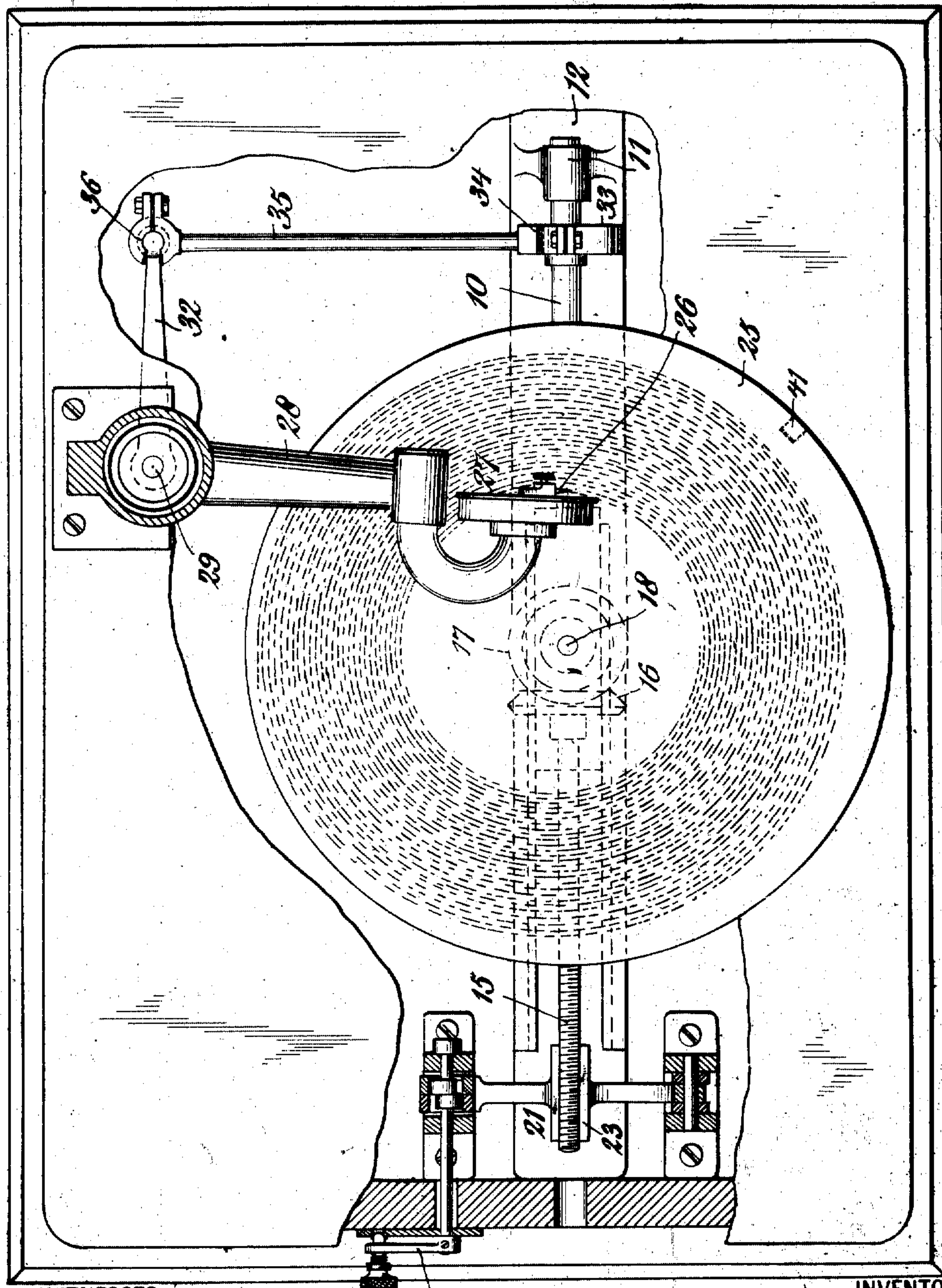


D. H. HAYWOOD.
SOUND RECORDING AND REPRODUCING MACHINE.
APPLICATION FILED DEC. 24, 1909.

995,347.

Patented June 13, 1911.

4 SHEETS-SHEET 1.



WITNESSES:

W. Sandberg Jr.
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4 SHEETS—SHEET 2.

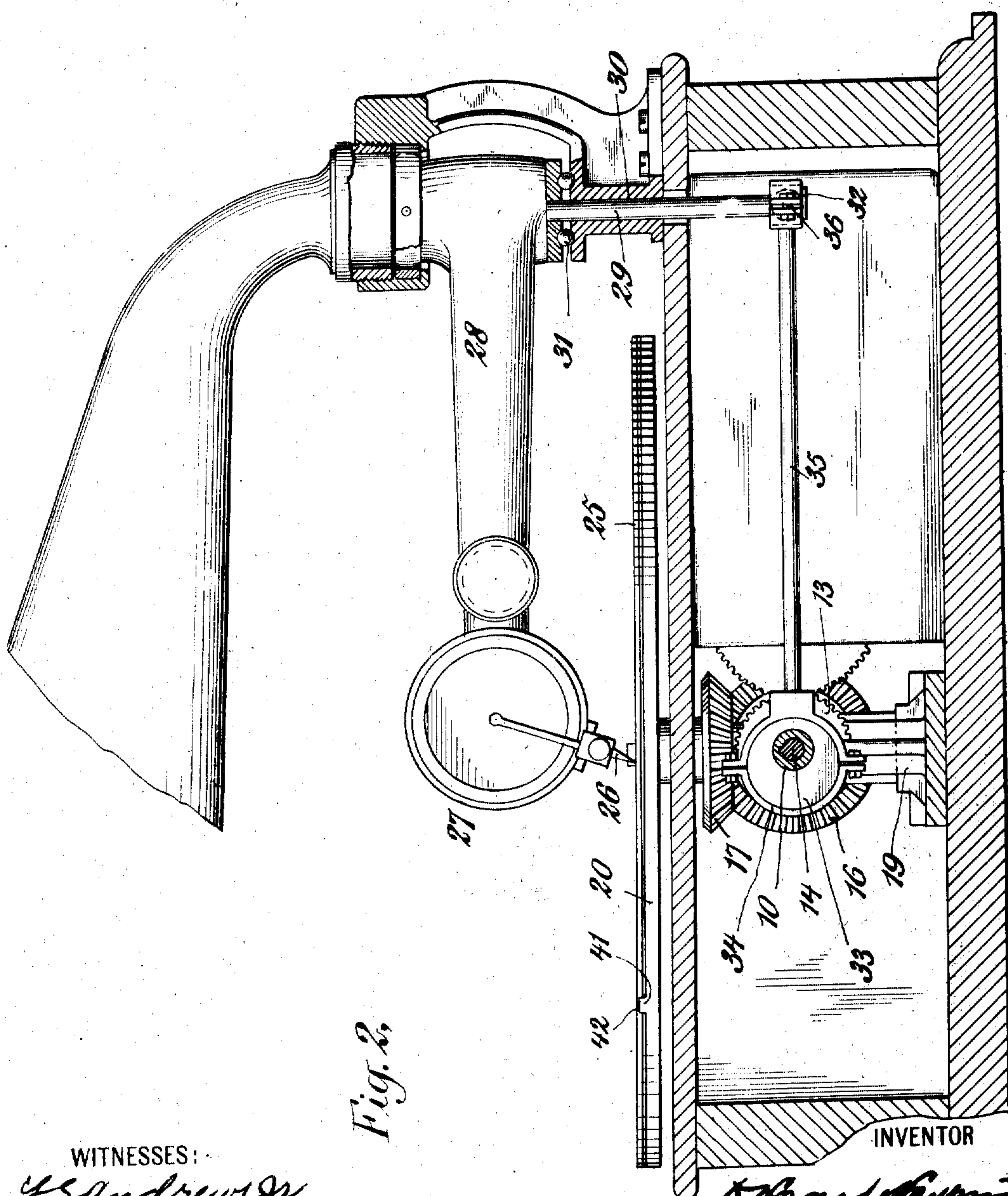


Fig. 2.

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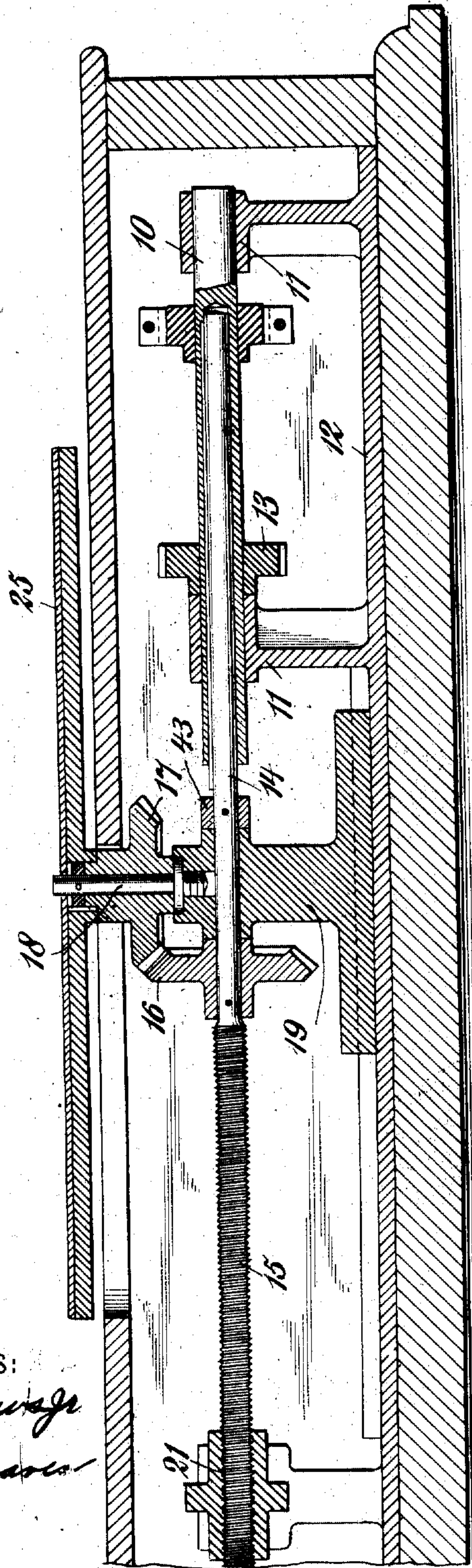
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4 SHEETS—SHEET 3.

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Fig. 3.



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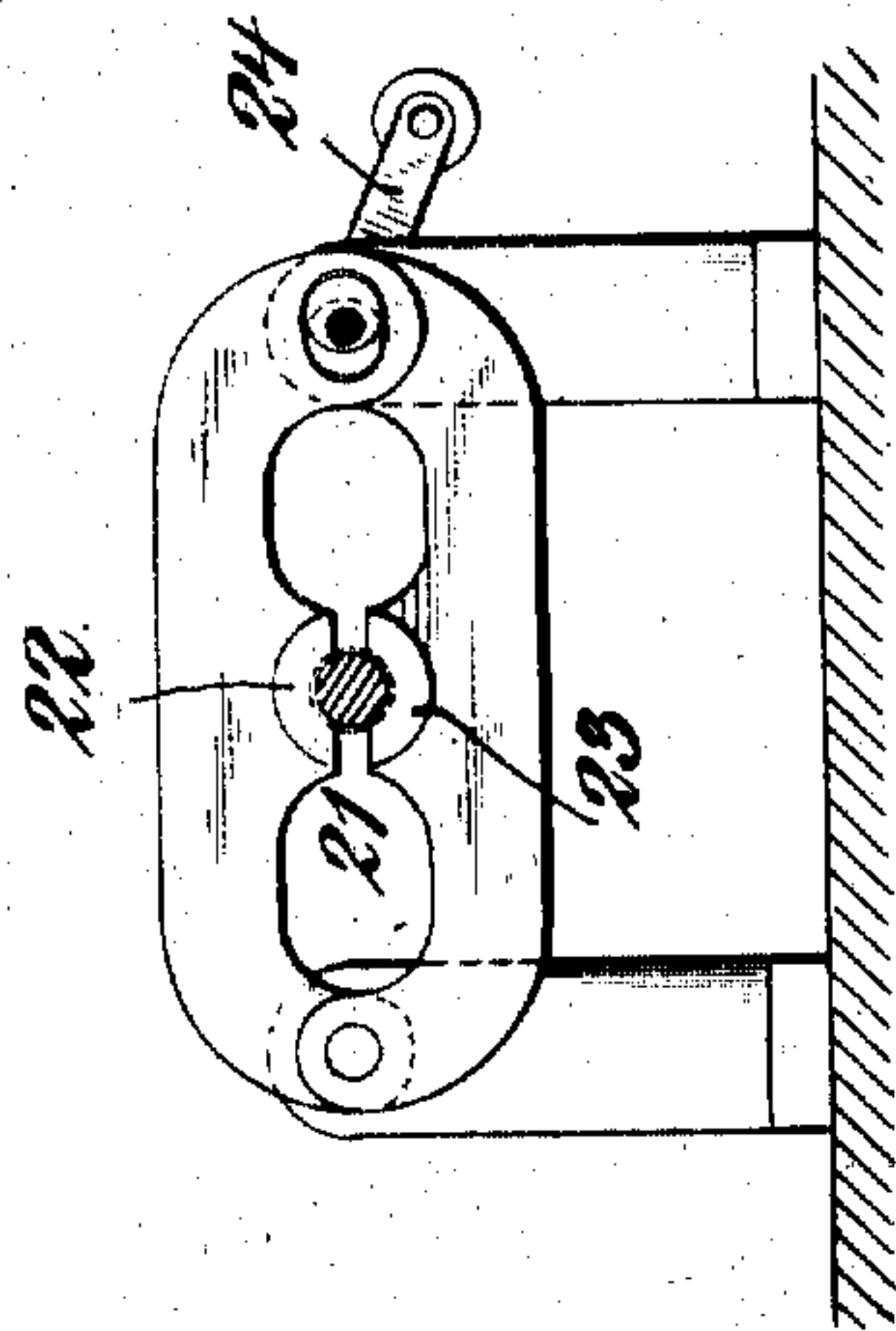


Fig. 4.

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4 SHEETS-SHEET 4.

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Fig. 6

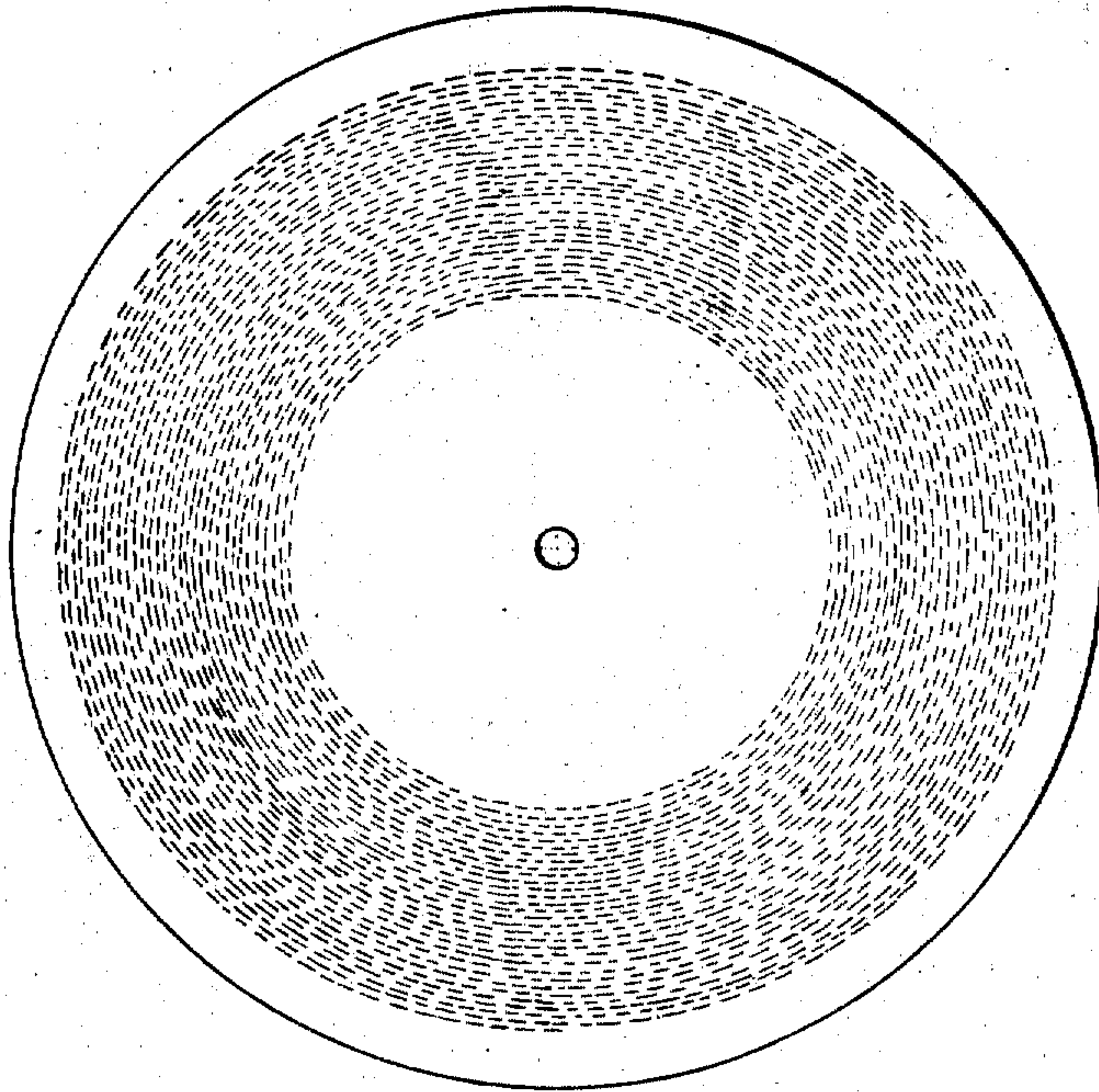
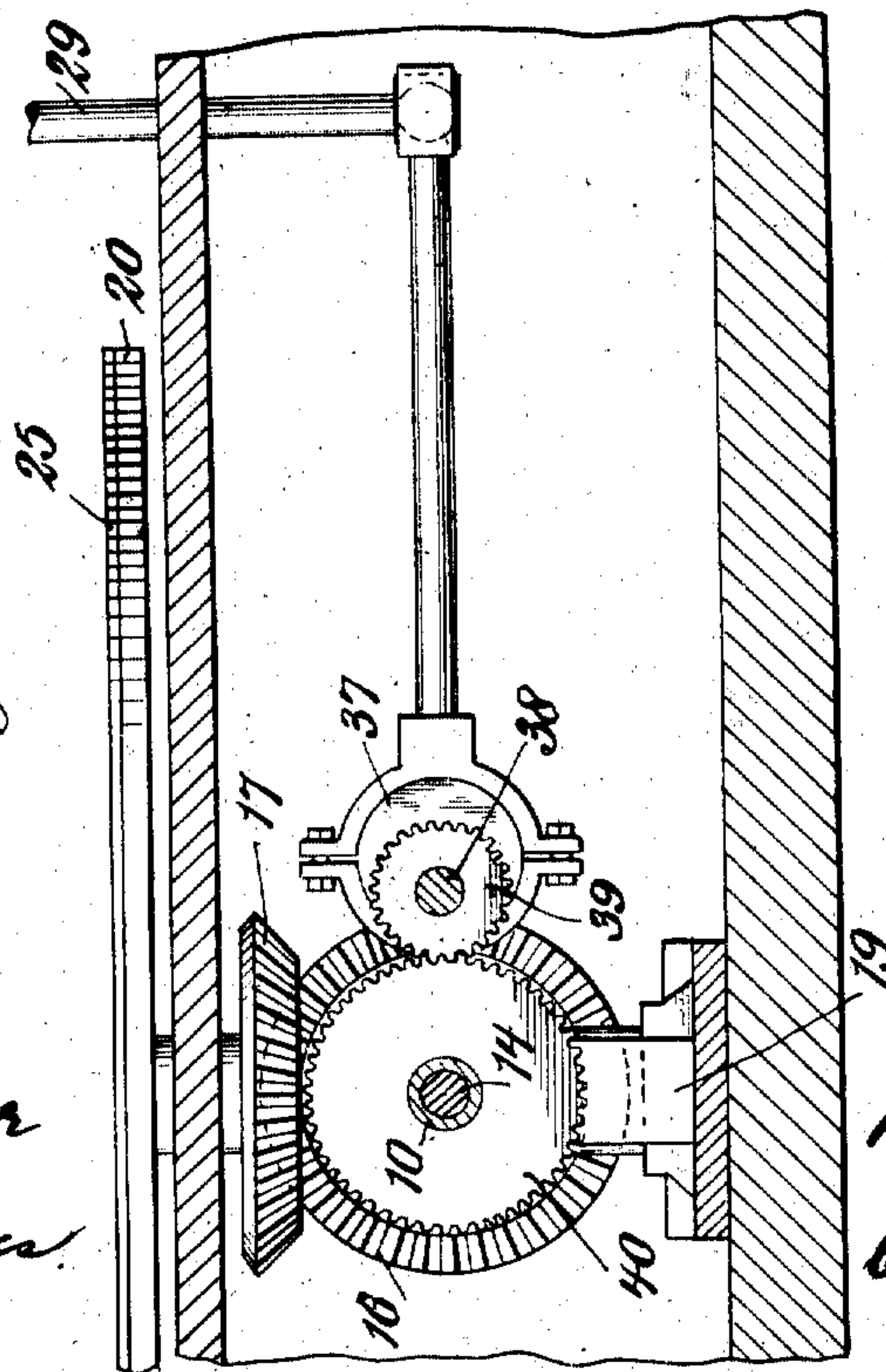


Fig. 5.



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UNITED STATES PATENT OFFICE.

DANIEL HOWARD HAYWOOD, OF NEW YORK, N. Y.

SOUND RECORDING AND REPRODUCING MACHINE.

995,347.

Specification of Letters Patent. Patented June 13, 1911.

Application filed December 24, 1909. Serial No. 534,834.

To all whom it may concern:

Be it known that I, DANIEL HOWARD HAYWOOD, a citizen of the United States of America, and a resident of New York, county and State of New York, have invented certain new and useful Improvements in Sound Recording and Reproducing Machines, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

In U. S. Letters Patent No. 948,137 which issued to me on the 1st day of February, 1910, a sound record is shown and claimed in which the sound groove, independent of its sound producing undulations, advances irregularly throughout its length, and my present invention relates to a machine for producing such a record and for reproducing sound from a record of such character. Sound producing records are commonly made by simultaneously rotating the record blank and producing a relative feeding movement between the record blank and a record stylus. In my present machine I provide, in addition to these two movements, for a third movement, namely, a relative lateral movement between the rotating sound record and the stylus independent of the feeding movement above referred to. It is, of course, apparent that in the broad aspect of my invention, the feeding may consist either of a lateral movement of the record blank while it is being simultaneously rotated, the stylus being meanwhile held stationary so far as such feeding movement is concerned, or a lateral movement of the stylus while the record is relatively stationary with respect to such lateral movement. Similarly the independent lateral movement may be given either to the stylus or to the record and that regardless of to which of these elements the feeding movements are imparted.

For the purpose of the present specification, I have described and illustrated a machine in which the feeding movements are imparted to the record simultaneously with movements of rotation thereof, while I have provided that the independent movements for causing the irregularity of the sound groove are imparted to the stylus, but it will be understood that the same is intended in no way as a limitation of my invention, but rather as an illustrative of one form of the machine embodying my invention. It will also be understood that while for clearness

of description I will refer to the machine mainly as a machine for producing the sound records, the machine may be similarly used with a reproducing stylus for reproducing the sound as will be well understood by those skilled in this art.

In order that my invention may be fully understood, I will now proceed to describe an embodiment thereof, having reference to the accompanying drawings illustrating the same, and will then point out the novel features in claims.

In the drawings: Figure 1 is a top view of a machine constructed in accordance with my invention, certain portions thereof being broken away to show other parts beneath them. Fig. 2 is a view in partial transverse section and partial side elevation thereof.

Fig. 3 is a view in longitudinal section through the record support and means for imparting rotational and feeding movements thereto. Fig. 4 is a detail transverse sectional view through one form of feed nut employed. Fig. 5 is a detail transverse sectional view showing a modified form of the mechanism for imparting the irregular movements to the stylus. Fig. 6 is a detail face view of a record which may be produced in the machine.

The machine comprises a drive shaft 10 mounted in suitable bearings 11 upon the main frame 12 of the machine, the said shaft being rotated by any suitable power element (not shown) suitably connected thereto as by means of a gear wheel 13. The said drive shaft is arranged in splined connection with the secondary shaft 14, one portion of which is screw-threaded as at 15 whereby the said shaft constitutes a feed shaft in addition to a shaft for transmitting rotary motion. Rotary motion is transmitted from the said shaft by means of miter gear wheels 16 and 17, the former being secured fast to the shaft 14 and the latter mounted loosely upon a stud 18 which is mounted upon a carriage 19. The said carriage is mounted in ways in the base plate 12 of the machine, and is arranged to slide longitudinally therein in a path parallel with the axes of the shafts 10 and 14.

Rotatively secured with the miter gear wheel 17 is a record carrier 20. From inspection of the drawings, it will readily be understood that rotary movements of the shaft 10 are imparted to the shaft 14 through, the miter gears 16 and 17 to the

record carrier 20. The threaded portion 15 of the shaft 14 is arranged in engagement with a feed nut 21 whereby as the said shaft 14 is rotated in one direction, *i. e.* clockwise, the said shaft will be gradually drawn to the left as viewed in Fig. 3, and as the carriage 19 is retained against relative longitudinal movement between the gear wheel 16 and a collar 43, the said carriage is thereby similarly moved, and with it the record carrier 20. The screw-threaded portion 15 has the proper pitch to give the desired feed so that the record will be simultaneously rotated and fed laterally in the operation of the machine. The feed nut 21 is conveniently formed in two portions, 22—23 (see Fig. 4) which are carried by arms adapted to be thrown in opposite directions by a suitably operating member 24, whereby the shaft may be released at the end of a feeding operation to permit the carriage 19 to be quickly returned to its initial position in which it is shown in Fig. 3 of the drawings. The record carrier 20 forms a support for a record blank 25, and a stylus 26 carried by a sound box 27 which is in turn carried by a tone arm 28, is arranged for engagement with the said record. The tone arm 28 is arranged to swing horizontally about a vertical axis so that it may have a lateral movement with respect to the record carrier. In the present instance, the said arm 28 is provided with a vertical shaft suitably mounted in a bearing 30 formed as a part of the frame of the machine, ball-bearings 31 being provided for the purpose of reducing the friction between the supporting means and the said arm so that the said arm will turn freely and with a minimum of effort. At its lower end the said shaft 29 is provided with an arm 32 by which it may be operated. The means here shown for operating the same comprises a cam 33 of the type commonly known as an eccentric, mounted upon the shaft 10, an eccentric strap 34 engaged thereby and an eccentric rod 35 connected with the said strap and having a ball and socket connection 36 with the said arm. A rotational movement of the shaft 10 will produce an oscillating movement of the arm 32 through the eccentric mechanism just described, which oscillating movement will be imparted to the tone arm 28, the same resulting in a lateral movement of reciprocation of the stylus 26 with respect to the record carrier. As this movement is produced simultaneously with the rotation of the record carrier and simultaneously with the feeding movement thereof, and a complete reciprocation synchronizes with a complete rotation of the record carrier, it will follow that the stylus will be caused to describe a spiral upon the record blank which is eccentric to the axis of rotation thereof, and the groove resulting therefrom will in

its general direction, advance and recede transversely as the record is revolved.

Other forms of irregular groove may be produced by varying the movements imparted to the tone arm, and in Fig. 5 I have shown a cam or eccentric 37 carried by a shaft 38 connected by gearing 39—40 with the shaft 10, the gearing having such a ratio that the shaft 38 will revolve twice to one revolution of the shaft 10. Instead of producing a regular spiral which is eccentric to the center of rotation of the record carrier as in the form above described, such an arrangement will produce a form of groove which might be termed an "oblong spiral", this, of course, being for the reason that the stylus will have two reciprocating or oscillating movements for each revolution of the record carrier instead of one as in the first example shown. In Fig. 6, I have shown somewhat conventionally such a record. By using different forms or relationship of gearing, or cams or eccentrics of different character any desired form of groove may be produced as will be well understood. In case the record thus produced is to be employed later in a positive feed machine, it will be necessary that the record be placed in the same relation in the reproducing machine as it occupied in the record machine, and for this purpose, I may employ an eccentric projection 41 upon the record table for co-engagement with a corresponding recess upon the under side of the record. On the contrary, if a record of this kind be used upon a "Berliner" type of machine in which no positive feed is employed, such a positioning element and recess will not be necessary for this purpose, though it may be employed if desired in the recording machine for the purpose of holding the record blank steady while the record is being produced.

What I claim is:

1. In a machine of the character described, the combination with two elements, one comprising a record support and the other a stylus carrier, of means for imparting relative rotational movements and relative lateral movements between the two said elements, and means for also imparting lateral movements of reciprocation to one of the said elements with respect to the other.
2. In a machine of the character described, the combination with two elements, one constituting a record support and the other a stylus carrier, of means for imparting feeding movements to one of the said elements with respect to the other, means for simultaneously rotating the said record support, and means for simultaneously imparting movements of reciprocation to one of the said elements in the direction of said feeding movements.

3. In a machine of the character described the combination with a record sup-

porting element, a stylus carrying element, and means for rotating the record carrying element, of means for imparting lateral feeding movements to one of the said elements with respect to the other and for simultaneously imparting lateral movements of reciprocation to the stylus carrier in the direction of the said feeding movements.

4. In a machine of the character described, the combination with a record support, means for rotating the same, and means for simultaneously imparting lateral feeding movements thereto, of a stylus carrier, and means for imparting lateral movements of reciprocation to the said stylus carrier.

5. In a machine of the character described, the combination with a record supporting element, a stylus carrying element, and means for rotating the record carrying element, of means for imparting lateral feeding movements to one of the said elements with respect to the other, and a cam for simultaneously imparting lateral movements of reciprocation to the stylus carrier in the direction of the said feeding movements.

6. In a machine of the character described, the combination with two elements, one constituting a record support and the other a stylus carrier, of means for rotating the record support, and means including a feed screw and a cam for simultaneously imparting lateral feeding movements to one of the said elements with respect to the other and movements of reciprocation to one of the said elements with respect to the other, in the direction of the said feeding movements.

7. In a machine of the character described, the combination with a record support and a stylus carrier, of means for rotating the record support, and means for feeding the stylus across the face of a record supported by the said record support, and for alternately advancing and receding it during its feeding movement.

8. In a machine of the character described, the combination with a record carrier, means for rotating it, and means for simultaneously imparting lateral feeding movements thereto, of a tone arm pivoted about an axis at right angles to the face of the record carrier, a sound box carried thereby, and means for oscillating the tone arm about its pivotal support during the feeding movements of the record carrier.

9. In a machine of the character de-

scribed, the combination with a record support,—a carriage upon which the same is rotatably mounted, a rotatable feed screw connected with the said carriage, a drive shaft with which the said feed screw is connected to rotate, and means connecting the record support in rotative engagement with the said drive shaft, of a stylus carrier, and means in rotative engagement with the said drive shaft for imparting lateral movements of reciprocation to the said stylus carrier.

10. In a machine of the character described, the combination with record support, a carriage upon which the same is rotatably mounted, a stationary frame having a longitudinal guideway in which the carriage is arranged to slide, a feed shaft journaled in the said carriage and held against relative longitudinal movement with respect thereto, the said feed shaft having a threaded portion, a relatively stationary nut for engagement with said threaded portion, and gearing connecting the said feed shaft with the said record support, of a stylus carrier, and a cam in rotative engagement with the said feed shaft, for imparting lateral movements of reciprocation to the said stylus carrier.

11. In a machine of the character described, the combination with two elements, one constituting a record support and the other a stylus carrier, of means for imparting feeding movements to one of the said elements with respect to the other, means for simultaneously rotating the said record support, and an eccentric for simultaneously imparting movements of reciprocation to one of the said elements in the direction of the said feeding movements, the said eccentric being connected to rotate with the said record support but at a rate of speed which is a multiple of the rate of speed thereof.

12. In a machine of the character described, the combination with a record support, means for rotating the same, and means for simultaneously imparting lateral feeding movements thereto, of a stylus carrier, and means timed in relation to the movements of rotation of the record support, for imparting a plurality of complete lateral movements of reciprocation to the stylus carrier for each complete rotation of the record support.

D. HOWARD HAYWOOD.

Witnesses:

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LYMAN S. ANDREWS, Jr.