

Dec. 28, 1948.

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2,457,668

AUTOMATIC PHONOGRAPH

Filed Nov. 1, 1943

4 Sheets-Sheet 1

FIG. 1

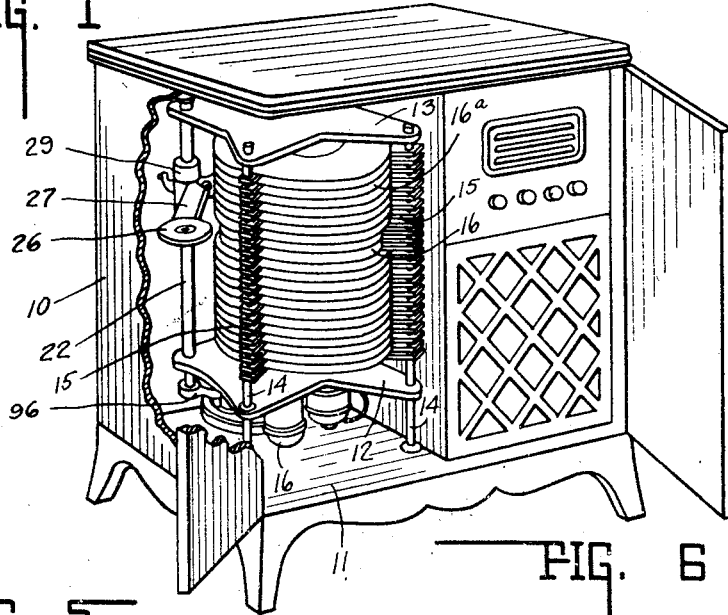


FIG. 5

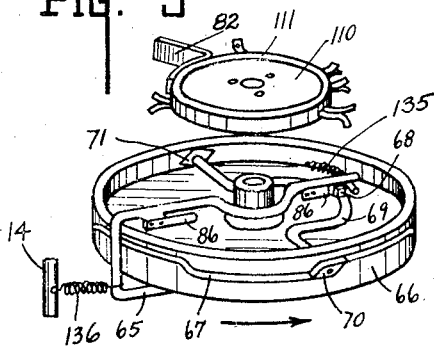


FIG. 6

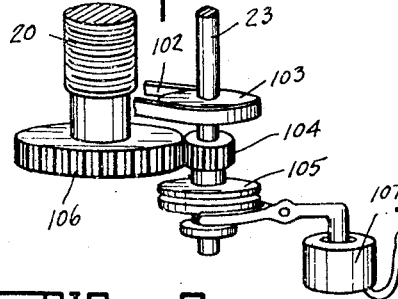


FIG. 8

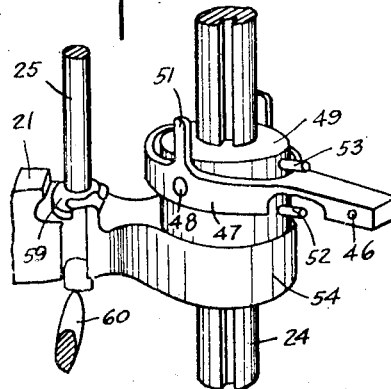
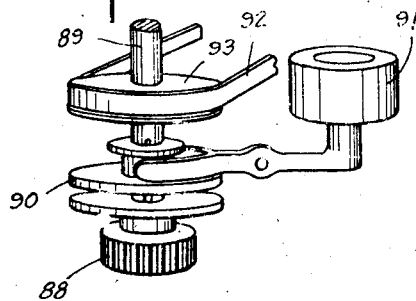


FIG. 7



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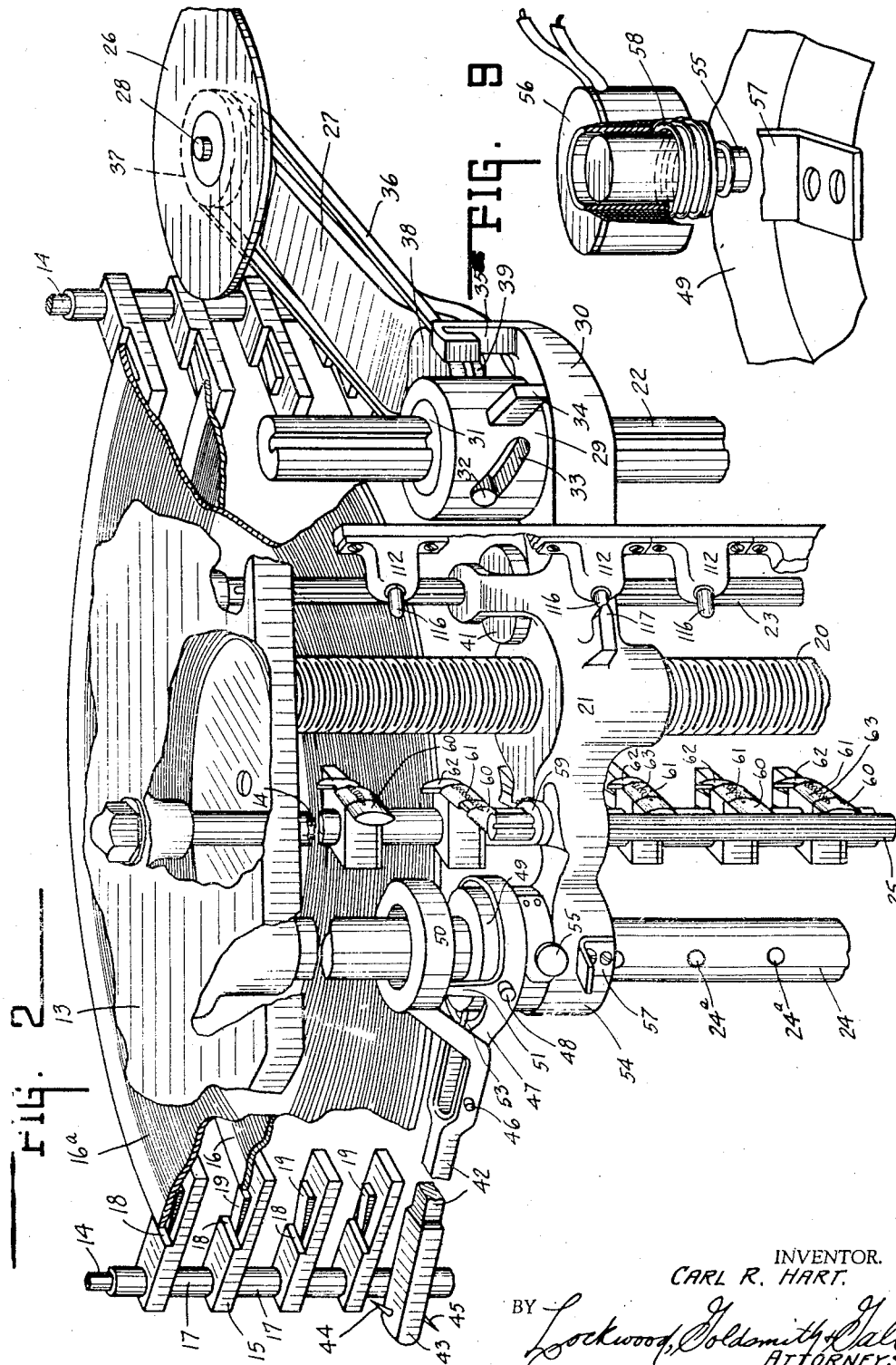
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AUTOMATIC PHONOGRAPH

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4 Sheets-Sheet 2



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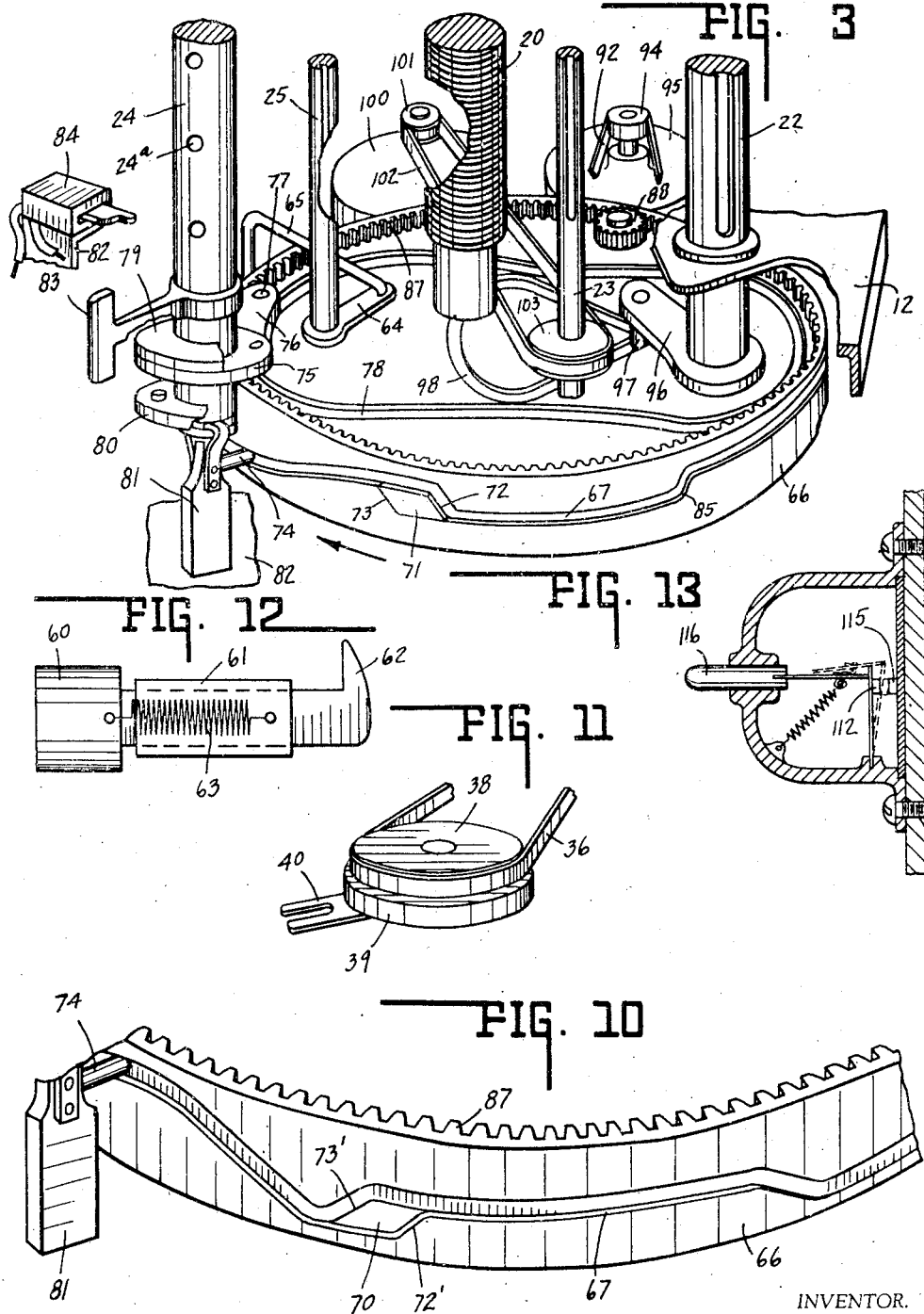
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AUTOMATIC PHONOGRAPH

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4 Sheets—Sheet 3



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4 Sheets-Sheet 4.

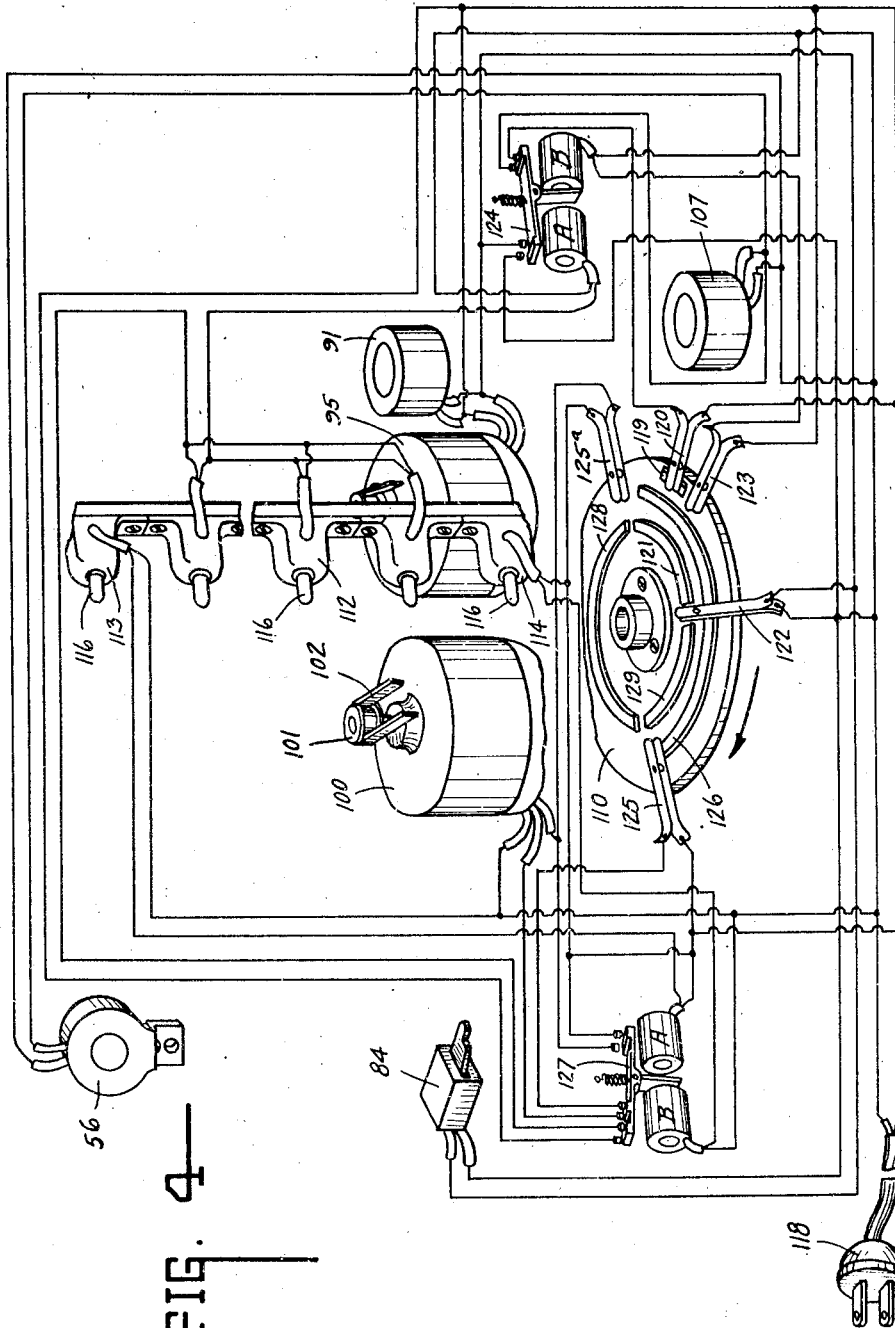


FIG. 4

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UNITED STATES PATENT OFFICE

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AUTOMATIC PHONOGRAPH

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Application November 1, 1943, Serial No. 508,512

15 Claims. (Cl. 274—10)

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This invention relates to an automatic phonograph applicable for the automatic playing of disc records on both sides consecutively or selectively, and irrespective of whether or not said records are of the 10 or 12 inch size.

The invention is more particularly directed to an automatic phonograph wherein the play selection is made by the selective positioning of the turn table and reproducer as distinguished from the more common arrangement wherein the selection is made by manipulation of the records. Thus, this invention contemplates a vertical column of records of either size supported in spaced relation to each other adapted to remain in their relative relation during the playing of the records selected, and whereby the underside of the record as well as the upper side thereof is engaged for reproduction while remaining in its same relative position with respect to the other records in the magazine.

One feature of the invention resides in the vertically disposed record magazine having vertically spaced supports for receiving individual records whereby either 10 or 12 inch records may be conveniently inserted or withdrawn from the magazine, the record being reproduced on either or both sides thereof while remaining in its same relative position in the magazine and without being removed therefrom.

Another feature of the invention resides in the selectively positioning of the turntable with respect to the record selected for reproduction, whereby the turntable is caused to move under the selected record, centrally engage and elevate it slightly to free it from its support and rotate it to permit of its reproduction, and after completion thereof lower it back onto its support in its original position.

Another feature of the invention resides in the corresponding manipulation of the tone arm and reproducer whereby it is similarly selectively positioned to engage and reproduce the particular record rotated by the turntable, and additionally is automatically positioned for reproduction of either size record, on either side thereof, or first one side and then the other.

Another feature of the invention resides in the automatic electric control by which the above mentioned manipulations of the turntable and reproducer are accomplished through magnetically actuated controls and a master cam member.

Other features and advantages of this invention will be apparent from the following specifications and drawings illustrative of the above

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operations and their mechanisms, and as more particularly set forth in the appended claims.

The full nature of the invention will be understood from the accompanying drawings and the following description and claims:

Fig. 1 is a perspective view showing the record magazine and associated parts mounted in a cabinet.

Fig. 2 is a perspective view of certain parts of the mechanism with portions thereof broken away.

Fig. 3 is a perspective view illustrating the driving mechanism with parts thereof removed.

Fig. 4 is a combination wiring diagram and operating mechanisms shown in perspective with parts broken away.

Fig. 5 is a reduced perspective view of the underside of the cam member with the switch control disc associated therewith but removed therefrom in spaced relation.

Fig. 6 is a perspective view of the clutch control and the record selective shaft.

Fig. 7 is a perspective view of the clutch control and the cam member drive.

Fig. 8 is a perspective view of the tone arm support and control device for adjusting the position of engagement of the tone arm to different size records.

Fig. 9 is an enlarged perspective view of the tone arm setting control with parts broken away.

Fig. 10 is a perspective view of the cam setting plunger for controlling the position of the tone arm in respect to different size records.

Fig. 11 is a perspective view of the turntable driving mechanism.

Fig. 12 is an enlarged side elevation of cam control member.

Fig. 13 is an enlarged sectional view of control switch.

In the drawings there is shown for purpose of illustration, a phonograph cabinet 10 having magazine compartment 11 which also houses the record engaging and playing mechanism. Said mechanism includes a base plate 12 at the bottom of the magazine and a top plate 13 at the top thereof, said plates being supported on the floor of the compartment and in spaced relation to each other by the upright supporting posts 14, there being three such posts equally spaced from each other secured to the plates 12 and 13. This part of the structure forms a supporting frame for the column of records and the selecting and reproducing mechanism.

Extending radially inwardly from the posts 14 there is provided a series of record support-

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ing fingers 15, one of said fingers on each post extending in the same plane for peripherally supporting records 16, 16a thereon. As indicated, the record 16 is a 10 inch record and the record 16a is a 12 inch record. Each column of said fingers is provided with intermediate spacing sleeves 17 on the respective posts 14 for securing said fingers in fixed spaced relation. Each of said fingers 15 is formed with an inwardly extending reduced portion to provide a shoulder 18 for engaging the peripheral edge of 12 inch records 16a to center said records in the column. The reduced extensions of said fingers are each provided with a spring pressed centering plate 19 so positioned as to provide an abutting and centering shoulder for engagement by the peripheral edge of the 10 inch records, but depressible so as to be ineffective upon a 12 inch record extending thereover.

Extending vertically of the magazine with their bearings in the base and top plates 12 and 13 there is a series of control shafts. The position of the turntable and reproducer is selected for a certain record of the column by rotation of the screw threaded selecting shaft 20 through the medium of a turntable and reproducer carrying yoke 21 in screw threaded engagement therewith. The turntable is swung into and out of record centering position and elevated into engagement with the selected record by the oscillating turntable shaft 22. The turntable is rotated for reproduction of the record by the record rotating shaft 23. The tone arm is raised and lowered with respect to the selected record for engagement and disengagement thereof, and swung to and from said record by the vertically reciprocating and oscillating tone arm shaft 24. The reproducer is automatically limited in its inward swinging movement for initially engaging either a 10 or 12 inch record by the record control of the oscillating reproducer control shaft 25.

The turntable 26 is pivotally supported on the turntable arm 27 for free rotation thereon. Said arm is adapted to swing about the turntable shaft 22 from its inoperative position outside the periphery of the records as shown in Fig. 2 to a record centering and engaging position in alignment with the axial center of the records. The turntable carries an upstanding centering pin 28 and is of a diameter no greater than the inner diameter of the record reproducing grooves.

The turntable supporting arm 27 is carried at its pivotal end by the collar 29 which freely rests upon the arm 30 of the yoke 21, having its bearing thereon. Said collar is in frictional engagement with an inner driving plug 31 slidably keyed upon the turntable shaft 22, said plug further engages the collar 29 by a pin 32 normally extending into the upper end of a downwardly sloping cam slot 33 formed in said collar. Said collar is also provided with a radially extending lug 34 engageable with the upstanding finger 35 on the arm 30 and slidably into a recess formed in the upper end thereof positioned to center and maintain the turntable in record engaging and rotating position.

The turntable manipulating mechanism above described operates in the following manner. Upon the selecting yoke 21 carrying the turntable to a plane immediately below the selected record, the turntable shaft 22 will be oscillated by the mechanism to be hereinafter described, for swinging the turntable inwardly to record centering position, in which position the lug 34 engages the

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finger 35, thereby preventing further movement of the collar 29 and the turntable 26. Continued movement of the shaft, however, causing relative rotation in respect to the collar, moves the pin 32 in the cam slot 33 whereby the collar and turntable are elevated to engage and lift the record free of its supports 15. Thereupon the lug 34 is interlocked in the groove of the finger 35 to maintain the turntable in its centered position. Upon the record being completed, counter oscillation of the shaft 22 causes the pin 32 to lower the collar free of locking engagement with the finger, thereby causing the turntable to lower the record back onto its supports 15. Continued counter oscillation of the shaft swings the collar 29 with the arm 27 and turntable outwardly to one side of the column of records back to its inoperative position as shown in Fig. 2. Thereupon the turntable is free to be moved to a new record selecting position.

The turntable is rotated by the belt 36 which drives the pulley 37 carried by the underside of the turntable immediately above its pivoted support on the arm 27. Said belt is driven by the pulley 38 carried by the friction drive wheel 39 mounted upon the turntable supporting arm 27. The friction drive wheel 39 has a bifurcated yoke 40 mounted upon the arm 27 to extend under the friction driving wheel 41 when the turntable is swung to record engaging position. In this position friction wheel 39 engages wheel 41 so as to be driven thereby. The wheel 41 is slidably keyed upon the record rotating shaft 23 so as to rotate therewith and thereby drive the turntable when the wheels 39, 41 are engaged. The driving wheel 41 is supported upon the yoke 21 so as to move with the turntable upon its driving shaft 23. The yoke 40 assures driving alignment between the driving wheels 39 and 41 as the turntable is raised into record rotating position.

The tone arm 42 carries at its free end the reproducer 43 adapted for electrical connection with an amplifier and speaker in the well known manner, and having an upwardly and rearwardly sloping needle 44 adapted to engage the underside of the record. On the opposite side it is provided with a downwardly and forwardly extending needle 45 for engaging the upper side of the record. The tone arm is provided with two fulcrum points. When engaging the underside of the record, it fulcrums at 46 where it is pivotally supported upon the tongue of the yoke 47. When engaging the upper side of the record it is fulcrumed at 48, the pivotal mounting of the yoke 47 upon the collar 49. When engaging the underside of the record, such engagement has the effect of depressing the reproducer, causing the tone arm to fulcrum at 46 to raise the counterweight 50 from its supporting tongues 51 on the yoke 47. Thus the counterweight 50 exerts the required contact pressure between the needle 44 and the underside of the record. When the reproducer engages the upper side of the record, the weight of the tone arm forwardly of the fulcrum point 48 maintains the necessary effective engaging pressure. However, the tone arm is prevented from dropping down about its fulcrum 48 by engagement of the yoke 47 upon the pin 52 which extends outwardly from the collar 49, its upward movement being limited by the pin 53.

The tone arm, as in the case of the turntable is carried by the positioning yoke 21 through the arm 54 slidably on the tone arm shaft 24

and carrying thereon the collar 49. Thus, the yoke 21 through the action of the selecting shaft 20 raises or lowers the tone arm to position it for engagement with the selected record. In normal operation the tone arm is initially positioned so that the needle 45 of the reproducer is above the plane of the rotating record. In this position the collar 49 is locked to the tone arm shaft 24 through engagement of a locking pin 55 in one of the series of holes 24a in said shaft. For actuating the locking pin 55 there is provided an electromagnet 56 supported upon the bracket 57 which in turn is secured to the arm 54 of the yoke 21. Upon the electromagnet being energized the pin 55 is withdrawn from the hole 24a to permit selective movement of the yoke relative to the shaft 24. When deenergized, the pin 55 is permitted to be forced into its hole by the spring 58, as shown in Fig. 9.

The tone arm is limited in its inward swinging position to engage the beginning of the playing groove of the record by the reproducer control shaft 25. Said shaft extends adjacent to one of the posts 14 and has slidably keyed thereon a cam 59. Said cam is free to oscillate within a groove provided in the yoke 21 so as to be carried by said yoke in selectively positioning the tone arm. Each of the record supporting fingers 15 on the post 14 carries a camming member 60 adjacent the shaft 25 which is slidably supported in a sleeve 61, the forward end of said member having a cam 62 engageable by the edge of a 12 inch record but not affected by a 10 inch record. Said cam member is normally held in its inoperative position by a spring 63 as shown in Fig. 12.

The tone arm is swung by the actuating cam hereinafter described through turning of the shaft 24 inwardly over the record upon which it is lowered. The timing of the lowering of the tone arm for engagement of the record by the reproducer controls the extent of its inward swinging movement. This timing is in turn controlled by actuation of the cam 59 through the shaft 25. For this purpose the shaft 25 is connected at its lower end to an arm 64 as shown in Fig. 3. Arm 64 in turn is pivotally connected with the control rod 65 which extends about and under the main control cam 66, as shown in Fig. 5. Said control cam 66 carries a cam groove 67 about its periphery for raising and lowering the tone arm. By the shifting of the control rod 65 through actuation of the shaft 25, the timing in the lowering of the reproducer on the record is varied according to the diameter thereof. To change the timing through alteration of the cam groove 67, the shifting rod 65 is moved into and out of position thereby through engagement by a projection 68 on the U-shaped shifting rod 69. Said U-shaped rod is carried on the underside of the cam 66. On each end thereof there is a cam segment 70 and 71 respectively, as shown in Fig. 5. This arrangement is such, as shown in Fig. 3 that when the cam segment 71 is moved outwardly flush with the periphery of the cam 66, it provides in conjunction with the cam groove 67 a cam surface 72 (for 10 inch records); whereas when it is moved inwardly (for 12 inch records), it leaves the normal cam surface 73 ahead of the cam surface 72. The raising and lowering of the reproducer into engagement with the record is effected by the cam follower 74 riding in the cam groove 67 so that for a 12 inch record it will be lowered by the cam surface 73 approximately one inch ahead of the cam surface 72, by which it is lowered onto a 10 inch

record when the cam segment 71 is in effective position.

The tone arm is swung to and from record engagement by the collar 75 freely mounted upon the shaft 24 and having a laterally extending arm 76 carrying a cam follower 77 which rides in the cam groove 78 formed in the upper surface of the master cam 66. Said shaft has rigidly secured thereto in spaced relation above and below collar 75, clutch discs 79 and 80 respectively, said clutch discs having mounted on their faces yieldable pins to engage corresponding holes in the faces of collar 75. The lower end of the shaft 24 has its bearing support upon the sliding plunger 81 movable in a bracket 82, said plunger carrying the cam follower 74. Said shaft 24 also has secured thereto a trip arm 83 in position to engage and actuate the lever of the trip switch 84 mounted on said bracket 82 so positioned as to trip the mechanism as hereinafter described upon the reproducer reaching the end of the record.

The tone arm is normally to one side of the record, but as the cam 66 rotates in the direction of the arrow, the cam groove 67 will elevate the follower 74 and shaft 24 to raise the tone arm above the record and bring the collar 75 into clutching engagement with the clutch element 80. The cam groove 78 will thereupon swing the tone arm inwardly until it reaches a position relative to the particular record whereupon it will be lowered into playing position by the follower 74 dropping down the cam surface 73 on to a 12 inch record or moving further to drop down cam surface 72 for a 10 inch record. As it drops, collar 75 disengages clutch member 80 whereupon the reproducer is free to follow the record groove inwardly until trip arm 83 engages the trip switch 84. In the meantime, as hereinafter described, the master cam 66 will have stopped movement, but upon the trip being effected, it will start to move causing the cam follower 74 to move upwardly upon the cam surface 85 to raise the reproducer from the record and cause the clutch member 80 to engage collar 75, whereupon cam groove 78 will swing the collar outwardly carrying the reproducer free of the record.

The tone arm is similarly controlled but in reverse fashion when the lower side of the record is to be reproduced. Thus, on the opposite side of the master cam 66 cam groove 67 is so arranged that the shaft 24 is elevated thereby, carrying the reproducer into engagement with the under side of the record. Thereupon the collar 75 is freed from engagement with the clutch member 79 after it had been effective to swing the tone arm inwardly. This action is accomplished by the cam segment 70 in association with the cam groove 67, whereby in the case of a 12 inch record the reproducer will be raised by cam surface 73' in advance of its being raised by cam surface 72' for a 10 inch record, as shown in Fig. 10.

As noted in Fig. 5, the control rod 65 is provided with springs 86 on opposite sides of the center of rotation of the cam so that as the cam rotates, assuming a 12 inch record has actuated it, projection 68 will engage one of said springs to move the cam segments 70, 71 to effect the proper location of the reproducer on the respective sides of the 12 inch record. Immediately thereafter projection 68 will pass the spring 86 whereupon spring 135 returns the cam segments 70 and 71 to their normal position for playing 10 inch records. Thereafter the cam rotates approximately 170 degrees to engage projection 68 with the op-

posite spring 86 to control the location of the reproducer on the opposite side of the 12 inch record. Spring 136 holds the control rod 65 in its normal position for 10 inch records, having one end secured to said rod 65, and the other end to one of the posts 14 or any other convenient anchorage.

The driving mechanism comprises the master cam 66 above referred to which is pivotally mounted for rotation beneath the base plate 12, said cam carrying the external peripheral cam groove 67 and the inner upper surface cam groove 78, said cam grooves controlling the tone arm. Said cam is flanged upwardly, the inner face of the flange being provided with driving teeth 87 with which a driving pinion 88 meshes. The pinion 88, as shown in Fig. 7, is carried on the lower end of stub shaft 89 having its supporting bearing in the base plate 12. Said driving pinion is arranged to be connected and disconnected with the stub shaft through the clutch 90 actuated by solenoid 91. The stub shaft is driven by a belt 92 and pulley 93 from the pulley 94 on the electric motor 95.

The turntable shaft 22 carries at its lower end an arm 56 having an outwardly extending cam follower 57 operating in the cam groove 98 formed in the upper surface of the master cam 66. Through the medium of the cam groove the turntable is first swung inwardly as above described into center alignment with the record and then is raised to elevate the record to rotating position. At this point the timing is such that the clutch 90 is disengaged and the motor 95 deenergized during the record playing operation. When the trip switch 94 is actuated upon completion of the record, the clutch 90 is engaged and the motor 95 energized so that the master cam rotates. The cam groove 98 is so formed and timed that it swings shaft 22 in the opposite direction permitting the turntable to first lower the record on to the support, disengage the record and then swing outwardly free of the record.

The driving mechanism for the turntable comprises the constantly rotating turntable drive motor 100 having a driving pulley 101 which drives the belt 102, in turn driving the pulley 103 keyed to the record rotating shaft 23.

The driving mechanism for the record selecting yoke 21 emanates from the record rotating shaft 23 as shown in Fig. 6. Said shaft, below its pulley 103 is provided with a loose pinion 104 connected with the upper member of the clutch 105, the lower member of said clutch being keyed to shaft 23. The clutch is engaged to drive the selecting shaft 20 through meshing of pinion 104 with the gear 106 secured to the lower end of said shaft, upon engagement of the clutch 105 by energizing the solenoid 107.

The control circuit is shown in Fig. 4 and includes a cam disc 110 secured to the underside of the master cam 66 and rotatable therewith. Said disc rotates within a switch supporting band 111 mounted upon the supporting bracket 82 extending from the base plate 12. The supporting band carries a group of inwardly extending contact switches engageable by certain concentrically formed switch closing cams mounted about the upper surface of the disc 110 as shown in Figs. 4 and 5.

Extending vertically between the base plate 12 and the top plate 13 there are a series of intermediate control switches 112, one for each record in the column. At the extreme upper end thereof there is a reversing switch 113 and at the ex-

treme lower end thereof there is a reversing switch 114. Said switches are of the character diagrammatically illustrated in Fig. 13 comprising the switch contact points 115 and a plunger 116. Said switch is so arranged that upon the plunger 116 being forced inwardly contact points are momentarily engaged to close the circuit but are immediately disengaged to break the circuit, the circuit remaining broken while the plungers are in their inward position as well as their outer position. Said switches 112, 113 and 114 are actuated to momentarily close their respective circuits upon being engaged by the projection 117 carried on the yoke 21.

The electric control arrangement is such that upon the yoke carrying the turntable and tone arm to the selected record, the switch 112 corresponding to such record will be momentarily closed. This will react in the circuit to stop the selecting shaft 20 through disengaging clutch 105 by means of deenergizing solenoid 107 and will deenergize electromagnet 56 to permit the pin 55 to lock the tone arm with its shaft 24. Switch 113 is so arranged in the circuit that upon its projection being engaged when the yoke is moved upwardly beyond the uppermost record, closing of its circuit will act to reverse the turntable motor 100 causing reverse rotation of the selecting shaft 20 to thereby carry the yoke back to the bottom of the record column, the intermediate switches 112 being then out of circuit. When the yoke has thereby been lowered to below the column of records, the bottom switch 114 is momentarily closed, which again reverses motor 100 to raise the yoke and throw the intermediate switches 112 into circuit so that the yoke is brought to rest for playing the lowermost record. Upon completion of the playing of the top side of the lowermost record actuation of the trip switch 84 causes the motor 100 to reverse and actuates the master cam to set the tone arm for playing the underside of said record. After the underside thereof has been completed, a tripping of switch 84 thereupon causes the control circuit to rotate the selecting shaft after the tone arm and turntable are swung clear of the records to elevate it in a position for repeating the cycle on the next record above. This continues until all records have been played on both sides, whereupon switch 113 is again engaged for repeating the entire cycle.

The control circuit is made effective by plugging in the wall plug 118 to connect it with the usual source of electric current. A master control switch in the main line may likewise be employed for that purpose. When the machine is in position to move the yoke 21 upward, the switch control disc 110 is in the position shown in Fig. 4. In this position cam 119 thereon is holding switch 120 closed. Through said switch the circuit is closed to operate clutch 105 and energize electromagnet 56 thereby disengaging pin 55 from shaft 24, and causing motor 100 (which runs continuously) to turn screw 20 relocating yoke 21. As said yoke comes to the next record location, projection 117 actuates switch 112 which energizes magnet A of relay 124, thus said relay de-energizes solenoid 107 declutching shaft 20 to stop the yoke. It also de-energizes the electromagnet 56 causing pin 55 to enter one of the shaft holes 24a. Relay 124 also starts the motor 95 and engages clutch 90 by energizing the solenoid 91, thus starting the cam 66 and the disc 110 in the direction of the arrows. As the cam 66 starts to rotate, cam 121 on the

disc 110 engages and closes the switch 122 which is in parallel with the contacts of relay 124 that energize the motor 95 and solenoid 91. The cam 119 clears the switch 120 and closes the switch 123 to reset the relay 124 to the position shown in Fig. 4.

As the master cam continues to rotate, the turntable has been swung into record rotating position and the reproducer lowered onto the record whereupon the switch 122 reaches the end of the cam 121 on the disc 110 and opens to break the circuit through the solenoid 91 and the motor 95, bringing the master cam to a stop. The top side of the record then plays, the circuit through the record driving motor 100 remaining closed through switch 125 due to its engagement by cam 126 on the disc 110.

For playing the top side of the record which is rotated clockwise, the motor 100 is rotated counterclockwise. Such direction of rotation of motor 100 is controlled by switch 125 which directs the motor circuit through contacts on the relay 127.

Upon the top side of the record having been reproduced, the trip arm 83 acts to trip switch 84, closing the circuit through the solenoid 91 and motor 95 to again start rotation of the master cam. Thereupon switch 122 is closed by engagement with the cam 128 on the disc 110 for maintaining the said current closed after the momentary closing of trip switch 84. By reason of the length of cam 128 the master cam now rotates one-half revolution, whereas it previously rotated one-quarter revolution. During this one-half revolution the yoke remains in its position. For the next quarter revolution the master cam carries the tone arm outwardly and starts it downwardly while said cam holds the turntable in its position. At this point, while disc 110 continues to rotate, cam 126 opens switch 125 and closes switch 125a, reversing the motor 100 to rotate in a clockwise direction which rotates the record in a counter-clockwise direction. The master cam 66 continues on to swing the tone arm inwardly and upwardly to engage the reproducer with the under side of the record. The master cam is then brought to rest as the cam 128 moves past the switch 122, de-energizing the solenoid 91 and motor 95. The lower side of the record is then reproduced thereby causing trip arm 83 to trip switch 84.

After both sides of the selected record have been played and trip 84 actuated, the circuit is closed by the cam 119 and the motor 95 again rotates the master cam, the circuit therethrough being maintained by closing of switch 122 by the cam 129. The master cam continues to rotate one-quarter revolution to lower the turntable and swing it outwardly free of the records, and lower and swing the tone arm outwardly free of the records. Thus one complete cycle of operation, i. e., the playing of both sides of a record, is completed when the switch 122 is opened by the gap between cams 121 and 129 on disc 110. However, if the master switch is still closed, cam 119 again moves into position to close switch 120 which will start the cycle over again including the raising of the yoke to the next record which is selected by closing of the switch 112.

When the turntable and reproducer have played the upper-most record of the column, the yoke then moves upwardly to close the top switch 113. This switch is directly connected with the relay 127 which acts to reverse the motor 100 with solenoid 107 energized to rotate shaft 20 in the

opposite direction to screw the yoke downwardly to the bottom of the column. During this movement intermediate switches 112 are out of circuit by reason of the electromagnet "A" of relay 127 having been energized, and the motor 95 for driving the master cam is out of circuit by reason of electromagnet "B" of relay 124 having been energized, therefore only the selective shaft 20 is operated to lower the turntable and reproducer to the bottom of the column. At the bottom of the column projection 117 closes switch 114 which energizes electromagnet "B" of relay 127 to again reverse the motor 100 to run in the direction to raise the yoke with the turntable and reproducer. At the same time switches 112 are thrown back in circuit by relay 127, whereby upon the yoke moving upwardly to close the first switch thereabove, electromagnet "A" of relay 124 will be energized to energize solenoid 91 and motor 95 to drive the master cam and switch control disc 110 in the manner above first described in respect thereto.

The invention claimed is:

1. An automatic record selecting mechanism for a phonograph adapted to reproduce disc records including a magazine for removably supporting a column of records about their peripheral edges and in spaced relation, a record supporting turntable shiftable axially of said column exteriorly thereof, a tone arm carrying a reproducer shiftable with said turntable exteriorly of said column, a selectively positioned support for said turntable and tone arm, means for shifting and positioning said support relative to a selected record, and cam controlled mechanism operable to swing said turntable under and in rotating engagement with the selected record and swing said tone arm into reproducing engagement therewith.

2. An automatic record selecting mechanism for a phonograph adapted to reproduce disc records including a column of vertically spaced record supports for peripherally supporting individual records in spaced relation, a record supporting turntable shiftable axially of and to one side of said records, a tone arm and reproducer shiftable with said turntable adjacent the opposite side of said records, a selectively positioned support shiftable relative to and axially of said records adjacent their peripheries for carrying and positioning said turntable and tone arm in substantially the plane of the record to be reproduced, means operable to shift said support for so positioning said turntable and reproducer, control mechanism operably connected with said means, turntable and tone arm, movable to swing said turntable under and into record centering and rotating position and swing said tone arm and reproducer therewith into record engaging position, and a drive for said control mechanism and turntable whereby the selected record may be reproduced thereby.

3. An automatic record selecting mechanism for a phonograph adapted to reproduce disc records including a magazine for removably supporting a column of records in spaced relation, a record supporting turntable shiftable axially of and exteriorly of said column of records, a tone arm carrying a reproducer shiftable with said turntable exteriorly of said column of records, mechanism operably connected with said turntable movable to sequentially shift it to a position to one side of a selected record, swing it inwardly and under said record and lift it from its support for rotation, a drive for rotating said turntable and actuating said mechanism and means operably associated with said mechanism actuated thereby

to shift and swing said tone arm and reproducer into playing engagement with the rotated record.

4. An automatic record selecting mechanism for a phonograph adapted to reproduce disc records including a magazine for removably supporting a column of records in spaced relation, a traveling yoke shiftable axially of and adjacent said column of records, a swinging turntable supported on one side of said yoke movable into and out of supporting and rotatable engagement with a selected record, driving means for rotating said turntable, a tone arm carrying a reproducer supported on the other side of said yoke for swinging movement into playing engagement with the record engaged by said turntable, means for shifting said yoke to position said turntable and reproducer for engagement with a selected record, and mechanism operable to actuate said shifting means and swing said turntable and reproducer into and out of record engaging position in timed relation.

5. An automatic record selecting mechanism for a phonograph adapted to reproduce disc records including a magazine comprising a column of fixed supports adapted to peripherally engage and support a column of disc records in spaced relation, a record supporting turntable shiftable beyond the periphery of said records axially thereof and mounted to be swung inwardly into engaging and centering position with a selected record for supporting and rotating said record free of its peripheral support, mechanism operably connected to said turntable for shifting it to a selected position and swinging it into record supporting position, and driving means for rotating said turntable while in record engagement.

6. An automatic record selecting mechanism for a phonograph adapted to reproduce disc records including a magazine for supporting a fixed column of disc records in spaced relation, a movable assembly including a record supporting turntable and a reproducer shiftable exteriorly of said column of records axially thereof and movable into operative engagement with a selected record, mechanism operably connected to said assembly for shifting it to record selecting position, said mechanism being operable to elevate and rotate said turntable in engagement with the selected record free of its support and place said reproducer in playing position thereon.

7. An automatic record selecting mechanism for a phonograph adapted to reproduce disc records including a magazine for removably supporting a column of disc records in horizontal spaced relation, a turntable and tone arm assembly shiftable axially and vertically of said column exteriorly of said records carrying a record supporting turntable and a tone arm adapted to move inwardly of said column for engaging and reproducing a selected record, means for shifting said assembly, and control mechanism operable to arrest and support said assembly relative to said selected record upon being elevated to substantially the plane thereof.

8. An automatic record selecting mechanism for a phonograph adapted to reproduce disc records including a magazine for removably supporting a column of disc records in spaced relation, a turntable and tone arm assembly shiftable axially of said column exteriorly of said records carrying a record supporting turntable and a tone arm adapted to move inwardly of said column for engaging and reproducing a selected record, mechanism automatically operable to shift said

assembly from one selected position to the next and move said turntable and tone arm inwardly to engage and reproduce the next adjacent record of the column, and means for automatically controlling said mechanism to move said assembly from one end of the column to the other without record engagement after the end record of the column has been engaged and reproduced, whereby the consecutive engagement and reproduction of said records will be repeated.

9. An automatic record selecting mechanism for a phonograph adapted to reproduce disc records including a stack of disc records supported in horizontal and stationary spaced relation, a record supporting turntable and tone arm assembly mounted to one side of said stack of records vertically movable the full length thereof, means for moving said assembly vertically to operative alignment with a selected record, and mechanism operable to thereupon move said turntable inwardly under the selected record and elevate it to engage and rotate said record, said mechanism being simultaneously operable to and move said tone arm into reproducer engagement with the playing surface of said selected record for its reproduction.

10. An automatic record selecting mechanism for a phonograph adapted to reproduce disc records including a magazine for removably supporting a column of records in spaced relation, a record supporting turntable and tone arm assembly shiftable axially relative to and outside of said column, a record selecting shaft having threaded engagement with said assembly, driving means for periodically rotating said selecting shaft to shift said assembly into operative alignment with a selected record, a turntable shaft extending axially of said column parallel to said selecting shaft operable to swing said turntable into and out of position to engage and elevate a record, a shaft having means movable with said assembly operable to rotate said turntable upon record engagement thereby, a tone arm shaft parallel with said turntable shaft mounted for oscillation and reciprocation, means for interlocking said tone arm thereto, and control mechanism connected with each of said shafts operable to actuate the same in timed relation for positioning said assembly and moving said turntable and reproducer into and out of effective engagement with the selected record for rotation and reproduction thereof.

11. An automatic record selecting mechanism for a phonograph adapted to reproduce disc records including a magazine comprising a series of vertical rods having spaced inwardly extending record supporting fingers arranged to support a group of horizontal records in vertical spaced relation, a vertically extending record selecting shaft, a yoke in threaded engagement with said shaft for vertical movement thereof relative to said records upon rotation of said shaft, a series of electric contact members vertically spaced corresponding with the vertically spaced records individually engageable by said yoke, means for rotating said shaft and arresting its rotation upon one of said contact members being engaged, a turntable mounted for swinging movement on said yoke adjacent a record corresponding to the engaged member, a turntable shaft extending parallel with said selecting shaft operable to swing said turntable into and out of centering engagement with the selected record, a record rotating shaft parallel to said shafts rotatable for driving said turntable to effect the rotation

of a record engaged thereby, a tone arm having a reproducer supported on the opposite side of said yoke, a tone arm shaft engageable with said tone arm for raising and lowering the reproducer into and out of engagement with the selected record and swinging the tone arm relative thereto, driving mechanism for periodically oscillating said turntable shaft and reciprocating and oscillating said tone arm shaft upon said yoke being selectively positioned, and means for rotating said record rotating shaft during record engagement by said turntable.

12. An automatic record selecting mechanism for a phonograph adapted to reproduce disc records including a horizontally disposed record supporting turntable engageable with the central portion of a horizontally disposed record within its playing grooves to horizontally support and rotate said record with the playing grooves exposed on both sides thereof, a tone arm carrying a reproducer on the free end thereof, said reproducer being engageable with the playing grooves on either side of the record, means for swinging said tone arm and reproducer inwardly in the horizontal plane of the record to reproducing position, and a cam actuated member operable to lower said tone arm to engage said reproducer with the playing grooves on the upper side of the record when in one position and raise said reproducer into engagement with the playing grooves on the underside of the record when in another position.

13. An automatic record selecting mechanism for a phonograph adapted to reproduce disc records including a horizontally disposed record supporting turntable engageable with the central portion of a horizontally disposed record for supporting and rotating it with the playing grooves on the upper and under sides of said record exposed for reproducer engagement, a reproducer operable to engage the record grooves on the upper side of the record when in one position and the record grooves on the underside thereof when in another position, a horizontally swinging tone arm carrying said reproducer, said tone arm being pivotally supported for vertical movement upon a swinging support, means operable to swing said support and tone arm over and lower it for reproducer engagement with the upper side of the record to be reproduced, a fulcrum mounting for a section of said tone arm intermediate the ends thereof, and a counterweight supported on the end of said section opposite the reproducer for overbalancing and applying the reproducer to the grooves of the underside of the record under pressure exerted by said counterweight.

14. An automatic record selecting mechanism for a phonograph adapted to reproduce disc records, including a magazine for removably supporting a column of records in spaced relation, a turntable and tone arm assembly shiftable axially of and exteriorly of said records, an

electric control circuit a series of contact switches in said circuit corresponding to said records and progressively engageable by said assembly, motor driven means in said circuit for shifting said assembly between the ends of said column of records, control mechanism in said circuit operable to arrest said motor driven shifting means in operative relation to a selected record upon engagement of its corresponding switch, and mechanism actuated by said motor and operably connected with said turntable and tone arm respectively to move them into playing engagement with the record selected by operation of its corresponding switch.

15. An automatic record selecting mechanism for a phonograph adapted to reproduce disc records including a magazine for removably supporting a column of records in spaced relation, a turntable and tone arm assembly, a rotatable screw shaft having threading engagement with said assembly for shifting it exteriorly of said records when rotated and supporting it in shifted position when stationary, an electric circuit, a motor drive in said circuit for rotating said shaft, a series of contact switches in said circuit extending adjacent said records and assembly, one switch corresponding to each record, said switches being arranged for progressive engagement by said assembly, means for normally rotating said shaft to shift said assembly from its previous switch engaging position to its next switch engaging position, means for arresting said motor drive upon said switch engagement to support said assembly in operative relation to the record selected thereby, mechanism controlled by said arresting means and operably connected with said turntable and tone arm assembly for moving said turntable and tone arm respectively into playing engagement with said selected record, reversing switches in said circuit positioned at each end of said series of contact switches engageable by said assembly, and mechanism controlled by said circuit upon engagement of one of said reversing switches for causing said motor drive to reverse said screw shaft to redirect said assembly upon reaching the limit of its travel.

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