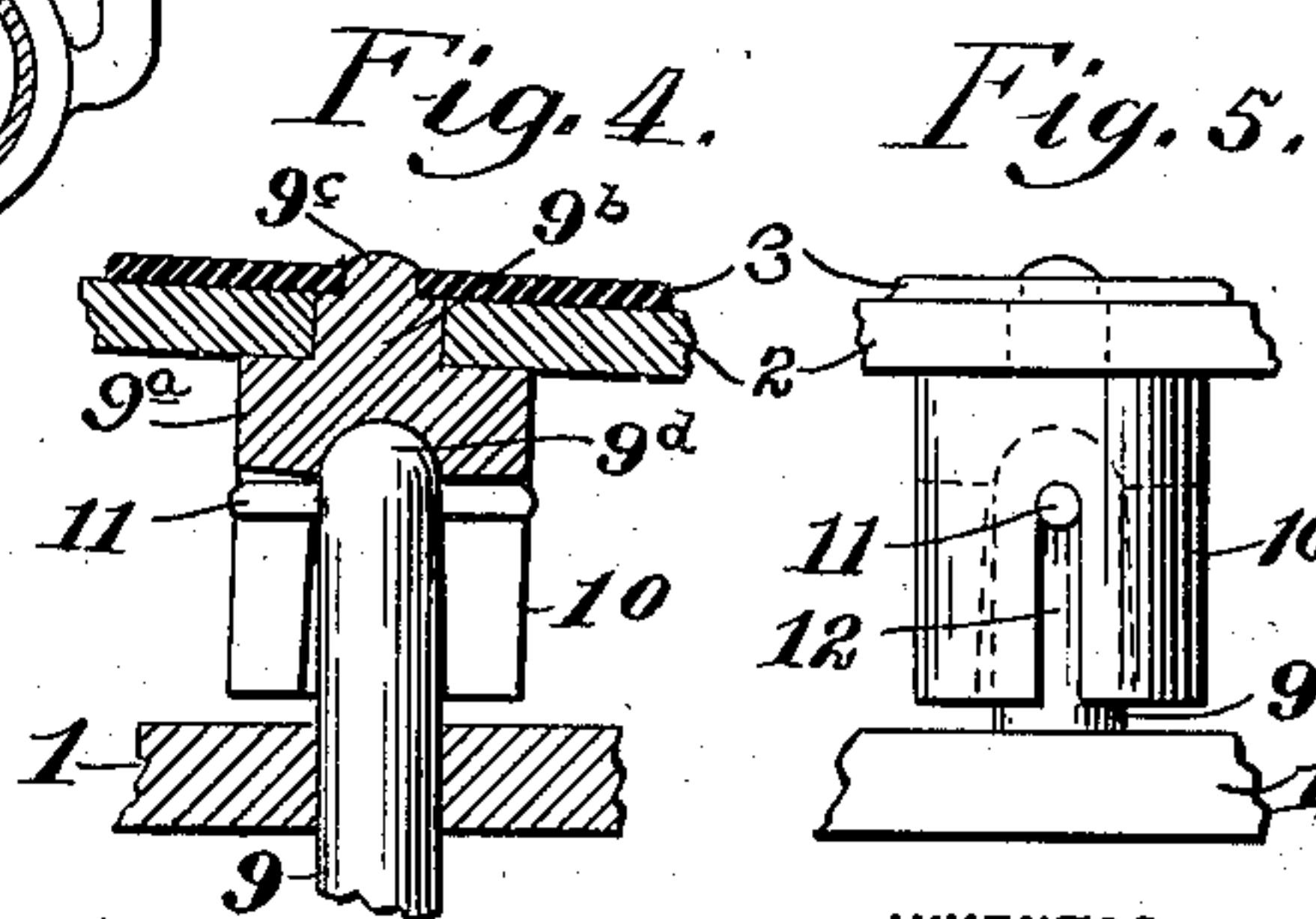
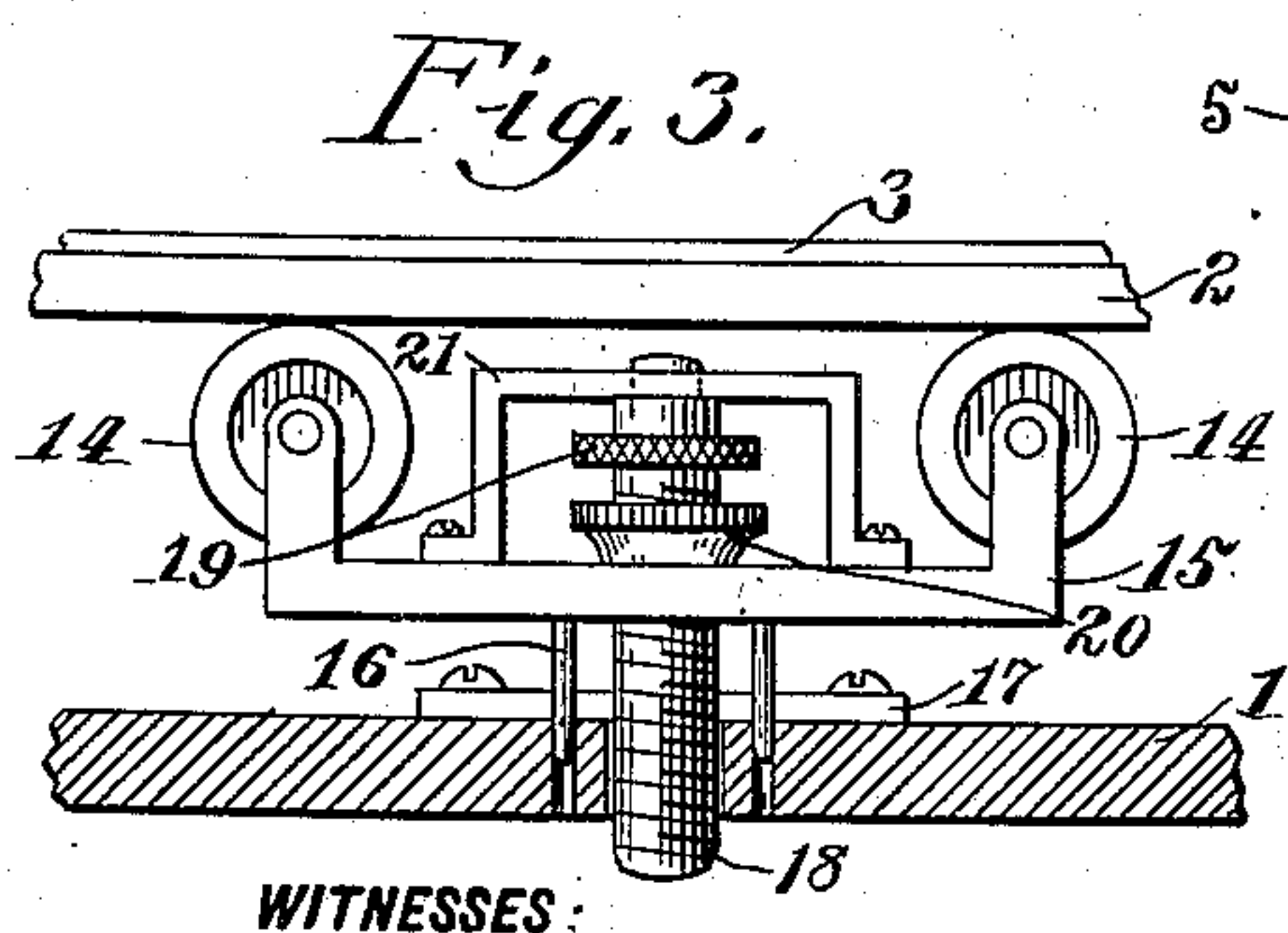
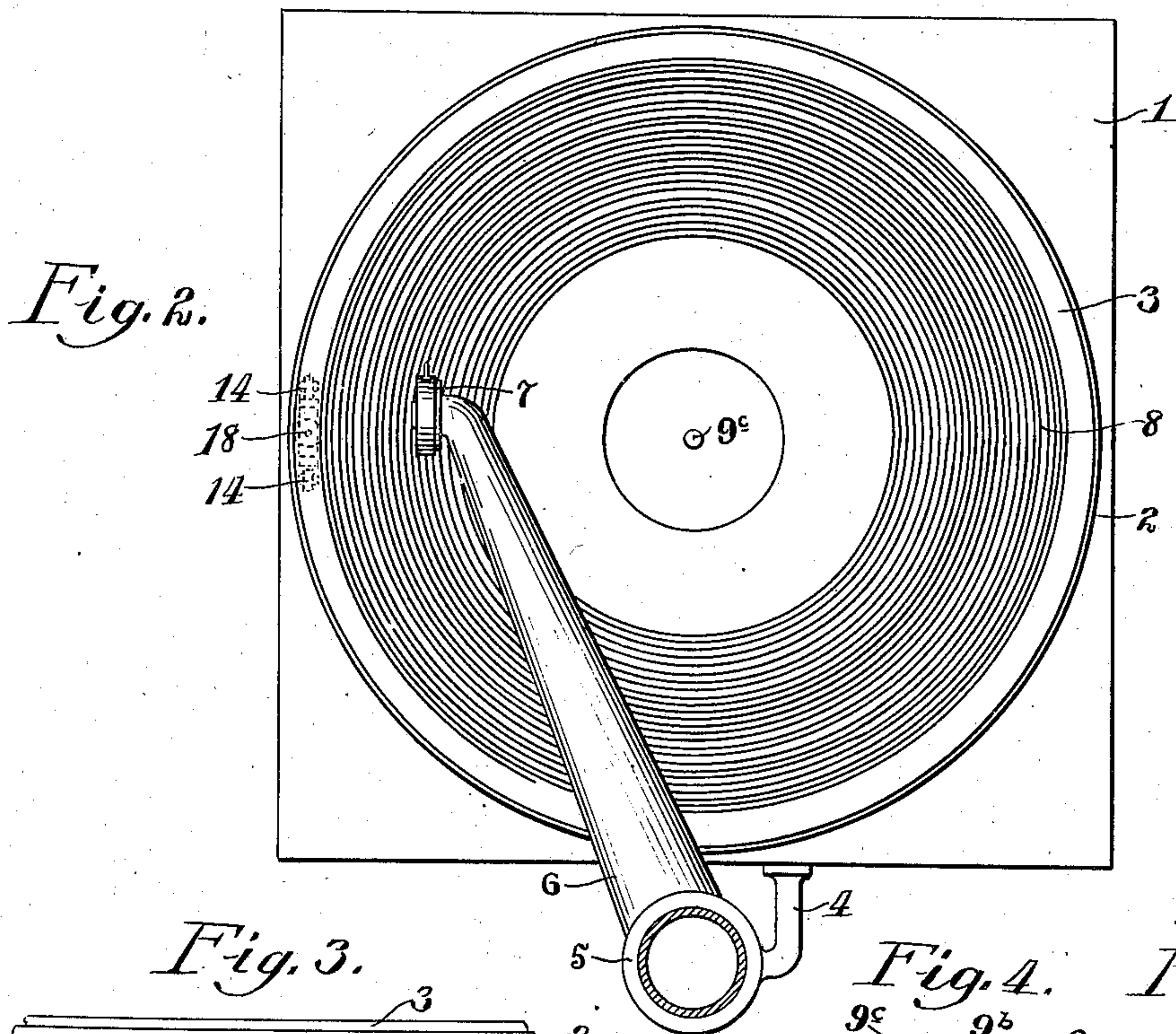
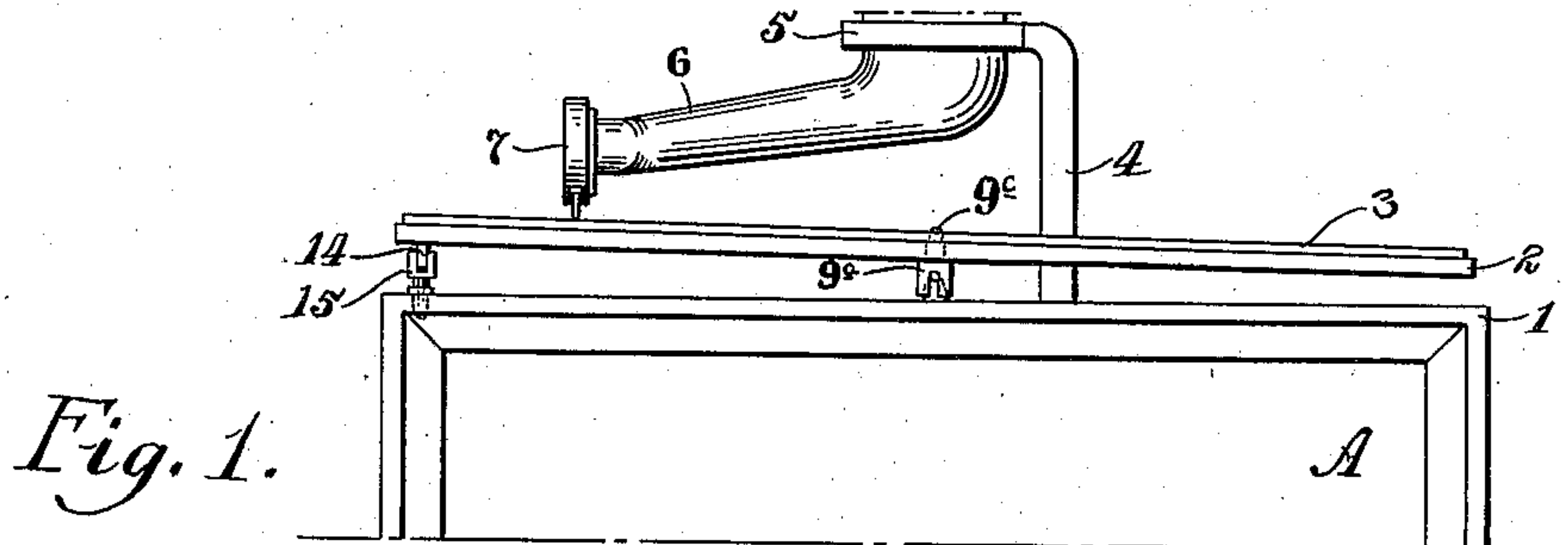


L. T. HAILE.
SOUND REPRODUCING MACHINE.
APPLICATION FILED DEC. 4, 1907.

919,856.

Patented Apr. 27, 1909.



WITNESSES:
R. M. Biddle
J. H. Gamble.

INVENTOR
Luther J. Haile
BY
H. V. Hutton
ATTORNEY.

UNITED STATES PATENT OFFICE.

LUTHER T. HAILE, OF PHILADELPHIA, PENNSYLVANIA.

SOUND-REPRODUCING MACHINE.

No. 919,856.

Specification of Letters Patent.

Patented April 27, 1909.

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To all whom it may concern:

Be it known that I, LUTHER T. HAILE, a citizen of the United States, residing in the city of Philadelphia, State of Pennsylvania, have invented certain new and useful Improvements in Sound-Reproducing Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to sound-reproducing machines of the class of gramophones so-called, wherein a grooved disk-record rotated in a horizontal plane and over such record is operatively supported on the end of a pivotally-mounted sound-conveying arm, a reproducer comprising a sound-box and its stylus, the diaphragm of the reproducer being vibrated by a radially traversing contact of the stylus with the sound-grooves of the record. In all such devices as far as I am aware, the disk is and must be supported for rotation in a horizontal plane, the means for propelling the sound-box over the record being varied in the several types comprising the method described in Berliner's U. S. Patent No. 534,543 wherein the propulsive effect of the grooved surface of the rotating disk is solely relied upon, while in another type a screw-feed or other positively-acting feed device is employed, while in still another type means independent of the record and its actuating shaft are employed to impart a swinging movement to the pivotally-mounted arm itself which carries the reproducer and its stylus.

My method and means hereinafter described for causing the reproducer to be operatively carried over the disk-record is radically different in principle from any of the three types of mechanism above referred to, and is distinguished by a novel mode of operation, namely, that the operative movement of the reproducer, is effected by its own momentum after a moving impulse is first initiated and then continued by the rotation of the disk, the spiral groove in the disk operating to impart only a restraining effect on such movement in contradistinction to its usual propulsive effect.

In addition to the general and primary object stated, the purpose of my invention is to effect that object notwithstanding that the convolutions of the sound-groove may not happen to be of uniform depth or of uniform distance apart, also of insuring the full op-

erative tracking of the stylus in the sound-groove and particularly against the inner and sensitive wall thereof, the stylus being restrained thereby against too rapid gravital propulsion as before stated.

To these ends my invention consists of the combination in a talking machine comprising a spirally-grooved disk-record and a supporting turn table therefor, a sound-conveying arm pivotally-mounted in a plane above the record, a reproducer carried on the free end of said arm, with its stylus contacting by gravity with the grooves of the record, of means dependent solely on the rotative effect of the record to impart an initial impulse movement to the reproducer and then permit it to continue such movement, by its own momentum, save as restrained by its stylus tracking in the record groove and bearing at all times against the inner wall thereof, said means consisting of axially actuating devices operating primarily to rotate the record and secondarily to support it operatively in a horizontally-inclined plane during such rotation, said actuating and supporting devices being pivotally mounted on the head of a rotatable main shaft the axis of which is perpendicular; and my invention further comprises means coacting therewith, but independent thereof, operating to adjustably regulate the degree of inclination of the record-holder or turn-table.

In the accompanying drawings illustrating my invention, Figure 1 is a side elevation, with the lower part of the casing or motor box broken away, and Fig. 2 is a plan view thereof, Fig. 3 is a side elevation, partly in section, of the top of the motor casing, the record and record-holder, and the device to adjust the degree of inclination of the latter; Fig. 4 is a side elevation, partly in section, of the record, record-holder, the divided actuating shaft, and the top of the motor box; and Fig. 5 is a side elevation of a preferred form of universal joint between the divided sections of the actuating shaft.

Referring now to the annexed drawings in which is illustrated one form in which my invention may be exemplified, A indicates the cabinet, while the numeral 1 indicates the top wall of the cabinet; 2 the turn table, and 3 the grooved disk record removably supported thereon, the upper face of which contains the usual sound-groove 8 in spiral form.

The numeral 4 indicates a bracket or other like means on the cabinet side wall to piv-

otally-support, by a bearing such as 5, the swinging sound-conveying arm 6 on the free end of which is carried the reproducer 7 with its stylus.

5 The cabinet contains the usual motor, not shown, for rotating an axial shaft 9 the primary function of which is to rotate the turn table and record, its secondary function being to support or aid in supporting the record
10 in a horizontally-inclined plane, the highest point of inclination being that segment of the outer edge of the record over which is the free end of the pivotal arm 6 and its reproducer 7 when in initial position. The degree of in-
15 clination from the horizontal need be very slight, that is to say an incline in which the rotative movement of the disk would, without reference to its grooves, impart an impulse movement to the pivotally-mounted
20 arm and its reproducer. The means by which this may be effected, as illustrated in the drawings, wherein is shown the axial actuating shaft 9 sectioned near its head end, in other words constructed in two parts with
25 connecting actuating means between the parts, such means being of the general nature of a ball and socket joint, whereby the upper and short section may be vertically inclined relatively to the perpendicular lower end,
30 and at same time be rotated thereby. In said drawings, the upper section of the shaft is indicated at 9^a (see Figs. 4 and 5) and the turn table 2 is fixedly mounted thereon by means of a head 9^b on the shaft section, said
35 head having on its end a head 9^c adapted to pass through a central aperture 10 in the disk record 3 by which the latter is removably supported in place on the turn table.

40 The lower end of the upper section 9^a of the shaft is formed as a longitudinally-bored hood or connecting cap, to admit freely the upper end of the lower section 9 of the shaft. The head end of section 9 is rounded to conform to the shape of the rounded concavity
45 9^d in the interior of the upper section 9^a of the shaft; and the bored out hood or cap end is slotted longitudinally on opposite sides as at 12, Fig. 5, to admit a connecting actuating pin 11 passing transversely through the up-
50 per end of the shaft section 9, see Fig. 4. It is obvious that this construction will allow the upper section 9^a of the shaft to be slightly inclined from the vertical while being rotated by the shaft section 9. It is equally
55 obvious that any well known form of ball and socket joint or universal joint may be substituted with like results, and also that such form of joints may be substituted as will not only permit the upper shaft section
60 9^a to assume a vertical incline during rotation, but will fixedly hold and support it in such inclined position relatively to the lower shaft section, during rotation. I prefer however to employ means separate from the
65 shafts and their jointed actuating connec-

tion, to produce the required vertical inclination of the shaft section 9^a and of the horizontal inclination of the turn table fixedly attached to such shaft section. Various means to accomplish this may be employed, 70 as is manifest, but one of the best I know of, because of its capability of delicate adjustment, is that shown in Fig. 3, which consists of a pair of rubber-tired wheels 14 mounted in spaced relation and supported, vertically 75 adjustable, beneath a segmental surface of the underside of the turn table, on that side of the cabinet top over which it rides in its highest plane. These wheels being in duplicate, are therefore guiding as well as sup- 80 porting devices, and they are mounted in a bracket 15, the underface of which has a pair of vertical pins 16 passing freely through apertures in the cabinet top 1 and through a plate 17 fixed thereon. Fastened to the top 85 side of the bracket 15 and between the wheels 14, is a lifting plate 21 which affords a bearing for a lifting screw 18 provided with an annular actuating surface 19. The lower end of this screw passing downward through 90 the wheel bracket 15, between its guiding pins 16, through plate 17 and through the top wall of the cabinet, whereby the height of the wheel bracket, relatively to the turn table may be adjusted; and a locking nut 20 95 is provided to set it when so adjusted.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:—

1. In a talking machine the combination 10 with a disk sound-record, a holder therefor, a movable tubular arm, reproducing mechanism carried on the free end thereof with its stylus resting by gravity on the surface of the record, of means dependent upon the ro- 10 tative movement of the record but independent of the grooves thereof, operating to automatically impart an impulse movement to the reproducer over the record in reproducing direction and cause its stylus to track 11 in the sound-grooves thereof, said means consisting of an actuating shaft, means to rotate it, and devices between the head of said shaft and the record holder operating to support and rotate said record holder in a 11 horizontally-inclined plane.

2. In a sound-reproducing machine of the type recited, the combination with a disk record having a sound-groove spirally formed thereon a holder therefor, a sound-conveying 11 arm pivotally mounted over and adjacent to said disk, a reproducer carried on the free end of said arm, of actuating devices consisting of a rotatable shaft, means to drive it, and a connecting pivotal support between 12 the head of said shaft and the record holder, operating to support and rotate the disk record in a horizontally-inclined plane and impart a gravity momentum to the reproducer-carrying arm about its pivotal axis to 11

carry the stylus radially across the record in reproducing direction, and in operative engagement with the sound-groove thereof, said mechanism being so constructed and arranged that the reproducer will be automatically restrained against excessive movement by contact, successively, with the inner walls of the spiral groove of the record in its radial traverse over the same.

3. In a talking machine, the combination with a rotatable disk-record-holder, means to rotate the same, a tubular sound-conveying arm pivotally mounted to swing radially over said record holder and record supported thereon, a reproducing mechanism carried on the free end of said pivotally mounted tubular arm, of means operating to yieldingly impart to said reproducing mechanism a propulsive momentum over the record in reproducing direction, save as restrained by its stylus tracking in the record groove, said means consisting of a longitudinally-divided actuating shaft, a universal joint between the sections thereof, with means to operatively support the turn table on the upper of said shaft sections in a horizontally-inclined plane during its rotation.

4. In a talking machine a rotatable record-holder and an axial actuating shaft therefor, a disk record supported on said holder and whose upper surface lies in a single plane and has a laterally undulating record groove, the combination therewith, of means between the head of said shaft and the record-holder operating to guidingly support and rotate the latter in a horizontally-inclined plane, a movable tubular sound-conveying arm, with reproducing mechanism carried on the free end thereof and comprising a stylus normally engaging, in initial position, the exterior convolution of the sound-groove of said disk record in its highest plane of rotation.

5. In a talking machine the combination with an axial actuating shaft, a turn table rotated thereby, a disk-record supported on said turn table, with reproducing mechanism including a stylus, resting by gravity thereon, of a universal joint between the head of said shaft and the turn table, with means to cause said shaft to horizontally incline the turn table on its axis during its rotation by the shaft, whereby the reproducing mechanism is automatically propelled by its own momentum over the record and its stylus caused to track in and be restrained by the record groove throughout its several convolutions.

6. In a talking machine a turn-table, a disk sound-record operatively supported thereon, a pivotal mounted tubular arm

carrying a reproducing diaphragm with its stylus resting by gravity on said record, and a vertically extending axial driving shaft; the combination therewith of connecting actuating devices between the head of said shaft and the turn table adapted to operatively support and rotate the same in a horizontally-inclined plane, whereby the reproducing mechanism is operatively propelled by its own momentum radially over the record and is adapted to be restored to potential position by restoring said elements to initial position.

7. In a machine of the class recited a disk record whose operative grooved surface is in a single plane, and a sound-conveying arm, pivotally mounted, with a sound-reproducer carried on the free end thereof over and adjacent to said disk, the combination therewith of mechanism co-acting with said disk in rotative motion and operating to impart an impulse movement to said reproducer-carrying arm, in a sidewise direction and in a plane substantially parallel with that of the operative face of said disk, said means constituting actuating devices to pivotally support and rotate said record carrier and disk at an inclination to the horizontal, with means to adjustably regulate the angle of inclination thereof to decrease or increase the impulse movement of the reproducer and maintain it in any desired degree of operative contact with the groove of the record.

8. In an instrument of the class recited, a motor, a vertically-extending actuating shaft, a record-carrier, a disk record supported on said carrier, connecting actuating means between the head of said shaft and the record carrier operating to pivotally support and rotate said record-carrier and record in a plane inclined from the horizontal, with devices to adjustably regulate the planular inclination of record carrier, a pivotally-mounted sound-conveying arm, a reproducer including a stylus, carried on the free end of said arm, and resting by gravity on the record, whereby on the rotation of the inclined record holder the reproducer has imparted to it an impulse movement radially over the record, and is restrainingly governed in such movement by the stylus tracking in the record grooves and bearing against the inner walls thereof.

In testimony whereof, I have hereunto affixed my signature this 30th day of November A. D. 1907.

LUTHER T. HAILE.

Witnesses:

A. M. BIDDLE,
H. T. FENTON.