H. C. MILLER.

SOUND BOX.

APPLICATION FILED MAY 1, 1906.

1,124,636.

Patented Jan. 12, 1915.

2 SHEETS—SHEET 1.

Fig. 1.

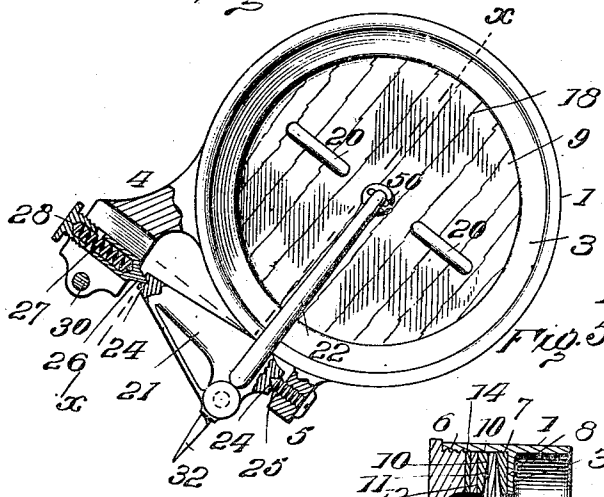
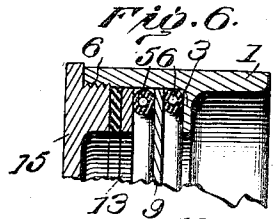


Fig. 6.



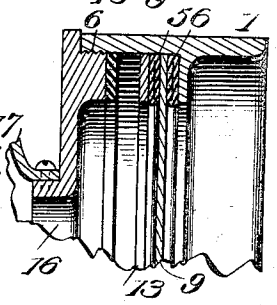


Fig. 5.

Fig. 2.

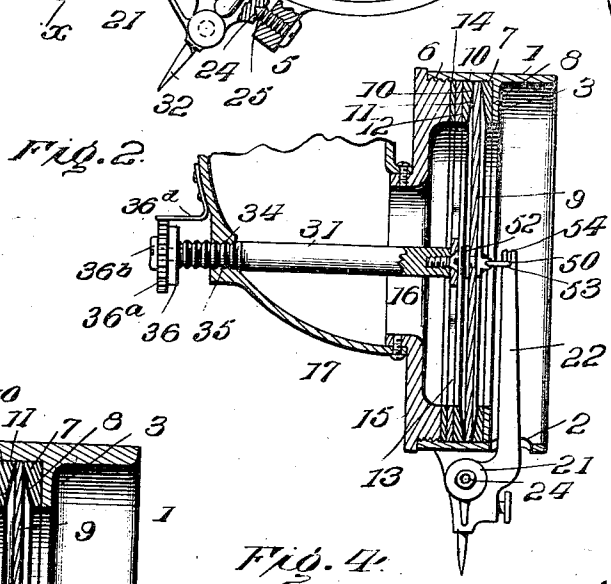
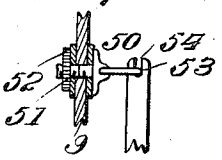


Fig. 7.



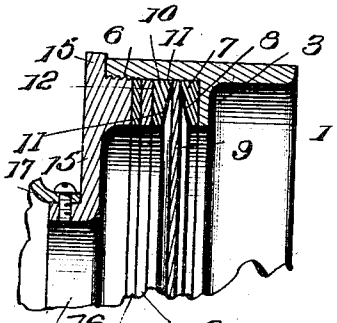


Fig. 3.

Fig. 4.

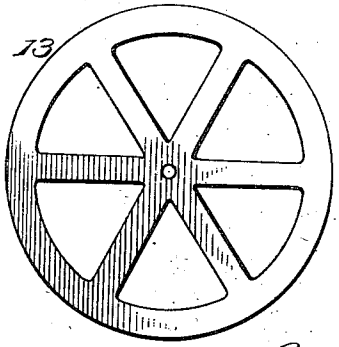
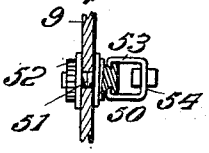


Fig. 8.



Witnesses

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2 SHEETS—SHEET 2.

Fig. 9.

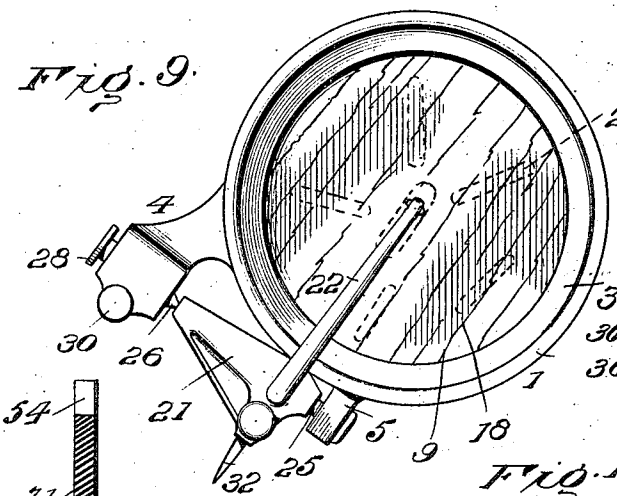


Fig. 14.

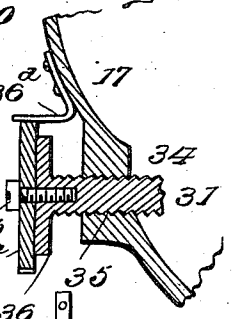
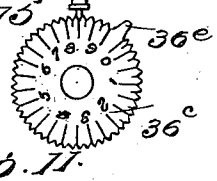


Fig. 15.



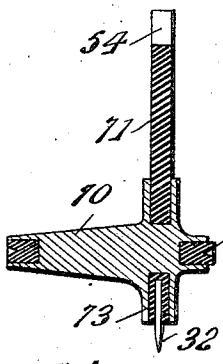


Fig. 10.

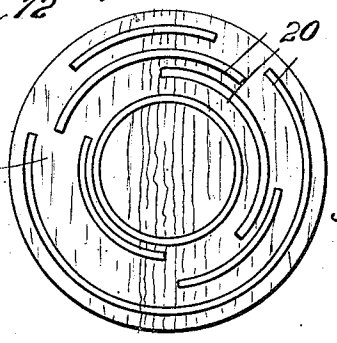


Fig. 16.

Fig. 11.

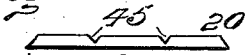


Fig. 12.

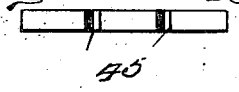
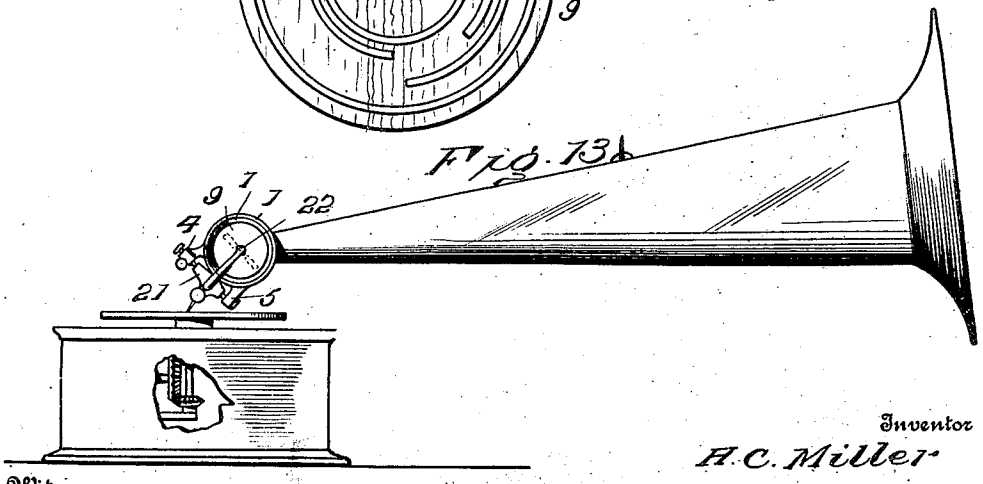


Fig. 13.



Witnesses

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HENRY C. MILLER, OF WATERFORD, NEW YORK.

SOUND-BOX.

1,124,636. Specification of Letters Patent. Patented Jan. 12, 1915.

Application filed May 1, 1906. Serial No. 314,654.

To all whom it may concern:

Be it known that I, HENRY C. MILLER, a citizen of the United States, residing at Waterford, in the county of Saratoga and State of New York, have invented certain new and useful Improvements in Sound-Boxes, of which the following is a specification.

This invention relates to improvements in sound boxes for talking machines, of the type shown in my Patent No. 793,012, dated June 20, 1905.

Those familiar with this art and with present talking machines find the sound produced is deficient in quality, in that it is harsh and unnatural. These differences exist particularly with musical selections. I attribute these difficulties to the imperfect construction, and the imperfections in material, principally of the parts constituting the sound box. The defects are furthermore present because of the necessity of limiting the diameter of the diaphragms, on account of the inherent difficulties in securing suitable material of absolutely homogeneous character.

It is my purpose to improve the sound box by using a wooden diaphragm, applying a tuning or modifying element, employing a stylus lever and bar of hard rubber or like non-conducting material, and means for adjusting and regulating the diaphragm. By these various details of construction a diaphragm of larger area than commonly used may be employed; the desired pitch may be obtained; range of power and compass increased and the quality of sound improved, so that the several musical instruments and voices recorded on a record can be distinguished.

I also find that a sound box of the general structure indicated, prevents interference of sound, and in a large measure harsh sounds are obviated.

The diaphragm adjustment also permits an operator to regulate the diaphragm to suit individual taste, according to the special characteristics of a selected piece being reproduced.

Other objects and advantages will be hereinafter referred to and particularly pointed out in the claims.

In the drawings—Figure 1 is a side elevation of my improved sound box, parts being shown in section. Fig. 2 is an enlarged vertical transverse section on the line *x*—*x* of Fig. 1. Fig. 3 is an enlarged detail vertical transverse section of the sound box. Fig. 4 is a detail view of a spider. Fig. 5 is a view similar to Fig. 3 but showing the washers compressed. Fig. 6 is a detail view of a slight modification. Figs. 7 and 8 are detail views of means for securing the stylus lever to the diaphragm. Fig. 9 is a face view of the sound box showing a different arrangement of attaching the modifying elements thereto. Fig. 10 is a face view of the diaphragm showing modifying elements of different formation. Figs. 11 and 12 are detail views of a special form of modifying element. Fig. 13 is a view showing the invention in connection with a horn. Fig. 14 is a detail sectional view of the means employed for altering the pitch of the diaphragm. Fig. 15 is a detail elevation of the same. Fig. 16 is a detail view of a slight modification.

The numeral 1, indicates a sound box formed in its periphery with an opening 2; interior flange 3; bearings 4, and 5; and internal threads 6.

Bearing against one face of the flange 3, is the flat surface of a preferably rubber washer 7, beveled on its opposite face at 8, to bear on the outer face of a wooden diaphragm 9.

A washer 10, similar to washer 7, bears on the opposite side of the diaphragm 9, and holds the same relative position to the diaphragm as washer 7. That is, its beveled surface 11, bears on the diaphragm, while its flat face 12, co-acts with a spider 13. On the other side of spider 13, is a rubber washer 14, and bearing directly on said latter washer is the flange of a cover plate 15, threaded to engage the threads 6, of the sound box. The cover plate is formed with a flanged opening 16, and communicating therewith is the end of a sound tube 17.

The grain 18, of the wood of the dia-

phragm is as near straight as can be secured, and preferably runs in line with the stylus lever, and is suitably coated to protect it from atmospheric changes. On one or both faces of the diaphragm I place a modifying element or elements 20, the surrounding edges and the outer face of each element being entirely free, and each element is wholly disconnected from the other, except through the diaphragm.

The stylus bar 21, and lever 22, are preferably formed of hard rubber or similar composition, and in one piece. The internal sound non-conductive qualities of this material are well known, and it is my purpose in using it to suppress those sound vibrations which tend to cause buzzing or like unnatural conditions when reproducing a voice or a piece of music. While it is true this material is effective in suppressing the unnatural vibrations, it is also true that the more natural and essential vibrations of the selection being reproduced, are, accurately and minutely produced, resulting in what may be termed the highest quality of sound.

The stylus bar 21, is formed at its ends with two conical depressions 24—24, into which fit the ends of conical journals 25 and 26. The journal 25, is in the form of a screw seated in a threaded opening in the bearing 5, while the journal 26, is cup shaped to receive a spring 27, bearing at its opposite end in a seat in an adjusting screw 28, working in the threaded end of an opening in the bearing 4. Bearing 4, is split at its free end for the free passage of the journal 26, and a screw 30, in the ends of said bearing, serves to fix the stylus bar in position after it has been adjusted. The stylus lever 22, is in line with the stylus 32, and passes through opening 2, and as before stated is preferably of hard rubber and formed with the stylus bar.

I have found it to be quite essential to provide a single adjusting means exterior of the sound box to alter the pitch of the diaphragm, that each record may be reproduced, in accord with the original. This means consists preferably of a rod 31, swiveled in the center of the spider 13, and having at its outer end threads 34, engaging a threaded opening 35, in the sound tube 17. The outer end of the rod is formed with a head piece 36, and provided with a dial plate 36^a. The dial plate 36^a, is fastened to the head piece 36, by a screw 36^b, passing into a threaded opening in the rod 31. On the face of the dial plate are arbitrary indicating marks, each mark representing a determined pitch, and opposite the marks are indications 36^c, with which a spring pressed locking device 36^d coöperates to hold the parts in set position after they have been adjusted, a stop 36^e, limiting the movement of the dial plate.

When positioning the dial plate, the diaphragm is first set to zero, and the plate is placed against head 36, with the stop 36^e, against the locking device, and then the screw 36^b, is screwed into place to bind the dial plate to the head piece 36. The stop will limit the movement of the rod and prevent the diaphragm being clamped too tight.

50 indicates a hinge connection between the stylus lever and the diaphragm which permits vibration of the parts without binding. This connection consists of a headed screw 51, passed through an opening in the diaphragm and provided on its inner end with a nut 52, and a link 53, engaging an opening in the head of the screw, and a slot 54, in the end of the stylus lever.

In Fig. 6, 56, indicates sectional rubber tubing in place of beveled washers shown in Figs. 3 and 4.

The modifying element may be made in various ways, and is of such material as will permit of its being shaved down, or peeled to reduce its dimensions. As shown in the preferred embodiment of the invention a single piece, preferably wood, is employed, but this may not be of sufficient area to meet the requirements with a diaphragm having a low pitch. I, therefore may use a tuning element as shown in Figs. 11 and 12, which consists of an elongated piece of material, provided with one or more grooves or weak points 45—45, so that if it is found a large area is necessary little trimming will be required, but if the larger area is not wanted such trimming will be effected by breaking the element at the grooves, and then trimming it down to obtain sufficient elasticity of the diaphragm to produce the desired results.

By placing a strip of wood on a thin wooden diaphragm, which has been previously treated to resist atmospheric changes, several important results are accomplished. Each diaphragm is different from the other, and the peculiarities are determined in each instance by testing, and to make each diaphragh produce and transmit sound vibrations naturally in tune and in unison with a standard, it is quite essential that the grain, and the requisite thickness of wood be carefully considered. I find that a thickness of approximately one two hundredths of an inch will produce a diaphragm having a pitch below the original sound, and then by placing upon the surface thereof one or more pieces or strips of wood of dimensions in excess of requirements, and gradually remove fractional portions thereof, guided of course by sound tests, until the reproduced sound is in accord with the original. This construction will permit of the diaphragm

being made larger than is now the custom, because the tuning element may be so regulated as to make the result affective in proportion to its size.

The regulation of the active diameter of the diaphragm is quite essential to alter its pitch which contributes to produce the result obtained with my invention. Therefore, I utiiize the beveled washers and the adjusting means to uniformly, and by one operation increase or decrease the dimensions of the active surface of the diaphragms, which of course, alters the properties of the sound emitted. This feature is of the utmost importance because of the fact that a particular record may require a greater or less active diaphragm surface to produce the quality of sound, and must be arranged to be regulated in a convenient and quick manner.

While I have described specifically the special parts which contribute to make up a sound box for the production of, and preserving the essential quality of sound, nevertheless, the combined action of these structural details coöperate to bring about the desired result.

So far as I am aware, I am the pioneer in the art, using a wooden diaphragm and permanently modifying it to get the best results, and yet providing means for regulating the pitch and harmony of sound produced. By tests and actual practice, I have found it absolutely necessary to obtain the best quality of sound, to modify the diaphragm to be in accord with the horn.

In Fig. 16, a stylus lever is shown, composed of metal and rubber or like material. 70 represents the metal stylus bar; 71, a rubber stylus lever; 72, rubber bearings in the stylus bar, and 73, a rubber stylus holder.

While I have described what I regard as the preferably details of construction to cooperate with each other to produce the best result, it will be obvious minor changes may be made without departing from the spirit and scope of my invention. For instance the stylus bar may be formed in part or complete in metal; the fulcrums of the same may be provided with springs; the diaphragm may be constructed of any material, and the pitch adjustment may be omitted. Either of the changes or omissions noted may be made to produce a particular result with a given record.

It is to be understood that the improvements herein described are to be used in connection with a diaphragm for reproducing or recording purposes.

What I claim is:

1. A sound box having a wooden diaphragm, a stylus lever and bar, and a modifying element located across the grain of the wooden diaphragm.

2. A sound box having a wooden diaphragm coated with a hardening solution, a modifying element secured to the coated face of the diaphragm and across the grain of the wood, and a stylus lever and bar cooperating with the diaphragm and the modifying element.

3. A sound box having a wooden diaphragm and a modifying element provided with grooves on its outer face, and extending across the grain of the wood.

4. A sound box having a wooden diaphragm, and a modifying element provided with grooves and secured to the diaphragm.

5. A sound box having a diaphragm, a stylus lever and bar coöperating therewith, bearings for the stylus bar, one of said bearings being spring pressed, a regulating screw operating to compress or release the spring in line with the stylus bar, and means for fixing the position of the regulating screw.

6. A sound box having a diaphragm, a stylus lever and bar coöperating therewith, bearings for the stylus bar, one of said bearings being spring pressed, means operating to compress or release the spring in line with the stylus bar, and means for fixing the position of the former means.

7. A sound box having a wooden diaphragm, modified by a strip attached diametrically thereto and across the grain of the diaphragm, and a stylus lever and bar of one piece of hard rubber.

8. In combination, a sound box having a cover, a sound tube communicating with the rear of the sound box, a diaphragm, resilient washers bearing on the diaphragm, a spider on the inside of the sound box and bearing on one of the resilient washers, a rod extending from the spider and through the tube for adjusting said spider, and a bearing formed in the sound tube to receive the rod.

9. A sound box having a wooden diaphragm with its grain running parallel with the stylus lever, a stylus bar and lever formed of a single piece of hard rubber, and a modifying element secured across the grain of the diaphragm.

10. The combination with a sound box provided with a diaphragm, a stylus lever and bar formed of one piece of hard rubber, a modifying element on the diaphragm, a cover formed with an opening and secured to the sound box, a sound tube secured to the cover, washers, and a rod passing through the sound tube to regulate the pressure of the washers on the diaphragm.

11. A sound box having a diaphragm with a modifying element attached thereto, and a stylus lever attached directly to said diaphragm and wholly disconnected from the modifying element except through the diaphragm.

12. A sound box having a diaphragm pro-

vided with a series of diametrically disposed modifying elements, and a stylus lever and bar formed of one piece of hard rubber and attached directly to the diaphragm and wholly disconnected from the modifying elements.

13. A sound box having a diaphragm, a grooved modifying element coöperating with the diaphragm, and a stylus lever attached directly to the diaphragm.

14. A sound box having a diaphragm with a series of modifying elements disposed on opposite sides of a stylus lever, and a stylus lever directly attached to said diaphragm at a point between the series of modifying elements and wholly disconnected from the stylus lever except through the diaphragm.

15. A sound box having a diaphragm, a modifying element formed of wood and attached to the face of the diaphragm to tune said diaphragm, and a stylus lever attached directly to the diaphragm but wholly disconnected from the modifying element except through the diaphragm.

16. A sound box having a diaphragm modified by elements attached to its face, a stylus lever directly attached to the diaphragm, washers on opposite sides of the diaphragm and having their adjacent faces beveled and means for compressing the washers to cause their beveled faces to gradually engage the diaphragm from its edge toward its center to change the pitch.

17. A sound box having a casing and a diaphragm, a stylus lever, and modifying strips on the diaphragm, said strips being disconnected from each other and from the stylus lever except through the diaphragm and stopping short of said casing.

18. A diaphragm having modifying elements attached thereto, said modifying elements being attached to the surface of the diaphragm and having their edges and one face free, and a stylus lever attached directly to the diaphragm.

19. A diaphragm modified by strips sufficiently thick to be reduced after having been applied to the diaphragm, each of said strips having an attaching surface which extends throughout the whole of its length, and a stylus lever attached directly to the diaphragm and wholly disconnected from the modifying strips.

20. A diaphragm modified by a strip subdivided by grooves.

21. A wooden diaphragm modified by diametrically arranged modifying strips independent of and wholly disconnected from each other, except through the diaphragm, and a stylus lever attached to the diaphragm.

22. A wooden diaphragm modified by a wooden strip, said wooden strip being spaced at one end from a stylus lever, and terminating at its opposite end short of the edge of the diaphragm, and a stylus lever attached directly to the diaphragm.

23. A diaphragm modified by strips attached to its face, each strip having its edges and one face free and being wholly disconnected from the adjacent strip except by connection through the diaphragm, and a stylus lever attached directly to the diaphragm.

24. A sound box having a diaphragm modified by strips attached thereto, the outer edges and one face of the strips being free, and a pivoted stylus lever of non-metallic material attached directly to the diaphragm and wholly disconnected from the modifying strips.

25. A sound box comprising a casing, a flexible diaphragm having attached thereto a flexible modifying element having a surface to be attached to the diaphragm and designed to be reduced after having been applied to said diaphragm for modifying the sound given out by the latter, the modifying element being secured to the diaphragm throughout the whole of its attaching surface, and a stylus lever for vibrating the diaphragm and the modifying element.

26. A diaphragm having a series of modifying elements attached to its surface, said elements being composed of material adapted to be reduced after having been attached on the diaphragm for the purpose of modifying the tone of the diaphragm down to a standard, each element being disconnected from the other except through the diaphragm.

27. A sound box comprising a casing, a flexible diaphragm having attached thereto a flexible modifying element wholly disconnected from the casing and having a surface to be attached to the diaphragm and designed to be reduced after having been applied to said diaphragm to modify the sound given out by the latter, the modifying element being secured to the diaphragm throughout the whole of its attaching surface, and a stylus lever for vibrating the diaphragm and the modifying element.

28. A sound box comprising a diaphragm, a stylus lever, and modifying elements secured to the diaphragm in series each side the stylus lever, said modifying elements being spaced from each other and wholly disconnected from each other except through the diaphragm.

29. A diaphragm having attached to it a plurality of modifying elements alined with each other and also spaced from each other and wholly disconnected from each other except through the diaphragm, each modifying element being located between a

stylus lever and the edge of the diaphragm, and a stylus lever attached directly to the diaphragm.

30. A diaphragm having a modifying element attached thereto, said modifying element being attached to the surface of the diaphragm and having its edges and one face free, and a stylus lever attached directly to the diaphragm.

31. A sound box having a diaphragm, modified by a strip attached thereto, the outer edges and one face of the strip being free, and a pivoted stylus lever of non-metallic material attached directly to the diaphragm and wholly disconnected from the modifying strip.

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

HENRY C. MILLER.

Witnesses:
WM. F. PALMER,
GEO. L. RICHARD.