

**July 31, 1934.**

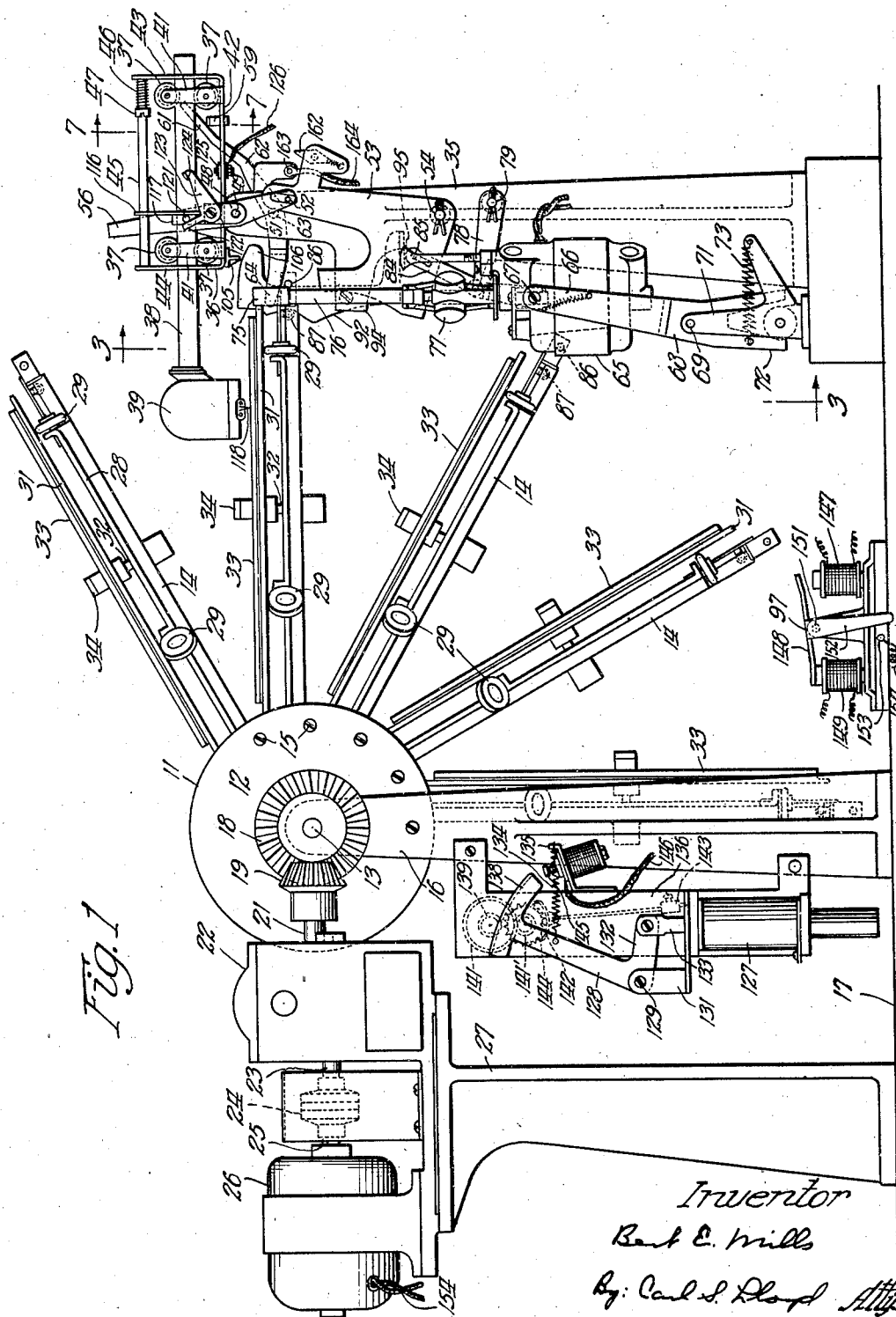
**B. E. MILLS**

**1,968,498**

AUTOMATIC PHONOGRAPH

Filed July 16, 1928

4 Sheets-Sheet 1



July 31, 1934.

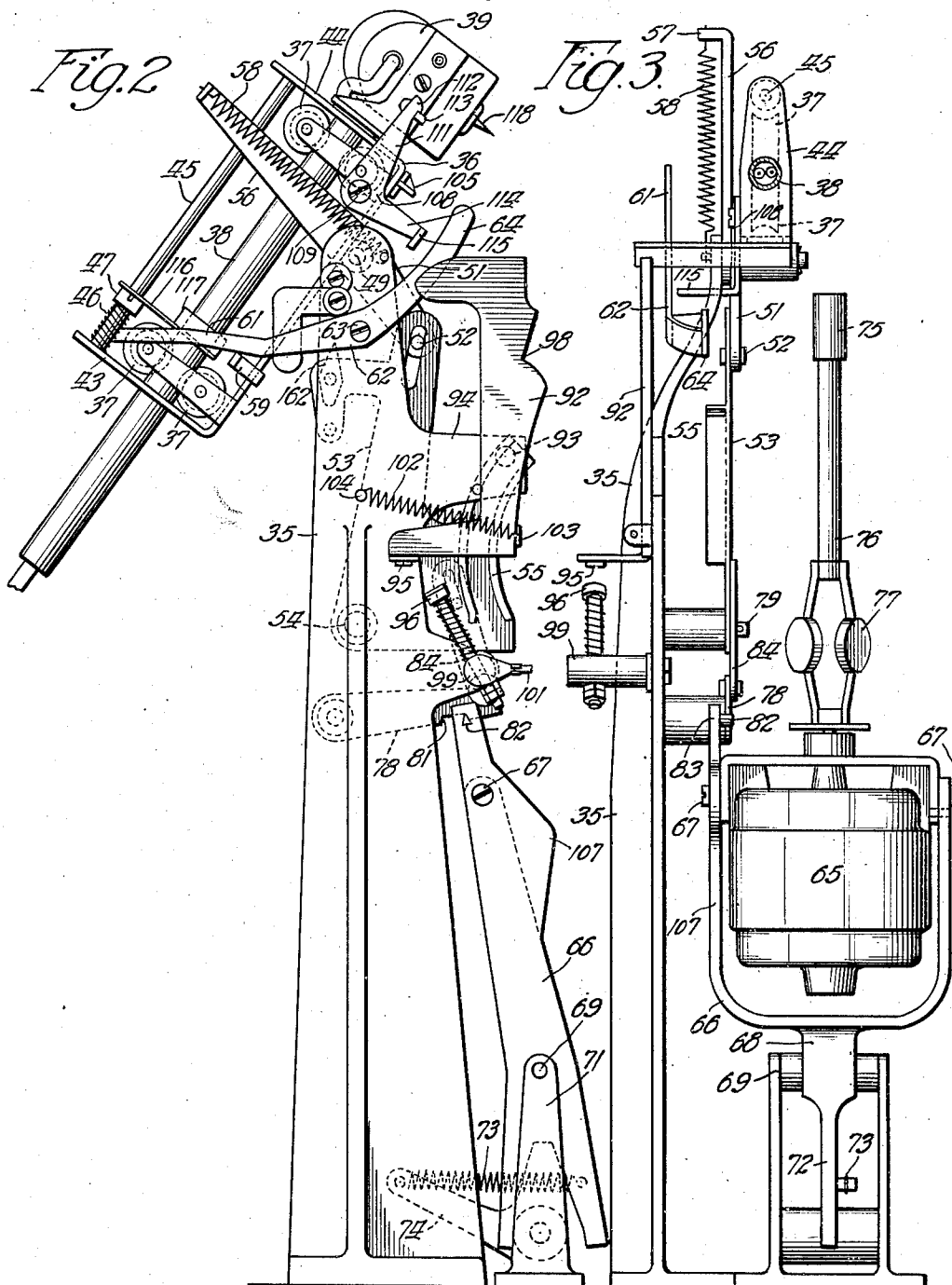
B. E. MILLS

1,968,498

AUTOMATIC PHONOGRAPH

Filed July 16, 1928

4 Sheets-Sheet 2



Inventor  
B. E. Mills  
By: Carl S. Floyd

July 31, 1934.

B. E. MILLS

1,968,498

AUTOMATIC PHONOGRAPH

Filed July 16, 1928

4 Sheets-Sheet 3

Fig. 4

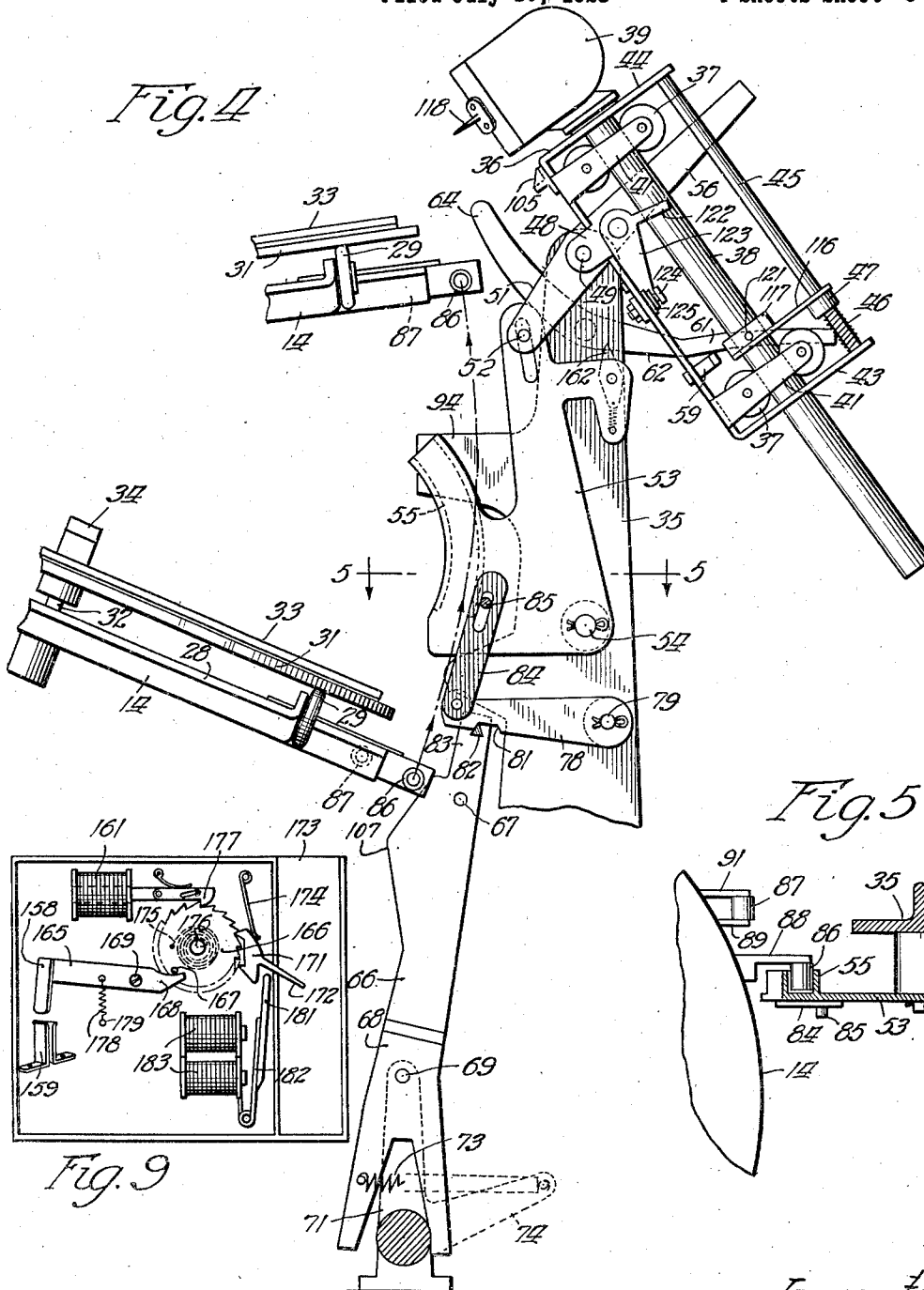


Fig. 5

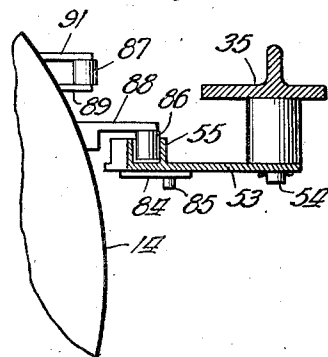
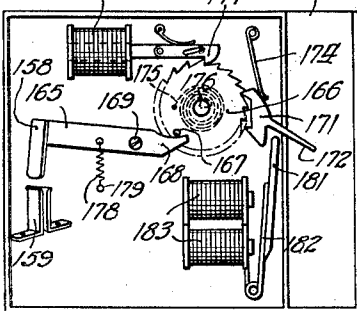


Fig. 9



Inventor  
Bert E. Mills  
By: Carl S. Lloyd Atty

July 31, 1934.

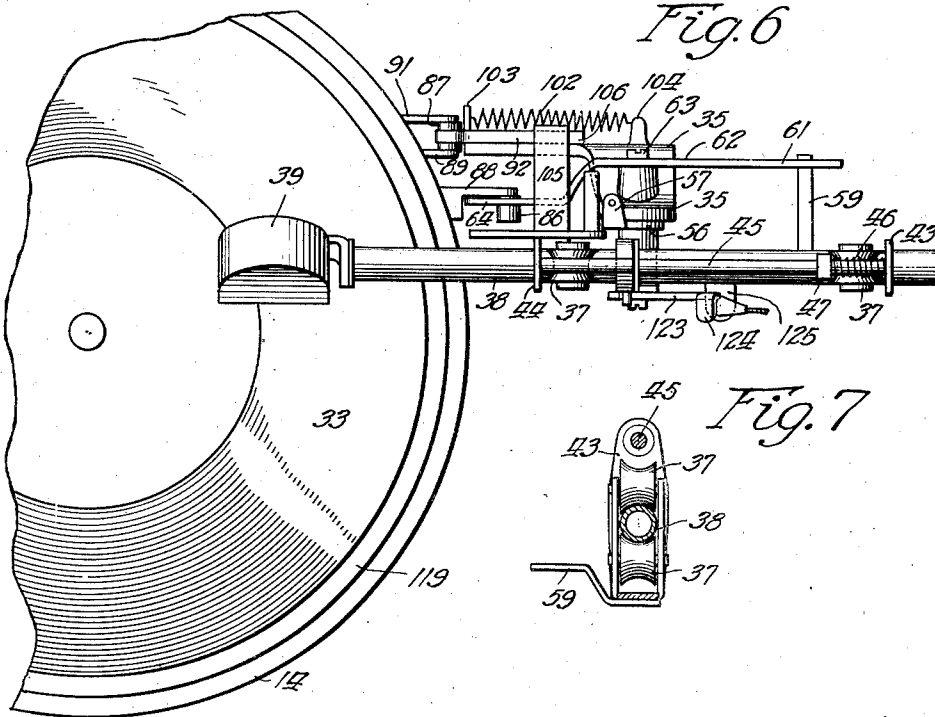
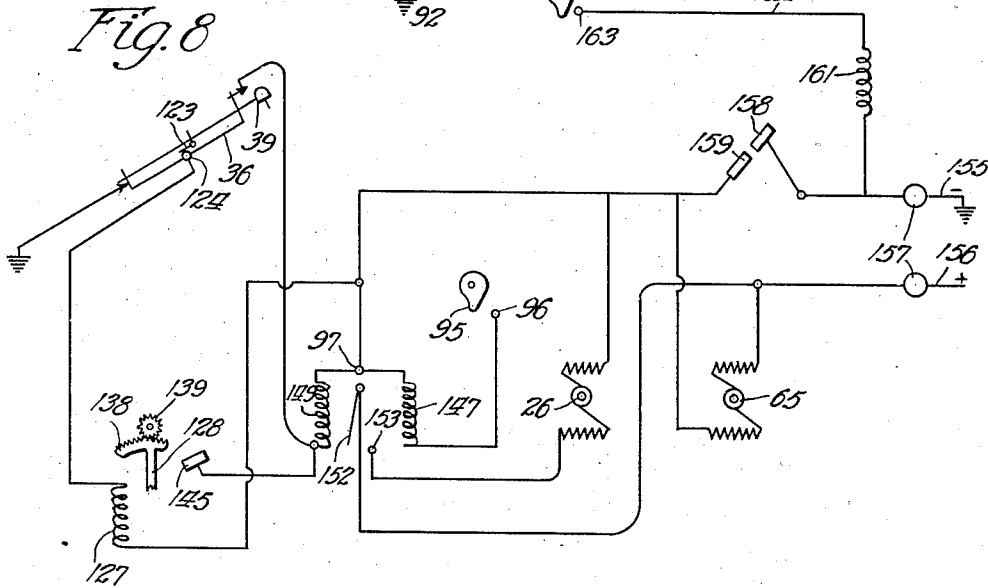
B. E. MILLS

1,968,498

AUTOMATIC PHONOGRAPH

Filed July 16, 1928

4 Sheets-Sheet 4



Inventor  
Bert E. Mills  
By: Carl S. Lloyd  
Att'y

## UNITED STATES PATENT OFFICE

1,968,498

## AUTOMATIC PHONOGRAPH

Bert E. Mills, Oak Park, Ill., assignor to Mills Novelty Company, Chicago, Ill., a corporation of Illinois

Application July 16, 1928, Serial No. 293,126

11 Claims. (Cl. 274—10)

This invention relates to automatic phonographs, and has for its object the provision of a machine of this character adapted for coin operation and so constructed that it may be economically manufactured and will be simple and sure in performance, requiring no other act than the insertion of a coin or a plurality of coins to produce the playing of a desired number of selections.

A further object of the invention is the provision of an automatic phonograph in which a plurality of records may be carried upon fixed supports, which are adapted to be successively moved to a playing station and in such movement to automatically control a tone arm assembly so that the latter is brought into and moved away from operative position by the movement of said record supports.

Another object of the invention is the provision of a machine of this character in which the record supports may be mounted radially upon a rotary member which is adapted to be intermittently rotated to successively present the records carried by the several holders at the playing station, the rotation of the record holder assembly controlling, through cam action, the position of the reproducer and the record rotating instrumentalities.

Numerous other objects and advantages of the invention will be apparent as it is better understood from the following description, which, taken in connection with the accompanying drawings, discloses a preferred embodiment thereof.

Referring to the drawings,

Figure 1 is a side elevation of a rotary record holder and associated driving and playing mechanism, certain of the record supports being omitted for convenience in illustration;

Fig. 2 is a side elevation of the reproducer unit and associated parts, being taken from the opposite side to that shown in Fig. 1;

Fig. 3 is an elevational view, taken substantially on the plane 3—3 in Fig. 4;

Fig. 4 is a broken elevational view of the parts shown in Fig. 2; being taken from the opposite side;

Fig. 5 is a horizontal sectional view, taken substantially on the plane 5—5 in Fig. 4;

Fig. 6 is a top plan view of the reproducer assembly;

Fig. 7 is a detail sectional view, taken substantially along the section line 7—7 in Fig. 1;

Fig. 8 is a wiring diagram, illustrating the control circuit and electrical instrumentalities employed in the machine; and

Fig. 9 is an elevational view of a multiple-coin control device employed in the circuit and adapted to control the operation of the machine so as to cause a number of records to be played corresponding to the number or value of the coins inserted, notwithstanding that a plurality of coins may be inserted at one time, or prior to the completion of the playing of records responsive to coins previously inserted.

Upon said drawings I have shown, for illustrative purposes only, and without intention to limit the scope of the invention to the specific embodiment selected for illustration, an automatic phonograph in which the record holder indicated by the reference character 11 comprises a hub part 12, carried upon a horizontal shaft 13 and having radially extending record holders 14 secured thereto in any suitable manner, as, for example, by means of screws 15, shaft 13 having bearings in uprights 16 arising from a bed plate or floor board 17. Said shaft 13 carries a bevel gear 18, meshing with a bevel pinion 19, carried upon a shaft 21 adapted to be driven through suitable reduction gearing (not shown) enclosed in a gear box 22, the drive to said gearing being through a shaft 23, a clutch 24, and the armature shaft 25 of a motor 26, the driving elements just described being supported upon a bracket 27 extending upwardly from the base plate, or floor board, 17 above-mentioned.

Each record support comprises a circular track member 28, having a plurality of rollers 29 spaced about the periphery thereof and supporting a rotatable disk 31, which is mounted upon a center shaft, or stud, 32 and adapted to carry a record 33, which may be of the usual form having a central aperture and adapted to be clamped in place by means of a screw 34.

Mounted adjacent the record holder unit just described there is an upright 35, to the upper end of which a reproducer assembly is pivotally secured, said assembly including a bracket 36, equipped with two pairs of rollers 37, between which a tone arm 38, carrying a reproducer, or sound box 39, is slidably carried. Said rollers 37 are mounted between lugs 41, arising from a base part 42 of the bracket 36, said bracket having end pieces 43 and 44 which are connected at the top by means of a rod 45, upon one end of which is mounted a light coil spring 46, bearing at one end against the bracket end piece 43 and at the opposite end against a slidable collar 47 mounted on said rod 45. The bracket 36 is provided at opposite sides with lugs 48, which are

pivoted at 49 to the upper end of the upright 35, and said bracket is also equipped with an arm 51, which has a pin and slot connection at 52 with a cam member 53, which is pivoted at 54 to the upright 35 and is provided on one side with a cam track 55 (see Figs. 2 and 3). An arm 56 extends upwardly from the bracket 36 and has an angular end part 57 connected by a spring 58 with the upper end of the upright 35, the upper end of said arm 56 being but slightly over the center, or pivot point, 49 of the tone arm assembly. The bracket 36 is provided with a cross-piece 59, adapted to be engaged by the tail 61 of a lever 62, which is pivoted at 63 to the upright 35 and has a free end 64 projecting forwardly of the bracket. The lever 62 serves to turn the tone arm assembly on the pivot 49 in direction to lift the producer or sound box from the record and the cam member 53, which is connected with the bracket arm 51, serves to turn said tone arm assembly in the opposite direction to bring the reproducer into horizontal position for engagement with the record, as will presently appear.

A driving motor 65 is carried in a yoke 66, to the arms of which it is pivoted at 67, the yoke being formed in a support 68, which is pivoted at 69 to a fixed bracket 71 and has a lower extension 72, which is connected by means of a spring 73 to an arm 74. It will be seen that said spring 73 tends to hold the motor in forward position with the driver 75 thereof in engagement with the record-supporting disk 31. The driver 75, as will be apparent, is formed upon the armature shaft 76 of the motor, which is also equipped with a governor 77. The motor and driver assembly is movable away from the record-supporting disk, in manner which will later appear, and is adapted to be held in the outward position by means of a latch 78, pivoted at 79 to the upright 35 and having a notch 81 adapted to receive a lug 82 on an extension 83 of one of the arms of the yoke 66, the outer end of the latch member 78 being connected by a link 84 with the cam member 53 with which it has a pin and slot connection at 85 (see Fig. 4).

Each record support 14 carries at the forward side thereof two rolls, indicated by the reference characters 86 and 87, which are clearly shown in Fig. 5, the roller 86 extending laterally from a projection 88 on said support 14 and the roller 87 being mounted between arms 89 and 91 projecting from said support 14 on the opposite side of the upright 35. The roller 86 is adapted to travel in the cam track 55 of the member 53, to move the tone arm assembly down into operative relation to the record as the latter is moved up to the playing station, and is also adapted to act upon the free end 64 of the lever 62 to raise said tone arm assembly to the tilted position shown in Figs. 2 and 4 after the completion of the playing of the record. This action will be clearly understood by reference to Fig. 4, in which the course of the roller 86 is indicated by the arrows and in which the parts of the machine are illustrated in their normal or inactive position. Upward movement of the lowermost support 14, shown in Fig. 4, will cause the roller 86 on said support to enter the cam track 55 of the member 53, turning the latter rearwardly on its pivot 54 and turning the tone arm assembly downwardly by reason of the pin and slot connection 49 between the member 53 and the arm 51 on the tone arm bracket.

A cam member 92 is pivoted at 93 to a forward

projection 94 on the upright 35 and is adapted to be acted upon by the roller 87 during the upward movement of the record support, said action causing said cam member to be turned upon its pivot, thereby establishing contact between members 95 and 96, the latter having a yieldable mounting in a laterally extending projection 99 on the upright 35 and being adapted to operate a relay switch 97, shown in Fig. 1, to cut off the record changer motor 26, thus stopping the rotation of the record holder, the roller 87 which actuates said cam 92 then settling into a depression 98 in said cam and holding the record support at the playing station, as shown in Fig. 2. Suitable electrical connections are provided between the contact 96 and said relay switch, as indicated at 101. The contact cam 92 is normally held in the position shown in Fig. 2 by means of a spring 102, connected at the forward end to a projection 103 on said cam and at the opposite end to a fixed point 104 on the frame.

The tone arm bracket 36 is provided with a laterally extending member 105, which is attached to the bottom of said bracket and is adapted when the bracket is in its horizontal position to be disposed directly above a tail part 106 at the top of the cam member 92. When the record carrier is rotated, the roller 86 on the horizontal support at the playing station acts upon the forward end 64 of the tilting lever 62, thus tilting the tone arm support and causing the tone arm and reproducer to drop by gravity to the position shown in Fig. 2, as previously explained, and at the same time the roller 86 on the next following record support, i. e., the one immediately below the support which is leaving the playing station, acts upon a cam 107 provided on one arm of the drive motor supporting yoke 66, thus moving the motor assembly on its pivot to the position shown in Figs. 2 and 4, in which position the locking pawl, or latch, 78 engages the projection 82 on the motor supporting yoke, the assembly being thus held in retracted position until said latch is disengaged upon the next actuation of the cam member 53, with which the latch is connected by means of the link 84.

Referring to Fig. 2, it will be noted that a latch 108 for holding the reproducer in retracted position is provided upon the tone arm bracket, said latch consisting of a bellcrank pivoted at 109 to the frame and having a forwardly extending arm 111, which is provided at its forward end with a hook 112, adapted to engage a lateral projection 113 on the side of the reproducer, the opposite arm 114 of the bellcrank having an angular end part 115, adapted to engage the upper end of the bracket 35 when the tone arm bracket 36 is brought to horizontal position, to thereby disengage the latch. When in such horizontal position, the latch having been disengaged, the reproducer is urged forwardly by means of the light spring 46, which acts upon the tone arm through the collar 47 and an arm 116, which is integral with a collar 117 fixed upon the tone arm 38, the movement of the tone arm and reproducer produced by this spring being sufficient to carry the needle 118 of the reproducer across the smooth area 119, at the edge of the record, the needle being then engaged by the grooves of the record and the reproducer drawn forwardly thereby.

The collar 117 on the tone arm carries a projection 121, which, at an intermediate position, is adapted to engage an arm 122 on a pivoted contact lever 123, which carries a contact ele-

ment 124, normally engaging a fixed contact element 125, which is connected by wiring 126 into a circuit including a magnet 127 (see Fig. 1) which normally holds a clock arm 128 in the position shown in Fig. 1, said arm being pivoted at 129 to a fixed bracket 131 and having an extension 132 connected by a link 133 with the core of said magnet 127, the breaking of the contact 124, 125, causing said magnet 127 to be deenergized, thereby releasing the clock arm 128, which is then moved to the right, viewing Fig. 1, by means of a spring 134, which is connected at one end to said arm 128 and at the other end to a contact support 135, attached to a bracket 136, which is secured to an upright 137, which supports the multiple-arm record holder, previously described.

The arm 128 is formed with a rack 138 at the upper end thereof, the teeth of which mesh with a pinion 139 forming a part of clock mechanism which includes gears 141, a pinion 141', a toothed escapement wheel 142, and a pendulum 143 which is pivotally mounted and formed with escapement teeth 144 at the upper end thereof, which teeth cooperate with the teeth of the escapement wheel 142, in known manner, to properly time the movement of the arm 128, which is urged toward the right, viewing Fig. 1, by means of the spring 134. A contact 145 is carried by the support 135 and is adapted to be engaged by the end of the rack 138 when the latter has been moved sufficiently to the right, this contact being connected by wiring 146 with a magnet 147 of the relay switch 97, to which reference has previously been made.

This relay switch consists of an armature 148, the opposite ends of which are associated respectively with the magnet 147 and with a magnet 149, which is suitably connected with the stop contact 96 (see Fig. 2), the armature 148 being pivoted at 151 and being adapted to actuate a switch arm 152, which has an off position, as shown in Fig. 1, and an on position, to which it is moved when the magnet 147 is energized, said arm in the on position being in engagement with a contact 153, which is connected with the motor 26 by wiring 154.

It will be apparent from the immediately preceding description that when the contact 145 is engaged by the rack 138, the magnet 147 is energized, thus operating the relay switch to establish contact between the switch arm 152 and the contact 153, thereby operating the record changer motor 26 and rotating the record holder to remove the completed record and bring a new one into position at the playing station, the motor being cut off through the stop contact 96 upon actuation of the cam 92 by the roller 87 on the new record support, as the latter comes to the playing station. By using a clock mechanism of this character, the record changer motor is actuated after a predetermined time which is sufficient to permit the playing of a record of maximum length, and this irrespective of the position of the reproducer, which, due to a defective record, may sometimes be prevented from advancing, as, for example, in case the needle should become engaged in a circular groove which may be cut in the surface of the record. Manifestly, if the record changer motor be actuated only when the reproducer has completely traversed the record, as is the case with certain prior constructions, the change might be prevented for an indefinite period of time in case the needle should fall into a circular groove, or for other reason the reproducer should fail to completely traverse the record.

Referring now to Fig. 8, the wiring of the instrument will be described. The negative and positive sides of the line are indicated, respectively, by the reference characters 155 and 156, in which there is a fuse 157 and line contacts 158 and 159. Said line contacts may be located in a coin box, as illustrated in Fig. 9, from which it will be apparent that the contact is made upon the insertion of a coin, and if successive coins be inserted before the completion of the playing of the first piece, the contacts will not be broken until after a number of pieces have been played corresponding to the number of coins inserted. A cut-off magnet is also provided in the coin box and is adapted to be momentarily energized, upon the completion of the playing of a piece, by means of a cut-off contact 162, located at a suitable point in the circuit and adapted to be actuated upon each actuation of the cam member 53, by which said contact 162 is carried (see Figs. 1 and 4), the contact 162 being adapted to engage a fixed contact 163, which is connected by wiring 164 with the magnet 161.

As will appear from the description which will presently be given of the multiple-coin device illustrated in Fig. 9, each actuation of the contact 162 merely moves the control, or stop member, one step towards circuit-breaking position, and the line contacts 158, 159 are not disengaged until the stop member has been moved a number of steps corresponding to the number of coins inserted. The phonograph drive motor 65, it will be noted, is connected in the line for constant operation so long as the main circuit is unbroken, and the record-changer motor 26 is adapted to be periodically operated by means of the relay switch 97, the arm 152 of which is adapted to be moved to and from the on position by means of the magnets 149 and 147, the former being controlled by the contact 145 and the latter by the stop contacts 95, 96. The time clock magnet 127 is illustrated at the left of this figure, and the timing mechanism is also diagrammatically shown. The parts of the reproducer assembly, as shown in this figure, will be readily identified by the reference characters, the construction having been previously described.

Referring now to Fig. 9, the switch 158, 159 is illustrated in conjunction with a switch lever 165, carrying the contact 158, which lever is adapted to be controlled by a step member 166, which carries a pin 167 adapted in the normal position of said member to engage a tail part 168 of the lever 165, which is pivoted at 169, thus holding said lever in position with the contact 158 out of engagement with the contact 159. An escapement member 171 is pivotally mounted adjacent the member 166 and has an arm 172 extending into a coin slot 173, the upper tooth of the escapement member being normally held in engagement with the member 166 by means of a leaf spring 174. The member 166 is connected by means of a spring 175 with a shaft 176, upon which it is mounted, and is adapted to be rotated one step upon each actuation of the escapement member 171, as will be readily understood. It will thus be moved one step away from the circuit-breaking position for each coin inserted.

The magnet 161 is adapted to actuate a retracting pawl 177 upon each actuation of the contact 162 to thereby return the member 166 one step towards normal position, and when finally the normal position is reached, the pin 167 on said member 166 engages the tail part

168 of the switch lever 165, thus breaking the contact at 158, 159.

A spring 178 is connected at one end with the switch lever 165 and at the other end to a fixed point, at 179, and tends to close the contacts 158, 159. The escapement member 171 may be controlled, if desired, from a remote point by means of an actuator 181, carried by an armature 182, which is adapted to be actuated by magnets 183, which may be energized by coin-actuated contacts (not shown) at remote points, in known manner.

Although the operation has been indicated in the foregoing description, it will now be briefly described.

Assuming the parts to be in the position shown in Fig. 4, if a coin be inserted in the coin slot 173 (shown in Fig. 9), the motors 26 and 65 will be operated, due to the closing of the circuit at 158 and 159, and the record support 14, shown at the bottom in Fig. 4, will be moved up to the playing position, acting upon the cam member 53, during its movement to such position, to thereby lower the reproducer assembly to horizontal position. At the same time, the cam member 92 will be actuated by the roller 87, thereby making the stop contact at 95, 96 and cutting off the motor 26. There is sufficient play between the gears 19 and 18 to permit the record support to settle with the roller 87 in the recess 98 in the cam member 92 after the motor 26 is stopped. With the parts in playing position, the reproducer 39 is projected across the smooth band 119 at the edge of the record by means of the spring 46, and when the needle engages the groove of the record, said reproducer is drawn forwardly until the grooved surface of the record is completely traversed.

It will be understood that, upon lowering of the reproducer assembly, the latch member 108 is actuated to release the reproducer and permit it to advance. It is held down by means of the spring 58, which, as will be noted, is but slightly forward of the pivot point of the reproducer assembly, so that while it holds the reproducer assembly in proper position, it does not exert undue pressure upon the reproducer as the latter approaches the end of the piece.

When the reproducer is in the mid-position, the contact member 123 is actuated by engagement of the pin 121, on the collar 117 carried by the reproducer arm or shaft 38, with the arm 122 of said contact member, thus breaking the contact 124, 125 and deenergizing the clock magnet 127. The clock mechanism then starts operating and continues until the end of the rack 138 engages the contact 145, at which time the relay switch 97 is operated to cut in the record-changer motor 26, which starts the rotary record holder in motion, with the result that the driver 75 is moved away from the record supporting disk by the actuation of the roller 86 of the lower record support upon the cam 107 on the driver motor support, the reproducer assembly being tilted at the same time by the action of the roller 86 of the upper record support (viewing Fig. 4) upon the outer end 64 of the tilting lever 62. This action draws the cam member 53 inwardly from the position shown in Fig. 1 to that shown in Fig. 4, with the result that the contact member 162 engages the contact 163, thereby returning the stop member 166 of the coin control mechanism one step towards circuit-breaking position. This, however, does not stop the machine if additional coins have been inserted, as the stop member 166

will not then be returned sufficiently to cause the pin 167 to engage the switch lever 165. The record holder will therefore continue to rotate under such conditions, bringing in the records to the playing station in number corresponding to the number of coins deposited. If only one coin has been inserted, or, in any event, when a number of pieces corresponding to the number of coins inserted have been played, the actuation of the contact 162 results in the line switch being opened by the pin 167 on the stop member 166, thus stopping the machine with the parts in the position shown in Fig. 4.

It is thought that the invention and many of its attendant advantages will be understood from the foregoing description, and it will be apparent that various changes may be made in the form, construction, and arrangement of the parts without departing from the spirit and scope of the invention, or sacrificing all of its material advantages, the form hereinbefore described being merely a preferred embodiment thereof.

I claim:

1. An automatic, multiple-record phonograph comprising a rotatable record carrier including a plurality of record supports, a tiltably mounted record drive mechanism mounted adjacent said carrier and automatically movable into and out of operative relation to the record supports as the latter are presented to and removed from a playing station, a tiltably mounted reproducer assembly automatically movable into and out of operative relation to the records at predetermined stages in the operation of the machine, and means movable with the carrier for moving said record drive mechanism and said reproducer assembly to and from operative position.

2. An automatic, multiple-record phonograph comprising a record carrier rotatably mounted on a horizontal axis including a plurality of record supports, a record drive mechanism mounted adjacent said carrier and automatically movable into and out of operative relation to the record supports as the latter are presented to and removed from a playing station, a tiltably mounted reproducer assembly mounted outside the path of rotation of the outer ends of said record supports and automatically movable into and out of operative relation to the records at predetermined stages in the operation of the machine, and means movable with the carrier for moving said reproducer assembly to and from operative position.

3. An automatic, multiple-record phonograph comprising a record carrier, including record supports radially disposed from a common center, a reproducer assembly mounted adjacent said carrier, means for rotating said carrier, a pivotally mounted record driving mechanism including a motor, cam elements operated through rotation of said carrier for moving said reproducer assembly into and away from playing position, and cam elements also operated through rotation of said carrier for moving said driving mechanism into and out of operative position.

4. An automatic, multiple-record phonograph comprising a record carrier rotatably mounted on a horizontal axis, including record supports radially disposed from a common center, a reproducer assembly mounted adjacent said carrier outside the path of rotation of the outer ends of said record supports, means for rotating said carrier, cam elements operated through rotation of said carrier for moving said reproducer assembly into and away from playing position,



and means operable by the carrier for stopping the action of said carrier rotating means as a record support arrives at the playing station.

5. An automatic, multiple-record phonograph comprising a record carrier, including record supports radially disposed from a common center, a reproducer assembly mounted adjacent said carrier, means for rotating said carrier, a pivotally mounted record driving mechanism, and cam elements operated through rotation of said carrier for moving said driving mechanism into and out of operative position.

6. An automatic multiple record phonograph comprising, a rotatable record carrier including a plurality of record supports mounted in spaced relation on the carrier, a motor for intermittently rotating said carrier to move the records to and from a playing station, a tiltably supported record drive motor mounted adjacent said carrier and automatically movable into and out of operative relation to the records as the latter are presented to and removed from the playing station, a tiltably mounted reproducer assembly automatically movable into and out of operative relation to the records at predetermined stages in the operation of the machine, and means supported on and rotatable with the carrier for moving said reproducer assembly and record drive motor to and from operative position.

7. An automatic, multiple-record phonograph comprising a record carrier rotatably mounted on a horizontal axis provided with a plurality of record supports, a reproducer assembly mounted adjacent said carrier outside the path of rotation of the outer ends of said record supports, means for rotating said carrier, and cam elements operated through rotation of said carrier for moving said reproducer assembly into and away from playing position.

8. An automatic, multiple-record phonograph comprising a record carrier provided with a plurality of record supports, a reproducer assembly mounted adjacent said carrier, means for rotating said carrier, and means supported on the carrier at the outer ends of said record supports for moving said reproducer assembly into and away from playing position.

9. An automatic, multiple-record phonograph

comprising a record carrier including record supports, a reproducer assembly mounted adjacent said carrier, means for rotating said carrier, a pivotally-mounted record driving mechanism, and cam elements operated through rotation of said carrier for moving said driving mechanism into and out of operative position.

10. An automatic, multiple-record phonograph comprising a rotatable record carrier including a plurality of record supports radially mounted on a common center, a record drive mechanism mounted adjacent said carrier and automatically movable into and out of operative relation to the record supports as the latter are presented to and removed from a playing station, a tiltably mounted reproducer assembly automatically movable into and out of operative relation to the records at predetermined stages in the operation of the machine, said reproducer assembly including a frame part, a pick-up element, a member carrying said element and movable relative to said frame part, and spring means acting on said reproducer assembly slightly forwardly of the pivot point thereof to hold said reproducer in contact with the record with decreasing force upon the pick-up element as it approaches the end of the record.

11. An automatic, multiple-record phonograph comprising a record carrier, a reproducer assembly mounted adjacent said carrier and automatically movable to and from operative position, a motor for moving said carrier to change records at a playing station, and a timing mechanism for controlling the record changing movement of said carrier, said timing mechanism comprising a clock arm, a magnet for holding said arm stationary during the playing of the first part of a record, a circuit breaker automatically operable at a predetermined stage in the playing of a record, escapement mechanism for controlling the advance of said arm after the latter is released by said magnet, a motor switch and contact elements adapted to be engaged after predetermined advance of said arm to operate said switch and thereby energize the motor to effect a record change.

BERT E. MILLS.

50	125
55	130
60	135
65	140
70	145
75	150