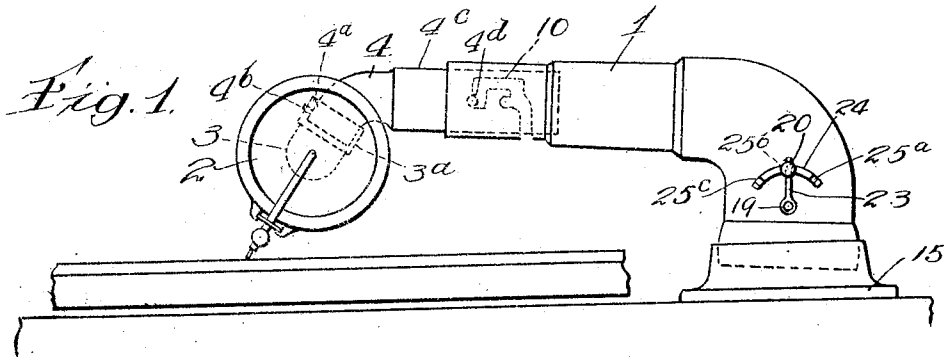
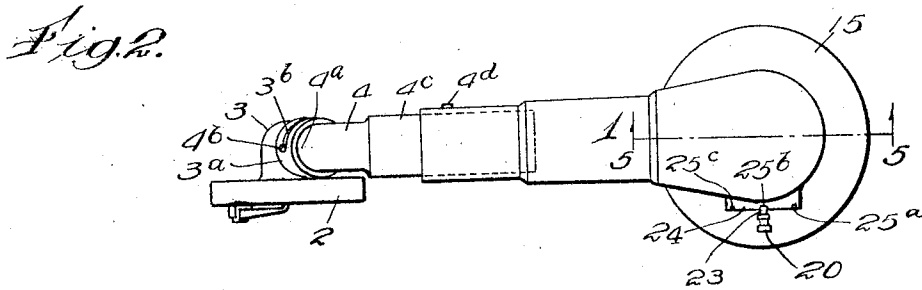
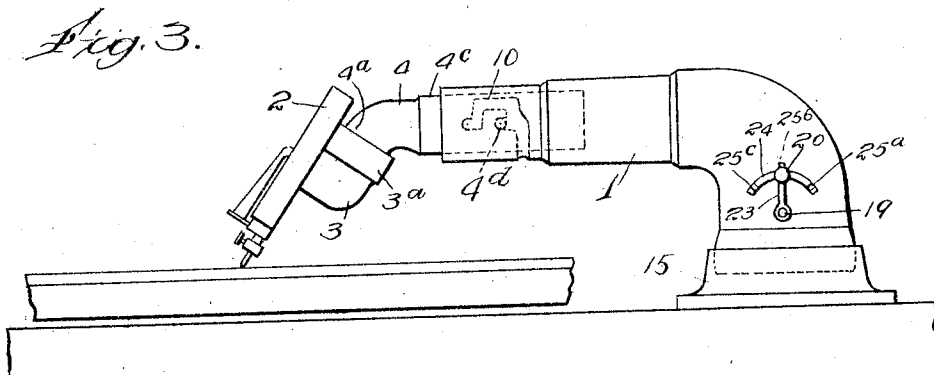


J. MATSON.
 PHONOGRAPH TONE ARM CONNECTION.
 APPLICATION FILED OCT. 14, 1916.

1,243,853.

Patented Oct. 23, 1917.
 2 SHEETS—SHEET 1.



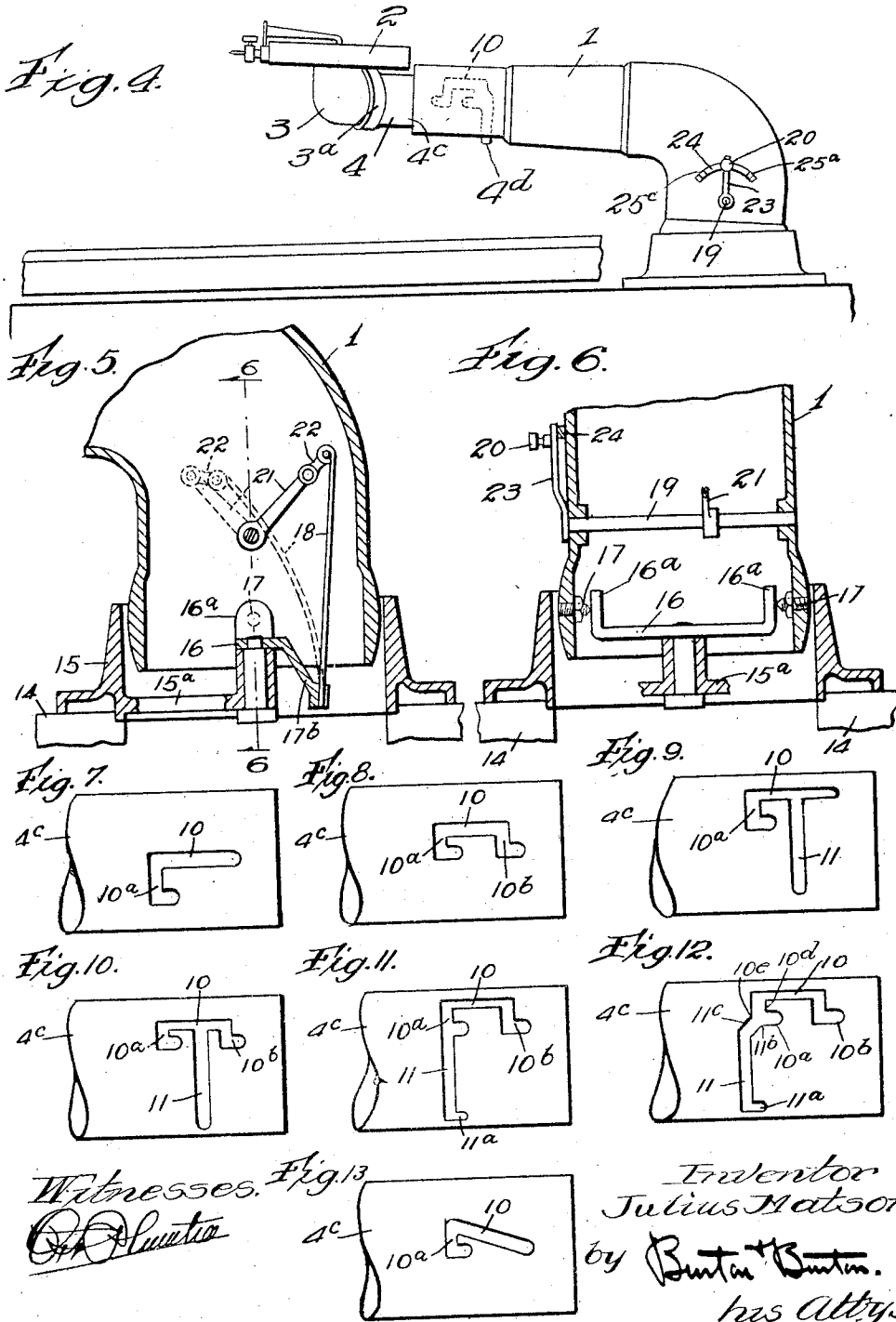
Witnesses.
[Signature]

Inventor,
 Julius Matson,
 by *Burton & Burton.*
 his Attys

J. MATSON:
 PHONOGRAPH TONE ARM CONNECTION.
 APPLICATION FILED OCT. 14, 1916.

1,243,853.

Patented Oct. 23, 1917.
 2 SHEETS—SHEET 2.



UNITED STATES PATENT OFFICE.

JULIUS MATSON, OF GLENWOOD, ILLINOIS, ASSIGNOR TO STEGER & SONS PIANO MANUFACTURING COMPANY, OF STEGER, ILLINOIS, A CORPORATION OF ILLINOIS.

PHONOGRAPH-TONE-ARM CONNECTION.

1,243,853.

Specification of Letters Patent.

Patented Oct. 23, 1917.

Application filed October 14, 1916. Serial No. 125,554.

To all whom it may concern:

Be it known that I, JULIUS MATSON, a citizen of the United States, residing at Glenwood, in the county of Cook and State of Illinois, have invented new and useful Improvements in Phonograph-Tone-Arm Connections, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

The purpose of this invention is to provide an improved construction of the tone arm of a phonograph or talking machine, particularly with respect to its connections for swinging over the record and toward and from the record and with respect to the mounting of the sound box thereon for various adjustments of the latter. It consists in the elements and features of construction shown and described as indicated in the claims.

In the drawings:—

Figure 1 is a side elevation of a portion of a phonograph comprising a tone arm and sound box, and embodying the features of this invention.

Fig. 2 is a top plan view of the structure shown in Fig. 1.

Fig. 3 is a side elevation of a portion of the tone arm and sound box having the sound box adjusted to a different position from that shown in Fig. 1.

Fig. 4 is a similar view showing the sound box in a third position, namely, for receiving the stylus.

Fig. 5 is a vertical section at the line, 5—5, on Fig. 2.

Fig. 6 is a section at the line, 6—6, on Fig. 5.

Figs. 7, 8, 9, 10, 11, 12, and 13 are detail views of a telescopic connection between the tone arm and the sound box elbows, showing a variety of forms of a slot in one of the telescopically-interfitting members for permitting the various adjustments of said joint and locking the members at the various positions in such adjustment.

In the structure shown in the drawings, 1 represents the tone arm, 2 the sound box. 3 is an elbow having one end connected to the sound box at the usual position, namely, at the center of the back of the sound box, and having the other arm extending upward obliquely in a plane parallel to the plane of the sound box,—that is, parallel to the plane

of the diaphragm therein. 4 is a second elbow whose two arms are at an obtuse angle, one arm being interfitted with the obliquely-extending arm of the elbow, 3, and the other arm being telescopically interfitted with the free end of the tone arm, 1. The obliquely-extending arms, 3^a, of the first elbow, and 4^a, of the second elbow are interfitted with each other for relative rotation about their common axis for the purpose of adjusting the sound box at will to either of two positions, to-wit: a position such as shown in Figs. 1 and 2, holding the stylus at the proper position for coöperating with the records of the type having laterally undulatory grooves, and the position shown in Fig. 3 for holding the stylus at the proper position for coöperating with the record having the "hill-and-valley" type of groove. For the purpose of this adjustment the two oblique arms of said elbows are connected by a pin, 3^b, in the oblique arm, 3, which is the inner one of the two, engaging a circumferentially-extending slot, 4^b, in the arm, 4^a, said slot extending for about ninety degrees around the arm in which it is formed so as to permit a substantially ninety-degree change of position of the sound box for the purpose indicated.

It will be observed that in the change of position of the sound box from that at which the stylus is positioned for coöperating with a record of the first mentioned type to the position for coöperation of the stylus with the record of the second mentioned type, by reason of the fact that the axis about which the sound box is turned in this adjustment is offset laterally from the vertical plane in which the stylus extends and is inclined, the point of the stylus is carried away from the vertical axis about which the tone arm swings in its movement over the record; that is to say, this change of position of the sound box increases the radius of the arcuate path of the stylus over the record. Inasmuch as the most perfect coöperation of the stylus over the record requires that the path of the stylus should be as nearly as possible radial with respect to the record, that is, that the chord of the arc of its path over the record should be substantially radial to the latter, it will be seen that this change of radius-length involved in the adjustment of the sound box from one position to the other, is liable to

operate disadvantageously for playing either with one type of record or the other, if the radius length for either one of them is correct in accordance with the above-stated requirement. In providing for this adjustment of the sound box to the two positions to accommodate the two types of record, it becomes desirable therefore to provide in some way for compensating for this change of radius length. This is effected by means of the telescopically interfitting connection between the arm, 4^c of the elbow, 4, and the tone arm, 1, said telescopically-interfitting connection being constructed for permitting relative longitudinal movement of the two interfitting parts,—that is, for the movement of the elbow member in and out along the length of the tone arm. For the purpose of this longitudinally-telescoping movement, the arm, 4^c, of the elbow, 4, is connected to the tone arm by means of the pin, 4^d, rooted in said arm, 4^c; and engaging a slot in the tone arm. This slot may have a variety of forms, several of which are illustrated, but in all cases it comprises a longitudinally-extending main part, 10, and an angle-shaped notch, 10^a, at one end of the part, 10. It will be observed that in either position of the sound box and stylus, the travel of the record exerts a pull the tendency of which would be to extend the tone arm at said telescopic connection; and it is important therefore that the connection between the two telescoped parts, or their connection together at that joint should be such that at either position this tendency to extend should be resisted. This requires that the pin, 4^d, should be in a position to be pulled against an end of the slot in the tone arm at both positions. This will be the condition normally at the position at which the pin is at the forward or outer end of the slot, but except for provision to the contrary, it would not be the condition when the pin is at the other end of the slot. In order to produce the condition stated at said other end of the slot,—that is, at the position at which the sound box is adjusted with the shorter radius, the main slot, 10, is provided with the angle-shaped notch, 10^a, at the rear or inner end, the return bend of the angle in that case constituting the end of the slot against which the pin is stopped when the joint is adjusted to a shorter radius. This form of slot, which is the simplest which is adequate for accomplishing the purpose stated, may be seen in Fig. 7. It will be observed that when the slot is in this form, there will be caused an angular change of position of the sound box in changing from one adjustment to the other due to the fact that the forwardly-extending end of the notch, 10^a, is laterally out of line with the forward end of the main portion, 10, of the slot. Except as this defect might be compensated by the relative rotary adjustment of the two members at the joint between the two elbows, it would tend to cause the stylus in one position or the other to be inclined laterally, which is undesirable. It is therefore preferable to employ an angle-shaped notch at the forward end of the main slot, 10, as well as at the rear end; and in the form of the slot shown in Fig. 8, an additional angle-shaped notch is shown at 10^b. It will be observed that for the purpose mentioned, namely, preventing longitudinal displacement of the parts by the drag upon the stylus, without defeating the function of the slot performed by the engagement of the pin with the sides of the slot,—that is, preventing rotary movement of the two parts,—it is necessary that the notches referred to should be of the angle form described so that at the operative position in each the pin may be engaged between two sides of a slot which shall prevent the relative rotary movement of the two parts. The angle-shaped slot, 10^b, added for the purpose of bringing the two stopped positions of the pin into alinement directly longitudinally of the tone arm, may be avoided by inclining the main slot, 10, as seen in Fig. 13, so that the forward end without the addition of the angle shaped notch is in such alinement with the end of the angle-shaped notch, 10^a.

The telescopic joint between the tone arm and the elbow, 4, is adapted to another purpose beside the extension of the parts, by means of the supplemental branch, 11, which is added to the slot above described, said supplemental branch extending circumferentially in the tone arm and terminating at a point about ninety degrees around from the main portion, 10, of the slot;—that is, so that the pin following this supplemental branch from the main slot can traverse substantially ninety degrees of the tone arm. This permits the sound box to be swung through ninety degrees about the axis of the tone arm from either of its operative positions to reach a position convenient for inserting and removing the stylus. In order to render the tone arm secure against the liability to swing back from this stylus-inserting position, so that the operator's hands may be entirely free for adjustment of the stylus and not be obliged to hold the sound box in position while doing so, the branch, 11, is terminated in a forwardly-extending notch, 11^a, in which the pin is engaged by pulling the sound box forward after having swung it around to the position indicated. This supplemental branch slot, 11, may extend off from the main slot at any convenient point in the length thereof, including the notches, 10^a and 10^b. In Fig. 9 it is shown extending off from a slot of the form

which is shown in Fig. 7 at about the middle point in the length of that slot. In Fig. 10 it is shown extending off at the same point from a slot of the form shown in Fig. 8, that is, one having both the angle-shaped notches, 10^a and 10^b. In Fig. 11 it is shown extending off from the circumferentially-extending member of the angle-shaped notch, 10^a. It is obviously immaterial which way the notches, 10^a and 10^b, are offset from the main slot, 10, but it is material that the supplemental branch slot, 11, should extend off from the main slot in the direction which will cause the sound box to be turned face-upward and not face-downward in using said branch slot. In all the forms shown the angle slots, 10^a and 10^b, are shown offset from the main slot, 10, at the side toward which it is necessary that the branch slot, 11, should extend for the reasons stated, but this is not essential. In Fig. 12 is shown a slight modification of the slot from the form shown in Fig. 11, consisting in extending the branch slot, 11, off obliquely from the angle of the angle-shaped notch, 10^a, instead of making it open directly behind the notch. The reason for this special form is that when it is employed the pin will encounter a stop at each point at which a change of direction should be made in adjusting the device in all the adjustments in which the pin has to pass to or from the notch, 10^a, or the supplemental branch slot, 11, and the operator is thus warned to make the change in the direction necessary for whatever adjustment he is making, and is therefore less liable to make the wrong adjustment inadvertently. It will be seen that the pin moving out from the main slot, 10, will encounter the angle or corner, 11^b, and the operator will then be warned either to turn into the forwardly extending member of the notch, 10^a, or to turn in the other direction to enter the branch, 11. Likewise, in moving out of the branch, 11, the pin will first encounter the shoulder, 11^c, and one will be warned to change the direction of movement to cause the pin to traverse this oblique shoulder, 11^c, which will bring the pin into collision with the angle or corner, 10^a, suggesting a change of direction of movement either to cause the pin to pass into the main slot or to pass into the forwardly-extending portion of the angle slot, according to which adjustment of the sound box it is intended to make. Likewise, in passing out of the forwardly-extending portion of the angle slot, 10^a, the pin will encounter the corner, 10^b, and one will thereby be warned either to move to the right into the main slot, or into the left into the oblique slot according to his purpose in the adjustment which he is making. The form of slot shown in Fig. 12 is therefore the form preferred for maximum efficiency and widest adaptation.

It is known that for the most effective and perfect reproduction of music, either vocal or instrumental, as well as for the most perfect reproduction of articulate sounds of the human voice, whether in song or speech, the proper adjustment of the weight or pressure of the stylus upon the record to the character of the record is essential, and that a poor reproduction results from either too great or too little weight or pressure of the stylus upon the record. The normal weight of the sound box and tone arm pivoted for swinging vertically toward and from the record, when the pivot for such swinging movement is substantially at the vertical line of the pivoting of said arm for swinging horizontally over the record, is usually in excess of the weight necessary for producing the maximum desirable pressure upon the record; and for the purpose of offsetting the necessary proportion of this weight, a counterpoising spring may be connected with the arm. In the structure shown in the drawing, the construction for pivoting the tone arm for both its swinging movements comprises a plate, 15, mounted upon the top of the table, 14, on which the record carrier is supported in a familiar manner not necessary to be shown or described, said plate forming the upper end of the vertical throat or downwardly-extending portion of the sound conduit not further illustrated, and having therefore an aperture corresponding in diameter to that throat, which aperture is bridged by a spider, 15^a, at the center of which there is pivoted for turning horizontally a yoke, 16, to whose up-turned ends, 16^a, the tone arm is pivoted by means of cone-pointed pivot screws, 17, 17, set in through the tone arm at diametrically opposite points for engaging said up-standing lugs of the yoke. The yoke has a short arm, 17^b, projecting off from the middle point of its length, to the end of which there is secured in any convenient manner the lower end of a flat spring or spring bar, 18, which extends up within the downwardly-extending elbow member of the tone arm. In the tone arm a little above its pivot to the yoke there is mounted a rock shaft, 19, which extends out through the tone arm at one side, provided with an operating means, as for example the knob, 20, for rocking it. Inside the tone arm the rock shaft has a lever arm, 21, extending up in the same general direction as the spring, 18, and connected to the latter by a short link, 22. Outside the tone arm the rock shaft has an index and locking finger, 23, which extends up alongside the downwardly-extending member of the elbow of the tone arm close alongside the latter in position to play over a notched segment, 24, which is formed or mounted rigidly upon the side of the tone arm. This index finger or lever arm has some elasticity

so that it is adapted to snap into the notches, 25^a, 25^b and 25^c, formed in the notched segment, and thereby lock the rock shaft at the position at which it may be rocked for tensioning the spring, 18, more or less according to the requirement for adapting it to compensate more or less of the weight of the tone arm so as to produce the proper amount of pressure of the stylus upon the record. In practice for various records on the market three degrees of pressure are found adequate and the segment is therefore provided with three notches only, though a greater number may be provided if intermediate adjustments are found desirable. The knob or handle, 20, is preferably at the end of the index and locking finger, 23, so that the operator can use it to spring the finger, 23, out of its locking engagement with the segment whose notches may therefore be made square shouldered for positive engagement of the locking finger.

I claim:—

1. In a phonograph a tubular tone arm mounted for swinging to carry the sound box over the record, in combination with such sound box and its sound conduit connections with the tone arm, said connections comprising an elbow member joining the sound box at one end and having the other end extending obliquely upward; a second elbow member having one arm telescopically interfitting with the tone arm for longitudinal movement, and the other arm at an obtuse angle to the first and interfitting with the oblique arm of the first mentioned elbow for relative rotary movement of said interfitting oblique arms about their common axis, the telescopically interfitting parts having one a pin and the other a slot engaged by the pin, said slot trending generally longitudinally of the tone arm and having both end portions pointing in the same longitudinal direction for stopping the pin against pull in that direction when it is at either end of the slot.

2. In a phonograph a tubular tone arm mounted for swinging to carry the sound box over the record, in combination with such sound box and its sound conduit connections with the tone arm, said connections comprising an elbow member joining the sound box at one end and having the other end extending obliquely upward; a second elbow member having one arm telescopically interfitting with the tone arm for longitudinal movement, and the other arm at an obtuse angle to the first and interfitting with the oblique arm of the first mentioned elbow for relative rotary movement of said interfitting oblique arms about their common axis, the telescopically interfitting parts having one a pin and the other a slot engaged by the pin, said slot having portions at the opposite ends extending longitudinally

dinally of the tone arm and having said ends directly alined longitudinally of the tone arm.

3. In a phonograph a tubular tone arm mounted for swinging to carry the sound box over the record, in combination with such sound box and its sound conduit connections with the tone arm, said connections comprising an elbow member joining the sound box at one end and having the other end extending obliquely upward; a second elbow member having one arm telescopically interfitting with the tone arm for longitudinal movement, and the other arm at an obtuse angle to the first and interfitting with the oblique arm of the first mentioned elbow for relative rotary movement of said interfitting oblique arms about their common axis, the telescopically interfitting parts having one a pin and the other a slot engaged by the pin, said slot comprising a main part extending longitudinally and a notch opening off laterally from said main part at one end thereof for entrance of the pin therinto and turning back toward the other end of the main slot.

4. In a phonograph a tubular tone arm mounted for swinging to carry the sound box over the record, in combination with such sound box and its sound conduit connections with the tone arm, said connections comprising an elbow member joining the sound box at one end and having the other end extending obliquely upward; a second elbow member having one arm telescopically interfitting with the tone arm for longitudinal movement, and the other arm at an obtuse angle to the first and interfitting with the oblique arm of the first mentioned elbow for relative rotary movement of said interfitting oblique arms about their common axis, the telescopically interfitting parts having one a pin and the other a slot engaged by the pin, said slot comprising a main part extending longitudinally and notches opening off laterally from said main part at each end thereof for entrance of the pin therinto, and trending at their terminal part in the same longitudinal direction, said notches terminating in alinement longitudinally of the tone arm.

5. In a phonograph a tubular tone arm mounted for swinging to carry the sound box over the record, in combination with such sound box and its sound conduit connections with the tone arm, said connections comprising an elbow member joining the sound box at one end and having the other end extending obliquely upward; a second elbow member having one arm telescopically interfitting with the tone arm for longitudinal movement, and the other arm at an obtuse angle to the first and interfitting with the oblique arm of the first mentioned elbow for relative rotary movement of said inter-

fitting oblique arms about their common axis, the telescopically interfitting parts having one a pin and the other a slot engaged by the pin, said slot comprising a main part extending longitudinally and a supplemental portion extending from said main part circumferentially substantially ninety degrees and terminating with the notch extending off from said circumferential part longitudinally.

6. In a phonograph a tubular tone arm mounted for swinging to carry the sound box over the record, in combination with such sound box and its sound conduit connections with the tone arm, said connections comprising an elbow member joining the sound box at one end and having the other end extending obliquely upward; a second elbow member having one arm telescopically interfitting with the tone arm for longitudinal movement, and the other arm at an obtuse angle to the first and interfitting with the oblique arm of the first mentioned elbow for relative rotary movement of said interfitting oblique arms about their common axis, the telescopically interfitting parts having one a pin and the other a slot engaged by the pin, said slot comprising a main part extending longitudinally, notches opening off laterally from said main part and terminating in a longitudinal direction the supplemental portion extending circumferentially substantially ninety degrees and terminating in a longitudinally-extending notch.

7. In a phonograph a tubular tone arm mounted for swinging to carry the sound box over the record, in combination with such sound box and its sound conduit connections with the tone arm, said connections comprising an elbow member joining the sound box at one end and having the other end extending obliquely upward; a second elbow member having one arm telescopically interfitting with the tone arm for longitudinal movement, and the other arm at an obtuse angle to the first and interfitting with the oblique arm of the first mentioned elbow for relative rotary movement of said interfitting oblique arms about their common axis, the telescopically interfitting parts having one a pin and the other a slot engaged by the pin, said slot comprising a main part extending longitudinally, a notch leading off laterally from said main part and terminating longitudinally, and a supplemental portion leading off from said notch and extending circumferentially to a point approximately ninety degrees around from the main portion and terminating with a notch extending longitudinally.

8. In a phonograph a tubular tone arm mounted for swinging to carry the sound box over the record, in combination with such sound box and its sound conduit connections with the tone arm, said connections comprising an elbow member joining the sound box at one end and having the other end extending obliquely upward; a second elbow member having one arm telescopically interfitting with the tone arm for longitudinal movement, and the other arm at an obtuse angle to the first and interfitting with the oblique arm of the first mentioned elbow for relative rotary movement of said interfitting oblique arms about their common axis, the telescopically interfitting parts having one a pin and the other a slot engaged by the pin, said slot comprising a main part extending longitudinally, a notch leading laterally from said main part and then terminating longitudinally and a supplemental portion leading off from said notch obliquely therefrom, for a short distance and then extending circumferentially to a point approximately ninety degrees around from the main portion and terminating with the notch extending longitudinally.

9. In a phonograph a tubular tone arm mounted for swinging to carry the sound box over the record, in combination with such sound box and its sound conduit connections with the tone arm, said connections comprising joints by which the sound box may be adjusted to two positions for cooperating with different types of record, said joints comprising a telescopic joint between the tone arm and an adjacent member of the conduit at which said adjacent member is adapted to receive both longitudinal and rotary movement with respect to the tone arm, the telescopically-interfitting parts at such joint having one a pin and the other a slot engaged with the pin, the slot having longitudinally-extending and circumferentially-extending portions, and having terminals in which respectively the pin stands for holding the sound box in two playing positions and out of playing position, said slot having changes of direction producing stop shoulders for impeding the continuance of movement of the pin in the direction for colliding with such stop shoulders at the several points at which the direction of movement is to be changed from rotary to longitudinal or the reverse for reaching the desired terminal.

In testimony whereof, I have hereunto set my hand at Steger, Ill., this 7th day of October, 1916.

JULIUS MATSON.