July 6, 1943. E. F. ANDREWS 2,323,365

AUTOMATIC PHONOGRAPH

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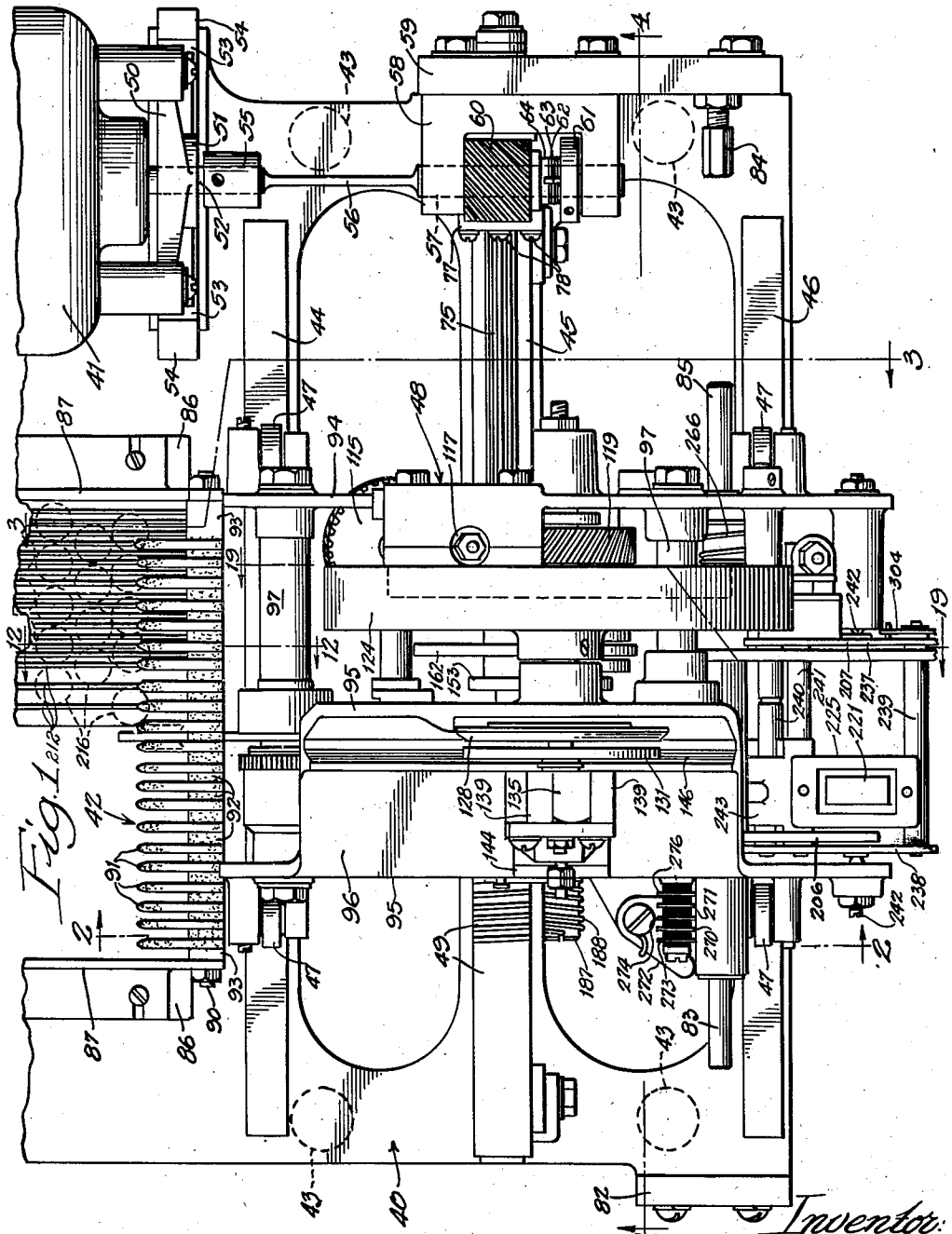


Fig. 1

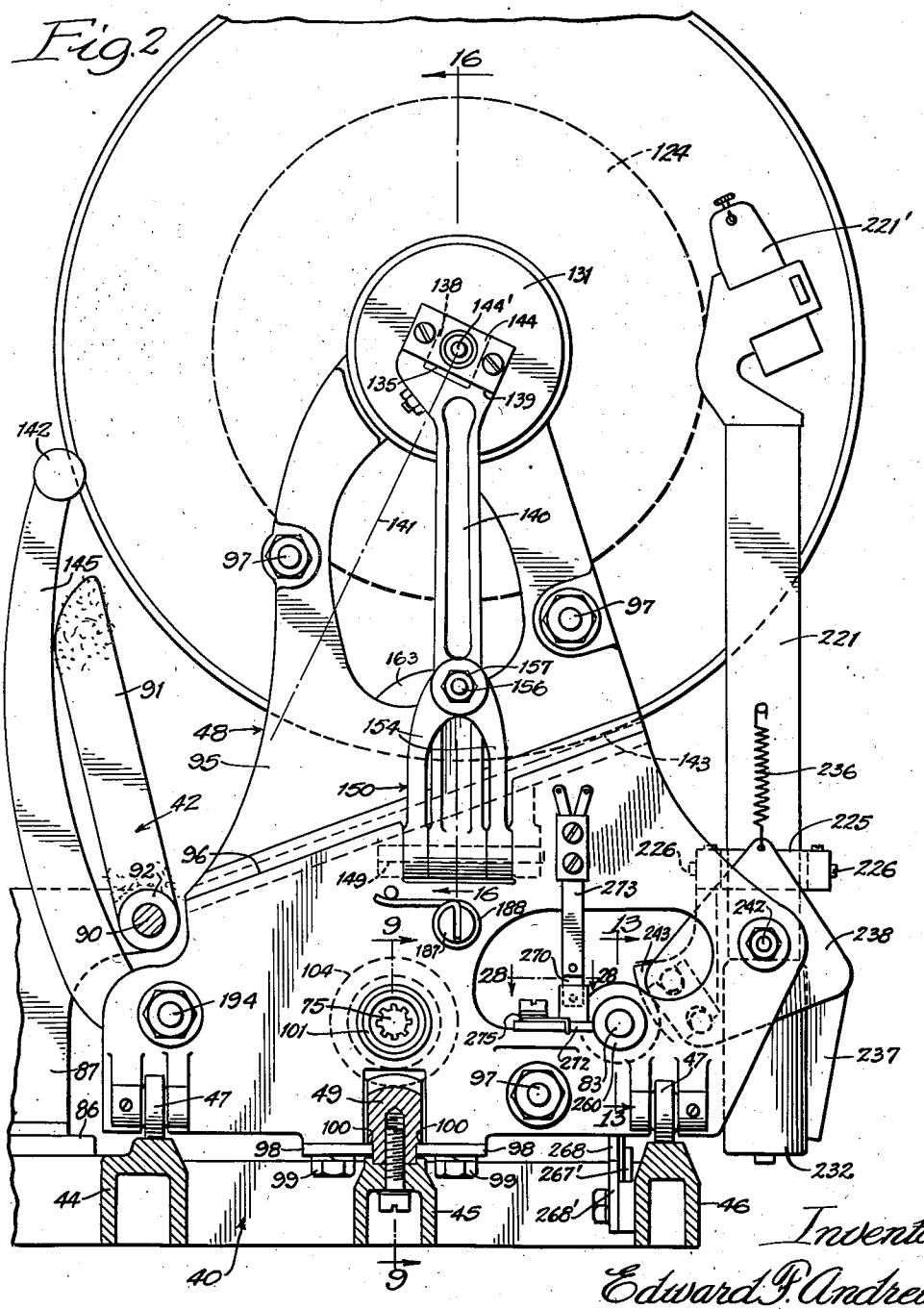
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Fig. 2



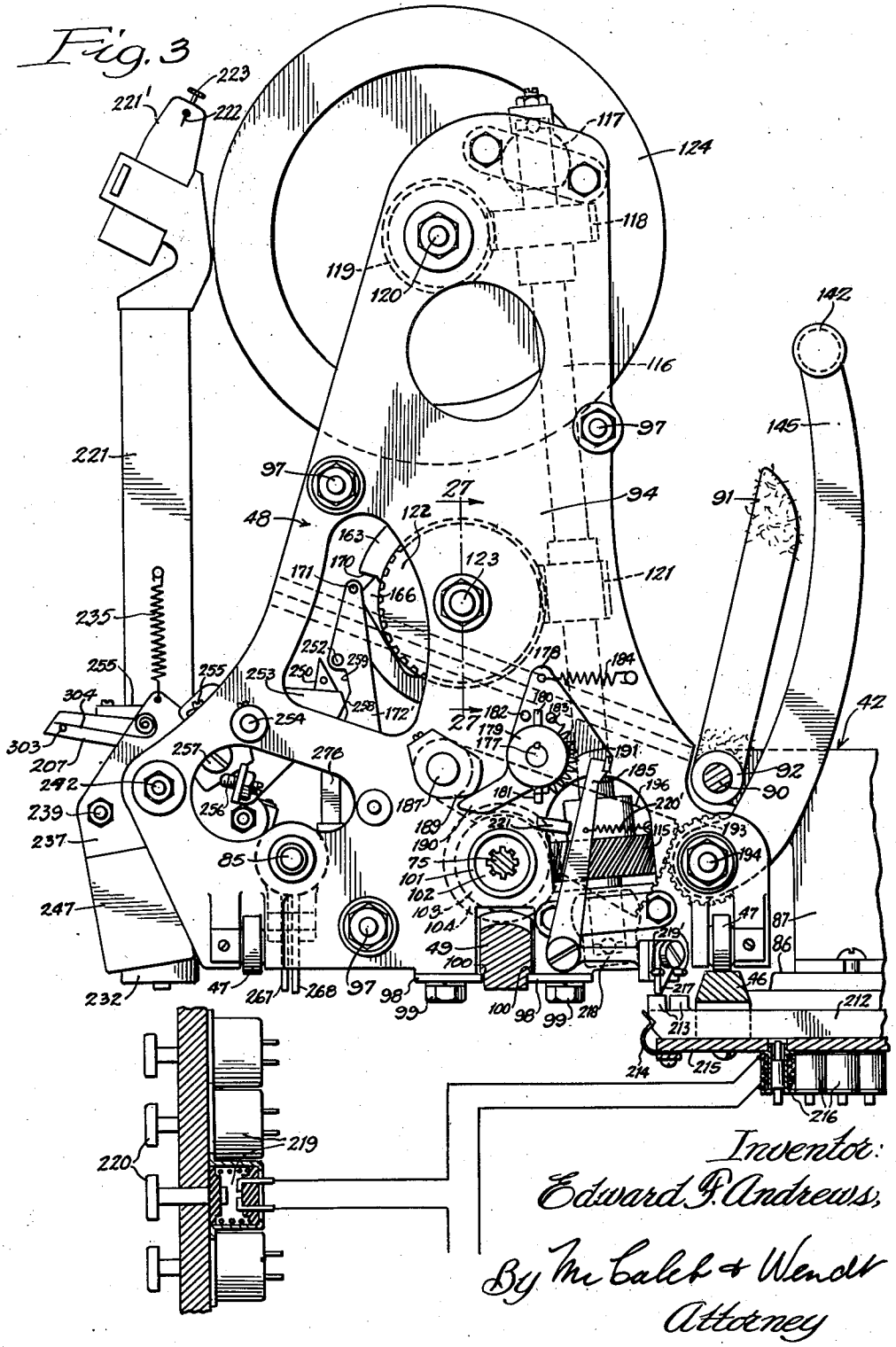
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Fig. 3



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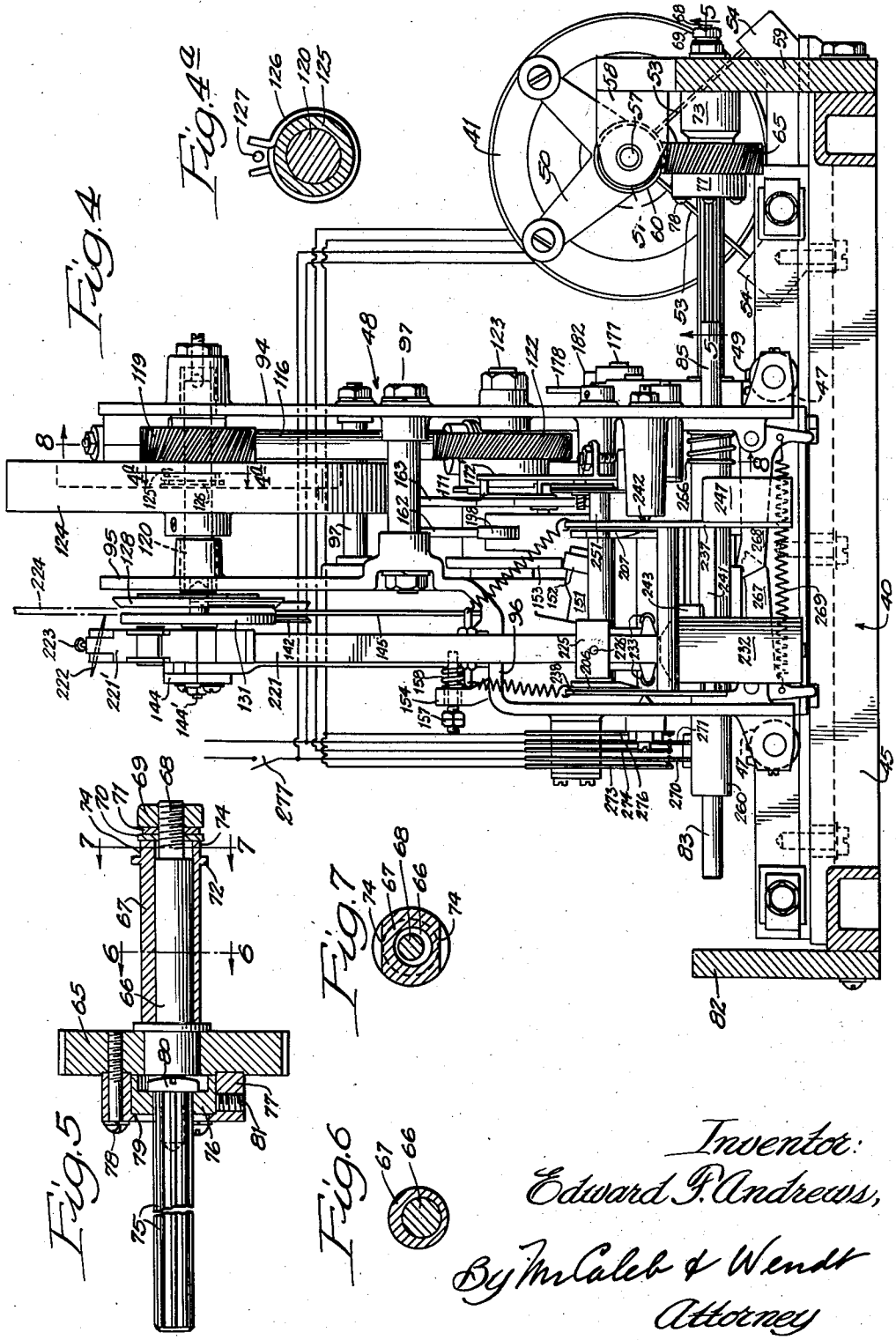


Fig. 4

Fig. 4a

Fig. 5

Fig. 7

Fig. 6

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Fig. 8

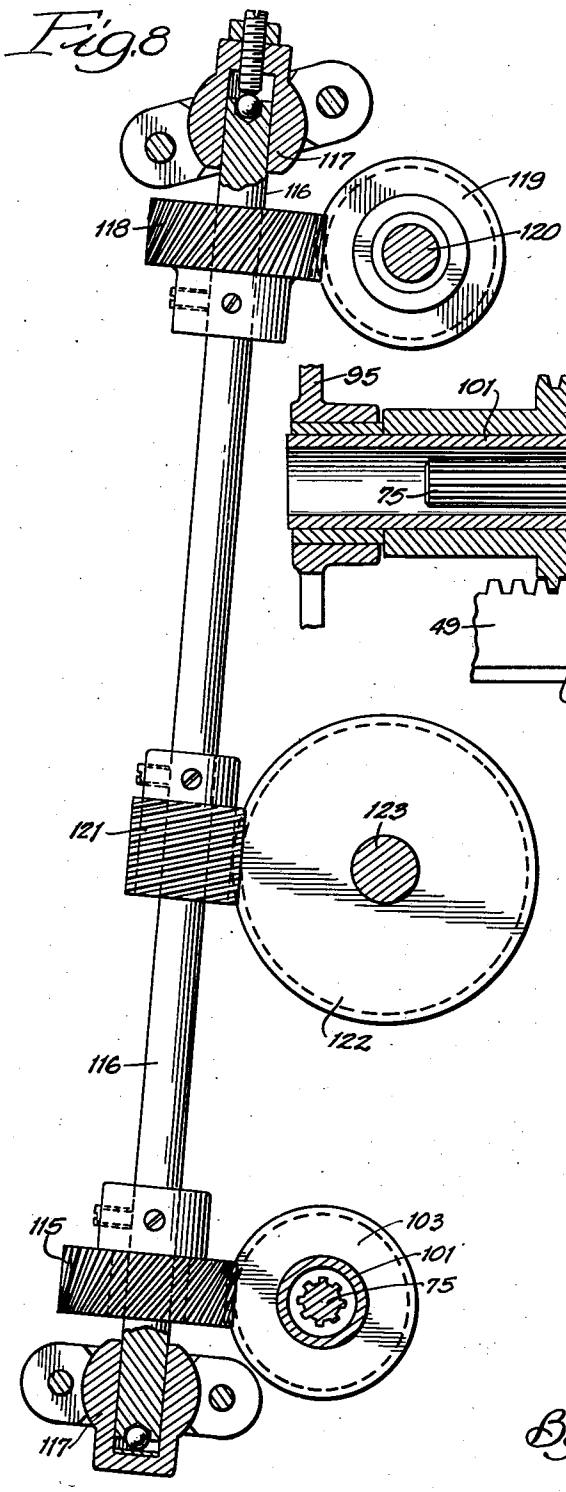


Fig. 10

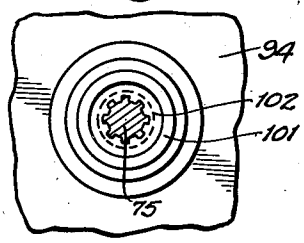


Fig. 9

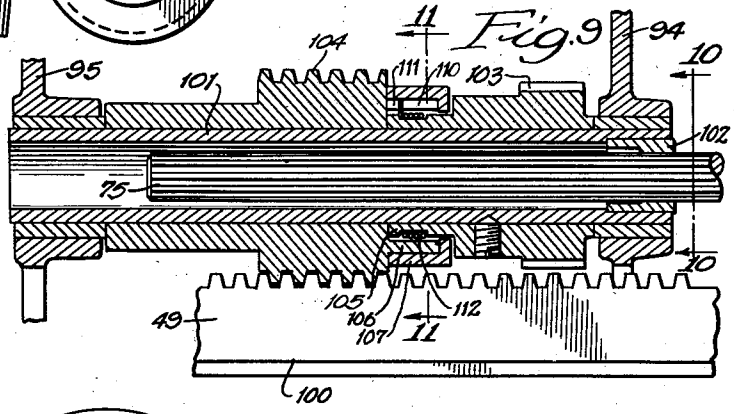
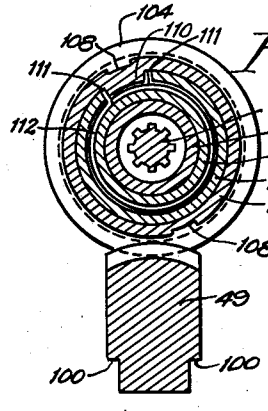


Fig. 11



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AUTOMATIC PHONOGRAPH

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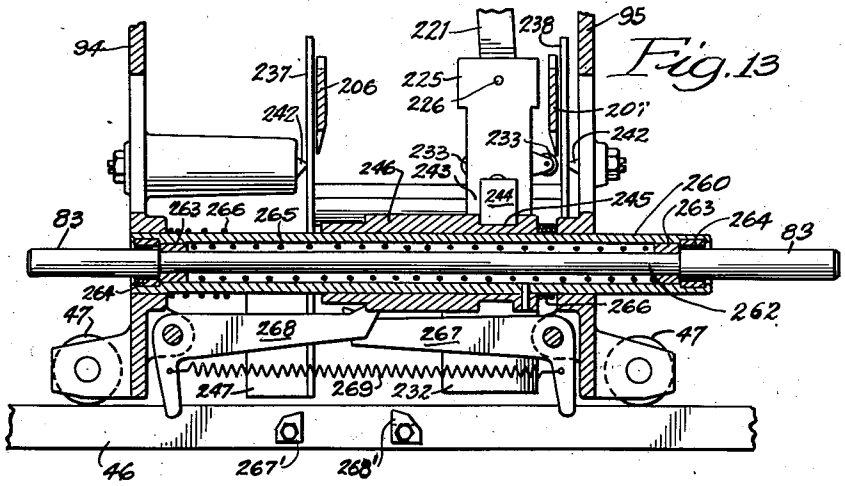


Fig. 13

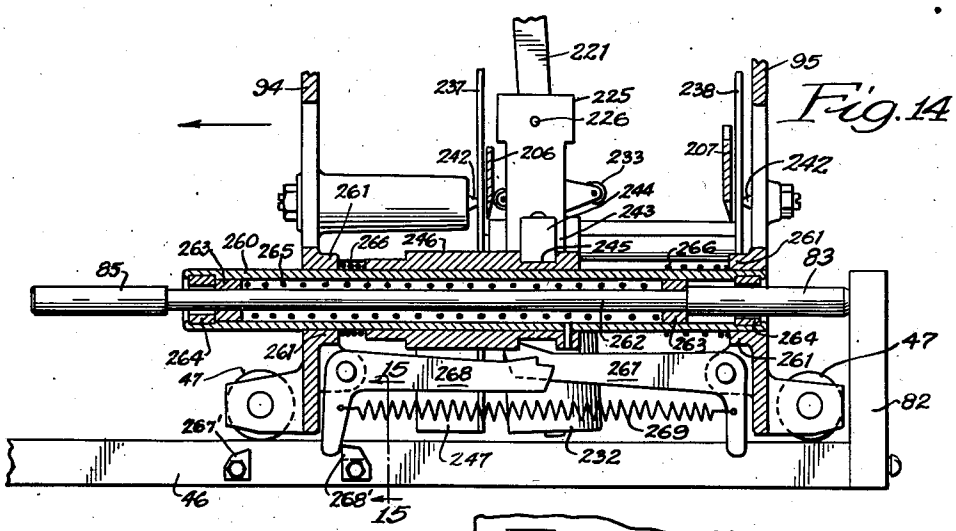


Fig. 14

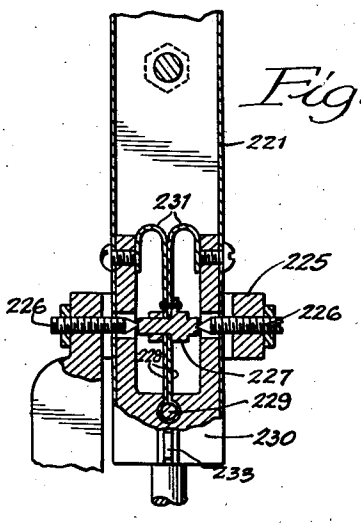


Fig. 29

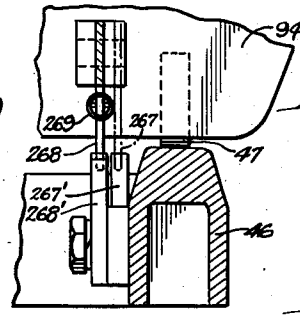


Fig. 15

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Fig. 16

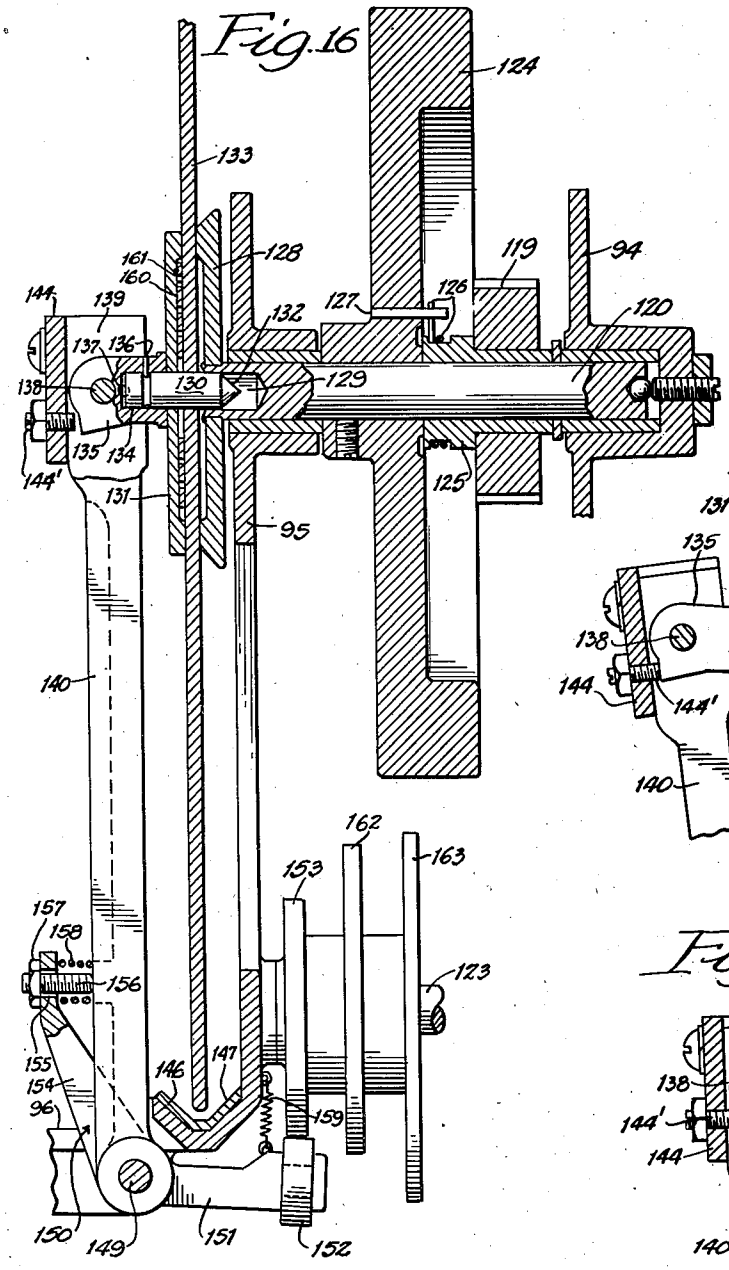


Fig. 17

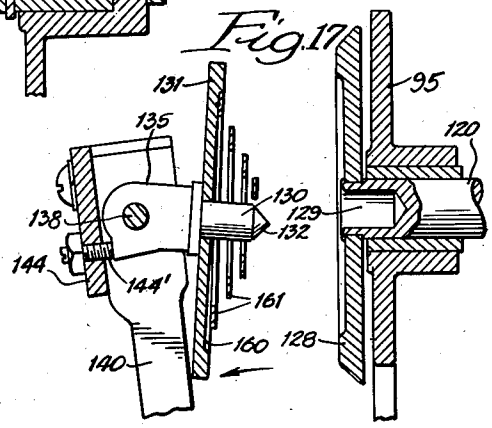
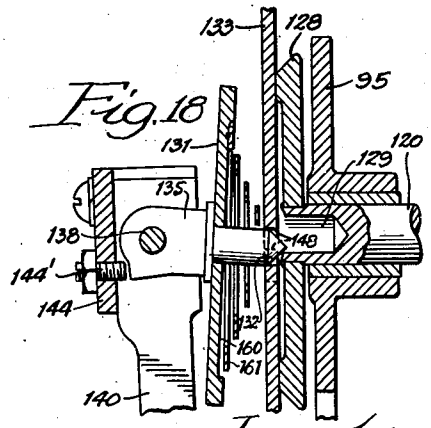


Fig. 18



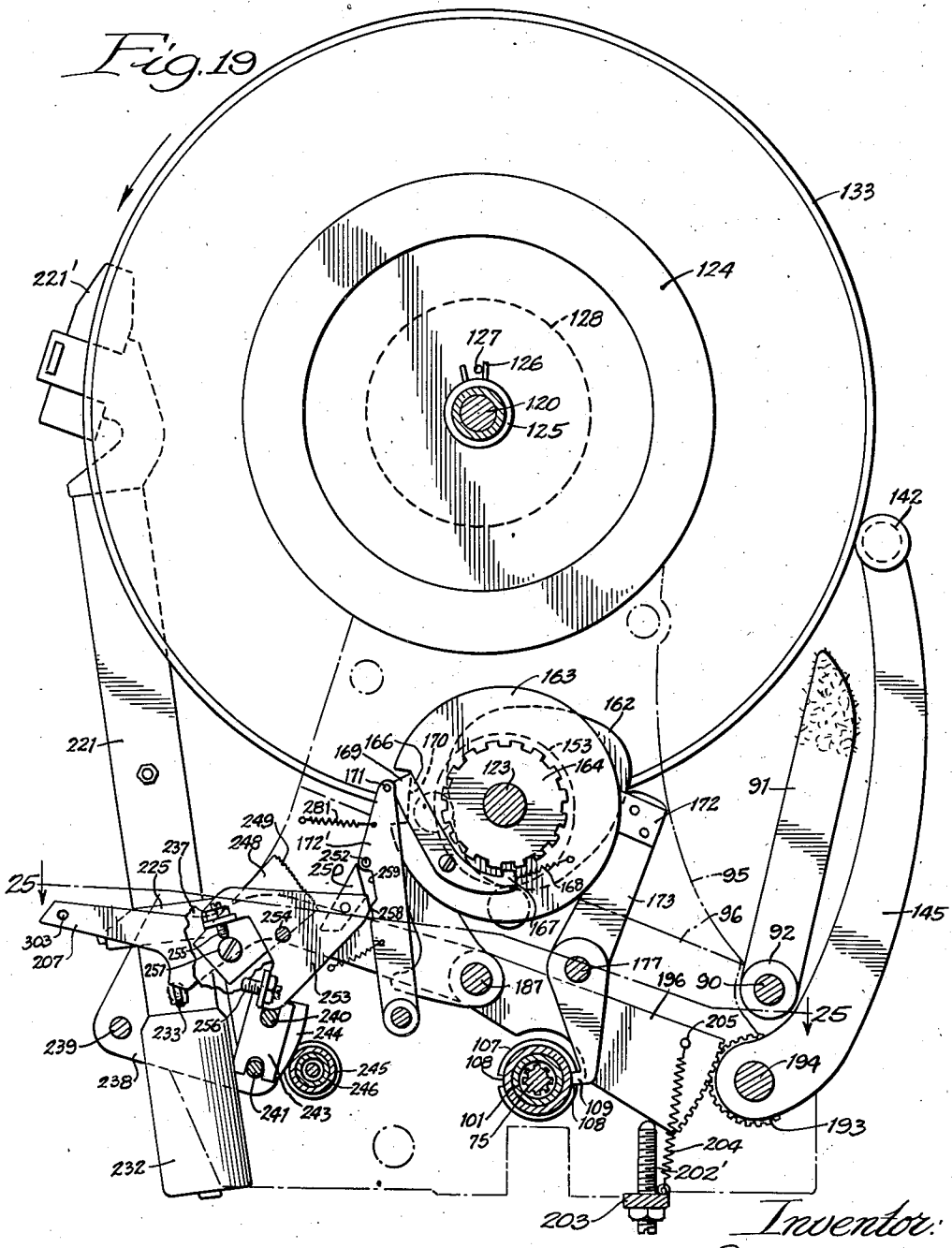
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Fig. 19



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Fig. 20

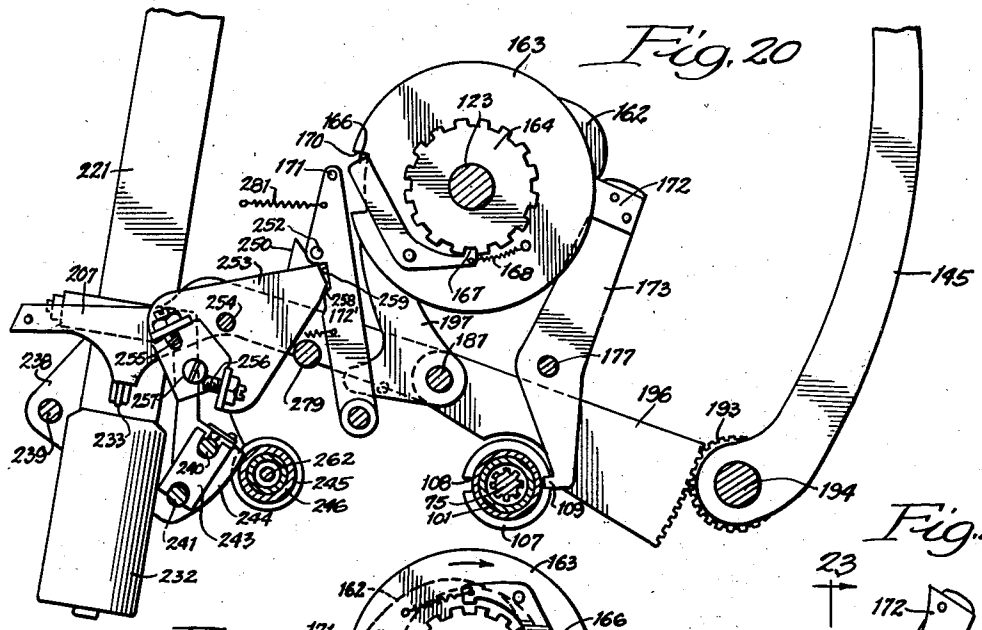


Fig. 22

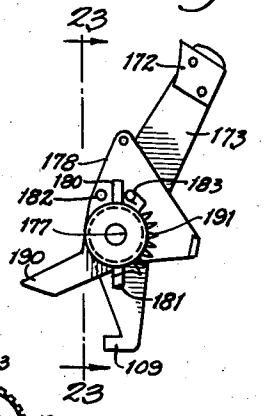


Fig. 21

Fig. 28

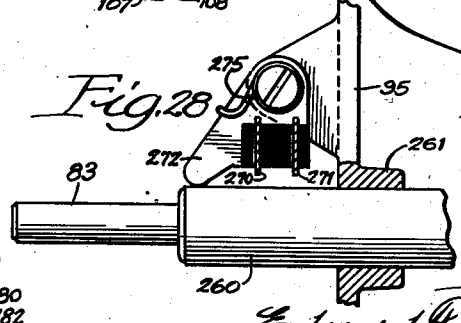
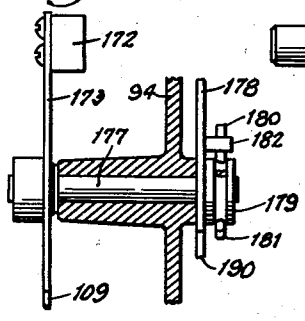


Fig. 23



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Fig. 24

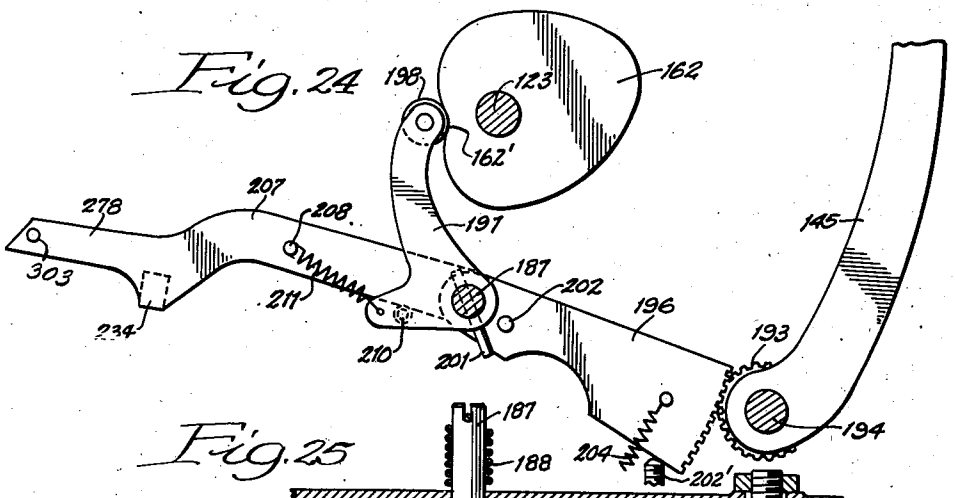


Fig. 25

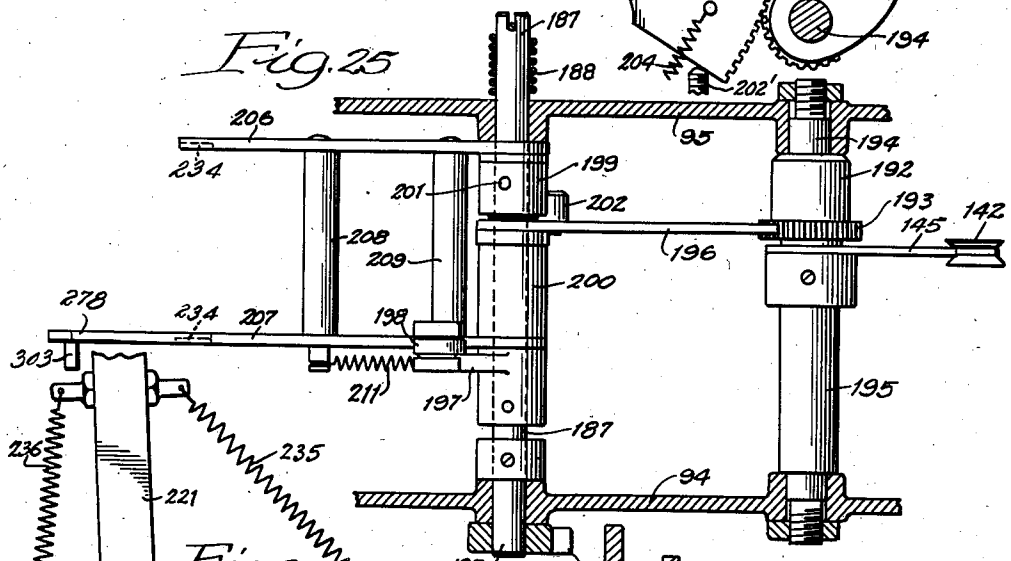


Fig. 26

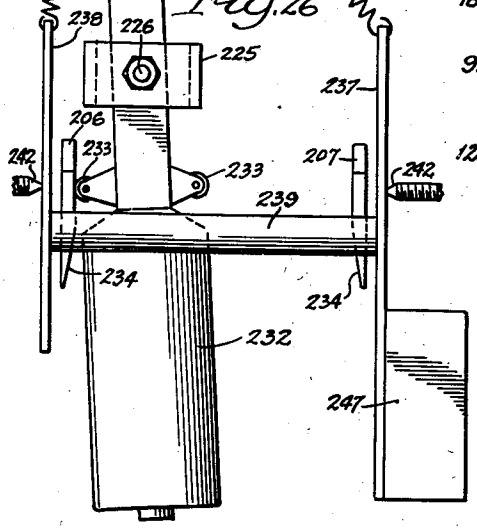
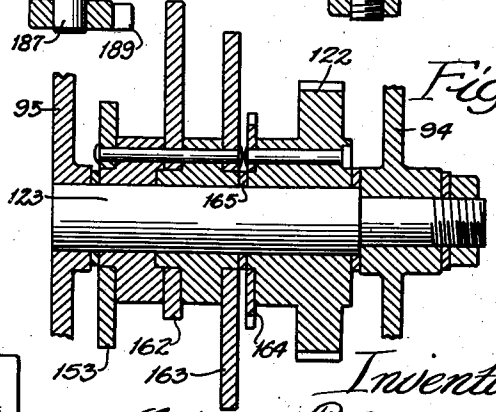


Fig. 27



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Fig. 30

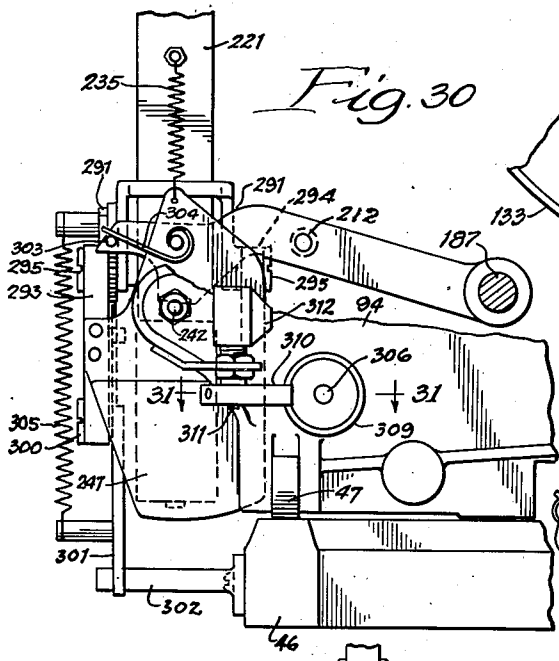


Fig. 12

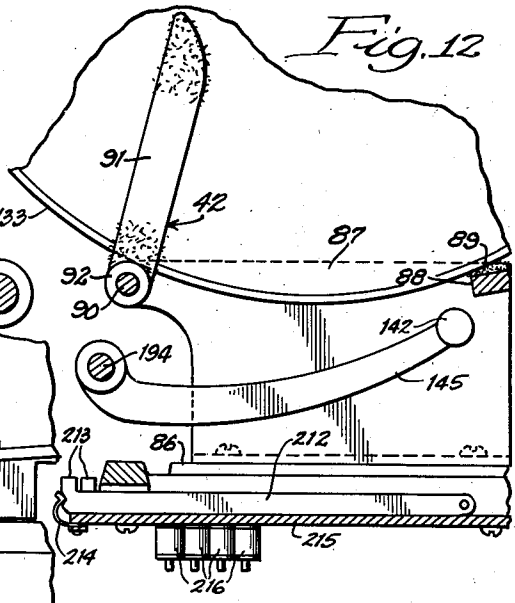


Fig. 31

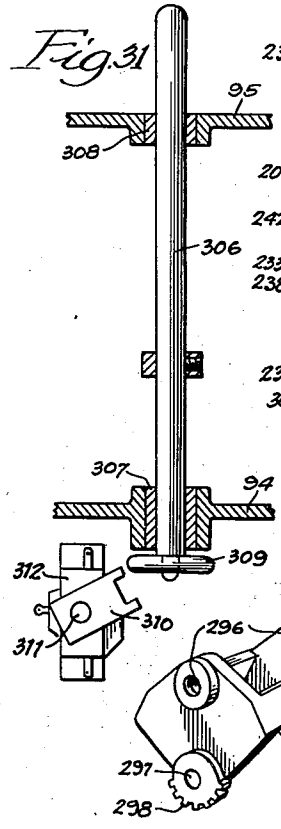


Fig. 32

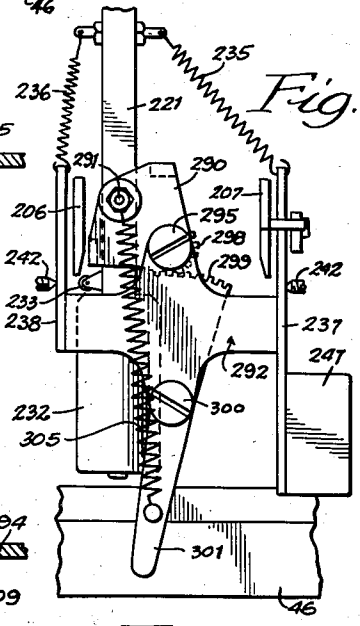


Fig. 33

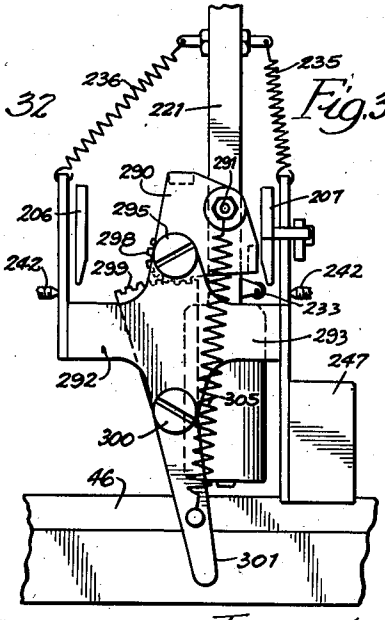
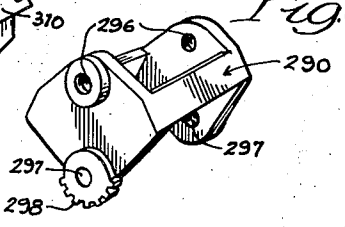


Fig. 34



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AUTOMATIC PHONOGRAPH

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Fig. 36

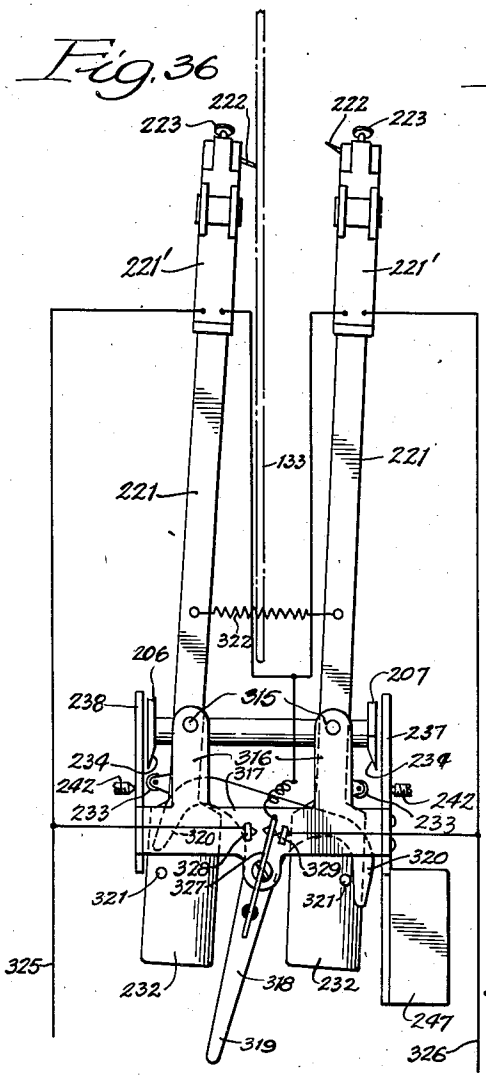


Fig. 35

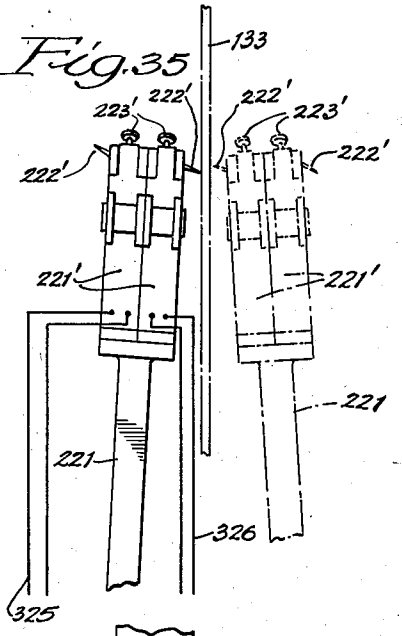
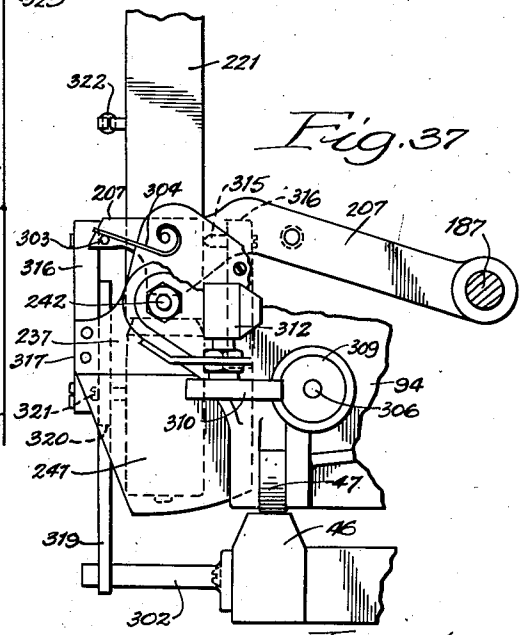


Fig. 37



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Patented July 6, 1943

2,323,365

UNITED STATES PATENT OFFICE

2,323,365

AUTOMATIC PHONOGRAPH

Edward F. Andrews, Chicago, Ill.

Application July 18, 1940, Serial No. 346,105

60 Claims. (Cl. 274—10)

This invention relates to automatic phonographs, and more particularly to phonographs of the same general type as those described and claimed in my co-pending applications Serial No. 180,752, filed December 20, 1937 (Patent No. 2,281,547), and Serial No. 214,310, filed June 17, 1938 (Patent No. 2,281,548) and to phonograph selector mechanism similar to that disclosed and claimed in my co-pending application Serial No. 332,175, filed April 29, 1940.

This general type of phonograph can be readily adapted for playing any desired number of records, even including the accommodation of a very large number of records in its magazine, and only very few and very simple additional parts are required per additional record accommodated.

In this general type of phonograph, the record is removed from the magazine onto rotatable record supporting means which supports and rotates the record with the recorded surfaces on both sides exposed. The record supporting means may be driven in opposite directions for the playing of opposite sides of the record supported thereon.

One of the objects of the invention is to provide a player arm adapted to operate on either side of the record playing position, said player arm being slidably mounted for movement to either side of said position;

A further object of the invention is to provide a player arm operable on either side of the record playing position and adapted to provide a needle point directed toward said record playing position from either side thereof;

A further object of the invention is to provide a phonograph of this type in which the magazine, on the one hand, and the record supporting means and player arm on the other, are arranged for relative movement, the rotation of the record supporting means and the position of the player arm being co-related so that one side of the records is played during a period in which the relative movement is in one direction, and the other sides of the records are played during a period when the relative movement is in the opposite direction;

A further object of the invention is to provide a phonograph of the last mentioned type, in which means are provided at the end of each movement in one direction for reversing the direction of rotation of the record supporting means and for bodily transporting the player arm from one side of the record playing position to the other side of that position;

A further object of the invention is to provide in a phonograph of this general type a player arm adapted to be moved bodily from one side to the other of record playing position, and common means for effecting the movement of the player arm away from a record being played on either side of the playing position;

A further object of the invention is to provide a player arm system comprising a frame on which the player arm is shiftably mounted, and means for counterbalancing the frame and player arm about their respective axes in all positions of the player arm, and providing resilient means for causing the needle to press upon the record;

A further object of the invention is to provide an improved drive for the operation of the record supporting means and the relative movement between the supporting means and the magazine;

A further object of the invention is to provide in a phonograph of this type improved drive means for record supporting members and for record changing cam mechanism, and for effecting said relative movement, and having improved means whereby the cam means and the means effecting said relative movement are operated alternately;

A further object of the invention is to provide a shifting player arm adapted to be operated by an energized spring;

A further object of the invention is to provide a phonograph of this type employing two player arms and improved means for rendering said player arms effective alternately for playing opposite sides of records;

A further object of the invention is to provide a novel double-pointed needle;

A further object of the invention is to provide an improved pick-up means with two needle points projecting outwardly in opposite directions therefrom;

A further object of the invention is to provide an improved pickup, thin in a direction perpendicular to the plane of the record being played, with the two needle points of a double pointed needle projecting diagonally outwardly in either direction from the thin dimension of said pickup;

A further object of the invention is to provide an improved pickup means with two needle points projecting outwardly in opposite directions therefrom, and means for moving said pickup to a position in which one needle point makes playing contact with one face of a record

to be played, and to a position in which the other point makes playing contact with the other face of a record to be played;

A further object of the invention is to provide means for resiliently biasing the pickup means toward the center of the record during either direction of rotation of the turntable;

A further object of the invention is to provide an extensible torque transmitting connection between the motor on the base and the record supporting means and carriage moving means on the carriage;

A further object of the invention is to provide a pickup capable of occupying one position for playing one side of a record and another position for playing the other side of a record, and in which the same motion effects the return of the pickup from the end of the record to initial playing position in either of the two said positions;

A further object of the invention is to provide an improved player arm, means for moving it to opposite sides of a playing position, and a pair of biasing means rendered effective alternately when the player arm is shifted to bias the player arm towards record playing position;

A further object of the invention is to provide a phonograph of this type comprising a stationary magazine and a playing unit movable along the magazine in opposite directions, the playing unit comprising a player arm and record supporting and rotating means, the player arm and record supporting and rotating means being co-related to cooperate to play one side of the records when the player unit is moving in one direction, and the other side of the records when the player unit is moving in the opposite direction;

A further object is to provide means for introducing eccentricity variable in amount and position into one set of gearing between the motor and the turntable to compensate for an eccentricity already present in another set of said gearing to minimize the variations in turntable speed;

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

Fig. 1 is a plan view, the rear or record magazine end being partly broken away and with no record in playing position better to illustrate other details, of a phonograph embodying my invention;

Fig. 2 is a sectional elevational view thereof, the section being taken on the line 2—2 of Fig. 1. In this view a record is shown on the movable carriage or player unit;

Fig. 3 is a sectional elevation of the phonograph, the section being taken on the broken line 3—3 of Fig. 1;

Fig. 4 is an elevational view of the phonograph, the frame being shown in section, taken on the line 4—4 of Fig. 1. This view also illustrates diagrammatically the electrical circuits of the apparatus;

Fig. 4A is a sectional detail view of a portion of the turntable drive, the section being taken on the line 4A—4A of Fig. 4;

Fig. 5 is a sectional detail view of a portion of the drive between the motor and movable player unit, the section being taken on the line 5—5 of Fig. 4;

Fig. 6 is a sectional detail view, the section being taken on the line 6—6 of Fig. 5;

Fig. 7 is a sectional detail view, the section being taken on the line 7—7 of Fig. 5;

Fig. 8 is an enlarged sectional detail view of the turntable and camshaft drive shaft 116 and associated elements, the view being taken on the line 8—8 of Fig. 4;

Fig. 9 is a fragmentary sectional detail view showing a clutch mechanism for driving the player unit, the section being taken on the line 9—9 of Fig. 2;

Fig. 10 is a sectional detail view, the section being taken on the line 10—10 of Fig. 9;

Fig. 11 is a sectional detail view, the section being taken on the line 11—11 of Fig. 9;

Fig. 12 is a fragmentary sectional elevational view through the magazine and illustrating a portion of the record transfer mechanism and the record selector mechanism, the section being taken on the line 12—12 of Fig. 1;

Fig. 13 is a sectional detail view of the player arm shifting mechanism when the player unit is moving toward the left as viewed in Figure 1 and to the right as viewed in Figure 13, the section being taken on the line 13—13 of Fig. 2;

Fig. 14 is a view similar to Fig. 13, showing the mechanism when the player unit is at the limit of its movement toward the right as viewed in Figure 14 and about to move to the left;

Fig. 15 is a sectional detail view illustrating details of the player arm latching mechanism, the section being taken on the line 15—15 of Fig. 14;

Fig. 16 is a fragmentary sectional elevation through the turntable shaft and record clamping and centering mechanism with a record clamped and centered, the view being taken on the line 16—16 of Fig. 2;

Fig. 17 is a fragmentary sectional view showing the record clamping and centering mechanism when separated;

Fig. 18 is a view similar to Fig. 17, showing the manner in which the record clamping and centering members approach during the clamping of a record thereby;

Fig. 19 is a sectional elevation of the phonograph, the section being taken on the broken line 19—19 of Fig. 1, the view illustrating, among other things, the camshaft clutch and its associated control;

Fig. 20 is a sectional detail view taken on the same plane as Fig. 19, showing the camshaft clutch dog 166 in engaged relation to effect the driving of the camshaft after a record has been played;

Fig. 21 is a view similar to Fig. 20, showing the camshaft clutch dog 166 engaged by dog clutch release member 172 after the played record has been returned and the drive of the carriage released to permit the movement of the movable carriage into alignment with the record next to be played;

Fig. 22 is a diagrammatic view showing the relationship of the control lever 173, carrying the release member 172, and a carriage drive clutch control member 178, which members are on the inner and outer sides of the frame member 94;

Fig. 23 is a fragmentary sectional elevation taken on the line 23—23 of Fig. 22, the frame member 94 being shown in section;

Fig. 24 is a sectional elevation similar to Fig. 20, certain elements being omitted to show the mechanism for moving the record out of the magazine, raising the player arm out of engagement with the record, and swinging the player arm back to initial position;

Fig. 25 is a fragmentary sectional plan view of the mechanism shown in Fig. 24 (except for the cam 162 and camshaft 163), the section being taken on the line 25—25 of Fig. 19;

Fig. 26 is a fragmentary elevational view of the lower portion of the player arm in the mechanism whereby it is supported, certain parts of the mechanism being omitted;

Fig. 27 is a sectional detail view through the cam shaft assembly, the section being taken on the line 27—27 of Fig. 3;

Fig. 28 is a sectional plan detail of the motor reversing switch, the section being taken on the line 28—28 of Fig. 2;

Fig. 29 is a sectional detail view through the player arm adjacent its pivotal support and illustrating details of the resilient mounting for the arm;

Fig. 30 is a fragmentary elevation of a modified player arm frame and shifting mechanism;

Fig. 31 is a sectional detail, the section being taken on the line 31—31 of Fig. 30 and illustrating a modified form of reversing switch and its operating mechanism;

Fig. 32 is an elevation of the player arm mounting mechanism, as viewed from the left of Fig. 30;

Fig. 33 is an elevational view similar to Fig. 32, showing the player arm in position to play the opposite side of a record from that shown in Fig. 32;

Fig. 34 is a perspective view of a player arm supporting and shifting cradle employed in the structure shown in Figs. 30, 32, and 33;

Fig. 35 is a fragmentary diagrammatic view showing the manner in which two pickups may be mounted on the player arm instead of the single pickup, as shown in previously illustrated embodiment;

Fig. 36 is an elevational view of a player arm structure comprising two separate player arms; and

Fig. 37 is a fragmentary elevational view of the lower part of the structure shown in Fig. 36, the structure being viewed from the right in that figure.

Certain features of the apparatus illustrated in the above referred to drawings and described hereinafter are disclosed and claimed in the application of Olgierd Gierwiatowsky, application Serial No. 441,624, filed May 4, 1942. These features include a record transfer mechanism wherein the transfer of records from one position to another are effected by a single record edge engaging transfer arm, the construction whereby the said arm is actuated from a cam, and the arrangement for centering and clamping a record in playing position.

Referring to the drawings, the reference numeral 40 designates a base which may consist of an integral casting which provides a support for a motor 41 and a record magazine 42. The base comprises six downwardly projecting legs 43 (only four of which are shown in dotted lines in Fig. 1) whereby the machine may be supported in suitable manner, preferably by means of springs (not shown). The motor 41 and magazine 42 are located in the rear part of the machine, as shown in Fig. 1. In the forward part of the machine, the base comprises three transverse rail formations 44, 45, and 46. The rail formations 44 and 46 have flat machined surfaces for the reception of rollers 47, upon which the movable unit 48 is supported. The rail formation 45 is recessed to receive a rack 49, which is securely bolted to the rail formation 45, as best seen in Fig. 2. The motor 41 has secured to each end an integral V structure 50 which comprises a hub portion 51 in axial alignment with the motor shaft 52 which extends freely through one of the hub portions, as best shown in Fig. 1 wherein but one of the structures is illustrated because of the limited space available. The hub portions 51 are connected to resilient members 53 which extend downwardly and outwardly in radial relation to the shaft 52, as best seen in Fig. 4. The resilient members 53 are anchored to blocks 54 which are rigidly mounted on the base 40. The resilient members 53, located at each end of the motor, provide a resilient mounting therefor. The motor shaft 52 is coupled to a shaft 55, the major portion of which is of substantially reduced cross-sectional area, as best shown in Fig. 1 at 56. This portion of the shaft is round in cross-section and is so small that it is sufficiently resilient to serve in place of universal joints. A small piece of flexible shafting may also be employed at 56. The end of the shaft 55 remote from the motor, which portion of the shaft is indicated by the reference numeral 57, is provided with bearings in a bracket 58, which is mounted on a plate member 59, rigidly bolted to the base 40. Between the two bearing portions of the bracket 58, the shaft 57 freely supports a helical pinion 60, and has rigidly mounted thereon a disc 61. The disc 61 carries a pin 62 which is directed towards the pinion 60. This pin serves as an anchorage for a spring clutch member 63, several turns of which embrace a cylindrical hub member 64, which is integral with the pinion 60. The spring clutch member 63 is arranged so that the drive of the motor tends to release the spring clutch member. Thus, in normal operation of the machine, the motor will drive the mechanism, but if, for any reason, the mechanism becomes overloaded, the spring clutch member 63 will slip and the motor may continue to rotate without driving the pinion 60.

The pinion 60 meshes with the helical gear 65, which is rigidly mounted on a shaft 66 (Figs. 4 and 5). The shaft 66 is arranged in eccentric relation to the gear 65 and it is surrounded by an eccentric sleeve 67, which is adapted to be rigidly secured to the shaft 66. For this purpose, the outer end of the shaft 66 is provided with a reduced threaded end 68 which is adapted to receive a nut 69. A washer 70 bears against the outer end of the sleeve 67, and a lock washer 71 is interposed between the nut 69 and the washer 70. It will readily be understood with reference to Fig. 5 that by merely tightening the nut 69, the sleeve 67 may be immovably secured to the shaft 66. The sleeve 67 is provided near its outer end with a flange 72, which serves to hold the assembly in an elongated bearing 73 mounted on the plate member 59 (see Fig. 4). The outer end of the sleeve 67, that is, the portion beyond the flange 72, is provided with flat faces 74 (Fig. 7) whereby the sleeve 67 may be rotated relative to the shaft 66 so as to provide any desired degree of eccentricity between the outer surface of the sleeve 67 and the gear 65. When such an adjustment is made, the nut 69 is of course loosened, and after the desired adjustment is made, the nut 69 is tightened so that the gear 65 is provided with a definite desired degree of eccentricity relative to the bearing 73. The purpose of this eccentricity will be hereinafter more fully explained.

It may be noted, however, that the eccentricity of the shaft 66 and the eccentricity of the sleeve 67 should be very closely the same so that in at least one position of the sleeve 67 on the shaft 66, the outer surface of the sleeve 67 may be in concentric relation to the axis of the gear wheel 65.

A splined shaft 75 is secured to the gear 65 so as to extend axially therefrom away from the shaft 66. This splined shaft 75 extends inwardly of the machine over the rack 49 (Figs. 1, 2 and 3). Its extremity adjacent the gear wheel 65 is non-rotatably received in a disc 76, with which it has a splined connection (Fig. 5). The splined disc 76 is held to the gear 65 by means of an annular member 77, which is mounted on the gear 65 by means of screws 78. The annular member 77 is provided with an inner flange 79 which is adapted to overlap the disc 76. The side of the disc 76 adjacent the gear 65 is countersunk and receives a screw 80 which projects beyond the shaft 75 so as to loosely anchor the shaft to the disc 76. The disc 76 is secured to the annular member 77, and consequently to the gear 65 against relative rotation by means of a set screw 81 mounted in the annular member 77. It will readily be understood that by merely loosening the screw 81 and rotating the shaft 75 relative to the gear 65, that the eccentricity resulting from the relative positions between the shaft 66 and the sleeve 67 may be adjusted circumferentially to any desired position relative to the shaft 75. After the desired adjustment is made, the set screw 81 is tightened.

On the opposite side of the base from the plate member 59 is mounted a plate member 82 (Fig. 1), which is adapted to serve as an abutment for a member 83 on the movable carriage. A bolt 84, adjustably mounted on the plate member 59 serves as an abutment for a member 85, also mounted on the movable carriage.

The base 40 provides supports 86 for the reception of the magazine 42 (Figs. 1 to 3 and 12). The magazine 42 comprises two end members 87, each provided with a flange at its lower end, which flange rests on one of the supports 86. The end members are connected by a rear bar 88 (Fig. 12) provided with a series of notches 89, each notch being adapted to receive a record. The forward extremities of the end members 87 are connected by a bolt 90 upon which are supported a series of guide bars 91. The guide bars are separated by shoulders 92, and the extreme guide bars are separated from the end members 87 by spacer members 93. The guide bars extend upwardly and are inclined rearwardly to a slight extent. Their upper ends are preferably tapered to a relatively sharp point so that the space between adjacent guides is relatively greater at their upper extremities. The spaces between the guide bars 91 are located in alignment with the notches 89. The guide bars 91 are preferably of flat stock, their width being located in the longitudinal direction of the machine.

The remaining mechanism of the machine is mounted on the carriage 48, previously referred to. This carriage comprises two main frame members 94 and 95. The main frame member 94 is vertically disposed and consists of a casting of substantially rectangular form, as shown in Fig. 3. The main frame member 95 is likewise in the form of a casting and is preferably of substantially triangular form, as shown in Fig. 2. The frame member 95 is, however, stepped at an intermediate height in the manner shown in Figs. 1 and 4, the stepped portion providing a shelf formation 96, which is inclined downwardly and rearwardly towards the magazine, as best seen in Fig. 2. The two frame members 94 and 95 are assembled together in spaced relation by means of three bolts and spacing members 97, as best shown in Figs. 2 and 3. The supporting wheels 47 are mounted on the end members 94 and 95. The carriage is movably secured to the base by means of guide bars 98 which extend transversely of the machine and are rigidly secured at the lower ends of the frame members 94 and 95 by means of bolts 99. The guide bars 98 extend inwardly beneath shoulders 100 formed on the rack 49, as best seen in Figs. 2 and 3.

A sleeve 101 (Fig. 9) located in alignment with the shaft 75, is rotatably mounted in the frame members 94 and 95. The splined shaft 75 extends into the sleeve 101 through a splined member 102, with which it has a spline connection. The member 102 is rigidly secured to the sleeve 101 so that this sleeve is driven by the splined shaft 75 at all times during the operation of the motor and irrespective of the particular location in which the carriage 48 is for the time being.

Rigidly mounted on the sleeve 101 adjacent the frame member 94 is a helical gear 103. Adjacent the gear 103 and between it and the frame member 95 is mounted a worm gear 104 which is freely mounted on the sleeve 101, but is adapted to be driven thereby through suitable clutch mechanism. As best seen in Figs. 9 and 11, this clutch mechanism includes an inner annular member 105 which is integral with the gear 103, an intermediate annular member 106 which is integral with the worm 104, and an outer annular member 107. The outer annular member is provided with one or more peripheral recesses 108 (Fig. 11) whereby its rotation may be arrested by a detent 109 (Figs. 19, 20, and 21) in a manner which will be more particularly described hereinafter. The outer annular member 107 is provided with an interior projection 110 which extends into a slot in the annular member 106, as best seen in Fig. 11. Between the projection 110 and the sides of said slot are pockets 111 which receive the out-turned ends of a coil spring 112 which naturally coils tightly around the annular member 105. As shown in Figs. 9 and 11, clearance is provided between the annular members 105 and 106 to provide for the location and limited expansion of the spring 112. When the annular member 107 is allowed to rotate freely, then when the shaft 75 is rotated in one direction or the other, then the gear 103 and the worm 104 will rotate in the same direction. Thus, if the pinion 103, and of course its annular member 105, is rotated in the clockwise direction, as viewed in Fig. 11, then the spring 112 is tight upon the annular member 105, and the right hand end of the spring, as viewed in Fig. 11, will engage the annular member 104 so as to rotate this member also in the same direction. When, however, the annular member 107 is held against rotation, in the manner previously indicated, then the annular member 106 is carried in the clockwise direction away from the right hand end of the spring 112 so that the tendency to drive is exerted by the left hand side of the spring 112 against the projection 110. In this relation, the rotation of the member 105 tends to loosen the spring so that the clutch connection between the worm 104 and the gear 105 is substantially disengaged. It will be understood that a precisely similar effect takes place when the direction of rotation of the splined shaft 75 is in the opposite direction.

The helical gear 103 meshes with a helical gear 115 on a drive shaft 116 (Figs. 3 and 8). The shaft 116 is mounted in suitable bearings 117 which are carried by the frame member 94. Adjacent its upper end, the shaft 116 is provided with a helical gear 118 which meshes with a helical gear 119, freely mounted on the turntable shaft 120. The helical gears 103, 115, 118, and 119 are of the same diameter. At an intermediate position, the shaft 116 carries a worm 121 which meshes with a worm gear 122 which is freely rotatable on a cam shaft 123 which extends between the frame members 94 and 95, as shown in Fig. 27.

The shaft 120 is rotatably mounted in suitable bearings in the frame members 94 and 95, as shown in Figs. 4 and 16. Between these frame members and alongside the gear 119, the shaft 120 rigidly carries a fly wheel 124. Upon the hub 125 of the gear 119 is mounted a coil spring 126 which is of such a size that it grips the hub 125. The ends of the spring are turned outwardly, as shown in Fig. 4A so that one or other of these ends tends to contact a pin 127 carried by the fly wheel 124. The arrangement is such that when the hub 125 is driven in one direction, then one of the ends of the spring 126 engages the pin 127, and this engagement is such that it tends to release the spring 126 from the hub 125. The spring is sufficiently strong that this release does not ordinarily take place, but the turntable elements and the fly wheel 124 are driven through the engagement of this end of the spring 126 with the pin 127. As will hereinafter appear, the turntable 124 is driven in opposite directions. It will be seen that when the direction of rotation is reversed, then the other end of the spring 126 is brought into driving operation. This connection, and also the previously described similar connection 62 and 63 between the motor shaft and pinion 60, are effective in suppressing high frequency speed fluctuations which might otherwise affect the quality of the musical reproduction.

One end of the shaft 120 projects through the frame member 95 and carries a turntable element 128 which is adapted to engage the record at its center. This turntable element is so small that it is clear of the recorded surface on substantially all records. As best seen in Fig. 4, the turntable element 128 is located immediately on the outer side of the frame member 95 at a position substantially above the shelf portion 96 of that frame member. As best shown in Fig. 16, the end of the shaft 120 which carries the turntable element 128 is provided with an axial opening 129 which is adapted to receive a pin 130 which projects out of a movable turntable element 131. The pin 130 has an outer tapered end 132 which is adapted to project into the opening 129 when a record 133 is held between the turntable elements 128 and 131, as shown in Fig. 16. The turntable member 131 is rigidly secured to the pin 130 to which it may be secured by a pressed fit. The pin 130 is rotatably mounted in an opening 134 in a block 135 in which it is secured against removal by any suitable means, for example, by means of a circumferential groove and a set pin 136. The inner end of the pin 130 comprises a ball 137 which is adapted to bear against the inner end of the opening 134. The block 135 is pivotally mounted by means of a pivot 138 between the bifurcated upper ends 139 of an arm 140. The pivot 138 is located obliquely, as shown in Fig. 2, so that the block 135 is mounted to swing in a plane which includes the dot and dash line 141 which lies approximately halfway between the point at which a record being loaded on the turntable is engaged by the record elevating member 142 and the point at which such a record engages the shelf portion 96 of the frame member 95, this point being approximately indicated by the reference numeral 143. The two arms 139 are bridged by a plate 144 which carries a set screw 144'. This set screw is adapted to engage the block 135 in the manner shown in Fig. 17, and by use of this set screw, the pin 130 can be adjusted accurately to cooperate with a record 133 which is to be loaded onto the turntable element, and with the recess 129, in a manner which will now be described.

It will be understood that the record elevating arm 145 which carries the record elevating member 142 is swung into the position in which it is shown in Fig. 2 in order to elevate a record from the magazine into loading position. When a record is thus elevated, it rolls up the shelf portion 96 of the frame member 95. This shelf portion is provided with a groove 146 (Figs. 1 and 16), preferably lined with a flexible member 147, so as to guide the record while it rolls up the shelf portion 96. When the record is thus elevated into a position in which it is shown in Fig. 2, its central opening 148 is so located that the point of the pin 130 enters just below the top edge of the opening 148, when the arm 140 is swung inwardly towards the turntable element 128, as shown in Fig. 18. Continued movement of the arm 140 towards the turntable element 128 first raises the record and then brings the conical extremity 132 of the pin 130 into the opening 129 in the manner shown in Fig. 18. Continued approach of the arm 140 towards the turntable element 128 causes the pin 130 and the block 135 to swing about its pivot both upwardly and away from the record elevating element 142 so that when the pin 130 is in alignment with the opening 129, the record 133 is clear both from the lining 147 in the groove 146 and from the record elevating element 142. Continued movement of the arm 140 towards the turntable element 128 finally clamps the record 133 between the two turntable elements 131 and 128, as is shown in Fig. 16. The arm 140 is mounted on a pivot 149 supported in suitable bosses on the frame member 95 below the shelf portion 96 thereof. Also supported on the pivot 149 is a bell crank lever 150. This lever comprises an arm 151 which extends inwardly, as shown in Fig. 16, and carries at its innermost end a cam roller 152 which cooperates with a cam 153, which will hereinafter be more particularly described. The other portion of the bell crank lever 150 comprises a yoke 154 (Figs. 2 and 16), the upper portion of which is in alignment with the arm 140, and is provided with an opening 155 through which projects a bolt 156 carried by the arm 140. The outer end of the blot 156 carries a nut 157 which limits the outward movement of the yoke 154 away from the arm 140. A coil spring 158 is located around the bolt 156 and bears against the arm 140 and the yoke 154 in the manner shown in Fig. 16. Spring means 159 are provided which tend to move the arm 140 outwardly away from the turntable element 128. It will be understood that the cam 153 is adapted to throw the yoke member 154 inwardly, that is, towards the frame member 95, and this inward movement applies resilient force through the spring 158 upon the arm 140 so as to cause

it to engage the record 133 in loading position, raise it, and finally hold it between the turntable elements 131 and 128, as has previously been described. When the cam 153 is moved to another position, the spring 159 moves the arm 140 away from the turntable element 128. In order to prevent any tendency of the record 133 to move outwardly with the pin 130, I provide a recess 160 in the face of the turntable element 131 which is directed towards the turntable element 128. In this recess I mount a spring 161 of flat stock. When the spring 161 is in engagement with a record 133 in playing position, as shown in Fig. 16, the spring 161 is in the form of a spiral, the outer convolution being secured to the turntable element 131. When the turntable element 131 is displaced from the turntable element 128, as shown in Fig. 17, the spring 161 is expanded outwardly in the form of a conical helix. This spring is relatively weak, since it need only be strong enough to insure the removal of the record from the pin 130.

The cam 153, a cam 162, and a disc 163 are rigidly secured together to form an integral cam assembly which is mounted on the shaft 123, as shown in Fig. 27. The disc 163 is located adjacent a notched wheel 164 which is rigidly mounted on the hub of the gear wheel 122. The cam unit is separated from the notched wheel 164 and the hub of the gear 122 by a washer 165. The disc 163 has pivotally mounted thereon a dog 166 (Figs. 19, 20, and 21) which has a detent 167 which is adapted to enter any of the notches of the notched wheel 164. Means, such as the spring 168, are provided to bias the dog 166 towards engaging relation with the notched wheel 164. The dog 166 is provided with an elongated tail 169, which is located in transverse alignment with a recess 170 formed in the disc 163, as is shown in Figs. 19 and 20. The dog 169 is adapted to be held out of engagement with the notched wheel 164 by means of a pin 171 carried by an arm 172', as shown in Fig. 19, or by a member 172 carried by an arm 173, as shown in Fig. 21. When the dog 166 is not engaged by either the pin 171 or by the member 172', the detent 167 is forced into engagement with the notched wheel 164 with the result that the cams 153 and 162 are driven from the gear wheel 122. The pitch of the worm 104 is such that each half revolution of this worm corresponds to a translation of the carriage 48 through a distance equal to the distance between centers of adjacent record pockets in the magazine 42.

As best seen in Figs. 19 and 23, the detent 109 associated with clutch control member 107, previously referred to, is carried on the lower end of the lever 173, also previously referred to. This lever carries at its upper end the contact member 172 which is in alignment and adapted to cooperate with the disc 163. The lever 173 is rigidly mounted on a shaft 177 (Fig. 23), supported by the boss formed on the frame member 94. On the outer side of the frame member 94 a member 178 is freely mounted on the shaft 177. The member 178 is held in position by means of a collar 179 (Figs. 3 and 23), which is keyed to the shaft 177. The collar 179 carries diametrically opposed radial pins 180 and 181. The pin 180 is located between laterally projecting pins 182 and 183 (Fig. 3) carried by the member 178, said pins being adapted to engage the pin 180. The member 178 is biased in clockwise direction, as viewed in Fig. 3, by means of a spring 184. The collar 179 and the shaft 177 are biased in counterclockwise direction, as viewed in Fig. 3, and consequently the arm 173 is biased in the counterclockwise direction, as viewed in Figs. 3, 19, 20, 21, and 22, by means of a spring 191 connected to the pins 181 and 183, with the contact member 172 in engagement with the disc 163. When the pin 171 has raised the detent 167 of the dog 166 away from the notched wheel 164, as shown in Fig. 19, a condition which exists during the playing of a record, the contact member 172 bears against the disc 163 and the detent 109 is located within one of the notches 108 so that the worm 104 is held stationary. In this relation the record elevating member 142 is in alignment with one of the record spaces of the magazine 42. At this time, also, the member 178 is in the position in which it is shown in Fig. 3, being in latching relation to a latch member 185 pivotally mounted on the outer side of the frame member 94. The member 178 is moved into latching relation by means of a cam member 189 which engages a projection 190 on the member 178. The cam member 189 is rigidly mounted on the outer end of a shaft 187. The shaft 187 is rotatably mounted on the frame members 94 and 95, as shown in Fig. 25, and it is biased in the counterclockwise direction, as viewed in Fig. 2 (clockwise as viewed in Fig. 3) by means of a spring 188, shown in Figs. 2 and 25. As shown in Fig. 3, the member 178 has just been moved into latching relation with the latch 185 by a clockwise movement of the cam 189. The latch 185 is actuated to release the member 178, allowing this member to move clockwise, as viewed in Fig. 3, under the influence of the spring 184. As will hereinafter be explained, before this release takes place, the shaft 187 is moved in the counterclockwise direction, as viewed in Fig. 3, so as to provide clearance between the cam 189 and the member 190 for this clockwise movement of the member 178. This clockwise movement of the member 178 brings the pin 182 into engagement with the pin 180, thus biasing the shaft 177 in the clockwise direction, as viewed in Figs. 3, 19, 20 and 21. Consequently, the detent 109 is pressed against the surface of the annular clutch control member 107. When one of the recesses 108 is presented thereto, the detent enters this recess and the drive of the worm 104 is terminated. It may here be noted that the release of the member 178 occurs when the member 172 is holding the dog 166 out of engagement with the notched wheel 164 in the manner shown in Fig. 21. Consequently, the release of the member 178 not only terminates the rotation of the worm 104, but it also initiates the drive of the cam assembly, including the cams 153 and 162 and the disc 163, in one direction or in the opposite direction, depending upon the direction of rotation of the motor, until the dog 166 is engaged by the pin 171 and elevated away from the notched wheel 164, in the manner shown in Fig. 19.

It may here be noted that means will hereinafter be described whereby the pin 171 is withdrawn from engagement with the dog 166. When this occurs, the cam assembly is put into motion until the recess 170 of the disc 163 is presented to the member 172. While the cam assembly is thus rotating, the member 178 is in latched condition and the shaft 177 is biased in the counterclockwise direction, as viewed in Figs. 3, 19, 20, and 21, by a spring 191. Consequently, when the recess 170 arrives in alignment with the contact member 172, this member moves into the recess

and swings the dog 166 away from the notched wheel 164. At the same time the detent 109 is withdrawn from the notch 108 and the drive of the worm 104 is resumed.

The record lifting member 142 is in the form of a small disc carried at the outer end of the arm 145. The record lifting member 142 is of a width which enables it to engage a record in the magazine and to clear the adjacent records. It is provided with a peripheral recess in which the record 133 being lifted is received and supported against lateral displacement. The record lifting arm 145 is rigidly mounted on a hub member 192 which includes a gear member 193 (Fig. 25). The hub member 192 is rotatably mounted on a shaft 194 extending between the frame members 94 and 95 for free rotation, and it is held in position by means of a spacing sleeve 195, also mounted on the shaft 194. It may here be remarked that the record elevating member 142 is in alignment with the playing position of the record on the turntable members and with the center of the groove 146 in the shelf portion 96 of the frame member 95. The gear member 193 meshes with a sector member 196 which is freely mounted by means of a boss 200 on the shaft 187 (Fig. 25). Rigidly mounted on the shaft 187 is an arm 197 which extends upwardly and carries a cam roller 198 which engages the cam 162 (Fig. 24). As previously indicated, the spring 188 biases the shaft 187 in the clockwise direction, as viewed in Fig. 24, so that the roller 198 follows the cam 162 at all times. A sleeve 199 rigidly mounted on the shaft 187 has a pin 201 projecting radially into the path of a pin 202 carried by the sector 196. When a record is being played, the sector 196 bears against a set screw 202' which is mounted on an extension 203 of one of the guide bars 98 (Fig. 19). The sector is biased downwardly into this position by means of a strong spring 204 which is connected to the extension 203 and to a pin 205 carried on the sector. This pin is sufficiently strong to enable it to lift the arm 145 and a record from the magazine. During the playing of a record, the cam roller 198 is located at the lowest dwell point 162' of the cam 162, as shown in Fig. 24, and there is a substantial clearance between the pins 201 and 202 at that time. Two arms 206 and 207 are freely mounted on the shaft 187 and extend away from the sector 196 in parallel spaced relation, as shown in Fig. 25. The arms 206 and 207 are rigidly connected by bars 208 and 209 so that they swing in unison as a frame around the shaft 187. A pin 210 carried by the arm 197 extends below the arm 207 so that the arms 206 and 207 are elevated, as shown in Fig. 24 when the cam roller 198 is located at the dwell 162' of the cam 162. A spring 211 connects the arm 207 to the arm 197 so that counterclockwise movement of the arm 197 causes the arms 206 and 207 to move downwardly. When, however, the arms 206 and 207 are arrested in a manner which will hereinafter be described, the arm 197 is able to continue its rotation in the counterclockwise direction, as viewed in Fig. 24. It may be added that when the arms 206 and 207 are thus arrested, the pin 201 engages the pin 202 and the sector 196 is rotated in the counterclockwise direction, as viewed in Fig. 24, so that the arm 145 is swung in a direction to return a played record to the magazine. It may be here noted that the arms 206 and 207 effect the raising of the player arm away from the record, and that the return of the record to the magazine is effected after the tone arm is thus raised.

The latch member 185 is adapted to be released from the member 178 by means of selector levers 212 which are pivotally mounted below the magazine, as shown in Figs. 3 and 12. Two levers 212 are provided for each record in the magazine, these levers being provided with upwardly directed projections 213, which are alternately displaced. The levers are normally held in lower position by means of individual springs 214 which engage notches in the ends of levers adjacent the projections 213. In their lower position, the levers 212 rest upon a plate 215 which serves as a support for lever operating solenoids 216 which are located on the under side of the plate 215. One solenoid 216 is provided for each lever 212, and when a solenoid 216 is energized, its armature moves upwardly and displaces the corresponding lever 212 upwardly so as to bring its projection 213 into operative relation with a dog 217 (Fig. 3). The dog 217 is pivotally mounted on the end of an arm 218, which is integral with the latch 185, and upon a horizontal axis which is oblique relative to the direction of travel of the phonograph carriage and also to the longitudinal direction of the selector levers 212. The dog 217 normally hangs downwardly, and in its normal position, it may engage either series of projections 213 depending upon the direction of movement of the carriage. If these projections are in their normal position, the dog 217 is merely displaced, as shown in Fig. 3. If, however, a projection 213 is in elevated position, then the dog 217 is swung until it contacts either of two stops 219' carried by the end of the arm 218, and the arms 218, 185, swing counterclockwise, as viewed in Fig. 3, against the action of a spring 220', thus unlatching the member 178. The arm 185 then contacts a stop 221, and further movement of the carriage causes the dog 217 to move the actuated lever 212 downwardly towards its initial position. Its complete return to initial position is effected by the engagement of a spring 214 with the cam shaped surfaces at the end of the lever.

Each solenoid 216 is controlled by an individual selector switch 219 (Fig. 3), each of which may be actuated by its selector button 220. It will be understood that when the appropriate selector button is pressed inwardly, the switch 219 is closed and the corresponding solenoid 216 is energized so that the corresponding bar 212 is pressed upwardly so as to bring its end into operative relation to the dog 217. It will be understood that the circuits of the solenoids and the motor 41 may be controlled directly by manually operable switches or that they may be controlled by coin actuated means.

It will be understood that two levers 212 are provided for each record. Thus, for twenty records, forty levers 212 are provided. Owing to the swinging of the dog 217, the two levers 212 corresponding to one record are displaced sideways, and the two series of levers 212 corresponding to the playing of one side of the records, say the left hand side, and the series corresponding to the playing of the other side of the records, say the right hand side, are displaced sideways. As shown in Fig. 1, the displacement of the levers 212 for one particular record is two and one-half times the record spacing. Consequently, reading from left to right in Fig. 1, the first lever 212 corresponds to the playing of one side of the first record, the second

lever 212 corresponds to the playing of the same side of the second record, the third lever 212 corresponds to the playing of the same side of the third record, the fourth lever 212 corresponds to the playing of the opposite side of the first record, and the fifth lever 212 corresponds to the playing of the first said side of the fourth record, and so on. The first three levers 212 at each end have magazine record spacing. The other levers 212 have half this spacing and are arranged alternately for playing opposite sides of records. The dog 217 is swung, as has previously been explained, so as to cooperate with one series of levers 212 when the carriage is moving in one direction, and is swung to cooperate with the other series of levers 212 when the carriage is moving in the opposite direction.

The pickup 221' is carried by a player arm 221 with its smallest dimension substantially perpendicular to the plane of its record playing position (Figs. 3 and 4), and is provided with a double pointed needle 222 which extends through the pickup and is held in place by a set screw 223. The double pointed needle 222 is located in oblique direction relative to the longitudinal direction of the player arm 221. The needle 222 is arranged so that it forms an acute angle with the approaching groove of the record. Thus, when the right hand point of the needle is operating, as shown in Fig. 4, the direction of rotation of the record 224 is clockwise, as viewed from the left in this figure. When, however, the left hand point of the needle 222 engages the record, the player arm 221 occupies a position to the right of the record 224, as viewed in Fig. 4, and the direction of rotation of the record is counterclockwise, as viewed from the left in Fig. 4.

In the embodiment of the invention shown in Figs. 1 to 29, the player arm 221 extends through a ring 225 (Figs. 2 and 29) which is provided with two pivot points 226 held in adjusted position by means of set screws. The pivots 226 cooperate with a block 227 resiliently mounted within the arm 221. The block 227 is carried by springs 228, the ends of which are rigidly mounted within and to the interior of the player arm 221. They may, as shown in Fig. 29, be anchored at 229 to a hollow or U-shaped block 230 contained within the hollow player arm 221, and their opposite ends may be bent around away from each other to provide U-shaped portions 231, which are also rigidly secured to the block 230. The axis provided by the pivot members 226 is parallel to the playing plane of a record supported on the turntable elements 128 and 131. And they are maintained in this relation by the support of the ring member 225 on an axis which is parallel to the axis of the turntable elements. The player arm 221 projects downwardly beyond the axis provided by the pivots 226, and it is provided with a counterweight 232 (Figs. 2 and 26) which accurately locates the center of gravity of the player arm on the axis of the pivots 226. Adjacent the weight 232, the arm 221 carries two rollers 233 which are adapted to be engaged by inclined or cam surfaces 234 on the arms 206 and 207. Thus, referring to Fig. 26, it will be understood that when the arm 221 is adjacent the arm 206, then the player arm is located so as to cooperate with the back side of the record, as viewed in Fig. 19 or the left side of a record as viewed from the front of the machine. When the arm 206 is elevated above its position shown in Fig. 26, the player arm 221 is biased by a spring 235 so as to apply the appropriate side of the needle against the record. When the arms 206 and 207 are moved downwardly, in a manner previously described, the inclined surface 234 of the arm 206 engages the left hand roller 233, as viewed in Fig. 26, and the arm 221 is swung counterclockwise, as viewed in Fig. 26, to a slight extent, so that the needle 222 is moved away from the record to a slight degree. When, however, the needle 222 is located to cooperate with the other side of the record, that is, the adjacent side, as viewed in Fig. 26, the arm 221 occupies a position adjacent the arm 207. Under these circumstances, the spring 235 is relieved of its tension and the spring 236 is tensioned so that the arm 221 is biased towards that side of the record, that is, the adjacent side, as viewed in Fig. 26. When the arms 206 and 207 are elevated, the needle 222 engages that side of the record. When, however, the arms 206 and 207 are moved downwardly, in the manner previously described, the cam surface 234 of the arm 207 engages the right hand roller 233, as viewed in Fig. 26, with the result that the arm 221 is swung around the pivots 226 to a slight degree in the clockwise direction, as viewed in Fig. 26, so that the needle is raised or displaced away from the face of the record with which it has been cooperating.

The spring 235 is connected to a plate 237 and the spring 236 is connected to a similar plate 238. The plates 237 and 238 are rigidly connected by means of rods 239, 240, and 241 to constitute a rigid frame. The rods 239, 240 and 241 are best illustrated in Figs. 1, 4, 19 and 20 and particularly the latter where they are shown in section and from which their location relative to the plates may be readily ascertained. This frame is pivotally mounted by means of opposed pivots 242 carried by the frame members 94 and 95 on an axis which is parallel to the shaft 120 of the turntable element 128, and consequently at right angles to the axis provided for the player arm 221 by the pivot members 226. The ring 225 is integral with a block 243 which is slidably mounted upon the bars 240 and 241 (Fig. 19). The block 243 can be slid along the rods 240 and 241 so as to locate the ring 225 adjacent the plate 238, as shown in Figs. 1 and 4, to adapt the player arm 221 for playing the left hand side of the record, as viewed in Fig. 1, or it can be slid towards the plate 237 to effect the playing of the opposite side of the record. The block 243 carries a formation 244 which is arcuate with respect to the axis provided by the pivots 242. This formation 244 extends into a groove 245 and a sleeve 246, which is adapted to be displaced in a manner hereinafter to be described, in a direction parallel to the axis provided by the pivot 242.

The mechanism carried by the pivots 242, that is, the frame including members 237, 238, 239, 240, 241, together with the player arm 221 and elements carried thereby, needle 222, counterweight 232, ring 225, and the block 243, are counterbalanced by a counterweight 247 (Figs. 4 and 26) carried by plate 237 so that the center of gravity of this system is located on the axis provided by the pivots 242. Thus, the player arm 221 and associated elements are counterbalanced for movement about the axes parallel to and perpendicular to the shaft 120 which carries the turntable element 128. The rollers 233 are located so that they lie in alignment with the pivots 242. Consequently, when the arm 206 or 207 moves downwardly and cams the player arm 221 away from the record, the inclined surfaces 234

do not apply any torque to the system mounted upon the pivots 242. Consequently, the needle is raised away from the record without any tendency for the needle to travel over the face of the record during the elevation.

Upon the outer side of the plate 237, that is, on the right hand side of this plate, as viewed in Figs. 1 and 4, is rigidly mounted a member 251 which carries a member 248 having an arcuate edge 249 which is serrated. As the player arm 221 moves inwardly during playing (Fig. 19), the serrated edge 249 engages a dog 250 and moves it away from a pin 252 carried by the arm 172'. The dog 250 is pivotally mounted upon a plate 253 which is pivotally mounted at 254 on the frame member 94. The plate 253 carries two set screws 255 and 256 which are adapted to cooperate with a screw 257 which is rigidly mounted on the plate 237. The plate 253 is normally in abutting relation with a shoulder 258 on the arm 172', and it holds the pin 171 against the dog 166 so as to maintain this dog out of contact with the notched wheel 164.

During the playing of a record, the player arm 221 moves inwardly and the serrated edge 249 moves past the dog 250. When the record has been fully reproduced, an eccentric groove in the central portion of the record may cause the player arm 221 to move outwardly. When this occurs, the serrated edge 249 moves the dog 250 and the plate 253 in counterclockwise direction, as viewed in Fig. 19. This brings the abutting portion of the plate 253 into a recess 259 adjacent the shoulder 258 so that the dog 166 may enter a notch on the wheel 164 and the record changing cycle may begin. During this record changing cycle, the pin 252 holds the dog 250 clear of the serrated edge 249 so that the tone arm may be returned to initial playing position. If the record being played is not provided with an eccentric groove, the tone arm moves inwardly until the screw 257 engages the set screw 256 and swings the plate 253 in the counterclockwise direction, as viewed in Fig. 19, with the same results.

The sleeve 246 is rigidly mounted on a tubular member 260 (Figs. 13 and 14) which is slidably mounted in bosses 261 in the frame members 94 and 95. The members 83 and 85 are carried on the ends of a rod 262 which extends through the tubular member 260. The rod 262 is of smaller diameter than the members 83 and 85 so as to provide annular shoulders which are adapted to engage collars 263 located within the tubular member 260. The collars 263 are held within the tubular member 260 by means of stationary collars 264 located at the ends of the tubular member 260, being retained therein by spinning inwardly the extremities of the tubular member 260. The collars 263 are biased towards the collars 264 by means of a helical spring 265 located within the tubular member 260. On the outside of the tubular member 260 are mounted two short helical springs 266 which are adapted to be compressed by the sleeve 246 at the ends of its travel, as shown in Figs. 13 and 14.

During the playing of a record, the ring 225 and the player arm 221 is held adjacent the plate 237 or the plate 238, as shown in Figs. 14 and 13, respectively, by means of latch members 267 and 268, which are arranged to engage shoulders on the sleeve 246. Latch members 267 and 268 are pivotally mounted on the frame members 94 and 95, respectively, and are biased towards latching position by a spring 269 which is connected to downward extensions of the latch members. The downward extensions of the latch members 267 and 268 are adapted to cooperate with spaced contacts 267' and 268', respectively, (Figs. 14 and 15) which are mounted on the inner side of the rail formation 46. When the carriage is moving to the right, as viewed in Fig. 13 (corresponding to the movement of the carriage to the left, as viewed in Fig. 1), the tubular member 260 is engaged by the latch 268 so that it is held projecting to the right, as viewed in Fig. 13, the player arm 221 being adjacent the plate 238, as shown in that figure. The members 83 and 85 bear against the collars 263, these collars being forced outwardly by the spring 265. Towards the end of the travel of the carriage, the member 83 engages the abutment plate 82, and consequently, the spring 265 is compressed. The travel of the carriage to the right brings the depending extension of the latch 268 into engagement with the contact 268' so that this latch moves away from the sleeve 246. When this occurs, the spring forces the tubular member 260 to the left, as viewed in Fig. 14, and the sleeve 246, moving with the tubular member 260, carries the player arm to the left, as viewed in Fig. 14, adjacent the plate 237. This movement of the sleeve 246 brings its shoulder past the co-acting detent of the latch 267 and compresses the spring 266 slightly. The same movement of the tubular member 260 effects the reversal of the motor 41 so that the carriage now moves to the left, as viewed in Fig. 14. When this occurs, the sleeve 246 moves slightly to the right, as shown in this figure to engage the detent of the latch 267. This slight movement establishes clearance between the formation 244 and the groove 245 in which it is located. Consequently, the player arm is unimpeded by any friction or engagement between the formation 244 and the sleeve 246. During the travel of the carriage to the left, as viewed in Fig. 14, the tubular member 260 remains projecting outwardly to the left. When the member 83 moves away from the abutment plate 82, the spring 265 locates the members 83 and 85 symmetrically with relation to the tubular member 260. Towards the end of the travel of the carriage to the left, as viewed in Fig. 14, the member 85 engages the abutment 84 and compresses the spring 265. When the downward extension of the latch 267 engages the contact 267', the tubular member 260 and the sleeve 246 are enabled to move to the right so as to bring the player arm over towards the plate 238. The same movement enables the latch 268 to engage its shoulder on the sleeve 246 so that the player arm is maintained in this position while the carriage moves again to the right. It may here be noted that the relation between the latch member 268 and the sleeve 246 is such that clearance is provided between the formation 244 and the sleeve 246, as shown in Fig. 13.

The reversal of the motor 41 is controlled by two switch poles 270 and 271 (Figs. 1, 4 and 28), which are adapted to be swung in one direction or the other by the tubular member 260. Thus, when the tubular member 260 is swung to the left, as viewed in Figs. 1, 14 and 28, a member 272 is swung to the left, carrying the switch poles 270 and 271 in the same direction. In this condition, the pole 270 engages a contact 273, and the pole 271 engages a contact 274 (Fig. 4), which engagements cause the motor to drive the carriage to the left, as viewed in Figs. 13 and 14. When the tubular member 260 is moved to the

right at the end of the leftward travel, a spring 275 swings the member 272 in counterclockwise direction, as viewed in Fig. 28, bringing the poles 270 and 271 into engagement with the contact 274 and a contact 276, thus causing the motor to operate in the opposite direction.

The poles 270 and 271 are connected to the power supply through switch 277 (Fig. 4) and to two terminals of the motor 41. The contact 274 is connected to another terminal of the motor and the two contacts 273 and 276 are connected to a fourth terminal of the motor. The motor may be of any well known reversible type. For example, it may have two windings, one of which is in series with a condenser. It will be readily understood that the switching arrangement 270—276 merely changes the direction of flow of current through the condenser and associated winding so that the motor is caused to rotate in one direction or the other.

Upon the outer end of the arm 207 I mount a pin 303 (Fig. 3). Upon the plate 237 I mount a spring 304 which is adapted to project beyond the plate 237 and to cooperate with the pin 303. It will be understood that when the arm 206 and 207 move upwardly, the inclined portions 234 are moved out of contact with the rollers 233 so that the needle is moved by the effective spring 235 or 236 into engagement with the record. When the arms 206 and 207 move still further towards their top position, that is, their position as shown in Fig. 24, the pin 303 gently tensions the spring 304 and biases the player arm assembly toward the center of the record. Consequently, the needle is moved inwardly of the record with a gentle pressure until it engages the first groove of the record. It will be understood, of course, that the spring 304 may be omitted in the case of records which are provided with starting grooves.

In the modification shown in Figs. 30 to 34, the player arm 221 is pivotally mounted on an axis parallel to the plane of the record being played upon a swinging cradle 290 by means of pivots 291. The cradle 290 is pivotally mounted upon a frame 292 on an axis parallel to the axis provided by the pivots 291. The frame 292 comprises plates 237 and 238 which are mounted in the same manner to the corresponding frame of the previously described embodiment. The frame 292 also comprises two bridge portions 293 and 294 upon which the pivots 295 are carried for mounting the cradle 290 upon the frame 292. The pivots 291 extend through openings 296 in the cradle 290. The pivots 295 extend into openings 297 in the cradle 290. The cradle 290 is provided with a toothed sector 298 which is in engagement with a sector 299, pivotally mounted on the bridge member 293 at 300. The sector 299 has a downward extension 301 which is adapted to cooperate with spaced projections 302 (Fig. 30) at the ends of the movement of the carriage in opposite directions. The pins 302 are rigidly mounted at suitable positions on the transverse rail 46. The extension 301 is connected to the cradle 290 at one of the pivots 291 by a spring 305 which holds the cradle 290 in the position in which it is shown in Fig. 32 or in the position in which it is shown in Fig. 33. The function of the spring 305 may also be performed by the downward component of the springs 235 and 236 and/or by gravity. It will be understood that when the carriage is moving to the left, as viewed in Fig. 32, and when it is approaching the end of its travel, the extension 301 engages the left hand pin 302, and the sector 299 is rotated in counterclockwise direction, as viewed in Figs. 32 and 33. When the pivot 291, the pivot 295, and the extension 301 of the sector 299 are brought into alignment, and then are moved out of alignment, the spring 305 snaps the cradle 290 to the right, into the position in which it is shown in Fig. 33. When, however, the travel of the carriage is to the right, as viewed in Fig. 33, then near the end of this travel, the extension 301 engages the right hand pin 302 so that the cradle is thrown to the left into the position in which it is shown in Fig. 32.

In this modification, the members 83, 85, tubular member 260, and associated elements, are omitted. To control the reversal of the motor, a shaft 306 is mounted in their stead in bosses 307 and 308 on the frame members 94 and 95 respectively. The shaft 306 is adapted to engage the abutments 82 and 84 at the ends of the travel of the carriage so that the shaft 306 is displaced relatively to the carriage. The shaft 306 carries a disc 309 which cooperates with a yoke 310. The yoke 310 is carried by the spindle 311 of a switch 312, which is rigidly mounted on the frame member 94. This switch controls the operation of the motor 41 in one direction or the other in the same manner as the switch elements 270—276, previously described. It will be understood that when the upper end of the shaft 306, as viewed in Fig. 31, engages the abutment 82, the yoke 310 will be moved downwardly, and that when the opposite end of the shaft 306 engages the abutment 84, the yoke 310 will be returned to its initial position. It will of course be understood that the shifting of the player arm and the reversing of the motor are effected after the carriage has moved the record elevating arm 145 past all the records in the magazine in either direction.

The operation is as follows:

The motor 41 is started by the closing of the switch 277. This may be done manually or by means of coin controlled mechanism. The direction in which the motor 41 starts is determined by the position of the poles 270 and 271. The result is that the carriage moves to one side and then to the other, the poles 270 and 271 being shifted at each end of the travel of the carriage. Thus, when the carriage is moving to the right, as viewed in Fig. 13, the tubular member 260 is displaced to the right, as shown in that figure, and consequently the poles 270 and 271 have a right hand position, since the tubular member 260 is withdrawn out of engagement with the member 272 (Fig. 28.) When, however, the carriage attains its extreme right hand position, as shown in Fig. 14, the tubular member 260 is projected to the left, and owing to its engagement with the member 272 (Fig. 28), the poles 270 and 271 are swung to the left, reversing the direction of the motor and causing the carriage to move to the left. When the carriage reaches its extreme left hand position, the tubular member 260 is displaced to the right relative to the carriage, as viewed in Fig. 13, and the direction of the motor is again reversed. It will, of course, be understood that each time the motor is reversed, the tubular member 260 is latched in one of its positions by either latch 267 or 268, and consequently, the player arm 221 is located for playing one side of the records when the carriage is traveling in one direction and the opposite sides of the records when the carriage is traveling in the other di-

rection. Thus, in Fig. 13, it is to be noted that the carriage is traveling to the right, and that the player arm 221 is located so as to cooperate with the right hand side of any record which may be moved out from the magazine. It will, of course, be understood that the turntable element 128 is driven by the motor in the appropriate direction for the proper playing of the record when the player arm is thus located. When the carriage is about to move to the left, which is the condition shown in Fig. 14, the player arm 221 is, of course, shifted over to the left to play the left hand sides of records which may be moved out from the magazine to cooperate with it. In the modification shown in Figs. 30 to 34, the player arm is located in similar manner by engagement of the extension 301 with the pins 302, and the drive of the carriage and of the turntable elements is controlled in the same manner by the switch 312.

Let us assume that a certain recording is selected by one of the buttons 220, with the result that the corresponding solenoid 216 is actuated and the corresponding lever 212 is elevated. Then, as the carriage moves to and fro, the dog 217 trips over the non-actuated levers 212 without effectively engaging either one of the stops 219'. When, however, the dog 217 hits an actuated lever 212, the arm 218 is swung in the counterclockwise direction, as viewed in Fig. 3, and the latch 185 is withdrawn out of contact with the projection on the member 178. Consequently, the member 178 rotates to some extent in the clockwise direction, as viewed in Fig. 3, under the influence of the spring 184, the cam 189 having a low portion opposite the extension 190 of the member 178. This movement brings the pin 182 into engagement with the pin 180 and causes the shaft 177 to rotate in clockwise direction, as viewed in Figs. 3 and 19. The spring 184 forces the detent 109 against the annular clutch control member 107, and when the next notch 108 is presented to it, the detent 109 enters the notch and the contact member 172 (Fig. 21) is withdrawn out of contact with the dog 166. Consequently, the drive of the worm 104 is terminated, and simultaneously, the detent of the dog 166 enters a notch on the wheel 164 so that the cams 153 and 162 and the disc 163 are put into motion. The movement of the disc 163 moves the recess 170 away from the contact 172 so that the detent 109 is held in one of the recesses 108 until the recess 170 is again brought into register with the contact member 172. During the travel of the carriage, the record elevating arm 145 moves below the records in the magazine, as shown in Fig. 12.

It is to be noted that the arrestment of the carriage occurs when the record removing arm 145 is located below the record which carries the recording to be played. Furthermore, it occurs when the carriage is moving in the appropriate direction and the player arm 221 is located in the appropriate corresponding position for playing of the side of the record which has been selected by the button 220. It is to be noted that after the latch member 185 has been disconnected and has engaged the stop 221, the dog 217, having a slight travel before the arrestment of the carriage, pushes the lever 212 down partway towards normal position, its complete return being effected by the spring 214 which cooperates with the notch in the end of the lever 212. Irrespective of the direction of the drive of the cams, the roller 198 moves inwardly towards the center of the cam 162; that is, it moves down a fall on this cam so that the member 197 moves in the clockwise direction, as viewed in Fig. 21, this rotation being effected by the spring 188. This movement carries the pin 201, which is rigidly carried by the shaft 187, away from the pin 202 so that the sector member 196 is capable of being moved downwardly by its spring 204 until the sector member 196 engages the set screw 202'. At that time, the record elevating arm 145 has carried the record up by contact of its member 142, which rolls the record out of the magazine and over the shelf portion 96 of the frame member 95. This brings the record with its center somewhat below the axis on which it is intended to rotate and slightly to the rear of that axis. It will of course be understood that the record is now located between the turntable elements 128 and 131, the arm 140, which carries the latter element, being displaced outwardly from the turntable element 128 in the manner shown in Fig. 17.

It is to be noted that when the carriage is traveling, an extension 278 of the arm 207 is in engagement with the bar 239 or bar 293 (Fig. 33), this extension having swung the player arm 221 back to initial position, the player arm having been arrested in this position by the engagement of the screw 257 with the set screw 255 and the engagement of the plate 253, which carries the set screw, with an abutment 279. The clockwise movement of the arm 197, as viewed in Fig. 21, brings the pin 280 on the arm 197 into engagement with the arm 207 so that the arms 206 and 207 are elevated away from the bar 239 and away from the rollers 233. When the player arm 221 is swung to initial playing position by the projection 278 of the arm 207 (Fig. 21), the plate 253 swings the arm 172 so that its pin 171 is located in the path of the tail of the dog 166, the arm 172 being latched in this position by the plate 253. The rotation of the cam 162 continues until the end of the dog 166 is brought into contact with the pin 171. This engagement swings the dog 166 so that its detent is withdrawn from the notched wheel 164, whereupon the rotation of the cam 162 is terminated for the time being. When this occurs, the arm 197 and cam 162 have the relation shown in Fig. 24, and the player arm 221 is free for inward movement during the playing of a record. After the needle has contacted the record, owing to the elevation of the arm 206 or 207 away from the roller 233, the pin 303 engages the spring 304 and biases the player arm inwardly until its needle engages the first groove of the record. This inward biasing is especially important when the direction of rotation of the record is towards the end of the player arm.

During the rotation of the cam 162 for approximately half a revolution, the cam 153 also performs a similar rotation. At the beginning of the rotation, the cam 153 had the position shown in Fig. 21. Towards the end of the half rotation, a rise on the cam 153 engages the roller 152 and swings the arms 151 and 154 in the clockwise direction, as viewed in Fig. 16. This brings the pin 130 into the center opening of the record 133 and causes the elevation of the record upwardly and its movement away from the record elevating member 142 and the clamping of the record between the turntable elements 128 and 160 in the manner previously described. The record clamping action is completed before the arm 206 or 207, as the case may be, is withdrawn from the effective roller 233. This subsequent

withdrawal causes the player arm 221 to move its needle into engagement with the record under the action of the tension spring 235 or 236, as the case may be. Consequently, the record is reproduced.

At the end of the reproduction of the record, the reverse movement of the member 248, in cooperation with the dog 250, swings the plate 253 so that its latching end moves into the recess 259 on the arm 272', if the record is provided with an eccentric groove. If the record is not so provided, the needle moves in toward the center of the record sufficiently to bring the screw 157 into engagement with the set screw 256 so that the plate 253 is swung in the counterclockwise direction, as viewed in Fig. 19, with the same result. In any event, the spring 281 swings the arm 172' to the left, as viewed in Fig. 20, and the pin 171 is removed from the dog 166 so that its detent enters a notch on the notched wheel 164, as shown in Fig. 20. Consequently, the drive of the cams 153 and 162 and the disc 163 is resumed for another half revolution.

During this second half revolution, the cam roller 152 promptly rolls over a fall on the cam 153, with the result that the arm 140, the turntable element 131, and the pin 130 are moved to the left, as viewed in Fig. 16. The spring 161 expands and the record 133 is cleared off the pin 130 so that it rests in a groove 146 and against the record elevating member 142. During this second half revolution, the cam 162 swings the arm 197 in the counterclockwise direction, as viewed in Fig. 24, from its position in that figure into its position in Fig. 21. During the initial part of this revolution, and before the release of the record from the turntable elements, the arms 206 and 207 descend so that one of the inclined portions 234 engages the adjacent roller 233 and moves the needle out of contact with the record. Continued downward movement of the arms 206 and 207 swings the player arm 221 outwardly until the plate 253 engages the stop 259 in the manner previously described. It will, of course, be understood that the arm 197 can move to a greater extent, this movement being permitted by the spring 211. During the counterclockwise movement of the arm 197, as viewed in Fig. 24, the pin 201 engages the pin 202, and swings the sector member 196 in the counterclockwise direction, as viewed in Fig. 24. Consequently, the record elevating arm 145 is rotated in the clockwise direction, as viewed in that figure, and the record, following the member 142, rolls back into its position in the magazine.

It is to be noted that during the first half revolution of the cam 162, the cam 189 is rotated in the clockwise direction, as viewed in that figure. This enables the spring 220' to move the latch 185 into latching engagement with the member 178, since the discharge of the arresting lever 212 leaves the latch 185 and the arm 218 free to resume their initial position. During the second half revolution of the cam 162, that is, during the return of the record to the magazine, the arm 197 is swung in the counterclockwise direction, as viewed in Fig. 24, and consequently, the cam 189, as viewed in Fig. 3, is swung in the same direction so as to move the cam 189 out of contact with the extension 221 of the member 178, providing clearance for the movement of the member 178 in the clockwise direction, as viewed in Fig. 3, whenever the latch 185 is again released by the engagement of the dog 217 with an actuated lever 212.

The second half revolution of the cams 153 and 162 is terminated when the recess 170 is again aligned with the contact member 172. When this occurs, the tension of the spring 191 causes the arm 173 to rotate in the counterclockwise direction, as viewed in Fig. 21, simultaneously disengaging the dog 166 from the notched wheel 164, and withdrawing the detent 109 from the recess 108. Consequently, the cams 162 and 153 are arrested, and the drive of the carriage is resumed simultaneously. The carriage is driven in the same direction, and then in the opposite direction, and in the same direction again, until during one of these movements, the dog 217 again engages an actuated lever 212.

It will be understood that instead of the single pickup 221', previously described, I may mount two such pickups on the player arm 221, as shown in Fig. 35. Each of these pickups carries a needle 222', which is held in place by means of a screw 223'. As best seen in Fig. 35, these two needles 222' are located in parallel relation so that one has an outward component relative to the player arm 221, while the other has an inward component relative to the arm 221. Consequently, these needles are located in the correct direction relative to the direction of rotation of the record when located on either side of the record, as shown in Fig. 35.

Furthermore, as shown in Figs. 36 and 37, two player arms may be employed, one being adapted to operate on one side of the record playing position, and the other being adapted to operate on the opposite side. The two player arms 221 are pivotally mounted by means of pivots 315 upon members 316, which are carried by bridge members 317, extending between the plates 237 and 238, and rigidly mounted thereon. The plates 237 and 238 and the bridge members 317 constitute a rigid frame which is pivotally supported by the pivots 242 upon an axis parallel to the axis of the record, in record playing position, and at right angles to the pivots 315. As shown in Fig. 36, the needle 222' in the left hand player arm 221 slants toward the axis of the pivots 242, while on the right hand player arm, the needle slants away from this pivot. The plate 237 carries the counterweight 247 which counterbalances this frame and all the elements carried by it, including the two tone arms 221, so that the center of gravity of the whole system is on the axis provided by the pivots 242. Each player arm 221 is provided with a counterbalance weight 232, which locates the center of gravity of each player arm 221 on the axis defined by its pivots 315. Upon the outermost bridge member 317 is pivotally and frictionally mounted a member 318, which includes a central downwardly projecting arm 319 and two laterally extending members which terminate in downwardly directed hook formations 320. The hook formations 320 are adapted to cooperate with pins 321 carried by the counterbalance weights 232. Upon the frame member 46 are mounted two projections 302 (Fig. 37) which are adapted to be engaged by the arm 319 as the carriage approaches the end of its travel. Consequently, one of the hook members 320 engages one of the pins 321 when the carriage is moving in one direction, and the other hook member engages the other pin 321 when the carriage is moving in the opposite direction. It will be readily understood from Fig. 36 that the player arm 221, whose pin 321 is engaged by the corresponding hook portion 320, is held inoperative

with respect to the record, while the other player arm is adapted to cooperate with the record in the manner shown in Fig. 36. The two arms 221 are biased towards each other by a spring 322, and this spring biases the free arm 221 towards the record.

Each player arm 221 carries a roller 233, which is adapted to be engaged by the inclined portion 234 of the arm 206 or 207, as the case may be. Consequently, when these arms move downwardly in the manner described in connection with the previously described embodiments, the free arm 221, which is in engagement with a record, is swung about its pivots 315 so that its needle is raised away from the record. When the arms 206 and 207 move upwardly again, the effective player arm 221 is moved towards the record by the spring 322. It will, of course, be understood that this embodiment of the device may be provided with a spring 304 carried by the plate 237, and that the arm 207 may carry a pin 303 for the purpose of applying a slight bias to the effective tone arm, so as to move its needle into the first groove of the engaged record. Furthermore, in this embodiment also, the forward extension of the arm 207 engages the outer bridge piece 317 when the arms 206 and 207 move downwardly, so that the player arms 221 are swung outwardly from the center of the record to initial playing position. Before the player arms 221 are thus swung, the effective player arm 221 is moved away from the record by the engagement of one of the sloping surfaces 234 with its roller 233. When the arms 206 and 207 move upwardly again, the effective player arm is moved into engagement with the record adjacent the first groove of the record by the spring 322. When the arm 207 regains its uppermost position, the spring 304 becomes effective to move the operating player arm into the first groove of the record.

Where two separate electric pickups are employed, as shown in Fig. 35 and in Figs. 36 and 37, they are preferably connected in series, and switch means are provided for shunting the inoperative pickup. These switch means may suitably be operated by the mechanism which shifts over from one pickup to the other. Thus, as shown in Fig. 36, two lead wires 325 and 326 are connected one to each of the two pickups. The other sides of the pickups are connected to an insulated resilient contact 327 carried by the arm 319. The contact 327 is adapted in each of its two positions to engage a contact 328 or 329. The contact 328 is connected to the lead 325. The contact 329 is connected to the lead 326. It will be seen that when one of the pickups is in engagement with one side of the record, for example the left hand pickup, as shown in Fig. 36, the other pickup, that is the right pickup, is shunted by engagement of the contact 327 with the contact 329. Similarly, when the right hand pickup is operating, the left hand pickup is shunted by the contacts 327 and 328.

In the embodiment shown in Fig. 35, one or the other of the two pickups may be shunted by similar switch means controlled by the position of the player arm 221 and the members on which it is mounted.

Although the invention has been described in connection with the specific details of 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 following claims.

Having thus described my invention, what I claim and desire to secure by Letters Patent of the United States is:

1. In a phonograph, in combination, means for rotatably supporting a disc record with the recording surfaces on both sides exposed, a player arm, supporting means pivotally secured to said arm to permit pivotal movement of said arm toward and away from a record playing plane, means for pivotally mounting said supporting means to permit movement of said supporting means and said arm in a direction parallel to the record plane, means for moving said player arm to either side of the record position, and means adapted to engage said player arm in either position and in alignment with the pivotal axis about which said supporting means is adapted to pivot in a plane parallel to the record plane for raising the player arm away from a record in playing position on either side of said record position.

2. In a phonograph, in combination, means for rotatably supporting a disc record with the recording surfaces on both sides exposed, pickup means having needle means directed outwardly therefrom toward either side, said pickup means being movable relative to said supporting means to locate it on one side or the other of said record supporting means, a magazine for records, said magazine and said other elements being arranged for relative reciprocating movement whereby the record supporting means may be located in cooperative relation with any record in the magazine, means for transferring records between said magazine and said record supporting means, means for causing said relative reciprocating movement and means actuated by said movement causing means for moving said pickup means bodily from one side of the record supporting means to the other.

3. In a phonograph, in combination, means for rotatably supporting disc records, means for driving said supporting means in either direction, pickup means having needle means directed outwardly therefrom toward either side, means for movably mounting said pickup means, means for moving said pickup means relative to said supporting means to locate it on one side or the other of said record supporting means, a magazine for records, said magazine and said pickup means and said supporting means being arranged for relative reciprocating movement therebetween whereby the record supporting means may be located in cooperative relation with any record in the magazine, means for transferring records between said magazine and said record supporting means, means for causing said relative movement and means actuated by said movement causing means for moving said pickup means bodily from one side of the record supporting means to the other, engaging the correspondingly directed part of said needle means with the corresponding side of the record, and for reversing the direction of said driving means.

4. In a phonograph, in combination, means for rotatably supporting a disc record with the recording surfaces on both sides exposed, pickup means having needle means directed outwardly therefrom toward either side, said pickup means being movable relative to said supporting means to locate it on one side or the other of said record supporting means, a magazine for records, said magazine and said other elements being arranged for relative reciprocating movement whereby the record supporting means may be located in align-

ment with any record in the magazine, means for causing said relative movement means for arresting said movement with said supporting means in alignment with a selected record, means for transferring an aligned record between said magazine and said supporting means, and means controlled by said movement causing means for moving said pickup means bodily from one side of the record supporting means to the other.

5. In a phonograph, in combination, means for rotatably supporting a disc record with the recording surfaces on both sides exposed, means for driving said supporting means in either direction, pickup means having needle means directed outwardly therefrom toward either side, said pickup means being movable relative to said supporting means to locate it on one side or the other of said record supporting means, a magazine for records, said magazine and said other elements being arranged for relative reciprocating movement whereby the record supporting means may be located in alignment with any record in the magazine, means for causing said relative movement means for arresting said movement with said supporting means in alignment with a selected record, means for transferring an aligned record between said magazine and said supporting means, and means actuated by said movement causing means for moving said pickup means bodily from one side of the record supporting means to the other and for reversing the direction of said driving means.

6. In a phonograph, in combination, means rotatable about an axis for supporting a disc record in playing position with the recording surface on both sides exposed, means for supporting a plurality of records in storage position, means for transferring records from one of said supporting means to the other of said supporting means, drive means for rotating said rotatable supporting means in one direction or the other, pickup means having needle means directed to either side, the needle means directed to one side being arranged to follow a record surface when the record is rotated in one direction and the needle means directed to the other side being arranged to follow the opposite record surface when the record is rotated in the other direction, said pickup means being movable from one side to the other of the playing position defined by said rotatable record supporting means to bring said needle means into cooperative relation with either side of a record, means for locating said pickup means at the same initial playing position on either side of the record rotating position, and means for bodily shifting the pickup means from one side of the record rotating position to the other and for reversing the direction of said driving means.

7. In a phonograph, in combination, rotatable means for supporting a record in playing position with the recorded surfaces on both sides exposed, supporting means pivotally mounted on an axis parallel to the axis of record rotation, a swinging member pivotally mounted on said supporting means on an axis at right angles to the axis of the supporting means, a player arm pivotally mounted on said member on an axis parallel to the axis of said member, and means for swinging said member so as to locate said player arm on either side of said playing position.

8. In a phonograph, in combination, rotatable means for supporting a record in playing position with the recorded surfaces on both sides exposed, supporting means pivotally mounted on an axis parallel to the axis of record rotation, a swinging member pivotally mounted on said supporting means on an axis at right angles to the axis of the supporting means, a player arm pivotally mounted on said member on an axis parallel to the axis of said member, means for swinging said member so as to locate said player arm on either side of said playing position, and a spring maintaining said member in one extreme position or the other.

9. In a phonograph, in combination, rotatable means for supporting a record in playing position with the recorded surfaces on both sides exposed, supporting means pivotally mounted on an axis parallel to the axis of record rotation, a swinging member pivotally mounted on said supporting means on an axis at right angles to the axis of the supporting means, a player arm pivotally mounted on said member on an axis parallel to the axis of said member, means for swinging said member so as to locate said player arm on either side of said playing position, and a spring connecting each side of the player arm to the adjacent side of the supporting means.

10. In a phonograph, in combination, rotatable means for supporting a record in playing position with the recorded surfaces on both sides exposed, supporting means pivotally mounted on an axis parallel to the axis of record rotation, a swinging member pivotally mounted on said supporting means on an axis at right angles to the axis of the supporting means, a player arm pivotally mounted on said member on an axis parallel to the axis of said member, a toothed sector on said member, a lever pivotally mounted on said supporting means and having a toothed sector in mesh with first said sector, and means for swinging said lever so as to locate the player arm on one side or the other of said playing position.

11. In a phonograph, in combination, means rotatable about an axis for supporting a disc record in playing position with the recorded surface on both sides exposed, drive means for rotating said supporting means in one direction or the other, pickup means pivotally mounted adjacent said playing position and movable from one side of said position to the other to engage opposite sides of records at the same initial position at opposite sides, whereby the pickup means tends to move away from the record grooves when located on one side of the playing position, means for moving said pickup means from one side of the record position to the other, a movable member for displacing said pickup means from the record and moving it in displaced condition back to a position adjacent initial playing position and thereafter permitting the pickup means to engage the adjacent side of a record, and means associated with said movable member for biasing the pickup means into cooperation with the first groove of the record after the pickup means has engaged the record on the side where the pickup means tends to move away from the record grooves.

12. In a phonograph, in combination, means for rotatably supporting a record in a record playing position with the recorded surfaces on both sides exposed, means for driving said supporting means in either direction, player arm means movably mounted adjacent said playing position for engaging either side of a record in said position at substantially the same adjacent initial playing positions, whereby the player arm means tends to move away from the record grooves when in engagement with one side of a record, and a

member adapted to displace said player arm means away from the record and to move said player arm means to the same initial playing position on either side of said record playing position, and to release said player arm means to permit it to engage a record in said initial playing position, and spring means energized by said member for biasing said player arm means into the first groove of the record after said release at least when said player arm means is brought into contact with the record upon the side where relative rotation between the record and the pickup tends to cause the pickup to move away from the center of rotation of said record.

13. In a phonograph, in combination, two relatively movable elements, means for relatively reciprocating said elements, supporting means secured to but movable with respect to one of said relatively movable elements, a player arm secured to said supporting means but bodily displaceable in the direction of said relative movement, latch means on one of said elements for holding said arm in either of two positions relative to the supporting means, spring means on one of said elements adapted to be energized by said relative movement, and means on the other element for releasing said latch means whereby the energized spring causes a displacement of said arm on its supporting means.

14. In a phonograph, in combination, two relatively movable elements, means for relatively reciprocating said elements, a support movably mounted on one of said elements for movement between two positions on said one of the elements, a player arm secured to said support and movable therewith into two positions relative to said one of the elements, and abutting means on the relatively movable elements engageable with each other at the ends of the reciprocating relative motion of said elements for moving said support and arm from one position to the other on said one element at said ends of said relative motion.

15. In a phonograph, in combination, a magazine for records, a playing unit movable along the magazine, motor means for driving said unit in opposite directions along the magazine, record supporting means on said unit for rotatably supporting a record with the recorded surfaces on both sides exposed, record transfer means on said unit for transferring records between said magazine and record supporting means, means for driving said supporting means, means operable at the end of the travel of said playing unit in one direction for reversing the drive of said record supporting means, pickup means movably mounted on said unit for movement in one direction into engagement with a record for playing one side of the record and in the opposite direction into engagement for playing the other side of the record, means operable at one end of the travel of said playing unit for conditioning the pickup means for movement in one direction for playing one side of the records, and means operable at the other end of the travel of said playing unit for conditioning the pickup means for movement in the other direction for playing the other side of the records.

16. In a phonograph, in combination, a magazine for records, a playing unit movable along the magazine, motor means for driving said unit in opposite directions along the magazine, record supporting means on said unit for rotatably supporting a record with the recorded surfaces on both sides exposed, record transfer means on said unit for transferring records between said magazine and record supporting means, means for driving said supporting means, means operable at the end of the travel of said playing unit in one direction for reversing the drive of said record supporting means, pickup means movably mounted on said unit, means operable at one end of the travel of said playing unit for moving said pickup means into a position on the unit for playing one side of the records, and means operable at the other end of the travel of said playing unit for moving said pickup means into another position on the unit for playing the other side of the records.

17. In a phonograph, in combination, a stationary magazine, a player unit adjacent the magazine, record supporting and rotating means mounted on said player unit for bodily movement therewith, means supporting said player unit for movement along the magazine, and record transfer means carried by said player unit and movable between the magazine and record supporting and rotating means to transfer a record from said magazine onto said record supporting and rotating means, cooperative drive elements on said player unit and a member stationary with respect to said magazine to effect movement of said player unit with respect to said magazine in either direction to align said record transfer means with records in said magazine, and a reversible motor adapted to drive said player unit in either direction when rotating in one direction and in the opposite direction when rotating in the reverse direction.

18. In a phonograph, in combination, a stationary base, a carriage movably mounted on said base, a motor on said base, rotatable record supporting means on said carriage, drive means for said supporting means including a gear means, a second gear means operatively connected with last said gear means, spline means connecting said motor to second said gear means, a third gear means on said carriage, a clutch connecting said third gear means to said second gear means, stationary means cooperating with said third gear means for effecting drive of the carriage, a cam shaft, a clutch operatively connecting said cam shaft to first said gear means, and cooperating means for engaging one of said clutches and disengaging the other, and vice versa.

19. In a phonograph, in combination, means for rotatably supporting a disc record with the recording surface exposed, supporting means on spaced apart pivots for pivotal movement about an axis parallel to the axis of rotation of said record, a player arm pivotally secured to said supporting means between said pivots for movement about an axis parallel to the plane of rotation of said record, and means movable to engage said player arm in alignment with the pivotal axis of said supporting means between one of said pivots and said arm for raising the player arm away from a record in playing position.

20. In a phonograph, in combination, means for rotatably supporting a disc record with the recording surfaces on both sides exposed, pivotally mounted supporting means movable about an axis parallel to the axis of rotation of the record, a player arm on each side of the record playing position, said arms being movably secured to said supporting means on opposite sides of said position for movement about axes parallel to a record in said position, and means movable transversely of the axis of said supporting means to engage said player arms in alignment with the pivoted axis of said supporting means for raising the

player arms away from a record in playing position.

21. In a phonograph, in combination, means for rotatably supporting a disc record with the recording surfaces on both sides exposed, a frame pivotally mounted on an axis parallel to the axis of rotation of a record in playing position, a player arm positioned on each side of said position and pivotally mounted on said frame, a counterbalance for each player arm, a counterbalance for said player arms and frame, and means for alternately bringing one or the other of said arms into playing position with respect to a record on said supporting means.

22. In a phonograph, in combination, means for rotatably supporting a disc record with the recording surfaces on both sides exposed, a pickup positioned on each side of the record playing position, each of said pickups being movable towards and away from said position, a magazine for records, said magazine and said other elements being arranged for relative reciprocating movement whereby the record supporting means may be located in cooperative relation with any record in the magazine, means for producing said relative movement and means actuated by said movement producing means during continued relative movement for holding one of said pickups away from record playing position.

23. In a phonograph, in combination, means for rotatably supporting a disc record with the recording surfaces on both sides exposed, means for driving said supporting means in either direction, a pickup positioned on each side of the record playing position, each of said pickups being movable towards and away from said position, a magazine for records, said magazine and said other elements being arranged for relative reciprocating movement whereby the record supporting means may be located in cooperative relation with any record in the magazine, means for transferring records from said magazine to said record supporting means, means for producing said relative movement and means actuated by said movement producing means during continued relative movement for holding one of said pickups away from record playing position and for reversing the direction of said drive means.

24. In a phonograph, in combination, means for rotatably supporting a disc record with the recording surfaces on both sides exposed, a pickup positioned on each side of the record playing position, said pickups being movable towards and away from said playing position, a carriage on which said supporting means and pickups are mounted, a stationary magazine for records, said carriage being arranged for reciprocating movement with respect to said magazine whereby the record supporting means may be located in alignment with any record in the magazine, means for producing movement of said carriage, means for arresting said carriage with said supporting means in alignment with a selected record, means for transferring an aligned record between said magazine and said supporting means, and means controlled by said movement producing means for maintaining one of said pickups away from said record playing position.

25. In a phonograph, in combination, rotatable means for supporting a record in playing position with the recorded surfaces on both sides exposed, supporting means pivotally mounted on an axis parallel to the axis of rotation of a record, a swinging member pivotally mounted on said supporting means on an axis at right angles to the axis of the supporting means, a player arm pivotally mounted on said member on an axis parallel to the axis of said member, means for swinging said member so as to locate said player arm on either side of said playing position, and spring means for biasing said player arm towards record playing position.

26. In a phonograph, in combination, a movable element including a rotatable record support, record transfer means for transferring records between said magazine and record supporting means, and record reproducing means, a stationary element including a record magazine, cooperative drive means on each of said elements to effect the movement of said movable element along the magazine to align said transfer means with records in said magazine, and an electric motor mounted on said stationary element, and torque transmitting drive means including a pair of splined driving members connecting said motor to said movable element to drive said rotatable record support and to move said movable element along said magazine.

27. In a phonograph, in combination, means for rotatably supporting a double faced disc record in playing position with the record grooves on both sides exposed, a player arm movably mounted to play either side of double-faced records, pickup means carried at the end of said player arm, means for moving said player arm to move said pickup means from one side of the playing position to the other, needle means supported by said pickup means having two points and projecting outwardly from opposite sides of said pickup means to engage the record grooves of a record in playing position on said supporting means, means to support a plurality of records in storage position, means for transferring a record from said storage position to said rotatable record supporting means, and means correlated with said transferring means for moving said player arm in opposite directions for moving one or the other of said needle means into and out of contact with one side or the other of a record on said record supporting means.

28. In a phonograph, in combination, means rotatable in either direction for supporting a disc record, a pivotally mounted member, a player arm pivotally secured to said member for pivotal movement around an axis at an angle to that of first said pivot and shiftable thereon from one side of record playing position to the other, means including counterweights on said member and player arm for counterbalancing said player arm around both of said axes, pickup means carried at the end of said player arm, two needle points projecting diagonally and outwardly in opposite directions from said pickup means, and means for moving said player arm and its associated counterweight laterally from one side of record playing position to the other and in opposite directions on opposite sides of record playing position for raising one or the other of said needle means off one side or the other of a record on said rotatable supporting means.

29. In a phonograph, in combination, means for supporting a disc record, drive means for rotating said supporting means in one direction or the other, pickup means movably mounted for cooperation with either side of records on said supporting means, a movable member for moving said pickup means in opposite directions to move said pickup means out of contact with one side or the other of a record on said rotatable supporting means, and for moving the pickup means

to a position adjacent initial playing position and for thereafter permitting the pickup means to engage the adjacent side of a record, and spring means acting upon said pickup means and actuated by said movable member after the pickup means has contacted one side of the record for resiliently biasing said pickup means toward the center of the record.

30. In a phonograph, in combination, rotatable means for supporting records in a playing position with the record grooves on both sides exposed, power means for rotating said supporting means in opposite directions, a single pickup means and including needle means having two points projecting outwardly in opposite directions, said pickup means being movable to either side of said playing position to engage said points with opposite sides of records in said playing position on said supporting means, means to support a plurality of records in storage position, means to transfer records from said storage position to the playing position on said rotatable record supporting means, and means correlated with said transfer means for moving said pickup means to adjacent initial playing positions on opposite sides of the records in playing position.

31. In a phonograph, in combination, rotatable means for supporting records, power means for driving said supporting means in opposite directions, pickup means movably mounted to engage opposite sides of records on said supporting means, a record magazine, means for moving said supporting means and said pickup means past said magazine, means moving with said supporting means for transferring records between said magazine and said record supporting means, means for moving said pickup means to adjacent initial playing positions and adjacent opposite faces of said records, means for causing said pickup means to engage one face of a record when the supporting means is moved in one direction past said magazine and to engage the other face of a record when the supporting means is moved in the opposite direction past said magazine.

32. In a phonograph, in combination, rotatable means for supporting records in a playing position, power means for driving said supporting means in opposite directions, pickup means movably mounted adjacent said playing position to engage opposite sides of records on said supporting means, means for moving said pickup means to adjacent initial playing positions and adjacent opposite faces of said records, means for causing said pickup means to engage one face of a record when the supporting means is rotating in one direction and to engage the other face of a record when the supporting means is rotating in the opposite direction, whereby the pickup means tends to move away from the center of rotation of said record when in engagement with one side of said record, and means effective after said engagement for biasing the pickup means radially inward towards the record groove when the pickup means engages the side of a record that is rotating in such direction relative to said pickup means that it tends to move the pickup means away from the center of rotation of said record.

33. In an automatic phonograph, in combination, a stationary magazine adapted to support a series of records, a travelling player unit comprising rotatable record supporting means, player arm means movably mounted for movement in opposite directions to cooperate with opposite sides of records supported on said supporting means and means for transferring records between said magazine and said record supporting means; means for causing said player unit to travel along the magazine in opposite directions, and means operatively associated with said player arm means for effecting movement thereof in one direction to play one side of a record when the movement of the player unit is in one direction, and in the opposite direction to play the opposite side of a record when the player unit travels in the opposite direction.

34. In an automatic phonograph, in combination, a stationary magazine adapted to support a series of records, a travelling player unit comprising rotatable record supporting means, player arm means movably mounted for movement in opposite directions to cooperate with opposite sides of a record supported thereon and means for transferring records between said magazine and said record supporting means; means for moving said player arm means to a playing position at a peripheral position with respect to the record playing position, and means operatively associated with said player arm means for effecting movement thereof in opposite directions to engage opposite faces of records on said supporting means adjacent said peripheral position.

35. In an automatic phonograph, in combination, a stationary magazine adapted to support a series of records, a travelling player unit comprising rotatable record supporting means, a pickup means movably mounted on said unit adjacent the record supporting means for movement from one side of the record playing position to the other and means for transferring records between said magazine and said record supporting means; means for causing said player unit to travel along the magazine in opposite directions, and means operative at the end of the travel of said player unit for shifting said pickup means from one side of the record playing position to the other side of that position.

36. In an automatic phonograph, in combination, a stationary magazine adapted to support a series of records, a travelling player unit comprising rotatable record supporting means, a pickup means movably mounted on said unit adjacent the record supporting means for movement from one side of the record playing position to the other and means for transferring records between said magazine and said record supporting means; means for causing said player unit to travel along the magazine in opposite directions, means operative at the end of the travel of said player unit for shifting said pickup means from one side of the record playing position to the other side of that position, and means for locating said pickup means at initial playing position with respect to a record in said plane on either side of said plane and in the same position with respect to said plane.

37. In a phonograph, in combination, means for supporting records and rotating the same, a pair of player arms adapted to cooperate each with an adjacent face of a record, a frame on which said player arms are pivotally mounted on axes parallel to the plane of a record in playing position, means pivotally supporting said frame on an axis parallel to the axis of rotation of said record supporting means, counterbalance means on each of said player arms and counterbalance means on said frame for counterbalancing said player arms around both of said axes.

38. In a phonograph, in combination, means for supporting a record and rotating the same in opposite directions in a playing plane with the recorded surfaces on both sides exposed, a pair of player arms adapted to cooperate each with an adjacent face of said record, supporting means on which said player arms are pivotally mounted on axes parallel to the plane of a record in playing position, means on said supporting means movable selectively to condition one or the other of said player arms for movement on their axes dependent upon the direction of rotation of the record, and means pivotally supporting said supporting means on an axis parallel to the axis of rotation of said record supporting means, both of said player arms extending from said supporting means in the same radial direction.

39. In a phonograph, in combination, means for supporting records and rotating the same, a pair of player arms, resilient means adapted to urge each of said playing arms toward an adjacent face of a record on said supporting means, a frame on which said player arms are pivotally mounted on axes parallel to the plane of a record in playing position, means pivotally supporting said frame on an axis parallel to the axis of rotation of said record supporting means, and individual counterbalance means on each of said player arms and on said frame for locating the center of gravity of each player arm substantially on its axis and for locating the center of gravity of the player arms and frame substantially on the pivotal axis of the frame.

40. In an automatic phonograph, in combination, turntable means adapted to support a record, a player arm adapted to cooperate with the surface of said record, a movable member adapted to cooperate with said player arm to displace said player arm from the record, swing the player arm back to a position slightly beyond initial playing position, and to control the approach of said player arm to the record beyond initial playing position, and means on said movable member adapted to cooperate with said player arm to bias the same towards initial playing position after bringing said arm into engagement with the record, said movable member being adapted to bring said player arm into its initial playing position and being further adapted to operate said biasing means while moving in one direction, said biasing means being operated by over-travel of said movable means after said player arm has been brought into initial playing position.

41. In an automatic phonograph, in combination, turntable means adapted to support a record, a player arm adapted to engage said record, a frame on which said player arm is pivotally mounted on an axis parallel to the plane of the record, said frame being pivotally mounted on an axis parallel to the axis of rotation of said turntable means, a movable member, means for moving said member to cause it to engage the player arm to move the same away from the record and to cause said movable member to engage the frame to swing the player arm to a position beyond initial playing position and for moving said member in the opposite direction whereby the player arm is caused to engage the record beyond initial playing position, and resilient means operative between said movable member and said frame effective upon the reverse movement of said movable member to apply an inward bias to said player arm.

42. In an automatic phonograph, in combination, a stationary unit and a movable unit, one of said units including a magazine and the other of said units including turntable means and reproducing means for effecting reproduction of a record and means for transferring records between said magazine and said turntable means; means for moving the movable unit, a plurality of selective stops on said stationary unit adapted to be displaced from normal position, said stops being arranged in two aligned groups, the stops in one of said groups corresponding individually to recordings on one side each of the records in said magazine and the stops in the other of said groups corresponding individually to recordings on the other sides of said records, said stops having abutment portions, the abutment portions of the stops corresponding to one side of the records being in alignment, and the abutment portions of stops corresponding to the other side of records being in alignment, a swingable stop engaging member on the movable unit adapted to move over said abutments and to swing so that when the movement of the movable member is in one direction said stop engaging member will move over one group of said abutments while when the movement of the movable member is in the opposite direction said stop engaging member will move over the other group of said abutments and thus will engage displaced stops in one group when moving in one direction and will engage displaced stops in the other of said groups when moving in the opposite direction.

43. In an automatic phonograph, in combination, a stationary magazine, a player unit adapted to travel along said magazine, said player unit including a rotatable record supporting means, record transfer means for transferring records between said magazine and record supporting means, and record reproducing means; said reproducer means including needle means projecting in opposite directions and movably mounted for movement in opposite directions into engagement with and to play opposite sides of double faced disc records on said record supporting means, and a single power means adapted to move said player unit and to actuate said transfer means.

44. In an automatic phonograph, in combination, a stationary magazine unit, a player unit adapted to travel bodily along said magazine, said player including a rotatable record supporting means, record transfer means movable between the magazine and record supporting means for transferring records between said magazine and record supporting means, and record reproducing means; and an electric motor mounted on said magazine unit for causing the travel of said player unit relative to said magazine unit.

45. In a phonograph, in combination, means for rotatably supporting disc records, movably mounted player arm means, means cooperatively associated with said player arm means for moving same in one direction into contact with the right hand face of a record on said supporting means and in the opposite direction into contact with the left hand face of a record on said supporting means, means for mounting said player arm means, said means comprising a pivoted supporting member, movable about an axis parallel to an axis of rotation of a record on which said player arm means is pivotally mounted for movement about an axis parallel to the plane of a record, and means movable to engage said player

arm means in alignment with the pivoted axis of said supporting member for raising said player arm means away from either side of a record on said supporting means.

46. In a phonograph, in combination, means for rotatably supporting disc records in a playing position, means for rotating said supporting means, pickup means movably mounted adjacent said playing position, means acting on said pickup means for effecting engagement between said pickup means and the portion of said record between the periphery thereof and the recording grooves at an initial position whereat said pickup is urged away from said grooves, and means actuated by said pickup moving means after the pickup and record are in contact and acting upon said pickup to urge said pickup toward the center of rotation of said record.

47. In a phonograph, in combination, means for supporting a disc record in playing position for rotation in opposite directions, a movably mounted pickup arm, a pickup mounted on said arm, said pickup including a substantially straight double pointed needle secured thereto with its opposite ends projecting therethrough at an angle to the record grooves of a record in said playing position, and means for moving said pickup arm to locate the pickup to one side of said playing position when the direction of rotation of a record is in one direction and to an adjacent position on the other side when the direction of rotation is in the opposite direction, the angle of said needle being such that the pointed ends slant in the direction of rotation of the record.

48. In a phonograph, in combination, means for rotatably supporting a disc record with the recording surface exposed, supporting means pivotally mounted for movement about an axis parallel to the axis of rotation of said record, a player arm pivotally secured to said supporting means for movement about an axis parallel to the plane of rotation of said record, and means movable in a path transversely of and through the axis of said supporting means to engage said player arm for moving the latter away from a record in playing position.

49. In an automatic phonograph, in combination, a stationary unit and a movable unit, one of said units including a magazine and the other of said units including turntable means and reproducing means for effecting reproduction of a record and means for transferring records between said magazine and said turntable means, means for moving the movable unit, a plurality of selective stops on said stationary unit adapted to be displaced from normal position, said stops being arranged in two aligned groups and the stops in one group corresponding individually to recordings on one side of the records in said magazine and those in the other group corresponding individually to recordings on the other sides of said records, a stop-engaging member movably mounted on the movable unit to move over one group of stops when said unit moves in one direction and over the other group of stops when said unit moves in the opposite direction, whereby said stop engaging member engages displaced stops in one group when moving in one direction and engages displaced stops in the other group when moving in the opposite direction.

50. In a phonograph, in combination, stationary supporting structure, a movable player unit, means for moving said unit on said structure between limits of movement, said player unit including means for supporting and rotating a record in playing positions, a support mounted for pivotal movement between two positions about an axis parallel to the plane of rotation of a record on said supporting means and located to one side of and substantially in the plane of a record on said supporting means, a player arm secured to said support for pivotal movement about an axis parallel to said first mentioned axis and spaced from said first axis a distance such that said second mentioned axis and player arm is located on opposite sides of said playing position in the two positions of said support, and means including spaced abutments on said supporting structure for moving said support between its positions at the limits of movement of said unit.

51. In a phonograph, in combination, means for supporting a disc record in playing position for rotation in opposite directions, a movably mounted pickup arm, a pickup mounted on said arm, said pickup including substantially straight needle means having points protruding through from opposite sides of the pickup and said points being in axial alignment, and means for moving said pickup arm to locate the pickup to one side of said playing position when the direction of record rotation is in one direction and to the other side when the direction of rotation is in the other direction.

52. In a phonograph, rotatable means for supporting a disc record thereon with the record grooves on both sides exposed, supporting means positioned to one side of said record supporting means, said supporting means being mounted on a pivot substantially parallel to the axis of rotation of said rotatable record supporting means, a member movably associated with said supporting means, a pickup means supporting means, and means pivotally associating said pickup means supporting means with said member on an axis substantially perpendicular to the axis of rotation of the record supporting means, said member being movable in the general direction of the axis of rotation of the record supporting means while maintaining said pickup means supporting means axis substantially perpendicular to the axis of rotation of said record supporting means to position the pickup means supporting means alternately on either side of the record playing position.

53. In a phonograph, rotatable means for supporting a disc record thereon with the record grooves on both sides exposed, supporting means positioned to one side of said record supporting means, said supporting means being mounted on a pivot substantially parallel to the axis of rotation of said rotatable record supporting means, a member movably associated with said supporting means, a pickup means supporting means, means pivotally associating said pickup means supporting means with said member on an axis substantially perpendicular to the axis of rotation of the record supporting means, said member being movable in the general direction of the axis of rotation of the record supporting means while maintaining said pickup means supporting means axis substantially perpendicular to the axis of rotation of said record supporting means to position the pickup means supporting means on either side of the record playing position, and a pair of springs connected to said pickup means supporting means and to the supporting means on opposite sides of the pickup means supporting means pivot axis for biasing the pickup means support-

ing means toward the record position, one of said springs being effective when the pickup means supporting means is on one side of the playing position and the other spring being effective when the said supporting means is on the other side of the playing position.

54. In a phonograph, rotatable means for supporting a disc record thereon with the record grooves on both sides exposed, supporting means positioned to one side of said record supporting means, said supporting means being mounted on a pivot substantially parallel to the axis of rotation of said rotatable record supporting means, a member movably associated with said supporting means, pickup means having needle means extending outwardly from opposite sides thereof, pickup means supporting means, and means pivotally associating said pickup means supporting means with said member on an axis substantially perpendicular to the axis of rotation of the record supporting means, said member being movable in the general direction of the axis of rotation of the record supporting means while maintaining said pickup means supporting means axis substantially perpendicular to the axis of rotation of said record supporting means alternately to position said pickup means on one side of the record playing position with one needle means projecting toward playing position and on the other side of the playing position with the other needle means projecting toward the playing position.

55. In a phonograph, rotatable means for supporting a disc record thereon with the record grooves on both sides exposed, supporting means positioned to one side of said record supporting means, said supporting means being mounted on a pivot substantially parallel to the axis of rotation of said rotatable record supporting means, a member movably associated with said supporting means, pickup means, a pickup means supporting means, and means pivotally associating said pickup means supporting means with said member on an axis substantially perpendicular to the axis of rotation of the record supporting means, said member being movable parallel to the axis of rotation of said record supporting means while maintaining said pickup means supporting means axis substantially perpendicular to the axis of rotation of said record supporting means to position the pickup means alternately in adjacent initial playing positions on either side of said record playing position.

56. In a phonograph, rotatable means for supporting a disc record thereon with the record grooves on both sides exposed, supporting means positioned to one side of said record supporting means, said supporting means being mounted on a pivot substantially parallel to the axis of rotation of said rotatable record supporting means, a member slidably mounted on said supporting means for movement in the general direction of the axis of rotation of the record supporting means, pickup means, a pickup means supporting means, means pivotally mounting said pickup means supporting means on said slidable member for movement about an axis substantially perpendicular to the axis of rotation of the record supporting means, and means for sliding said member on said supporting means to position said pickup means alternately at either side of the record playing position.

57. In a phonograph, in combination, rotatable means for rotatably supporting a disc record in a definite playing position with the recording surfaces on both sides exposed, a player arm having pickup means with needle means projecting outwardly therefrom in both directions, means supporting said player arm for movement toward and away from said playing position about an axis parallel to the plane of said playing position, means mounting said supporting means for shifting movement to locate said last mentioned axis to one side or the other of said playing position, means limiting movement of said supporting means for defining two definite positions for said axis, and means for shifting said supporting means from one of said definite positions to the other to locate said player arm and pickup means on either side of said playing position with one or the other of said needle means projecting toward the playing position.

58. In a phonograph, in combination, means for rotatably supporting a disc record in a definite playing position with the recording surfaces on both sides exposed, a player arm having pickup means with needle means projecting outwardly therefrom in both directions, means supporting said player arm for movement toward and away from said playing position about an axis parallel to the plane of said playing position, means supporting said player arm supporting means for shifting movement to locate said player arm and said last mentioned axis to one side or the other of said playing position with one or the other of said needle means extending toward the record playing position, a pair of spaced apart arms located at opposite sides of said player arm and between which said player arm is shiftable, arm engaging structure associated with said player arm located in cooperative relation to one of said arms when said player arm is on one side of the playing position and to the other arm when said player arm is on the other side of said playing position, means supporting said spaced apart arms for simultaneous movement relative to said player arm, and means for moving said spaced apart arms toward and away from said structure whereby said player arm is moved away from the record playing position on either side of the record playing position when an arm engages said structure and the player arm moves toward the record on either side of the playing position when an arm is disengaged from said structure.

59. In a phonograph, in combination, means for rotatably supporting a disc record for rotation in opposite directions in a playing position, pickup means movably mounted adjacent said playing position to engage opposite sides of said record on said supporting means, means for moving said pickup means to engage opposite sides of said record, means associated with said last mentioned means for causing said pickup means to engage one face of a record when the supporting means is rotating in one direction and to engage the other face of a record when the supporting means is rotating in the opposite direction, whereby the pickup means tends to move away from the center of rotation of said record when in engagement with one side of a record, and means effective after said engagement for biasing the pickup means radially inward toward the record groove when the pickup means engages the side of the record that is rotating in such direction relative to said pickup means that it tends to move the pickup means away from the center of rotation of said record.

60. In a phonograph, in combination, two relatively movable elements, means for relatively reciprocating said elements, a support movably

mounted on one of said elements between two definite positions, a player arm pivotally secured to said support for movement about an axis, said support being movable to shift said player arm and the axis about which it pivots between two definite spaced apart positions, and abutting means on the relatively movable elements engageable with each other at limits of reciprocating relative motion of said elements for moving said support together with the player arm mounted thereon from one to the other of said definite positions at said ends of relative motion.

EDWARD F. ANDREWS.

CERTIFICATE OF CORRECTION.

Patent No. 2,323,365. July 6, 1943.

EDWARD F. ANDREWS.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows:. Page 15, second column, line 29, claim 17, for the word "either" read --one--; page 17, first column, line 26, claim 30, for "records" read --record--; page 18, second column, line 52, claim 44, after "player" insert --unit--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 9th day of November, A. D. 1943.

(Seal)

Henry Van Arsdale,
Acting Commissioner of Patents.