanism heretofore employed for moving these parts with relation to the record, and particularly doing away with the hollow reproducer-carrying arm heretofore universally employed.

With these objects in view the invention consists of a flat or disk record with mechanism for revolving the same in combination

with a reproducing diaphragm remaining in the same place or location throughout the act of reproduction, a reproducing stylus in operative relation with the record, and connections between said stylus and the diaphragm, a suitable relay device, as a friction roll and shoe, being introduced into or acting upon said connections.

The invention further consists in a fixed or permanently located reproducer diaphragm, a continuously driven friction roll, a friction shoe bearing on said roll and connected at its respective ends to the diaphragm and to a reproducing stylus bearing upon a flat disk-shaped or other style of record, and means for simultaneously revolving said record and friction shoe.

The invention further consists in certain details of construction which will be hereinafter more particularly described and then defined in the claims.

The inventive idea involved may receive a variety of mechanical expressions, one of which, for the purpose of illustrating the invention, is shown in the accompanying drawings, but it will be understood that such drawings are for the purpose of illustration only, and not for the purpose of defining the limits of the invention, reference being had to the claims for this purpose.

Referring to the drawings—Figure 1 is a detail vertical broken section, parts being shown in elevation; Fig. 2 is a broken plan view of the parts shown in Fig. 1, portions of the reproducer head being broken away and the friction roll shown in horizontal section; Fig. 3 is a detail vertical section showing the means of connecting the stylus-bearing parts with the friction shoe.

Referring to the drawings, in which like numerals indicate like parts, 1 is the usual or any suitable boxing or casing of a disk form of talking machine, such as the graphophone, within which boxing or casing the power mechanism for operating the parts is inclosed, power being transmitted from shaft 2. Mounted upon the top of the boxing 1 is a suitable bracket 3 upon which is the reproducer-head or casing 4 secured to the bracket in any suitable way, as by screws 5. Within the reproducer-head 4 there is mounted a diaphragm 6, preferably between suitable gaskets 7. Secured to a shaft 8 extending vertically through the top of the box is the tablet-holding table 9, upon which is placed



the record tablet 10. Turning in bearing 11 is a shaft 12 having keyed thereto a pulley 13. The inner end of said shaft 12 has an extension shaft 14 connected thereto by a ball and socket joint 15, Fig. 2, which extension shaft 14 extends in front of, and preferably slightly below the face of the diaphragm 6, and has bearing in a swinging arm 16 swinging on a pivot pin 17 carried in a fixed bearing lug or bracket 18 rigidly secured to the bracket-piece or plate 3. Preferably the extension shaft 14 passes through an opening (not shown) in the bracket-arm 18, and preferably also such extension shaft 14 is formed in two parts, the outer portion bearing a weight 19 and a friction roll 20 secured to and revolving with the shaft. The outer end of the shaft 14 is secured to the inner end thereof by a suitable coupling 21 so that the entire shaft 14 and the coupling 21, together with the weight 19 and the friction shoe 20 are free to swing about the joint 15, being supported in the swinging-arm 16. A friction shoe, preferably formed in two parts 22 and 23 suitably joined together, is in contact with the friction roll, one of the parts of the shoe, as 22, being pivotally connected by the link 24 to the diaphragm 6, such connection being preferably secured by means of a button 25 having a shank 26 which extends through an opening in the diaphragm, to which shank the link 24 is pivotally connected. The other portion 23 of the friction shoe has pivotally connected thereto a link 27, and a spring 28 acts through the link 27 to hold the shoe member 23 in contact with the friction roll 20, the tension of the spring 28 being adjustable in any suitable way, as by means of a screw 29, see Fig. 3. It will be understood that the spring 28 engages the link 27 as by passing through a hole therein.

Referring to Figs. 1 and 3, 30 is a bracket-arm extending outwardly, preferably from the bracket 3, in a horizontal direction, having the opening 31 therethrough, within which opening there is loosely mounted a sleeve 32 having a flange 33 taking bearing upon the upper surface of the bracket 30. Depending from the sleeve 32 and on opposite sides thereof, are two ears 34. A lever 35 of some considerable weight extends outwardly in a substantially horizontal position above the face of the record 10 and at its inner end is provided with forked arms 36—36, which are secured by trunnions 37 to the ears 34—34 of the sleeve 32, so that the lever 35 is free to move in a vertical plane around the trunnions 37, and also may be turned in a horizontal plane, the sleeve 32 turning in the opening 31 in bracket 30.

The lever 35 has depending from the under side thereof ears or lugs 38, see Fig. 1, and the stylus bar or lever 39 is connected to said lugs so as to rock in a vertical plane by a pivot pin 40, said stylus bar or lever bearing

at its outer end stylus 41 in contact with the record, and being connected at its other end by a suitable joint to the link 27, which link, as will be clearly seen from Fig. 3, extends downwardly through the sleeve 32. The connecting joint between the link 27 and the stylus lever 39 is one which leaves the stylus lever free to turn in a horizontal plane without affecting the link, but it will impart to the link all of the movements of the stylus lever in a vertical plane. Any suitable joint may be employed for this purpose, as for example the loose screw threaded connection between the link 27 and a socket 27' pivoted to the stylus bar as shown in Fig. 3, though the connection may be a ball and socket instead of a screw-thread connection, if desired.

The revolutions of the power shaft 2 are imparted to a shaft 43, Fig. 1, by a suitable train of gearing, which shaft 43, on its inner end, carries a bevel gear 44 meshing with a corresponding bevel gear on the shaft 8 for revolving the tablet, while the outer end of said shaft 43 carries a pulley 45, a belt 46 passing over the pulley 45 and the pulley 13, thereby revolving the shaft 12 and the friction roll and weight on the extension shaft 14.

Operation: The operator grasps the outer end of the weight lever 35, swings it so as to place the stylus 41 in the desired position on the record, and the motor being started the record 10 and the friction roll 20 are simultaneously revolved. As the record is revolved the stylus is carried across the face of the record by the action of the spiral groove, thereby carrying with it the weight lever 35 and the stylus bar or lever 39, both of which are turned in a horizontal plane around the joint made by the sleeve 32 and the bracket 30 for turning link 27. During the revolutions of the record the undulations of the latter (which, as here shown, are vertical undulations) impart up and down movements to the stylus end of the stylus lever 39, which vibrations are imparted to the link 27, which thereby acts to increase and decrease the friction of the friction shoe upon the friction roll in proportion to the amplitude of the vibrations, the friction roll thereby imparting to the diaphragm 6 corresponding vibrations but of magnified or increased amplitude. During this action shaft 14, with the link 18, is free to swing on pivot 17, thereby avoiding any undue strain upon the diaphragm through any excess of friction that might occur, the shaft 14 turning on the universal joint 15 to permit this swinging movement. The action of the friction roll and shoe with its swinging bearing and the weight attached thereto is substantially that occurring in talking machines above referred to employing the relay mechanism in connection with cylindrical tablets.

While the main object in the above de-



scribed invention is to provide a sound reproducing machine of the disk type with the relay feature consisting of the friction roll and shoe, there are certain features of the invention that are applicable to other forms of machines than the disk machine, and whenever in the accompanying claims the construction is not specifically limited to disk machines it is to be understood that other forms of record than the disk form are also in contemplation.

What is claimed is:—

1. In a sound reproducing machine, the combination of a revolving record, a stationary diaphragm, a stylus mounted to turn on a universal joint independent of said diaphragm, connections between said stylus and diaphragm, a friction device acting on said connections, and means simultaneously actuating said record and friction device.

2. In a sound reproducing machine, the combination of a record, with a diaphragm, a stylus mounted to move freely across said record independent of the diaphragm, connections between said stylus and diaphragm, a friction device acting on said connections, and means simultaneously actuating said record and friction device.

3. In a sound reproducing machine, the combination of a sound record, with a diaphragm, a stylus mounted to move across the face of the record independent of the diaphragm, a friction roll, connections between said stylus and diaphragm, one part of said connections constituting a friction shoe engaging said roll, and means simultaneously actuating said record and roll.

4. In a sound reproducing machine, the combination of a disk-shaped sound record, with a stationary diaphragm, an universally mounted stylus, a friction roll, connections between said stylus and diaphragm and having frictional engagement with said roll, and means simultaneously actuating said record and roll.

5. In a sound reproducing machine, the combination of a disk-shaped sound record, with a stationary diaphragm, a stylus mounted to move parallel with the face of said record and also at right angles thereto, a friction roll, connections between said stylus and diaphragm and having frictional bearing on said roll, and means simultaneously actuating said record and roll.

6. In a sound reproducing machine, the combination of a disk-shaped sound record, with a stylus mounted to swing freely across the face of the record and follow the record groove, a stationary diaphragm, a connection between said stylus and diaphragm, a friction device acting on said connections, and means simultaneously revolving said record and friction device.

7. In a sound reproducing machine, the combination of a stationary diaphragm cas-

ing or support, a diaphragm mounted therein, a flat or disk-shaped sound record, a stylus mounted to swing across said record connections between said stylus and diaphragm, an intermediate friction device acting on said connections, and means simultaneously revolving said record and friction device.

8. In a sound reproducing machine, the combination of a stationary diaphragm casing or support, a diaphragm mounted therein, a flat or disk-shaped sound record, an universally mounted stylus in contact with said record, connections between said stylus and diaphragm, an intermediate friction device acting on said connections, and means simultaneously revolving said record and friction device.

9. In a sound reproducing machine, the combination of a stationary diaphragm casing or support, a diaphragm mounted therein, a flat or disk-shaped sound record, a stylus mounted to move across said record, connections between said stylus and diaphragm, a friction shoe constituting part of said connections, a friction roll in contact with said shoe, and means simultaneously revolving said record and roll.

10. In a sound reproducing machine, the combination of a stationary diaphragm support, a diaphragm mounted therein, a flat or disk-shaped sound record revoluble in a horizontal plane, a lever mounted to twing in a plane above said record, a stylus bar fulcrumed on said lever and carrying a stylus in contact with said record, connections between said lever and diaphragm, an intermediate friction device acting on said connections, and means simultaneously revolving said record and friction device.

11. In a sound reproducing machine, the combination of a record, a stationary diaphragm, a stylus-bar or lever, a friction roll, a friction shoe bearing on said roll, a link connecting one end of said shoe to the diaphragm, and a link connecting the other end of said shoe and the stylus-bar or lever, the joint between said link and said bar or lever leaving the lever free to turn in a direction parallel to the record tablet independent of the link but imparting to the link all movements of the lever normal to the record.

12. In a sound reproducing machine, the combination of a disk-shaped record, a stationary diaphragm, a weight-lever mounted on a universal joint, a stylus-bar fulcrumed on said weight-lever, a stylus carried by said stylus-bar, connections extending from the stylus-bar to said diaphragm, a friction shoe interposed in said connections, a friction roll in contact with said shoe, a swinging shaft on which said roll is mounted, and means simultaneously revolving said roll-shaft and record.

13. In a sound reproducing machine, the



combination of a sound record, a diaphragm, a friction device restrained from longitudinal movement, a reproducing stylus mounted with free movement so as to follow the record, connections between said stylus and the diaphragm, said connections being in frictional engagement with said friction device, and means revolving said record and friction device.

14. In a sound reproducing machine, the combination of a sound record and means for revolving the same, a diaphragm, a revolving friction device restrained from longitudinal movement, a weight mounted to swing in a substantially horizontal plane above the record, a stylus bar carried by said weight and having a stylus engaging the record, and connections between said bar and said diaphragm, which connections engage said friction device and also pass through the axis of said weight.

15. In a sound reproducing machine, the combination of a sound record, with a diaphragm, a friction roll mounted to swing to and from the diaphragm but restrained from longitudinal movement, a reproducing stylus engaging the record, connections from said stylus to the diaphragm in frictional engagement with said friction roll, and means revolving said record and roll.

16. In a sound reproducing machine, the combination of a sound record and means for revolving the same, with a stationary dia-

phragm, a revolving friction roll restrained from longitudinal movement, a weight pivoted to the framework of the machine so as to be capable of movement parallel with the record surface and also to and from the surface, a stylus bar carried by said weight having a stylus engaging the record, and connections between said stylus bar and said diaphragm, which connections pass through the axis of the horizontal movement of said weight, and make frictional contact with said friction roll.

17. In a sound reproducing machine, the combination of a sound record and means for revolving the same, a stationary diaphragm, a revolving friction device mounted to swing to and from said diaphragm but restrained from longitudinal movement, a stationary bracket, a sleeve hung to turn in a bearing in said bracket, a weight pivoted to said sleeve, a stylus bar fulcrumed on said weight and having a stylus engaging the record, and connections between said stylus and diaphragm, which connections are in frictional engagement with said friction device and pass through said sleeve.

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

THOMAS H. MACDONALD.

Witnesses:

A. B. KEOUGH,  
C. A. GIBNER.