July 14, 1936. T. W. SMALL 2,047,749

AUTOMATIC RECORD CHANGING PHONOGRAPH

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FIG. 1

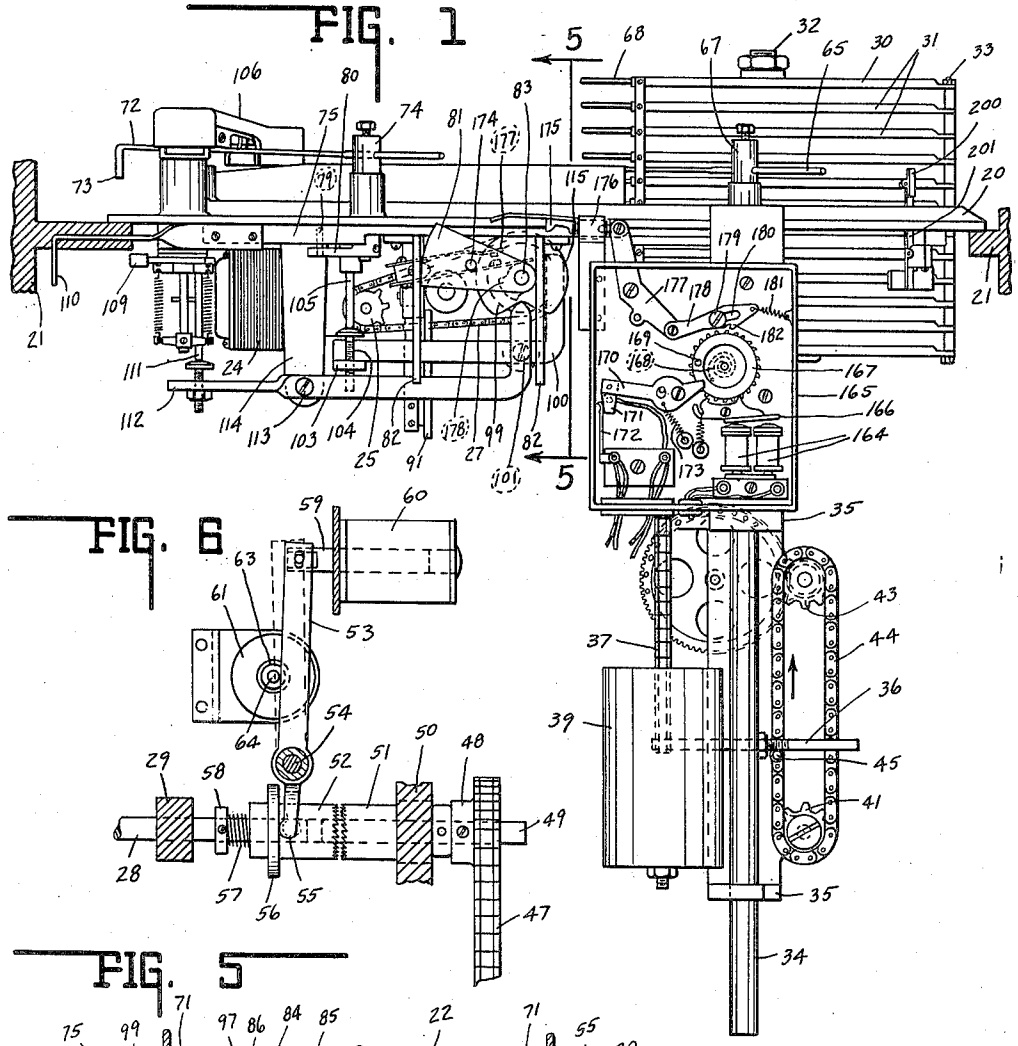
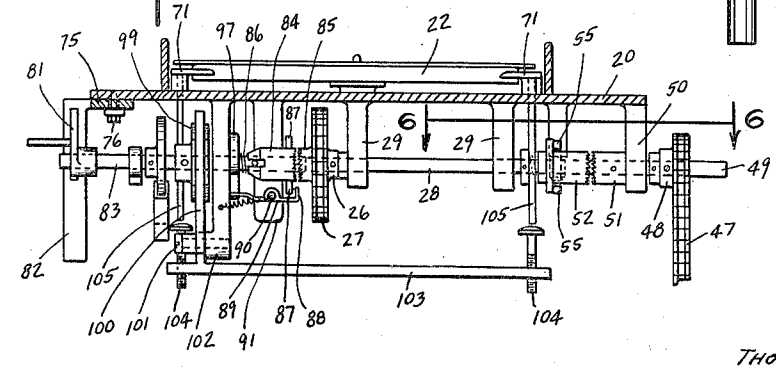


FIG. 6

FIG. 5



INVENTOR.
THOMAS W. SMALL.

BY Lockwood Goldsmith & Galt

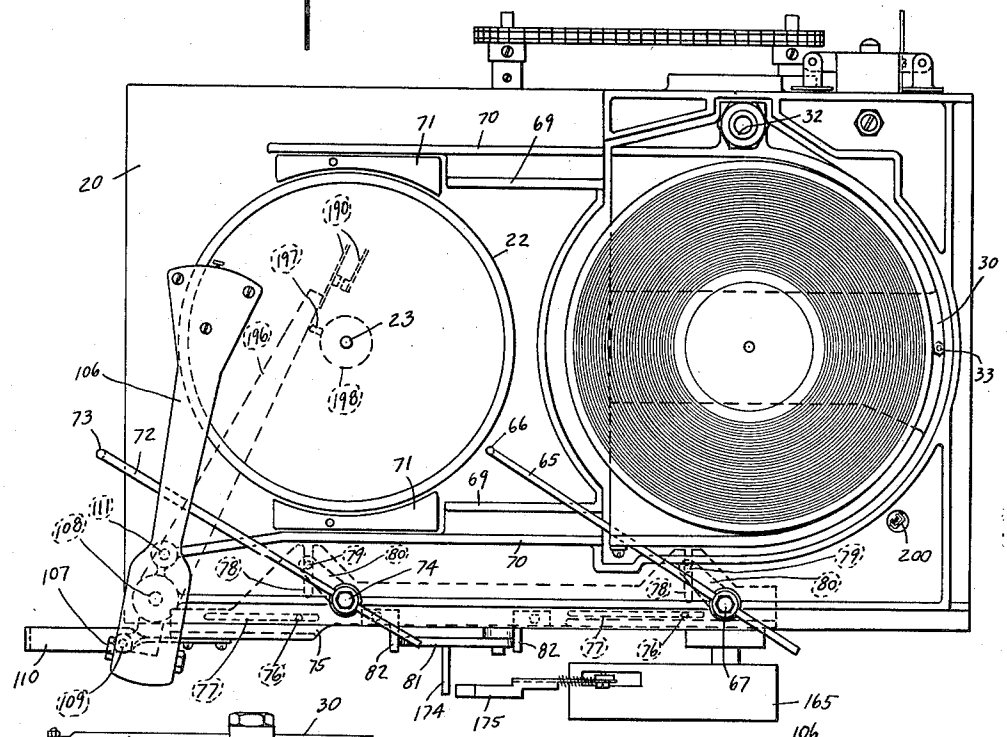
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AUTOMATIC RECORD CHANGING PHONOGRAPH

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FIG. 2



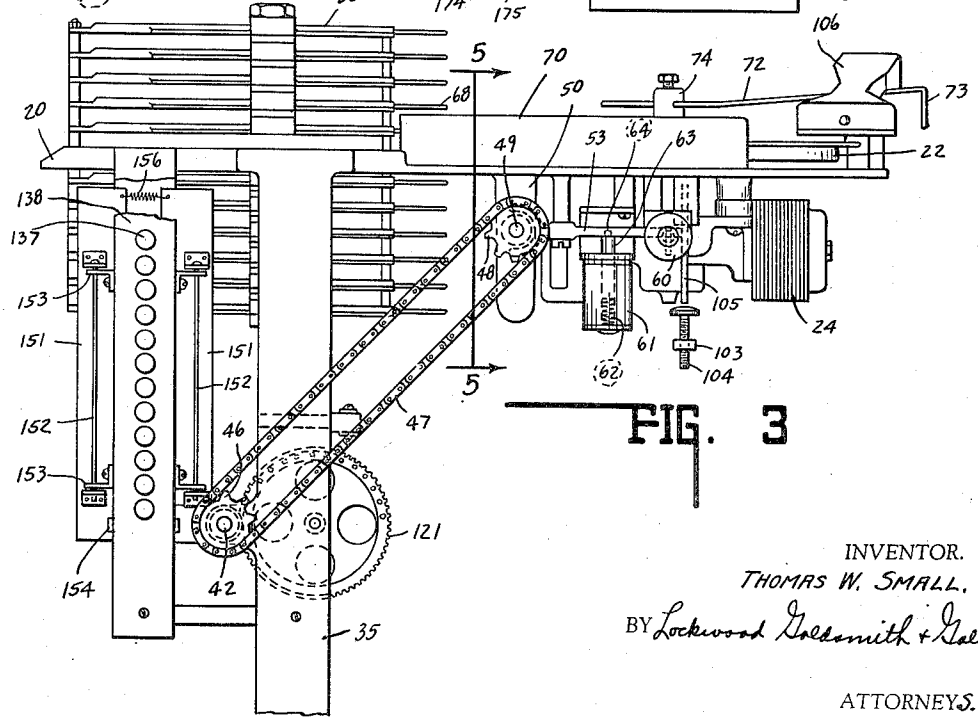


FIG. 3

INVENTOR.
THOMAS W. SMALL.
BY Lockwood Goldsmith & Galt
ATTORNEYS.

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AUTOMATIC RECORD CHANGING PHONOGRAPH

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FIG. 4

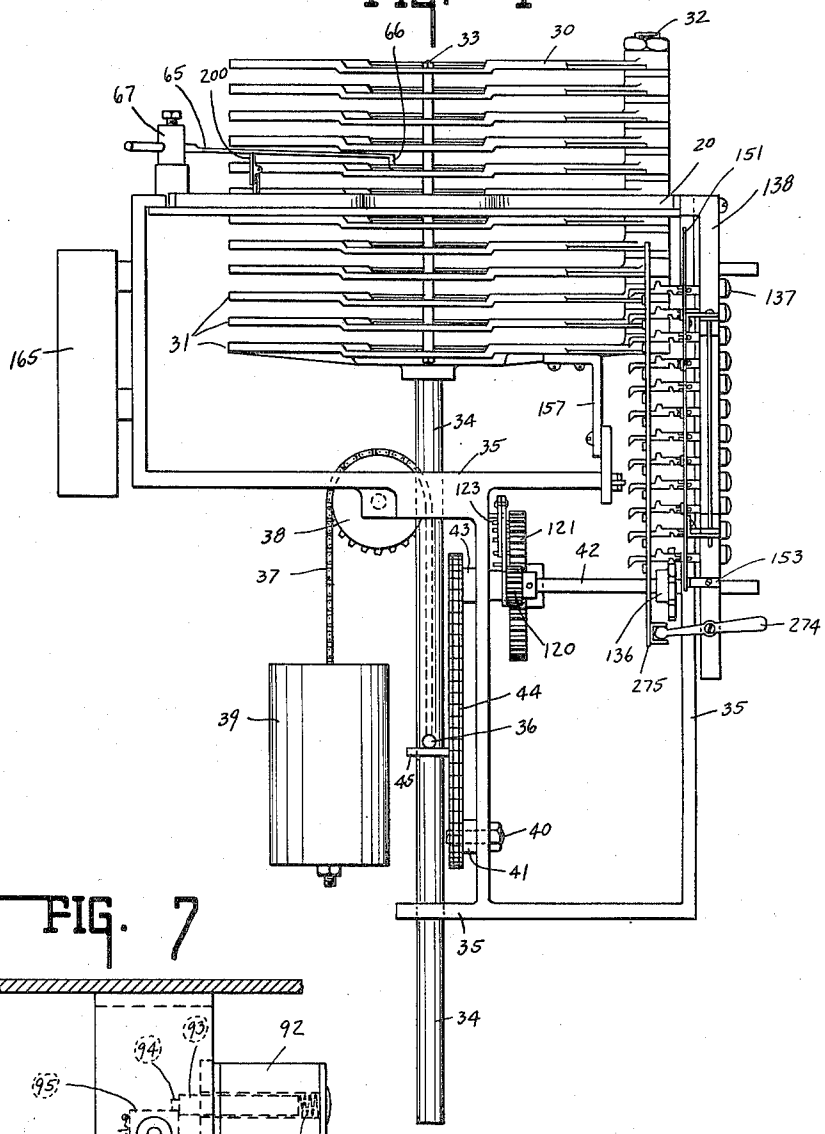
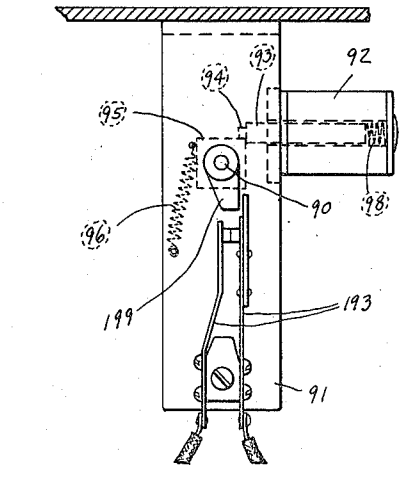


FIG. 7



INVENTOR.
THOMAS W. SMALL.
BY Lockwood Goldsmith & Galt
ATTORNEYS.

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FIG. 8

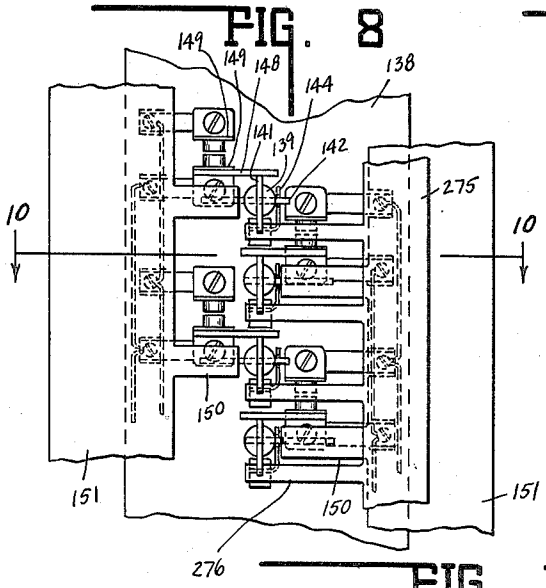


FIG. 9

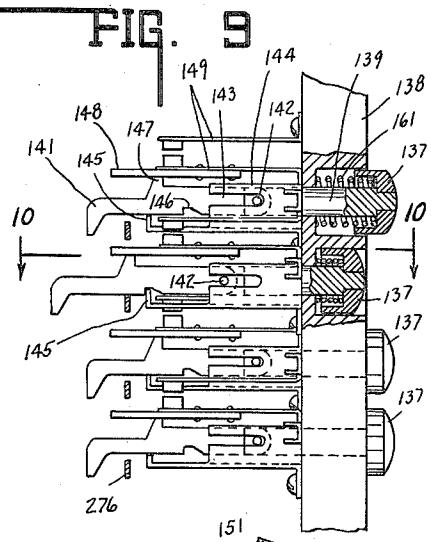


FIG. 10

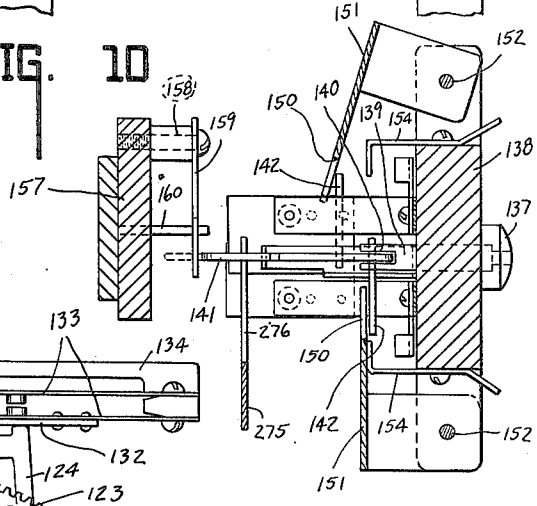
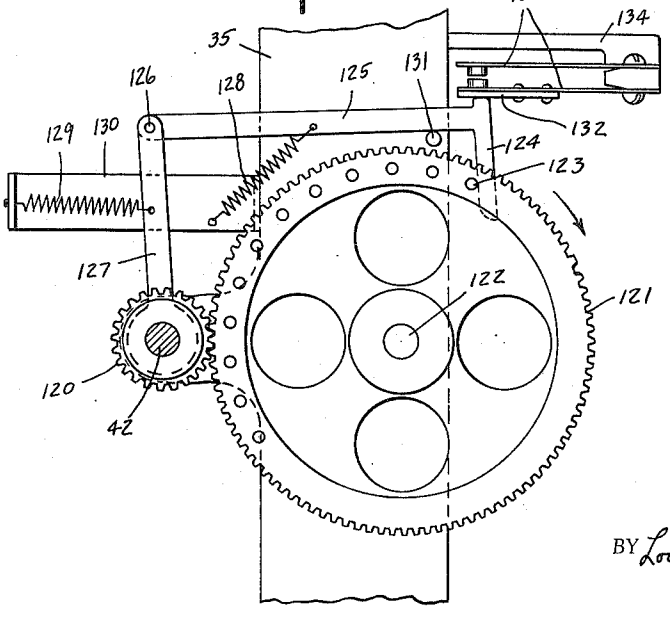


FIG. 11



INVENTOR.
THOMAS W. SMALL.
BY Lockwood Goldsmith & Galt.
ATTORNEYS.

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AUTOMATIC RECORD CHANGING PHONOGRAPH

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FIG. 12

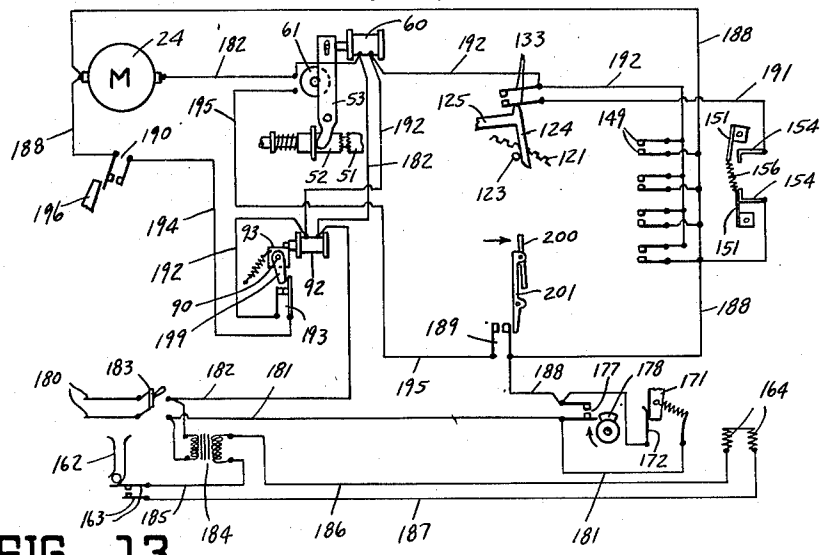
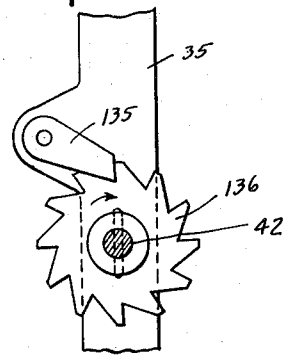


FIG. 13



INVENTOR.
THOMAS W. SMALL.
BY Lockwood Goldsmith & Galt
ATTORNEYS.

Patented July 14, 1936 2,047,749

UNITED STATES PATENT OFFICE

2,047,749

AUTOMATIC RECORD CHANGING PHONOGRAPH

Thomas W. Small, Fort Wayne, Ind., assignor to The Capehart Corporation, Fort Wayne, Ind., a corporation

Application September 27, 1934, Serial No. 745,654

7 Claims. (Cl. 274—10)

This invention relates to a record-changing phonograph of the general type illustrated in my prior Patents No. 1,792,553, issued February 17, 1931, No. 1,854,960, issued April 19, 1932, No. 1,872,835, issued August 23, 1932, No. 1,918,062, issued July 11, 1933, and No. 1,971,584, issued August 28, 1934, and my co-pending application, Serial No. 687,392, filed August 30, 1933. In this general type of phonograph a magazine is provided for the storage of a number of records and the individual records are moved by record-changing mechanism from said magazine to a playing turntable and are returned to the magazine when played.

The principal object of the present invention is generally to improve upon this type of phonograph and to this end the invention consists in the various novel features hereinafter disclosed and particularly pointed out in the claims appended hereto.

An important feature of the invention resides in the fact that means are provided whereby the records are normally played in a predetermined order but may be selectively played out of such order if desired.

Another important feature of the invention is that the selection of the next record to be played may be made at any time during the cycle of operation. It is not necessary to wait until one record has been played and returned to the magazine to determine which record is to be played next.

Another very important feature is that more than one record may be selected at a given time. This is advantageous in the type of coin controlled phonograph in which more than one coin may be deposited for the playing of more than one record. The operator may deposit two or more coins and at the same time make a complete selection of the records he wishes to hear.

Other objects and features of the invention will be understood from the accompanying drawings and the following description and claims.

In the drawings and specification there is disclosed, by way of illustration, a machine embodying the invention in a preferred form.

Fig. 1 is a side elevational view of said machine. Fig. 2 is a plan view thereof. Fig. 3 is a side elevation of the opposite side to that shown in Fig. 1. Fig. 4 is an end elevational view of the machine particularly showing the storage magazine and related mechanism. Fig. 5 is a sectional view in elevation taken substantially on the lines 5—5 of Figs. 1 and 3. Fig. 6 is a plan view partly in section taken on the line 6—6 of Fig. 5. Fig. 7 is an elevational view of certain parts used for controlling a portion of the record-changing mechanism. Fig. 8 is an elevational view of certain mechanism used for the selection of individual records to be moved from the magazine. Fig. 9 is an elevational view of the same taken at right angles to Fig. 8. Fig. 10 is a sectional plan view partly of the same taken on the lines 10—10 of Figs. 8 and 9. Fig. 11 is an elevational view of certain mechanism used for control of the movements of the magazine when individual records are not selected but the records are played in a predetermined sequence. Fig. 12 is a wiring diagram of electrical connections for intercontrol of the various movements of the machine. Fig. 13 is a fragmentary elevation of parts used for accurately placing the magazine for transfer of records therefrom.

The stationary framework of the machine herein described consists of a deck plate 20 which supports all of the movable mechanism of the machine and which may in turn be supported in any suitable manner within a cabinet. The said cabinet is not shown in detail in the drawing, fragmentary portions of the same appearing only at 21 in Fig. 1 by way of illustration.

Turntable and motor

At one side of the machine there is provided the usual rotatable turntable 22 having a centering pin 23 and being driven by an electric motor 24 through suitable reduction gears, not shown. The motor 24 is secured to the under side of the deck plate 20.

In addition to driving the turntable 22, the motor 24 also continuously drives, through suitable gearing, a sprocket 25 which in turn drives a sprocket 26 through a sprocket chain 27. The sprocket 26 is fixedly mounted upon a shaft 28 supported by hangers 29 from the under surface of the deck plate 20. The shaft 28 is, therefore, continuously rotated by the motor 24.

Storage magazine and mechanism for moving the same

A storage magazine 30 is mounted at the opposite end of the machine and consists of a plurality of horizontal plates 31 each adapted to carry a record 68 and all secured together by means of bolts 32 and 33 placed, as best shown in Fig. 2, in such position that they do not interfere with the records in the magazine. The magazine 30 is supported upon the upper end of a vertically movable stem 34 which is guided in bearings in a hanger frame 35 secured to the deck plate 20. A horizontal pin 36 extends

through the stem 34 and has attached to one end thereof a chain 37 which passes upwardly about a sprocket 38 and thence downwardly to support a counterweight 39. The counterweight is made sufficiently heavy to counterbalance the greater part of the weight of the magazine and the records stored therein, thus making it relatively easy for the magazine to be elevated but still leaving sufficient unbalanced weight so that the magazine will fall by gravity.

Supported upon the frame 35 there is a stub shaft 40 carrying a sprocket 41 and a second shaft 42 carrying a sprocket 43. A chain 44 is trained about said sprockets and carries a pin 45 in position to engage the under surface of the pin 36. The shaft 42 extends to one side of the machine and carries a sprocket 46 about which there is trained a chain 47 which also passes over a sprocket 48 carried by a shaft 49 supported in a bracket 50 from the under surface of the deck plate 20. The shaft 49 has fixedly secured thereto a clutch element 51 which is positioned to engage a mating element 52 splined to the shaft 28.

In the operation of this portion of the mechanism, when the element 52 is moved along its shaft to engage the mating element 51, the motor 24 is operatively connected to move the chain 44. The said motor operates in one direction only and the chain 44 moves only in the direction of the arrow in Fig. 1. In this movement, when the pin 45 is on the upwardly moving leg of the chain 44, it engages the pin 36 and moves the storage magazine upward. After the pin 45 passes over the sprocket 43 and onto the downwardly moving leg of the chain 44, the magazine is permitted to move by gravity to its lowermost position.

As will be seen in Figs. 5 and 6, the teeth of the clutch elements 51 and 52 are formed with their back faces inclined. The angle of this inclination is preferably such that the unbalanced weight of the magazine in its downward movement is able to overcome the frictional engagement of the clutch teeth. The clutch element 52 is thus forced to the left in Fig. 5 and the magazine is permitted to drop at a much more rapid rate than its rate of upward movement. If necessary, the downward movement may be checked by a dash pot, spring or other cushioning device.

For manipulating the clutch element 52, there is provided a lever 53 pivotally mounted at 54 upon the under surface of the deck plate 20 and having a forked end 55 straddling the clutch element and bearing against a flange 56 formed on said element. A compression spring 57 surrounding the shaft 28 and abutting at one end against a collar 58 and at its opposite end against the clutch element 52 tends to move said element into engagement with the mating element 51. The opposite end of the lever 53 is connected to the plunger 59 of a solenoid 60. When energized, the said solenoid moves the lever 53 to withdraw the clutch element 52 from its engagement with its mating element against the action of the spring 57. A second solenoid 61 is mounted beneath the lever 53 and is provided with an internal spring 62 tending to force its plunger 63 upwardly. The plunger is provided at its upper end with a reduced portion 64 which is so placed that when the solenoid 60 is energized it engages the edge of the lever 53, as best shown in Fig. 6, and latches said lever in position to hold the clutch element 52 in the disengaged position, even though the solenoid 60 is then deenergized. When the solenoid 61 is energized, it draws its plunger 63 downwardly, thus releasing the portion 64 thereof from its latching engagement with the lever 53 and permitting the spring 57 to move the clutch element 52 into engaging position. When the solenoid 61 is then deenergized, the plunger 63 again moves upwardly but its travel is stopped by the under surface of the lever 53 until the solenoid 60 is again energized. Thus, the engagement of the clutch for starting the movement of the magazine is secured by a momentary actuation of the solenoid 61 and the disengagement of the clutch for stopping said movement is secured by a momentary actuation of the solenoid 60.

Record shifting mechanism

For moving a record from the magazine to the turntable there is provided an arm 65 having a downwardly pointed finger 66 at one end. The arm 65 is carried by a pivotally mounted vertical post 67 which is adapted to oscillate about a vertical axis. The arm is so placed that the oscillation of its supporting post may move it between the plates 31 of the magazine when the magazine is stopped at the proper elevation. In this movement, the finger 66 engages the edge of a record 68 and slides the same from the magazine on to a trackway 69 formed upon the upper surface of the deck 20. Further movement of the arm 65 toward the position shown in Fig. 2 slides the record along the trackway 69 between guideways 70 which are of sufficient height to engage the edges of the record. From the trackways 69 the record is delivered to a pair of elevators 71 positioned beside the turntable 22. The length of the arm 65 and its arc of travel are so chosen that the record comes to rest upon the elevators with its centering hole directly above the centering pin 23. To place the record on the turntable, the elevators 71 are lowered by mechanism to be hereinafter described.

For moving the records from the turntable to the magazine there is provided a second arm 72 having a downwardly extending finger 73. The said arm is mounted upon a pivotally mounted vertical post 74 and oscillates about the axis of said post in unison with the oscillation of the arm 65. When the record has been lifted from the turntable by the elevators 71, the movement of the arm 72 to the right in Fig. 2 brings the finger 73 into engagement with the edge of the record and moves the same back to its original position upon the magazine.

The mechanism for operating the record-shifting arms 65 and 72 includes a slide 75 slidably mounted upon the under surface of the deck plate 20 by means of bolts 76 operating in slotted openings 77 in said slide. The slide has a second pair of slotted openings 78 each engaging a pin 79 carried upon an arm 80. Each of said arms 80 is secured to the lower end of one of the posts 67 and 74 and thus reciprocation of the slide 75 oscillates the said posts and the arms 65 and 72 in the manner described. The slide 75 is reciprocated by means of a cam 81 engaging vertical plates 82 secured to said slide. The cam 81 is mounted on a cam shaft 83 which in turn may be connected to the shaft 28 by means of clutch elements 84 and 85. The clutch element 84 is splined to the shaft 83 while the mating element 85 is formed integrally with the hub of the sprocket 26.

The clutch element 84 is biased to the right in Fig. 5 by a compression spring 86 and is me-

chanically moved to the left for disengagement when one of a pair of pins 87 carried thereby engages a cam surface 88 formed upon a trigger 89. The trigger 89 is fixedly mounted on a shaft 90 supported upon a bracket 91 formed on the under surface of the deck plate 20. The bracket 91 also supports a solenoid 92 (see Fig. 7) whose plunger 93 has a reduced portion 94 extending into the path of movement of a rectangular block 95 fixed upon the shaft 90. A tension spring 96 is secured to said block and to the bracket 91 and urges the shaft 90 in the counterclockwise direction, referring to Fig. 7, or the clockwise direction, referring to Fig. 5. A cam 97 (Fig. 5), mounted on the cam shaft 83, engages the end of the latch 89 during portions of the rotation of said cam shaft.

During the playing of a record the clutch is disengaged and the parts are in the positions shown in Figs. 5 and 7 with the plunger portion 93 in latching position on the upper surface of the block 95 preventing movement of the shaft 90. The latch 89 is in the position shown in Fig. 5 engaging one of the pins 87 and holding the clutch element 84 out of engagement. The opposite end of the latch is out of engagement with the cam 97. With the parts in this position, a momentary actuation of solenoid 92 withdraws its plunger against the action of a compression spring 98 and permits the shaft 90 to rock under the influence of spring 96. This permits the trigger 89 to release the pin 87 and the clutch member 84 is then forced into engagement by the spring 86. This engagement permits the cam shaft 83 to rotate, bringing the cam 97 into engagement with the latch 89 and returning the same to its original position after the pin 87 has cleared the same. When so returned, the plunger 93 is forced by the spring 98 into latching position and again holds the shaft 90 against rotation. When a half revolution of the cam shaft 83 has been completed, the second of the pins 87 engages the cam surface 88 of the latch 89 which, being immovable, forces the clutch element 84 out of engagement with its mating element and stops the rotation of shaft 83. Thus, the momentary actuation of solenoid 92 initiates the movement of the cam shaft 83 and said movement is stopped at the end of a half revolution by the engagement of one of the pins 87 with the latch member. During one half revolution of the said cam shaft, the slide 75 is moved to the left in Fig. 2 to move a record from the magazine to the turntable. During the second half revolution, which occurs only after the record has been played, the slide 75 is moved to the right to move the record from the turntable back to the magazine.

Elevator mechanism

The cam shaft 83 carries a cam 99 which engages an arm 100 pivotally mounted at 101 on a bracket 102 formed on the under surface of the deck plate 20. The said arm extends horizontally from its pivot 101 and is secured to a crossbar 103 carrying a pair of adjusting screws 104, the upper ends of which are positioned to engage the lower ends of a pair of stems 105 which are slidably mounted in the deck plate 20 and support at their upper ends the elevators 71. The cam 99 is so shaped that it moves the arm 100 to raise the elevators 71 at the proper time in the cycle of operations to remove a record from the turntable and to permit the said elevators to return by gravity to their lowered position at the proper time to place a record on the turntable.

Pick-up arm control

The phonograph is provided with the usual pick-up arm 106 which is pivotally mounted for vertical movement about a horizontal pivot 107 and for horizontal movement about the axis of a vertical stem 108. The stem 108 extends through the deck plate 20 and carries on its lower end an arm 109 which is engageable by a finger 110 carried by the slide 75. A vertical pin 111 extends through the deck plate 20 beneath the pick-up arm and engages at its lower end a lever 112 pivotally mounted at 113 on a bracket 114. The opposite end of the lever 112 engages a cam 115 carried by the cam shaft 83 and so shaped that when the cam shaft 83 is moved from its playing position, the lever 112 is moved to elevate the stem 111 and raise the pick-up arm from the record, said arm moving about its horizontal pivot 107. During further movement of the cam shaft 83, the finger 110 engages the arm 109 and moves the pick-up arm about its vertical pivot 108 to return the same to its initial playing position over the edge of the record. At the end of a complete revolution of the cam shaft 83 the cam 115 permits the lever 112 to be moved to lower the pick-up arm into playing position.

The pick-up arm carries the usual pick-up mechanism which may be of the electrical type connected to the usual amplifier and speaker, neither of which is shown in the drawings.

Non-selective magazine control mechanism

When the operator does not desire to select the records to be played, they are played in the order of their arrangement in the magazine beginning with the uppermost record and progressing downwardly through the magazine. Starting with the magazine in its lowermost position, it is moved upwardly and is stopped first with the uppermost record at the level of the oscillating arm 65. After the uppermost record has been played and returned to the magazine, the same is again elevated to bring the second record to the transfer position at the level of the oscillating arm 65. The raising of the magazine step by step after the playing of each record continues until the lowermost record has been played, at which time the magazine automatically returns to its lowermost position and the playing of the records in the same sequence is repeated.

The mechanism for controlling the step by step non-selective movement of the magazine is illustrated in Fig. 11. A pinion 120 is mounted on the shaft 42 and engages a gear 121 carried upon a stub shaft 122 in turn supported upon the hanger 35. The gear 121 carries a plurality of pins 123 adapted to engage a downwardly projecting portion 124 of a trigger 125. The trigger 125 is pivotally mounted at 126 on the upper end of a link 127 which is in turn pivotally mounted upon the shaft 42. Tension springs 128 and 129 secured to an extension 130 of the hanger 35 normally urge the trigger downwardly and to the left. The trigger normally rests upon a pin 131 secured to the hanger 35. The trigger 125 engages an insulation plate 132 secured to one of a pair of flexible contact members 133 in turn secured to an insulation block 134 mounted upon the hanger 35.

In the rotation of the gear 121 in the direction of the arrow, each of the pins 123 successively strikes the trigger and moves the same to the

right to the position shown in the drawings beneath the insulation member 132. Further rotation of the gear brings the pin 123 into contact with the curved lower end of the trigger and forces the trigger upwardly against the insulation plate 132. This upward movement causes the contact members 133 to be pressed together to complete an electric circuit which energizes the solenoid 60 for disengaging the clutch 51—52 and thus stops the upward movement of the magazine. The dimensions of the trigger are such that, before the magazine is stopped, the trigger slips past the pin 123 into the space immediately ahead of the next of said pins and is thus in position to again stop the magazine when engaged by the second of the pins 123. The pins 123 are so positioned upon the gear 121 that each of the same stops the magazine movement slightly above the proper level for the removal of one of the records from the magazine. As soon as the clutch is disengaged the magazine drops slightly until its movement is stopped by the engagement of a dog 135 with one of the teeth of a ratchet wheel 136 mounted upon the shaft 42 (see Fig. 13). The said ratchet wheel is so positioned upon the shaft that it accurately stops the magazine in proper position for the removal of each of the records. The use of the ratchet and dog obviates the necessity of an extremely accurate adjustment of the action of the contact members 133 and insures a very accurate positioning of the magazine.

Mechanism for selective control of magazine movement

When the operator desires to choose the record or records to be played, he presses one of a plurality of push buttons 137 which are mounted upon an insulation block 138 secured to the deck plate 20. There is one of said push buttons provided for each of the records in the magazine and each of said buttons may bear a number or label indicating its corresponding record.

As will be seen from Fig. 9, each of the buttons 137 is mounted on a stem 139 which extends through the insulation block 138. The inner end of each of said stems is provided with a slotted opening 140 which receives one end of a key 141. Each of the keys 141 is secured to its corresponding stem 139 by a pivot pin 142. Each of the pivot pins 142 is positioned to slide in a horizontal slot 143 formed in a stationary guide member 144 which prevents rotation of the stem and holds the key 141 in an upright position. The said guide members are secured to the inner surface of the insulation block 138. Each of the guide members 144 is provided with an upturned lip 145 at its inner end and each of said lips is adapted to engage a notch 146 in the lower edge of the corresponding key 141 when said key is moved by the operation of its push button 137. Each of the keys 141 is formed with a lug 147 on its upper edge which is adapted to engage an insulation plate 148 carried by one of a pair of flexible contact members 149. Said contact members are secured to the inner surface of the insulation block 138 and each pair operates when closed to energize the solenoid 60 for stopping the movement of the magazine.

Whenever one or more of the buttons 137 is pressed, the non-selective contacts 133 are rendered inoperative to stop the travel of the magazine by the following mechanism. A pair of vertical pivot rods 152 (Fig. 3) are supported on angle brackets 153 secured to the sides of the insulation block 138. These rods pivotally support a pair of vertical plates 151 each having a plurality of fingers 150 extending into the paths of travel of the pivot pins 142, each of which extends to the right or left a sufficient distance from its corresponding key to engage one of the fingers 150. Each of the plates 151 is normally in electrical contact with a contact member 154 mounted upon the insulation block 138 and said plates are continually in electrical contact with each other through a tension spring 156 adjacent their upper ends. Thus each of said pivot pins moves one of the plates 151 and breaks the electrical contact between said plates and its corresponding contact member 154 whenever one of the push buttons is pressed. These electrical contacts are connected in series with the contact members 133, as will be shown in more detail hereinafter. Thus they serve to render the contact members 133 inoperative to stop the travel of the magazine whenever selective operation is to be used.

Secured to the under side of the magazine 30 there is a bracket 157 upon which there is pivotally mounted, by means of a screw 158, a trigger 159, said trigger normally resting upon a pin 160 carried by the bracket 157. When one of the push buttons 137 is pressed, it moves the corresponding key 141 to the position illustrated by the second key from the top in Fig. 8, in which position it is latched by the corresponding lip 145. In this position the key 141 extends into the path of travel of the trigger 159. In the downward movement of the magazine the said trigger may strike the key, but, in so doing the trigger moves about its pivotal mounting and no further action results. In the upward movement of the magazine, however, when the trigger 159 strikes one of the keys 141 the trigger, resting upon its pin 160, causes the key to be elevated. The movement of the key raises the lowermost of the corresponding contactors 149 into engagement with the upper contactor and thus completes the circuit for stopping the magazine movement. At the same time, the key is released from the lip 145 and returns to its normal position under the action of a compression spring 161 positioned within a cavity in the insulation block 138 and pressing against the inner surface of the push button 137.

The keys 141 are so spaced that each stops the movement of the magazine slightly above the proper point for removal of one of the records. When stopped, the magazine returns by gravity to the proper transfer point, being accurately stopped at that point by the dog 135 and ratchet 136.

Whenever it is desired to cancel a selection, a lever 274 mounted on one edge of the insulation block 138 is pressed downwardly. The inner end of said lever is connected to a plate 275 mounted for limited vertical movement and carrying a plurality of fingers 276 each extending beneath one of the keys 141. Upward movement of said plate elevates any key which is in latched position and frees the same from its lip 145.

Coin control mechanism

The coin control mechanism illustrated herein is of a standard form adapted to receive a plurality of coins, to start the operation of the phonograph upon receipt of the first coin, and to continue said operation until a number of records have been played corresponding to the number of coins deposited. The coins are deposited one by one in a standard form of coin chute 162 shown diagrammatically in Fig. 12 and each coin mo-

mentarily closes a pair of electrical contact members 163. The closing of said contact members momentarily energizes a solenoid 164 located in a control box 165 which is shown in detail in Fig. 1. The said control box is preferably secured to the side of the machine as herein illustrated. Each momentary actuation of the solenoid 164 operates an escapement lever 166 which permits movement of a toothed wheel 167 through an angular distance corresponding to one of the teeth of said wheel. The said movement is caused by a torsion spring 168. The wheel 167 carries a pin 169 adapted to engage the end of a lever 170 formed of insulation material and carrying a contact block 171 on its outer end. When no coins have been deposited, the pin 169 is in engagement with the right hand end of the lever, holding the left hand end thereof in a raised position with the contact block 171 out of contact with its mating contact finger 172. The operation of the solenoid 164, upon deposition of the first coin, moves the pin 169 away from the lever 170 and permits a spring 173 to move the lever to bring the contact block 171 into engagement with the finger 172. An electric circuit is completed thereby which starts the operation of the phonograph.

For breaking the said circuit to stop the phonograph operation the following mechanism is provided. The cam 81 carries a pin 174 which strikes a stem 175 during the right hand movement of the record transfer mechanism. The stem 175 is guided in a guideway 176 and is pivotally connected to the upper end of a lever 177, the opposite end of which is connected to a link 178 mounted for sliding movement within the box 165 by means of a screw 179 passing through a slotted opening 180 therein. The link 178 is normally moved to the right by a tension spring 181. Each time a record is returned to the magazine the pin 174 strikes the stem 175 and causes a movement of the link 178 downward and to the left in Fig. 1. In said movement a tooth 182 on said link engages one of the teeth on the toothed wheel 167 and moves the same in the counterclockwise direction and through an angular distance equivalent to one of said teeth. By this means the playing of a number of records equivalent to the number of coins deposited returns the toothed wheel 167 to its original position in which the pin 169 engages the lever 170 and breaks the contact 171—172. At the time that the 171—172 contact is broken, a parallel contact 177 is held in closed position by a cam 178 carried upon the cam shaft 83. The operating circuit, therefore, is not broken until the last mentioned contact has been released by further movement of the record transfer mechanism. The release of the contact 177 occurs only when the record has been accurately positioned in the magazine. Thus the need for an accurate adjustment of the operation of the 171—172 contact is obviated.

Wiring diagram

In the wiring diagram, Fig. 12, power is supplied to the machine from any suitable source, preferably 110 volt alternating current, on a pair of power mains 183 which are connected to distributaries 181 and 182 by a main switch 183. Branches of the distributaries 181 and 182 are connected to the primary winding of a transformer 184. The secondary winding of said transformer has one terminal connected to one of the coin controlled contactors 163 and its opposite terminal connected to the solenoid 164 by conductors 185 and 186 respectively. Conductor 187 connects the second of the contactors 163 to the second terminal of the solenoid 164.

The distributary 181 is connected to the contact block 171 and to one of the contactors 177. The finger 172 and the second contactor 177 are connected to a distributary 188, branches of which lead to one of a pair of normally open contactors 189, to one of the contactors 154, to one of each pair of the contactors 149, to the motor 24 and to one of a pair of normally open pick-up controlled contactors 190. A conductor 191 connects the second of the contactors 154 to one of the contactors 133. A conductor 192 connects the second of each pair of the selective switches 149, the second contactor 133, the solenoid 60, the solenoid 92 and one of a pair of normally closed contactors 193. A conductor 194 connects the second of said last mentioned contactors to the second of the 190 contactors. A conductor 195 connects the second of the 189 contactors to the solenoid 60. The second terminal of each of the solenoids 60, 61 and 92 and of the motor 24 are connected to branches of the distributary 182.

Summary of operation

In the normal or inactive position of the machine, the magazine is at rest with the record last played at the transfer level, the transfer mechanism is at the end of its right hand movement (referring to Figs. 1 and 2) and is thus ready to remove a record from the magazine, the 171—172 contact and the 177 contacts are broken, the 193 contact is closed, the clutch 51—52 is engaged ready to start the elevation of the magazine when the motor is started, and the 84—85 clutch is disengaged to prevent movement of the transfer mechanism. The pick-up arm is elevated above the starting point on the turntable, the elevators 71 are in the raised position and no record is on the turntable. When the main switch 183 is closed the machine is ready for operation with the transformer 184 energized.

The deposition of a coin in the chute 162 momentarily closes the 163 contactors and completes the following circuit: 184, 185, 163, 187, 164, 186, 184. The solenoid 164 is momentarily energized thereby, permitting the 171—172 contact to be closed. The following circuit for starting the motor is then complete: 180, 183, 181, 171, 172, motor 24, 182, 183, 180. The operation of the motor rotates the turntable and starts the upward movement of the magazine.

If no record has been selected, the 154—151 contacts are closed and the magazine movement continues until the next lower record in the magazine is at the transfer level, whereupon one of the pins 123 operates the trigger 125 to close the 133 contact momentarily. The following circuit is completed thereby: 180, 183, 181, 171, 172, 188, 154, 150, 156, 150, 154, 191, 133, 192, solenoids 60 and 92, 182, 183, 180. By this circuit solenoid 60 is energized to disengage the 51—52 clutch to stop the magazine and solenoid 92 is simultaneously energized to start the record transfer mechanism by permitting engagement of the 84—85 clutch.

If one of the push buttons 137 has been pressed to select a record prior to the closure of the 133 contacts, one of the 154—150 contacts is opened and the above circuit is inoperative. In that case the upward travel of the magazine continues until the selected 149 contact is closed, whereupon the following circuit is completed: 180, 183, 181, 171, 172, 188, 149, 192, solenoids 60 and 92, 182, 183, 180. This circuit energizes solenoids 60 and 92 to

stop the magazine with the selected record at the transfer level and to start the transfer mechanism in the same manner as the parallel circuit in the preceding paragraph. If the selected record happens to be above the last played record in the magazine, the upward movement thereof continues until the upper limit is reached, whereupon the magazine drops to its lowermost position and the upward travel is resumed until the selected record is found.

After the energizing of solenoid 92 the cam shaft 83 rotates through its first half revolution and operates the transfer mechanism to move a record from the magazine, lower the same upon the turntable and lower the pick-up arm to the playing position. During the playing of the record the pick-up arm follows the record groove inwardly. In so doing, it tends to move an arm 196 in the same direction, said arm being frictionally mounted upon the vertical stem 108 upon which the pick-up arm is carried.

Since the pitch of the record grooves is very small, the arm 196 moves only a small fraction of an inch for one revolution of the turntable and the parts are so proportioned that this movement is not sufficient for the arm to strike the contact members 190. At each revolution of the turntable said arm is struck by a lug 197 mounted upon the hub 198 of the turntable and is moved outwardly, the frictional mounting of the arm permitting outward movement thereof without a corresponding outward movement of the pick-up arm. The arm 196 is thus prevented from moving inwardly an appreciable distance as long as the pick-up arm is following the record grooves with a relatively slow inward movement. When the playing of the record is complete the pick-up arm moves rapidly inward toward the center of the record following the terminal groove of the record which may be of either the common oscillating type or the equally well known spiral type. In this movement, the arm 196 also moves rapidly inward an appreciable distance in less than one revolution of the turntable. Since the lug 197 strikes said arm only once in each revolution it cannot prevent the arm from striking one of the contacts 190 and closing said contacts. The following circuit is completed thereby: 180, 183, 181, 171, 172, 188, 190, 194, 193, 192, solenoids 92 and 60, 182, 183, 180. Solenoid 92 is energized by said circuit and operates the 84—85 clutch to start the return movement of the transfer mechanism. Solenoid 60 is also energized but since the 51—52 clutch is already latched in disengaged position no action results. When shaft 90 is rocked following its release by solenoid 92, an arm 199 carried thereby opens the 193 contacts and thus kills the circuit. This prevents the solenoid 92 from "chattering" due to repeated operation thereof when the lug 197 strikes the arm 196 in the continued rotation of the turntable.

The operation of solenoid 92 permits the cam shaft 83 to make its second half revolution. In so doing, it elevates the pick-up arm from the record, raises the record from the turntable, returns the record to the magazine and returns the pick-up arm to initial position. During the operation of the cam shaft the pin 174 strikes the stem 175 and causes the 171—172 contact to be opened if no more coins have been deposited. Prior to the opening of said contact, cam 178 closes the 177 contact and the same is not released to stop the motor until the movement of the transfer mechanism is substantially complete.

Near the end of the return movement of the transfer mechanism, the oscillating arm 65 strikes a trigger 200 pivotally mounted on a lever 201 in such manner that it closes the 189 contacts. The following circuit is completed thereby: 180, 183, 181, 177, 188, 189, 195, solenoid 61, 182, 183, 180. This circuit energizes solenoid 61 to engage the 51—52 clutch for starting the movement of the magazine. If no more coins have been deposited the 177 contact is broken to stop the motor before an appreciable movement of the magazine takes place, and the machine comes to rest in its initial position ready to begin another cycle of operation when another coin is deposited. If another coin has been received prior to the breaking of the 177 contact the next cycle of operation follows immediately since the 171—172 contact will then be closed.

From the description of the selective mechanism and the operation of the machine it will be apparent that the push buttons 137 may be operated to select the next record to be played at any time in the cycle of operation without interfering in any way with the electric circuits or the mechanical operation of the machine. It is also immaterial whether or not another coin is deposited before or after the selection of the next record so long as the selection is made before the movement of the magazine operates the non-selective contact 133. Furthermore, any number of the buttons 137 may be operated at a given time to select the entire program for which coins have been or will be deposited. The machine then plays all of the selected records before returning to non-selective operation. It is also possible to change the selection at any time before or after the beginning of a program by operating the lever 274 and then pressing a different combination of the buttons 137 or permitting the machine to revert to non-selective operation.

The foregoing specification describes a preferred form of the invention, the details of which may obviously be varied through wide limits by those skilled in the art without departing from the scope of the invention as defined in the appended claims.

The invention claimed is:

1. In an automatic phonograph, the combination of a movable magazine adapted to contain a plurality of records, record transfer mechanism adapted to move a record from the magazine for playing, means for moving said magazine to bring the records successively into position to be moved by said transfer mechanism, electrical mechanism operable when energized to stop the movement of the magazine, a pair of parallel electric circuits for actuating said electrical mechanism, an electric switch in one of said circuits adapted to be closed in the movement of said magazine each time a record is in position for transfer by said transfer mechanism, a plurality of parallel connected electrical switches in the second of said circuits, selective means for conditioning each of said switches to be operated in the movement of said magazine when a corresponding record is in transfer position, and a switch in said first circuit opened by operation of said selective means and rendering said first circuit inoperative.

2. In an automatic phonograph, the combination of a playing turntable, a movable storage magazine adapted to contain a plurality of records, a motor, record transfer mechanism for moving a record from said magazine to said turntable for playing, a clutch connection between said mechanism and said motor, a solenoid arranged when actuated to operate said clutch con-

nection for operating said transfer mechanism, magazine moving mechanism adapted to bring the records successively in position to be engaged by said transfer mechanism, a second clutch connection between said motor and said magazine moving mechanism, a second solenoid adapted when actuated to disengage said second clutch to stop said magazine movement, an electric switch operable by movement of said magazine when one of said records is in transfer position, and electrical connections between said switch and said solenoids for actuating both of said solenoids when said switch is operated.

3. In an automatic phonograph, the combination of a vertically movable magazine adapted to contain a plurality of records, record transfer mechanism adapted to move a record from the magazine for playing, a motor, a driving connection for operatively connecting said motor and magazine to raise the same to bring the records successively into position to be moved by said transfer mechanism, and means operable adjacent the limit of the upward movement of said magazine for breaking said driving connection to permit the magazine to drop freely by gravity.

4. In an automatic phonograph, the combination of a movable record storage magazine, transfer mechanism adapted to move records therefrom for playing and to return said records thereto, a motor, a driving connection between said motor and said magazine for moving the same to bring the records therein successively into position to be transferred by said transfer mechanism, a solenoid adapted when momentarily actuated to move said driving connection to non-operative position, a latch for maintaining said connection in said position, a second solenoid adapted when momentarily actuated to trip said latch and permit return of said connection to operative position, means operable in the movement of said magazine when one of said records has reached transfer position to actuate said first mentioned solenoid, and means operable in the movement of said transfer mechanism when a record has been returned to the magazine for actuating said second mentioned solenoid.

5. In an automatic phonograph, the combination of a record storage magazine having a plurality of support members each adapted to support a record, a motor for moving said magazine to bring said support members successively to a transfer position, an oscillating arm adapted in its movement in one direction to remove a record from the support member at said transfer position, a disengageable driving connection between said motor and magazine, a solenoid adapted when energized to engage said driving connection to initiate movement of said magazine, and electric means engageable by said arm in its return movement and operating to energize said solenoid.

6. In an automatic phonograph, the combination of a vertically movable magazine adapted to contain a plurality of records, record transfer mechanism adapted to move a record from the magazine for playing, a motor, and a driving connection between said motor and said magazine operating to raise the magazine to bring the records successively into position to be moved by said transfer connection, said driving mechanism including a portion moving upward and downward in different paths and supporting the weight of the magazine to raise the same in its upward path but being freely movable by the weight of the magazine in its downward path, whereby the magazine may drop by gravity.

7. In an automatic phonograph, the combination of a vertically movable magazine adapted to contain a plurality of records, record transfer mechanism adapted to move a record from the magazine for playing, a motor, and a driving connection between said motor and said magazine operating to raise the magazine to bring the records successively into position to be moved by said transfer mechanism, said driving connection including a portion moving upward and downward in different paths and a clutch, said clutch positively driving said portion in its upward path to raise the magazine but permitting free movement thereof in the downward path whereby the magazine may drop by gravity.

THOMAS W. SMALL.