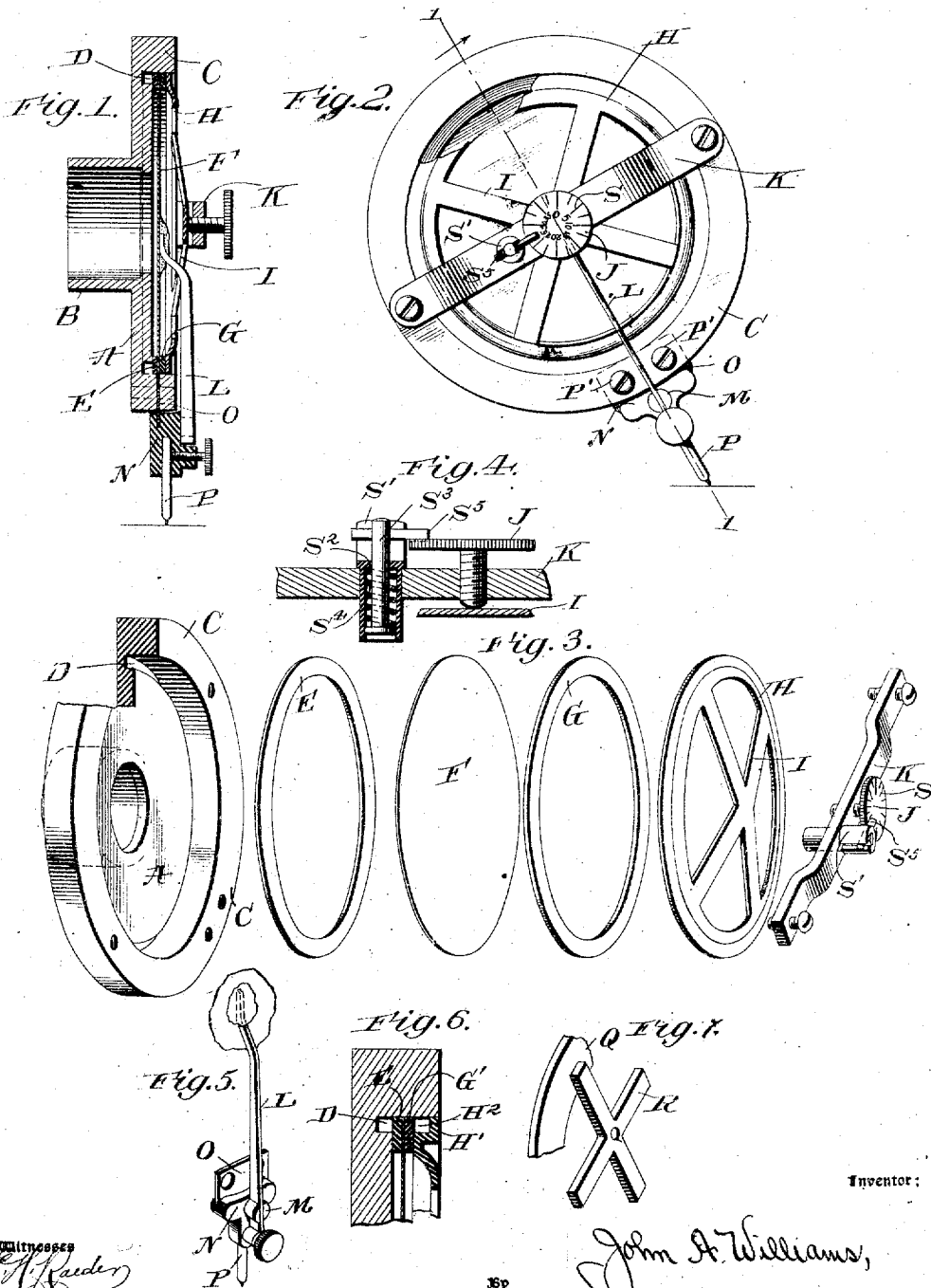


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SOUND BOX.
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SOUND-BOX.

987,205.

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To all whom it may concern:

Be it known that I, JOHN A. WILLIAMS, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Sound-Boxes, of which the following is a specification.

My present invention pertains to improvements in sound-boxes, the construction and advantages of which will be hereinafter set forth, reference being had to the annexed drawings, wherein:

Figure 1 is a longitudinal sectional view, on the line 1—1 of Fig. 2; Fig. 2 a front face view, the compression-ring or plate being partially broken away; Fig. 3 a perspective view of the various parts of the box, with the exception of the stylus-bar or arm; Fig. 4 a vertical sectional view of the combined indicating and locking device for the adjusting-screw; Fig. 5 a perspective view of the stylus-bar or arm; Fig. 6 a sectional view on a somewhat enlarged scale, showing a slight modification of the mounting of the diaphragm; and Fig. 7 a perspective view of a modification of the means employed clamping the diaphragm.

The primary object of my invention is to obtain a sound-box which may be readily assembled and adjusted by a person having but slight mechanical skill, the box then giving as good results as if assembled by an expert in such work.

A further object is to provide means whereby the pressure on the edge of the diaphragm may be varied, and the condition of the diaphragm so changed thereby that it will accommodate itself to the class of work being undertaken. In other words, the box has a wide or universal range, reproducing high and low notes, "blast" notes, and the tones of various instruments, or combinations of instruments with equal facility, and the tones produced being perfectly true at all times. The adjustment of the diaphragm also permits it to be regulated in accordance with the acoustic properties of the room or space in which the instrument is being employed.

A still further object of the invention is to provide means whereby the adjusting-screw (which is employed to vary the

amount of compression on the ring or plate) may be locked in position, and the degree of compression indicated by a combined scale and pointer.

In the construction shown in Figs. 1, 2 and 3, A denotes the shell or casing, having a sleeve B for attachment to the instrument, as usual. Within the lower portion of the shell, adjacent to the upstanding wall or rim C thereof, is formed a groove or channel D, a washer or gasket E, preferably of high-grade rubber, overlying said groove and bearing at its inner edge upon the bottom of the shell. A diaphragm F of mica, glass or other suitable material rests upon the gasket E, and a second packing-ring or gasket G is placed upon the diaphragm. A compression-ring or plate H overlies the parts thus assembled, said ring or plate (as shown in Figs. 1, 2, 3 and 6) being provided or formed with integral cross-bars I, which curve slightly upward from said ring. An adjusting-screw J is mounted in a supporting-bar K, secured to the shell or casing, the lower end of said screw being slightly rounded and bearing upon the cross-bars at their point of junction.

As will be readily appreciated, the degree of compression upon the diaphragm may be varied as desired, and the pressure exerted will be uniform by reason of the fact that force is applied to the ring or compression-plate at one point only, namely, the center thereof, so that the pressure is exerted evenly upon the diaphragm adjacent to its periphery or edge. In other words, the compression-plate may be said to have a universal tipping or tilting movement, with the rounded end or point of the adjusting-screw as a fulcrum. This universal movement permits the ring or plate to adapt itself to any minute irregularities which may exist in the parts, particularly in the diaphragm, thus preventing the latter from becoming wrinkled or distorted. As the screw J is turned inwardly, the parts are, of course, put under greater stress, and the quality of the tone becomes correspondingly sharper or thinner, while the reverse is true as the screw is loosened. When the screw is turned inwardly, the lowermost gasket E is expanded circumferentially and crowded

into groove or channel D to a greater or less degree, thereby tending to stretch the diaphragm and arch it to a slight extent, causing it to become extremely resilient and capable of producing a sharper or thinner quality of tone. The tension thus caused has no tendency to wrinkle, furrow or distort the diaphragm, which is especially apt to occur in case a mica diaphragm having slight undulations in its surface is used.

In order to ascertain the degree of compression exerted by the screw and to hold the same in its adjusted position, the upper face of the head of the screw is provided with a series of radial notches or recesses S, graduated as shown in Fig. 2. A barrel or tubular member S' is mounted in the bar K, the opening in the lower portion of the barrel being larger than that in its upper portion, thus forming a shoulder S². A rod or plunger S³ is mounted in the tubular member S', and a spring S⁴ surrounds said plunger, bearing against the head thereof at its lower end and against the shoulder S² at its upper end, thereby tending to draw the plunger downwardly in the tubular member. Said plunger is provided at or near its upper end with a cross-pin S⁵, which works in slots formed in the head of the tubular member S', the outer end of the cross-pin S⁵ overlying the head of the adjusting-screw J and entering the notches S formed therein as the adjusting-screw is rotated and its notches are brought into alignment with the cross-pin. It will thus be seen that the spring tends to hold the cross-pin in engagement with the adjusting-screw, and consequently locks said screw against accidental rotation, thereby preventing any change in the degree of compression exerted upon the diaphragm except when the screw is manually operated. The cross-pin therefore serves the double function of an indicator and a locking device.

In Fig. 6 a modification of the invention is shown, wherein the presser-plate or ring H' is formed with a circumferential groove or recess H², which provides a space for the expansion of gasket G', overlying the diaphragm. With this arrangement the diaphragm may be put under stress or tension without being arched. The adjustment of the ring or presser-plate permits the adjustment of the device to compensate for deterioration of the gaskets, whether the presser-plate be provided with a groove as H² (Fig. 6) or be of the form designated by H, Figs. 1, 2 and 3.

The stylus-bar L is connected at its inner end to the diaphragm, to one side of the center thereof, see Figs. 1 and 2, by any suitable adhesive, the outer end of the bar being soldered, sweated or riveted in a groove or saw-cut formed in a post or stud M, extending upwardly from a head or block N. A

thin web or plate O, permanently secured to the head N, or formed as an integral part thereof, extends outwardly therefrom in line with bar L, entering a saw-cut formed in the side wall C, and being secured in place by screws P'.

Any material possessing sufficient tenacity or strength may be employed in constructing the web or plate. Copper, of 5/1000 of an inch in thickness has thus far given the best results.

As will be seen upon reference to Fig. 1, the web stands in approximate alignment with the diaphragm, and by reason of this fact and the further fact that the head N lies close to wall C of the frame, no endwise movement of the stylus-bar can take place. It simply rocks upon a line which extends through the web, and as the latter is preferably formed of a material possessing but slight resiliency there is in effect practically no resistance to the rocking of the stylus-bar when moving in consonance with the diaphragm. As will be seen, there are no loose parts; no parts to be adjusted, and, as a consequence, no parts which can produce a rattling noise.

The head N carries the usual needle or stylus P. The inner end of the stylus-bar just clears the diaphragm when the parts are assembled, and previous to its being secured to the diaphragm,—consequently there is no tendency of the bar to buckle the diaphragm, as is the case in the usual construction, in which a screw passing through the diaphragm enters the end of the stylus-bar.

As previously noted, the stylus-bar is connected to the diaphragm to one side of the center thereof, or more nearly adjacent to that side of the frame to which the web O is secured. The point of attachment is, therefore, approximately coincident with the center of a line extending from the rocking-point of the bar to the diametrically opposite side or edge of the diaphragm, thus insuring the greatest possible range of movement.

In Fig. 7 a slight modification of the invention is illustrated. Instead of making the presser-plate or ring and the cross-bars integral, they are separately formed, the ring being designated by the letter Q and the spider or intermediate frame by R.

With a compression ring or plate constructed as shown in Figs. 1, 2 and 3, that is to say, formed of relatively light metal, struck up in a die, there is a tendency for the ring to respond slightly to the vibrations of the diaphragm, though not to a sufficient degree to prove detrimental in practice. The rigidity of the structure, however, is such as to permit the required degree of compression to be applied to the diaphragm.

As hereinbefore stated, the several parts of the box may be readily assembled and

adjusted, and further the compression on the diaphragm is equal throughout the entire extent of the plate or ring.

Having thus described my invention, what I claim is:

1. In a sound-box; the combination of a frame; a diaphragm mounted therein; a stylus connected to the diaphragm; a compression-plate adjacent to the edge or periphery of the diaphragm; and means for applying pressure centrally to said compression-plate, whereby the pressure upon the diaphragm may be varied as desired but maintained even throughout the entire bearing surface of the diaphragm, substantially as described.
2. In a sound-box, the combination of a frame; a diaphragm mounted therein; a stylus connected to the diaphragm; a compression-plate adjacent the diaphragm; and means for applying pressure to said plate and permitting it to rock or tilt with reference to said means, whereby the pressure may be varied as desired but will be even throughout the entire bearing surface of the plate, substantially as described.
3. In a sound-box, the combination of a frame having a groove or channel formed therein; a packing-ring overlying said groove or channel; a diaphragm; a second packing-ring mounted upon the diaphragm; a presser-plate or ring having a groove or recess formed adjacent to its periphery, said plate overlying the second packing-ring; and means for applying pressure to said plate or ring.
4. In a sound-box, the combination of a frame; a gasket or packing-ring mounted therein; a diaphragm mounted upon said packing-ring; a second packing-ring resting upon the diaphragm; a compression-plate or ring mounted upon said packing-ring, said plate being provided with cross-bars or members I; a supporting-bar secured to the frame and extending over the compression-plate; and an adjusting-screw carried by said bar and bearing at its lower end upon the cross-bars of the compression-plate.
5. In a sound-box, the combination of a frame; a diaphragm mounted therein, said diaphragm being free to expand circumferentially; and means tending to stretch said diaphragm, substantially as described.
6. In a sound-box, the combination of a frame; a diaphragm mounted therein and free from direct connection therewith; and means for applying pressure to and expanding the diaphragm circumferentially, substantially as described.
7. A sound box comprising a casing having an annular flange, a substantially flat diaphragm within the casing, a flange on which the diaphragm is seated, and means acting on an annular line within the margin of the annular flange on the casing to dish said diaphragm in concavo-convex form throughout its entire area to alter the pitch of the latter.
8. In a sound-box, the combination of a suitable frame; a diaphragm mounted therein; a stylus-bar connected said diaphragm; and a web connecting said bar directly to the frame, the web lying in substantially the same plane as the diaphragm.
9. A sound box comprising a diaphragm, a washer on which the diaphragm is seated, a washer acting on an annular line on the opposite side of the diaphragm to dish the latter in concavo-convex form throughout its entire area, and means operating the latter washer.
10. In a sound-box, the combination of a suitable frame; a diaphragm mounted therein; a stylus-bar connected to said diaphragm at a single point to one side of the center of the diaphragm; and a rocking connection between said stylus-bar and frame.
11. In a sound-box, the combination of a suitable frame; a diaphragm mounted therein; a stylus-bar; a connection between said stylus-bar and the frame; and a single connection between the stylus-bar and diaphragm substantially midway between the connection of the bar to the frame and the diametrically opposite side of the diaphragm, substantially as and for the purpose described.
12. In a sound-box, the combination of a suitable frame; a diaphragm mounted therein; a compression-plate; means for actuating said compression-plate; and means for determining the degree of compression, substantially as described.
13. In a sound-box, the combination of a suitable frame; a diaphragm mounted therein; a compression-plate; a screw for adjusting said plate; and a scale working in conjunction with said screw.
14. In a sound-box, the combination of a suitable frame; a diaphragm; means for varying the state of tension of said diaphragm; and means for determining said tension.
15. In a sound-box, the combination of a suitable frame; a diaphragm; means for varying the state of tension of said diaphragm; and means for determining the degree of tension and locking the tension-varying means in position.
16. In a sound-box, the combination of a suitable frame; a diaphragm mounted therein; a compression-plate; a screw for adjusting said plate; a scale working in conjunction with the screw; and means for locking the screw in position.
17. In a sound-box, the combination of a suitable frame; a diaphragm mounted therein; a compression-plate; a screw for adjusting said plate, the screw being provided with a series of notches; and a spring-

pressed pin working in conjunction with said notches.

18. In a sound-box, the combination of a suitable frame; a diaphragm mounted therein; a compression-plate; a screw for adjusting said plate, the screw being provided with a series of notches and graduations in line with said notches; and a spring-pressed pin working in conjunction with said notches and serving to indicate the degree of compression and to hold the screw in its adjusted position.

19. In a sound-box, the combination of a suitable frame; a diaphragm mounted therein; a compression-plate; a supporting-bar; a screw for adjusting said plate, the screw being provided with a series of notches in its upper face; a tubular member carried by said supporting-bar adjacent to the screw; a spring-pressed plunger mounted in said tubular member; and a cross-pin carried by the upper end of the plunger, the outer end of said pin lying in the same plane as the notches formed in the screw, substantially as described.

20. In a sound-box, the combination of a frame; a diaphragm mounted therein; and a resilient compression ring free at its periphery for holding the diaphragm.

21. In a sound-box, the combination of a frame; a diaphragm mounted therein; a resilient compression-ring for holding said diaphragm, said ring being free at its periphery; and means for adjusting the pressure of said ring.

22. In a sound-box, the combination of a frame; a diaphragm mounted therein; a compression-plate bearing on the diaphragm and free at its outer edge; and means for applying pressure centrally to said plate.

23. A sound-box comprising a diaphragm; means for altering the pitch of the diaphragm; an adjustable indicator cooperating with the pitch-altering means; and means for holding the indicator in adjusted position.

24. In a sound box, the combination of a frame formed with an annular groove, a diaphragm, a gasket interposed between the diaphragm and frame, the free edge of the gasket being adjacent the groove, and a resilient compression ring free at its periphery and adjacent the edge of the diaphragm to stretch the latter.

25. In a sound box, the combination of a frame formed with an annular groove, a diaphragm, a gasket interposed between the diaphragm and frame, the free edge of the gasket being adjacent the groove, a resilient compression ring adjacent the free edge of the diaphragm, said ring being free at its periphery, and means for adjusting the pressure of said ring, to stretch the diaphragm.

26. A sound box comprising a diaphragm, means for altering the pitch of the dia-

phragm, and an adjustable indicator cooperating with the pitch altering means.

27. In a sound box, the combination of a suitable frame, a diaphragm therein, a compression plate, a screw for adjusting said plate, and a scale working in conjunction with the screw.

28. In a sound box, the combination with a frame, formed with a recess, a thin plate fitting in the recess, a stylus lever supported on the thin plate, and a diaphragm with which the stylus lever cooperates.

29. In sound box, the combination with a casing formed with a recess at its edge in alinement with the center of the casing, a diaphragm in the casing, a thin plate fitting in the recess, a stylus lever supported on the thin plate at a point beyond the edge of the casing, said stylus lever extending from the support in a radial line with the center of the diaphragm.

30. A sound box comprising a diaphragm, means for altering the pitch of the diaphragm including a frame, the free edge of which is located adjacent the edge of the front of the diaphragm, a support in front of the casing and the frame, and an adjusting device mounted in the front support and bearing on the frame to stretch the diaphragm.

31. In a sound box, the combination with a casing formed at its edge with a radial recess, a diaphragm, a flat thin plate fitting in the recess, a stylus lever supported on the flat thin plate, a stylus carried by the stylus lever at a point below the thin-plate.

32. A sound box comprising a diaphragm, means cooperating with the diaphragm for altering the pitch, and an indicating device attached to the pitch altering means to indicate the degree of pitch of the diaphragm before operating the sound box.

33. A sound-box comprising a diaphragm, means cooperating with the diaphragm for altering the pitch, an indicator forming a part of said pitch altering means, and independent means for adjusting said indicator.

34. A sound box having a diaphragm, resilient washers adjacent the diaphragm, a spider for compressing the washers, and a single screw for adjusting the spider to regulate the pressure of the spider on the washers.

35. A sound box comprising a diaphragm, means for altering the pitch of the diaphragm, an indicator cooperating with the pitch altering means, and means for limiting the movement of the indicator.

36. A sound box comprising a casing, a diaphragm in the casing, a stylus lever cooperating with the diaphragm, and a flat resilient plate extending from the periphery of the casing parallel with the diaphragm, and means for securing the flat resilient plate to the casing and the stylus lever, said

flat resilient plate being unrestrained intermediately of its points of attachment to the casing and stylus bar.

37. A sound box comprising a casing 5 formed with a groove, a flat resilient plate fitting in the groove and extending from the periphery of the casing and disposed wholly within the front and rear planes of the opposite walls thereof, and parallel to said 10 walls, a diaphragm in the casing, and a stylus lever formed with a groove and secured to the diaphragm, the outer end of the flat resilient plate fitting in the groove in the stylus lever, said flat resilient plate being unrestrained 15 intermediately of its points of attachment to the casing and stylus bar.

38. A sound box comprising a casing, a flat resilient plate extending from the periphery of the casing in a directed which is 20 at an angle to the axis of said casing, a diaphragm in the casing, a stylus lever extending from the diaphragm and connected to the casing by the flat resilient plate, said flat resilient plate being unrestrained intermediately of its points of attachment to the 25 casing and stylus bar.

39. A sound box, comprising a casing formed with a groove, a flat resilient plate fitting in the groove and extending from the 30 periphery of the casing in a direction at an angle to the axis of said casing, fastening means passing through the casing and the flat resilient plate to hold the latter in position, a diaphragm, and a stylus lever extending 35 from the diaphragm and overlapping the periphery of the casing, and formed with a groove, the outer end of the flat resilient plate fitting in the latter groove.

40. A sound box comprising a casing, a 40 stylus lever, a stylus, a diaphragm, a flat resilient plate attached to and extending from the periphery of the casing, and attached at its opposite end to the stylus lever, and the diaphragm stylus and resilient plate 45 being in a single plane, said flat resilient

plate being unrestrained intermediately of its points of attachment to the casing and stylus bar.

41. A sound box comprising a casing, a diaphragm, a stylus bar, and a flat resilient 50 plate extending from said casing in a plane at an angle to the periphery of said casing and attached to the casing and the stylus bar at oppositely disposed ends, said plate being unrestrained intermediately of said 55 points of attachment.

42. In a sound box, the combination of a casing, a diaphragm, a stylus bar having a rigid arm, a spring fulcrum, parallel to the 60 face of the diaphragm and having one end fastened rigidly to the rigid arm and its other end fastened to the casing, the said spring fulcrum being flexible between the stylus arm and the casing, and unrestrained 65 intermediately of said points of connection.

43. In a sound box, the combination of a casing, a diaphragm, a stylus bar, a flexible spring fulcrum extending from the outer 70 surface of the casing and parallel with the face thereof, said spring fulcrum being rigidly fastened to the casing and the stylus bar, there being a minute flex between the points of connection of the spring, and the 75 latter being unrestrained between its points of attachment.

44. A sound box comprising a casing, a diaphragm, a stylus bar, and a resilient connection extending from said casing in a 80 plane at an angle to the periphery of said casing and attached to the casing and stylus bar at oppositely disposed ends, said resilient connection being unrestrained intermediately of said points of attachment.

In testimony whereof I have signed my name to this specification in the presence of 85 two subscribing witnesses.

JOHN A. WILLIAMS.

Witnesses:

R. H. MORRIS,
M. E. HEDGE.