July 16, 1940. E. F. ANDREWS 2,207,706

PHONOGRAPH

Filed Nov. 10, 1930 7 Sheets-Sheet 1

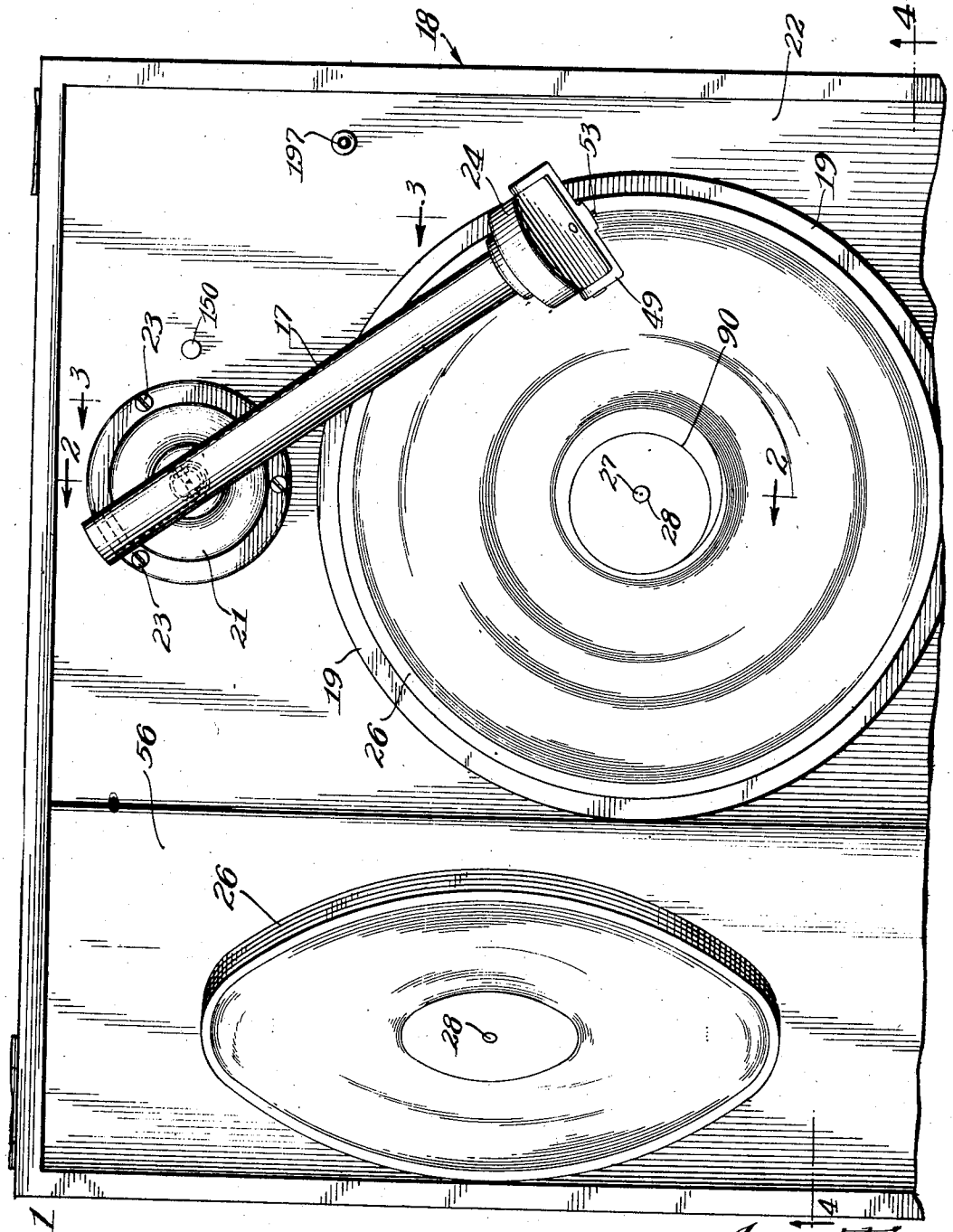


Fig. 1

Inventor
Edward F. Andrews.
By Williamson, Bradbury, McCall & Hinkle,
Attys.

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PHONOGRAPH

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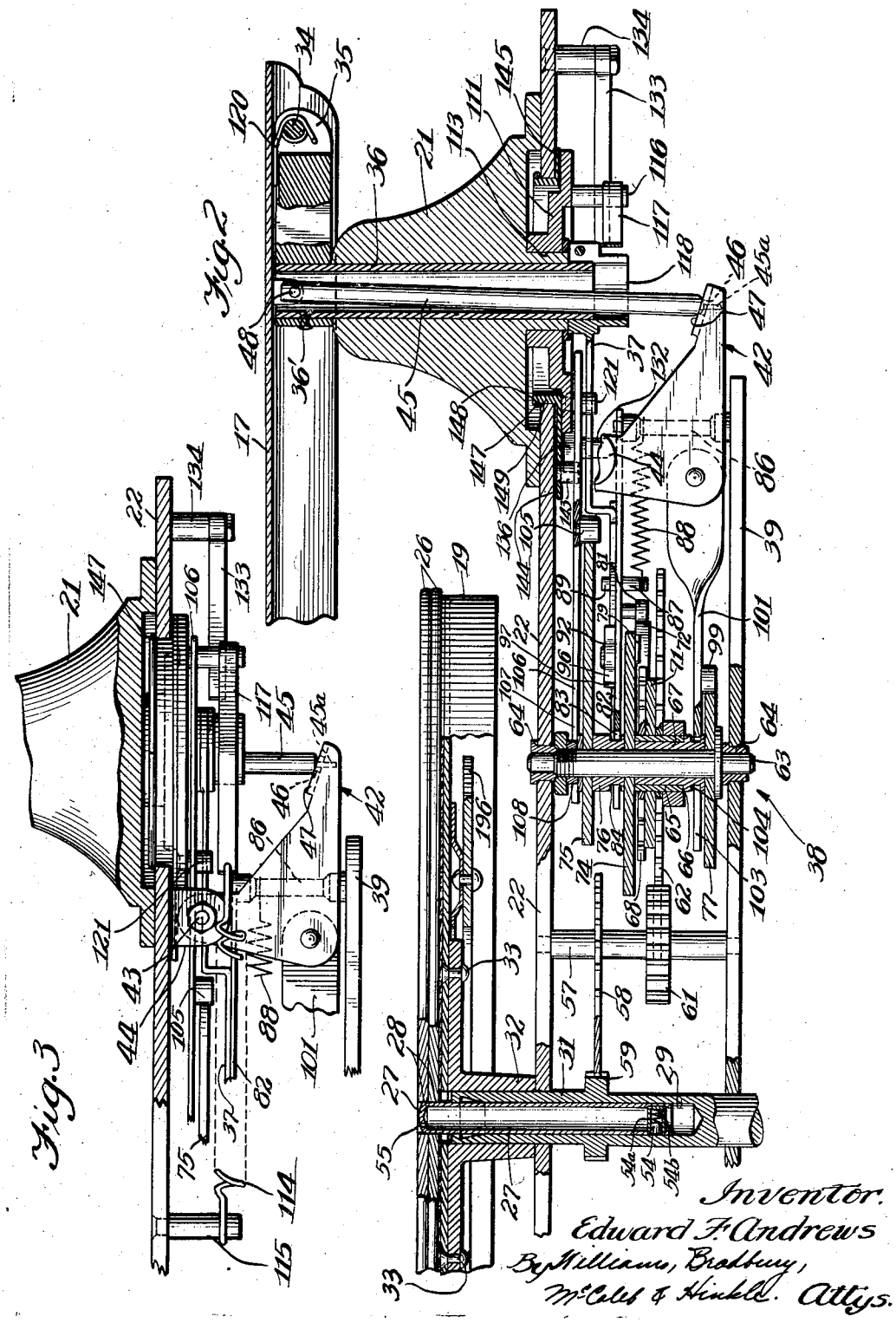


Fig. 2

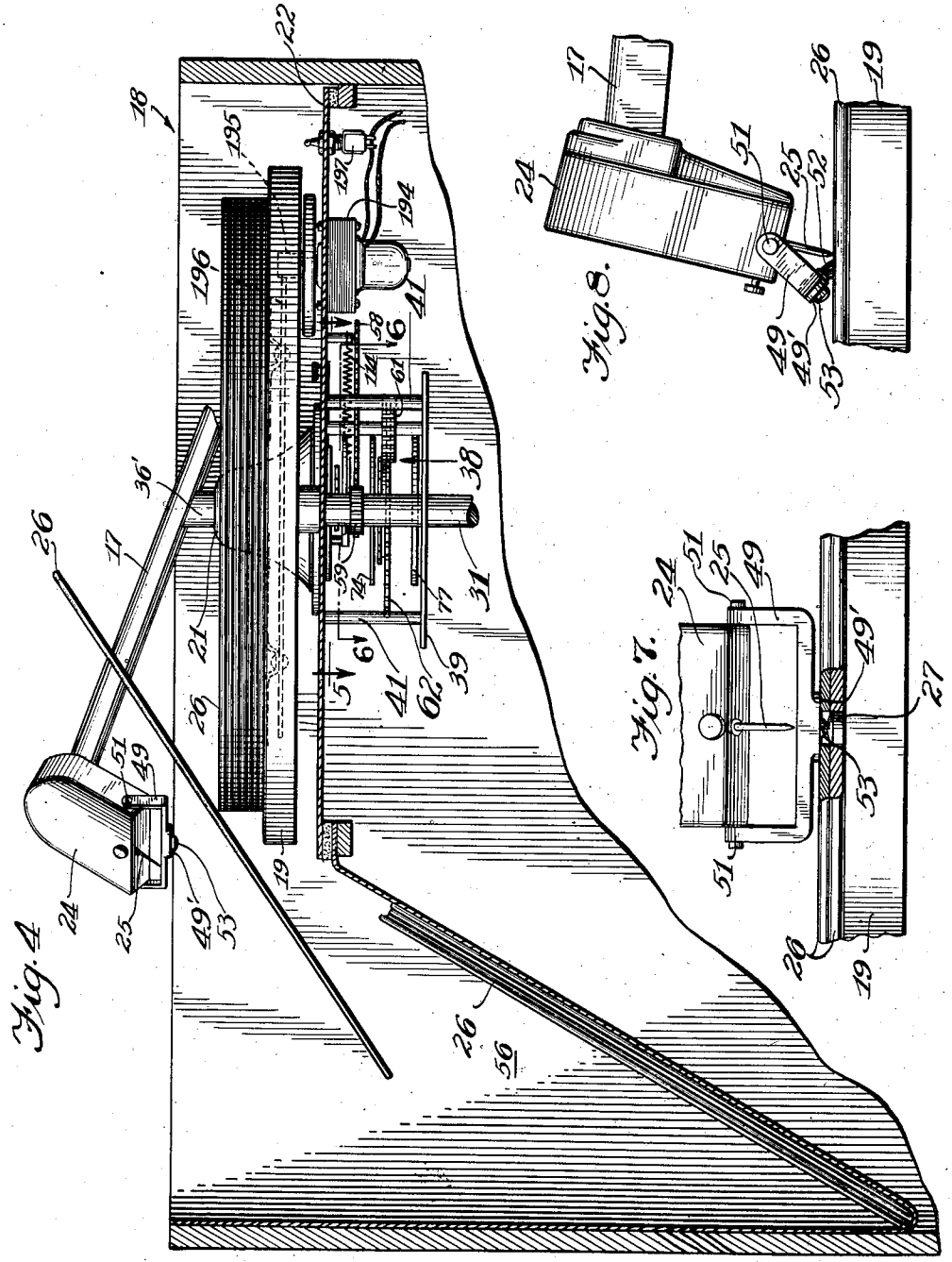
Fig. 3

Inventor.
Edward F. Andrews
By Williams, Bradbury,
McCaleb & Hinkle. Attys.

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PHONOGRAPH

Filed Nov. 10, 1930 7 Sheets-Sheet 3



Inventor:
Edward F. Andrews.
By Williams, Bradbury, McCalls & Hinkle
Attys.

July 16, 1940. E. F. ANDREWS 2,207,706

PHONOGRAPH

Filed Nov. 10, 1930 7 Sheets-Sheet 4

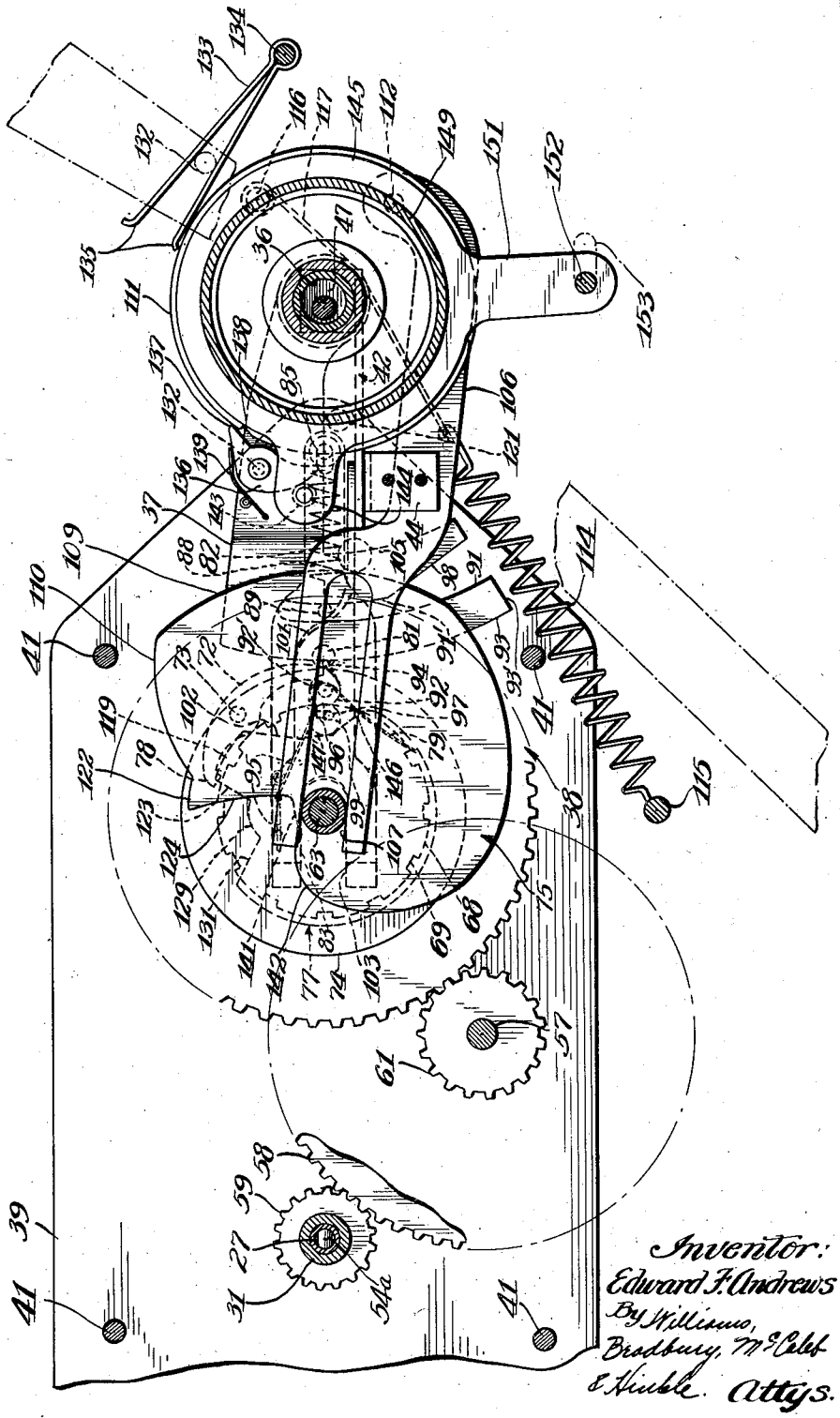


Fig. 5

Inventor:
Edward F. Andrews
By Williams, Bradbury, McCaleb & Hinkle Attys.

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PHONOGRAPH

Filed Nov. 10, 1930 7 Sheets-Sheet 5

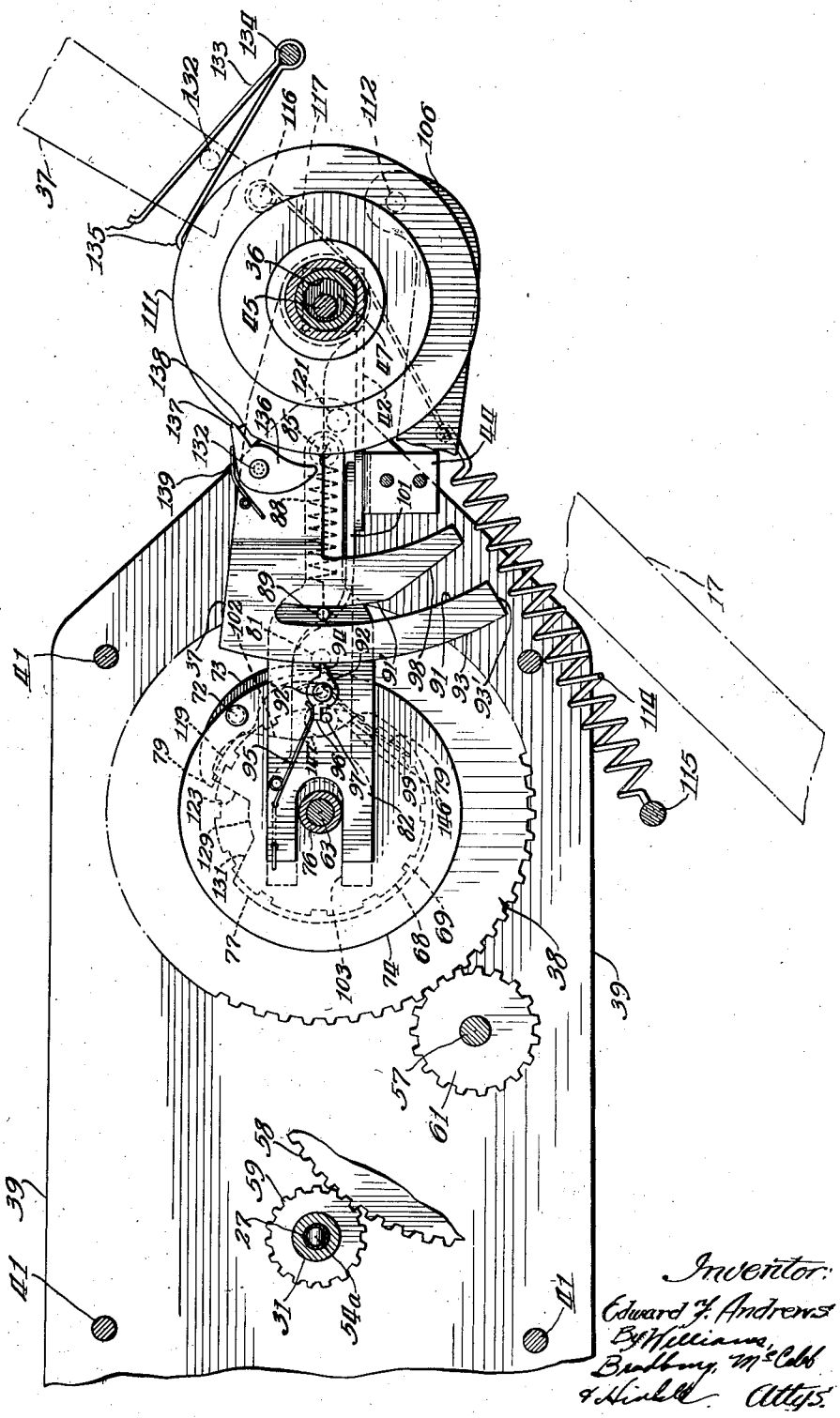


Fig. 6

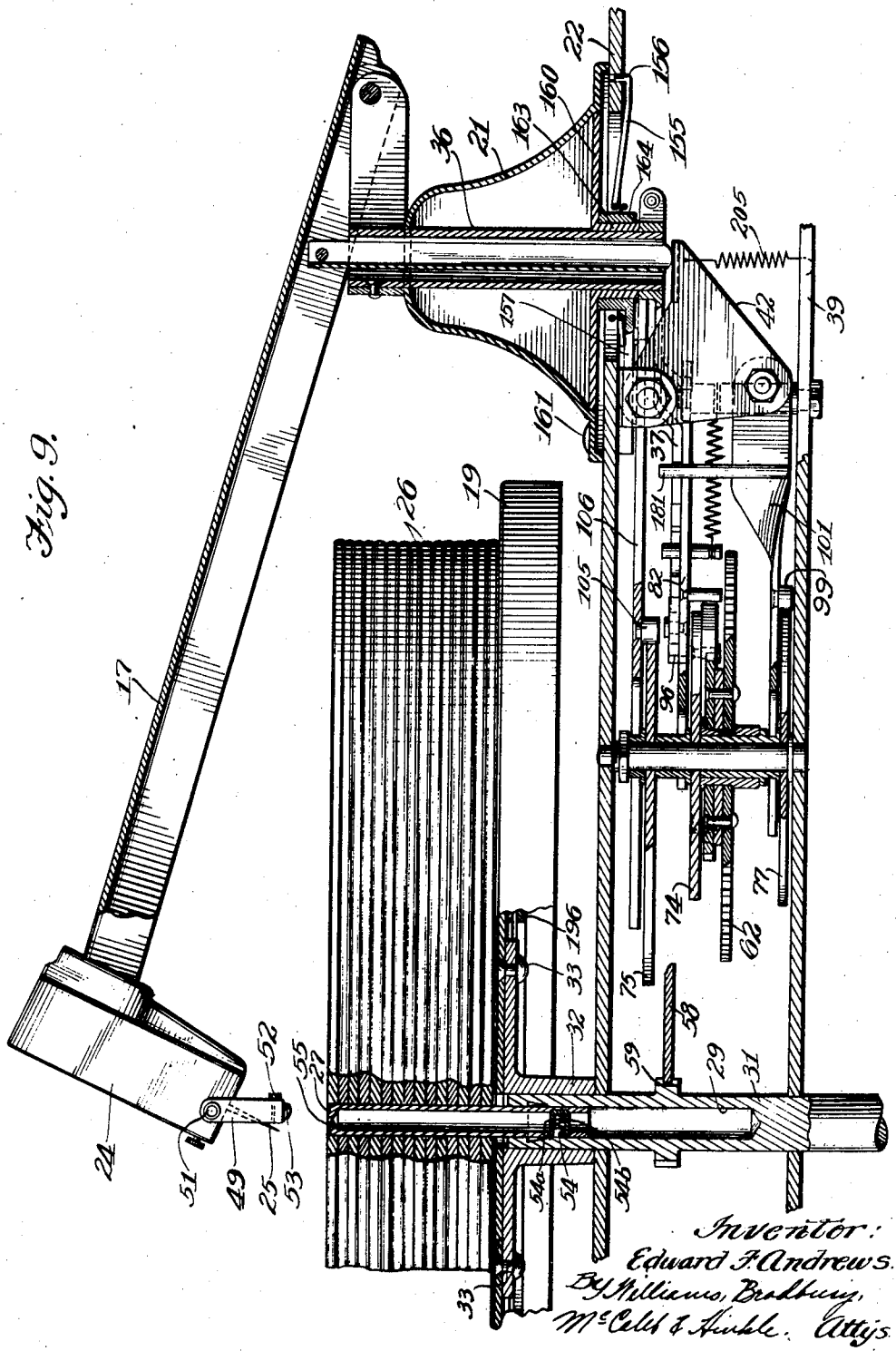
Inventor:
Edward F. Andrews
By Williams, Bradbury, McCabe & Hinkle Attys.

July 16, 1940. E. F. ANDREWS 2,207,706

PHONOGRAPH

Filed Nov. 10, 1930 7 Sheets-Sheet 6

Fig. 9.



Inventor:
Edward F. Andrews.
By Williams, Bradbury,
McCalls & Hinkle. Atty's.

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PHONOGRAPH

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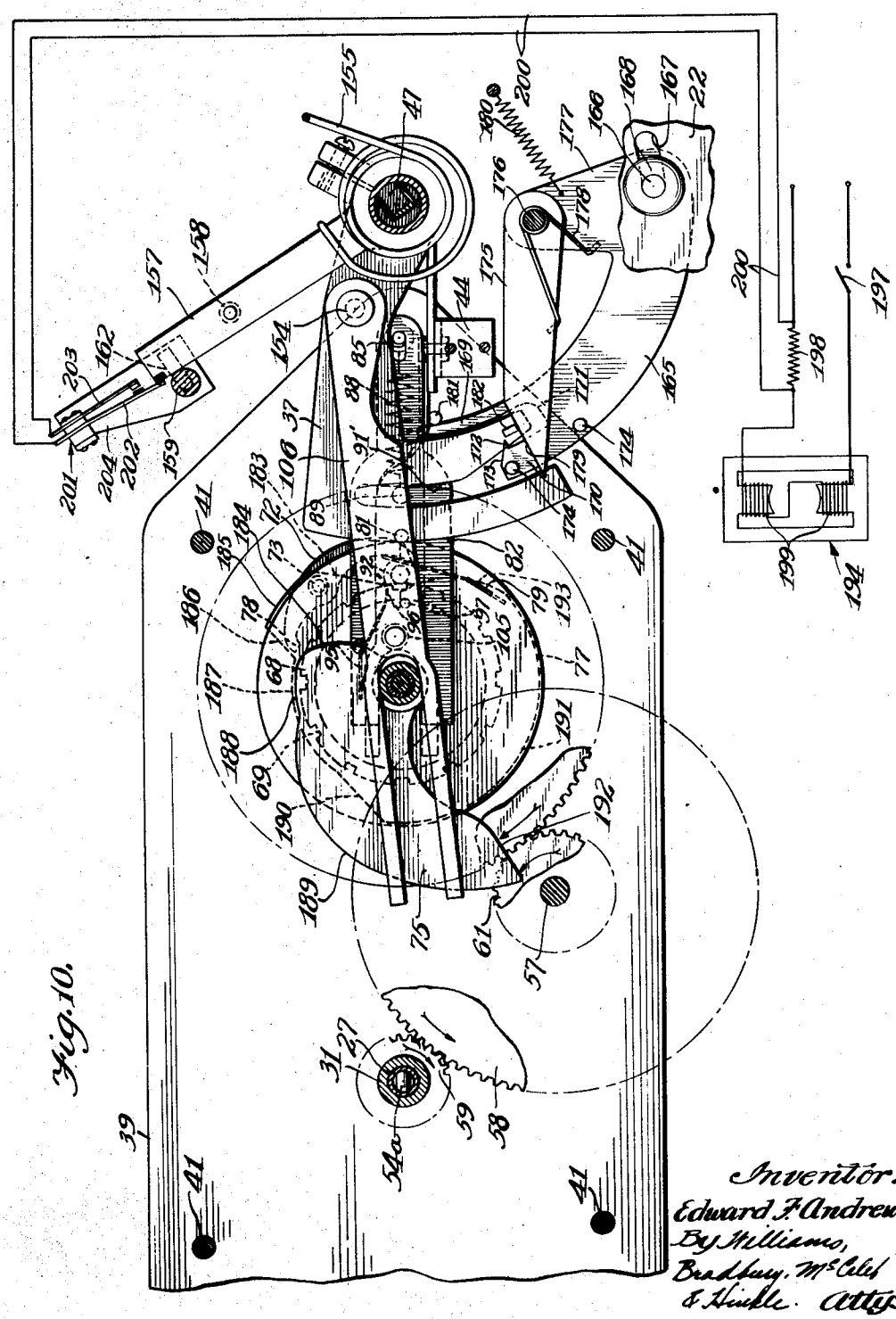


Fig. 10.

Inventor:
Edward F. Andrews
By Williams,
Bradbury, McCaleb
& Hinkle. Attys.

Patented July 16, 1940 2,207,706

UNITED STATES PATENT OFFICE

2,207,706

PHONOGRAPH

Edward F. Andrews, Chicago, Ill.

Application November 10, 1930, Serial No. 494,560

62 Claims. (Cl. 274—10)

This invention relates to phonographs, and particularly to phonographs in which a series of records may be played, and played records are automatically removed from the turntable.

One of the objects of the invention is to provide an improved automatic phonograph.

A further object of the invention is to provide a phonograph in which the player arm is adapted to remove a played record, and thereafter to become returned to initial playing position for playing a second record.

A further object of the invention is to provide a phonograph having automatic means of raising and lowering the player arm and automatic means for causing the arm to move transversely over the turntable, such means being coordinated so that a played record is removed and the player arm returned to initial playing position with respect to a second record.

A further object of the invention is to provide an automatic phonograph in which a played record is removed from the turntable by the action of the motor which drives the turntable.

A further object of the invention is to provide an automatic phonograph in which a record is adapted to be removed from the turntable by means of a spring energized by the turntable motor.

A further object of the invention is to provide an automatic phonograph in which the player arm is adapted to engage the record, and is actuated by the turntable motor to remove the record from the turntable and simultaneously energize a spring which is adapted to return the player arm to initial playing position.

A further object of the invention is to provide means for locating the returned player arm at initial playing position and to provide means of adjustment to adapt the phonograph for playing records of different sizes.

A further object of the invention is to provide an automatic phonograph in which a record is adapted to be removed from a turntable by means of the player arm, the mechanism for actuating the player arm being concealed from view.

A further object of the invention is to provide a phonograph turntable having a record centering pin adapted to be depressed from above.

A further object of the invention is to provide improved means for retaining a superimposed series of records upon a turntable, such means including a pin adapted to maintain any vertical position in which it is placed.

A further object of the invention is to provide means for removing superimposed records from a turntable in succession in which the removing member is adjusted separately for each record removal and is independent of cumulative error arising from variations of thickness of the records.

A further object of the invention is to provide a record removing member adapted to enter the opening of a record and having means cooperating with the face of the record to limit its entrance thereinto.

A further object of the invention is to provide in a phonograph, a centering pin having a convex end and a record removing member having means for limiting its entrance into a record so that records of various thicknesses may be removed thereby.

A further object of the invention is to provide a table for supporting a series of records, having a centering pin depressible from above, and a record removing member adapted to enter the opening of a record and depress the pin, said member having means limiting its entrance into the record opening, and said pin having a convex end to permit removal of records of various thicknesses.

A further object of the invention is to provide a stylus head and suspended member adapted to cooperate with a record when applied to the center thereof, said member being adapted to be displaced by the rotation of the record when applied to same adjacent the edge thereof.

Other objects, advantages and capabilities of the invention will appear from the following description thereof, taken in conjunction with the accompanying drawings, in which:

Figure 1 is a segmental plan view of a phonograph embodying the invention.

Fig. 2 is a sectional view on a larger scale, taken on the line 2—2 of Fig. 1.

Fig. 3 is a sectional detail view taken on the line 3—3 of Fig. 1.

Fig. 4 is a sectional detail view taken on the line 4—4 of Fig. 1.

Fig. 5 is a sectional view on a larger scale, taken on the line 5—5 of Fig. 4.

Fig. 6 is a similar sectional view taken on the line 6—6 of Fig. 4.

Fig. 7 is a fragmentary end view of the stylus head and associated parts, the records being partly broken away to disclose the cooperation of the record changing pin with the top record.

Fig. 8 is an elevational detail view showing the stylus head in playing relation.

Fig. 9 is a vertical sectional view through a

modified form of phonograph, the player arm being shown in elevated position over the center of the records; and

Fig. 10 is a sectional plan view of the machine shown in Fig. 9, the position of the parts corresponding to the commencement of playing of a record.

Referring to Figs. 1 to 8 of the drawings, I provide a combined tone or player arm and record changer 17 for a phonograph 18. This combined player arm and record changer is swingably supported above a turntable 19 by means of a bearing post or support member 21 which is secured to a motor board 22 adjacent the turntable 19 by means of screws 23, and is provided at its free end with the usual pick-up or stylus supporting member 24 carrying a needle 25 for playing records 26 supported on the turntable 19.

The records 26, as shown in Fig. 2, may be stacked on the turntable 19 and are held thereon by a depressible pin 27 engaging in the central apertures 28 of the records and slidably carried in a longitudinal bore or hole 29 of a shaft or spindle 31 which rotates with a hub or connector 32, secured to the under side of the turntable 19 by any suitable means such as rivets 33.

The pin 27 is provided with means which maintain it in record engaging position until it is moved during the record removing operations in the manner hereinafter described. Such means may suitably comprise a plunger 54 slidable in a tube 54*a* mounted transversely in the pin 27 so that the plunger 54 is pressed against the bore 29 of the shaft 31 by a spring 54*b*. It must be understood that this means is exemplary only since other suitable means may be employed for this purpose.

The end of the tone or playing arm 17 remote from the pick-up 24 is pivotally secured, as at 34, to bracket 35 which it overlies. The bracket 35 is riveted or otherwise rigidly secured to an upstanding spindle or hollow shaft 36 by means of rivets 36'. The support 21 provides a bearing for the hollow shaft 36 intermediate the ends of the playing arm 17, the playing arm being swingable about the axis of the hollow shaft 36 in playing a record and executing the movements hereinafter described. An arm 37 is rigidly mounted on the lower end of the shaft and cooperates, in a manner hereinafter described, with a record changer operating assembly generally designated by the reference character 38. This operating assembly 38 is carried by a mounting plate 39 preferably on the underside of the motor board 22, for example by bolts 41, to avoid marring the outer appearance of the motor board and to facilitate driving the operating assembly by compact and direct connections with the driving means. The motor board is preferably resiliently supported in a suitable cabinet.

The operating assembly 38 actuates a bell crank lever 42 journaled as shown in Figs. 2 and 3, on a pin or bolt 43 supported by lugs or brackets 44 depending from the motor board. The bell crank lever serves to raise and lower a link or spindle 45, the lower end of which is engaged in a slot or recess 46 in an arm 47 of the lever 42. At its lower end the spindle 45 is provided with a pin-like extension 45*a* which maintains it in engagement with the bell-crank lever 42. The link or spindle 45 extends upwardly through the hollow shaft 36, and its upper end is pivoted at 48 to the playing arm 17 for raising and lowering the arm.

When the playing arm is raised upon the completion of a record, by the link 45, as hereinafter described, a bridge member 49 pivotally suspended from the pick-up 24, as shown in Figs. 1 and 4, by pivot points 51, swings under the needle 25. It may be here noted that, when the player arm is again moved downwardly into the initial playing position at the edge of the record, as will be hereinafter described, the bridge member 49 is carried forwardly by the movement of the record to permit the needle to contact with the record surface as shown in Fig. 8. This bridge member 49 carries a brush or soft member 52 which rests upon the record while playing, preventing the bridge member from engaging and scratching the record or producing a sound interfering with the reproduced sound, and cleaning the record.

After the player arm is raised upon the completion of a record, it is then swung to the center of the record by means of the arm 37 rotating the hollow shaft 36. In this position the player arm is permitted to fall and a pin or finger 53 projecting as shown in Fig. 7, from the bridge member 49 below the needle 25 strikes the depressible pin 27 and depresses same sufficiently to permit the top record to be moved laterally to remove same from the turntable. The pin 27 is preferably hollow and is provided with an aperture 55 which vents the air enclosed within it and within the bore 29.

The downward movement of the player arm is arrested by the contact of the surface 49' of the bridge member 49 with the upper surface of the top record 26. It will thus be seen that the record removing member is positioned separately with respect to each record which is to be removed and is independent of variations in record thickness which might have a cumulative effect.

The pin 53, projecting from bridge member 49 is of a length substantially less than the thickness of the thinnest record to be played so that, when a played record is being removed, the pin 53 will not mar the sound track of the succeeding record. As shown in Figs. 2 and 7, the depressible pin 27 is provided with a convex surface on its upper end. Thus, although pin 53 may be substantially shorter than the thickness of a record to be removed, the record is easily removed and pin 27 is pushed down below the lower face of the record being removed by the combined weight of the record and player arm. It will readily be understood that the combined lengths of the pin 53 and the convex end of the pin can be readily arranged to permit records of a wide range of thickness to be played and removed without adjustment of the machine. The lower face of pin 53 is preferably slightly convex to prevent marring the top surface of the last record when it is being repeated. When records are placed on the turntable 19 for playing, the pin 27 is pulled out to the desired extent and the records are applied to the table with the pin 27 passing through the openings 28 therein.

The player arm, upon the engagement of the pin 53 in the record aperture, sweeps the record from the turntable and the record is deposited in a record receiver or magazine 56 adjacent the motor board 22, as shown in Figs. 1 and 4. After the record has been deposited in the magazine 56, the player arm is returned to a starting position for playing the next record.

This record changing movement of the tone or player arm is provided by the record changer operating assembly 38 which may be driven by any suitable means. Preferably, however, I

drive the assembly 38 from a drive shaft 57 journaled at one end in the motor board and at the other end in the plate 39 and carrying a gear 58 for enmeshing with a gear 59 carried by and rotating with the shaft 31, whereby the drive shaft 57 may be driven by or with the turntable. The drive shaft 57 also carries a gear 61 enmeshing with a gear 62 mounted for free rotation on a shaft 63 journaled in bearings 64 supported in the motor board 22 and the plate 39 for driving the assembly 38. See Figs. 2, 3 and 5.

The gear 62 is rigidly mounted on a sleeve 65 which is rotatably supported on a shoulder 66 of a bushing 67 fixed or keyed on the shaft 63. A notched wheel 68 having a plurality of notches or slots 69 therein at its periphery is also rigidly carried by the sleeve 65 so that it rotates with the gear 62 from which it is separated by a disc 71. The notched wheel 68 is connectable in driving relation with the shaft 63 by means of a spring pressed pawl 72 pivoted at 73 to a disc 74 which is keyed or otherwise rigidly fixed to the shaft 63. A cam 75 spaced above the disc 74 by a spacing sleeve 76 on the shaft 63 and a cam 77 located adjacent the plate 39 and engaged by the bushing 67, are also keyed or otherwise rigidly mounted upon the shaft 63, so that, when the end 78 of the pawl 72 engages in a slot 69 of the notched wheel, the shaft 63 is positively driven from the shaft 31.

The pawl 72 is actuated by a spring 79 on the disc 74, which tends to press the pawl into engagement with the notched wheel 68. It is held out of engagement with the notched wheel 68 while the record is being played by a pin 81 depending from a slidable bar 82. This bar 82 is bifurcated as at 83 to slidingly engage in a groove 84 in the spacing sleeve 76 and has a slot 85 at its other end to slidingly engage an end of a stud or rod 86 upstanding from the plate 39. Intermediate its ends the bar 82 is provided with a second depending pin 87 to which an end of a spring 88 is secured, the other end of the spring being secured to the stud 86. The spring 88 is adapted to retract the bar 82 carrying the pin 81 to release the pawl 72 and clutch the driving gear 62 to the shaft 63 at the end of the playing of a record.

The slidable bar 82 is held in the forward position during the first part of the playing of a record by the engagement of a pin 89 upstanding from the bar with a cam surface 91' of a sector carried by the arm 37, and suitably provided in the sector by an arcuate slot 91 therein, and during the latter part of the playing of the record, by the engagement between a pawl 92 pivoted on the bar 82 and the outer edge 93 of the sector. A spring 95 carried by the bar 82 presses a finger or projection 96 at the side of the pawl 92 opposite the projection 94 against a stop or pin 97 on the bar for holding the projection 94 against the edge 93 of the arm 37 to hold the lever in the forward position until the record is played. It will readily be understood from Fig. 5, that the pin 97 provides a positive abutment for the finger 96 when the arm 37 is moving in a clockwise direction during the playing of a record.

As the player arm 17 swings toward the center of a record the arm 37 swings with it. If the record is one ending in a spiral groove the slidable bar 82 is held in the forward position until the sector arm 37 has moved to such a position that the projection 94 of the pawl 92 is clear of the outer edge 93 of the sector arm 37, whereupon the slidable bar 82 and pin 81 thereon are retracted by the spring 88, permitting the pawl 72 to enter into driving engagement with the notched wheel 68. The end 93' of the edge 93 of the sector arm 37 is in such position relative to the player arm 17 that the projection 94 of the pawl 92 clears the edge 93 when player arm 17 is substantially at the inner end of the spiral groove of the played record.

If the record being played is of the type shown in Figure 1, which is provided with an eccentric groove 90 at the end of the playing portion of the record, the sector arm 37 will oscillate with the player arm 17 after the record is played. The projection 94, of the pawl 92, is held in engagement with edge 93 of sector arm 37, by the spring 88, and the pin 89, on the slidable bar 82, is in the enlarged portion of the cam-slot 91, provided by the cut away cam surface 98, when this oscillation of the player arm 17 and the sector arm 37 commences. When the sector arm 37 moves counter-clockwise, as viewed in Fig. 5, the surface 93 is in frictional engagement with the projection 94 of the pawl 92 and turns the pawl 92 clockwise on its pivot against the tension of the spring 95. As shown in Figure 5, the normal position of the pawl 92 is such that the projection 94 of the pawl 92 is perpendicular to the tangent at the point of contact between the projection 94 and the edge 93 of the sector arm 37. When the pawl 92 is rotated clockwise, as above described, this condition is destroyed and, due to the spring 88, the slidable bar 82 is retracted until the central portion 92' of the pawl 92 contacts with the edge 93 of the sector arm 37, thus permitting the pawl 72 to enter into driving engagement with the notched wheel 68, as heretofore described.

When the player arm is returned to the initial playing position, the pin 89 enters the slot 91. The contact of the pin with the cam surface 98 forces the bar 82 forwardly to the position to raise the pawl 72 out of engagement with the notched wheel 68. The advancement of the bar 82 enables the pawl 92 to resume the position shown in Fig. 5 with the finger 94 directed toward the edge 93 of the arm 37. During the subsequent playing the bar 82 is maintained in forward position by engagement of the pin 89 with the surface 91'. When the pin enters the enlarged portion of this slot such engagement is no longer provided and the bar 82 is maintained in forward position by engagement of the finger 94 with the edge 93 of the arm 37. Owing to the contact of the pawl with the pin 97, such abutment is positive during playing.

The retraction of the bar 82 moves the pin 81 on the bar from its pawl dogging position and the spring 79 turns the pawl 72 about its pivot 73 until the end 78 of this pawl engages in a slot 69 of the notched wheel 68, locking the notched wheel to the disc 74 for driving the disc and the shaft 63 carrying the disc. When the shaft 63 begins to rotate at the end of a record, the cams 75 and 77 rotate with it. A roller or cam follower 99 carried on the lever 101 is forced outwardly by a rise 102 in the cam 77, the lever 101 being bifurcated as at 103 to slidingly engage in a groove 104 of the bushing 67 and having its other end pivotally secured to the bell crank lever 42 for actuating the lever 42. The cam follower 99 moved rearwardly by the rise 102 of the cam, causes the lever 101 to turn the bell crank lever about its pivot bolt 43 whereby to raise the player arm through the medium of

the link 45 about the player arm pivot 34 until the needle 25 rises substantially above the top record 26.

Meanwhile, a roller or cam follower 105 depending from an arm 106 bifurcated as at 107 to slidably engage a groove in a spacing sleeve 108 on the shaft 63 is following a cam dwell 109 of the cam 75, the cam dwell 109 terminating at a cam fall 110 which is engaged by the follower 105 when the player arm has been raised by the rise 102 of the cam 77. The end of arm 106 opposite the bifurcated end 107 is pivotally secured to a spring actuated disc 111 as at 112, rotatably mounted by a hub 113 on a depending portion of the tone arm support 21. A spring 114 is secured at one end to a stud 115 depending from the motor board 22 and at its other end to a resilient arm or strap 117, which is secured to a stud or projection 116 depending from the disc 111. This spring maintains the arm 106 forward to keep the cam follower 105 against the cam 75. As shown in Figs. 2 and 5, a sleeve or bushing 118 carried at the lower end of the hollow shaft 36 maintains the strap 117 away from the axis of the disc 111 so that it may apply an effective torque upon the pin 116 when it is in the position shown in Fig. 5.

When the player arm has been raised by the cam rise 102 of the cam 77 after the playing of a record, the cam 75 has rotated to the position at which the cam follower 105 is adjacent the cam fall 110. During further rotation of the cams 77 and 75, the cam follower 99 rides on a cam dwell 119 which holds the playing arm in the raised position while the lever 106 is urged forwardly under the action of the spring actuated disc 111, the follower 105 riding on the cam fall 110. This rotation of the disc 111 is communicated to the arm 37 by means of a pin 121 projecting downwardly from the disc 111, the arm 37 being swung thereby in a clockwise direction, as viewed from above.

When the follower 105 reaches a cam dwell 122 at the end of the fall 110, the playing arm 17 is located centrally of the record. At this position the pin or projection 53 on the lug 49 is just above the depressible pin 27 at the center of the turntable and the cam 77 has rotated until the follower 99 is at the end of the cam dwell 119. Further rotation of the shaft 63 enables the follower 99 on the lever 101 to follow the cam fall 123, the lever 101 being forced forwardly by the weight of the player arm 17 acting through the link 45 and bell crank lever 42 so as to cause the follower 99 to cooperate with the cam 77. The speed of descent of the player arm 17 is governed by the degree of taper of cam fall 123 on cam 77 and is arranged so that the depressible pin 27 is given a blow to depress same. When the player arm 17 is thus lowered, the pin 53 of the bridge member 49 enters the opening 28 of the topmost record 26 and depresses the pin 27 in the manner described above. After the arm 17 has been lowered, the cam follower 105 on the lever 106 clears the cam dwell 122, abruptly releasing the lever 106 and permitting the spring 114 to rotate the disc 111, carrying the cam follower 105 past the cam fall 124 towards the cam surface 141.

As the disc 111 rotates under the action of the spring 114, the pin 121 engages the arm 37 and rotates it together with the player arm 17 so as to swing the topmost record toward the magazine 56. During the time the played record is being swept off the turntable the weight of the tone arm is on the record being removed, thus tending to stop the turntable due to the frictional drag between the record being removed and the succeeding record. To reduce this to a minimum the counterbalancing spring 120 carried by the pivot shaft 34 is provided. The spring 120 also provides that the correct pressure is on the playing needle for proper reproduction of the record. During this swinging or record sweeping movement of the playing arm, the cam follower 99 is opposite or in contact with a short cam dwell 129 of the cam 77. As shown in Fig. 4, the removed record overbalances at the edge of the turntable adjacent the magazine 56 and tilts downwardly to slide into the magazine, this being a simple manner of disposal.

After the dwell 129 has passed the cam follower 99, the latter engages a rise 131 which raises the player arm 17 to its highest position substantially above any unplayed records on the turntable. When removing the played record, the playing arm is swung to its extreme position by the spring 114, the arm being stopped by the engagement of a pin 132, depending from the arm 37, with a resilient or yieldable member 133 mounted on a stud 134 depending from the motor board 22. The resilient friction member 133 is shown as a bifurcated member having arms 135 yieldingly separable by the pin 132 whereby to stop the playing arm gradually and without shock.

The pin 132 extends through the arm 37 and carries at its upper end a pawl 136 having an end 137 engageable in a notch or slot 138 in the drive disc 111 and pressed against the edge of the disc by a spring 139 mounted upon the arm 37. During the initial rotation of the disc 111 by the spring 114, the notch 138 rotates past or into engagement with the end 137 before the pin 121 engages the arm 37 to swing the playing arm towards the center of the record.

After the playing arm has attained its extreme position after the removal of a record, the follower 105 of the lever 106 rides over a gradual cam rise 142 which gradually forces the lever 106 back rotating the disc 111 in a counterclockwise direction as viewed in Fig. 5, and tensioning or reenergizing the spring 114.

When the disc 111 is thus rotated by the cam 75 it drives the arm 37 and hence the playing arm 17 by means of the engagement of the pawl 136 in the notch 138.

The method of attaching spring 114 to the rotating disc 111 is such as to reduce the power required to tension the spring during the counter-clockwise movement of disc 111. The spring 114 exerts the greatest torque on disc 111 when player arm 17 is positioned at the center of the played record. The proper placement of stud 116, on disc 111, and stud 115, on motor board 22, together with the resilient strap 117 and bushing 118, carried at the lower end of shaft 36, combine to provide this result. With the player arm 17 over the center of the record the pin 116 is in such position that resilient strap 117 is at a tangent to the radius on which pin 116 travels. As the player arm is moved towards the initial playing position the effective radius on which spring 114 operates is gradually reduced until strap 117 contacts bushing 118, whereupon the effective operating radius is the radius of bushing 118 at the point of contact with strap 117. When the player arm 17 reaches a position above its initial playing position, a pin 143 depending from a lug 144 extending outward-

ly from an adjustably mounted ring 145 engages the pawl 136 and disengages the end 137 of the pawl from the notch 138 in the disc 111, thus terminating the return of the player arm. During the return of the player arm, the arm 37 cooperates with the pin 89 and pawl 92 in the manner described above to move the bar 82 into its forward position and bring the pin 81 into a position to engage the pawl 72 when it arrives at its initial location after a complete revolution of the shaft 63. After the follower 105 has passed over the cam rise 142 and rests upon the cam dwell 109, which corresponds with the maximum rotation of the disc 111, the follower 99 travels over a cam fall 146 towards a cam dwell 147', thus lowering the arm 17 until the stylus cooperates with the track of the record and playing is resumed. At this point of time or immediately thereafter, the pawl 72 has completed one revolution around the shaft 63 and comes into engagement with the pin 81 of the bar 82, which, as indicated above, has already been moved forward by the arm 37. The engagement between the pin 81 and the pawl 72 interrupts the drive of the cams 75 and 77 until, at the end of the playing of a record, the pawl 92 is released to permit the bar 82 to move once more into its retracted position.

The ring 145 is provided with a hub 149 which enters an opening in the motor board 22 around the shaft 36 and the hub 113 of the disc 111. The ring 145 is rotatably supported on the motor board 22 by means of a split ring 147 which is snapped into a groove 148 at the upper end of the hub 149. In order to adapt the machine for automatic operation with records of different diameters, I provide the ring 145 with a radial lug 151 which rigidly carries a threaded pin 152, which projects through a slot 153 in the motor board 22. The pin 152 is engaged by a thumb nut 150 and may readily be adjusted to desired position in the slot 153. It will readily be understood that adjustment of the pin 152 changes the position of the pin 143 and thus controls the returned position of the arm 37 to adapt it for records of desired size. The depressible center pin 27 is of such length, relative to the length of bore 29 in shaft 31, that it projects above the surface of the turntable, substantially the thickness of a record, when in its extreme lowest position. Thus, although the pin 53 comes down on the pin 27, it cannot depress it below the last record. Thus the last record is not removed but is played repeatedly until the machine is stopped. If desired, the cam dwell 129 may be located somewhat further from the center of the shaft 63 than is the cam dwell 147' so that the needle 25 may play the last record, but the pin 53 is held above its surface during the translating movement of the player arm.

The turntable may be driven continuously at substantially uniform speed by any suitable motor. An electric motor 194, preferably a synchronous motor, where alternating current is available, is advantageously employed. The motor 194 may be mounted on the motor board 22, and may be provided with a pinion 195 which meshes with a gear 196 carried by the turntable. The current for the motor may be controlled by the switch 197 and when a synchronous motor is employed, it may be conveniently started by manually rotating the turntable up to the normal or a greater speed.

In the modification shown in Figs. 9 and 10, the general phonograph structure and record changing mechanism are similar in construction and operation, and similar or identical parts are designated by the same reference numerals employed in Figs. 1 to 8 inclusive. In this modification the movements of the player arm to the center of the record and during the removal thereof, are positively effected by the cam 75, the return of the player arm to initial playing position being effected by a spring which is energized during the removal of the record.

In this modification the outer end of the arm 106 is pivoted at 154 to the arm 37. The support member 21 is preferably hollow, its lower end being closed by a plate 160 which is provided with a central hub 163 which provides a bearing for the shaft 36 and for a hub 164 of an arm 157 which is rotatably supported by means of the collar of the arm 37, which is rigidly mounted on the shaft 36. A spring 155 is located around the hub 164, one end 156 being secured to the motor board 22, and the other end of the spring engaging the arm 157 so as to tend to rotate same in the counter-clockwise direction as viewed in Fig. 10. The arm 157 carries a depending pin 158 which lies in the path of the arm 37 and is adapted to cooperate therewith in the manner hereinafter described.

The arm 157 is adapted to abut upon a pin 159 which may, if desired, be adjustable in position. For example, the pin 159 may be supported in a slot 162 in the motor board 22, and have a threaded upper portion which extends through the slot and is engaged by a thumb nut 161 on the upper side of the motor board 22. It will be readily understood that the thumb nut 161 may be unscrewed and the pin 159 adjusted in desired position in the slot 162 so as to adjust the movement of the arm 157 and the momentum which it supplies to the returning arm 17 and associated parts.

As shown in Fig. 10, means are provided for the adjustable positioning of the arm 17 so as to accommodate it for playing records of desired size. This mechanism comprises a sector 165 which is rotatably carried by a pin 166 adjacent the under side of the motor board 22. The pin 166 extends through a slot 167 in the motor board and is adapted to be secured in desired position therein by means of a thumb nut 168. The other end of the sector 165 is bifurcated to provide a relatively long arm 169 and a relatively short arm 170, a recess 171 being provided therebetween. The arm 170 is provided with a projecting tooth or catch 172 which overhangs the recess 171. Adjacent the catch 172 the outer surface of the arm 170 is bevelled as shown at 173 for a purpose which will hereinafter appear. The arm 165 carries stops 174 which limit the movement of the end of an arm 175 pivotally connected at 176 to a radial arm 177 carried by the opposite end of the sector 165. A weak spring 178 is provided which normally presses the edge 179 of the arm 175 outwardly to a position beyond the catch 172. The sector 165 tends to move in the clockwise direction, as viewed in Fig. 10, under the influence of a spring 180, which is secured to the arm 177 and to the motor board 22. The arm 169 of the sector 165 is normally held by this spring in engagement with a vertical rod 181 rigidly secured to the lever 101. A projection 182 mounted on one of the sectors of the arm 37 is adapted to cooperate with the catch 172 and the face 179 of the arm 175. A spring 205 suitably secured to the bell crank lever 42 and to the plate 39 causes the cam follower 99

to follow the cam 77. This spring is sufficiently strong to effect the release of the catch 172 against the action of the spring 180.

The configuration of the cams 75 and 77 differs considerably from that described in connection with the modification first described. The nature of these cams will more readily be understood from the operation of this modification, which will hereinafter be described.

In this modification, the motor 194, during the removal of a record has a considerable load imposed upon it. At this period the motor rotates the turntable, moves the player arm 17 to move the record over the turntable, and energizes the spring 155. It is, therefore, preferred to provide the motor with additional power at this time. This may conveniently be done by providing a suitable resistance 198 in series with the winding 199 of the motor 194, which resistance is automatically shunted when the increase of power is needed. The shunt circuit comprises a pair of conductors 200 connected by a switch 201 which is controlled by the movement of part of the mechanism. The switch may suitably be controlled by the movement of the arm 157 and may comprise a pair of resilient contact arms 202 and 203 tending to contact with each other. The contact arms may be mounted on a plate 204 carried by, and movable with the pin 159. The contact arm 202 is slightly longer than the contact arm 203 so that it is engaged by the arm 157, when it abuts against the pin 159, and breaks the shunt circuit. When the arm 157 begins to move from this position the contact arm 202 makes contact with the contact arm 203 and the resistance 198 is shunted and the power of the motor is increased until the arm 157 returns to its position in abutment with the pin 159. The portion of the pin 159 within the slot 162 is of square cross-section to maintain the plate 204 and the contact arms in operative position.

The position of parts shown in Fig. 10 corresponds to the commencement of the playing of a record, the catch 172 having been forced clear of the projection 182, arm 17 having been lowered into its initial playing position and being about to be brought into cooperation with the track of the record by the arm 175, and the arm 157 being in contact with the abutment 159 so that the shunt circuit is broken and normal power is supplied to the motor 194. The bar 82 is in its forward position, and the pawl 72 is thereby held out of engagement with the notched wheel 68 so that the cams 75 and 77 are stationary. As the playing progresses, the arm 37 moves in a clockwise direction as seen in Fig. 10, which movement is progressive until the pawl 72 is released and the cams are put into rotation in the manner described above.

During the playing, the lever 106 has been drawn rearwardly somewhat by the arm 37 and the cam follower 105 is out of contact with the cam 75. When the cam 77 begins to rotate the cam follower 99 rides over a cam rise 183 on the cam 77 which raises the player arm 17. Thereafter, the cam follower 105 is engaged by a cam rise 184 on the cam 75 and the arm 37 is rotated thereby to bring the elevated arm 17 into position over the center of the records 26, as shown in Fig. 9. As the player arm is put into movement by the cam 75, or shortly thereafter, the arm 37 contacts with the pin 158 of the arm 157 and moves it slightly, thereby closing the switch 201 and shunting the resistance 198 so as to increase the power of the motor as above described. While the arm 17 is being moved across the record, the cam follower 99 rides over a cam dwell 185 which maintains the arm 17 elevated. After the arm 17 has arrived at the center of the record, the cam follower 99 passes over a cam fall 186 which permits the arm 17 to fall to bring the pin 53 into the opening 28 of the top record, depressing the pin 27 in the manner above described. After this condition is established, the cam followers 99 and 105 riding on cam dwells 187 and 188 respectively, the cam follower 105 rides over a long gradual cam rise 189 which translates the arm 17 so as to remove the top record and discharge it into the magazine 56. During this movement the arm 37 is rotated through a wide angle so as to contact with the pin 158 and move the arm 157 to its extreme position, thereby coiling or energizing the spring 155. After the record has been translated sufficiently to enable it to fall into the magazine 56, the cam follower 99 enters into contact with the cam rise 190 which has the effect of elevating the arm 17 to its highest position. The subsequent movement of the arm 17 into its extreme position is effected with the arm thus elevated. This elevation corresponds to the contact of the cam follower 99 with the cam dwell 191. At the end of the cam rise 189 the cam 75 is provided with a radial fall 192 so that the return of the arm 17 is rapidly effected through the action of the spring 155 upon the arm 157, which in turn acts through the pin 158 upon the arm 37. When the arm 157 is stopped by contact with the pin 159, the arm 17 and associated parts have sufficient momentum to carry them beyond their initial playing position. As indicated above, this momentum may, if desured, be adjusted by the position of the pin 159 in the slot 162. The arm 37 consequently rotates in a counter-clockwise direction, as viewed in Fig. 10 until the projection 182, carried thereby, contacts with the beveled surface 173 of the sector 165 so as to displace same against the action of the spring 180 to permit the projection to enter the recess 171. It will be understood that the projection 182 also contacts with the face 179 of the arm 175 to enter the recess. The spring 180 causes the sector to move back so as to bring the catch 172 into the path of the projection 182. The arm 175 under the action of its spring 178 forces the projection 182 into contact with the catch 172 so as to locate the arm 17 in a predetermined position, which is such that the needle is above a point slightly outside the commencement of the track on the record. It will be readily understood that this position is adjustable by means of the thumb screw 168 so that the machine may be adapted with great ease for the playing of records of different sizes.

After the cam follower 105 moves over the cam fall 192, the cam follower 99 passes over a cam fall 193 which permits the player arm 17 to descend to bring the needle 25 into contact with the record. The descent of the arm 17 depends upon the number of records which are located upon the turntable 19. The cam follower 99 moves over the cam fall 193, being caused to follow same by the spring 205, until the rod 181 moves the sector 165 against the tension of the spring 180. Consequently, when the cam follower 99 approaches the end of the cam fall 193, the projection 182 of the arm 37 is released by the catch 172 and the player arm is pressed gently by the arm 175, under the action of the

spring 178, into engagement with the track of the record. It will be understood that during the return swing of the player arm back to initial playing position, the arm 37 engages with the pin 89 and pawl 92, to move the bar 82 into its forward position. Consequently, when the pawl 72 has completed one revolution, it is engaged by the pin 81 to disconnect the driving connection of the cams. This occurs after the cam follower 99 has moved over the cam fall 193.

In this modification of the invention also, the cam fall 193 may, if desired, lead the cam follower 99 to a position somewhat closer to the center of the shaft 63 than it has when it moves over the cam dwell 188, to permit the last record to be played repeatedly, the pin 53 not being maintained out of contact with its surface.

Although the invention has been described in connection with the specific details of the preferred embodiments thereof, it must be understood that such details are not intended to be limitative of the invention, except insofar as set forth in the accompanying claims.

I claim:

1. In a phonograph, in combination, a rotatable turntable, a player arm, means carried by the player arm for engaging a record in playing relation, means carried by the player arm for engaging the record to remove same from the turntable, and means for actuating the arm for removing the record from the turntable.

2. In a phonograph, in combination, a rotatable turntable, an arm having means to engage a record thereon to remove same, means for raising and lowering said arm, and a spring for moving the arm transversely to remove the record, said means and the turntable being operatively connected.

3. In a phonograph, in combination, a rotatable turntable, an arm having means to engage a record thereon to remove same, spring means adapted to move the arm transversely in one direction, and means for alternately raising and lowering said arm and moving it transversely in the opposite direction, said arm being adapted to move over the turntable in its lowered position during record removal so as to cause the record to slide upon the surface therebeneath.

4. In a phonograph, in combination, a rotatable turntable, an arm having means to engage a record thereon to remove same, spring means adapted to move the arm transversely to remove the record from the turntable, and means for raising and lowering said arm and moving it transversely in the opposite direction and reenergizing the spring means.

5. In a phonograph, in combination, a rotatable turntable, an arm having means to engage a record thereon to remove same, means for alternately raising and lowering said arm and moving it transversely to remove the record from the table, and spring means adapted to be energized by said transverse movement for returning the arm for repeated operation, said arm being adapted to move over the turntable in its lowered position during record removal so as to cause the record to slide off upon the surface therebeneath.

6. In a phonograph, in combination, a rotatable turntable, a player arm, means carried by the player arm for engaging the record to remove same, spring means adapted to move the arm transversely in one direction, and means for alternately raising and lowering said arm and moving it transversely in the opposite direction.

7. In a phonograph, in combination, a rotatable turntable, a player arm, means carried by the player arm for engaging a record in playing relation, means carried by the player arm for engaging the record to remove same, spring means adapted to move the arm transversely to remove the record from the turntable, and means for raising and lowering said arm and moving it transversely in the opposite direction and reenergizing the spring means.

8. In a phonograph, in combination, a rotatable turntable, a player arm, means carried by the player arm for engaging a record in playing relation, means carried by the player arm for engaging the record to remove same, means for raising and lowering said arm and moving it transversely to remove the record from the table, and spring means adapted to be energized by said transverse movement for returning the arm to initial position.

9. In a phonograph, in combination, a turntable, a player arm provided with a sound reproducing element, and operative means for actuating the player arm to cause it to engage a record on the turntable, move the arm away from the engaging position to remove the record and return the arm to initial playing position.

10. In a phonograph, in combination, a player arm having a needle adapted to cooperate with the track of a record, a depending member mounted on the player arm, means on said depending member adapted to enter the record opening to engage the record, and means adapted to swing said player arm transversely to move said record bodily.

11. In a phonograph, in combination, a player arm having a needle adapted to cooperate with the track of a record, a member pivotally supported on the arm and adapted to hang below the needle, said member being adapted to be moved out of the way of the needle by the rotation of the record when the arm is lowered in a playing position of the arm, means carried by said member adapted to enter the opening of a record when the arm is lowered in the central position thereof, and means adapted to swing said player arm transversely to move said record bodily.

12. In a phonograph, in combination, a player arm having a needle adapted to cooperate with the track of a record, a member pivotally supported on the arm and adapted to hang below the needle, said member being adapted to be moved out of the way of the needle by the rotation of the record when the arm is lowered in a playing position of the arm, means on said member adapted to enter the opening of a record when the arm is lowered in the central position thereof, yielding means carried by the depending member to contact with the record during playing, and means adapted to swing said player arm transversely to move said record bodily.

13. In a phonograph, in combination, a turntable, a player arm, operative means for removing a played record from the turntable, an arm rotatable with the player arm, and provided with a pair of arcuate surfaces, one of which is cut away to provide a cam surface, a movable element controlling the drive of said operative means, means carried by said element adapted to cooperate with the cam surface and associated arcuate surface, said means being adapted to engage the cam surface when the player arm is returned to initial playing position to move the element

into drive disconnecting position, and a pivoted pawl carried on said element adapted to engage the other arcuate surface of the arm and maintain said position until the end of the playing of the record.

14. In a phonograph, in combination, a turntable, a player arm, operative means for removing a played record from the turntable, an arm rotatable with the player arm and provided with an arcuate surface, a movable element controlling the drive of said operative means, and a pawl carried on said element adapted to engage said surface to maintain the element in drive disconnecting position during playing of a record, said pawl being adapted to be released by reverse movement of the arm to permit the element to move into drive connecting position.

15. In a phonograph, in combination, a turntable adapted to receive a plurality of superimposed records, a player arm adapted to cooperate with the topmost record in playing relation, a member carried by the player arm, a magazine located laterally of, and below the turntable and adapted to receive played records, and operative means adapted to actuate the player arm after playing a record, to elevate same, move it to the center of the record, lower it so that said member carried thereby enters the central opening of the topmost record, move it laterally to bring said record into a position where it may move into the magazine, elevate it, return it to initial playing position and lower it into playing relation with the next record.

16. In a phonograph, in combination, a turntable, a player arm provided with a sound reproducing element, record engaging means carried by said arm, means for actuating the arm to cause said record engaging means to sweep records from the turntable, means to return the arm to initial playing position, and adjustable means for arresting the arm in different positions to accommodate the phonograph for playing records of different sizes.

17. In a phonograph, in combination, a turntable, a motor for rotating the turntable, a player arm, means including resilient means for swinging the arm from final playing position back to a position adjacent initial playing position, a catch for engaging a member swingable with the arm and holding the arm in said position adjacent the initial playing position, and means driven from the motor for controlling the release of the arm from the catch.

18. In a phonograph, in combination, a turntable, a player arm, resilient means for swinging the arm from final playing position to initial playing position, means for elevating and lowering the arm, a catch for engaging a member swingable with the arm, to arrest the swung arm to hold the same adjacent initial playing position, and means associated with the means for lowering the arm for releasing the arm from the catch, said catch being mounted to permit adjustment to adapt the phonograph to play records of different sizes.

19. In a phonograph, in combination, a turntable, a player arm, resilient means for swinging the arm to initial playing position, means for elevating and lowering the arm, a catch for engaging a member swingable with the arm, to arrest the swung arm and hold same adjacent initial playing position, means associated with the means for lowering the arm for releasing the arm from the catch, and resilient means associated with the arm to impart a slight motion to the arm when released so as to push the arm towards the track of the record, said catch being mounted to permit adjustment to adapt the phonograph to play records of different sizes.

20. In a phonograph, in combination, a turntable, a player arm, a spring for returning the player arm to initial playing position, operative means intermittently operated for removing a played record from the turntable and compressing said spring motor means for driving the turntable and actuating said intermittently operative means, and means associated with said operative means for increasing the power of the motor means during the record removing operation.

21. In a phonograph, in combination, a turntable, a synchronous electric motor for driving same, a resistance in series with the winding of the motor, a player arm, a spring for returning the player arm to initial playing position, operative means intermittently operated by the motor for removing a played record from the turntable and compressing said spring, a circuit adapted to shunt said resistance, and a switch in said circuit adapted to be closed by movement of said operative means.

22. In a phonograph, in combination, a turntable, a pin frictionally held in a bore therein and adapted to project above the surface of the turntable to pass through the openings of a plurality of records placed thereon, said pin being readily movable in said bore and maintaining a position therein to which it may be moved.

23. In a phonograph, in combination, a turntable, a pin frictionally held in a bore therein and adapted to project above the surface of the turntable to pass through the openings of a plurality of records placed thereon, and a record removing arm having a pin, means for actuating the record removing arm to apply its pin to the first said pin to depress same, means limiting said depression to approximately the thickness of a record, means for swinging the arm to remove the record from the turntable, said first mentioned being readily movable in said bore and maintaining a position therein to which it may be moved.

24. In a phonograph, in combination, a turntable, a centering pin adapted to pass through the openings in records placed thereon, said pin being depressible from above, a record removing member, means for actuating said member to cause it to enter the opening of a record and depress the pin below the upper surface thereof, means associated with the record removing member adapted to contact with the surface of said record to limit its entrance into the record opening to substantially the thickness of the top record, said pin being inclined at its upper end to permit the record to be slid off the turntable, and means for moving the record moving member to slide the record off.

25. In a phonograph, in combination, a table for supporting records, a centering pin adapted to pass through the openings in records placed thereon, said pin being depressible, and frictional means for maintaining the pin in a plurality of positions.

26. In a phonograph, in combination, a table for supporting records, a centering pin having a convex upper end adapted to pass through the openings in said records, said pin being depressible, a record removing pin, means for causing the record removing pin to enter into a record opening and depress the depressible pin, said record removing pin having a shoulder adapted to engage the upper surface of said record and limit

its entrance into the opening to approximately the thickness of a record so that the record may move laterally over the centering pin.

27. In an automatic record changing phonograph, in combination, a rotary turntable having a spindle provided with an axial bore, said turntable being adapted to receive a stack of records having central openings, said turntable being mounted for rotation in a fixed plane during the playing of the series of records stacked thereupon, a pin in the center of the turntable, said pin being depressible into the bore of the turntable for substantially the thickness of the stack and being adapted to pass through the openings in the records, and a depressing pin, means actuating the depressing pin to cause it to move above the turntable and stack of records, and enter the opening in the uppermost record, means for limiting the entrance of the depressing pin into the opening in the uppermost record an amount substantially equal to the thickness of the record, depressing said depressible pin so as to release only the uppermost record, and to move sideways thereby removing the released record from the turntable.

28. In an automatic record changing phonograph, in combination, a rotatable turntable adapted to carry a series of superimposed records, a player arm carrying a needle for playing the records in succession, record engaging means carried by said arm, and means for actuating the player arm to cause said record engaging means to free each played record successively from the turntable and remove it therefrom, leaving the next lower record ready to be played by said needle.

29. In a phonograph, in combination, a turntable, a centering pin adapted to pass through openings in records placed thereon, said pin being depressible from above, a player arm adapted to cooperate with a record on the turntable to reproduce same, and means carried by the player arm adapted to depress the pin.

30. In an automatic phonograph, in combination, a turntable, a motor for driving same, record changing mechanism driven intermittently from said motor, clutch means for connecting said motor to said record changing mechanism, a player arm, means having a smooth arcuate surface moving therewith, a movable element controlling said clutch mechanism, and a pawl carried by said element adapted to engage said surface to maintain said clutch means disconnected, said pawl being adapted to be actuated by reversal of motion of said surface and by passing off said surface to effect engagement of said clutch mechanism.

31. In an automatic phonograph, in combination, a turntable having a spindle provided with an axial bore, a depressible pin in the bore of the turntable adapted to center a stack of records thereon, said pin being adapted to project through the complete stack of records and being mounted to permit it to be depressed substantially the thickness of the stack, said turntable being mounted for rotation in a fixed plane during the playing of a stack of records, an arm adapted to move above said record stack and downwardly through said stack position into close propinquity to the turntable, a magazine located laterally of, and below the turntable and adapted to receive played records, operative means for actuating said arm to cause it to move to depress said pin to progressively lower positions, engage the topmost record of said stack and slide it off, while all the records therebeneath are held centered by said pin, to raise said arm to a definite height and return same, and means controlling the operative means for repeated operation upon the record next below the topmost record after said next record has been played.

32. A phonograph comprising a sound reproducing element, a turntable adapted to support a stack of records, a motor for rotating the turntable, a depressible pin in said turntable projecting through the center holes of said records, an arm carrying a depressing pin adapted to depress said depressible pin, said arm being adapted to move downwardly through substantially the thickness of the stack, means associated with the depressing pin for engaging the topmost record to limit the entry of the depressing pin to a distance substantially the thickness of a record, means for swinging said arm transversely of the turntable while in its lowermost position to slide off said topmost record, a receptacle adjacent the turntable to receive the removed records, means for raising the arm to a definite height and returning it to engage the next record, and means controlled by the position of said sound reproducing element with respect to the uppermost record for initiating the record removing movements of said arm.

33. In an automatic phonograph, in combination, a record support, a member movable thereabove, a reproducer carried thereby and means for removing a played record from the support carried by said movable member.

34. In an automatic phonograph, in combination, a motor, a turntable operated thereby, a depressible pin adapted to center a stack of records on the turntable, an arm adapted to swing horizontally above said turntable, means for swinging said arm vertically to cause it to depress the depressible pin and engage the center opening of the topmost record of said stack, means driven by said motor for swinging said arm to slide off said topmost record from said turntable and means energized by the swinging of said arm for returning said arm towards its initial position.

35. In a phonograph, in combination, a turntable adapted to support a stack of records, said turntable having a spindle provided with an axial bore, a depressible center pin in said turntable bore adapted to pass through the holes in the records of said stack and to be depressed step by step until its upper end is located adjacent the turntable, means above the turntable for depressing said pin, means associated with the depressing means adapted to engage the topmost record and limit the depression of the pin to the level of the lower surface of said record, all the records below the top record being held centered by the depressible pin, and means for sliding the top record off the stack.

36. In a phonograph, in combination, a turntable adapted to support a stack of records thereon, said turntable having a spindle provided with an axial bore, a depressible centering pin within said bore and adapted to extend upwardly from the turntable through the central openings of the records of said stack and to be depressed step by step until its upper end is located adjacent the turntable, a pin movable above the stack of records, means causing said movable pin to enter the opening of the topmost record and depress the depressible pin step by step to free the topmost records therefrom, and means for moving said movable pin transversely while in said last mentioned position to cause the topmost rec-

ord to slide off over the surface therebeneath and thereby effect the removal of the topmost record from the stack.

37. In an automatic phonograph, in combination, record supporting means, a depressible pin for centering a stack of records on said supporting means, a member including a depressing pin mounted for movement over said record supporting means, and actuating means for said member for causing its pin to depress said depressible pin and slide the topmost record off said stack while all the records therebeneath are held centered by said depressible pin, said depressing pin being adapted to extend into the opening of the topmost record approximately the thickness of a record, at least one of said pins having a convex end.

38. In an automatic phonograph, in combination, record supporting means, a depressible pin centering a stack of records thereon by passing through their center holes, a member including a depressing pin located above said record supporting means, actuating means for said member causing its pin to enter the hole in the topmost record, depress said depressible pin and move laterally thereby sliding said record off said stack, and means associated with said depressing pin for limiting its entry and the depressing of said depressible pin to any substantial degree below the topmost record, said depressing pin having a convex lower end.

39. In a phonograph, in combination, a turntable adapted to support a stack of records, said turntable having a spindle provided with an axial bore, a depressible centering pin located in said bore extending upwardly from the turntable through the central openings of said records, an arm movable above said stack of records, a pin carried by said arm, means for moving said arm downwardly through progressively greater distances causing last said pin to enter the opening of the topmost record and depress the depressible pin to free the topmost record therefrom, and means for moving said arm transversely to cause the topmost record to slide over the surface therebeneath and thereby effect the removal of the topmost record from the stack.

40. In a phonograph, in combination, a sound reproducing element, a turntable adapted to support a stack of records, a depressible centering pin extending upwardly from the turntable through the central openings of said records, an arm movable above said stack of records, a pin carried by said arm, means causing said last mentioned pin to enter the opening of the topmost record and depress the depressible pin to free the topmost record therefrom, means for moving said arm transversely to cause the topmost record to slide over the surface therebeneath and thereby effect the removal of the topmost record from the stack, and means operable by the movement of the sound reproducing element into final playing position for initiating the record removal movements of said arm, at least one of said pins having a convex end.

41. In a phonograph, in combination, a turntable adapted to support a stack of records, a depressible center pin in said turntable passing through the holes in said records, depressing means above the turntable for depressing said depressible pin just enough to free the top record therefrom, all of the records below the top record being held in place by the depressible pin, means for removing the top record, and means for elevating the depressing means free of said record during record removal.

42. In a phonograph, in combination, a turntable adapted to support a stack of records, a depressible center pin in said turntable passing through the holes in said records, depressing means above the turntable for depressing said depressible pin just enough to free the top record therefrom, all of the records below the top record being held in place by the depressible pin, means for swinging said depressing means to slide off the topmost record, and means for elevating the depressing means free of said record to permit said record to move laterally.

43. In a phonograph, in combination, a turntable adapted to support a stack of records, said turntable having a spindle provided with an axial bore, a depressible center pin in said bore passing through the holes in said records, a record removing arm pivotally mounted to swing in a vertical plane through the record stack position, means carried by said arm for depressing the pin and means associated with the depressing means adapted to engage the top record and limit the depression of the pin to the level of the lower surface of said record, all of the records below the top record being held in place by the depressible pin.

44. In a phonograph, in combination, a turntable adapted to support a stack of records, said turntable having a spindle provided with an axial bore, a depressible center pin in said bore passing through the holes in said records, a record removing arm pivotally mounted to swing in a vertical plane through the record stack position, means carried by said arm adapted to enter the opening of the top record and depress the depressible pin, and means carried by said arm adapted to engage the top record and limit the depressing movement of the arm to free only the top record from the pin, the records below the top record being held in place by the depressible pin.

45. In a phonograph, in combination, a turntable adapted to support a stack of records, said turntable having a spindle provided with an axial bore, a depressible center pin in said bore passing through the holes in said records, a record removing arm pivotally mounted to swing in a vertical plane through the record stack position and pivotally mounted to swing in a horizontal plane, means carried by said arm for depressing the pin just enough to free the top record therefrom, the records below the top record being held by the depressible pin, and means for causing the arm to swing horizontally to slide said top record off the stack.

46. In a phonograph, in combination, a turntable adapted to support a stack of records, said turntable having a spindle provided with an axial bore, a depressible center pin in said bore passing through the holes in said records, a record removing arm pivotally mounted to swing in a vertical plane through the record stack position and pivotally mounted to swing in a horizontal plane, means carried by said arm adapted to enter the opening of the top record and depress the depressible pin, means carried by said arm adapted to engage the top record and limit the depressing movement of the arm to free only the top record from the pin, the records below the top record being held by the depressible pin, and means for causing the arm to swing horizontally to slide the top record off the stack.

47. In a phonograph, in combination, a turntable, said turntable being adapted to support

a stack of records and arranged to rotate in a fixed plane during the successive playing of records of the stack, a depressible center pin for said turntable passing through the holes in said records and adapted to be depressed through a distance substantially equal to the thickness of the stack, a. record-removing member extending above said turntable, means adapted to actuate said member to cause it to depress the pin, and means associated with the depressing means adapted to engage the topmost record and limit the depression of the pin to the level of the lower surface of said record, establishing for the top record a condition of freedom to slide with relation to the records therebeneath, the last said records being held by the depressible pin against sliding.

48. In a phonograph, in combination, a turntable, said turntable being adapted to support a stack of records and arranged to rotate in a fixed plane during the successive playing of the stack of records, a depressible center pin for said turntable passing through the holes in said records and adapted to be depressed to a position close to the turntable substantially through stack position, a record-removing arm extending above said turntable and operable to remove records from the turntable at various levels, a depressing pin carried by said arm, and means adapted to actuate said arm to cause said depressing pin to depress the depressible pin, means carried by said arm limiting said depression so as to free the top record only from the depressible pin, the records below the top record being held by the depressible pin.

49. In a phonograph, in combination, a turntable, said turntable being adapted to support a stack of records and arranged to rotate in a fixed plane during the successive playing of the stack of records, a depressible center pin for said turntable passing through the holes in said records and adapted to be depressed to a position close to the turntable substantially through stack position, a record-removing arm extending above said turntable and operable to remove records from the turntable at various levels, means adapted to actuate said arm to cause it to depress the pin just enough to free the top record, the records below the top record being held by the depressible pin, and means for moving said arm horizontally to slide off said top record.

50. In a phonograph, in combination, a turntable having a spindle provided with an axial bore, said turntable being adapted to support a stack of records and arranged to rotate in a fixed plane during the successive playing of the stack of records, a center pin in said bore of said turntable passing through the holes in said records and adapted to be depressed to a position close to the turntable substantially through stack position, a record-removing arm extending above said turntable and operable to remove records from the turntable at various levels, a depressing pin carried by said arm, means adapted to actuate said arm to cause said depressing pin to depress the depressible pin, means carried by said arm limiting said depression so as to free the top record, the records below the top record being held by the depressible pin, and means for moving said arm horizontally to slide off said top record.

51. In a phonograph, in combination, a turntable adapted to receive a stack of records, a depressible pin for said turntable adapted to project upwardly through the holes in said records, a record-removing arm mounted to swing vertically and horizontally, means for elevating the arm, a depressing member on said arm adapted to engage said depressible pin and depress same within the opening of the top record, means on said arm for engaging the surface of the top record whereby the depressing member frees the top record only, the remaining records being held by said depressible pin, and means operative when said arm is in a position above the depressible pin to allow same to descend under the influence of gravity whereby the depressing member strikes the depressible pin with a forcible impact in order to effect its depression.

52. In a phonograph, in combination, a turntable adapted to receive a stack of records, a depressible pin for said turntable adapted to project upwardly through the holes in said records, a record-removing arm adapted to swing vertically and horizontally, means for elevating the arm, a depressing member on said arm adapted to engage said depressible pin and depress same within the opening of the top record, means on said arm for engaging the surface of the top record whereby the depressing member frees the top record only, the remaining records being held by said depressible pin, and means operative when said arm is in a position above the depressible pin to allow same to descend under the influence of gravity whereby the depressing member strikes the depressible pin with a forcible impact in order to effect its depression, the arm being adapted to be arrested at various levels by said engagement of the record engaging means on said arm against the surface of the top record.

53. In a phonograph, in combination, a turntable for supporting a stack of records, a depressible centering pin passing through holes in the records, a depressing pin movable above said turntable, means for causing said depressing pin to depress said depressible pin and engage the hole in the topmost record, and means for moving said depressing pin horizontally in its depressing position and then raising said depressing pin out of engagement with the hole in said topmost record.

54. In a phonograph, in combination, a turntable adapted to support a stack of records, said turntable having a spindle provided with an axial bore, a depressible center pin movably mounted in said bore passing through the holes in said records, means movable above the turntable during the successive playing of said records for depressing the pin in a series of steps through a distance substantially equal to the thickness of said stack of records, and means associated with said first named means for limiting the depression of said pin at each step substantially to the level of the underside of the topmost record.

55. A phonograph comprising a turntable adapted to receive a stack of records, said turntable having a spindle provided with an axial bore, a depressible pin mounted in said bore and adapted to project upwardly through the openings in said records, record removing means being mounted for movement above said stack tending to fall downwardly through the space occupied by said stack to depress the pin nearly to the turntable, and means on said record removing means adapted to engage the top record to limit the depression of the pin to a position in which its upper end is substantially in the plane of the underside of the topmost record.

56. A phonograph comprising a turntable adapted to receive a stack of records, said turntable having a spindle provided with an axial

bore, a depressible pin mounted in said bore adapted to project upwardly through the openings in said records, a record removing arm movable above said records, means tending to cause said arm to descend by gravity in the path of said pin through the space occupied by said stack to a position adjacent the turntable, said arm being capable of being arrested at a series of higher positions by the then topmost record of the stack, and means carried by said arm for depressing the pin to a position in which its upper end is substantially in the plane of the underside of the topmost record.

57. In a record changing phonograph, in combination, a support for a stack of records, a centering pin passing through holes in said records, a depressing pin mounted for movement to a plurality of record levels for depressing said centering pin, means associated with the depressing pin adapted to engage the surface of the topmost record to bring the upper end of the centering pin substantially to the level of the underside of the topmost record, and means resisting the movement of said centering pin below said position.

58. In a record changing phonograph, a turntable for supporting a stack of records, a centering pin slidably mounted in a bore in said turntable and passing through holes in said records, a depressing pin, an abutment associated with said depressing pin, said abutment being spaced inwardly of the free end of said depressing pin a distance substantially equal to the thickness of a record, means mounting said depressing pin and abutment for movement to a plurality of record levels for engaging the uppermost record of the stack and depressing said centering pin to bring its upper end substantially to the level of the underside of the topmost record, and means associated with said centering pin for resisting the movement of said centering pin below said position.

59. In a phonograph, in combination, a turntable adapted to support a stack of records, said turntable having a spindle provided with an axial bore, a depressible pin located in said bore extending through said records, said bore and pin being correlated to permit the pin to be depressed into said bore to free at least all the records of the stack except the lowermost, means above said turntable to depress said pin and having a limited entry into the opening of the top record for freeing said record from the depressible pin, means resisting the movement of the depressible pin below the topmost record, and means for causing said record to slide off the stack.

60. In a phonograph, in combination, a turntable, a player arm, means including resilient means for swinging the arm from final playing position back to a position adjacent initial playing position, a catch for engaging a member swingable with said arm and holding the arm in said position adjacent the initial playing position, motor means for rotating the turntable and energizing said resilient means, and means actuated by said motor means for controlling the release of the arm from said catch.

61. In a phonograph, in combination, a turntable, a player arm, means including resilient means for swinging the arm in one direction from final playing position back to a position adjacent initial playing position, a catch for engaging a member swingable with the arm and holding the arm in said position adjacent initial playing position, motor means for rotating the turntable and energizing said resilient means, means actuated by said motor means for controlling the release of the arm from said catch, and means cooperating with the arm for biasing the arm in the opposite direction into initial playing position whereby the arm is pushed towards the track of the record when the arm is released from the catch.

62. In a phonograph, in combination, a turntable, a player arm, means including resilient means for swinging the arm to a position adjacent initial playing position, means mounting the arm and turntable for relative vertical movements for effecting separation and approach between the arm and turntable, a catch for engaging a member swingable with the arm to arrest the swung arm and hold same adjacent initial playing position, means associated with the means for effecting separation and approach between the arm and turntable for releasing the arm from the catch, biasing means for imparting a slight motion to the member when released so as to push the arm towards the track of the record, and motor means for rotating the turntable, energizing said resilient means, and operating the means for effecting separation and approach between the arm and turntable.

EDWARD F. ANDREWS.