No. 619,916. Patented Feb. 21, 1899.

D. S. WILLIAMS.

GRAPHOPHONE.

(Application filed Nov. 13, 1897.)

(No Model.) 2 Sheets—Sheet 1.

FIG. 1.

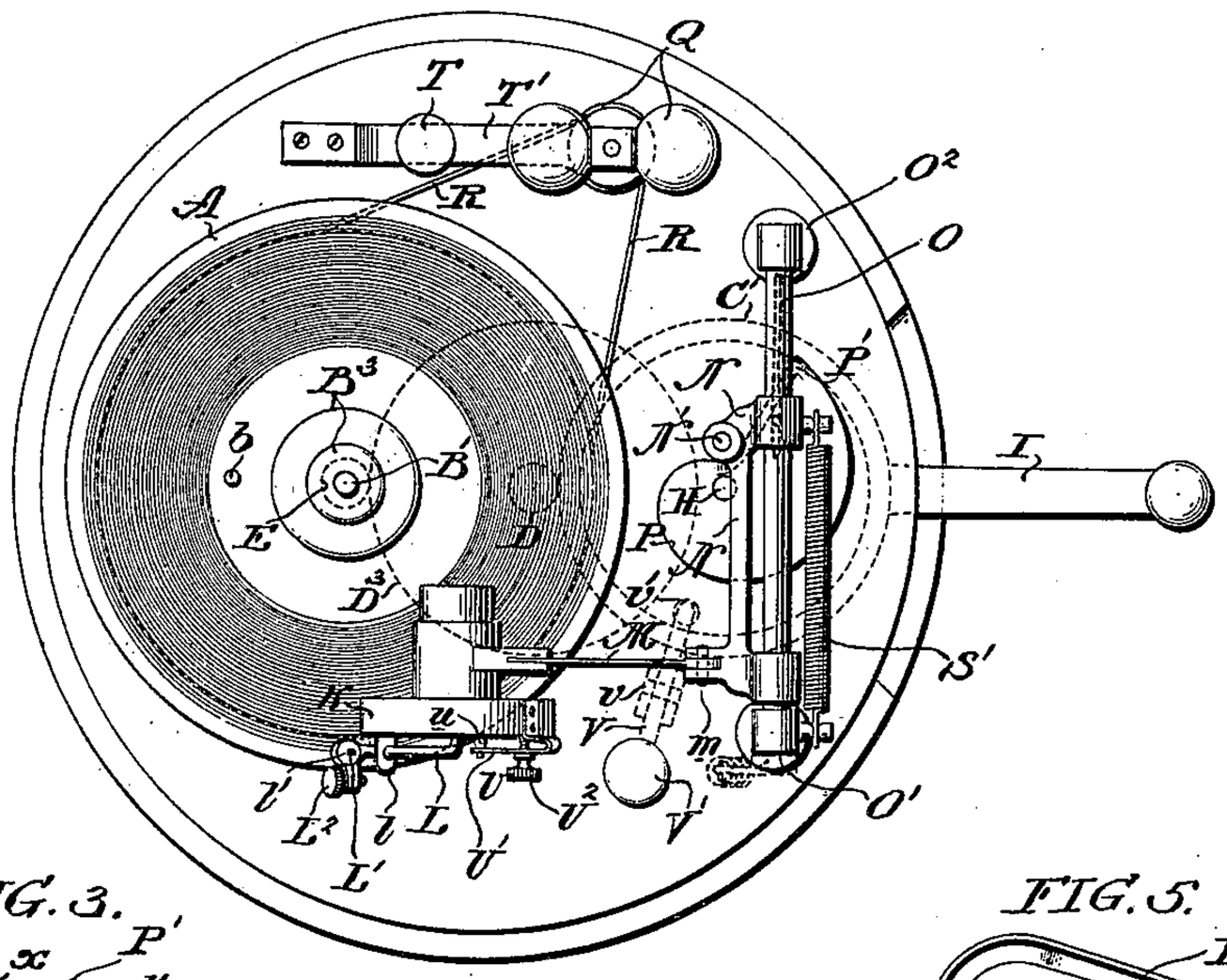


FIG. 3.

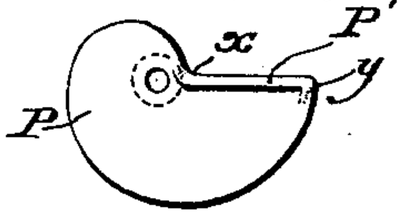


FIG. 5.

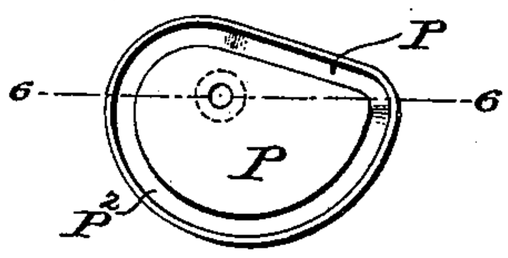


FIG. 2.

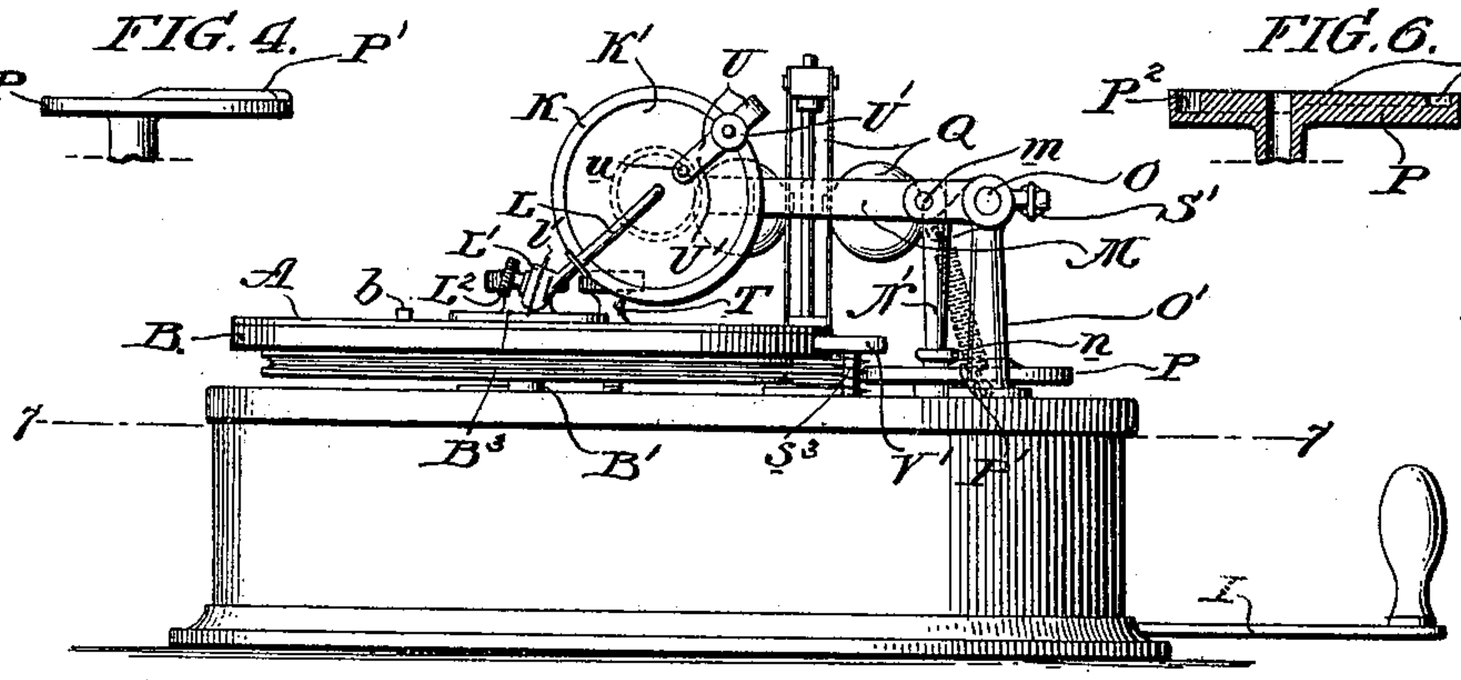


FIG. 4.

FIG. 6.

WITNESSES:

F. Norman Dixon

Harry E. Dawson

INVENTOR

David S. Williams

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 619,916.

Patented Feb. 21, 1899.

D. S. WILLIAMS.

GRAPHOPHONE.

(Application filed Nov. 13, 1897.)

(No Model.)

2 Sheets—Sheet 2.

FIG. 7.

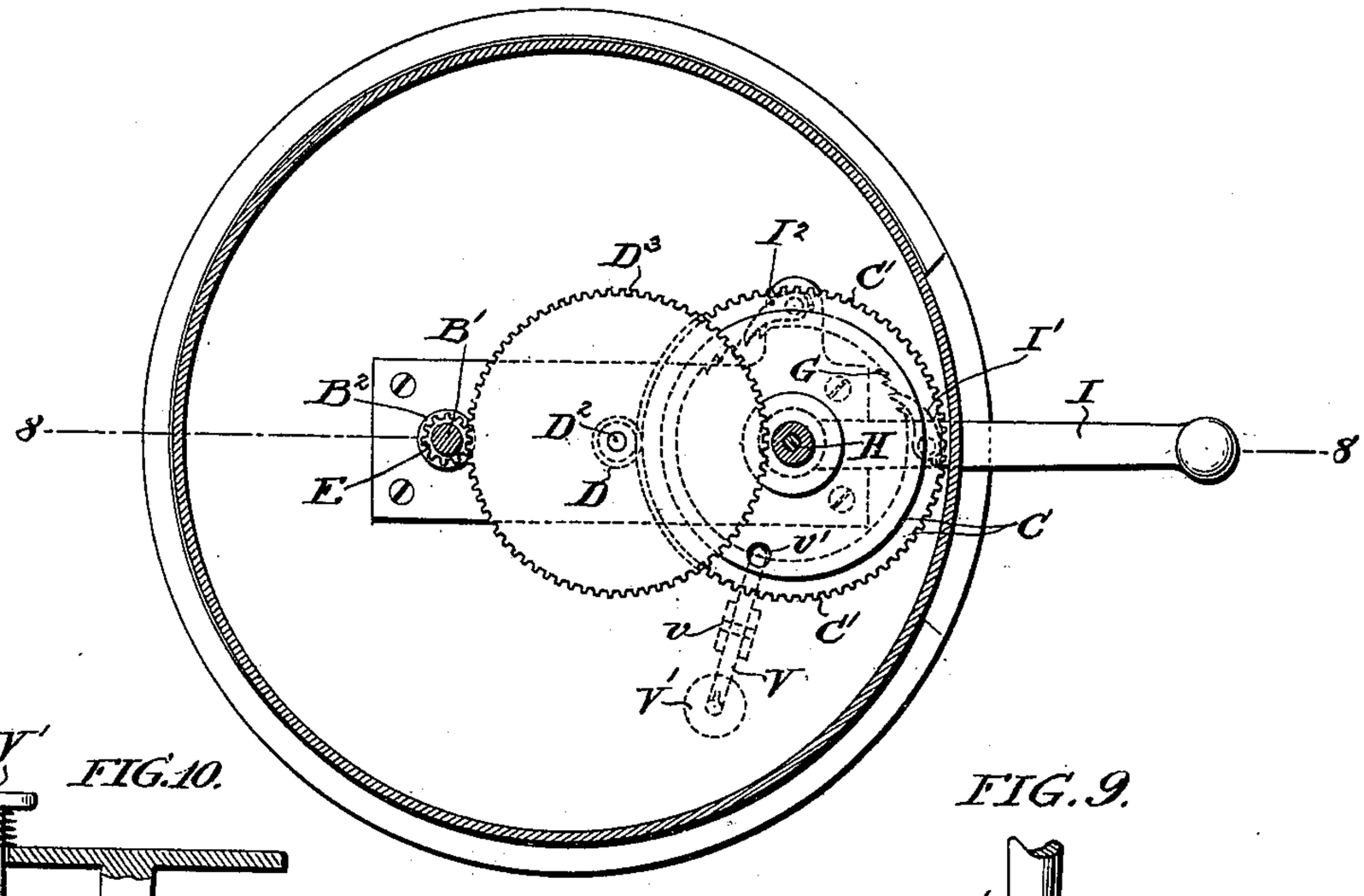


FIG. 10.

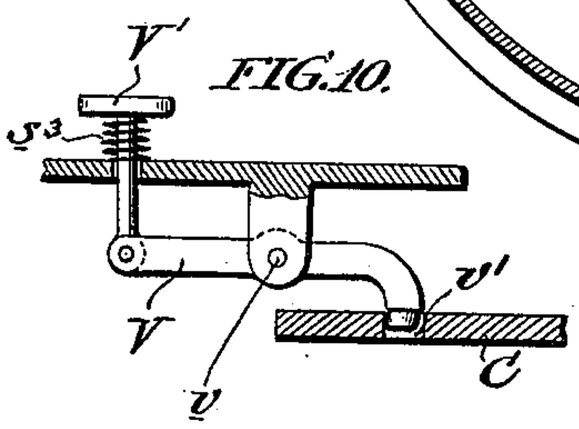


FIG. 9.

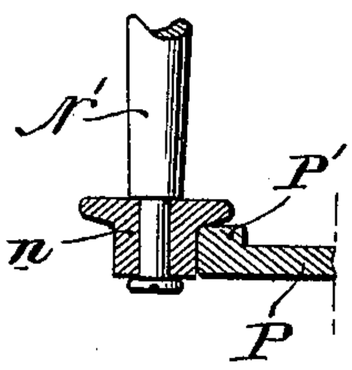
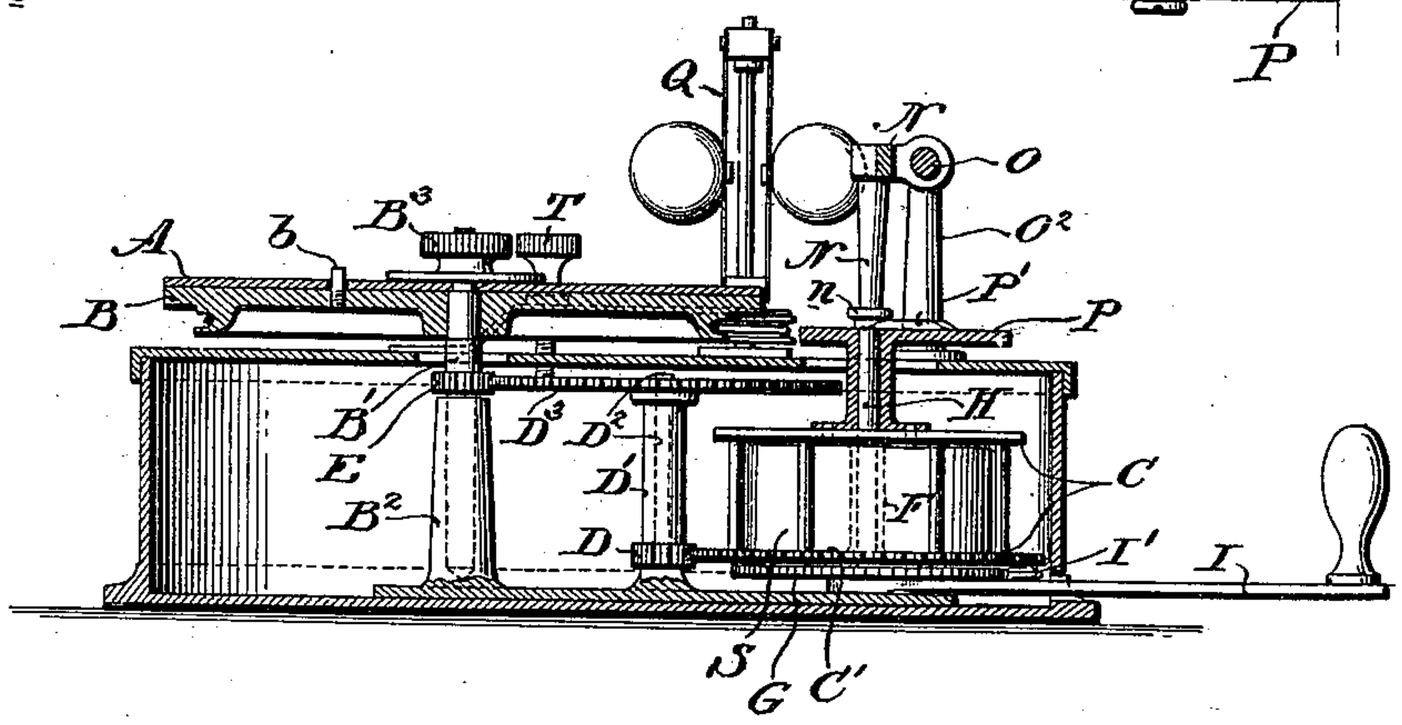


FIG. 8.



WITNESSES:

F. Norman Dixon

Harry E. Kimmey

INVENTOR

David S. Williams

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

DAVID S. WILLIAMS, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO HIMSELF AND JOSEPH A. VINCENT, OF SAME PLACE.

GRAPHOPHONE.

SPECIFICATION forming part of Letters Patent No. 619,916, dated February 21, 1899.

Application filed November 13, 1897. Serial No. 658,468. (No model.)

To all whom it may concern:

Be it known that I, DAVID S. WILLIAMS, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Sound Recording and Reproducing Machines; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to a simple and inexpensive machine for recording and reproducing the sounds of the human voice, musical instruments, &c., and contemplates a device having a disk coated with a layer of wax upon which is engraved by the stylus a helical groove of even depth containing sinuosities constituting sound-waves recorded in accordance with the sounds imparted to the sound-box and stylus as the same is automatically propelled across the face of the disk.

The chief features of my invention are, first, the feeding mechanism for positively conveying the sound-box and stylus across the record-disk, raising the stylus from the record at the end of its travel, and conveying the sound-box and stylus back to its initial position at the identical point at which it started; second, in the construction and arrangement of the sound-box and stylus, and, third, in minor details of construction, which will be more fully treated of hereinafter.

Referring to the accompanying drawings, forming part of the specification, Figure 1 represents a plan view of a machine embodying the principle of my invention. Fig. 2 represents a side elevation of the machine. Fig. 3 shows a plan view of the feeding-cam detached from the machine. Fig. 4 represents a side elevation of the feeding-cam shown in Fig. 3. Fig. 5 represents a plan view of a modified feeding-cam similar to that shown in Fig. 3. Fig. 6 shows a vertical section of said cam on the line 6 6 of Fig. 5. Fig. 7 indicates a horizontal section of the machine on a line 7 7 of Fig. 2. Fig. 8 represents a vertical section of the machine on a line 8 8 of Fig. 7. Fig. 9 shows a detached sectional view of a portion of the feeding cam and roller constituting a portion of the feeding mechanism, and Fig. 10 represents a detached sectional view of the stop-motion for checking the motion of the machine at the end of each operation.

Referring to the letters of the drawings, A represents a disk, formed of metal, hard rubber, or any other suitable material, provided upon its face with a coating of wax in a condition to offer very slight resistance to the action of the stylus while recording sounds. This disk I shall hereinafter refer to as the "record-disk."

The record-disk is mounted upon a table B, which rotates upon a vertical shaft B′, supported in a long upright bearing B^2. The upper end of the shaft B′ is threaded to receive the thumb-screw B^3, which holds the record-disk firmly upon the table B, and a pin *b*, projecting therefrom, passes through a hole in the record-disk and locates the record-disk in its proper position. Motion is imparted to the table B, carrying the record-disk, by a spring S, which is inclosed in a casing C, the lower side of which has a spur-wheel C′, which engages with a pinion D, mounted upon a sleeve D′, which is supported upon a shaft D^2, and upon the upper end of the sleeve D′ is secured a spur-wheel D^3, which engages a pinion E, secured to the shaft B′, which carries the table B.

The spring S is wound from the center, the inner end being secured to sleeve F, to which is also secured a ratchet-wheel G, both of which are supported upon a fixed central shaft H.

The spring S is wound by means of a lever I, which carries a spring-pawl I′ for the purpose of engaging the ratchet-wheel G. A second spring-pawl I^2, which is secured to the bed-plate of the machine, also engages the ratchet-wheel G and acts as a retaining-pawl to hold the ratchet-wheel in position.

The sound-box K is provided in the usual manner with a diaphragm K′, to which is firmly secured the stylus-lever L, the same being hinged or pivoted to the sound-box by a leaf-spring *l* or by any other well-known means employed for this purpose. The free end of the stylus-lever is provided with a

clamp L′, which is slotted to receive a fine steel or hard-metal wire *l′* of uniform diameter throughout, which constitutes the stylus and which is firmly held in the clamp by a thumb-screw L^2. I desire to use this particular form of stylus both for recording and reproducing for the reason that where tapered points are employed (and I am led to believe that only such are used in common practice) the wearing away of the point has a tendency to vary the width of the groove and widen the same as the operation of recording and reproducing the record progresses, and thus tends to materially injure and shorten the life of the record.

The sound-box K is secured to a lever M, which is preferably rigid; but where the machine is employed to reproduce record made upon other machines I prefer to make the same flexible to allow for any inequalities which may exist, said lever being pivoted at a point *m* to the bracket N, which is guided upon a bar O, secured to and supported by posts O′ and O^2, fastened to the top of the machine. Depending from the bracket N is the bar N′, provided at the lower end with a roller *n*, which engages a cam P, by means of which the sound-box and stylus are fed across the record.

The cam P, which I shall hereinafter designate as the "feeding-cam," is operated by the spring-casing, although it will readily be understood that the same may be driven through intermediate gearing from any part of the machine.

The feeding-cam P is so constructed as to impart a uniform feed to the stylus from the beginning of its operation at a point *x* to the end of its forward feed at a point *y*. At the latter point the roller is forced up an incline, which raises the stylus from the record, and as the feeding-cam continues to move the roller is carried over the elevation P′ by the action of the spring S′ until it reaches the point X, where it leaves the elevated portion of the cam and brings the stylus again in contact with the record.

I have illustrated in Figs. 5 and 6 a somewhat modified form of feeding-cam, by the use of which the spring S′ may be dispensed with, the roller *n* in this case being positively guided in the groove P^2 and the raising and lowering of the stylus being effected by means of the elevation P^3 at the bottom of the cam.

The governor Q is of the ordinary type commonly employed in sound recording and reproducing machines, the same being driven from the table B by means of a belt R or by a train of gearing, if desired, and regulated by a screw T, acting upon a lever T′, all of which is old and well known in machines of this character.

In order to prevent harsh and grating sounds which frequently occur in the sound-box, I desire to provide the same with a damper U, the same comprising a spring U′, secured at one end to the sound-box and provided at the other with a rubber button *u*, which rests against the diaphragm. By adjusting the thumb-screw U^2 the button may be brought to bear with greater or less pressure upon the diaphragm and the harsh sounds by this means may be overcome.

In order to automatically stop the machine after the operation of recording or reproducing, I provide a lever V, pivoted at a point *v*, one end of said lever being adapted to an opening *v′* in the spring-casing or other moving part of the machine, the other being pivoted to a push-button which is acted upon by a spring s^3, which tends to keep the lever in engagement with the opening in the spring-casing. By pressing the button V′ the lever is released and the machine free to operate.

As shown in the accompanying drawings, the weight of the sound-box is intended to give sufficient pressure to engrave the groove in the record when recording in soft wax; but, if desired, an additional weight or spring may be employed to increase the pressure without in any way departing from the scope of my invention.

Having described my invention, what I claim, and desire to secure by Letters Patent, is—

1. A sound recording and reproducing instrument, comprising a record-disk suitably supported upon a shaft, means for operating said shaft, a sound-box provided with a stylus adapted to the record-disk, a bracket carried by a stationary bar which is adapted to guide the sound-box and stylus, a cam operated from the source of power, the same being adapted to slowly feed the stylus across the face of the record-disk to lift the stylus from the record at the end of its forward travel and return the stylus in an elevated position with a quick movement to its initial position.

2. A sound recording and reproducing instrument comprising a record-disk detachably secured to a table which is rotated by a central shaft, means for rotating said shaft, a sound-box provided with a stylus adapted to the record-disk, a bracket carried by a stationary bar for guiding the stylus and sound-box, a short lever connected to the sound-box at one end and pivoted to the bracket at the other, a roller carried by an arm projecting from said bracket and a cam operated from the source of power and adapted to engage said roller and convey the sound-box and stylus forward across the face of the record, to raise the stylus at the end of its forward movement and convey the stylus backward in an elevated position to the starting-point.

3. A sound recording and reproducing instrument comprising a record-disk detachably secured to a table rotated upon a vertical shaft, spring means for rotating said shaft, a sound-box provided with a diaphragm and stylus adapted to the record-disk, a bracket guided upon a horizontal bar, a lever secured to the sound-box and pivotally connected to

said bracket, a roller carried by a depending arm of said bracket, and a cam rotated from the source of power having a portion adapted to slowly carry the stylus across the face of the record-disk, an inclined portion for raising the stylus from the record-disk and a quick return motion for operating the sound-box and stylus while in an elevated position to the starting-point.

4. A sound recording and reproducing instrument comprising a record-disk suitably supported and rotated upon a central shaft, means for rotating said shaft, a sound-box provided with a diaphragm having centrally connected thereto a stylus-lever which is pivoted to the sound-box, a clamp formed upon the free end of said stylus-lever, a stylus of fine wire secured in said clamp, a bracket pivotally secured to the sound-box and guided by a stationary bar, a roller carried by said bracket, a cam for acting upon said roller to convey the stylus forward across the face of the record-disk to elevate the stylus at the end of its forward travel and retain the stylus in an elevated position during its return movement, and a spring to return the stylus to its initial position.

5. A sound recording and reproducing instrument, comprising a record-disk suitably supported and rotated upon a central shaft, means for rotating said shaft, a sound-box provided with a diaphragm and stylus-lever, the latter being connected at one end to the diaphragm and fulcrumed to the sound-box, a clamp formed upon the free end of the stylus-lever, a stylus formed of fine hard-metal wire adapted to form and traverse the groove of the record, an adjustable damper secured to the sound-box and provided with an elastic button which rests against the diaphragm, a bracket guided upon a fixed bar and pivotally connected to a projecting arm of the sound-box, an arm projecting from said bracket and provided with a roller, a cam rotated from the source of power adapted to engage said roller and to carry the stylus forward and backward across the face of the record-disk, a projecting ledge upon said cam for holding the stylus out of engagement with the record-disk during the return movement, and a spring to keep said roller in engagement with said cam.

6. In a sound recording and reproducing machine, the combination of the sound-box and stylus, a rotating record, a cam adapted to feed the stylus forward across the record, to lift the stylus from the record at the end of its forward movement and retain the same in an elevated position during the backward movement, and means as a spring working in conjunction with said cam to return the stylus to its initial position.

7. In a sound recording and reproducing machine, the combination of the sound-box and diaphragm, a stylus-lever secured at one end to the diaphragm and fulcrumed to the sound-box by a leaf-spring, the same having formed upon the opposite end a clamp provided with an adjustable stylus-wire, a cam adapted to feed the stylus forward across the record-disk, and being provided with a raised portion upon its face to elevate the stylus at the end of its forward movement and a spring acting in conjunction with the movement of said cam to return the stylus while in an elevated position to the starting-point.

8. In a sound recording and reproducing machine, the combination of the sound-box and diaphragm, a stylus-lever pivoted to the sound-box and fixedly secured to the center of the diaphragm, a clamp formed upon the free end of the stylus-lever, a hard-metal stylus preferably formed of fine wire firmly held in said clamp, an adjustable damper secured at one end to the sound-box and having an elastic button which by means of an adjusting-screw can be applied with greater or less pressure against the diaphragm, and a cam adapted to feed the stylus forward across the record-disk, to elevate the stylus at the end of its forward travel, and to return the stylus in the elevated position back to the starting-point.

9. In a sound recording and reproducing machine, the combination of a rotating record-disk, a diaphragm and stylus adapted to said record, and a cam adapted to feed the stylus forward across the record-disk to elevate the stylus at the end of its forward travel, and to return the stylus in its elevated position back to its initial position.

10. In a sound recording and reproducing machine, the combination of the record-disk, A, suitably supported and rotated, the sound-box, K, diaphragm, K′, and stylus-lever, L, the clamp, L′, and stylus, *l*′, a cam, P, operated from the source of power and adapted to convey the stylus forward and backward across the record-disk, said cam having an elevated portion, P′, for raising the stylus out of engagement with the record upon its return movement.

11. In a sound recording and reproducing machine the combination of the sound-box and stylus, a rotating record-table adapted to contain a record-disk, a central stem, provided with a thumb-screw for holding the record in position, a pin, *b*, upon the record-table adapted to a hole in the record, a cam for feeding the stylus forward across the record, an elevated ledge upon said cam to lift the stylus from the record at the end of the forward travel, and to retain the same in an elevated position during its backward movement, means as a spring acting in conjunction with said cam to return said stylus, and a locking device as shown to automatically secure the mechanism against turning after the cam has completed a revolution.

12. In a sound recording and reproducing machine, the combination of the table, B, the shaft, B′, the record-disk, A, adapted to said shaft, a pin, *b*, to locate the position of the

record upon the table, a sound-box provided with a diaphragm, a stylus-lever connected to the diaphragm and provided with a clamp, L, the stylus-wire, *l*, a cam, P, operated from the source of power and adapted to convey the stylus forward and backward across the record-disk, said cam having an elevated portion for raising the stylus out of engagement with the record upon its return movement, and a spring-actuated lever, V, for locking the mechanism against movement.

In testimony whereof I affix my signature in presence of two witnesses.

DAVID S. WILLIAMS.

Witnesses:
WALTER C. PUSEY,
THOS. K. LANCASTER.