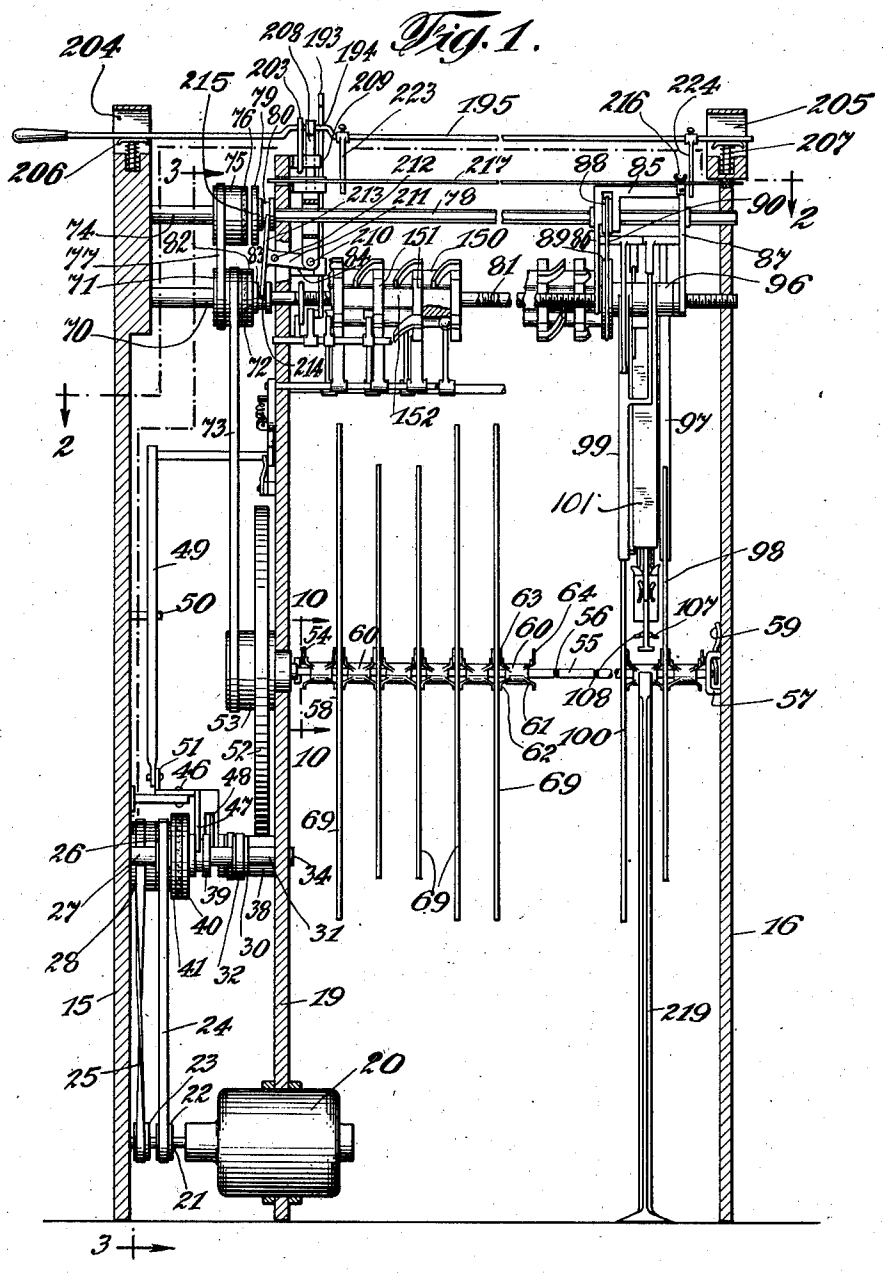
Sept. 9, 1930. N. J. CAPUTO 1,775,510

SOUND REPRODUCING APPARATUS

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Fig. 1.



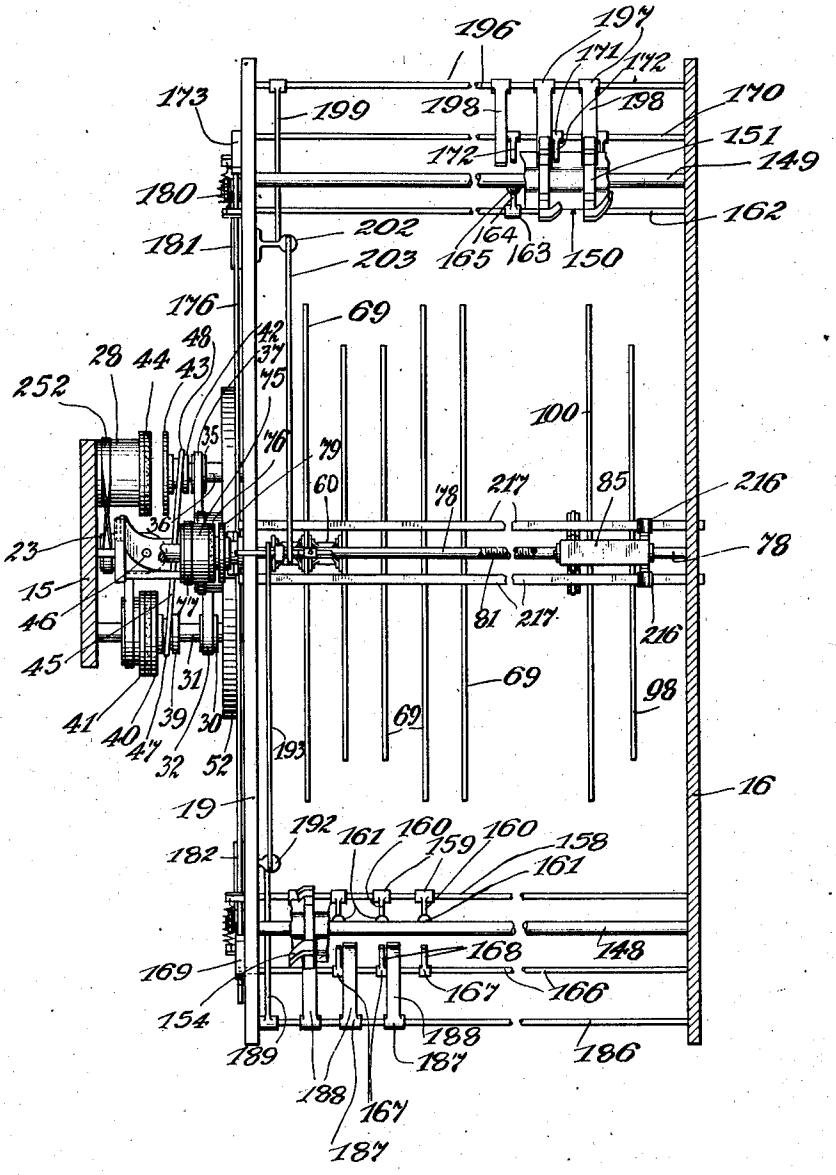
INVENTOR
Nicholas J Caputo
BY
his ATTORNEYS

Sept. 9, 1930. N. J. CAPUTO 1,775,510

SOUND REPRODUCING APPARATUS

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Fig. 2.



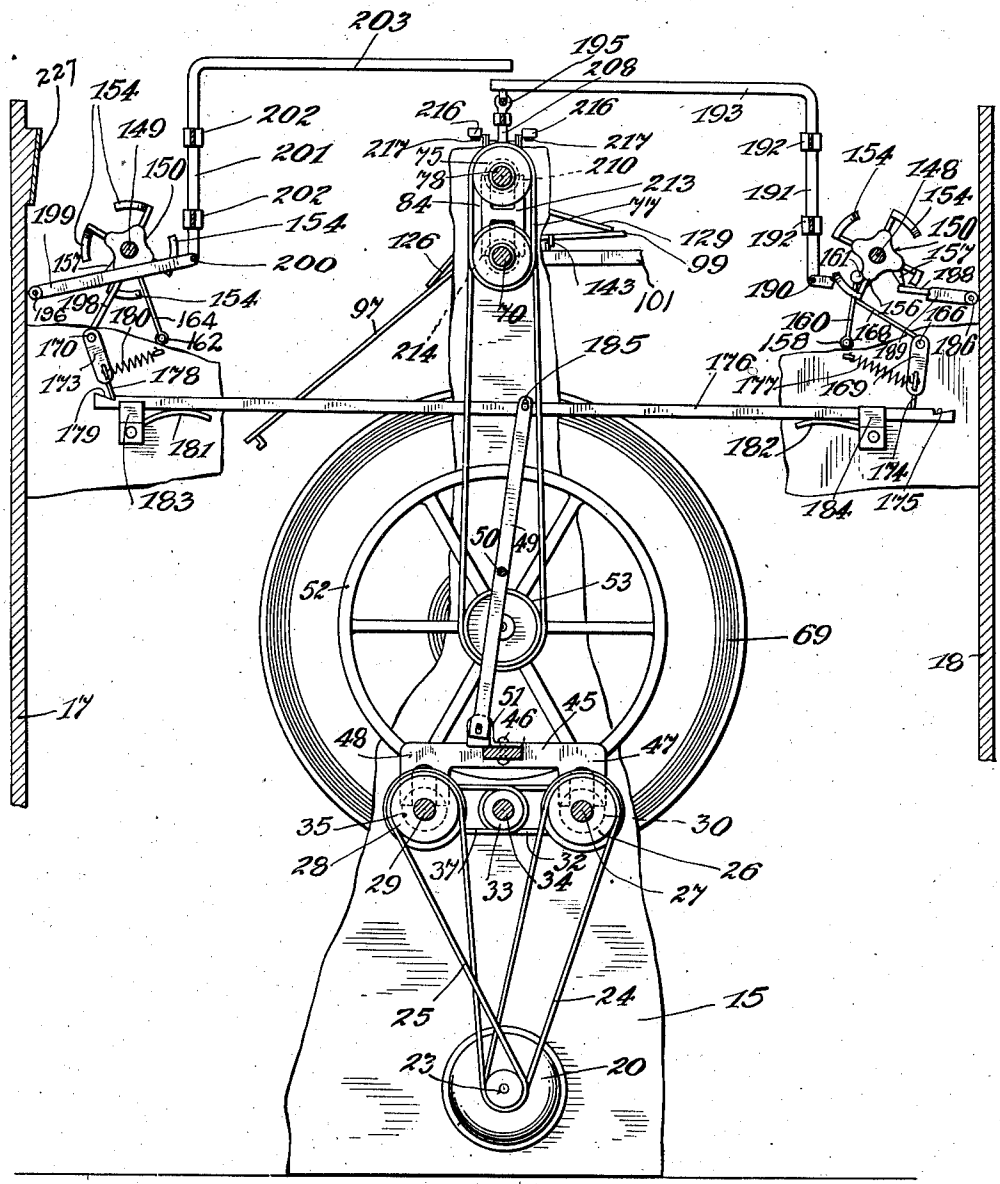
INVENTOR
Nicholas J. Caputo
BY
his ATTORNEYS

Sept. 9, 1930. N. J. CAPUTO 1,775,510

SOUND REPRODUCING APPARATUS

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Fig. 3.



INVENTOR
Nicholas J. Caputo
BY
his ATTORNEYS

Sept. 9, 1930. N. J. CAPUTO 1,775,510

SOUND REPRODUCING APPARATUS

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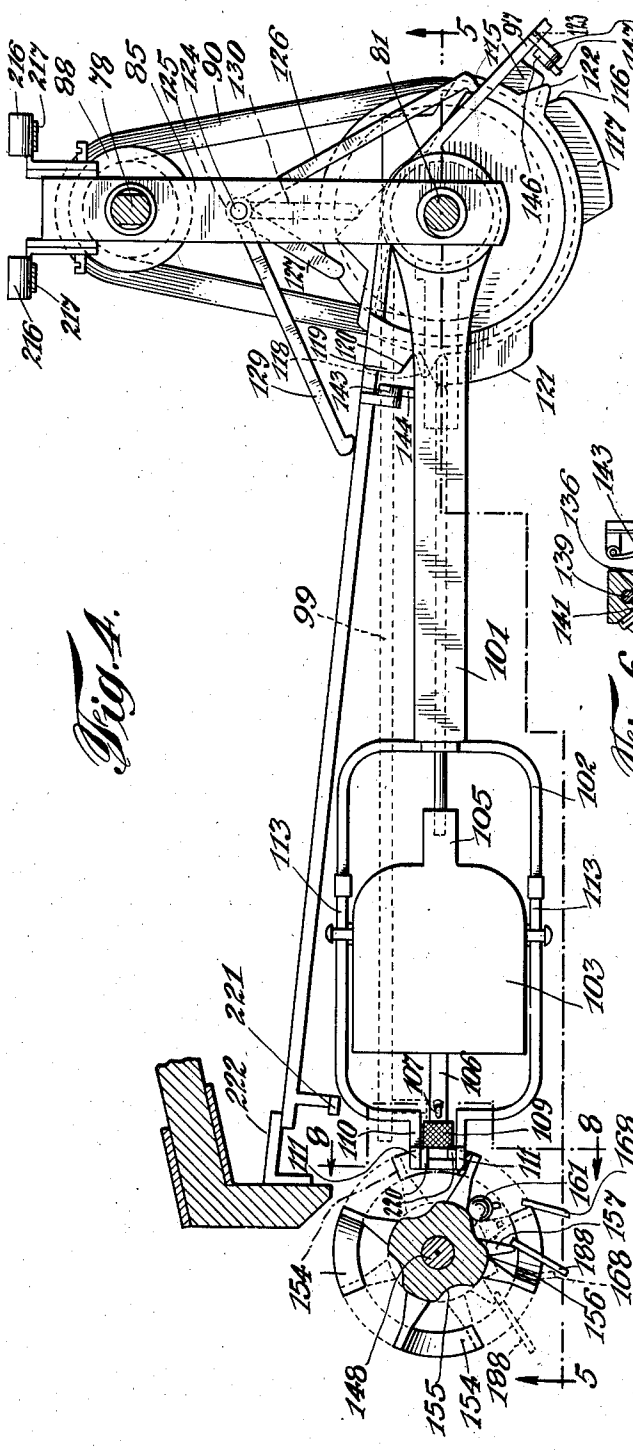


Fig. 4.

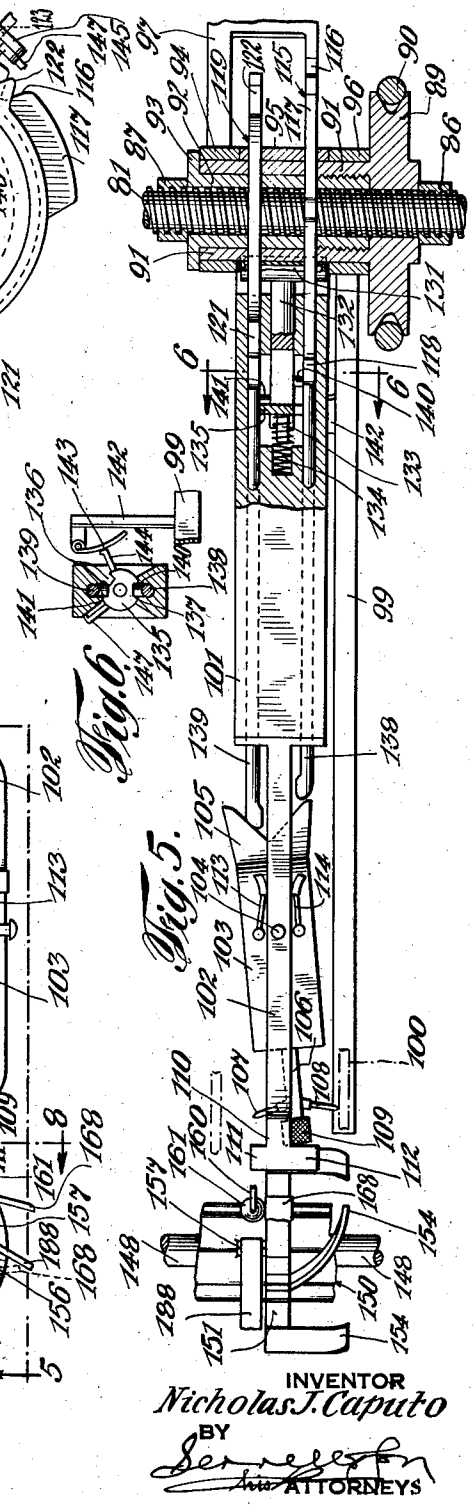


Fig. 6.

Fig. 5.

INVENTOR
Nicholas J. Caputo
BY
Sennegan
ATTORNEYS

Sept. 9, 1930. N. J. CAPUTO 1,775,510

SOUND REPRODUCING APPARATUS

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Fig. 7.

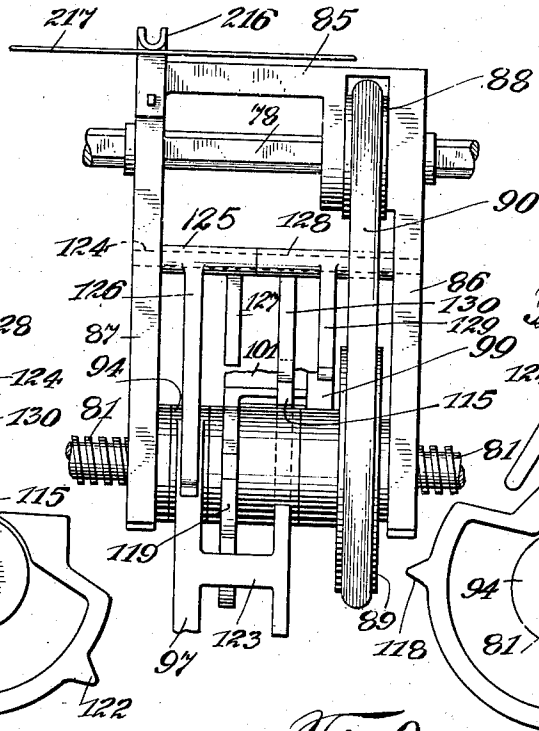


Fig. 12.

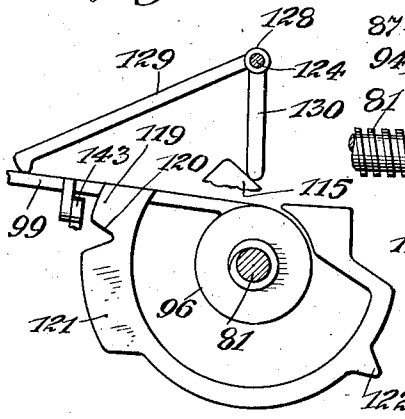


Fig. 13.

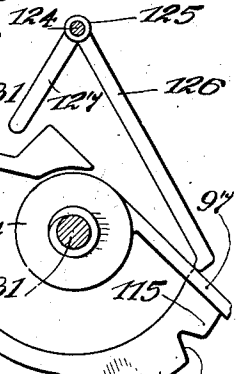


Fig. 8.

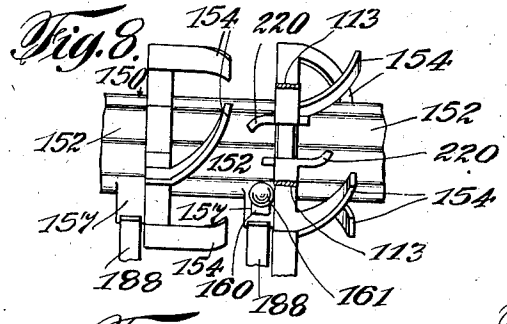


Fig. 9.

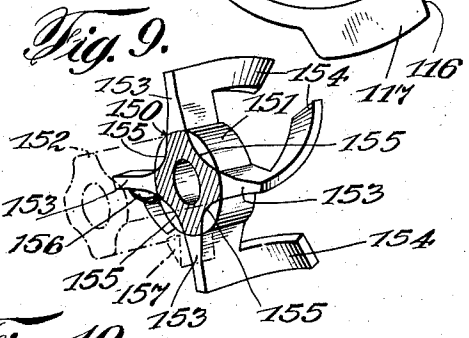


Fig. 11.

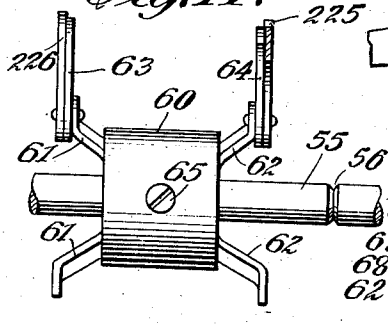
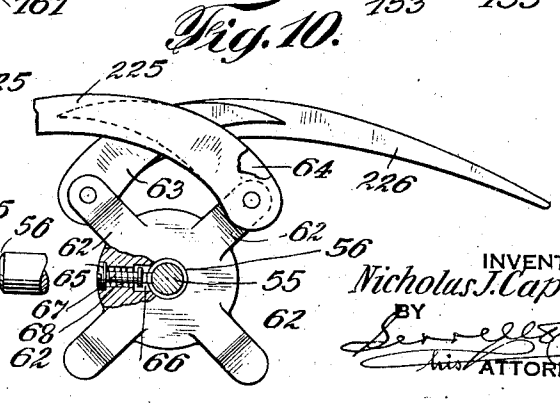


Fig. 10.



INVENTOR
Nicholas J. Caputo
BY
ATTORNEYS

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1,775,510

UNITED STATES PATENT OFFICE

NICHOLAS J. CAPUTO, OF HOLLIS, NEW YORK

SOUND-REPRODUCING APPARATUS

Application filed October 2, 1928. Serial No. 309,847.

This invention relates to an apparatus for reproducing sound and particularly to the type of apparatus generally known as phonographs, in the use of which sound is reproduced from records preferably of the disc type. In carrying out the invention either electro-magnetic or electro-static or other means may be employed in the reproduction of the sound.

I am aware that heretofore various devices have been made for use in phonographs whereby it is possible to automatically repeat the reproduction of sound from a given record and also to continuously and successively reproduce the sound from a series of records. The object of my invention, however, is the provision of an apparatus in the use of which it is not only possible to repeat as often as may be desired the reproduction of sound from a given record and to successively reproduce the sound from a plurality of records, but also to utilize a plurality of records and to automatically reproduce the sound from the records successively, for reproducing the sound from any desired record, and to make it possible to automatically reproduce the sound from any desired succession of records irrespective of the manner or sequence in which they may be placed in the apparatus.

In carrying out the invention I employ a device for supporting and revolving the records when placed preferably in vertical and suitably spaced positions, together with a carriage and devices associated therewith including a sound reproducer, and means operative in the actuation of the apparatus for so moving the carriage and the devices associated therewith that the sound reproducer may be moved to position between any of the adjacent record discs, set and moved to reproduce the sound recorded on the faces thereof, either successively or alternately, and automatically shifted in such a manner as to reproduce the sound recorded on the successive record discs in any desired manner or sequence at the option of the operator of the apparatus, as will be hereinafter more particularly described.

In the drawing Figure 1 is a sectional vertical elevation illustrating the parts of a sound reproducing apparatus made in accordance with my invention,

Fig. 2 is a sectional plan on line 2—2, Fig. 1,

Fig. 3 is a partial sectional elevation on line 3—3, Fig. 1,

Fig. 4 is a sectional elevation on an enlarged scale showing the carriage, the sound reproducer, and various parts associated therewith, looking at the same from the rear of the apparatus,

Fig. 5 is a section on line 5—5, Fig. 4,

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

Fig. 7 is a front elevation on an enlarged scale of the sound reproducer carriage,

Fig. 8 is an elevation of the cam members taken on line 8—8, Fig. 4,

Fig. 9 is a perspective view of one of the sets of these cams,

Fig. 10 is a sectional elevation on an enlarged scale taken on line 10—10, Fig. 1,

Fig. 11 is a side elevation of one of the spacer devices as shown in Fig. 10,

Fig. 12 is an elevation of the end of one of the guide arms with the cam associated therewith, and

Fig. 13 is a similar view of the end of the other guide arm and the cam associated therewith.

In carrying out the invention the apparatus is mounted in a suitable casing comprising a front, rear and side walls. As illustrated the front wall is indicated at 15, the rear wall at 16 and the side walls at 17 and 18 respectively. There is also preferably included in the casing an intermediate wall 19 extending in a position parallel to the front and rear walls. The mechanism as illustrated is operated by the motor 20. This may be mounted in any suitable manner and in any desired position. On the shaft 21 of the motor there are pulleys 22 and 23. A belt 24 passes around the pulley 22 and a belt 25 around the pulley 23. A pulley 26 is mounted on a stub shaft 27 connected or journaled in a suitable position in the wall 15. The belt 24 also passes around this pulley 26. There is also a pulley 28 mounted on a stub shaft 29 complementary to the stub shaft 27

and similarly journaled or mounted in the wall 15. The belt 25 is crossed and also passes around the pulley 28. By this construction, as will be understood, the shafts 27 and 29 are turned in opposite directions by the motor.

A pulley 30 is mounted on a shaft 31 which is journaled in the wall 19 in alignment with the shaft 27. Passing over this pulley 30 is a belt 32. A pulley 33 is mounted on a shaft 34 also journaled in the wall 19 and the belt 32 also passes around the pulley 33. A pulley 35 is mounted on a shaft 36 which is journaled in the wall 19 in alignment with the shaft 29. A belt 37 passes around the pulley 35 and also around the pulley 33. As clearly indicated in Fig. 1 of the drawing on the shaft 34 there is also a friction pinion 38.

On the shaft 31 there is a clutch collar 39 connected with which there is a friction disc 40 adapted to engage a friction disc 41 carried by the pulley 26, the clutch collar and its disc being slidably mounted on the shaft 31 and adapted to turn therewith. Similarly on the shaft 36 there is a clutch collar 42 associated with which is a friction disc 43 adapted to engage with a friction disc 44 carried by the pulley 28. Associated with the clutch collars is a shift lever 45 pivotally mounted at 46 and having yoke ends 47 and 48 adapted respectively to engage the circumferential notches in the clutch collars 39 and 42. This shift lever 45 is actuated by an operating lever 49 pivotally mounted on a pin 50 and connected at one end to an arm 51 carried by the shift lever in order, as will be understood, to move either one of the friction discs 40 or 43 into contact with its respective friction disc 41 or 44.

Engaging with the friction pinion 38 there is a friction wheel 52 the hub 53 thereof being journaled in a bearing provided therefor in the wall 19. Extending from the hub 53 there is a stub shaft 54. Associated with the stub shaft there is a support shaft 55. In suitably spaced positions this shaft 55 is provided with circumferential grooves 56. One end of the shaft 55 is mounted in a bearing 57 supported on the wall 16, while the opposite end of the shaft is provided with a collar 58 adapted to engage the stub shaft 54. This shaft 55 is normally maintained in an operative position by means of the spring 59 or otherwise. The shaft 55 functions as a support for the disc records which are placed in spaced positions thereon.

The records are spaced by sleeves 60 each one of which is provided with spaced arms 61 and 62 adapted to engage the records for maintaining the same in position, as illustrated at a predetermined distance. Each of these sleeves is fitted with cams 63 and 64, as illustrated in Figs. 10 and 11, and which will be hereinafter described. The sleeves as also illustrated in Fig. 10 are each preferably fitted with a screw plug 65 located in a recess 66 provided therefor in the plug and carrying a pin 67 actuated by a spring 68 for normally engaging the inner end of the pin against the shaft 55 and preferably one of the circumferential grooves 56 therein. As illustrated in the drawing the record discs are designated at 69 and as will now be understood are maintained in their respective spaced positions, which is preferably vertical on the shaft 55 which passes through the central opening in each disc whereby through the turning of the shaft in either direction the records mounted thereon will be simultaneously revolved in a corresponding direction.

Suitably journaled in the upper portion of the frame member 15 there is a stub shaft 70. Mounted on this stub shaft 70 is a pulley 71 with which there is associated a friction disc 72. A belt 73 passes over the hub pulley 53 and also over the pulley 71 whereby this pulley is driven from the hub pulley 53. In a position above and suitably spaced from the stub shaft 70 there is another stub shaft 74 also suitably journaled in the frame member 15. On this stub shaft there is a pulley 75 and associated with the pulley 75 there is a friction disc 76. A belt 77 passes over the pulleys 71 and 75 whereby the pulley 75 is driven from the pulley 71.

Suitably journaled in the frame members 16 and 19 and in alignment with the stub shaft 74 there is a shaft 78 which may be called a carriage shaft and which is clearly indicated in Fig. 4 is preferably flat sided. Mounted on the shaft 78 adjacent the stub shaft 74 there is a clutch disc 79 and a sleeve 80 adapted to turn with and slide upon the shaft 78 and to be connected with and disconnected from the pulley 75 by means of the discs 76 and 79. Also suitably journaled in the frame members 16 and 19 there is a shaft 81. This shaft is provided with a suitable screw thread and is in alignment with the stub shaft 70. On the end of the shaft 81 adjacent the stub shaft 70 there is a clutch disc 82 and a sleeve 83 mounted to slide on the shaft and to turn therewith and to engage with the friction disc 72 whereby the shaft 81 may be turned by the pulley 71 through the friction discs 72 and 82. A suitable shift lever 84 engages the sleeves 80 and 83 and is actuated as hereinafter described to shift the discs 79 and 82 in such a manner as to cause them respectively to be disengaged from or to be engaged with the corresponding friction disc associated therewith.

Mounted on the shafts 78 and 81 there is a carriage 85. This carriage comprises a suitable frame having arms 86 and 87 through which both the said shafts pass. Mounted on the shaft 78 and between suitable guides provided therefor in the carriage there is a pulley 88. This pulley is mounted on the shaft so as to slide thereon and turn there-

with, it being understood that the carriage is adapted to slide on the shaft 78 and to be shifted on this shaft by the shaft 81, the screw threads of which engage with the screw threaded portions of the arms 86 and 87 through which this shaft 81 passes so that when the shaft 81 is turned in one direction or the other the carriage 85 is correspondingly moved in one direction or the other.

Mounted to turn freely on the shaft 81 and immediately within the arm 86 is a pulley 89. Passing over this pulley and also over the pulley 88 there is a belt 90 whereby when the shaft 78 is revolved and the pulley 88 turned thereby the pulley 89 is also turned on the shaft 81. This pulley 89 has a hub 91 which fits upon and is connected to a sleeve 92 by means of the screw threads as indicated in Fig. 5, or otherwise. At one end the sleeve 92 is flanged, as indicated at 93 and also as illustrated in Fig. 5 this flange 93 preferably lies immediately within the carriage arm 87 whereby these parts are mounted to extend and fit between these carriage arms.

Mounted on the hub 91 of the pulley 89 there is a series of rings 94 and 95 and 96. These rings extend between the flange 93 and the pulley 89 and are adapted to turn on the hub 91. Connected with the ring 94 there is a guide arm 97 adapted, as hereinafter described, to contact with the periphery of the record disc 98 and similarly connected to the ring 96 there is a guide arm 99 adapted to bear against the periphery of another disc record which is indicated at 100. The guide arm 97 extends to one side of the shaft 81 and the guide arm 99 to the other side thereof. The purposes and functions of these guide arms will be hereinafter more particularly described.

Extending from the ring 95 there is a reproducer arm 101. This reproducer arm 101 carries a frame 102 between the oppositely disposed parts of which a reproducer 103 is pivotally mounted, as indicated at 104. The reproducer may be of any desired type but is preferably an electro-magnetic or electrostatic reproducer. At one end the reproducer has a projection 105 in which there is a V-shaped notch and at the opposite end there is a needle arm 106 carrying needles 107 and 108. At the extremity of the needle arm there is a screw head 109 for maintaining the needles in position. The outer end 110 of the reproducer frame is provided with projections 111 and 112. The reproducer is normally maintained in position, which may be a neutral position, by means of springs 113 and 114 connected at corresponding ends in the sides of the reproducer and adapted at their opposite ends to yieldingly engage the side members of the reproducer frame, as is clearly shown in Figs. 4 and 5 of the drawing.

Connected to the guide arm 97 there is a cam 115. This cam is made to include a notch or recess 116, a cam face 117 and a projection 118 spaced therefrom. In a similar manner the guide arm 99 is provided with a cam 119. This cam 119 is constructed to include a notch or recess 120, a cam face 121 and a projection 122 spaced therefrom.

The cam 115 is connected to and carried by the guide arm 97 by means of a cross arm 123 and in a similar manner the cam 119 is connected to and carried by the guide arm 99 by a similar cross piece.

Extending between the members 86 and 87 of the carriage 85 there is a shaft 124. Mounted on this shaft 124 there is a sleeve 125 extending from which there is a long arm 126 and a short arm 127. The long arm is adapted to bear against the guide arm 97 and when raised or lifted thereby to swing the short arm 127 into contact with a shoulder on the guide arm 99 to thereby raise the same in order to cause it to clear the records. On the shaft 124 is also a sleeve 128 extending from which is a long arm 129 adapted to bear against the guide arm 99 and a short arm 130. When the long arm 129 is lifted or raised by the guide arm 99 it thereby swings the short arm 130 into contact with a shoulder on the guide arm 99 to thereby raise the same, causing it to clear the records. It will therefore be understood that the lifting of one of the guide arms causes the other guide arm to be raised so that when necessary to shift the carriage both the guide arms are clear of the records irrespective of the diameters thereof.

Associated with the reproducer arm 101 there is a clutch adapted to engage the hub 91. The head 131 of this clutch may be made of any suitable material adapted to functionally engage the hub so that when thus engaged through the turning of the hub the reproducer arm and parts associated therewith will be swung or moved correspondingly. The clutch head 131 is carried by a plunger 132 mounted to move in a guide provided therefor in the reproducer arm 101. This plunger is provided with a reduced end 133 on which there is associated a spring 134 for actuating the plunger to normally move the same and the clutch head toward the hub.

Swiveled on the reduced end 133 of the plunger there is a disc 135 having notches 136 and 137 in the periphery thereof. Mounted to move longitudinally thereof in the reproducer arm 101 there are rods 138 and 139. These rods are adapted normally to contact with the edge of the disc 135 and the rod 138 is provided with a pin 140 and the rod 139 with a corresponding pin 141. The pins 140 and 141 are adapted to engage the disc 135 or to pass through the notches therein depending upon the position of the disc. As hereinafter described it will be seen that the rods 138 and 139 are operated to

engage and disengage the clutch head 131 with the hub 91 and to engage the surfaces of the V-shaped notch at the end of the reproducer 103 to swing the same to one side or the other of its neutral position and to thereby cause one of the needles to engage the face of a record. The guide arm 99 is provided with a projection 142 carrying a spring 143 adapted to cooperate with a pin 144 connected to and extending from the disc 135. Similarly the guide arm 97 is fitted with a projection 145 carrying a spring 146 for cooperating with a pin 147 connected to and extending from the disc 135. The operation of these parts will be hereinafter more particularly described.

In the upper portion of the cabinet or casing there is a shaft 148 at one side thereof and a corresponding shaft 149 at the opposite side thereof. Both these shafts extend between and are fixed in the walls 16 and 19. Mounted on these shafts there are series of cam devices 150. On each shaft there is one of these cam devices for each one of the records mounted on the shaft 55. These cam devices are similarly constructed and placed on the shaft 148 in one position and on the shaft 149 in the opposite position. The cam devices 150 are moreover illustrated in detail in Figs. 8 and 9. Each of these cam devices, as will be seen from these figures, comprises a collar 151 and a hub 152 extending therefrom and mounted to turn freely on the shaft on which it is placed.

Extending radially from each hub there is a series of spaced arms 153 and each arm 153 has a curved projection 154 extending therefrom which functions as a cam, as hereinafter described. The hub portion 152 is so constructed as to include spaced recesses 155 which are intermediate of the arms 153. Moreover, each of these cam devices includes a boss 156 and a projection 157. The boss 156 extends from one of the ribs intermediate of adjacent recess 155 and the projection 157 extends from the collar 151 intermediate of two of the arms 153.

Also in the upper portion of the casing and in the same side thereof as the shaft 148 there is a shaft 158. This shaft 158 extends between and is mounted in the walls 16 and 19 and is parallel with but below the shaft 148. On the shaft 158 there is a series of collars 159 corresponding in number with the number of cam devices 150 and consequently with the number of records on the shaft 55. Each collar 159 has an arm 160 extending therefrom with a ball 161 at the extremity thereof. This ball is adapted to operate in the recess 155 in the hub of the corresponding cam device and is normally maintained in position therein by any suitable spring or other tension means which may be applied either to the shaft or to each of the arms individually. Each arm 160 may itself be a spring and the shaft 158 fixed in position. In the opposite side of the apparatus there is a shaft 162 corresponding with the shaft 158. On the shaft 162 there is a series of collars 163, one of which is shown in Fig. 2 and each of which is provided with an arm 164 at the extremity of which there is a ball 165 adapted to cooperate with the recessed hub portion of the cam devices 150 mounted on the shaft 149. The balls 165 are each maintained in contact with the surface of the hub of the corresponding cam device by any suitable tension means, it being understood of course, that there is a collar 163 and its arm and spherical head for each of the cam devices on the shaft 149.

In the upper portion of the apparatus and on the same side as the shafts 148 and 158 there is another shaft 166. This shaft extends between and is journaled in the walls 16 and 19 and is fitted with a plurality of collars 167 each having an arm 168 extending therefrom. The number of these collars corresponds to the number of cam devices on the shaft 148 and the arm 168 extending from each of these collars is sufficiently long to be engaged by any one of the arms 153 of the corresponding cam devices 150. The shaft 166 extends through the wall 19 and on the outer side thereof is provided with a crank 169. On the opposite side of the apparatus there is a shaft 170 corresponding to the shaft 166. On this shaft 170 there is a series of collars 171 each having an arm 172 extending therefrom, these collars and arms corresponding in number with the cam devices 150 on the shaft 149 and each arm 172 is sufficiently long to be engaged by any of the arms 153 on these cam devices on the shaft 149. The shaft 170 also passes through the wall 19 and on the outer side thereof is provided with a crank 173.

The crank 169 carries a pawl 174 adapted to engage in a notch 175 adjacent the corresponding end of the rod 176. The crank 169 and consequently the shaft 166 are normally maintained in an initial position by means of a spring 177. In a corresponding manner on the opposite side of the apparatus the crank 173 carries a pawl 178 adapted to engage a notch 179 adjacent this end of the rod 176 and the crank 173 and the shaft 170 are normally maintained in their positions by a suitable spring 180 or otherwise. The rod 176, as illustrated in Fig. 3 is mounted on springs 181 and 182 and is adapted to be shifted in guides 183 and 184. A central portion of the rod 176 is pivotally connected, as indicated at 185, to the upper end of the lever 49 whereby in shifting the rod 176 from one position to another the lever 49 is actuated to swing the arm 51 and consequently to rock the shift lever 45 causing the yoke ends 47 and 48 thereof to operate the clutch disc and to thereby turn the disc record shaft 55 in the direction in which the carriage shaft

78 and the reproducer shaft 81 is caused to turn.

In the upper portion of the apparatus and at one side thereof there is still another shaft 186 which extends between and is journaled in the walls 16 and 19. On this shaft there is series of collars 187 each having an arm 188 extending therefrom. The collars 187 and the arms 188 correspond in number with the number of cam devices 150 on the shaft 148 so that there is a collar 187 and an arm 188 for each of the records in the apparatus. At one end of the shaft 186 there is a link 189. One end of this link is fixed on the shaft. The other end of the link 189 is pivotally connected as indicated at 190 to one end of the arm 191 of a shift rod. This arm 191 is mounted in guides 192 and is extended in an arm 193 at right angles thereto and integral therewith, or otherwise, the arm 193 being sufficiently long to extend over a crank 194 in a shaft 195.

At the opposite side of the apparatus the shaft 186 has a counter part in a shaft 196. Mounted on the shaft 196 there is a series of collars 197. Each of these collars 197 carries arms 198 and the number of collars 197 and the arms 198 correspond with the number of cam devices 150 on the shaft 149 so that there is one of these collars 197 and its arm 198 for each of the records mounted on the shaft 55. Secured on one end of the shaft 196 there is a link 199. One end of the link 199 is secured to the shaft and the opposite end is pivotally connected, as indicated at 200, to the end of an arm 201 of another shift rod. The arm 201 is mounted in guides 202, and has an extension 203 at right angles thereto and which may be integral therewith or suitably connected thereto. The arm 203 also extends over the crank 194 of the shaft 195. This shaft 195 extends through slots 204 and 205 provided therefor in the walls 15 and 16 and is mounted on spring actuated plungers 206 and 207 so as to be yieldingly supported and normally maintained in an initial position.

Pivotally connected at one end on the crank 194 there is a rod 208 which is movable in guides 209. The lower end of this rod 208 is pivotally connected at 210 to one end of a link 211 forming part of the shift lever 84. The link 211 is pivotally mounted on a pin 212 and carries a cross arm 213 having yoke ends 214 and 215 which complete this shift lever 84. The yoke end 214 is adapted to engage in the circumferential recess of the sleeve 83, and the yoke end 215 in the sleeve 80.

The carriage 85 is fitted with terminals 216 for leads from the reproducer and the terminals 216 are caused to slide on and bear against trolleys 217 which exteriorly of the wall 16 or otherwise may be fitted with terminals for lead wires to a suitable vacuum tube amplifying apparatus. The diameter of the shaft 55 is necessarily limited by the diameter of the centering holes of the records and consequently the diameter of this shaft is relatively small. In some instances as will be understood, where a relatively large number of records is to be employed and is provided for it may be necessary to employ one or more supports to maintain the shaft 55 in alignment. One of these supports is indicated at 219, in Fig. 1. At its base the support rests upon the floor of the cabinet or casing and at its upper end it is provided with a bearing adapted to receive any one of the spacer sleeves 60. By this means, as will be understood the shaft 55 may be maintained in alignment irrespective of its length and the number of records it may support.

In the operation of the apparatus the various parts of the mechanism are driven by the motor 20. The records 69 are placed on the shaft 55 and maintained in position thereon by means of the spacer sleeves 60. The reproducer arm 101 and the reproducer 103 carried thereby are caused to swing first in one direction and then in the opposite direction between the various and succeeding records either in one direction or the other, that is, the reproducer arm and reproducer may be caused to move from the front to the rear of the apparatus and to play the records successively in this direction, or the reproducer arm and reproducer may be caused to move from the rear toward the front of the apparatus and to play the successive records when traveling in this direction. The arrangement, furthermore, is such that when desired any one or more of the records may be omitted, that is, unplayed when the reproducer arm and reproducer are caused to travel in either one direction or the other. In the further explanation of the operation of the apparatus it will be assumed that in looking at the parts from the front the nearest face of each record will be called the obverse face and the distant face of each record the reverse face, and that when swinging clockwise, when viewed from the front of the apparatus, the parts are operated to play the record on the obverse face of the adjacent record discs and when moving counter-clockwise are operated to play the record on the reverse face of the next adjacent disc. It will be understood, of course, that when playing the record on the reverse face of the disc the shaft 55 and the record thereon turn in one direction, whereas when playing the records on the obverse face of the same or adjacent record discs the shaft 55 and the records thereon must turn in the opposite direction.

For the sake of illustration it may be assumed that the reproducer arm and reproducer have been moving counter-clockwise and playing the record on the obverse face of the record 98 (see Fig. 1). During the playing of the record, as hereinafter described,

the reproducer arm is free to move on the hub 91 and the needle 107 is maintained in contact with the record so as to freely track in the groove thereof. After the playing of this record has been completed the clutch head 131 engages the hub and the reproducer arm and reproducer continue to swing in a counter-clockwise direction by means of the motor operating the various parts as hereinbefore described to turn the shaft 78 and thereby the pulley 88 and through the belt 90, the pulley 89 and the hub 91. These members then continue to travel in this direction, as indicated in Figs. 4 and 5, until the reproducer arm and the reproducer frame have reached a substantially horizontal position, as shown in Fig. 4. When this position of the reproducer arm has been reached the projection 111 will have come into contact with one of the arms 153 on the corresponding cam device on the shaft 148. Assuming that this cam device is set to be given a partial turn by the projection 111 the continued movement of the reproducer arm and the frame carried thereby causes this cam device to be given a partial turn wherein the corresponding ball 161 is caused to ride over the intervening rib between the adjacent recess in the hub of the cam device, thereby limiting and determining the extent to which the cam device is turned. This occurs at the moment when the stop 221 carried at the end of the guide arm 99 comes into contact with the needle arm 106 of the reproducer which determines the extent of the swinging movement of the reproducer arm relatively to the frame carried thereby, it being understood that the upward swinging movement of the reproducer arm carries the guide arm 99 along with it until the free end of the guide arm 99 contacts with a stop 222 suitably connected to the frame, as indicated in Fig. 4. Also as hereinbefore described the upward swinging movement of the guide arm 99 swings the long arm 129 and actuates the short arm 130 of the bell crank lever which also swings upwardly the other guide arm 97 so that both guide arms are entirely free or clear of the upper edges of the record discs irrespective of the diameter thereof.

In the upward movement of the reproducer arm the rod 139 has been free to move in the reproducer arm and consequently to ride over the projection 122 and the cam face 121 on the cam 119 which is actuated by the guide arm 99, it being understood that in this swinging movement of the reproducer arm the pin 138 has been employed. At the time the cam device is caused to turn a partial revolution it operates the corresponding arm 168 on the shaft 166 causing the shaft to rock and to thereby swing the crank 169 sufficiently far to cause the pawl 174 to engage in the notch 175 and to shift the rod 176 from right to left, as viewed in Fig. 3, thereby swinging the operating lever 49 and causing the reversal of the direction in which the carriage shaft 78 is revolved. This, as will be understood, causes the hub 91 to also turn in the opposite direction whereby the reproducer arm and the parts associated therewith swing in the opposite direction, which is clockwise, as viewed from the front of the apparatus. When the reproducer arm reaches the position in which the stop 221 bears against the needle arm 106 the disc 135 is shifted to the position shown in Fig. 6 by means of the pin 144 being brought into contact with the spring 143 carried by the cross arm connected to the guide arm 99. At this time the inner end of the rod 139 is permitted to engage in the recess 120 of the cam 119, then, as will be understood, the clutch head 131 is still in engagement with the hub 91 and the parts continue to descend. This motion continues until the guide arm 99 rests upon the periphery of the corresponding record disc. When this action takes place, as will be understood, the guide arm 99 remains stationary and the reproducer arm and the parts associated therewith continue to descend. During this continued movement the inner end of the rod 139 rides upon an inclined face forming part of the recess in the cam carried by the guide arm 99. As the downward movement of the reproducer arm continues the inner end of the rod 139 rides upon the cam face 121. In reaching this position this rod 139 is shifted from right to left as seen in Figs. 4 and 5 and this movement of the rod 139 causes the pin 141 carried thereby to contact with the face of the disc 135 and to thereby shift the disc from right to left, as viewed in Figs. 4 and 5. This is done against the action of the spring 134 and imparts a corresponding movement to the plunger 132 thereby relieving frictional contact between the clutch head 131 and the hub 91. This movement of the rod 139 also causes the outer end thereof to engage in the V-shaped notch at the end of the reproducer, swinging the same into the position shown in Fig. 5 wherein the needle 108 is brought into contact with the adjacent face of the record disc 100, between the periphery of the record and the first groove thereof. This is done because of the varying distances between the periphery of the first groove in various records. When the rod 139 is moved from right to left by riding over the cam face 121 the frictional contact between the clutch head 131 and the hub 91 is not relieved until the end of the rod is on the high portion of the face of the cam 121. Consequently as the rod rides between the recesses 120 and the cam face 121 the clutch head and hub are held in frictional engagement and the needle after having made its initial contact with the face of the record will ride from the position of this initial contact to the first groove of the record. The end

portions of the rods 138 and 139 are preferably made of a material sufficiently resilient to create a pressure between the rod and the reproducer which is sufficiently flexible or variable to permit the parts to function in their intended manner. The hub 91 and the parts associated therewith continue to turn, and the reproducer arm and the parts carried thereby are now free to swing so that the needle 108 may track freely in the groove in the face of the record disc 100. The reproducer and the needle are maintained in this position by means of the rod 139 when shifted to the position shown in Fig. 5, as hereinbefore described. In order that the needle may track freely in the groove of the face of the record disk, the frictional contact between the end of the rod 139 and the cam face 121 must be kept at a minimum by any suitable means such for example a ball bearing. The pressure exerted between the needle and the face of the record is sufficient to maintain the needle in the groove of the record against the force of gravity. It will be obvious that the reproducer may be suitably placed in order to cause the same to be adequately maintained in position to permit the needle to track in the groove of the record and to prevent the needle from jumping from the groove of the record. It will be also understood that at this time the disc 135 is in that position in which the pin 140 on the rod 138 is free to move in its notch in the disc 135, that is, irrespective of the action of the cam 115 the rod 138 remains inoperative. However, during the playing of this record the inner end of the rod 138 can only bear against the low face of the cam. The inner end of the rod 139 remains in contact with the cam face 121 until the record has been played. In instances where the downward movement of the reproducer arm is of sufficient extent to carry the end of the pin off the cam face 121 is coincident with the length of the record, the end of the pin then runs onto the low face of the cam and the rod is free, thereby liberating the disc 135 and permitting the spring 134 to again shift the plunger 132 bringing the clutch head 131 into engagement with the hub 91 whereby, it will be understood, the reproducer arm and parts associated therewith continue to swing in this clockwise direction. Of course when the end of the rod moves off the cam face 121 the rod being free permits the action of the springs 113 and 114 to come into play and to thereby return the reproducer to its normal or central position relatively to the frame 102 in which it is pivotally mounted. In instances where the recorded record is short the needle may reach the end of the groove therein before the inner end of the rod rides off the cam face 121. In such instances the cam 63 or 64 is set so that the corresponding cam picks up the needle and the needle is carried along the cam in the same manner that it would have been carried by the record grooves until the point is reached in the travel of the reproducer arm for the end of the rod 139 to slide off the cam face 121. This clockwise swinging movement of the reproducer arm is then continued until the same reaches a substantially horizontal position on the other side of the apparatus so as to actuate in one manner or another one of the cam devices 150 on the shaft 149. Of course it will be understood that irrespective of the shift which is effected at this time the parts are eventually reversed so that the reproducer arm again swings in the opposite direction in which the disc 135 is re-set so that the rod 139 is free to move in the reproducer arm and the rod 138 is actuated by the cam on the guide arm 97 to swing and maintain the reproducer 103 in a position in which the needle 107 tracks in the groove in a record. In this action the inner end of the rod 138 bears against the cam face 117 carried by the guide arm 97 and the operation is otherwise similar to but the reverse of that hereinbefore described. Likewise, as will be understood, the upward movement of the reproducer arm carries the guide arm 97 with it and this operates the long arm 126 actuating the short arm 127 to bear against the projection of the guide arm 99 so that these guide arms are again raised sufficiently far to be entirely free of the periphery of the discs. It is also to be noted that in moving upwardly to shift the position of one of the cam devices 150 the end of the reproducer frame and the reproducer arm, due to the initial or normal position of the arm 153, carries the cam device sufficiently far to remove the corresponding ball from one groove in the cam device to permit it to move into the next succeeding groove, whereas in the return or downward movement of the reproducer arm the projection at the end of the reproducer arm contacts with the next succeeding arm 153 of the corresponding cam device but does not move it sufficiently far to permit the ball to move over the rib between the grooves in the cam device whereby in the return movement of the reproducer arm the cam device is merely rocked and no result is effected thereby.

It will be obviously necessary to raise the tone arm after completing the obverse side of one record before beginning the reverse side of the next adjacent record because the rotation of the disk records must be reversed in changing over from the playing of the record on one disk to the playing of the record on the other. This is caused by the fact that the grooves in the record are made to extend from a point adjacent the periphery to a point adjacent the center thereof. Obviously, however, the record grooves might be made special so that the grooves on the obverse face of one record might extend from a point adja-

cent its periphery to a point adjacent its center and the grooves on the reverse side of the next adjacent record be made to start at a point adjacent its center and to end at a point adjacent its periphery. In so doing it would not be necessary to raise the tone arm or reproducer in successively playing the records on the obverse and reverse faces of adjacent record disks. The apparatus made in accordance with my present invention, however, is constructed to use record disks as ordinarily made although the changes necessary for the use of specially constructed records as hereinbefore indicated might be made without departing from the nature and spirit of my invention.

It will be understood, as hereinbefore stated, the cam devices 150 on the shafts 148 and 149 may be set manually to any desired position. As the reproducer arm swings upwardly, as hereinbefore last described, the corresponding cam devices 150 on the shaft 149 may be set in that position in which when the projection 112 at the end of the reproducer frame strikes one of the arms 153 of the cam and blocks the same the movement of the cam device will be insufficient to permit the corresponding ball to move over the projection or boss 156 and this initial movement of the cam device causes the projection 157 thereon to contact with the corresponding arm 198 on the shaft 196 thereby rocking the shaft and swinging the link 199 to move the arms 201 and 203 downwardly to depress the rod 208 thereby actuating the shift lever 84 and causing the clutch discs 76 and 79 to be separated and the clutch discs 72 and 82 to be brought together. This action causes the shaft 78 to stop rotating and sets the shaft 81 in motion.

The reproducer arm will, therefore, be maintained in that relatively horizontal position in which this action takes place. Upon the shaft 81 being turned, as will be understood, the carriage 85 will be shifted. The carriage continues to move until the projection 112 runs off the arm 153 of the cam device with which it has been in engagement whereupon this cam device is free and is returned by the action of the corresponding ball 165 and the spring actuating the same thereby releasing the projection 157 and permitting the arm 198 and the shaft 196 to return to their normal positions, in doing which, of course, the arms 201 and 203 are raised by the action of the shaft 195, thereby again shifting the shift lever 84, releasing the shaft 81 and setting again in motion the shaft 78. In the meantime the projection 220 at the end of the reproducer frame is advanced sufficiently far to come into contact with the corresponding projecting cam 154 of the next succeeding cam device, thereby turning the same a partial revolution. This partial revolution of the next succeeding cam device is effected simultaneously with or immediately after the re-shifting of the shift lever and the re-setting in motion of the shaft 78 whereby, as will be understood, the rod 176 is reshifted and the shaft 78 is set in motion in the opposite direction, thereby causing the reproducer arm and the parts carried thereby to swing again in a counter-clockwise direction to play the record on the obverse face of the next succeeding record disc. This, of course, assumes that the travel of the carriage is from the rear to the front of the apparatus. Obviously the reverse condition maintains in causing the carriage to travel from the front to the rear of the cabinet and to play the successive records when traveling in this direction. Obviously also the cam devices may be so set on the shafts 148 and 149 as to cause the omission of the playing of any one or more of the records, as may be desired.

The shaft 195 as illustrated in Fig. 1 may be provided with stop arms 223 and 224 which are adjustable to position thereon and with which the sides of the carriage are adapted to contact to limit the extent of the travel of the carriage either toward the front or toward the rear of the apparatus so that these parts may be set to determine the records, or sets of records, to be played. As will be seen by reference to Figure 1, the elevated portion of the rod 195 may be shifted to the right when the carriage 85 contacts with the stop arm 224. In so doing the arm 203 when moved downwardly will not allow the rod 208 to rise and as will be understood will stop the travel of the carriage 85 from right to left. Similarly the arm 223 in contacting with the carriage 85 will stop the travel of the carriage in the movement thereof from left to right. Furthermore, the spacer devices for the records may be fitted with long cams 225 and 226 which may be used alternatively with the cams 63 and 64 when necessary in order, as will be understood, to cause the needle to be guided by the edge of one or the other of these long cams when it is desired to omit the playing of the record on the face of any of the record discs. As will be apparent the apparatus as hereinbefore described may be made for use merely as an ordinary phonograph or sound reproducing device, and may also be used in conjunction with a motion picture apparatus in which, of course, it is necessary to so regulate the speed of the motor and the disc record shaft that the same will synchronize with the motion picture apparatus and as another instance of use the apparatus may be employed in conjunction with a coin freed mechanism, whereby as desired the instrument may be played through the intervention of inserting a coin in a slot. In some instances it may also be advisable to furnish each one of the cam devices 150 with a numeral, or other index, so that it may be read-

ily set in any desired position and in order to make the indices of the cam devices visible the apparatus in a suitable position may be provided with a mirror or other reflector, as indicated at 227 in Fig. 3. It will now be understood that the cam devices and the other parts of the apparatus may be set so as to cause the automatic playing of any desired number of the records mounted on the record shaft in sequence, or in repetition, or as may be otherwise desired by the operator.

I claim as my invention:—

1. In a sound reproducing apparatus, a support for a plurality of spaced disc records, means for turning the said support and disc records in either direction, a reproducer, a reproducer carrier, means for moving the reproducer carrier and reproducer in one direction between adjacent disc records and causing the reproducer to engage a groove in a disc record when the record support is turned in one direction and moving the reproducer carrier and reproducer in the opposite direction between the same disc records and causing the reproducer to engage a groove in the adjacent face of the adjacent disc record when the record support is turned in the opposite direction, and devices for shifting the reproducer carrier and reproducer to place the same in position to move between another set of disc records.

2. In a sound reproducing apparatus, a shaft, devices for spacing and maintaining a plurality of disc records in position on the said shaft, means for turning the said shaft and disc records thereon in either direction, a reproducer, a reproducer carrier, means for moving the reproducer carrier and reproducer in one direction between a pair of adjacent disc records and causing the reproducer to engage and track in a groove in the face of one disc record when the said shaft is turned in one direction and moving the reproducer carrier and reproducer in the opposite direction between the same disc records and causing the reproducer to engage and track in a groove in the adjacent face of the other disc record when the said shaft is turned in the opposite direction.

3. In a sound reproducing apparatus, a shaft, devices for spacing and maintaining a plurality of disc records in position on the said shaft, means for turning the said shaft and disc records thereon in either direction, a reproducer, a reproducer carrier, means for moving the reproducer carrier and reproducer in one direction between a pair of adjacent disc records and causing the reproducer to engage and track in a groove in the face of one disc record when the said shaft is turned in one direction and moving the reproducer carrier and reproducer in the opposite direction between the same disc records and causing the reproducer to engage and track in a groove in the adjacent face of the other disc record when the said shaft is turned in the opposite direction, and devices for shifting the reproducer carrier and reproducer to place the same in a position to move between another pair of disc records.

4. In a sound reproducing apparatus, a shaft, a disc record mounted thereon, a carriage, a carriage shaft on which the said carriage is mounted, a reproducer, a reproducer arm, a threaded shaft engaging the said carriage, a hub on the threaded shaft and on which the reproducer arm is mounted to swing, means for turning the disc record shaft and the carriage shaft in a predetermined direction, means for turning the said hub from the said carriage shaft, means for connecting the reproducer arm to the said hub and disconnecting the same therefrom, and means operative when the reproducer arm is disconnected from the hub for causing the reproducer to engage a groove in the face of the disc record and to track freely therein.

5. In a sound reproducing apparatus, a shaft adapted to support and to turn a disc record mounted thereon, a carriage, a carriage shaft upon which the carriage is mounted, a reproducer, a reproducer arm, a threaded shaft engaging the said carriage, a hub mounted to turn freely on the threaded shaft and on which the reproducer arm is mounted to swing, means for turning the said hub from the said carriage shaft, a clutch for connecting and disconnecting the said reproducer arm to and from the said hub, a guide arm mounted to swing on the said hub and to contact with the periphery of the said disc record, and means actuated by the relative movement between the guide arm and reproducer arm in releasing the said clutch and causing the said reproducer to engage a groove in a face of the said disc record and to track freely therein and after the record has been played to cause the clutch to reengage the said hub.

6. In a sound reproducing apparatus, a shaft adapted to have a disc record mounted and maintained in position thereon, a carriage, a carriage shaft upon which the carriage is mounted, a reproducer arm, a reproducer pivotally connected on the said reproducer arm, means for normally maintaining the reproducer in an initial position, a threaded shaft engaging the said carriage, a hub on the threaded shaft and on which the reproducer arm is mounted to swing, means for turning the said hub from the said carriage shaft, a clutch for connecting and disconnecting the said reproducer arm to and from the said hub, a guide arm mounted to swing on the said hub and to contact with the periphery of the said disc record, a cam connected to the said guide arm, a rod mounted to slide in the said reproducer arm and to be actuated by the said cam to disengage the said clutch and to cause the reproducer to en-

gage a groove in a face of the said disc record and to track freely therein, and means operative after the record is played for causing the said clutch to re-engage the said hub.

7. In a sound reproducing apparatus, a shaft adapted to have a disc record mounted and maintained in position thereon, a carriage, a carriage shaft upon which the carriage is mounted, a reproducer arm, a reproducer pivotally connected on the said reproducer arm, means for normally maintaining the reproducer in an initial position, a threaded shaft engaging the said carriage, a hub on the threaded shaft and on which the reproducer arm is mounted to swing, means for turning the said hub from the said carriage shaft, a clutch carried by the said reproducer arm and adapted to connect and disconnect the same to and from the said hub, means for normally tending to move the said clutch into engagement with the said hub, a guide arm mounted to swing on the hub and adapted to engage the periphery of the disc record, a cam carried by the said guide arm, a rod adapted to slide in the said reproducer arm, a revoluble disc carried by the said clutch, and a pin on the said rod for engaging the disc whereby due to the relative movement between the reproducer arm and guide arm the cam on the reproducer arm actuates the said rod to cause the pin thereon to engage the disc and to thereby disengage the clutch from the hub and to swing the reproducer into contact with the groove in the face of the disc record and to track freely therein while the record is being played after which the rod is released by the cam permitting the reproducer to assume a normal position and the clutch to re-engage the said hub.

8. In a sound reproducing apparatus, a disc record shaft, a plurality of spacers for operating and maintaining a plurality of disc records in position on the said shaft, means for turning the said disc record shaft in either direction, a carriage shaft, a carriage thereon, a threaded shaft engaging the said carriage, a hub mounted to turn loosely on the said threaded shaft, means for turning the carriage shaft from the disc record shaft, means for turning the said hub from the carriage shaft, a reproducer arm mounted to swing on the said hub, a reproducer carried by the reproducer arm, devices for connecting and disconnecting the said reproducer arm to and from the said hub, and means operative when the said reproducer arm is in predetermined positions for disconnecting the same from the hub and causing the reproducer to bear against a record and when the record is played to again connect the said reproducer arm to the said hub and to thereby continue the movement of the said reproducer arm and reproducer.

9. In a sound reproducing apparatus, a disc record shaft, spacers for separating and maintaining a plurality of disc records in position on the said shaft, means for turning the record shaft in either direction, a carriage shaft, a carriage thereon, means for turning the carriage shaft from the record shaft, a threaded shaft engaging the frame of the said carriage, a hub mounted to turn freely on the threaded shaft, a reproducer arm mounted to swing on the said hub, a reproducer carried by the reproducer arm, means for turning the hub from the said carriage shaft, means for connecting and disconnecting the reproducer arm to and from the said hub, means operative when the reproducer arm is moved in one direction and it is in a predetermined position for releasing the said clutch and moving the reproducer into contact with the face of a disc record, permitting the same to track freely thereon to play the record and after the record is played to re-engage the clutch with the hub to continue the movement of the reproducer arm, and means operative when the reproducer arm is turned in the opposite direction and has reached a predetermined position for moving the reproducer in the opposite direction to cause the same to engage the adjacent face of an adjacent record and to track freely thereon to play the record and after the record is played to re-engage the clutch and continue the movement in this direction of the said reproducer arm.

10. In a sound reproducing apparatus, a disc record shaft, spacers for separating and maintaining a plurality of disc records in position on the said shaft, means for turning the record shaft in either direction, a carriage shaft, a carriage thereon, means for turning the carriage shaft from the record shaft, a threaded shaft engaging the frame of the said carriage, a hub mounted to turn freely on the threaded shaft, a reproducer arm mounted to swing on the said hub, a reproducer carried by the reproducer arm, means for turning the hub from the said carriage shaft, means for connecting and disconnecting the reproducer arm to and from the said hub, means operative when the reproducer arm is moved in one direction and it is in a predetermined position for releasing the said clutch and moving the reproducer into contact with the face of a disc record, permitting the same to track freely thereon to play the record and after the record is played to re-engage the clutch with the hub to continue the movement of the reproducer arm, means operative when the reproducer arm is turned in the opposite direction and has reached a predetermined position for moving the reproducer in the opposite direction to cause the same to engage the adjacent face of an adjacent record and to track freely thereon to play the record and after the record is played to re-engage the clutch and continue the movement in this di-

rection of the said reproducer arm, and devices for shifting the carriage and the reproducer arm and reproducer to place the same in position for the reproducer arm and reproducer to move between another set of disc records.

11. In a sound reproducing apparatus, a motor, a shaft for supporting a plurality of spaced disc records, a reversing gear through which the disc record shaft may be driven in either direction by the motor, a reproducer arm, a reproducer carried thereby, means for moving the reproducer arm and the reproducer to and fro between sets of adjacent disc records, sets of cam devices each adapted to be actuated by the reproducer arm, means actuated by any of the cam devices for operating the reversing gear to reverse the direction of rotation of the disc record shaft and the means for moving the reproducer arm and its reproducer, means for shifting the reproducer arm and its reproducer to place the same in position to move between another set of disc records, and means also actuated by any of the cam devices for operating the last aforesaid means.

12. In a sound reproducing apparatus, a motor, a shaft for supporting a plurality of spaced disc records, a reversing gear through which the said disc record shaft may be driven in either direction by the motor, a carriage shaft, a carriage mounted to slide thereon, a threaded shaft operating in the frame of said carriage, means for driving the carriage shaft from the said disc record shaft, a hub in the carriage loosely mounted on the said threaded shaft, means for driving the said hub from the carriage shaft, a reproducer arm mounted to swing on the said hub, a reproducer carried by the reproducer arm, means for connecting the reproducer arm to the hub to move the same to and fro between a set of adjacent disc records, sets of cam devices, there being a cam device in each set thereof for each disc record, each cam device being adapted to be actuated by the reproducer arm, and means actuated by any of the said cam devices for operating the said reversing gear to reverse the direction of rotation of the disc record shaft and also the carriage shaft and the said hub driven therefrom.

13. In a sound reproducing apparatus, a motor, a shaft for supporting a plurality of spaced disc records, a reversing gear through which the said shaft may be driven in either direction by the motor, a carriage shaft, a carriage slidably mounted thereon, a threaded shaft operating in the frame of the said carriage, a clutch device by which the carriage shaft may be driven from the said disc record shaft, a hub in the carriage and mounted loosely on the said threaded shaft, means for driving the said hub from the said carriage shaft, a reproducer arm mounted to swing on the said hub, a reproducer carried by the reproducer arm, means for connecting the reproducer arm to the said hub to move the same to and fro between a set of adjacent disc records, sets of cam devices, there being a cam device in each set for each of the disc records, each cam device being adapted to be actuated by the movement of the reproducer arm, means actuated by any cam device for operating the reversing gear to reverse the direction of rotation of the disc record shaft and the hub for swinging the reproducer arm, and means also operative by any cam device for operating the said clutch device to throw out the carriage shaft and to throw in the threaded shaft whereby the carriage and the reproducer arm are shifted to place the same in position for swinging between another set of the disc records.

14. In a sound reproducing apparatus, a motor, a shaft for supporting a plurality of spaced disc records, a reversing gear through which the disc record shaft may be driven in either direction by the said motor, a carriage shaft, a carriage slidably mounted thereon, a threaded shaft operating in the frame of the carriage, means for driving the carriage shaft from the disc record shaft, a hub in the carriage mounted on the said threaded shaft, a reproducer arm mounted to swing on the said hub, a reproducer carried by the reproducer arm, a clutch for connecting and disconnecting the said reproducer arm to and from the said hub so that when the reproducer arm is connected to the hub it is swung to and fro between a set of adjacent disc records, means operative when the reproducer arm reaches a predetermined position in moving in one direction for shifting the clutch to release the reproducer arm from the hub and causing the reproducer to move into contact with a face of one of the disc records for maintaining the reproducer in contact with the disc record during the playing thereof and then to permit the clutch to operate to again connect the reproducer arm to the hub whereby it continues its movement in the said direction, sets of cam devices, there being a cam device in each set for each of the disc records, each cam device being actuated by the reproducer arm at approximately the end of the swinging movement in one direction, means actuated by each cam device for operating the reversing gear to reverse the direction of the travel of the said disc record shaft, the carriage shaft and the hub on the threaded shaft thereby also reversing the direction of the swinging movement of the reproducer arm, and means operative when the reproducer arm reaches a predetermined position in the direction of the reversed travel for releasing the clutch thereby freeing the reproducer arm from the hub and causing the reproducer to swing in the opposite direction to bear against the adjacent face of another disc record main-

taining the reproducer in contact therewith during the playing thereof and then permitting the clutch to operate to engage the hub thereby continuing the reverse swinging movement of the said reproducer arm.

15. In a sound reproducing apparatus, a motor, a shaft for supporting a plurality of spaced disc records, a reversing gear through which the said disc record shaft may be driven in either direction by the motor, a carriage shaft, a carriage slidably mounted thereon, a threaded shaft operating in the frame of the said carriage, a hub in the carriage mounted to turn on the said threaded shaft, a clutch device by which either the carriage shaft or the threaded shaft may be driven by the disc record shaft, a reproducer arm mounted to swing on the said hub and being adapted to travel to and fro between the said adjacent disc records, a clutch for connecting and disconnecting the reproducer arm to the said hub, a reproducer carried by the reproducer arm, means operative when the reproducer arm reaches a predetermined position in one direction of its travel for releasing the clutch and causing the reproducer to move into contact with the surface of a disc record to play the same and when the record is played to actuate the clutch to again engage the hub to continue the travel of the reproducer arm and reproducer in this direction, sets of cam devices, there being a cam device in each set for each of the disc records, each cam device being adapted to be actuated by the end of the reproducer arm at the end of the travel thereof in one direction, means actuated by any of the cam devices for operating the reversing gear to reverse the direction of rotation of the disc record shaft, the carriage shaft and the hub on the threaded shaft thereby reversing the direction of travel of the reproducer arm and reproducer, means operative when the reproducer arm has reached a predetermined position in this reverse travel for actuating the clutch to disengage the hub and cause the reproducer to be moved in the opposite direction to bear against the face of the next adjacent disc record to play the same and when the record is played to permit the actuation of the clutch to again engage the hub to continue the travel of the reproducer arm in the said reverse direction, means actuated through any of the cam devices for operating the said clutch device to throw out the said carriage shaft and throw in the said threaded shaft thereby shifting the carriage and the reproducer arm and reproducer to a position in which the reproducer arm and reproducer are adapted to move between another set of disc records, and means then operative for actuating the said clutch device in the opposite direction to again throw out the threaded shaft and throw in the carriage shaft and then to actuate the next succeeding cam device to operate the reversing gear to again change the direction of the travel of the disc record shaft, the carriage shaft, the hub carried by the threaded shaft and thereby swing the reproducer arm in the first aforesaid direction.

16. In a sound reproducing apparatus, a motor, a shaft for supporting a plurality of spaced disc records, a reversing gear through which the said disc record shaft may be driven in either direction by the motor, a carriage shaft, a carriage slidably mounted thereon, means for driving the carriage shaft from the disc record shaft, a threaded shaft, a hub mounted in the carriage to turn freely on the said threaded shaft, means for turning the said hub from the said carriage shaft, a reproducer arm mounted to swing on the said hub, a reproducer pivotally connected to the said reproducer arm, a clutch connecting and disconnecting the reproducer arm to the said hub, a pair of guide arms carried by the said hub, one adapted to bear against the periphery of one disc record and the other against the periphery of another disc record, the bearing points of the said guide arms on the peripheries of the records being on opposite sides of the said threaded shaft, a cam carried by each of the said guide arms, a pair of rods mounted to slide in the said reproducer arm, a disc mounted on the said clutch, a spring for normally moving the clutch into contact with the said hub, a pin mounted on each of the said rods and adapted to engage the said disc, means operated by the guide arms for shifting the disc whereby when the reproducer arm in one direction of its travel reaches the position in which a corresponding guide arm bears against the periphery of its record the cam actuates one of the rods in the reproducer arm, causing the pin thereof to shift the clutch to release the reproducer arm and to move the reproducer in one direction to bring the same into contact with the surface of one of the disc records, to maintain the same in contact with the disc record while being played, and then to free the rod and permit the spring to cause the plunger to again engage the hub thereby continuing the movement of the reproducer arm in this direction, sets of cam devices, there being a cam device in each set for each of the disc records, each cam device being adapted to be actuated by the end of the reproducer arm when the reproducer arm has reached the limit of its travel, and devices actuated by each cam device for shifting the reversing gear to thereby reverse the direction of the rotation of the disc record shaft, the carriage shaft and hub on the threaded shaft thereby causing the reproducer arm to move in the opposite direction in which when the other guide arm bears against the periphery of the other disc record the cam carried by the said other guide arm operates the other rod in the reproducer arm causing the pin thereof to bear against the said disc to

release the clutch and move the reproducer in the opposite direction to contact with the adjacent face of the adjacent disc record maintaining the same in contact therewith during the playing thereof and after to free the pin and to thereby reset the clutch permitting it to again engage the hub to continue the travel of the said reproducer arm in the said reverse direction.

17. In a sound reproducing apparatus, a motor, a shaft for supporting a plurality of spaced disc records, a reversing gear through which the said disc record shaft may be turned in either direction by the motor, a carriage shaft, a carriage slidably mounted thereon, a threaded shaft, a hub mounted in the carriage to turn loosely on the said threaded shaft, a clutch device whereby either the carriage shaft or the threaded shaft may be driven from the disc record shaft, means for turning the said hub from the said carriage shaft, a reproducer arm mounted to swing on the said hub, a clutch for connecting and disconnecting the said reproducer arm to and from the said hub, a reproducer pivotally mounted in the said reproducer arm, means for normally maintaining the reproducer in an initial centrally disposed position, a pair of guide arms, one adapted to bear against the periphery of one disc record at one side of the threaded shaft and the other to bear against the periphery of another disc record at the other side of the threaded shaft, a cam carried by each of the said guide arms, a pair of rods mounted to slide in the said reproducer arm, a disc mounted on the said clutch in the reproducer arm, a pin carried by each of the said rods and adapted to engage the said disc whereby when the reproducer arm travels in one direction and one of the guide arms contacts with one of the disc records the continuing movement of the reproducer arm causes one end of one of the rods to cooperate with the cam carried by the guide arm to shift the said rod, causing the pin thereof to move the said disc to disengage the clutch from the hub and to move the reproducer into contact with the surface of the said disc record maintaining the same in contact therewith during the playing thereof and after to free the said pin permitting the free movement of the rod and the return of the clutch into engayement with the hub to continue the movement of the reproducer arm in this direction, a plurality of sets of cam devices, there being a cam device in each set for each disc record, each cam device being actuated by contact with the end of the reproducer arm when the same reaches a position adjacent the end of its travel, means actuated by any of the said cam devices for shifting the said reversing gear to reverse the direction of the revolution of the said disc record shaft, the carriage shaft and the hub carried by the threaded shaft whereby the reproducer arm is swung in the opposite direction in which when the other guide arm comes into contact with the periphery of the next adjacent disc record the continued movement of the reproducer arm brings the other rod in the reproducer arm into contact with the cam carried by the other guide arm, thereby shifting the rod bringing the pin carried thereby into contact with the disc to again release the clutch and free the reproducer arm from the hub and to move the reproducer in the opposite direction into contact with the adjacent face of the adjacent disc record maintaining the same in contact therewith during the playing thereof, and thereafter freeing the said rod, permitting the return of the clutch into contact with the said hub to continue the movement of the reproducer arm in the said reverse direction, and means operative by each of the said cam devices through the cooperation of the end of the reproducer arm for operating the clutch device for throwing out the said carriage shaft and throwing in the said threaded shaft, thereby shifting the carriage and the reproducer arm and reproducer carried thereby to a position in which the reproducer arm and reproducer may be swung to and fro between any set of disc records, then reversing the clutch device to throw out the threaded shaft and to throw in again the carriage shaft, and then to actuate the next succeeding clutch device to again operate the reversing gear to cause the reversal of the direction of rotation of the disc record shaft, the carriage shaft and the said hub, thereby again moving the reproducer arm in the first aforesaid direction.

Signed by me this 14th day of September, 1928.

NICHOLAS J. CAPUTO.