Jan. 26, 1943. F. D. LEWIS 2,309,197

AUTOMATIC PHONOGRAPH

Filed Sept. 20, 1939 5 Sheets-Sheet 1

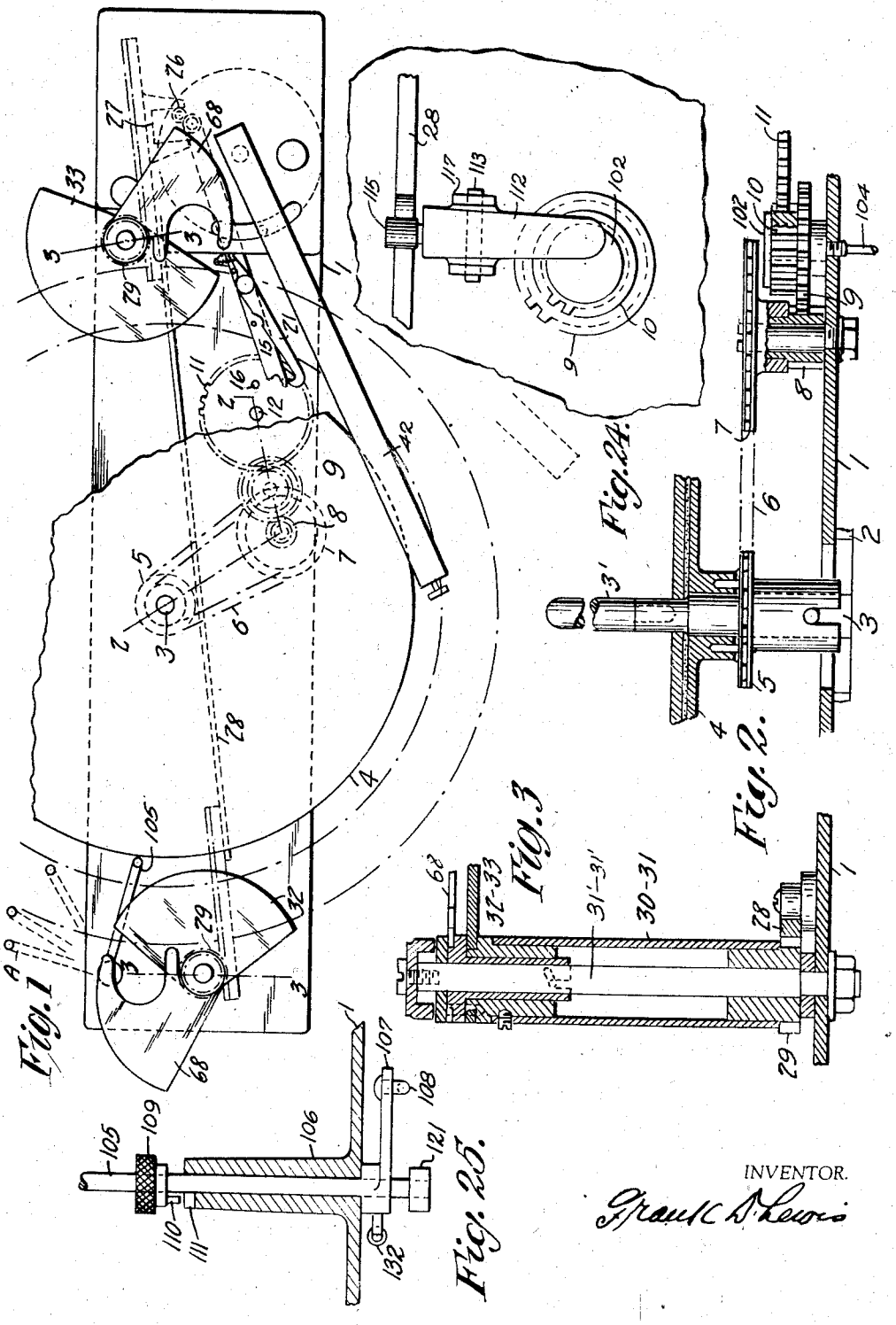


Fig. 1

Fig. 2A

Fig. 2.

Fig. 3

Fig. 2B

INVENTOR.

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AUTOMATIC PHONOGRAPH

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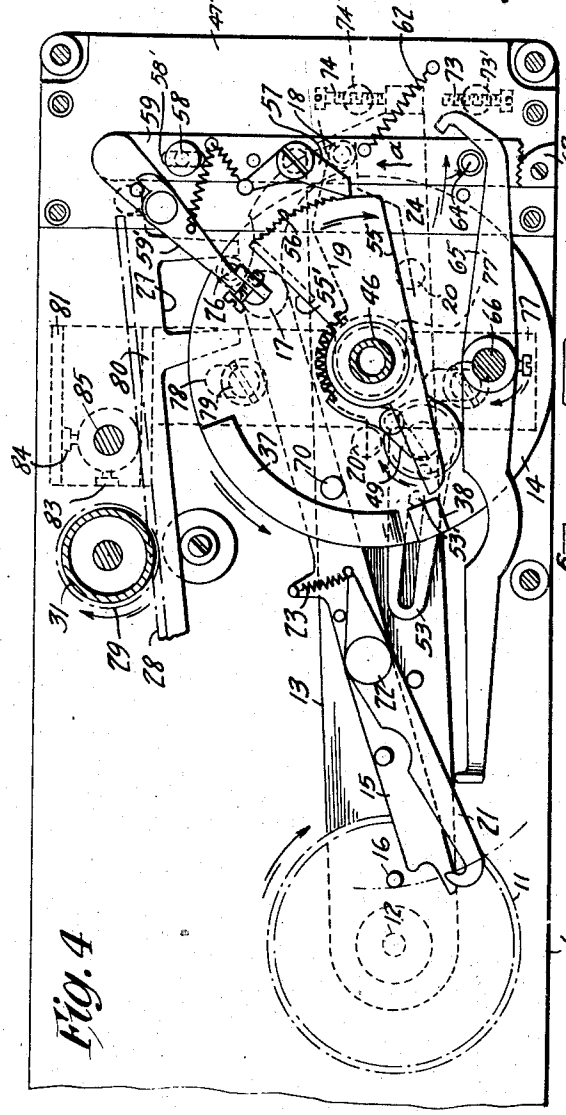


Fig. 4

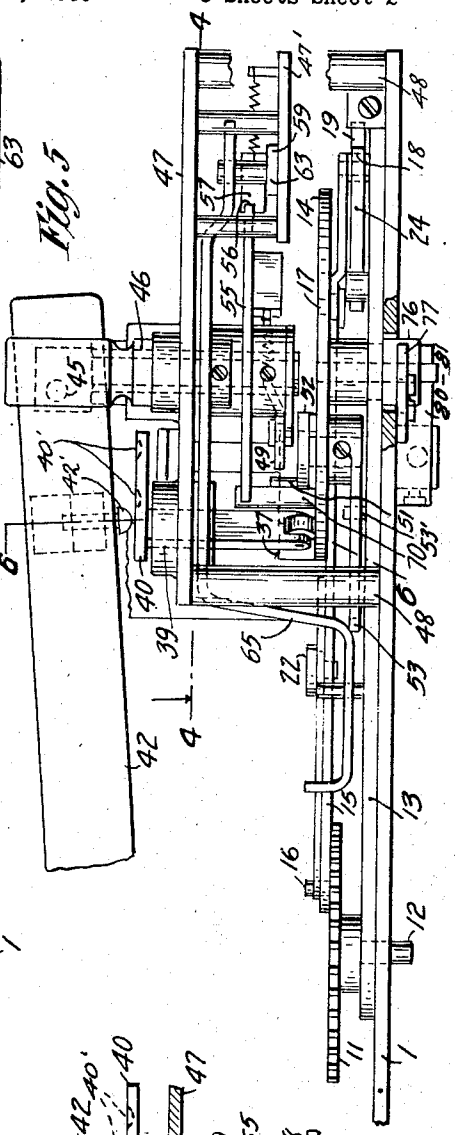


Fig. 5

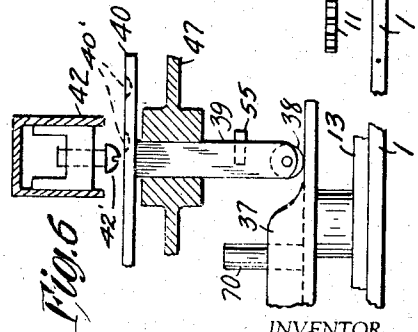


Fig. 6

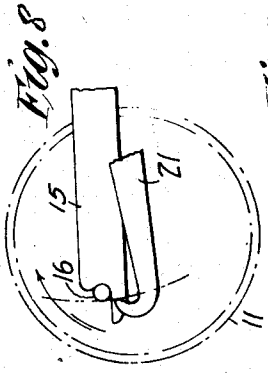


Fig. 8

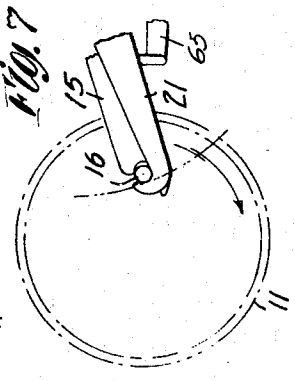


Fig. 7

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AUTOMATIC PHONOGRAPH

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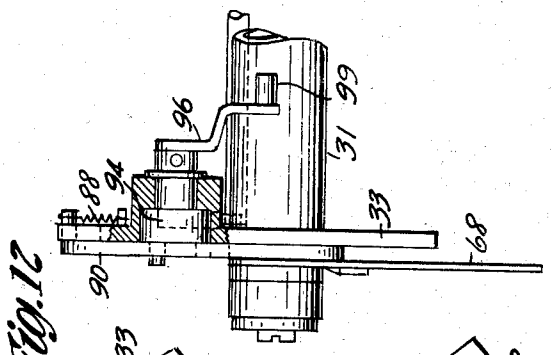


Fig. 12

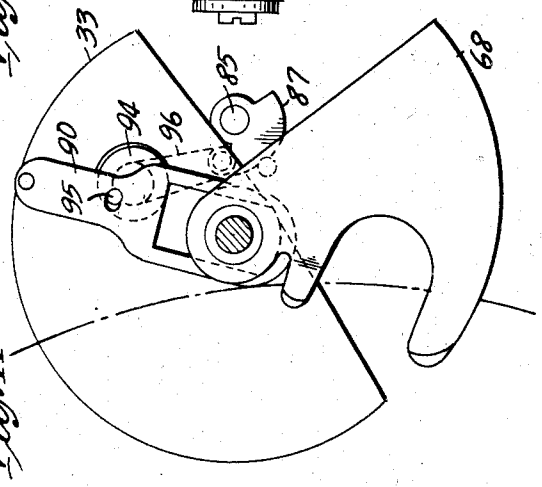


Fig. 11

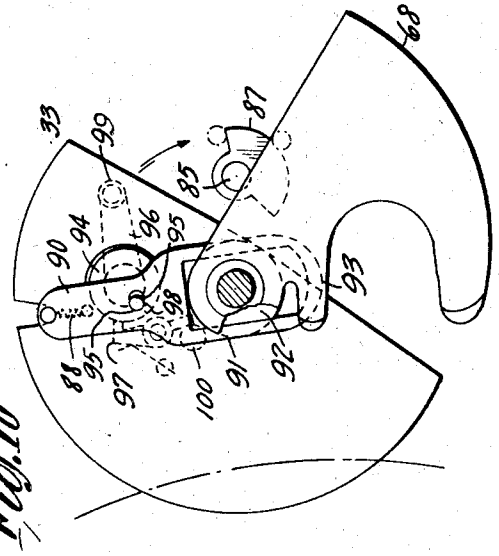


Fig. 10

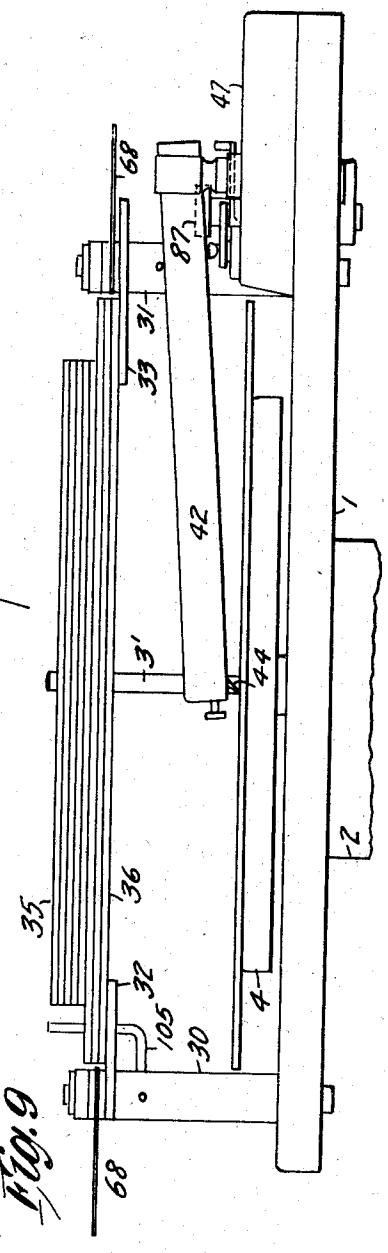


Fig. 9

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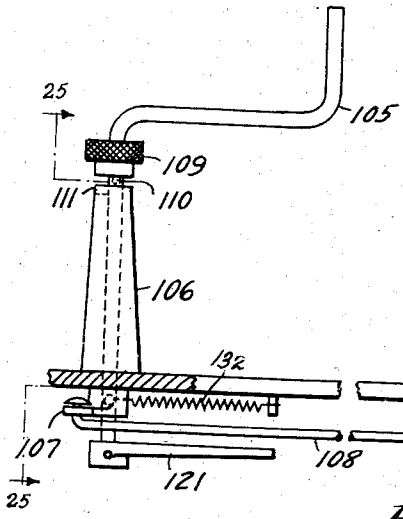


Fig. 13

Fig. 16

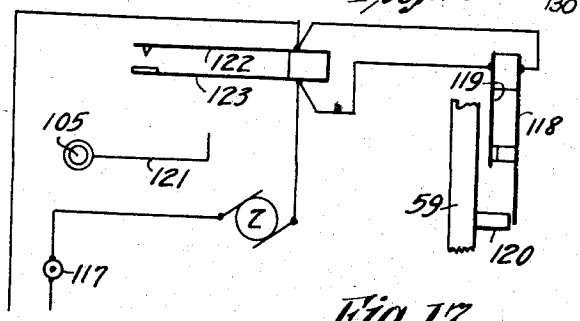


Fig. 14

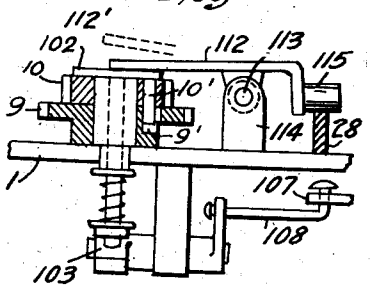


Fig. 17

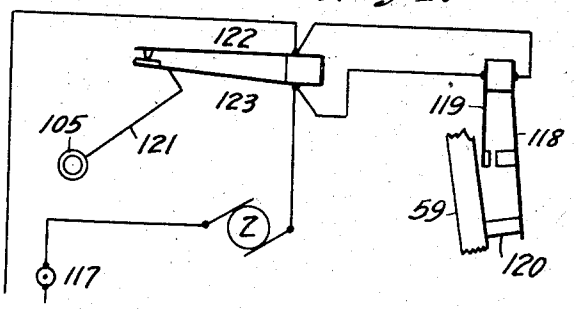
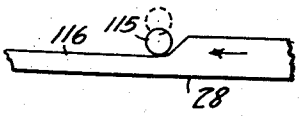


Fig. 15



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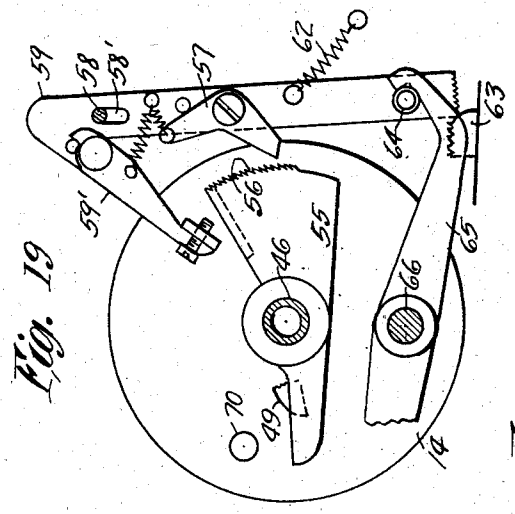


Fig. 19

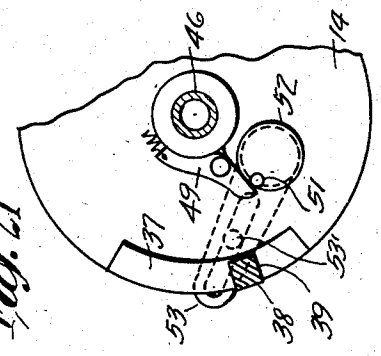


Fig. 21

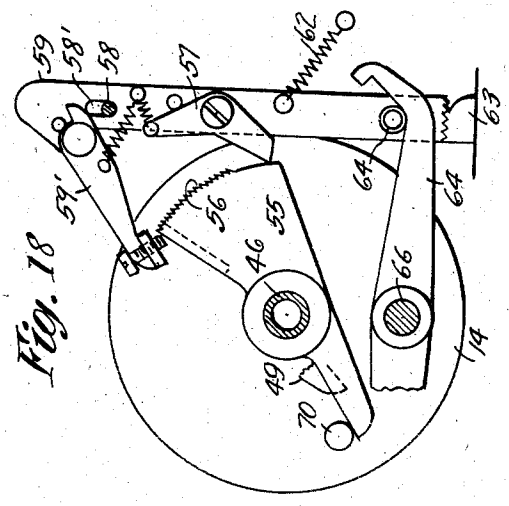


Fig. 18

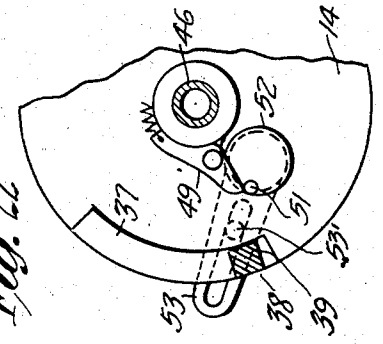


Fig. 22

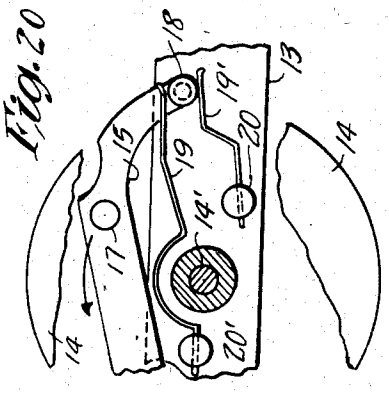


Fig. 20

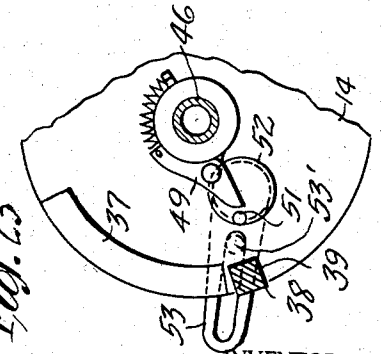


Fig. 23

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Patented Jan. 26, 1943 2,309,197

UNITED STATES PATENT OFFICE

2,309,197

AUTOMATIC PHONOGRAPH

Frank D. Lewis, West Orange, N. J.

Application September 20, 1939, Serial No. 295,813

2 Claims. (Cl. 274—10)

This invention relates to phonographs, and more particularly to an automatic phonograph in which a plurality of different diameter records are placed in a magazine and are fed to the turntable to be played one at a time.

Another object of my invention is to provide a phonograph that is always ready to play single records without a previous manual setting to cut out mechanism used for automatic operation.

Another object of my invention is to use the records themselves for setting the machine to perform many operations heretofore performed manually.

Another object of my invention is to provide a suitable automatic phonograph for home use that can be manufactured at low cost.

Referring to the accompanying drawings:

Fig. 1 is a plan view showing the parts in starting position on a small record.

Fig. 2 is a section on line 2—2 of Fig. 1 showing the driving and only continuously rotating members.

Fig. 3 is a section on line 3—3 of Fig. 1 showing the construction of the record supporting members that forms a magazine.

Fig. 4 is a view, partly in section, taken on line 4—4 of Fig. 5 showing the driving and driven mechanism.

Fig. 5 is an elevation, partly in section, of one end of the phonograph.

Fig. 6 is a section on line 6—6 of Fig. 5 showing principal parts for elevating and guiding the tone arm.

Figs. 7 and 8 show a portion of the mechanism in operating positions.

Fig. 9 is an elevation showing particularly the arrangement of the records in the magazine.

Fig. 10 is a plan view of the record support for controlling the position of the tone arm at the start of playing in its neutral position and for playing records of small diameter.

Fig. 11 is the same as the above except in position to locate tone arm at the start of playing a larger record.

Fig. 12 is an end elevation, partly in section, of Figs. 10 and 11.

Fig. 13 is a detail showing the clutch mechanism.

Fig. 14 is a similar view on line 14—14 of Fig. 13.

Fig. 15 is a detail of the clutch mechanism.

Figs. 16 and 17 are wiring diagrams of the circuit for stopping the motor at the end of the last record.

Figs. 18 and 19 show details of trip mechanism.

Fig. 20 is a detail of the connecting rod guide.

Figs. 21, 22 and 23 show a sequence of operations of the actuating mechanism.

Fig. 24 is a plan view of the clutch mechanism.

In the drawings, 1 is a base plate to which all the parts are secured as well as the motor 2 that has a shaft 3 made in two parts projecting upward through said plate to which is secured a turntable 4. Also secured to the shaft is a sprocket 5 that drives a chain 6 that engages a sprocket 7.

Secured to the hub of sprocket 7 is a pinion 8 engaged with a gear 9, all of which run continuously with the motor.

I will endeavour to simplify the description, eliminating the clutch now, as this part can be eliminated if desired.

Rotating with gear 9 is a pinion 10 that drives a gear 11 that rotates continuously when said gear and pinion are locked together. The gear 11 has a stud 12 secured thereto that is journaled in the base plate 1. Movable about the stud 12 is a supporting plate 13 that carries all the driving mechanism which comprises a cam disc 14 having a shaft secured thereto and journaled in said plate. This cam disc 14 rotates after the completion of one record and before the start of another and is stationary during the playing of a record. Forming part of the cam disc 14 at its periphery is a cam 37 that engages a roller 38 journaled in a reciprocating member 39 that has a horizontal track 40 secured thereto. Also secured to and projecting upwardly from the disc is a projection 70 that engages an arm 55 that is secured to a shaft 46 that is rotatably mounted in a top plate 47. Pivotally mounted on the cam disc 14 is a member 52 having a projection 51 that engages an arm 49 also secured to the shaft 46. Secured to the lower end of the member 52 is a slotted arm 53 that engages a pin 53' secured to the supporting base plate 13. Pivotally mounted on a stud 17 under the cam disc 14 is a connecting rod 15, the forward end of which has an arm 21 hinged thereto by a stud 22 and normally held apart by a spring 23. The rear end of the rod 15 is provided with roller 18 that engages a flat yielding spring 19' that holds the rod in its normal position as shown in Fig. 4. Opposite the spring 19' is a similar yielding spring 19 that engages the roller 18 when the rod 15 is travelling with the gear 11 and engages the pin 16.

Projecting downwardly from the cam disc 14 is a stud 26 that engages a yoke 27 of a movable

rack 28 as shown in Fig. 1 that meshes with pinion 29 secured to uprights 30 and 31 which form part of a magazine. The uprights are provided with projections 32—33 for supporting a stack of records 35 and with separators 68 that separates and supports the stack from the record that is being discharged. These uprights are rotatable about studs 30' and 31' secured in the base plate 1 as shown in Fig. 3.

Depending from the top plate 47 is a plate 47' on which is located a tripping mechanism which is shown in Figs. 4, 5, 18 and 19 which comprises an arm 59 pivoted about a stud 58. The arm 59 has a slot 58' permitting free movement about the stud 58. Projecting at an angle from the rear of the arm 59 and pivoted thereto is a yielding arm 59' that normally is held under tension in the position shown in Figs. 4 and 18. The end of the arm 59 is serrated and engages with a serrated locking member 63 secured to the plate 47'. Pivoted on the arm 59 is a pawl 57 that engages a ratchet segment 56 on the periphery of the arm 55. A spring 62 fastened at one end to the arm 59 and at the other end to the plate 47' tends to give a radial and longitudinal pull on the arm holding it in engagement with member 63 and throwing it outward when it is freed therefrom. Also on the arm 59 is a projection 64 for engaging a trip arm 65 the operation of which will be described later.

Secured to the upper end of the shaft 46 is a tone arm 42 having the usual magnetic unit therein for transmitting sound recordings to an amplifier in which is secured a needle 44 that engages the record on the turntable. To permit vertical movement to the tone arm a horizontal pin 45 is provided. An adjustable support 42', forming part of the tone arm 42, engages the horizontal track 40 only when the arm is being brought into playing position. I also provide two cup shaped notches 40' on the track 40 for gauging the position of the arm relative to the starting line on the various size records.

To play the different diameter records the tone arm is controlled so that the needle 44 is located in the first groove in the record about to be played. I accomplish this automatically by shifting the base plate 13 having the driving mechanism thereon between adjusting screws 73 and 74 in the projections 73' and 74' on the base 1 about the axis of the tone arm 42 by means of a movable carriage 77 located below the base 1. The carriage 77 has a fork 77' that fits snugly about a hub 76 on the base plate 13, a yoke having prongs 80 and 81 that surrounds a collar having adjustable projections 83 and 84 the former to engage 81 to move the carriage outward and into locked position and the latter to engage 80 to move the carriage inward, depending upon the direction of rotation of a shaft 85 journaled in the base plate 1. The carriage 77 is supported in the base 1 by screws 79 passing through slots 78 in said carriage as shown in Fig. 4. Secured to the upper end of the shaft 85 is a knob 87 shown in Figs. 10 and 11 that will be engaged on either side, when the magazine is rotated by a roller 99 on an arm 96 secured to a member 94 that is journaled in the projection 33 of the upright 31. Projecting upward from the member 94 is a pin 95 connected to a slotted sliding member 90 that is guided about a hub 92 on the separator 68 and between the support 33 and separator 68 and held under tension by a spring 88 in the path of a large diameter record as shown in Fig. 10. Automatic means is provided to eliminate the operation of the record discharge mechanism and permit the manual operation of the phonograph. Gear 9 rotates on the hollow stationary stud 104'. This gear 9 has one or more apertures 9' opposite a pin 101 secured to a disc 102 that forms a part of vertically movable rod 104 journaled in the stud 104'. The pin 101 is held in position but is freely movable with the disc 102 in the pinion 10 that drives the gear 11. To operate this clutch a control arm 105 movable in a bearing 106 secured to the base 1 is normally held in the position shown in Fig. 1 that is, in the path of any records stacked on the supports 32 and 33 of the magazine by means of a spring 132 fastened at one end to an arm 107 as shown in Figs. 13 and 25 that is secured to the control arm and at the other end to the base 1. The control arm 105 is connected to the clutch by a connecting rod 108 between the arm 107 and a bell crank 103 secured to a jack shaft 130 movable in a bearing 131 depending from the base 1, one end of the bell crank engaging the rod 104 that is provided with a spring 133 for keeping it in contact with said bell crank.

When one or more records are placed on the record supports 32 and 33 of the magazine, the control arm 105 contacting the edge of said records is forced outwards as indicated by dotted lines in Fig. 1. This will relieve the pressure on the clutch mechanism member 102 permitting the pin 101 to engage the gear 9 until the last record is discharged from the magazine and the tone arm is returned to its playing position on this record. To prevent declutching between the discharge of the last record and the placing of the tone arm on the same, I provide an arm 112 shown in Fig. 14 and partly in Figs. 13 and 15 which is pivoted on a stud 113 in bearing 114 forming a part of base 1. At one end it engages the disc 102 and at the other it has a roller 115 engaging the rack 28 which becomes a cam at 116. When a record is being discharged the rack moves in the direction of the arrow and back as shown in Fig. 15, raising the roller to the dotted position shown in the same figure when moving forward and in the full line position shown in Fig. 14 when it returns. Although this arm 112 is moved into engagement with the clutch disc 102 upon the discharge of each record due to the movement of the rack 28 it functions only when the control arm 105 swings inward to its normal position after the last record has been discharged from the magazine and the tone arm 42 is returning to the starting position on said record. Without the above provision the actuating mechanism would stop when the control arm 105 swings in and the tone arm would not be carried to the starting position of the last record.

The phonograph is operated by removing the spindle 3 and placing one record on the turntable 4, replacing the spindle and stacking a plurality of records of the same diameter, large or small, or a mixture of large and small diameter records in any sequence, on the supports 32 and 33 of the magazine. The tone arm 42 with a needle 44 is placed in the first groove of the record and the motor started by the switch 117. When the records are being stacked on the magazine it will be obvious that the edge of the records coming in contact with the control arm 105 will cause said arm to move outward as shown in dotted lines in Fig. 1. This will move the arm 103 to the dotted position shown in Fig. 13 permitting the clutch pin 101 to engage in the aper-

ture 9' of the driving gear 9 causing the gear 11 to rotate continuously while the phonograph is in operation.

The tone arm 42 being fed across the record until it reaches the eccentric groove at the end of the record which reverses the movement of the tone arm and its shaft 46 causing the rack 56 to push the arm 59 through the pawl 57 rearwardly about the stud 58 releasing said arm from the member 63. The projection 64 engages the trip arm 65 moving it into contact with the arm 21 that engages the pin 16 on the rotating gear 11. After the arm 21 engages the pin 16, the cam disc is rotated forward, the cam 37 engaging the roller 38 raising the track 46 that will contact the adjusting member 42' of the tone arm 42 raising the tone arm vertically from the record groove. After the tone arm 42 has been raised, the projection 70 engages the forward part of the arm 55 moving the tone arm clear of the record about to be discharged from the magazine. If the discharged record happens to be of a large diameter its edge will engage the slide 90 as the supports 32 and 33 are rotated by the rack 28 that meshes with the pinion 29 through the pin 26 engaging the forward prong of the yoke 27. The slide 90 will rotate the arm 96 through the pin 95 on the member 94 to the position shown in Fig. 11, the roller 99 on said arm will engage the knob 87 and as the support 33 continues to rotate the knob and its shaft 85 will turn the projection 83 into engagement with the prong 80 moving the carriage 77 outward carrying with it the supporting plate 13 and the center of cam disc 14 to one side of the axis of the tone arm.

In the above referred to outward position the cam disc 14 with its projection 70 will move the tone arm to its extreme outward position clear of the following record.

The return stroke of the rod 15 is shown in Fig. 8, the pin 16 passing over the center of the gear 11 now pushing said rod, relieving the pressure on arm 21 permitting its release from the pin, the cam disc 14 moving backward. The projection 51 on the rotatable member 52, engaging the arm 49 as shown in Fig. 21, will move the tone arm to a position just above the first groove of the record now on the turntable, see Fig. 22. The arm 53 guided about the pin 53' having turned the projection 51 away from the arm 49 leaves the needles 44 of the tone arm in a position just above the first groove of the record, the roller 38 reaching the incline of the cam 37 gradually lowers the arm and the needle to said groove. The arm 53 having been moved around the pin 53' thus turned the member 52 with the projection 51 beyond the arm 49 as shown in Fig. 23. While the tone arm 42 was moving outward the separators 68 moved between the record about to be discharged and remainder of the stack 35, supporting them until the supports 32 and 33 return to their normal position. After the return to the normal position of the magazine, the slide member 90 will always return to the position shown in Fig. 10 regardless of the size of the record discharged. However, the knob 87 will remain in the position it was moved to and stay there until a record of another diameter than the previous one is discharged. When a small diameter record is discharged, the edge of this record will not reach the slide member 90, therefore the arm 96 will not be moved and it will travel in a path indicated by the arrow in Fig. 10, the roller 99 engaging the knob 87 rotating the shaft 85 in the opposite direction to the above in discharging a larger diameter record. The cam projection 84 engaging the prong 81 moves the carriage inward with the base plate 13 and the center of the cam 14 to the other side of the axis of the tone arm. The outward movement of the tone arm at the needle end will be less the difference in radius of the two records, in this case the first record discharged was twelve inches in diameter and the second record ten inches in diameter, therefore the amount will be one inch. The return movement and actions of all parts will be the same for both records.

When it is desired to use the machine for playing one record at a time, the spindle 3' is removed and a record is placed on the turntable and the tone arm is operated manually, that is, put on the record and removed therefrom by hand, as all moving parts will be out of engagement from the continuously rotating turntable except the gearing between said spindle and the clutch in gear 10.

It is possible to repeat single records by performing the above manual operations and by returning the control arm 105 to the position indicated by A in Fig. 1, where it can be locked by a pin 110 on the knob 109 engaging a notch 111 in the bearing 106. The locking of the control arm 105 in the above position will be equivalent to holding the arm outward by the records in the magazine as described above.

In the machine shown, provision is made for automatically stopping the motor after playing a single record as shown in Fig. 16 in which case a switch 117 is closed manually to start the motor, the current flowing through the closed circuit of flexible contacts 118 and 119 will be broken when the tone arm reaches the eccentric groove in the record that actuates the pawl 57, not shown in this figure, on the arm 59, that has a projection 120 engaging one of said contacts.

To keep the motor circuit closed when playing automatically a plurality of records a lever 121 is secured to the lower end of the arm 105, pressing contacts 123 and 122 together as shown in Fig. 17, in which case the motor will continue running regardless of the tripping at the end of each record until the last record is dropped from the magazine, but by this time the arm has returned to its full return position and closed the circuit through the contacts 118 and 119 by the arm 59 returning to its normal position.

The motor will be run continuously when the arm 105 is in its locked, or "repeat" position, as the lever 121 will keep contacts 123 and 122 closed.

Having fully described my invention, what I now claim and desire to secure by Letters Patent is:

1. In an automatic phonograph, the combination of a rotating turntable with a record thereon, means for continuously rotating said turntable and record, a swinging tone arm for playing said record, and a magazine for supporting a plurality of records above the turntable, an actuating mechanism for moving the tone arm away from and to the record and operating the magazine to discharge the records singly to the turntable, means controlled by the records in the magazine for automatically connecting the continuously rotating mechanism when one or more records are in the magazine to the actuating mechanism and disconnecting said members

when all the records have been discharged from the magazine permitting the tone arm to return to its playing position on the last record.

2. In an automatic phonograph a continuously rotating turntable, a tone arm, a magazine supporting a plurality of records above the turntable and adapted to discharge the records successively to the playing position on the turntable, actuating mechanism for driving the tone arm and magazine, means for connecting the continuously rotating turntable with the actuating mechanism when one or more records are supported on the magazine comprising a clutch mechanism controlled by an arm that is moved into operation by one or more records in the magazine and out of operation when the last record is discharged from said magazine, permitting the tone arm to return to its starting position on the last record.

FRANK D. LEWIS.