Oct. 11, 1949. C. G. JOHNSON 2,484,570

AUTOMATIC PHONOGRAPH

Filed March 31, 1945 5 Sheets-Sheet 1

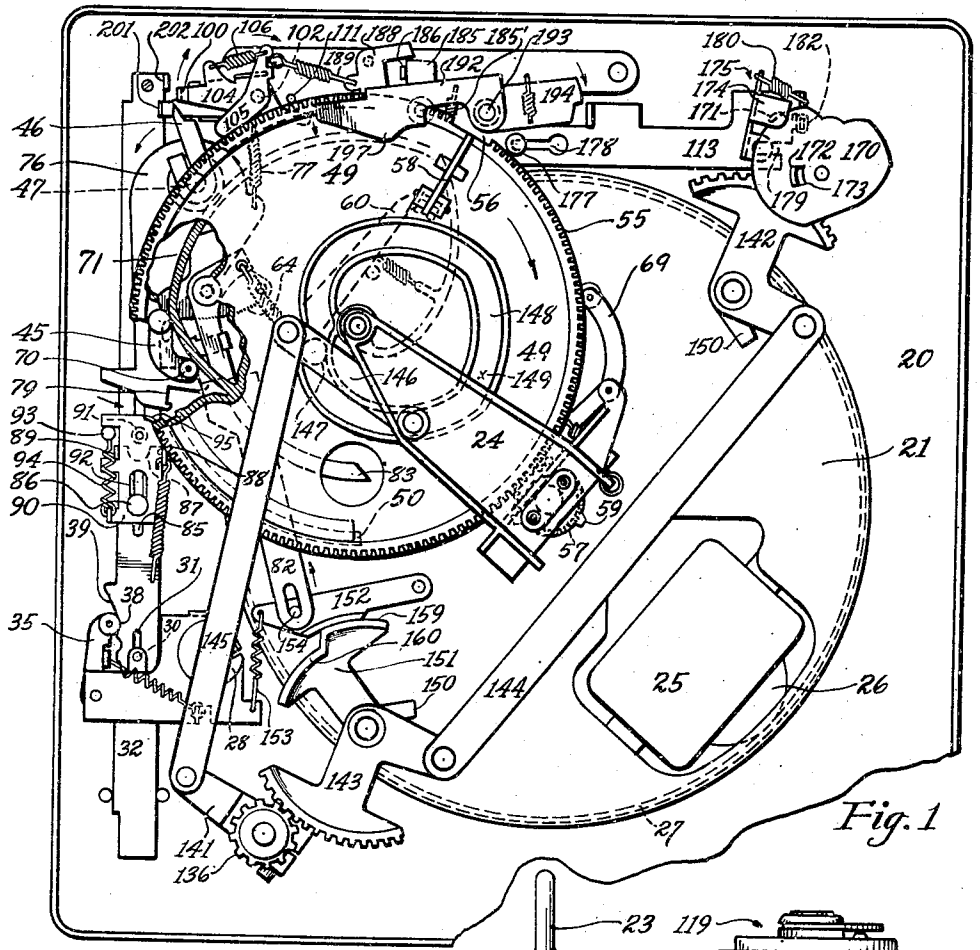


Fig. 1

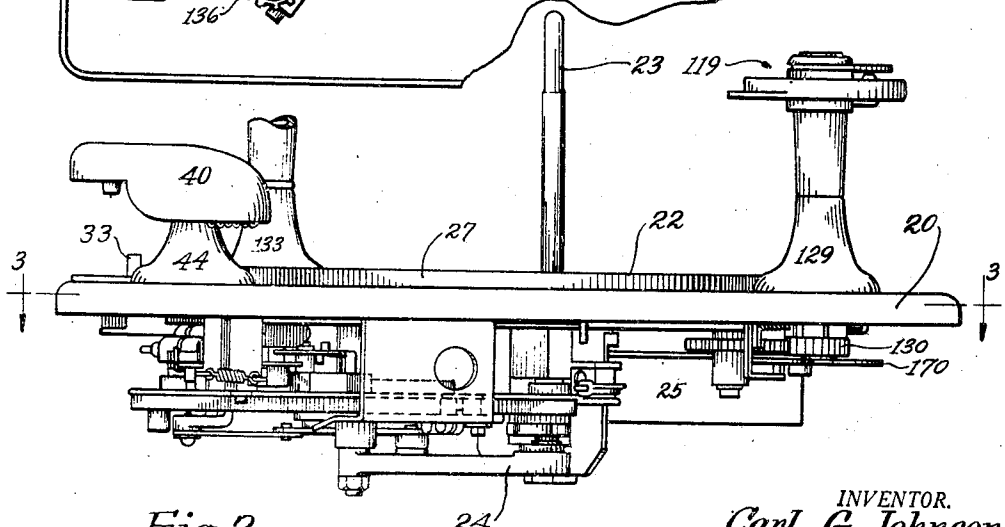


Fig. 2

INVENTOR.
Carl G. Johnson
BY John F Eakin
ATTORNEY

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AUTOMATIC PHONOGRAPH

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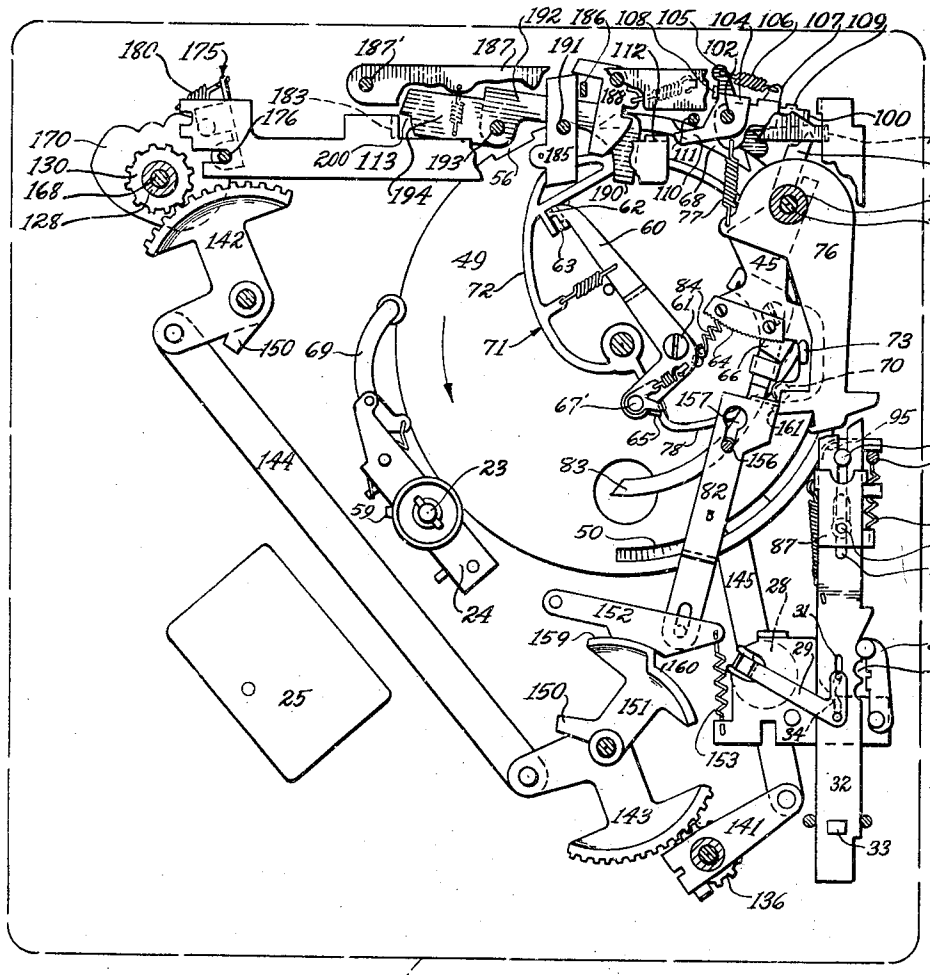


Fig. 3

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INVENTOR.
Carl G. Johnson
BY John F. Eakins
ATTORNEY

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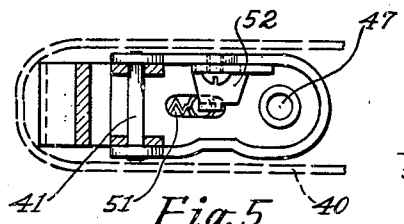


Fig. 5

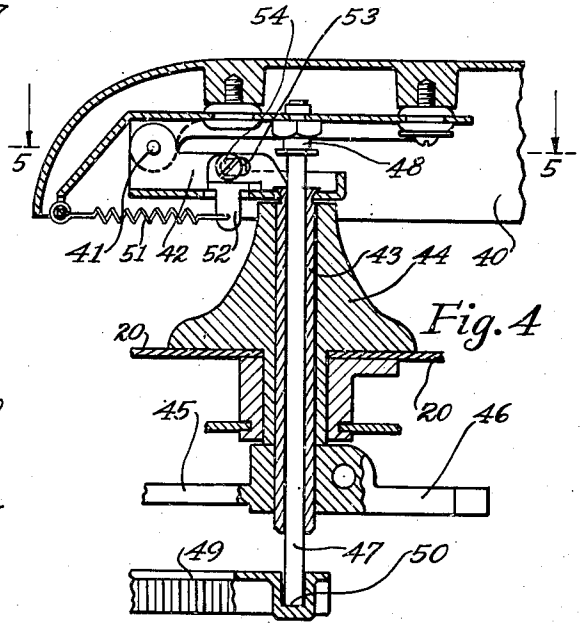


Fig. 4

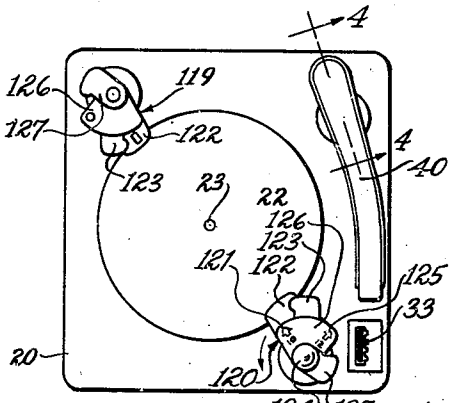


Fig. 3A

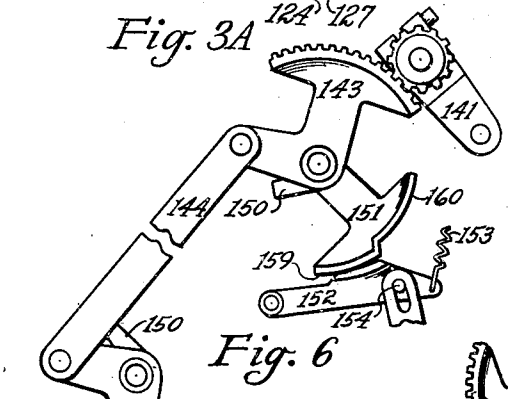


Fig. 6

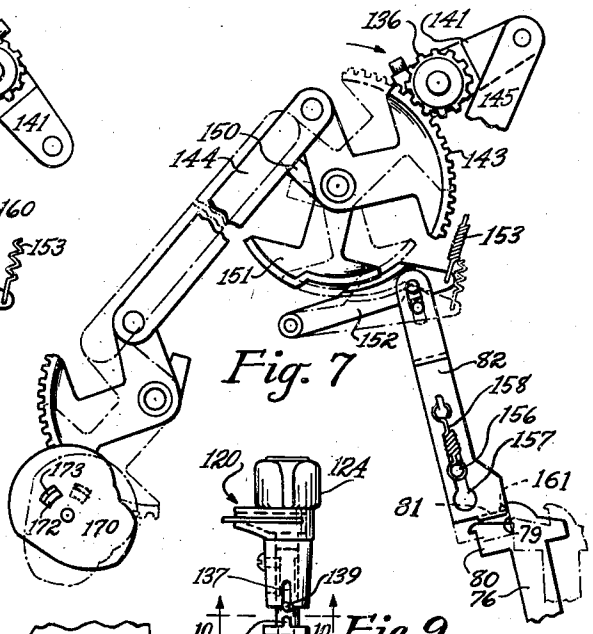


Fig. 7

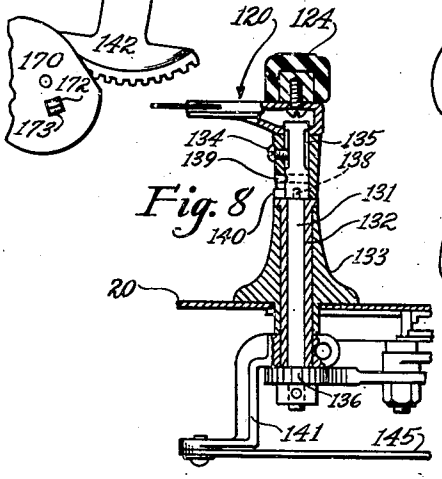


Fig. 8

Fig. 9

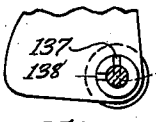


Fig. 10

INVENTOR.
Carl G. Johnson
BY
John F. Eakins
ATTORNEY

Oct. 11, 1949. C. G. JOHNSON 2,484,570

AUTOMATIC PHONOGRAPH

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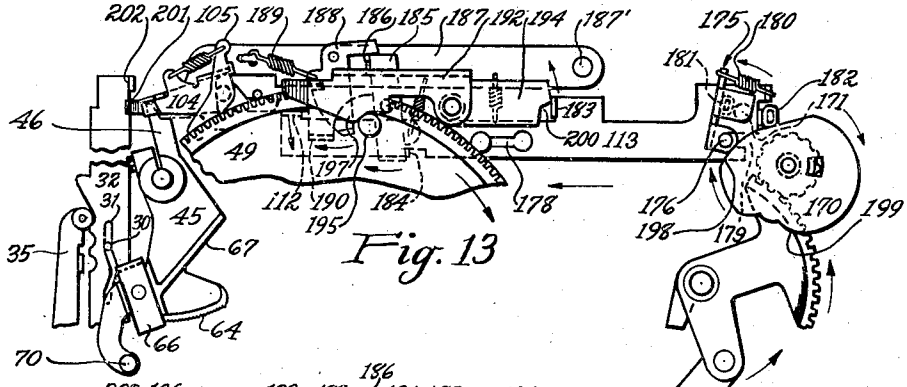


Fig. 13

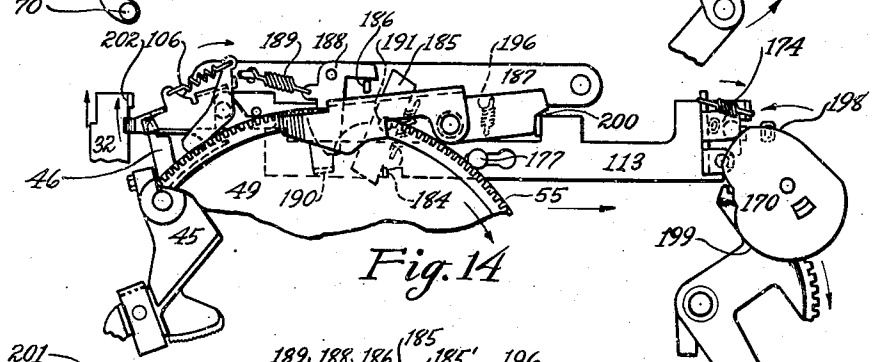


Fig. 14

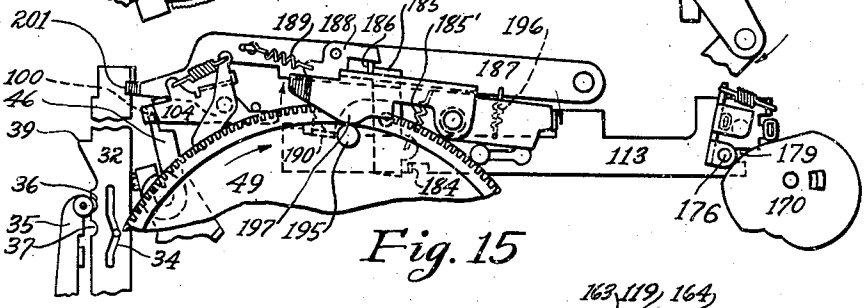


Fig. 15

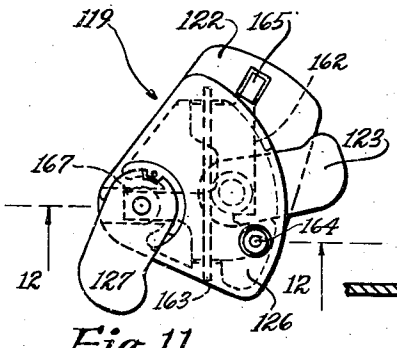


Fig. 11

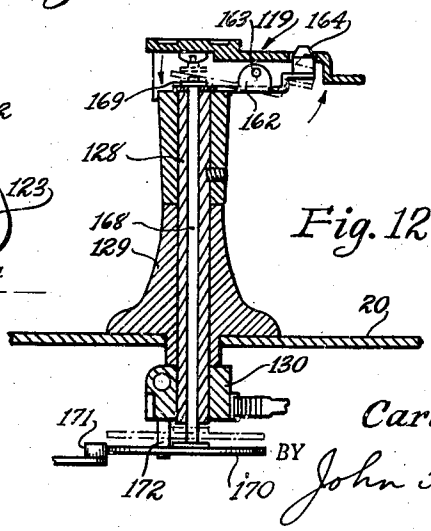


Fig. 12

INVENTOR.
Carl G. Johnson
BY John F. Eakins.
ATTORNEY

Oct. 11, 1949. C. G. JOHNSON 2,484,570

AUTOMATIC PHONOGRAPH

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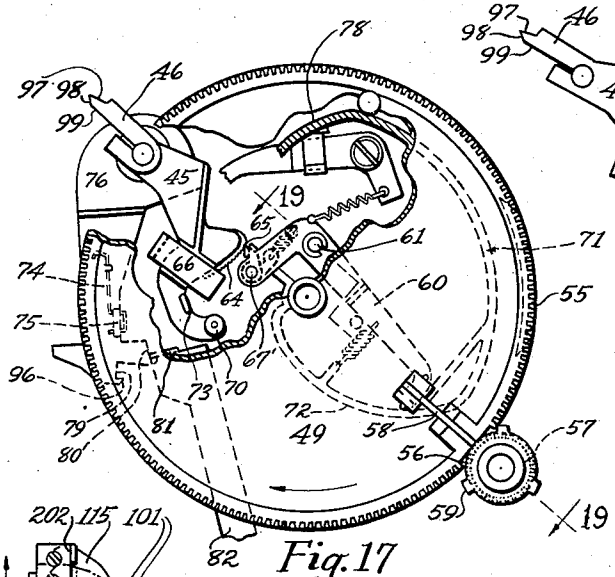


Fig. 17

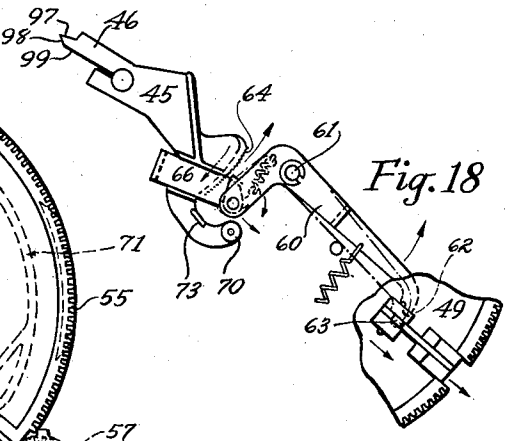


Fig. 18

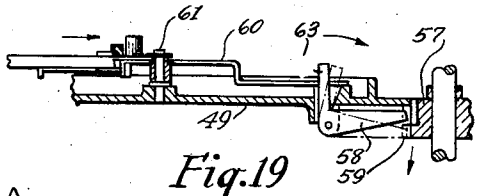


Fig. 19

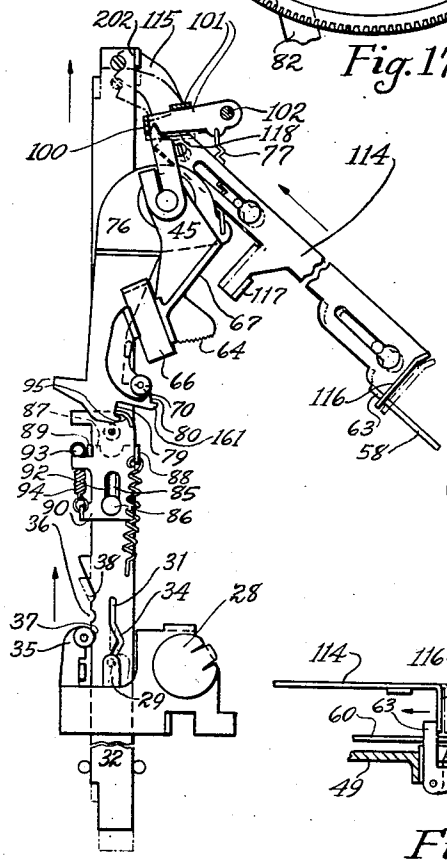


Fig. 16

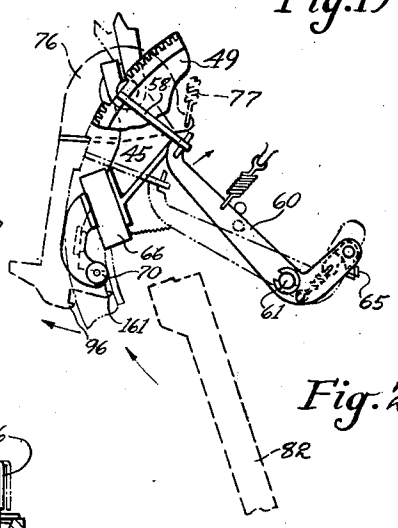


Fig. 20

Fig. 21

INVENTOR.
Carl G. Johnson
BY
John F. Eakins
ATTORNEY

Patented Oct. 11, 1949

2,484,570

UNITED STATES PATENT OFFICE

2,484,570

AUTOMATIC PHONOGRAPH

Carl G. Johnson, Chicago, Ill., assignor to J. P. Seeburg Corporation, Chicago, Ill., a corporation of Illinois

Application March 31, 1945, Serial No. 585,901

9 Claims. (Cl. 274—10)

1

This invention relates to automatic phonographs and primarily to automatic phonographs of the type in which a stack of records is maintained by a plurality of escapement heads above a turntable, which heads are actuated periodically to drop the lowermost record of the stack on to the turntable for reproduction.

One of the principal objects of the invention is to provide an improved automatic phonograph of this type with improved means for terminating the operation of the phonograph when the last record of the stack has been dropped and reproduced.

A further object of the invention is to provide an automatic phonograph of this type in which all the escapement heads are interconnected for simultaneous actuation by one of them and in which the mechanical drive of the escapement heads may be disconnected by manual manipulation of one of them whereby the heads may be positioned for records of different sizes and may be moved simultaneously to inoperative position for the removal of records from the turntable.

A further object of the invention is to provide an improved automatic phonograph of this type in which means are associated with the escapement heads for terminating the operation of the phonograph in all positions of adjustment of the escapement heads.

A further object of the invention is to provide an improved phonograph of this type in which means are provided for preventing termination of the operation of the phonograph by manual movement of the escapement heads.

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

Figure 1 is an inverted plan view of the phonograph, the elements being shown at the part of the cycle after a twelve inch record has been dropped and the player arm has moved into initial playing position over the record on the turntable;

Fig. 2 is an elevational view of the phonograph;

Fig. 3 is a sectional plan view taken on the line 3—3 of Fig. 2, the position of the elements being similar to that shown in Fig. 1;

Fig. 3A is a plan view of the phonograph on reduced scale, the escapement heads being positioned for the reception of ten inch records;

Fig. 4 is a fragmentary sectional elevation view taken on the line 4—4 of Fig. 3A;

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Fig. 5 is a sectional detail view taken on the line 5—5 of Fig. 4;

Fig. 6 is a fragmentary inverted plan view showing the mechanism interconnecting the escapement heads in one extreme position where a twelve inch record is being dropped;

Fig. 7 is a similar view showing this mechanism and the escapement members manually thrown to their opposite extreme position for removal of records from the turntable;

Fig. 8 is a sectional elevation through one of the escapement heads and associated parts;

Fig. 9 is an elevational view of the escapement head of Fig. 8, the escapement head being manually elevated for purposes of adjustment;

Fig. 10 is a sectional detail taken on the line 10—10 of Fig. 9;

Fig. 11 is a plan view of the other escapement head;

Fig. 12 is a sectional elevation thereof, the section being taken on the broken line 12—12 of Fig. 11;

Fig. 13 is a fragmentary inverted plan view showing the mechanism for stopping the phonograph during the playing of a ten inch record;

Fig. 14 is a similar view showing this mechanism during the record changing cycle after the playing of the last ten inch record;

Fig. 15 is a similar view showing the mechanism in its position where it has just opened the motor switch;

Fig. 16 is an inverted plan view showing the control bar and associated mechanism in position for "manual" operation;

Fig. 17 is an inverted plan view showing the cam gear and associated elements during the playing of a twelve inch record, the lower cam being omitted for clarity;

Fig. 18 is an inverted plan view showing the manner in which the trip is actuated by inward movement of the player arm by a spiral groove;

Fig. 19 is a fragmentary sectional elevational view taken on the line 19—19 of Fig. 17;

Fig. 20 is a fragmentary inverted plan view showing the trip mechanism; and

Fig. 21 is a sectional elevational detail showing the manner in which the record changing mechanism is held out of operation in "manual" operation.

Referring to the drawings, the mechanism is mounted on a base plate or motor board 20 which is dished at 21 for accommodation of the turntable 22. The turntable 22 is rigidly carried by the spindle 23 which is rotatably mounted in bearings carried by a bracket 24 supported by the

motor board 20. The turntable is driven by a motor 25, mounted on the motor board 20, by means of a rubber tired wheel 26 which engages the depending flange 27 of the turntable.

The motor is controlled by a switch 28 which is actuated by a switch arm 29. The switch arm carries a pin 30 which extends into a slot 31 in a bar 32 which is slidably mounted on the underside of the motor board 20. The bar 32 carries a button 33 which projects upwardly through the motor board for manual manipulation. When the button 33 is in the position shown in Fig. 3A, the pin 30 is in the laterally displaced portion 34 of the slot 31, the switch 28 is open and the motor is stopped. The bar 32 is held in this position by engagement of a spring pressed detent 35 with a recess 36 in an edge of the bar 32. In all other positions of the bar 32 the switch 28 is closed, the pin 30 being in a longitudinal part of the slot 31 and the arm 29 being in the position shown in Figs. 1 and 3.

When the button 33 is moved upwardly one step as viewed in Fig. 3A the bar 32 is moved to its position of Fig. 16 which, as hereinafter explained, prevents operation of the record-changing mechanism. This position is referred to as the "manual" playing position. In this position the motor is in operation. The bar 32 is retained in the "manual" position by engagement of the spring pressed detent 35 with a recess 37 in the edge of the bar 32.

When the button 33 is moved downwardly one step from its position in Fig. 3A the bar 32 is moved into its position of Figs. 1 and 3. In this position the spring pressed detent 35 enters a recess 38. This is the "automatic" position of the bar 32. When the button 33 is moved downwardly one step further, as viewed in Fig. 3, it attains the "reject" position which initiates the operation of the record-changing mechanism, as will hereinafter be described. In moving to the "reject" position the spring pressed detent 35 rides upon an inclined projection 39 on the bar 32 and when the button 33 is released the pressure of the detent upon the inclined projection 39 displaces the bar 32 upwardly until it attains the "automatic" position shown in Figs. 1 and 3. In starting the machine the button 33 is moved from its "off" position shown in Fig. 3A down two steps to the "reject" position so as to start the motor and put the record-changing mechanism into operation. On release of the button 33 the bar 32 moves to its "automatic" position shown in Figs. 1 and 3. As will be hereinafter explained this operation results in the first record being deposited on the turntable and being played.

The player arm 40 is pivotally mounted by means of a horizontal pivot 41 on a bracket 42 rigidly carried by a vertical sleeve 43. The sleeve 43 is rotatably mounted in a standard 44 carried by the motor board 20. The sleeve 43 extends to the lower side of the motor board, where it has mounted rigidly upon it the arms 45 and 46. A rod 47 slidably extends through the sleeve 43 and its upper end is arranged to engage an abutment 48 adjustably and rigidly carried by the player arm 40. When the rod 47 is moved upwardly the player arm is moved upwardly about its pivot so that the needle is elevated from the record. The lower end of the rod 47 rests upon the upper surface of a cam gear 49. The cam gear 49 is at rest when a record is being played and in its position of rest the lower end of the rod 47 is located at the lowest point of a cam formation 50 which extends downwardly from the surface of the cam gear 49. The cam formation 50 is in a form of a double inclined plane which extends over a relatively small arc of the cam gear 49. Consequently when the cam gear 49 starts to move the rod 47 is projected upwardly, elevating the needle clear of the record which has been played. For the major part of the rotation of the cam gear 49 the rod 47 rides on the top surface of the cam gear so that the player arm is held elevated until the latter part of its rotation whereupon the rod 47 moves down the cam formation 50 until the needle engages the next record. The needle pressure is adjusted by means of a counter-balance spring 51 which is connected to the rear end of the player arm and to a lug 52 carried by the bracket 42. The lug 52 is provided with a slot 53 through which extends a screw 54 whereby the lug is mounted on the bracket 42. The lug 52 may therefore be adjusted in position to vary the tension of the spring 51 and thereby the pressure of the needle on the record.

The cam gear 49 is mounted for rotation in a horizontal plane between the bracket 24 and the motor board 20. It is provided with a circumferential series of teeth 55 arranged to cooperate with the teeth of a pinion 57 rigidly mounted on the turntable spindle 23. During the playing of a record the mutilation or interruption 56 is opposite the pinion 57 so that the gear 49 is not driven. In alignment with the interruption 56 the cam gear 49 pivotally carries an L-shaped lever 58 which clears the teeth of the pinion 57 and which is adapted, when released to drop and engage one of a plurality of radial projections 59 which are integral with the pinion 57 and which project beyond its teeth. During the playing of a record the lever 58 is held clear of the projections 59 by means of a latch 60 which is pivoted at 61 on the upper side of the cam gear 49. When the latch 60 is displaced from its normal position its detent 62 clears the upwardly directed arm 63 of the lever 58 so that this lever drops.

The arm 45 carries a serrated edge 64 which is adapted to slip past the spring pressed dog 65 as the needle moves over the record. The dog 65 is carried by the latch 60 and when the movement of the arm 45 is reversed, as a result of the needle running into an eccentric groove after the playing of the record, the serrated edge 64 carries the dog 65 outwardly and disengages the latch 60 from the lever 58, thus starting the record-changing cycle. The arm 45 carries an abutment 66 which is adapted to engage the latch 60. In the case of a record provided with a spiral rather than an eccentric groove at the inner end of the recording groove the projection 66 engages the latch 60, as shown in Fig. 18, and swings it so as to release the lever 58 and start the record-changing cycle.

During the rotation of the cam gear 49 the upwardly directed arm 63 of the lever 58 is engaged by a formation 67 on the arm 45 so that it is again engaged by the detent 62 of the latch 60. Consequently at the end of one revolution the drive is terminated when the blank space 56 arrives at a position opposite to the pinion 57. The cam gear 49 is retained in this position by means of a spring pressed member 69 which engages a recess in a cam 68 on the upper side of the cam gear 49.

The arm 45 carries a downwardly directed cam follower 70 which is arranged to cooperate with the external cam 71 mounted on the upper surface of the cam gear 49. When the cam gear

49 is in its normal stationary position the roller 70 is clear of the cam 71, as shown in Fig. 17, so that the player arm is able to move freely over the record as the needle follows the spiral groove to reproduce the record. When the lever 53 is released in either of the manners referred to above the cam gear 49 is rotated in the clockwise direction as viewed in Fig. 17. The rise 72 on the cam 71 engages the roller 70 and moves the player arm outwardly clear of the records. This outward movement is effected after the pin 47 is elevated by the recess 50 so that the needle is clear of the record which has just been played. The arm 45 carries an upturned lug 73 which is adapted to engage the light spring 74 on a lug 75 carried by an arm 76. The arm 76 is pivotally mounted on the sleeve 43 above the arms 46 and is biassed inwardly by a strong spring 77. Consequently the outward movement of the arm 45 compresses the light spring 74 and carries the arm 76 outwardly. When the roller 70 rides down the fall 78 of the cam 71, the spring 77 moves the arm 76 inwardly, carrying the arm 45 with it so that the player arm is moved inwardly towards initial playing position on the record until a surface 79 and 80 on the arm 76 engages an abutment 81 on a bar 82. When the surface 80 engages the abutment 81 the player arm is adjusted for the playing of a twelve inch record. When the abutment 81 is engaged by the surface 79 the player arm is moved into initial playing position for a ten inch record. The manner in which the bar 82 is moved to ten and twelve inch position will hereinafter be described. Before the arm 76 engages the abutment 80 the cam follower 70 is brought into engagement with the end of a lever 83 which is mounted on the upper side of the cam gear 49 so as to project through the fall 78 of the cam 71. The lever 83 is biassed outwardly by a relatively weak spring 84 which is weaker than the spring 77 but is stronger than the tiny spring 74. Consequently the lever 83 holds the lever 45 against the weak spring 74, compressing it against the lug 75. When the arm 76 is arrested by engagement with the abutment 81 locating the player arm at initial playing position the lever 83 holds the player arm against inward displacement until the tone arm is lowered by the downward movement of the pin 47 in the recess 50, thus bringing the needle into engagement with the record on the turntable. After this occurs the cam follower 70 is disengaged by the lever 83 so that the weak spring 74 moves the player arm gently inwardly, bringing its needle into the playing groove. Thereafter the gap 56 in the cam gear comes opposite the pinion 57 so that the drive of the cam gear 49 is terminated until the latch 60 is again tripped at the end of the playing of the record. The bar 32 is provided with a relatively long slot 85 which receives a stud 86 rigidly mounted on an upper slider 87. The slider 87 is provided with downwardly turned lugs 88 and 89 which straddle the bar 32 and cooperate with the stud 86 to guide the slider 87 on the bar 32. One of the lugs 88 serves for the connection of a spring which tends to move the slider 87 away from the arm 76. A lower slider 90 shown in full lines in Fig. 1 is mounted for sliding movement on the bar 32 by means of a stud 91 which extends through the slot 85 and by a slot 92 through which extends the stud 86.

A stop 93 carried by the motor board 20 engages a projection on the slider 90 so as to limit its movement away from the arm 76. A spring 94 connected to the slider 90 and to the stop 93 tends to move the slider 90 relative to the slider 87 so that the stud 86 normally engages the end of the slot 92 remote from the arm 76. The spring connected to the lug 88 is much stronger than the spring 94 so that in normal position the two sliders 87 and 88 have the position shown in Figs. 1 and 3 when the machine is set for "automatic" operation. If the control bar 32 is moved to the "manual" position, the down turned lug 95 on the slider 90 is brought into alignment with the surface 79 of the arm 76. If the bar 32 is moved when the player arm is locked out, as it is when the machine stops automatically, then the arm 76 is in its outermost position and the lug 95 is free to move into alignment with the surface 79.

As will hereinafter be explained, the movement of the bar 32 into "manual" position unlocks the player arm so that it can be moved manually. The arm 76, being engaged by the lug 95, is unable to follow the arm 45, which moves with the player arm, and consequently the player arm is quite free for manual manipulation. If the player arm is in an inner position when the bar 32 is moved to "manual" position, the portion of the arm 76 which carries the surfaces 79 and 80 is inward of the slider 90. In these circumstances if the bar 32 is moved to "manual" position, the lower end of the slot 85 engages the stud 86 and carries it upwardly as viewed in Figs. 1 and 3. The spring 94 causes the slider 90 to follow the stud 86 thus bringing the lug 95 into alignment with the surface 79.

At the end of the playing of the record, the player arm is moved outwardly manually and the curved end of the arm 76 adjacent the surface 79 cams the lug 95 and its slider 90 downwardly as viewed in Fig. 1 and immediately the end of the arm 76 clears the lug 95, the spring 94 moves the slider 90 upwardly as viewed in Fig. 1 so that it can engage the surface 79 when the player arm is moved in slightly.

A projection 96 at the outer end of the surface 79 is arranged to lock the arm 76 and the slider 90 together. If it were not for the projection 96, movement of the bar 32 away from manual position would result in withdrawal of the lug 95 from the surface 79. The lever 76 would then snap in the counterclockwise direction as viewed in Fig. 1 under the influence of the spring 77, with possible injury to the needle or record.

In the present structure, if the bar 32 is moved from "manual" position, the projection 96 locks the lug 95 from movement with the bar 32 and only when the arm 45 is moved outwardly sufficiently is the projection 96 removed from the lug 95. Upon such removal the stronger spring connected to the slider 87 snaps the slider downwardly as viewed in Fig. 1, against the tension of spring 94, carrying the lug 95 out of alignment with the surface 79.

The outer end of the arm 46 is provided with two sloping surfaces 97 and 98. The sloping surface 98 is relatively short, the adjacent surface 99 of the arm 46 being radial. The surfaces 97, 98 and 99 are adapted to cooperate with a latching-locking detent 100. When the player arm is swung outwardly to its extreme position the surface 97 cams the detent 100 outwardly so that this detent engages either the surface 98 or 99. When the detent is engaged by the surface 98 the player arm is merely latched out and it may be moved inwardly by hand. When the detent engages the surface 99 the player arm is

locked out in its extreme position. The detent 100 is turned up from the lower web of a frame 101. The frame 101 is pivotally mounted on a pin 102 and is biassed towards latching-locking position by the spring 77. Also pivotally mounted on the pin 102 is a frame 104 which embraces the frame 101, and a dog 105 which is pivotally mounted on the lower end of the pin 102. The dog 105 is deflected from its normal position by the cam 68 at an intermediate position of the cam gear 49 as shown in Fig. 3. The outer end of the dog 105 is connected by a spring 106 to a lug 107 on the frame 104. Consequently when the dog 105 is deflected as shown in Fig. 3 it tends to swing the frame 104 in the counterclockwise direction as viewed in that figure. The dog 105 has an upturned lug 108 which normally abuts against the frame 104 under the influence of the spring 106. The lower web of the frame 101 carries a downturned lug 109 which engages the lower arm of the frame 104. Consequently when the frame 104 is swung from its normal position by the dog 105 as shown in Fig. 3, the frame 104 carries the detent 100 clear of the arm 46. This occurs during a normal record changing cycle so that the arm 76 moves the player arm inwardly towards initial playing position and carries the arm 46 clear of the detent 100 before the dog 105 clears the cam 68. When the dog 105 clears the cam 68 the spring 77 carries the frame 101 into locking position and its lug 109 carries the frame 104 and dog 105 into their normal positions. These normal positions are defined by the engagement of a tail 110 on the upper end of the frame 104 with a pin 111 carried by the motor board 20. The tail 110 is adapted to be locked in its normal position by means of a projection 112 on a sliding bar 113. It will readily be seen in Fig. 3 that if the bar 113 is moved to the right the projection 112 will engage the tail 110 and hold the frame 104 in its normal position. Operation of the dog 105 merely extends the spring 106 when the frame 104 is thus locked up. This operation occurs when the cam gear 49 is driven through its cycle after the playing of the last record when no record is in the magazine. Consequently the player arm remains locked out by engagement of the detent 100 with the surface 99.

A bar 114 is slidably mounted on the underside of the motor board 20 by means of slots and studs. The bar 114 is connected by a link 115 to the bar 32. The connection between the link 115 and the bars 32 and 114 may suitably be provided by down turned lugs on the link 115 which extend freely into openings in the bars 32 and 114. When the bar 32 is moved to "manual" position, as shown in Fig. 16 a down turned flange 116 on the bar 114 is brought into engagement with the upstanding arm 63 of the lever 58 as shown in Fig. 21 so that this lever cannot make contact with the projections 59. Thus the operation of the cam gear 49 is prevented as long as the bar 32 is in "manual" position. The bar 114 also carries a downwardly directed flange 117 which is adapted to engage a pin 67' on the latch 60 when the cam gear 49 is in its normal position and the bar 32 is moved down to its "reject" position. When the bar is thus moved the latch 60 is unlatched so that the cam gear 49 is put into rotation. When the button 33 is manually released it moves into its "automatic" position and the flange 117 is withdrawn from the path of the pin 67'. A lug 118 turned down from the bar 114 is arranged to engage the upper web of the frame 101 when the bar 32 is moved to "manual" position. This engagement swings the detent 100 out of engagement with the surface 99 on the arm 46 into engagement with the sloping surface 98 on that arm. Consequently when the bar 32 is in "manual" position the detent 100 serves as a latch for the player arm and the player arm may be moved inwardly manually and it may be latched out by simply moving the player arm outwardly.

In the operation of the machine a stack of records is supported by two escapement heads 119 and 120 above the turntable 22, the records being positioned by the spindle 23 extending through their central openings. For playing a stack of ten inch records the escapements are located in their position of Fig. 3A, the arrow 121 on the head 120 being directed towards the spindle 23. The escapement heads are provided with shelves 122 which support the stack of ten inch records. During the record changing cycle the heads 119 and 120 are oscillated in the counterclockwise direction and then in the clockwise direction. The first movement brings two blades 123 into the stack above the lowermost record, these blades being located the thickness of one ten inch record above the shelves 122, and brings the shelves 122 clear of the lowermost record so that that record falls down on to the turntable. The return movement carries the blades 123 clear of the stack so that the remaining records drop down and are supported by the shelves 122.

To set the machine for playing a stack of twelve inch records the head 120 is elevated slightly by its handle 124 and rotated in counterclockwise direction to bring the arrow 125 into the radial direction with respect to the spindle 23. The heads 119 and 120 are mechanically connected so that the head 119 is also positioned for the playing of twelve inch records. The heads 119 and 120 are provided with shelves 126 for supporting twelve inch records and blades 127 which are located above the shelves 126 by the thickness of a twelve inch record so that oscillation of the heads 119 and 120 results in the discharge of the lowermost twelve inch record on to the turntable. For removal of played records from the turntable the handle 124 may be raised slightly and both the heads 119 and 120 may be rotated so that all the blades and shelves are moved outwardly and the records may be removed from the turntable by vertical movement. The head 119 is rigidly mounted on a sleeve 128 which is rotatably mounted in a standard 129 carried by the motor board 20. At its lower end the sleeve 128 rigidly carries a pinion 130. The head 120 is mounted for limited sliding movement on a shaft 131 which is rotatably mounted in a rotatable sleeve 132 carried by a standard 133 also mounted on the motor board 20. A screw 134 carried by the head 120 extends into a cylindrical recess 135 on the shaft 131 to limit the vertical movement of the head 120. At its lower end the shaft 131 rigidly carries a pinion 136. The lower end of the mounting sleeve of the head 120 is provided with a relatively long vertical slot 137 and a relatively small slot 138. A pin 139 carried by the shaft 131 extends into the long slot 137, the arrangement being such that the pin 139 is always located in the slot 137 so that the head 120 cannot be rotated independently of the shaft 131. When the machine is set for ten inch records the slot 137 engages a projection 140 carried at the upper end of the sleeve 132. When the projection 140 is engaged by the small slot

138 the heads are in the twelve inch position. At its lower end the sleeve 132 rigidly carries an actuating arm 141 which effects the oscillation of the heads 119 and 120. Pinions 130 and 136 engage sectors 142 and 143 which are pivotally mounted on the motor board 20. A link 144 is connected to two arms carried by the sectors 142 and 143 so that the pinions 130 and 136 move simultaneously. The arm 141 is pivotally connected to a link 145 which is pivotally connected to an arm 146 pivotally connected to the bracket 24. The arm 146 carries a cam roller 147 which rides in a cam track 148 on the underside of the cam gear 49. In the normal position the roller 147 is located at the position 149 (Fig. 1) with respect to the cam track 148. During the first part of the movement of the cam gear 49 the link 145 remains stationary then moves upwardly as viewed in Fig. 1 and then downwardly, effecting the oscillation of the heads 119 and 120. These heads do not operate until the player arm is elevated and moved outwardly by the cams 50 and 71. The record is dropped when the cam gear 49 has made approximately half a revolution so that the record is dropped before the player arm starts to move inwardly towards initial playing position. The movement of the link 145 oscillates the arm 141 and the sleeve 132. The oscillation of the sleeve 132 oscillates the head 120 by virtue of the engagement of the projection 140 with one of the slots 137 or 138 and the oscillation of the head 120 is communicated to the shaft 131 by virtue of the permanent connection between the pin 139 and the slot 137. Consequently the oscillation is communicated to the head 119 through the pinion 136, sector 143, link 144, sector 142 and pinion 130.

The sectors 142 and 143 carry stops 150 which engage the link 144 in the extreme positions of the escapements. The sector 143 rigidly carries a stepped cam member 151. The cam member 151 engages a shoe 152 which is biassed towards it by a spring 153. The shoe 152 carries a pin 154 which extends into a slot in the bar 82 which is slidably mounted on the underside of the motor board 20 by means of a stud 156 carried by the motor board and extending through a slot 157 in the bar 82. The bar 82 is biassed away from the shoe 152 by means of a spring 158 which is weaker than the spring 153. The abutment 81 is turned down from the end of the bar 82 remote from the pin 154, this abutment cooperating with the surfaces 79 and 80 of the arm 76 as heretofore described.

The cam member 151 is provided with two arcuate surfaces 159 and 160 which engage the shoe 152. When a twelve inch record is being dropped the surface 159 cooperates with the shoe 152 as shown in Fig. 6, thus positioning the abutment 81 opposite the surface 80 of the arm 76. When the machine is dropping a ten inch record the shoe 152 cooperates with the surface 160 and the abutment 81 is located opposite the surface 79 of the arm 76 so that the player arm is moved to initial playing position for a ten inch record. The projection 161 at the end of the surface 80 prevents the abutment from being moved away from the surface 80 by manipulation of the escapements into ten inch position when the arm 76 is forcing the surface 80 against the abutment 81. Consequently the player arm is not snapped inwardly. When the player arm is again moved outwardly the bar 82 is moved into the ten inch position by the spring 153. If the escapement heads are moved to the twelve inch position when the surface 79 is in engagement with the abutment 81 the shoe 152 is moved upwardly as viewed in Fig. 3 but the bar 82 is held against movement by the shoulder 117 on the arm 76 until the arm 76 is moved outwardly clear of the abutment 81, whereupon the bar 82 moves into twelve inch position under the influence of the spring 158.

Within the escapement head 119 a frame 162 is pivotally mounted at 163. This frame carries two contact members 164 and 165 which project through the shelves 126 and 122 of the escapement head 119 so that they are depressed by a twelve inch or ten inch record respectively. The frame 162 includes a tail 167 which is perforated to receive a rod 168 which extends freely through the sleeve 128. The tail 167 engages a washer 169 mounted on the upper end of the rod 168. At its lower end the rod 168 carries a cam 170 which is arranged to engage a cam follower 171 when no record is resting on the escapement head 119. When a record of either size is resting on the escapement head the frame 162 is swung into its phantom position in Fig. 12 and the cam 170 is elevated clear of the cam follower 171. A projection 172 carried by the pinion 130 projects downwardly into an opening 173 in the cam 170 so that the cam oscillates and moves with the escapement 119.

The cam follower 171 is mounted on the upper side of a bracket 174 which depends from a frame 175 pivotally mounted on a stud 176 depending from the motor board 20. The bar 113 is slidably mounted on the underside of the motor board by means of a stud 177 which extends through a slot 178 and by means of a slot 179 which engages the stud 176. The frame 175 is connected to the bar 113 by means of a spring 180. Normally the frame 175 engages an abutment 181 on the bar 113. Owing to the advantageous leverage of the spring 180 over the leverage at the position of the abutment 181, the tension of the spring 180 biasses the bar 113 to the right as viewed in Fig. 13 against an abutment 182. It will readily be understood that when the cam 170 actuates the cam follower 171 the bar 113 is displaced to the left by the spring 180 unless it is held against such displacement. In the event that it is so held the spring 180 expands and the frame 175 is merely displaced to the left as viewed in Fig. 13.

In addition to the projection 112 the bar 113 carries a down turned projection 183 and a down turned projection 184. When the bar 113 is moved by the cam 170 to the left as viewed in Fig. 13 the projection 184 swings a latch member 185, which is pivoted at 191 on the motor board 20, in the clockwise direction. This movement carries the latch member away from its normal position in engagement with a stop 186 carried on an arm 187, pivotally mounted on the motor board 20 at 187', and allows a dog 188 pivotally mounted on the arm 187 to swing in the clockwise direction from its position in Fig. 13 into its position in Fig. 14. The dog 188 is biassed towards the latter position by a spring 189 connected to the dog 188 and to the arm 187. In its latched condition the tail of the dog 188 bears against one end of the latch 185, as shown in Fig. 13. In its unlatched condition as shown in Fig. 14 the tail of the dog 188 bears against the stop 186 and its outer end is brought into the path of a flange 190. The latch member 185 is biassed towards the stop 186 by a spring 185' connected to the member 185 and the arm 187.

The flange 190 is bent upwardly from the upper flange of a frame 192 pivotally mounted on the

motor board 20 by means of a pin 193. The frame 192 includes a tail 194 which cooperates with the projection 183 on the bar 113. When the frame 192 is in the position of Fig. 13, that is, when the cam gear 49 is in its normal stationary position, a pin 195 projecting from the lower side of the cam gear 49 engages the frame 192 so as to hold it outwardly from the inner position into which it is biassed by a spring 196 connected to the arm 187 and to the tail 194. This inner position is shown in Figs. 1 and 3 and is defined by the engagement of the upper flange of the frame 192 with the pivot 191. In this position the end of the tail 194 is directed towards the projection 183 so that the bar 113 is held against movement towards the left as viewed in Fig. 13. The lower flange of the frame 192 carries a cam-shaped projection 197 which is engaged by the pin 195 during each rotation of the cam gear 49. In the normal automatic operation of the machine a series of records are played and the switch is automatically opened at the end of the playing of the last record in a manner which will shortly be described. It is usually necessary to remove the records from the turntable, which involves moving the escapement heads 119 and 120 out of their operating position. After the records are removed the heads are located for the reception of records of the desired size. Since this movement of the escapement heads is effected without a record resting thereon the cam 170 engages the cam follower 171 and the frame 175 is swung about its pivot. The bar 113 being held by engagement of its projection 183 against the tail 194, the spring 180 merely expends and the latch 185 remains in the position shown in Fig. 13. Consequently the dog 188 is not released by the latch 185.

After the playing of each record except the last the cam 170 is held above the cam follower 171 so that the bar 113 is not actuated and the dog 188 is latched out. During each revolution of the cam gear 49 the pin 195 moves away from the frame 192 which then moves inwardly into its position in Fig. 14 and near the end of the revolution of the cam gear 49 the pin 195 moves past the cam projection 197, moving the frame 192 outwardly. During such outward movement the flange 190 on the frame 192 engages the sloping side of the dog 188 so that this dog is merely swung on its pivot and the arm 187 is not actuated. During each such revolution of the cam gear 49 the cam 68 actuates the dog 105 which swings the frame 104 and the frame 101 so that the detent 100 clears the arm 46 and the player arm moves into initial playing position.

After the last record has been played the cam gear 49 makes a complete revolution and, since there is no record on the escapement head 119 the cam 170 is in alignment with the cam follower 171. The cam follower 171 is moved to the left as viewed in Fig. 13 by the cam rise 198 in the case of a ten inch record and by the cam rise 199 in the case of a twelve inch record. Since the movement of the cam follower 171 occurs after the pin 195 has clear the frame 192, the projection 183 is opposite a recess 200 in the tail 194 of the frame 192 so that the bar 113 is moved by the cam 170 into its position of Fig. 14. Its projection 184 swings the latch 185 clear of the dog 188 so that the tail of the dog engages the stop 186. At the same time the projection 112 on the bar 113 moves below the tail 110 of the frame 104. This occurs before the dog 105 engages the cam 68 so that the cam does not unlock the player arm and the player arm remains in its locked out position. After the cam 68 has passed the dog 105 the bar 113 moves to the right again as viewed in Fig. 15 as a result of the return movement of the escapement head 119. The player arm remains locked out and the latch 185 remains unlatched, its end engaging the end of the tail of the dog 188, which now engages the stop 186. When the cam gear 49 approaches its normal position its pin 195 engages the cam formation 197 of the frame 192 so that the flange 190 of the frame 192 engages the end of the dog 188, with the result that the dog 188 and the arm 187 are moved outwardly so that the end 201 of the arm 187 engages a lug 202 on the bar 32 and carries the bar into the "off" position, opening the switch 28. After the switch is opened, as is shown in Fig. 13, the cam gear 49 coasts into its normal position and the elements resume their positions of this figure with the exception that the bar 32 is moved up one step to its "off" position. When the arm 187 is moved outwardly as shown in Fig. 15 the dog 188 clears the latch 185 so that the latch now engages the stop 186. Consequently the tail of the dog 188 engages the end of the latch 185 and is swung in counterclockwise direction into its normal position as the arm 187 returns to its normal position of Fig. 13.

It is to be noted that the arm 187 is biassed inwardly by the springs 185' and 196 against a suitable stop. The arm 187 may contact the lug 118 in the "manual" and "off" positions of the bar 32 and may contact the pivot pin 102 in the other positions of the bar 32.

While the complete mechanism and its manner of operation will readily appear from the foregoing description thereof, certain salient features of the machine are now set forth briefly. The escapement heads 119 and 120 always move simultaneously. They may be moved to the position for either size of record by merely raising the escapement head 120 slightly and rotating it to desired position. In the same way the escapement heads may be moved out of alignment with the records on the turntable so that these records may be removed. Merely raising the escapement head 120 slightly disconnects the mechanical drive of the heads. Manual operation of the escapement head 120 is usually effected when the machine is out of operation so that the bar 113 is prevented from moving to the left as viewed in Fig. 1 by the tail 194 of the frame 192. Thus latch 185 remains in its normal position. If this latch were unlatched by manual manipulation of the escapement head 120, the motor would stop at the end of the first revolution of the cam gear 49. When a record is dropped from the turntable during a rotation of the cam gear 49 the bar 113 is not actuated because the record on the escapement 119 holds the cam 170 elevated above the cam follower 171 during the displacement of the cam 170 which would effect the displacement of the bar 113 if there had been no record on the escapement heads. After the last record has been played the cam gear 49 makes a complete revolution. In this case the cam 170 is in its lower position and it moves the bar 113 to the left as viewed in Fig. 13 at a time when the frame 192 is in its inner position. This moves the latch 185 to unlatched position and allows the dog 188 to assume operative position relative to the flange 190 so that near the end of the revolution of the cam gear 49 the pin 195 forces the frame 192 outwardly and forces the arm 187 outwardly, moving the bar 32 to "off" position. When the bar 32 is in "manual" position the detent 100 is merely a latch. When the bar 32 is in "automatic" posi-

tion, the detent 100 is a lock and the player arm is locked out and the player arm is positively locked out when it is moved into its outermost position. During each record changing cycle of the cam gear 49 the dog 105 actuates the frame 104 so as to unlock the player arm and permit it to move inwardly to initial playing position. When, however, the cam gear 49 moves the bar 113 to the left as viewed in Fig. 1 after the last record has been played, the frame 104 is held inoperative by engagement of the projection 112 with the tail 110 so that the player arm remains locked out after the motor switch has been opened by the displacement of the bar 32 by the arm 187 from "automatic" to "off" position.

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

Having thus described my invention, I declare that what I claim is:

1. In an automatic phonograph, in combination, a control switch, a record dropping escapement head, means for oscillating said head to discharge the lowermost record therefrom for reproduction, a cam movable with the escapement head, means for opening said control switch, means including a cam follower adapted to condition the switch opening means for automatic operation, and means on said head adapted to be engaged by a record thereon to displace the cam out of operative engagement with the cam follower, whereby the means for opening the control switch is maintained out of condition for operation as long as a record is supported on the escapement head.

2. In an automatic phonograph, in combination, a player arm, a turntable, a motor for driving the turntable, a switch controlling the motor, means for opening said switch, a record dropping escapement adapted to support a stack of records, cam means controlling a record changing cycle periodically including means for moving the player arm outwardly and inwardly and means for actuating said escapement to drop a record on the turntable while the player arm is out, a member arranged to be displaced to condition said switch opening means for actuation by said cam means, resilient means connecting said displaceable member to said escapement, means arranged to be actuated by a record on the escapement for disconnecting the escapement from the member, and latch means controlled by the cam means in its normal position for preventing displacement of said member when the escapement is actuated manually with no record thereon.

3. In an automatic phonograph, in combination, a player arm, a turntable, a motor for driving the turntable, a switch controlling the motor, means for opening said switch, a record dropping escapement adapted to support a stack of records, a cam wheel adapted to make a cycle occasionally to move the player arm out and in and actuate the escapement to release a record therefrom, an arm to move said switch opening means, a dog pivotally mounted on said arm, a swinging member adapted to actuate said arm by means of said dog, a latch normally holding said dog in inoperative position, means biassing said swinging member to a definite position, a member on said cam wheel adapted to swing said member near the end of its revolution to an extreme position and normally to maintain the swinging member in an intermediate position, a member actuable by the escapement to release said latch, means on said swinging member to prevent such actuation when the swinging member is in its normal intermediate position.

4. In a record dropping automatic phonograph, in combination, an escapement head, means for oscillating said head, a cam movable with said head, means for disconnecting said head from said oscillating means, whereby the head may be adjusted into one of a plurality of normal positions for supporting records of definite sizes, a displaceable member including a cam follower adapted to engage said cam, said cam having a plurality of effectively similar formations to establish the same operative relation with the follower in all said normal positions of the escapement head, and means engaged by a record on the escapement head for moving said cam clear of the follower.

5. In a record dropping automatic phonograph, in combination, an escapement head, means for oscillating said head, a cam movable with said head, means for disconnecting said head from said oscillating means, whereby the head may be adjusted into one of a plurality of normal positions for supporting records of definite sizes, a displaceable member including a cam follower adapted to engage said cam, said cam having a plurality of effectively similar formations to establish the same operative relation with the follower in all said normal positions of the escapement heads, means engaged by a record on the escapement head for moving said cam clear of the follower, and means controlled by said displaceable member for conditioning the phonograph for automatic stopping.

6. In an automatic phonograph, in combination, a pair of record dropping escapement heads, inseparable means connecting them for simultaneous movement, operating means for said escapement heads, separable means connecting said operating means to one of the heads, said one of the heads being movable to effect the separation, whereby the separation may be effected and all the heads may be adjusted to any of a plurality of normal positions for supporting records of definite sizes by manual actuation of said one of the heads, a cam oscillatable with one of the heads, a displaceable member including a cam follower normally engageable by said cam, said cam having a plurality of effectually similar cam formations whereby similar cam and follower relations are established in any of the said plurality of normal positions of the heads, means on the head associated with said cam adapted to be engaged by a record on the head to clear the cam from the follower, and means controlled by said displaceable member for conditioning the phonograph for automatic stopping.

7. In an automatic phonograph, in combination, a pair of record dropping escapement heads, inseparable means connecting them for simultaneous movement, operating means for said escapement heads, separable means connecting said operating means to one of the heads, said one of the heads being movable to effect the separation, whereby the separation may be effected and all the heads may be adjusted to any of a plurality of normal positions for supporting records of definite sizes by manual actuation of said one of the heads, a cam oscillatable with one of the heads, a displaceable member including

a cam follower normally engageable by said cam, said cam having a plurality of effectually similar cam formations whereby similar cam and follower relations are established in any of the said plurality of normal positions of the heads, means on the head associated with said cam adapted to be engaged by a record on the head to clear the cam from the follower, means controlled by said displaceable member for conditioning the phonograph for automatic stopping, operating means for moving the player arm out and in to initial playing position, a movable abutment adapted to be located in any of a plurality of positions corresponding to the positions of the escapement heads, and cam means operatively connected to the heads for correspondingly locating said abutment means.

8. In an automatic phonograph, in combination, a pair of record dropping escapement heads, inseparable means connecting them for simultaneous movement, operating means for said escapement heads, separable means connecting said operating means to one of the heads, said one of the heads being movable to effect the separation, whereby the separation may be effected and all the heads may be adjusted to any of a plurality of normal positions for supporting records of definite sizes by manual actuation of said one of the heads, a cam oscillatable with one of the heads, a displaceable member including a cam follower normally engageable by said cam, said cam having a plurality of effectually similar cam formations whereby similar cam and follower relations are established in any of the said plurality of normal positions of the heads, means on the head associated with said cam adapted to be engaged by a record on the head to clear the cam from the follower, a latch adapted to be released by said displaceable member, an arm movable to stop the phonograph, a swinging member, means for swinging the member after the escapement heads have been operated, a dog on said arm adapted to cooperate with the swinging member to swing the arm to stop the phonograph, said dog being normally held in inoperative position by said latch, and means normally positioning said swinging member to prevent displacement of said displaceable member.

9. In an automatic phonograph, in combination, a pair of record dropping escapement heads, inseparable means connecting them for simultaneous movement, operating means for said escapement heads, separable means connecting said operating means to one of the heads, said one of the heads being movable to effect the separation, whereby the separation may be effected and all the heads may be adjusted to any of a plurality of normal positions for supporting records of definite sizes by manual actuation of said one of the heads, a cam oscillatable with one of the heads, a displaceable member including a cam follower normally engageable by said cam, said cam having a plurality of effectually similar cam formations whereby similar cam and follower relations are established in any of the said plurality of normal positions of the heads, means on the head associated with said cam adapted to be engaged by a record on the head to clear the cam from the follower, a latch adapted to be released by said displaceable member, an arm movable to stop the phonograph, a swinging member, means for swinging the member after the escapement heads have been operated, a dog on said arm adapted to cooperate with the swinging member to swing the arm to stop the phonograph, said dog being normally held in inoperative position by said latch, means normally positioning said swinging member to prevent displacement of said displaceable member, operating means for moving the player arm out and in to initial playing position, a movable abutment adapted to be located in any of a plurality of positions corresponding to the said normal positions of the escapement heads, and cam means operatively connected to the heads for correspondingly locating said abutment means.

CARL G. JOHNSON.

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