

April 9, 1929.

T. A. EDISON

1,708,692

PHONOGRAPH

Filed Feb. 13, 1926

2 Sheets-Sheet 1

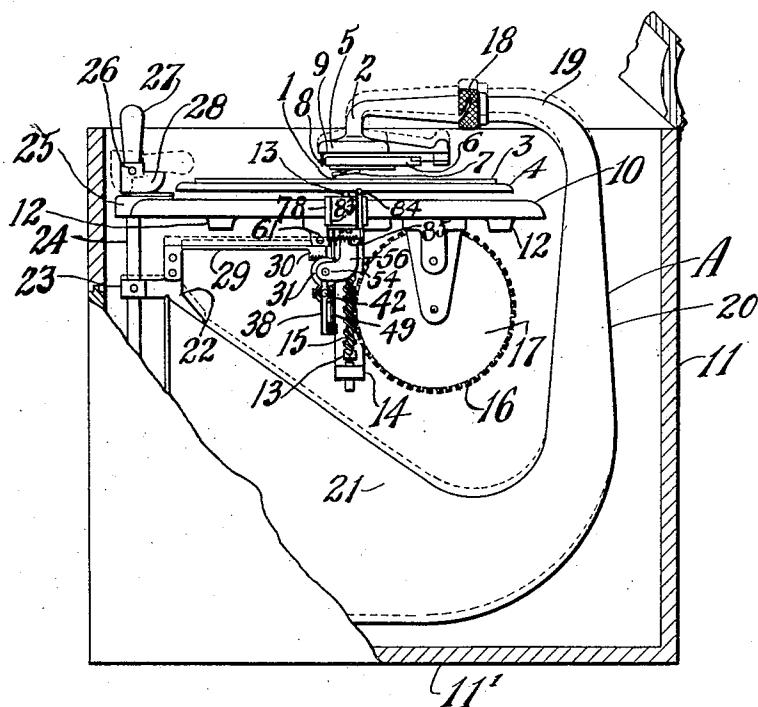


Fig. 1

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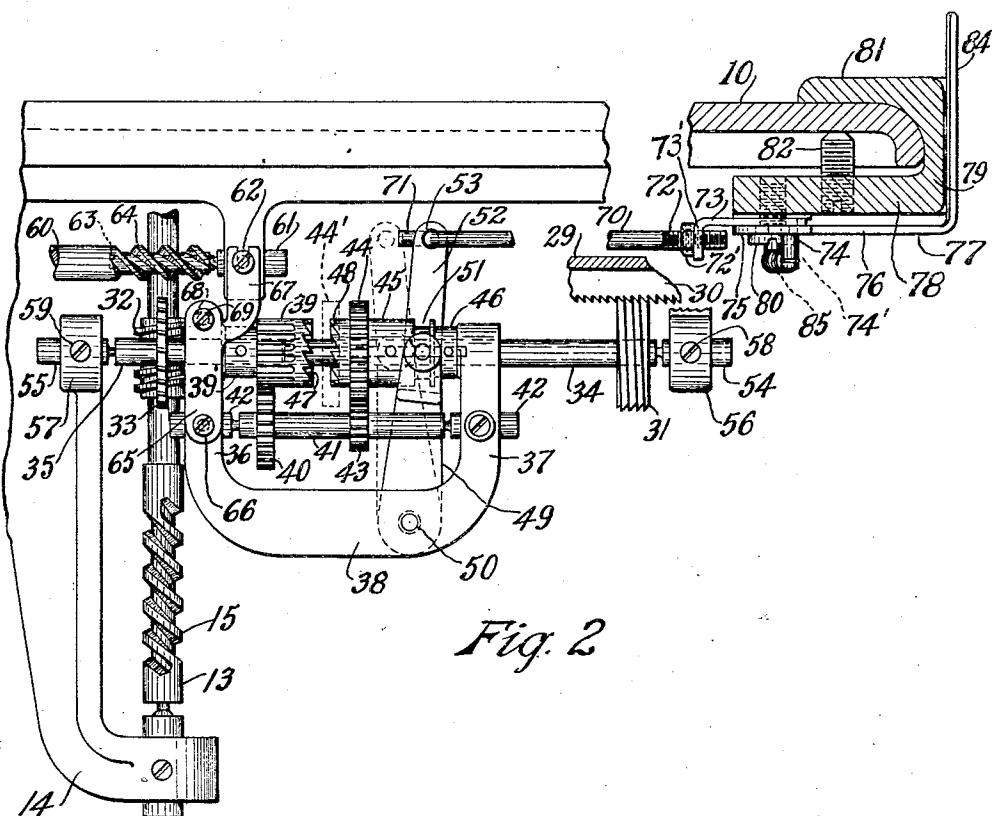


Fig. 2

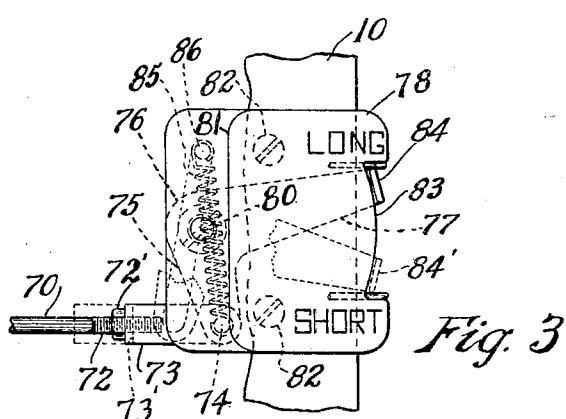


Fig. 3

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PHONOGRAPH.

Application filed February 13, 1926. Serial No. 88,049.

My invention relates to phonographs, and more particularly though not exclusively, to disc phonographs, wherein means are provided for automatically moving or feeding the reproducer across the record support or turntable at a rate in conformity with the pitch of the threads of the record being reproduced or operated upon.

The principal object of my invention is to provide a phonograph of the character described with an improved and simple arrangement and construction of the means for automatically feeding or moving the sound box or reproducer across the record support, whereby for a given speed at which the said support is rotated, the sound box may be fed across the support at either of two rates of speed, one of which, for example, may be suitable for operating upon a record having 150 threads per inch and the other for operating upon a record having 450 threads per inch.

Another object of my invention is to provide a compact and simple device which may be made in the form of an attachment capable of being readily substituted for parts of the feeding mechanism with which disc phonographs of the type referred to above have heretofore been generally equipped, to convert said feeding mechanism into a change-speed feeding mechanism such as described.

Other objects and features of my invention will be hereinafter more fully described and claimed.

In order that my invention may be more clearly understood, attention is directed to the drawings accompanying and forming a part of this specification, and in which:

Fig. 1 is a view in side elevation, with the cabinet partly broken away, of a disc phonograph equipped with a preferred form of my invention;

Fig. 2 is an enlarged detailed view in front elevation, partly in section, of the phonograph shown in Fig. 1, showing the construction of the change-speed automatic feed mechanism and the manner in which the same is applied to the phonograph; and

Fig. 3 is a plan view of the means for controlling the change-speed feed mechanism and the arrangement for securing such means to the top-plate or other part of the frame of the phonograph mechanism.

Referring to the drawing, and especially

to Fig. 1, the stylus 1 of the reproducer 2 is adapted to track a record 3 carried by the turntable or record support 4. The reproducer shown is of a well-known type employed for playing hill and dale records and comprises a sound box 5 in which the diaphragm (not shown) is mounted, a floating weight 6 supported from the sound box for up and down and lateral movements with respect thereto, and a lever 7 pivotally mounted on the floating weight 6 carrying the stylus 1 at one end thereof and connected at its other end to the diaphragm. The floating weight 6 is provided at its forward end with the usual limit pin 8 extending within the limit loop 9 depending from the sound box. Reference character 10 designates the bed or top-plate of the frame of the phonograph mechanism, said top-plate being mounted on brackets 12 secured to the side walls of the cabinet 11. The turntable 4 is mounted on the upper end of a rotating spindle 13 which extends through the top plate 10 and is supported at its lower end in a bracket 14 depending from the top-plate 10, this spindle being provided with a worm 15 whereby it may be driven by a gear 16 which engages said worm and is secured to the rotating spring-barrel 17 forming a part of the spring motor. The reproducer 2 is supported by the horn or sound amplifier A, the neck of the reproducer extending rearwardly from the sound box and being connected to the small end of the horn by any suitable connection 18, which may comprise a sleeve-like member rotatably mounted on the amplifier and connected to the neck of the reproducer by a bayonet-joint, as shown. The amplifier or horn extends from the connection 18 rearwardly, as shown at 19, then downwardly past the record support and motor, as shown at 20, and terminates in a forwardly directed exit portion 21.

The horn or amplifier A and the reproducer 2 carried thereby are supported for pivotal movement about a vertical axis so that the sound box may be moved to traverse a record carried by the turntable 4, and for rectilinear vertical movement so that the reproducing stylus may be moved to and from operative relation with respect to the record, as follows: Secured to the horn at the top of the exit end thereof is a bracket 22, a similar bracket, (not shown) being secured to the exit end of the horn at the bottom thereof.

Each of the said brackets is provided with a collar, only one of which is shown at 23, these collars being provided with vertically aligned openings therethrough, in which is disposed a cylindrical rod 24. The rod 24 is suitably secured to the said collars and is mounted for pivotal and vertical movements in two spaced bearings, one of these bearings being provided in the top plate 10, as shown at 25, 10 and the other bearing (not shown) being carried by the bottom wall 11 of the cabinet 11. The rod 24 extends through the bearing 25 a short distance above the top-plate 10 and has pivotally secured to the upper end thereof at 26, a member provided with a handle 27 at one side and with a cam 28 at the other side of said pivot. The cam 28 is adapted to co-act with the upper flat surface of the portion of the top plate 10 in which the bearing 25 is provided, when the handle 27 is moved to the horizontal dotted-line position shown in Fig. 1, to lift the rod 24 and thereby raise the horn A and the reproducer 2 to inoperative position as indicated in dotted lines. When the handle 27 is moved from such horizontal position to a vertical position, the weight of the horn and the parts carried thereby cause the rod 24 to move downwardly in its bearings and return the horn and the parts connected thereto to their operative positions, as shown in full lines. It will be apparent that the horn A and the reproducer 2 are thus mounted for swinging movement about the axis of the vertical rod 24 and that they are also mounted for rectilinear vertical movement in the direction of said axis so as to control the movement of the reproducer to and from operative position with respect to a record carried by the turntable 4.

40 The feeding means employed for causing the reproducer to traverse the record during the operation of the phonograph preferably comprises an arm 29 secured at one end to the bracket 22 and extending rearwardly therefrom, the rear end of said arm being provided with a sector having a downwardly extending toothed portion or rack 30 curved on the arc of a circle coaxial with the rod 24. The rack 30 will therefore partake of the movements of the horn A, and the arrangement is such that when the horn and reproducer are in their lowered operative positions, the rack 30 will engage a worm gear 31 driven from the spindle 13 to thereby effect swinging movement of the horn about the axis of rod 24 and movement of the reproducer 2 transversely of the record 3, and when the horn and reproducer are raised, by movement of the handle 27 to a horizontal position, the rack 30 will also be raised from engagement with the worm gear 31.

50 The worm gear 31 is arranged to be driven from the spindle 13 by means comprising a worm 32 provided on the spindle just above the worm 15, a worm wheel 33 engaging the

worm 32, and suitable change-speed gearing between the worm wheel 33 and the worm gear 31, whereby for a given or predetermined and substantially constant speed of the spindle 13 and turntable 4 the worm gear 31 may be driven at either of one of two speeds, preferably bearing a ratio of one to three and preferably respectively adapted to cause the reproducer 2 to traverse the turntable 4 at speeds proper to operate on records having the usual number of grooves to the inch, namely 150 grooves to the inch, and on records having 450 record grooves per inch. The worm gear 31 is secured to a shaft 34, and the worm wheel 33 is secured to a similar shaft 35, these shafts being disposed in alignment and being respectively rotatably mounted intermediate their ends, in bearings provided at the ends of the legs 36 and 37 of a U-shaped bracket 38. The worm gear 31 and the worm wheel 33 are respectively mounted on those portions of the shafts 34 and 35 which extend outwardly beyond the bracket 38. The shaft 35 extends from the leg 36 of bracket 38 a short distance toward the leg 37 and has secured to such extending portion a gear 39, this gear preferably being secured to the shaft 35 by having its hub 39' pinned to the shaft. The gear 39 meshes with a second and larger gear 40 secured to a counter-shaft 41 which is mounted on adjustable pivot pins 42, carried by the legs of the bracket 38, in a position parallel to the shafts 34 and 35. A gear 43, smaller in diameter than the gear 40, is also rigidly secured to the counter-shaft 41 and is adapted to engage and drive a larger gear 44 which is fixed to a sleeve 45 intermediate the ends of the latter, the sleeve 45 being splined to that portion of the shaft 34 extending from the leg 37 of bracket 38 towards the leg 36, so that it is slidable on the shaft but will rotate therewith. The shaft 34 extends through the sleeve 45 and into the axial opening in the gear 39 to a position in which the end thereof substantially abuts the adjacent end of the shaft 35; and as the gear 39 is fixed to the shaft 35 with its hub 39' closely adjacent the leg 36 of the bracket 38, and as the shaft 34 has a collar 46 pinned thereto and located in a position closely adjacent the leg 37 of said bracket, any substantial endwise movement of either of the shafts 34 and 35 with reference to the bracket 38 is prevented. The adjacent ends of the gear 39 and the sleeve 45 are respectively provided with toothed clutch sections 47 and 48, the teeth of which sections, when the sleeve 45 is moved on the shaft 34 from the position shown, to the left, will be brought into engagement to effect a direct drive connection between the shafts 35 and 34, under which conditions the worm gear 31 will be turned or rotated at the same speed at which the worm wheel 33 is rotated by the spindle 13, while the gears 40 and 43 and the

countershaft 41, though they will be rotated by reason of the engagement of gear 40 with gear 39, will merely idle as the gear 44 will then be out of engagement with the gear 43 and in the dotted-line position indicated at 44'. When the sleeve 45 is in the position shown in Fig. 2, however, the gear 44 will be in engagement with gear 43 and the clutch sections 47 and 48 will be disengaged; and under these conditions the shaft 34 and the worm gear 31 will be rotated from the shaft 35, through the reducing gearing consisting of the gears 39, 40, 43 and 44, at a reduced speed as compared with the rotation of the shaft 35 and the worm wheel 33, the speed reduction thus effected preferably being 3 to 1. The means for shifting sleeve 45 on shaft 34 to effect either a direct drive connection between the shafts 35 and 34 or a drive connection through the speed reducing gearing, as described, comprises an arm 49 pivotally mounted at one end on a horizontal pin 50 carried by the base of the U-shaped bracket 38, and provided at its other end with a yoke, the arms of this yoke carrying pins extending into an annular recess or groove 51 with which the sleeve 45 is provided. The rear arm of the said yoke is provided with an extension 52 having an opening 53 at its upper end whereby such arm is adapted for connection with the device, hereinafter described, for controlling said shifting means.

The bracket 38 and the parts mounted thereon are supported on the frame of the phonograph mechanism in proper position by pivot pins 54 and 55 adjustably mounted in brackets 56 and 57, carried by said frame, and respectively engaging recesses in the outer ends of the shafts 34 and 35. The pivot pins 54 and 55 are secured in proper position in the brackets 56 and 57 to support the shafts 34 and 35, the bracket 38 and all the parts carried by the latter, by means of set screws 58 and 59. Reference character 60 designates the shaft of the speed governor of the phonograph, this shaft being supported at its ends on pivot pins (one of which is shown at 61) adjustably secured in brackets provided on the frame of the phonograph mechanism. The pivot pins supporting the governor shaft 60 are preferably adjustably held in position by means of set screws, the set screw for holding the pivot pin 61 in position being shown at 62. The governor shaft 60 is driven from the spindle 13 by means comprising a worm wheel 63 mounted on the spindle and a worm 64 provided on the shaft and engaging said worm wheel.

In a well-known make of disc phonograph adapted for playing hill and dale records, the feed mechanism for moving the sound reproducer across the record, as compared with the feed mechanism described above, comprises but a single shaft, in place of the two shafts 34 and 35, carrying only a worm gear

and a worm wheel respectively corresponding to the worm gear 31 and the worm wheel 33; the said single shaft having a length equal to the combined length of the two shafts 34 and 35 and being supported at its ends on pivot pins, exactly corresponding in location with the pivot pins 54 and 55, so that the worm gear thereon is adapted to co-act with a feed rack carried by the horn and corresponding to the rack 30 and the worm wheel thereon engages a worm corresponding to the worm 32 and carried by the vertical driving spindle of the phonograph mechanism.

From the foregoing it will be apparent that the bracket 38 together with the shafts, gears and other elements carried thereby, comprise an attachment which may be readily substituted for the said single shaft and the worm gear and worm wheel carried thereby, of the feed mechanism in a disc phonograph of the construction described below, to convert such feed mechanism into a change-speed feed mechanism. Reference character 65 designates an arm which is pivotally mounted on the leg 36 of the bracket 38 as by means of a screw 66, this arm being provided with an extension 67 having a forked end which is engaged beneath the head of the set screw 62 for holding the pivot pin 61 in place, so as to prevent the bracket 38 and the countershaft 41, gears 40 and 43, and arm 49 carried by said bracket, from partaking of any appreciable rotary movement about the shafts 34 and 35 when the attachment is embodied in a phonograph mechanism as shown. The frames of the mechanisms of disc phonographs of the type referred to herein consist of castings which are subject to slight variations; and to compensate for any such variation so as to permit the fork at the end of the extension 67 of arm 65 to be engaged beneath the head of the set screw corresponding to the screw 62 illustrated, means are provided whereby the said arm 65 may be secured in various positions of adjustment about the screw 66, this means preferably comprising a slot 68 formed in the arm 65 and a screw 69 extending through said slot and threaded into the leg 36 of the bracket 38.

The device for controlling the means for shifting the change-speed gearing of the feeding mechanism is also preferably so constructed that it may be readily attached to a disc phonograph of the type referred to herein as usually constructed, and, indeed, may be considered as a part of the attachment which includes the bracket 38, and the shafts, gears and other elements carried by such bracket. This controlling device comprises a cylindrical rod 70 having one end portion 71 in the form of an off-set which is removably connected to the shifting lever 49 by engagement with the opening 53 in the latter (this connection being in the nature of a button-hole connection) and having its

other end portion 72 adjustably connected to a bell-crank control lever 76. The connection between the rod 70 and the lever 76 comprises a flat bar or link 73 having an angular end portion or extension 73' threaded on the end portion 72 of said rod; the said threaded end portion 72 of the rod carrying a lock-nut 72' for securing the member 73 in any position to which it may be adjusted on the rod. The link or member 73 is provided at the end thereof opposite the extension 73' with an opening which is removably engaged by the upper end of a pin 74 secured to and extending through the end portion of the arm 75 of the bell-crank lever. The bell-crank lever 76 is removably and pivotally mounted, at the junction of its arms 75 and 77, on one arm 78 of a channelled bracket 79 by means of a shouldered screw 80. The bracket 79 is mounted on the top-plate 10 of the frame of the phonograph mechanism, with its arm 78 disposed beneath said top-plate, and with the base and arm 81 thereof respectively engaging the rim and top surface of said top-plate; the bracket being removably and rigidly secured in this position by two screws 82 which are threaded through openings provided in the arm 78 and are turned up into tight engagement with the under surface of the top-plate 10. The outer side of the base of the bracket 79 is recessed as indicated at 83, the bottom of the recess being formed on an arc concentric with the screw 80 on which the bell-crank lever 76 is pivotally mounted; and the arm 77 of the bell-crank lever is provided with an upstanding end portion 84 disposed in the said recess 83 and extending above the bracket. The upstanding end portion 84 of the lever arm 77 comprises a convenient handle whereby the lever 76 may be actuated to effect, through link 73, rod 70 and lever 49, the shifting of sleeve 45 so as to provide either a direct drive connection between the shafts 35 and 34 or a drive between these shafts through the speed-reducing gearing as described above. The arrangement is such that when the sleeve 45 is in a position to effect the driving of the shaft 34 from the shaft 35 through the speed reducing gearing 39, 40, 43 and 44, the upstanding end portion 84 of the lever arm 77 will be in engagement with that end of the recess 83 in the bracket 79 designated "Long", and when the sleeve 45 is shifted to a position in which a direct drive connection is effected between said shafts by the engagement of the clutch sections 47 and 48, the said end portion 84 of the lever arm 77 will be in engagement with the end of the recess 83 designated "Short", as indicated in dotted lines at 84' in Fig. 3. A coiled spring 85 is connected at one end to the lower end portion 74' of the pin 74 and at its other end to a pin 86 which is secured to and extends downwardly from the arm 78

of bracket 79. The arrangement is such that in the movement of the bell-crank lever 76 between the limits defined by the ends of the recess 83 in the bracket 79, the spring 85 will be moved about the pin 86 from a position at one side of the pivot screw 81 to a position at the other side thereof, as clearly indicated in Fig. 3. Accordingly this spring not only assists in moving the bell-crank lever 76 in either direction after the lever arm 75 passes the dead center position, as determined by the pins 74 and 86 and the pivot screw 81, but also acts to yieldingly hold or lock the bell-crank lever at either end of its movement with the end portion 84 of the lever arm 77 in engagement with the respective end of the recess 83 and to yieldingly hold or lock the change-speed gearing of the feeding mechanism in the respective position of adjustment to which it has been shifted by the bell-crank lever. The link or member 73 connecting the rod 70 and the lever 76 may be readily adjusted to and locked in such position on the rod as to insure the proper adjustment of the change-speed gearing when the lever arm 77 is at either limit of its movement.

It is to be understood that the construction specifically shown and described herein is merely illustrative of my invention and that such construction is subject to various changes and modifications without departure from the spirit of the invention and the scope of the appended claims.

Having now described my invention, what I claim as new and desire to protect by Letters Patent is as follows:

1. In a phonograph, the combination of a record support, actuating means adapted to drive said support at a predetermined and substantially constant speed, a reproducer, a sound conveyer carrying said reproducer, and means operated from said actuating means for moving said conveyer to thereby feed said reproducer across said support, said feeding means including a change-speed device which is shiftable to effect the feeding of said reproducer across said support at any of a plurality of different speeds while said record support is driven by said actuating means at such predetermined and substantially constant speed, substantially as described.

2. In a phonograph, the combination of a record support, actuating means adapted to drive said support at a predetermined and substantially constant speed, a reproducer, a sound conveyer carrying said reproducer, and means operated from said actuating means for moving said conveyer to thereby feed said reproducer across said support, said feeding means including change-speed gearing which is shiftable to effect the feeding of said reproducer across said support at either of two speeds while said record support is

driven by said actuating means at such predetermined and substantially constant speed, substantially as described.

3. In a phonograph, the combination of a 5 turntable, motive means adapted to rotate said turntable at a predetermined and substantially constant speed, a reproducer, a sound conveyer supporting said reproducer from one end thereof and mounted for swinging 10 movement about a given axis, means actuated from said motive means for swinging said conveyer about said axis to thereby feed the reproducer transversely of said turntable, said feeding means including a change-speed device 15 shiftable to effect the feeding of said reproducer across said turntable at either of two speeds while said turntable is rotated by said motive means at such predetermined and substantially constant speed, substantially as described.

4. In a phonograph, the combination of a turntable, motive means adapted to rotate said turntable at a predetermined and substantially constant speed, a reproducer, a horn 25 supporting said reproducer from its small end and mounted for swinging movement about a vertical axis, means actuated from said motive means for swinging said horn about said axis to thereby feed the reproducer transversely of 30 said turntable, said feeding means including a change-speed device shiftable to effect the feeding of said reproducer across said turntable at either of two speeds while said turntable is rotated by said motive means at such 35 predetermined and substantially constant speed, substantially as described.

5. In a phonograph, the combination of a record support, means for actuating said support, a reproducer, a sound conveyer carrying 40 said reproducer, means operated from said actuating means for moving said conveyer to thereby feed said reproducer across said support, said feeding means including change-speed gearing which is shiftable to effect the 45 feeding of said reproducer across said support at either of two speeds for a given speed of actuation of said record support, and means for effecting and controlling the shifting of said change-speed gearing and for yieldingly locking 50 the same in either of the operative positions to which it is shifted, substantially as described.

6. In a phonograph, the combination of a record support, means for actuating said support, a reproducer, a sound conveyer carrying 55 said reproducer, means operated from said actuating means for moving said conveyer to thereby feed said reproducer across said support, said feeding means including 60 change-speed gearing which is shiftable to effect the feeding of said reproducer across said support at either of two speeds for a given speed of actuation of said record support, and means comprising a lever and a 65 spring coacting therewith for effecting and

controlling the shifting of said change-speed gearing and for yieldingly locking the same in either of the operative positions to which it is shifted, substantially as described.

7. In a phonograph, the combination of a 70 record support, means for actuating said support, a reproducer, a sound conveyer carrying said reproducer, means operated from said actuating means for moving said conveyer to thereby feed said reproducer across 75 said support, said feeding means including change-speed gearing which is shiftable to effect the feeding of said reproducer across said support at either of two speeds for a given speed of actuation of said record support, and means for effecting and controlling the shifting of said change-speed gearing comprising a manually operable member and an adjustable connection between said member and gearing, substantially as described. 85

8. In a phonograph, the combination of a rotatable record support, motive means for operating said record support, a reproducer, a movably mounted sound conveyer carrying said reproducer, and feeding mechanism for 90 moving said conveyer to thereby cause said reproducer to traverse said support, said feeding mechanism comprising a feeding member connected with said conveyer and change-speed connecting means between 95 said motive means and said feeding member comprising two shafts and a shiftable member movable to effect either a direct connection or a speed reducing connection between said shafts, substantially as described. 100

9. In a phonograph, the combination of a rotatable record support, motive means adapted to drive said record support at a predetermined and substantially constant speed, a reproducer, a movably mounted 105 sound conveyer carrying said reproducer, a member adapted to be driven by said motive means independently of said record support, a feeding element connected with said conveyer, and change-speed connecting means between 110 said member and element comprising a shaft carrying said driven member, a second shaft carrying a member adapted to actuate said feeding element, clutch elements respectively mounted on said shafts, and reduction gearing between said shafts, the clutch element on one of said shafts being 115 movable to a position in which it engages the other clutch element to form a direct drive connection between said shafts and in which said reduction gearing is rendered inoperative, and to another position in which it is out of engagement with the other clutch element and in which said reduction gearing is rendered operative, substantially as described. 125

10. An attachment for disc phonographs of the type provided with means for automatically feeding the sound box across the record support, comprising a bracket having 130

two shafts rotatably mounted thereon, one of said shafts having secured thereto a member adapted to be driven by the motive means of the phonograph and the other of said shafts having secured thereto a member adapted when such shaft is rotated to effect feeding movement of the sound box, and a change-speed device connecting said shafts and mounted on said bracket, said change-speed device being shiftable to effect the driving of one of said shafts from the other at either of two speeds, substantially as described.

11. An attachment for disc phonographs of the type provided with means for automatically feeding the sound box across the record support, comprising a bracket having two shafts rotatably mounted thereon and speed reducing gearing carried thereby

and connecting said shafts, said gearing including a member slidably but non-rotatably mounted on one of said shafts, said member being adapted when moved to one position on its shaft to render said gearing operative to drive one shaft from the other at a reduced speed and when moved to another position on its shaft to render said gearing inoperative and to effect a direct drive connection between said shafts, and means comprising a manually operable member and a spring connected therewith for controlling the movement of said slidably mounted member on its shaft and for yieldingly locking such slidably mounted member in either of its said positions, substantially as described.

This specification signed this 1st day of February, 1926.

THOS. A. EDISON.