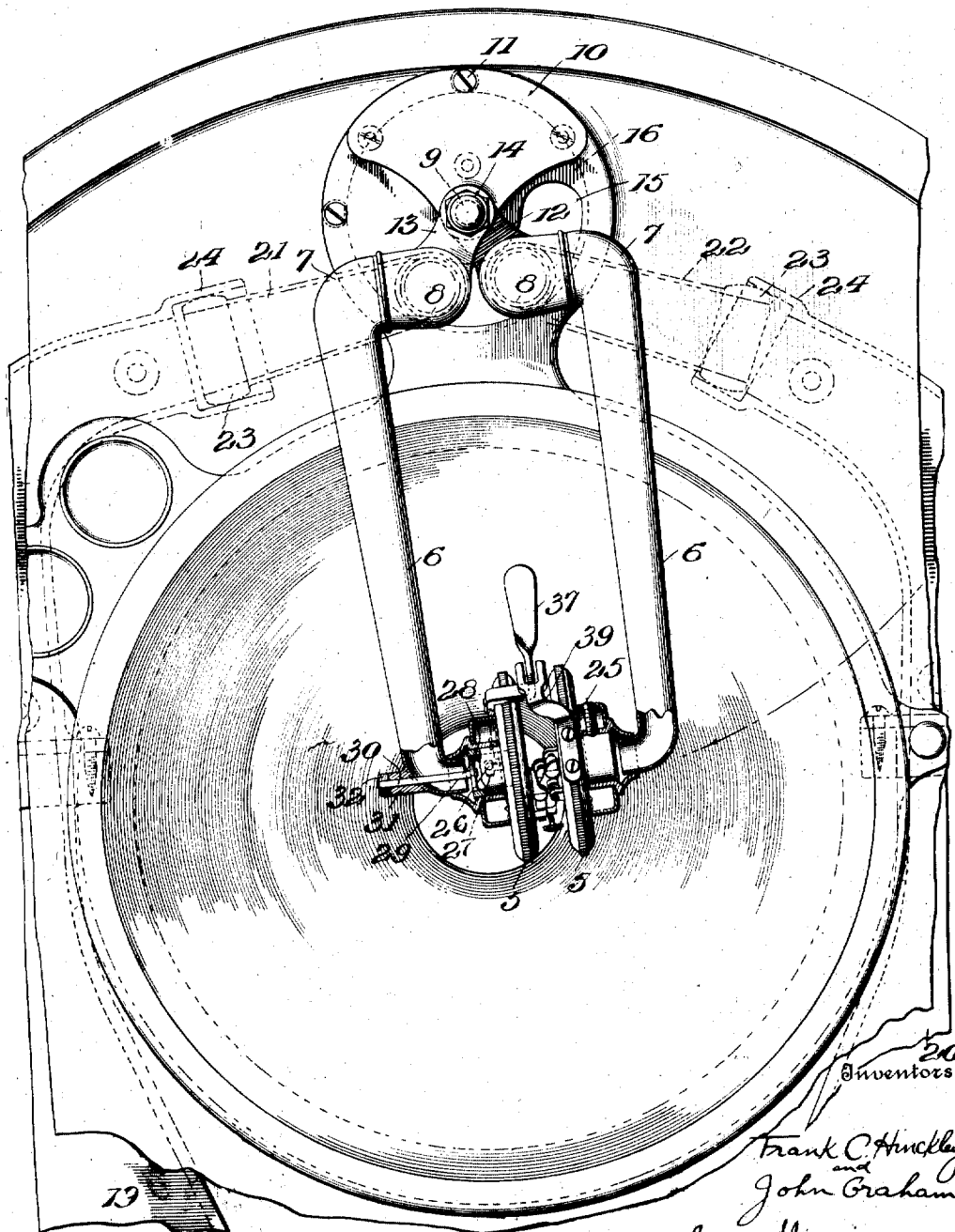


F. C. HINCKLEY & J. GRAHAM.
 DUPLEX GRAPHOPHONE.
 APPLICATION FILED JAN. 9, 1917.

Patented Aug. 27, 1918.
 3 SHEETS—SHEET 1.

1,276,759.

Fig. 1.



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Fig. 3.

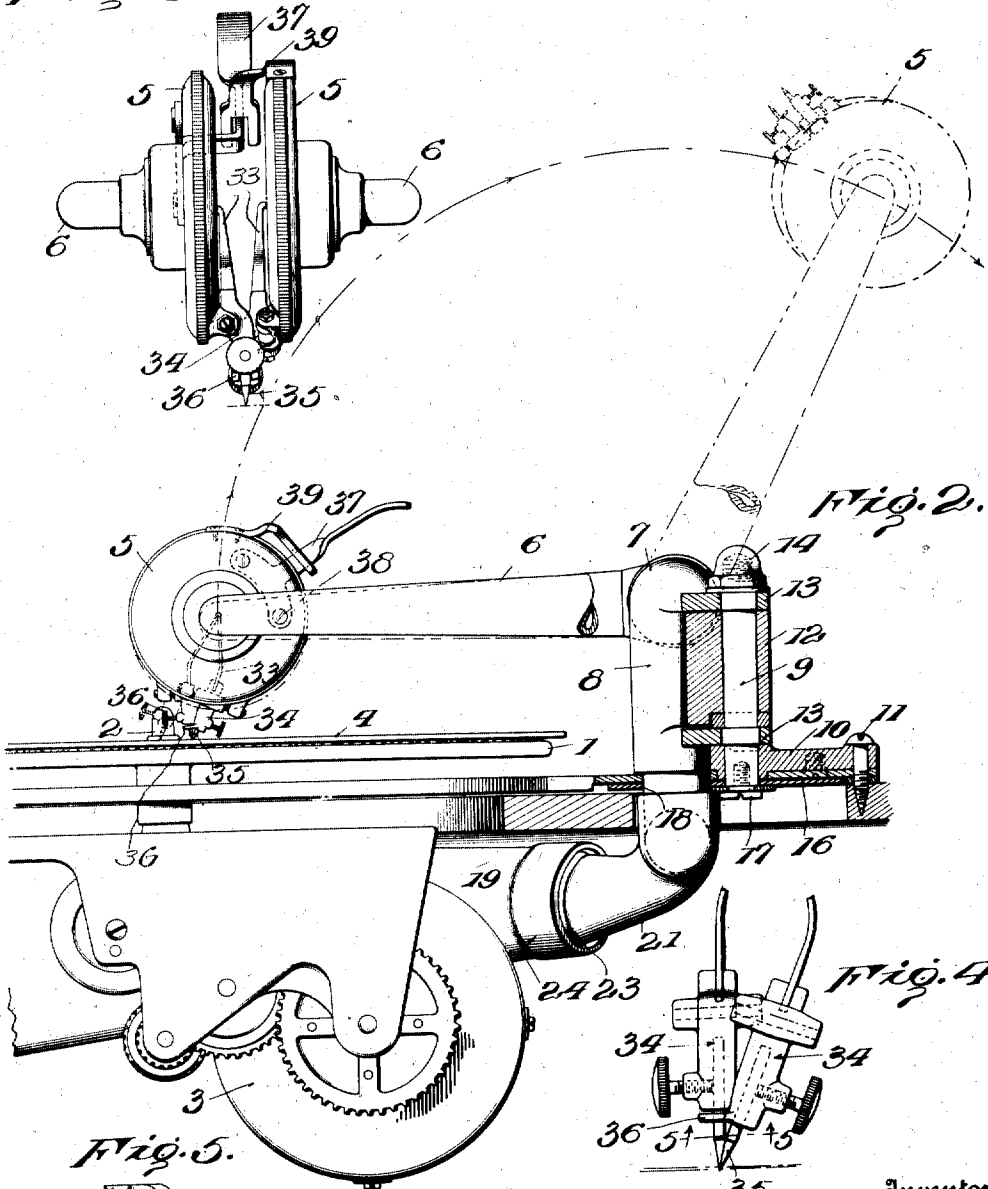


Fig. 2.

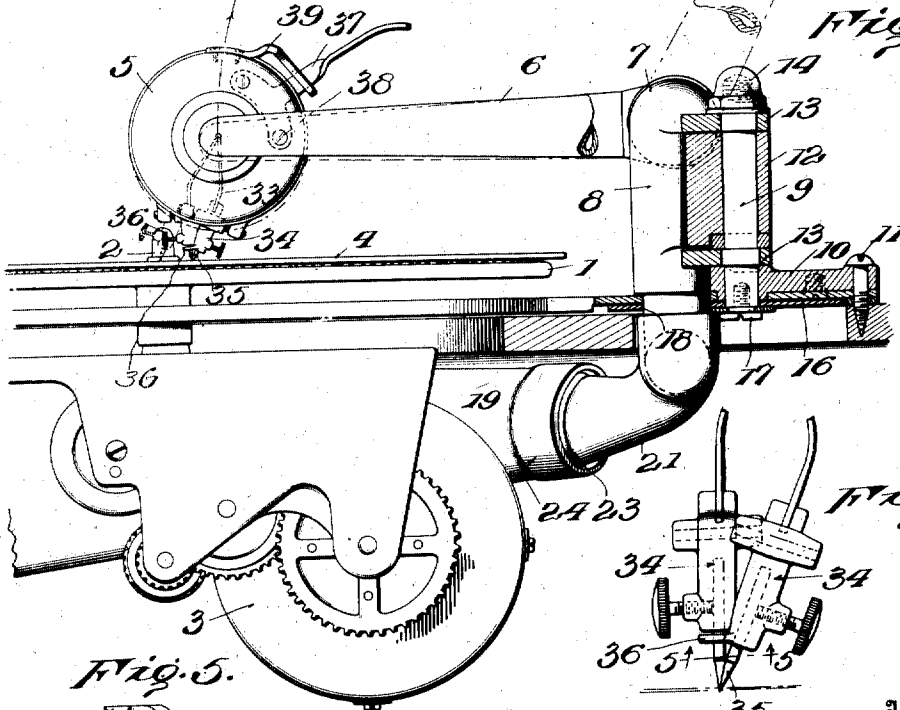


Fig. 4.

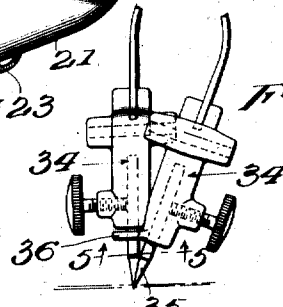
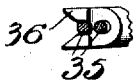


Fig. 5.



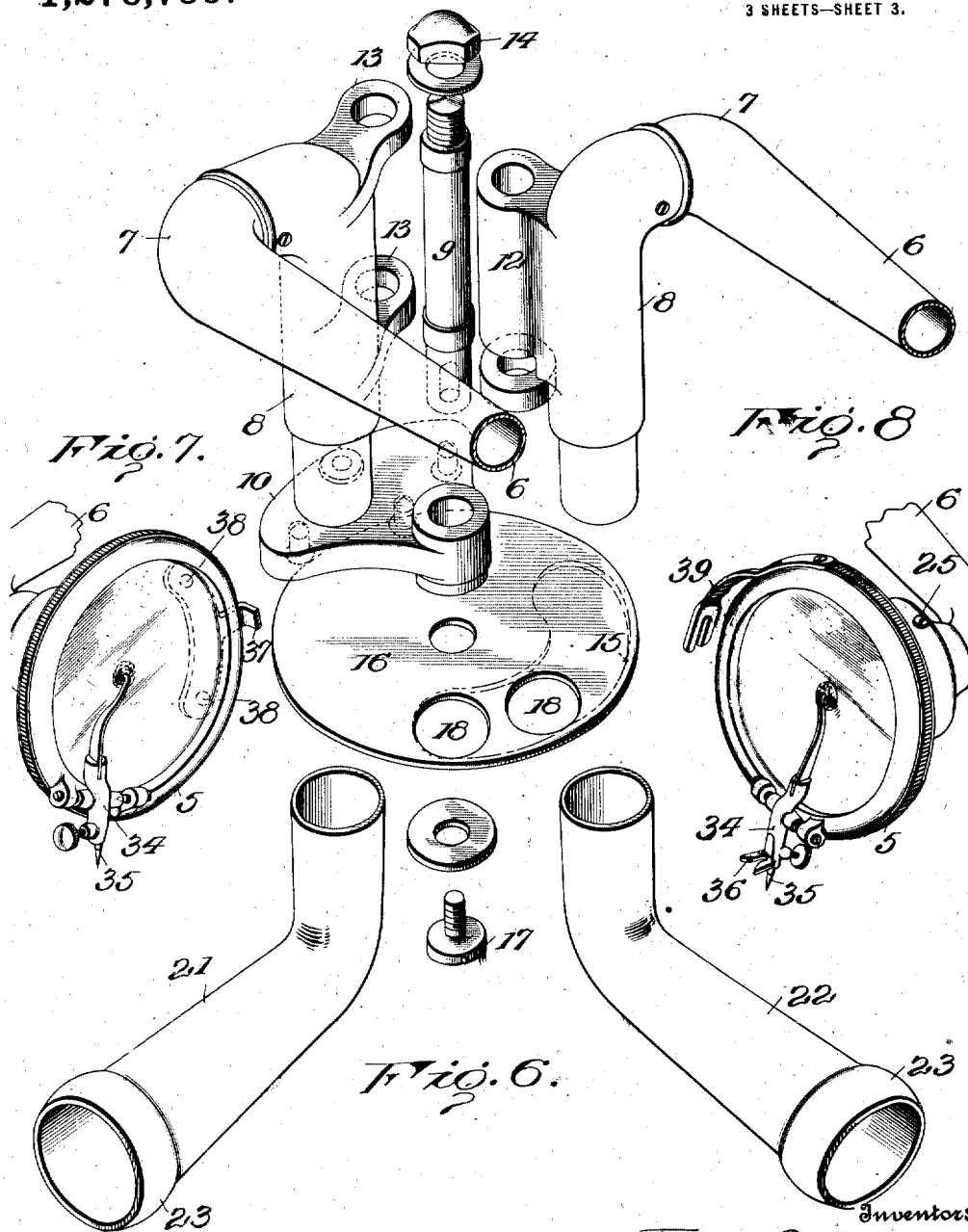
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UNITED STATES PATENT OFFICE.

FRANK C. HINCKLEY AND JOHN GRAHAM, OF BRIDGEPORT, CONNECTICUT, ASSIGNORS
TO AMERICAN GRAPHOPHONE COMPANY, OF BRIDGEPORT, CONNECTICUT, A CORPO-
RATION OF WEST VIRGINIA.

DUPLEX GRAPHOPHONE.

1,276,759.

Specification of Letters Patent.

Patented Aug. 27, 1918.

Application filed January 9, 1917. Serial No. 141,424.

To all whom it may concern:

Be it known that we, FRANK C. HINCKLEY and JOHN GRAHAM, citizens of the United States of America, and residents of Bridgeport, Connecticut, have invented a new and useful Improvement in Duplex Graphophones, which invention is fully set forth in the following specification.

This invention relates to talking machines, and more particularly to machines of this type employing a plurality of sound-boxes having styli which simultaneously and consecutively track the same record groove.

In machines of the type employing a plurality of styli simultaneously and consecutively tracking the record groove, it is essential that said styli be accurately positioned in consecutive portions of the same convolution of the record groove, else, if they engage in adjacent grooves, there will be a discordant confusion of sound. Furthermore, if one of the styli happens to strike the surface of the tablet between adjacent record grooves in the act of positioning the same, there is grave likelihood that such stylus will be thrown by centrifugal force into the next outer groove with the corresponding production of discord and confusion. On the other hand, it has been found, by experience, that the most desirable results are to be obtained in a machine of this type by mounting the sound-boxes for independent movement both as respects their traverse of the record-tablet and their movement in planes at right-angles to the tablet because of the irregularities occurring in its surface. Such independent mounting of the sound-boxes, however, necessitates the individual positioning of their respective styli in the record groove.

In machines of this type heretofore constructed, it has been exceedingly difficult, if not practically impossible, to correctly position the styli of the several sound-boxes in consecutive portions of the record groove to initiate the reproduction, owing to the difficulty in distinguishing one convolution of the record groove from another with the naked eye. To obviate this difficulty, it has been proposed to provide the sound-boxes with a device for alining the styli in a single plane preparatory to positioning the same in the record groove. Such devices, however, fail to make allowance for the con-

tinuous change, as the styli traverse the record, in the length of arc embraced by the paths of the styli as they cross successive convolutions of the groove and in the angle of any plane common to said styli to the chords embraced by said styli as they cross successive convolutions, whereby, although the styli may be spaced a proper distance within their plane for location in an outer convolution, such alining devices do not space the styli the proper distance for location in the inner convolutions.

It is an object of this invention to provide a talking machine of the type employing a plurality of sound-boxes mounted for simultaneous and consecutive tracking of the record groove by their styli with means whereby the styli may be positioned in consecutive portions of the record groove at any desired point in the length thereof, without any special care or close observation on the part of the operator.

A further object of this invention is to provide a machine of the type characterized with means enabling the stylus of one of the sound-boxes to be moved in a plane extending longitudinally thereof into alinement with the stylus of another of the sound-boxes, the points of said styli being brought preferably into substantial coincidence preparatory to their being positioned in the record groove, to obviate all likelihood of the styli being positioned in contiguous convolutions of the record groove rather than in consecutive portions of the same convolution.

A still further object of this invention is to provide a talking machine employing a plurality of sound-boxes having styli designed to simultaneously and consecutively track the same record groove with mounting means for said sound-boxes enabling the latter to have independent movement about common horizontal and vertical axes.

Another object relates to the provision of an improved connection between the tone-arms of a talking machine of the type specified and the sound-amplifying means thereof. Other objects will appear as the description proceeds.

Stated broadly, the invention comprises, in combination with a record support, a plurality of sound-boxes each provided with a stylus, means, preferably independent tone-

arms, mounting said sound-boxes in cooperative relation with a record on said support, to enable said styli to simultaneously and consecutively track the record groove, and means to position said styli in consecutive portions of the record groove at any desired point in the length thereof. One of said sound-boxes is preferably mounted for movement with respect to its mounting means to enable its stylus to be moved in a plane extending longitudinally thereof into alinement with the stylus of the other sound-box, such movement preferably bringing the points of said styli into substantial coincidence. To secure such proper alinement of the styli, one of said sound-boxes is preferably provided with cam means coacting with means upon the other of said sound-boxes for guiding said styli into their proper relationship. Furthermore, the sound-boxes are preferably mounted for independent movement about a common axis to permit their traverse of the record-tablet, and about a common axis to permit their movement in planes at angles to said record-tablet. Additionally, when tone-arms are employed for mounting said sound-boxes, said tone-arms are preferably connected with separate sound-amplifying means by elbows swivelly connected with the tone-arms and having rotatable and slidable connection with said amplifying means.

The invention is capable of receiving a variety of mechanical expression, one of which is shown on the accompanying drawings, but it is to be expressly understood that the drawings are for purposes of illustration only, and are not to be construed as a definition of the limits of the invention, reference being had to the appended claims for that purpose. In said drawings,

Figure 1 is a plan view of a talking machine embodying the present invention, parts being shown in section;

Fig. 2 is a side elevation of the machine shown in Fig. 1, parts being shown in section;

Fig. 3 is an end elevation of the plurality of sound-boxes on an enlarged scale;

Fig. 4 is a side elevation of the styli and stylus carriers when the former are moved into engagement, being on a further enlarged scale;

Fig. 5 is a section on the line 5—5 of Fig. 4;

Fig. 6 is a perspective view of the mounting for the tone-arms and of the connections between said arms and the sound-amplifying means, with the parts shown in detached relationship; and

Figs. 7 and 8 are perspective views of the respective sound-boxes.

Referring in detail to said drawings, wherein the same reference numerals indicate corresponding parts in the several fig-

ures, 1 illustrates the usual record support, 2 its spindle, 3 any suitable motor and transmission gearing for rotating said record support, and 4 any conventional sound record mounted upon said record support.

In accordance with the present invention, a plurality of sound-boxes are mounted in cooperative relation with the record 4 to enable their styli to simultaneously and consecutively track the record groove. As shown, two sound-boxes 5 are mounted upon hollow tone-arms 6, said tone-arms each being provided with a right-angled bend at 7 rotatably connected with a downwardly directed elbow 8. While the invention is illustrated as applied to a machine wherein the sound amplifying means is disposed beneath the plane of the record tablet, it is to be expressly understood that by obvious variation the invention is capable of application to a machine wherein the amplifying means is disposed above the plane of the record tablet. Said tone-arms 6 are mounted for independent rotatable movement in traversing the record tablet and in planes at angles thereto, such movements, however, taking place about common axes. As shown, the right-angled bends 7 have their inner ends in alinement whereby they have a common axis of movement in planes at angles to the record tablet. Said tone-arms also, by preference, have a common axis of movement in planes parallel to the surface of the record tablet, and to this end a stationary pivot post 9 is mounted by means of a bracket 10 on the motor board or a wall of the casing, any suitable means as screws 11 being employed to maintain the same in position. One of the elbows 8 is provided with an eccentric sleeve 12 mounted upon said pivot post 9, and the other of said elbows 8 is provided with a pair of apertured lugs 13 mounted upon said post 9 above and below the sleeve 12. Any suitable means, as a cap-nut 14, may be employed to maintain the lugs and sleeve in position upon the pivot post 9.

The upper wall of the casing, or the motor board, is provided with an arcuate slot 15 through which depend the lower ends of the elbows 8, said slot being of an extent sufficient to admit of the tone-arms traveling through a distance equal to the maximum extent of a sound record groove. To constitute a closure for that part of the slot not occupied by the depending portions of the elbows 8 in the course of their traverse of the record, a closure plate 16 is mounted in any suitable way to be moved by said depending ends. As shown, this closure plate 16 is pivotally mounted by pivot screw 17 upon the lower extremity of the pivot post 9, and the lower extremities of the elbows 8 pass loosely through apertures 18 provided in said plate.

Separate sound-amplifying means, as

horns 19 and 20, are provided for the separate tone-arms, and to constitute connections between the depending ends of the tone-arms and said sound-amplifying means, elbows 21 and 22 are swivelly connected to the depending ends of said tone-arms at one end and have rotatable and slidable connection with the sound-amplifying means at their opposite ends. As shown, each of said elbows 21 and 22 is provided with a spherical enlargement 23 snugly fitting within a socket 24 provided at the smaller end of each sound-amplifier. Each spherical enlargement 23 may slide longitudinally of its socket and also rotate about transverse axes. Inasmuch as one of said elbows has chiefly a reciprocating motion while the other has chiefly a rotative motion, one of said sockets may be made materially shorter than the other, as shown.

To provide for automatically bringing the styli of the sound-boxes 5 into proper alinement for disposition in the record groove, one of said sound-boxes is fixedly secured to the end of its tone-arm, as by a set-screw 25, while the other of said sound-boxes is mounted for a limited rotation on the end of its tone-arm. To this end, the latter sound-box is provided with a pin 26 working in a T-shaped slot 27 provided in the end of the corresponding tone-arm, and the sound-box neck 28 is further provided with a spider 29 from which extends a pin 30 passing through a boss 31 on the tone-arm and provided with a nut or screw-retained washer 32 upon its outer extremity. By adjustment of nut or washer 32, the freedom with which the sound-box may rotate upon the end of the tone-arm within the limits defined by slot 27 can be readily controlled.

Each of the sound-boxes is provided with the usual stylus bar 33 mounted thereon in any suitable manner and provided at its lower extremity with a stylus carrier 34 receiving a stylus 35. One or both of said stylus bars are preferably deflected as shown (Fig. 3) to enable the styli to track the same convolution of the record groove without the sound-boxes engaging each other. To guide the stylus on the sound-box movable with respect to its tone-arm into proper alinement with the stylus on the relatively stationary sound-box, one of said sound-boxes is provided with a cam coacting with means on the other sound-box. As shown, one of said stylus carriers 34 is provided with an extension 36 having a V-shaped slot adapted to receive the stylus secured in the other of the stylus carriers.

The movable sound-box is provided in any suitable manner with a handle 37, shown as attached to the rear face of the sound-box casing by screws 38. To provide a rough guide for the movement of the movable sound-box, and to maintain the two

sound-boxes with their styli in approximate alinement when not in engagement with the record-tablet, the stationary sound-box is preferably provided with a forked bracket 39 receiving the handle 37 between the bifurcations thereof.

To position the sound-boxes with their styli in consecutive portions of the same convolution of the record groove, handle 37 is grasped and its attached sound-box moved to the desired portion of the sound record groove. The act of elevating this relatively movable sound-box by the handle 37 will raise the other sound-box and also rotate the former upon the axis determined by the pin 30, during which rotation the stylus carried thereby will be moved into engagement with the stylus on the other sound-box, the V-shaped slot in the extension 36 acting as a cam to guide the moving stylus into exact alinement with the other stylus, preferably with the two stylus points in substantial coincidence as shown in Fig. 4. The sound-boxes may then be lowered to position the styli in the record groove. The engagement of the stylus on the relatively movable sound-box with the record groove will result in said stylus being moved by the tablet away from the stylus on the relatively stationary sound-box to the extent permitted by the coaction of pin 26 and slot 27, i. e., from the position shown in full lines in Fig. 2 to the position shown in dotted lines. The styli are now spaced a distance appropriate for the simultaneous and consecutive tracking of the record groove. During the reproduction of the record the two tone-arms will oscillate about the axis determined by the pivot post 9, the sound-boxes rising and falling owing to irregularities in the record surface about the axis determined by the rotatable engagement of the angular ends 7 with the elbows 8. As the tone-arms oscillate about the axis 9, they will carry with them the cover plate 16, preventing escape of sound-waves through the portions of the arcuate slot 15 not occupied by the depending ends of said tone-arms, and the elbows 22 and 23 will at one of their ends swivel about the depending ends of the tone-arms and at their opposite ends slide and rotate in the sockets provided at the smaller ends of the sound-amplifiers. When it is desired to replace the styli, the sound-boxes may be thrown to an inverted position, as shown in Fig. 2, about the axis determined by the rotative engagement of the laterally extending ends 7 and elbows 8, the sound-boxes being maintained in approximate alinement by the coaction of handle 37 with the forked bracket 39.

While the illustrated embodiment has been described with considerable particularity, it is to be expressly understood that the

invention is not to be restricted thereto, as other mechanical expressions thereof will readily suggest themselves to those skilled in the art, while certain features thereof are susceptible of use without other features thereof. Accordingly, reference is to be had to the appended claims as a definition of the limits of the invention.

What is claimed is:

1. In combination with a record support, a plurality of sound-boxes each provided with a stylus, means mounting said sound-boxes in coöperative relation with a record on said support to enable said styli to simultaneously and consecutively track the record groove, and means to position said styli in consecutive portions of the record groove at any desired point in the length thereof.
2. In combination with a record support, a plurality of sound-boxes each provided with a stylus, means mounting said sound-boxes in coöperative relation with a record on said support to enable said styli to simultaneously and consecutively track the record groove, and means to bring the points of said styli into substantial coincidence for positioning the same in the record groove.
3. In combination with a record support, a plurality of sound-boxes each provided with a stylus, means mounting said sound-boxes in coöperative relation with a record on said support to enable said styli to simultaneously and consecutively track the record groove, and means to move one of said styli into engagement with the other of said styli for positioning said styli in the record groove.
4. In combination with a record support, a plurality of sound-boxes each provided with a stylus, means mounting said sound-boxes in coöperative relation with a record on said support to enable said styli to simultaneously and consecutively track the record groove, and means to move one of said styli in a plane extending longitudinally thereof into alinement with the other of said styli for positioning said styli in the record groove.
5. In combination with a record support, a plurality of sound-boxes each provided with a stylus, means mounting said sound-boxes in coöperative relation with a record on said support to enable said styli to simultaneously and consecutively track the record groove, means for moving one of said styli in a plane extending longitudinally thereof, and cam means on one of said sound-boxes for guiding the point of said last-named stylus into alinement with the point of the stylus on the other sound-box.
6. In combination with a record support, a plurality of sound-boxes each provided with a stylus, means mounting said sound-boxes in coöperative relation with a record on said support to enable said styli to simultaneously and consecutively track the record groove, one of said boxes being mounted for movement with respect to its mounting means, and means for moving said last-named sound-box to engage its stylus with the stylus of the other sound-box.
7. In combination with a record support, a plurality of sound-boxes each provided with a stylus, means mounting said sound-boxes in coöperative relation with a record on said support to enable said styli to simultaneously and consecutively track the record groove, one of said boxes being mounted for rotation with respect to its mounting means, and means for rotating said last-named sound-box to aline the point of its stylus with the point of the stylus of the other sound-box.
8. In combination with a record support, a plurality of sound-boxes each provided with a stylus, means mounting said sound-boxes in coöperative relation with a record on said support to enable said styli to simultaneously and consecutively track the record groove, one of said sound-boxes being mounted for movement with respect to its mounting means, means for moving said last-named sound-box with respect to its mounting means, and means coacting therewith to aline its stylus with the stylus of the other sound-box.
9. In combination with a record support, a plurality of sound-boxes each provided with a stylus, means mounting said sound-boxes in coöperative relation with a record on said support to enable said styli to simultaneously and consecutively track the record groove, one of said sound-boxes being mounted for rotation with respect to its mounting means, means for rotating said last-named sound-box, and means coacting therewith to aline its stylus with the stylus of the other sound-box.
10. In combination with a record support, a plurality of sound-boxes each provided with a stylus, means mounting said sound-boxes in coöperative relation with a record on said support to enable said styli to simultaneously and consecutively track the record groove, one of said boxes being mounted for movement with respect to its mounting means, means for moving said last-named sound-box to engage its stylus with the stylus of the other sound-box, and cam means on one of said boxes coacting with means on the other of said boxes to bring the points of said styli into substantial coincidence.
11. In combination with a record support, a plurality of sound-boxes each provided with a stylus and its carrier, means mounting said sound-boxes in coöperative relation with a record on said support to enable said styli to simultaneously and consecutively track the record groove, one of said

boxes being mounted for movement with respect to its mounting means, means for moving said last-named sound-box to engage its stylus with the stylus of the other sound-box, and cam means on one of the stylus carriers coacting with the opposing stylus to bring the points of said styli into substantial coincidence.

12. In combination with a record support, a plurality of sound-boxes each provided with a stylus, means mounting said sound-boxes in coöperative relation with a record on said support to enable said styli to simultaneously and consecutively track the record groove, one of said sound-boxes being mounted for movement with respect to its mounting means, means for moving said last-named sound-box to move its stylus in a plane extending longitudinally thereof, and cam means on one of said sound-boxes for guiding said last-named stylus into alinement with the stylus of the other sound-box.

13. In combination with a record support, a plurality of sound-boxes each provided with a stylus, means mounting said sound-boxes in coöperative relation with a record on said support to enable said styli to simultaneously and consecutively track the record groove, means rotatably supporting one of said sound-boxes from its mounting means, means for rotating said last-named sound-box to aline its stylus with the stylus of the other sound-box, and coacting means on said sound-boxes to guide said rotatable box during its rotation.

14. In combination with a record support, a plurality of sound-boxes each provided with a stylus, means mounting said sound-boxes in coöperative relation with a record on said support to enable said styli to simultaneously and consecutively track the record groove, means rotatively supporting one of said sound-boxes from its mounting means, means for rotating said last-named sound-box, and cam means on one of said boxes for guiding the point of the stylus on the rotatable sound-box into alinement with the point of the stylus on the other sound-box.

15. In combination with a record support, a plurality of sound-boxes each provided with a stylus, means mounting said sound-boxes in coöperative relation with a record on said support to enable said styli to simultaneously and consecutively track the record groove, means rotatably supporting one of said sound-boxes from its mounting means, means limiting the extent of such rotation, and means for rotating said last-named sound-box to aline its stylus with the stylus of the other sound-box.

16. In combination with a record support, a plurality of sound-boxes each provided with a stylus, independent tone-arms mounting said sound-boxes in coöperative relation

with a record on said support to enable said styli to simultaneously and consecutively track the record groove, and means to position said styli in consecutive portions of the record groove at any desired point in the length thereof.

17. In combination with a record support, a plurality of sound-boxes each provided with a stylus, independent tone-arms mounting said sound-boxes in coöperative relation with a record on said support to enable said styli to simultaneously and consecutively track the record groove, and means to bring the points of said styli into substantial coincidence for positioning the same in the record groove.

18. In combination with a record support, a plurality of sound-boxes each provided with a stylus, independent tone-arms mounting said sound-boxes in coöperative relation with a record on said support to enable said styli to simultaneously and consecutively track the record groove, one of said boxes being mounted for movement with respect to its mounting means, and means to move said last-named sound-box with respect to its mounting means to aline its stylus with the stylus of the other sound-box.

19. In combination with a record support, a plurality of sound-boxes each provided with a stylus, independent tone-arms mounting said sound-boxes in coöperative relation with a record on said support to enable said styli to simultaneously and consecutively track the record groove, one of said boxes being mounted for movement with respect to its mounting means, means to move said last-named sound-box with respect to its mounting means, and means on one of said sound-boxes to guide the points of said styli into substantial coincidence.

20. In combination with a record support, a plurality of sound-boxes each provided with a stylus, independent tone-arms mounting said sound-boxes in coöperative relation with a record on said support to enable said styli to simultaneously and consecutively track the record groove, said tone-arms being bent vertically at their outer ends, sound-amplifying means, and elbows swivelly connected with the ends of said tone-arms and movably connected with said sound-amplifying means.

21. In combination with a record support, a plurality of sound-boxes each provided with a stylus, independent tone-arms mounting said sound-boxes in coöperative relation with a record on said support to enable said styli to simultaneously and consecutively track the record groove, said tone-arms being bent vertically at their outer ends, sound-amplifying means, and elbows swivelly connected with the ends of said tone-arms and operatively connected with

said sound-amplifying means, said elbows each having a rotatable and slidable connection with said amplifying means.

22. In combination with a record support, a plurality of sound-boxes each provided with a stylus, independent tone-arms mounting said sound-boxes in cooperative relation with a record on said support to enable said styli to simultaneously and consecutively track the record groove, said tone-arms being bent vertically at their outer ends, means providing an arcuate slot through which the ends of said tone-arms extend and within which they travel, means moving with said tone-arms and constituting a closure for said slot, sound-amplifying means, and elbows swivelly connected with the ends of said tone-arms and operatively connected with said sound-amplifying means.

23. In combination with a record support, a plurality of sound-boxes each provided with a stylus, independent tone-arms mounting said sound-boxes in cooperative relation with a record on said support to enable said styli to simultaneously and consecutively track the record groove, and means mounting said tone-arms for traverse of the record about a common eccentric axis.

24. In combination with a record support, a plurality of sound-boxes each provided with a stylus, independent tone-arms mounting said sound-boxes in cooperative relation with a record on said support to enable said styli to simultaneously and consecutively track the record groove, said tone-arms each comprising a section mounted for movement in planes at angles to the record surface about a common axis, and means mounting said tone-arms for traverse of the record.

25. In combination with a record support, a plurality of sound-boxes each provided with a stylus, independent tone-arms mounting said sound-boxes in cooperative relation with a record on said support to enable said styli to simultaneously and consecutively track the record groove, said tone-arms each comprising a section mounted for movement in planes at angles to the record surface about a common axis, and means mounting said tone-arms for traverse of the record about a common axis.

26. In combination with a record support,

a plurality of tone-arms provided with sound-reproducing means adapted to cooperate with a record on said support, a pivot post eccentric to said tone-arms, and means mounting said tone-arms on said pivot post for independent rotation.

27. In combination with a record support, a plurality of tone-arms provided with sound-reproducing means adapted to cooperate with a record on said support, said tone-arms being bent vertically at their outer ends, means providing an arcuate slot through which the ends of said tone-arms extend and in which they travel, means moving with said tone-arms and constituting a closure for said slot, and sound-amplifying means communicating with said tone-arms.

28. In combination with a record-support, a tone-arm provided with sound-reproducing means adapted to cooperate with a record on said support, said tone-arm being mounted for rotation about an eccentric axis for traverse of the record, stationary sound-amplifying means, and an elbow swivelly connected with said tone-arm and rotatably and slidably connected with said sound-amplifying means.

29. In combination with a record-support, a plurality of sound-boxes each provided with a stylus, means mounting said sound-boxes in cooperative relation with a record on said support to enable said styli to simultaneously and consecutively track the record groove, one of said sound-boxes being mounted for movement with respect to its mounting means, a handle on one of said sound-boxes, and a guide on the other of said sound-boxes embracing said handle.

30. In combination with a record support, a plurality of sound-boxes each provided with a stylus, means mounting said sound-boxes in cooperative relation with a record on said support to enable said styli to simultaneously and consecutively track the record groove, means for moving one of said sound-boxes with respect to its mounting means, and cooperating means on said sound-boxes for camming said styli into alignment.

In testimony whereof we have signed this specification.

FRANK C. HINCKLEY.
JOHN GRAHAM.