No. 704,047. Patented July 8, 1902.

# E. R. JOHNSON.

## SOUND RECORDING AND REPRODUCING DEVICE.

(Application filed Nov. 2, 1900.)

(No Model.)

Fig. 1.

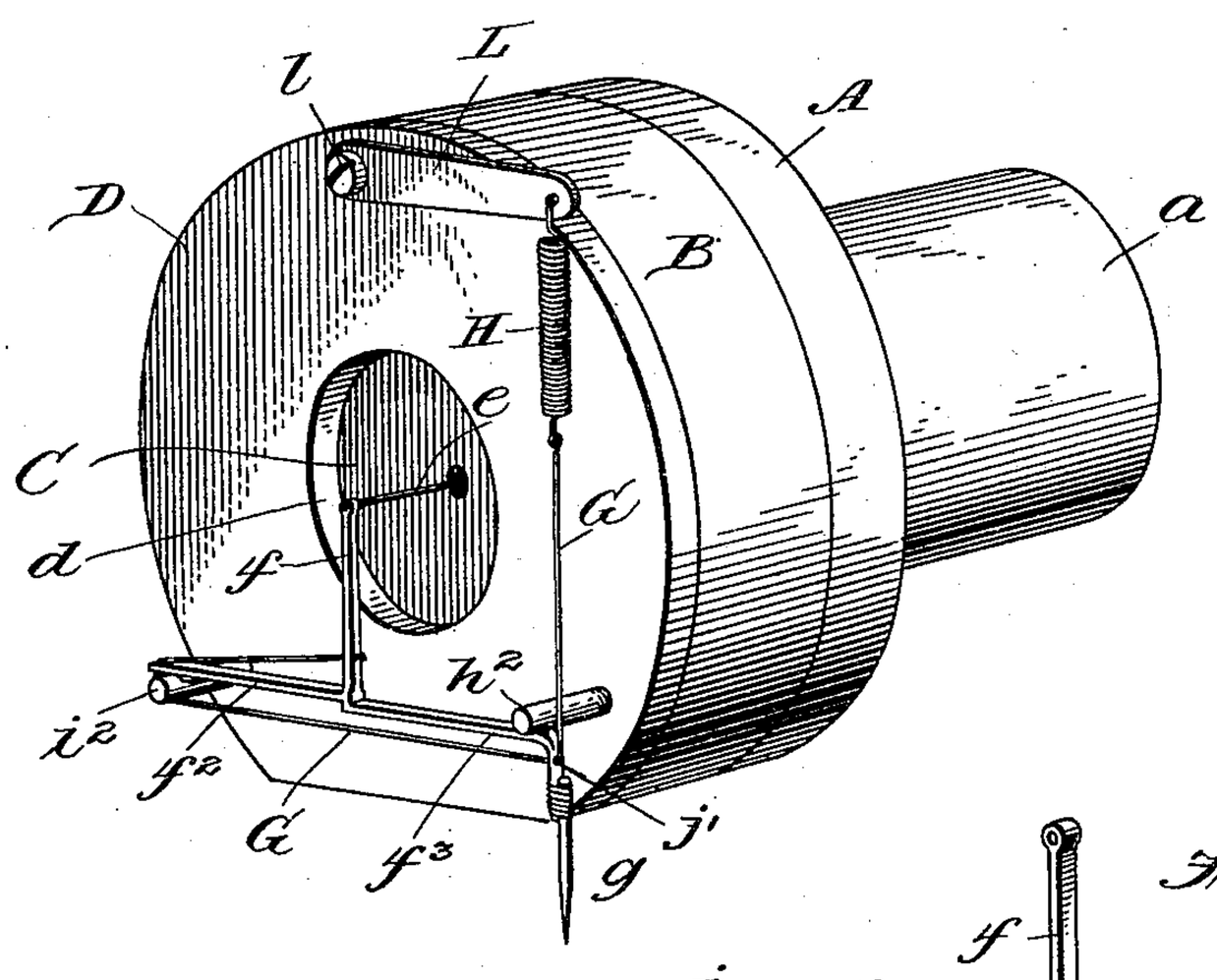



Fig. 2.

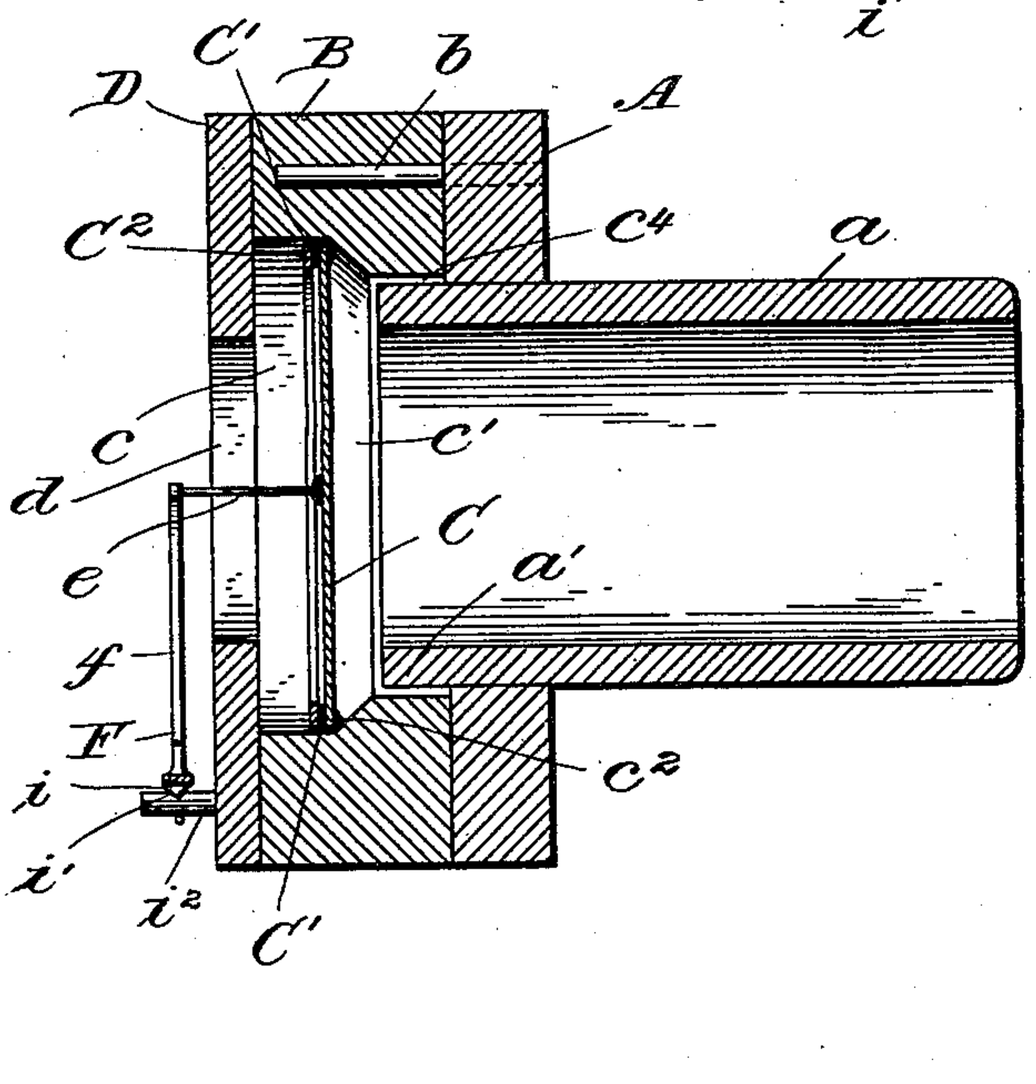



Fig. 3.

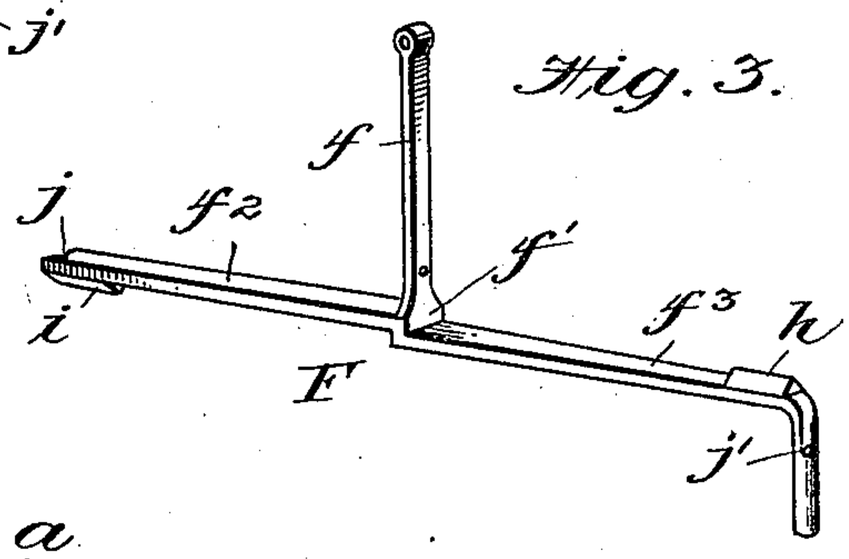
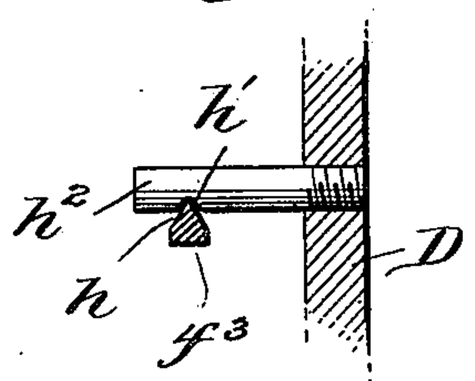



Fig. 4.




Witnesses.
Jno. T. Cross
Chas. H. Bennett

Inventor,
Eldridge R. Johnson
by Howe Ellis,
his Attorney.

# UNITED STATES PATENT OFFICE.

ELDRIDGE R. JOHNSON, OF PHILADELPHIA, PENNSYLVANIA.

## SOUND RECORDING AND REPRODUCING DEVICE.

SPECIFICATION forming part of Letters Patent No. 704,047, dated July 8, 1902.

Application filed November 2, 1900. Serial No. 35,193. (No model.)

*To all whom it may concern:*

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

My invention relates to certain improvements in sound recording and reproducing apparatus, and particularly to that part known as the "sound-box."

In recording sound-waves I have found from experience that the stylus-point must be adjusted to a nicety, even down to a thousandth of an inch, in order to obtain the very best results, and I also find that under different conditions of temperature this adjustment varies by reason of the contraction and expansion of the various parts of the device. Consequently I have found it necessary to provide for very finely adjusting the stylus-point and its supporting-bar and to provide a tensioning device therefor.

The principal object of this invention is to provide a sound-box particularly adapted for recording purposes so constructed as to readily yield to the impulses of the sound-waves in any and all directions; also, in providing means for finely adjusting the stylus-point, so that the depth of the cut may be regulated to a nicety; also, in providing a tensioning device which will maintain the proper adjustment of the stylus-bar under different conditions of temperature in the event of contraction or expansion.

With these and other objects in view my invention consists in the construction and arrangement of the mechanism, substantially as hereinafter set forth, and particularly pointed out in the claims.

Referring to the accompanying drawings, Figure 1 is a perspective view of a recording sound-box embodying my invention. Fig. 2 is a central sectional elevation through the same. Fig. 3 is a detail perspective view of the stylus-bar. Fig. 4 is a detail section illustrating one of the studs for supporting the stylus-bar and also illustrating the knife-edge bearing.

In the said drawings I provide a circular supporting-disk A, which has formed thereon or secured thereto the usual tubular section *a*, adapted to be connected either directly or indirectly to a mouthpiece or other sound-conveying device. The inner end of the tubular section *a* projects a short distance beyond the front face of the disk A, as illustrated in Fig. 2 of the drawings. Projecting from the front face of the section A is a pin or rod *b*, the said rod being riveted or otherwise secured in the section A.

B designates the diaphragm-holding section and consists of a circular disk of a diameter corresponding to that of the disk A, having its central portion cut out in the manner illustrated in Fig. 2 of the drawings for the reception of the diaphragm C. The front portion *c* of the diaphragm-chamber is larger in diameter than the rear portion *c'*, and between these two portions is formed an inclined wall $c^2$. The projecting end *a'* of the tubular section *a* fits into the opening $c^4$, formed in the rear of the section B, the said opening being of slightly larger diameter than that of the tubular section, so as to allow of a slight play between these two parts. The section B is pivotally mounted on the rod *b*, carried by the disk A, so that the said section B may swing very slightly, if desired. On the front face of the section B, I provide a circular plate D. The diaphragm C is supported by means of a liquid film C', which adheres to the inner walls of the section B and also to an adjustable ring $C^2$, the object of the said ring $C^2$ being to provide an enlarged surface adjacent to the diaphragm for the liquid film to adhere to, so that an increased body of liquid may be maintained and supported by capillary attraction, this particular construction of diaphragm being specifically described in my application for patent filed January 20, 1900, and bearing the Serial No. 2,178.

Secured to the center of the diaphragm C by means of the usual wax or cement is a very thin rod *e*, which extends out beyond the front plate D through the opening *d* provided therein and has secured to its free end the arm *f* of the stylus-bar F. This stylus-bar F is substantially T-shaped in form, having a step or shoulder *f'* in its center at the point

where the arm $f$ is secured to the horizontally-disposed arms $f^2$ and $f^3$. The arm $f^3$ is bent downwardly at its end to form a shank, to which is secured the stylus-point $g$. On the upper surface of arm $f^3$ I provide the knife-edge bearing $h$, which is adapted to bear against a V-shaped notch $h'$, formed on the under side of the stud $h^2$, which is secured in the plate D of the sound-box frame.

On the under surface of the arm $f^2$ of the stylus-bar F, I provide a knife-edge bearing $i$, located at or near the end of said bar, which is adapted to a V-shaped notch $i'$, provided in the upper surface of the stud $i^2$, which stud is also secured to the plate D of the sound-box frame. A small groove or notch $j$ is provided on the end of the arm $f^2$, and a small opening $j'$ is formed on the downwardly-extending portion of the arm $f^3$ a short distance below the knife-edge bearing $h$. Secured to the arm $f$ a short distance above its connection with the horizontal arms $f^2$ $f^3$ is a cord G, preferably composed of silk, the said cord passing over the end of the arm $f^2$, resting in the groove $j$, passing around the under side of the stud $i^2$, and through the opening $j'$, formed in the downwardly-extending section of the arm $f^3$. From thence it passes upwardly, bearing slightly against the stud $h^2$, and is connected at a point above the center of the diaphragm to a finely-tensioned coil-spring H. Secured to the upper face of the plate D of the sound-box frame is a substantially horizontally disposed arm L, the said arm being adjustably mounted to the sound-box frame by means of the pivot-screw $l$. To the free end of the arm L is secured the upper end of the coiled spring H, to the lower end of which is secured one end of the cord G, as heretofore described. It will thus be seen that the stylus-bar F is yieldingly supported by means of the silk cord G under the tension of the spring H and that this spring will serve to keep the knife-edge bearings always in contact with the notches provided in the studs $h^2$ $i^2$, and thus take up any looseness or defect which might be caused by reason of the expansion and contraction of the various parts. It will also be readily seen and understood that the tension may be increased or diminished by adjusting the set-screw $l$ and regulating the height of the arm L. By reason of the sound-box section B being pivotally mounted on the rod $b$ also allows this section to slightly expand or contract, as the opening $c'$ is slightly larger than the projecting end $a'$ of the tubular section $a$.

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

1. In a sound-recording apparatus, the combination with the sound-box frame having a diaphragm located therein, of a horizontally-disposed stylus-bar having an arm perpendicularly disposed and connected with the diaphragm, knife-edge bearings on the under side of the horizontally-disposed bar at one end and on the upper side at the opposite end, and means for maintaining the said stylus-bar in contact with its bearings, for the purpose described.

2. In a sound-recording apparatus, the combination with the sound-box frame, of a diaphragm located therein, a horizontally-disposed stylus-bar having a central arm connecting with the diaphragm, supports carried by the sound-box frame extending under one end of the stylus-bar and above the opposite end, knife-edges carried by the under and upper ends of the stylus-bar respectively adapted to bear against the supports, and means for keeping the stylus-bar in contact with its bearings, substantially as described.

3. In a sound-recording apparatus, the combination with the sound-box frame, a diaphragm located therein, a horizontally-disposed arm connecting the stylus-bar with the diaphragm, knife-edge bearings located at each end of the stylus-bar on its upper and lower sides respectively, studs carried by the sound-box frame against which the knife-edges bear, and a cord secured to the central arm of the stylus-bar bearing against one end of the horizontal bar and passing under its supporting-stud and through an opening provided in the opposite end of the same, the end of said cord being yieldingly secured to the sound-box frame, substantially as described.

4. In a sound recording and reproducing apparatus, the combination with the sound-box frame, of a diaphragm, a horizontally-disposed stylus-bar, a central arm for said bar having a connection with the diaphragm, studs arranged below one end and above the other end of the stylus-bar, knife-edges adapted to bear against the said studs, a cord secured to the stylus-bar and passing under each of its bearings, a spring secured to the other end of said cord and means for adjusting the tension of said spring, substantially as described.

5. The combination with the sound-box frame, of a diaphragm located therein, a T-shaped stylus-bar having its vertical arm secured to the diaphragm, a pair of studs secured to the sound-box frame, extending under the stylus-bar at one end and above the same at the other end, V-shaped notches formed in said studs, knife-edges carried by the lower side of the bar at one end and the upper side at the opposite end, a cord secured to the stylus-bar and passing under each of its bearings for keeping the said bearings in contact with the studs, a yielding spring connecting the end of the cord, and an adjustable arm secured to the sound-box to which the free end of the spring is connected, substantially as described.

6. The combination with the sound-box casing, of a diaphragm located therein, a T-shaped stylus-bar having its vertical arm connected to the diaphragm, a stud, $i^2$, extending under one end of the stylus-bar, a knife-

edge carried by the lower side of the stylus-bar adapted to a V-shaped groove in the stud, a stud, $h^2$, located above the other end of the stylus-arm, a knife-edge carried by the upper side of the stylus-bar adapted to a V-shaped groove provided in the stud, a cord, G, secured to the stylus-bar passing over the end of same and under the stud, $i^2$, said cord passing through an eye formed in the opposite end of the stylus-bar and passing upwardly against the stud, $h^2$, a coiled spring secured to the upper end of the cord, an arm, L, carried by the sound-box frame supporting the coiled spring at its free end, and a set-screw, $l$, for adjusting the said arm, substantially as described.

In witness whereof I have hereunto set my hand this 3d day of August, A. D. 1900.

ELDRIDGE R. JOHNSON.

Witnesses:

JNO. T. CROSS,

LEWIS H. VAN DUSEN.