

Feb. 12, 1935.

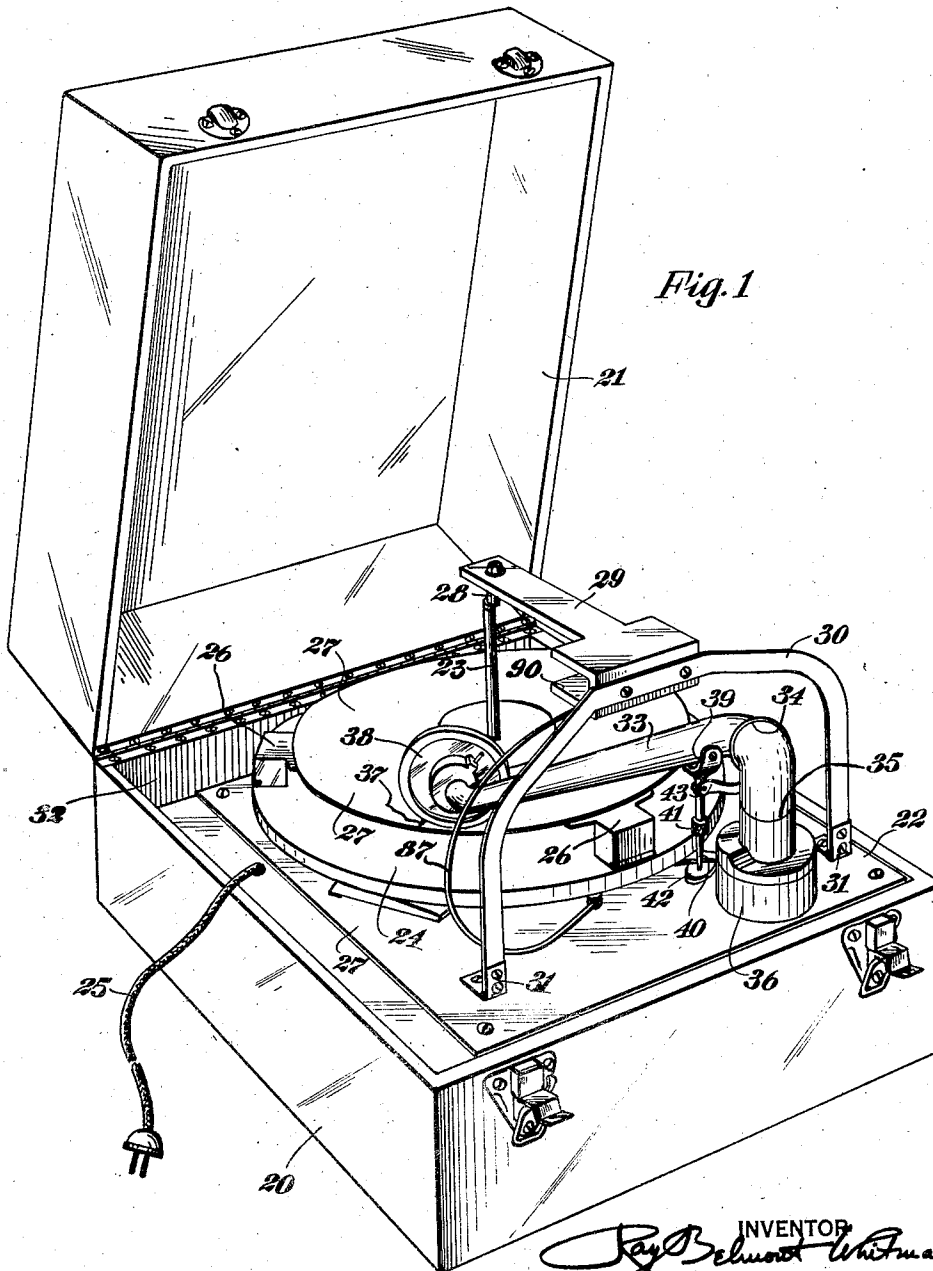
R. B. WHITMAN

1,991,005

METHOD AND MEANS FOR CHANGING PHONOGRAPH RECORDS

Filed Nov. 10, 1923

6 Sheets-Sheet 1



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METHOD AND MEANS FOR CHANGING PHONOGRAPH RECORDS

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Fig. 2

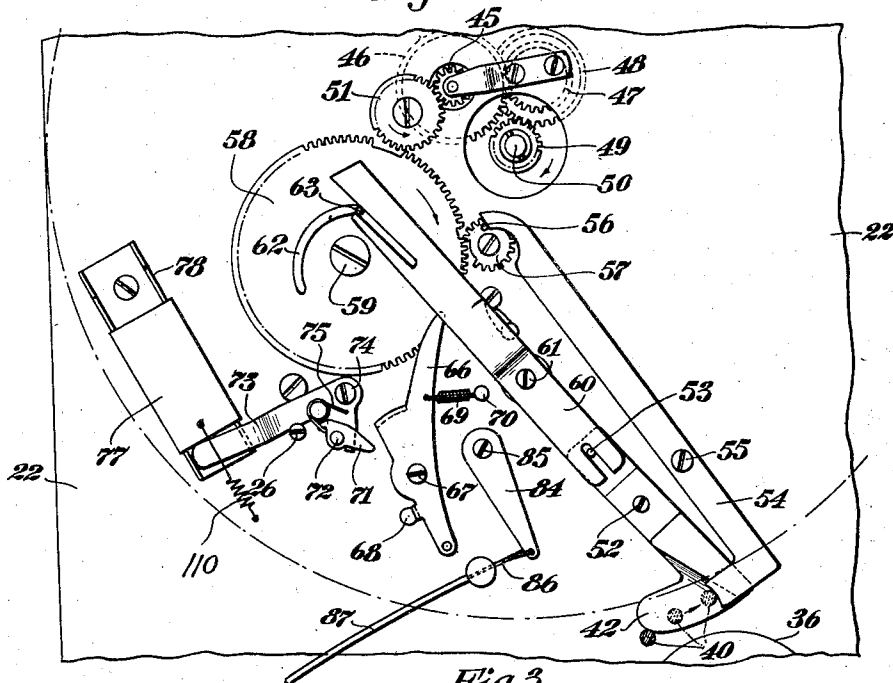
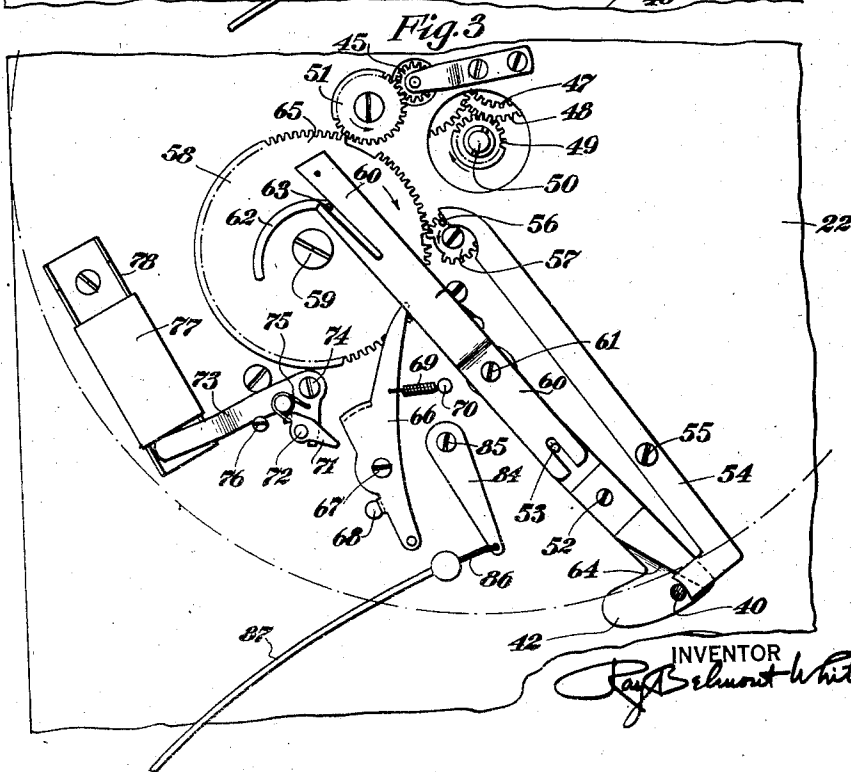


Fig. 3



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Fig. 4

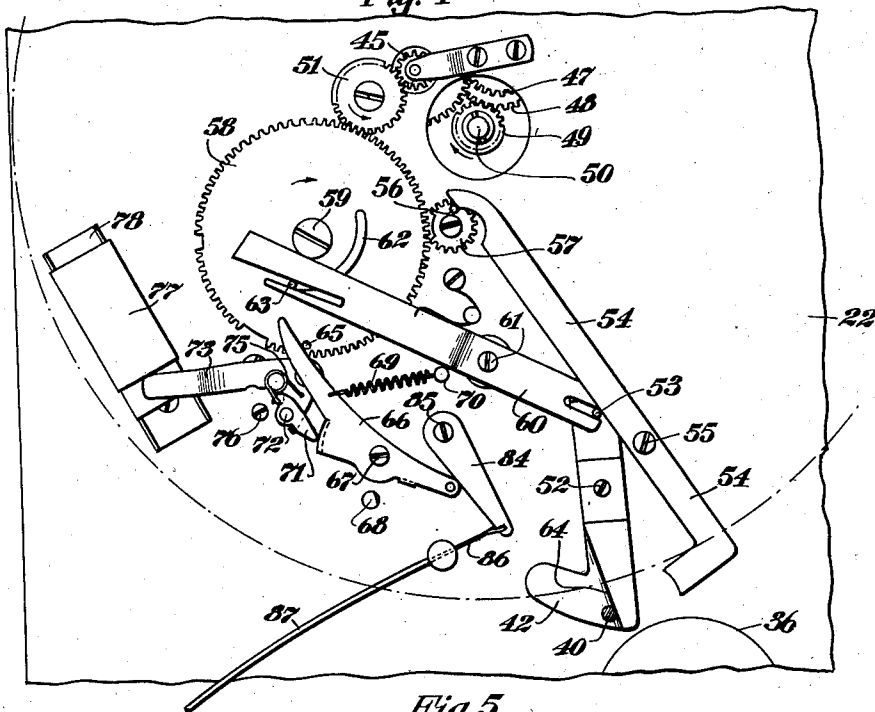
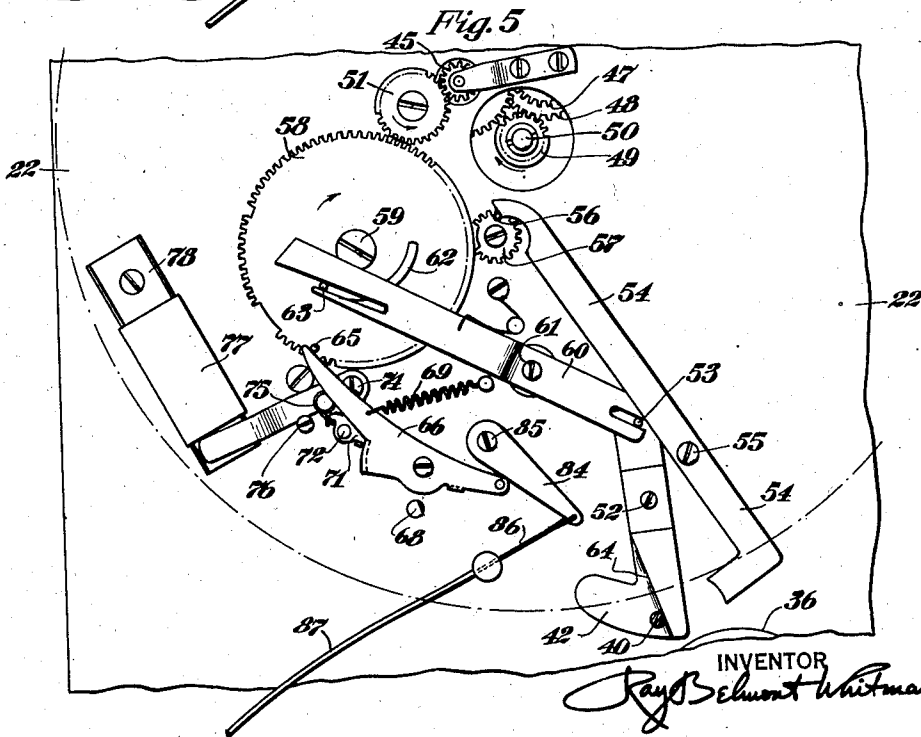


Fig. 5



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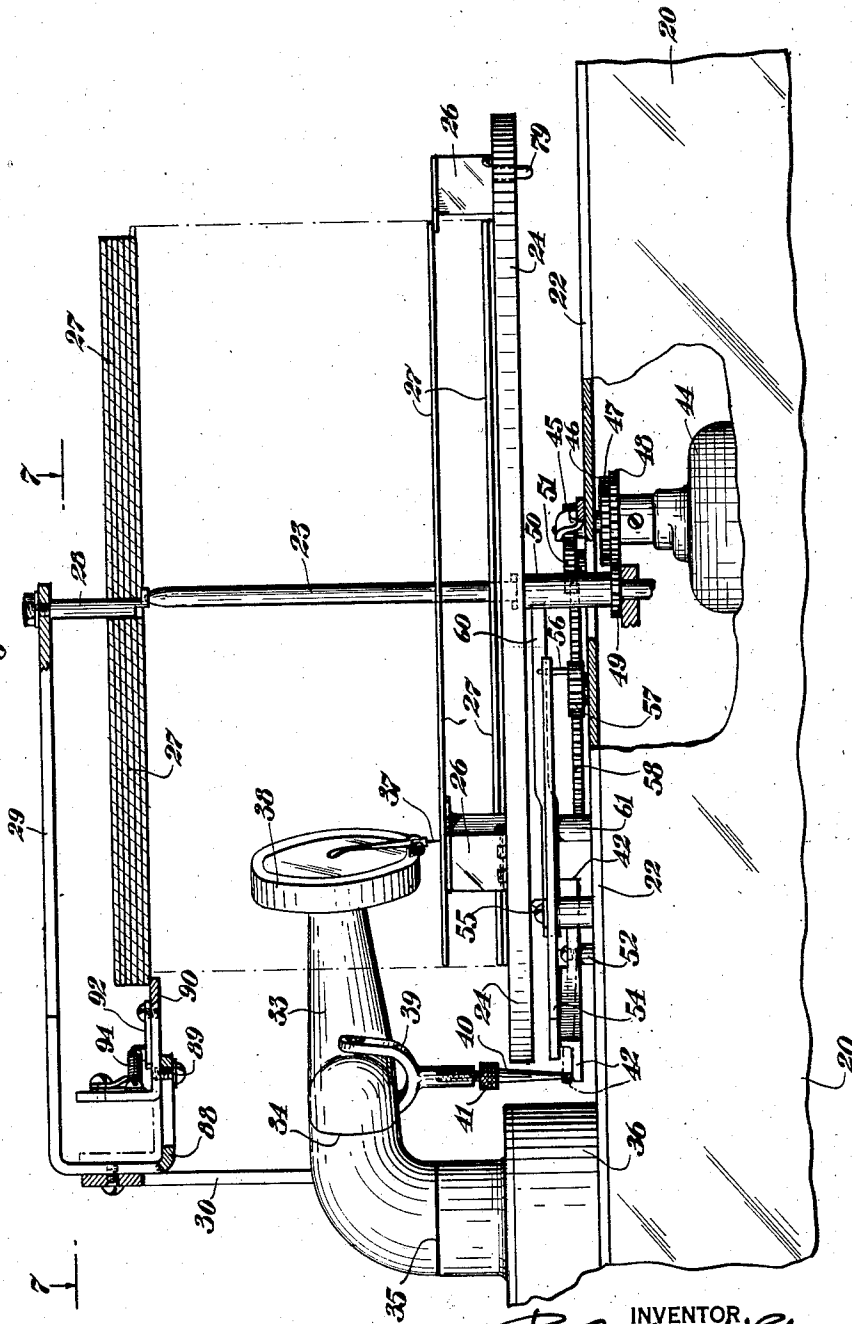
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Fig. 6



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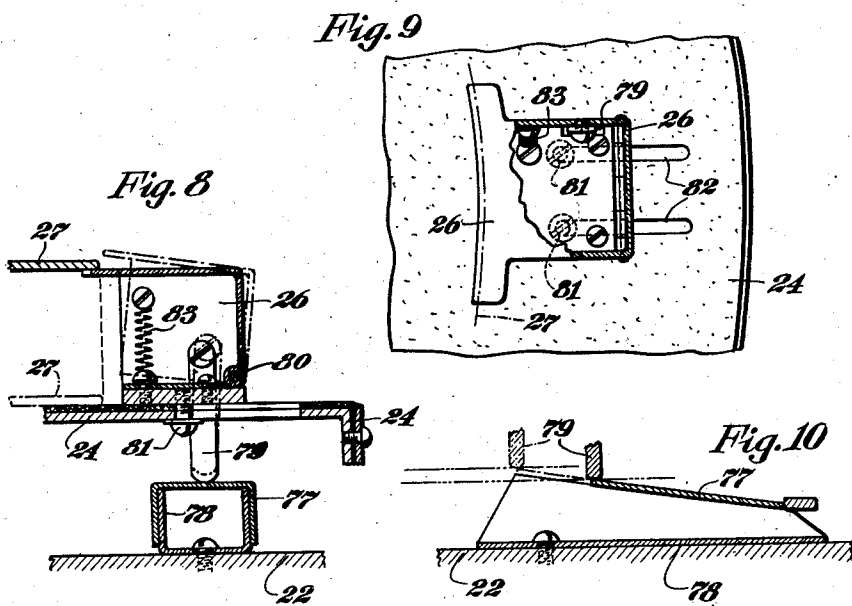
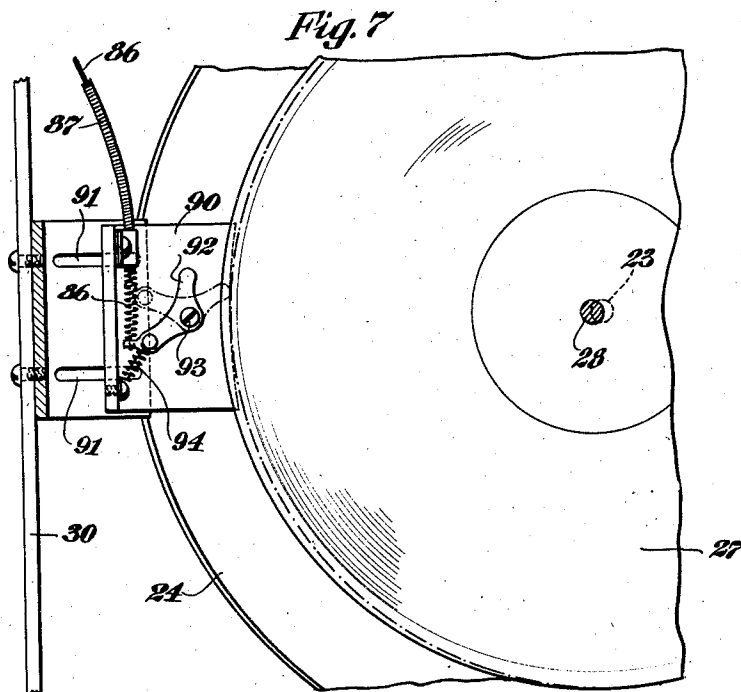
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Fig. 11

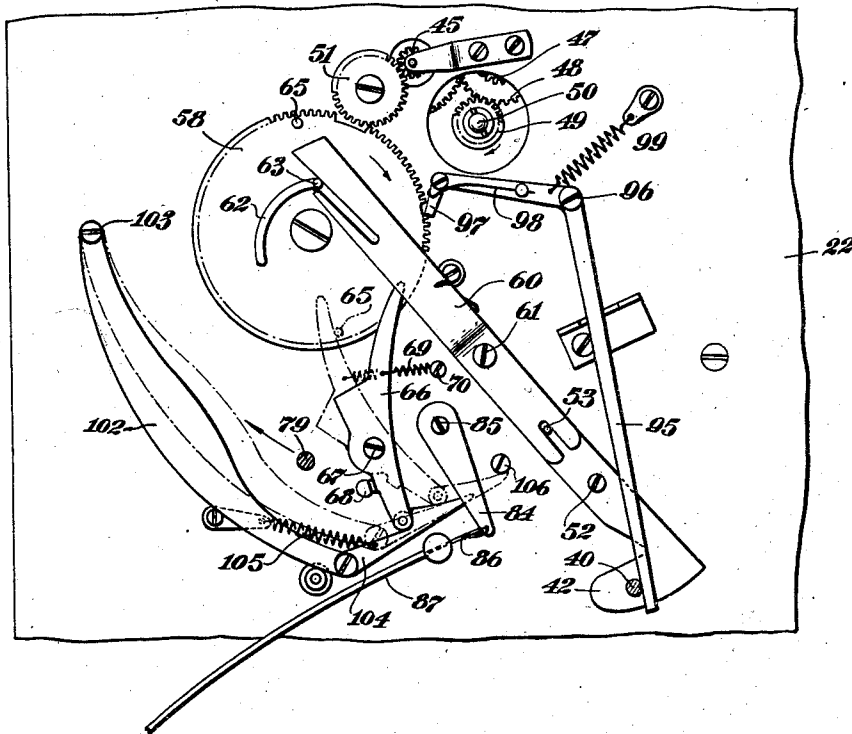


Fig. 12

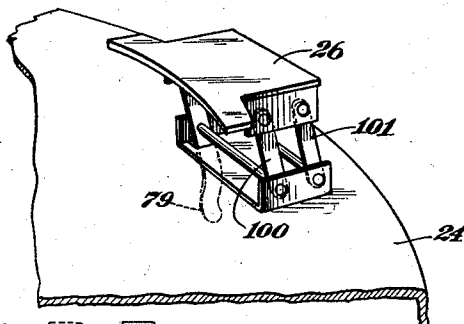


Fig. 13

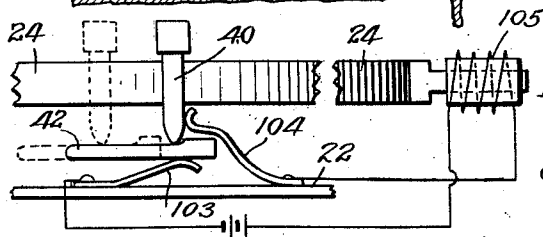
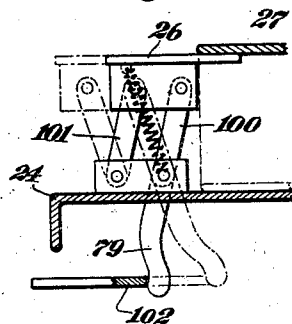


Fig. 14.

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UNITED STATES PATENT OFFICE

1,991,005.

METHOD AND MEANS FOR CHANGING PHONOGRAPH RECORDS

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Application November 10, 1928, Serial No. 318,447

28 Claims. (Cl. 274—10)

This invention relates to phonograph record-changing methods and means, and more especially to an automatic or multiple-playing phonograph embodying means for playing successively a plurality of records without any manual assistance between each record.

An object of the invention is to provide simple and positive methods and means for removing the phonograph reproducer from a played record, for moving the played record out of position, for moving an unplayed record into position to be played, and then for moving the reproducer and needle back into position on the first tone line of the record to be played.

Another object of the invention is to provide means associated with the tone arm of the phonograph for tripping the mechanism, which changes the record, upon movement of the needle into a large-pitch spiral groove at the end of the record.

A further object is to provide a support for the records yet to be played, to suspend them in position above the turn table, said support being on three points of the record to hold it securely in a horizontal plane, and being also independent of the lid or top of the phonograph.

Still another object is to provide a plurality of movable playing supports on which the record may rest when being played and which supports may be moved from beneath the record without upward movement.

All these and other objects, as suggested herebelow, are attained by the methods and means now to be described and illustrated in the accompanying drawings, in which—

Figure 1 is a completely assembled perspective view of the visible portion of the record-changing mechanism mounted in a small portable phonograph.

Fig. 2 is a top plan view of the essential operating mechanism positioned immediately beneath the turn table of the phonograph, and showing the parts in neutral or static position, as during the playing of a record or after the turn table has come to rest.

Fig. 3 is a view similar to that of Fig. 2, but showing these parts immediately after the needle has passed into the large-pitch spiral groove of the record, and which has caused the tone arm trip to throw the mechanism into gear, preparatory to effecting the changes of the various parts necessary to change to the next record.

Fig. 4 is a similar view of the mechanism after the needle has moved to its outside position beyond the edge of the record, and the played

record has dropped from its playing position down on to the main turn table to its played position.

Fig. 5 is a similar view showing the location of the parts at the time of the next succeeding cycle, when the record to-be-played has been tripped from its suspended position and caused to drop down on to the playing turn table supports and just prior to the movement of the needle in from its outermost position to the first tone line to begin the playing of the record.

Fig. 6 is a side elevational view, partly in section, of the essential operating parts of the record-changing mechanism, showing a record in playing position, several records beneath it which have been played, and a quantity of records above it ready to be tripped into position one at a time to be played.

Fig. 7 is a top plan view through the plane 7—7 of Fig. 6, and showing the mechanism which trips the lowermost of the unplayed records to permit it to drop down into playing position.

Fig. 8 is a cross-sectional detail view of one modification of the several identical turn table supports on which the record rests when being played, together with the means for removing it from beneath the record when same is to be changed after its playing has been completed.

Fig. 9 is a top plan view, partly in section, of the device of Fig. 8, as viewed from above the turn table.

Fig. 10 is a side-sectional view of the tripping means which removes these supports from beneath the record at the time of changing, and as viewed in end section beneath the turn table in Fig. 8.

Fig. 11 is a top plan view of the essential operating mechanism of a preferred embodiment of the record-changing device illustrated in the previous views, the essential changes being the lever operating means of the tone arm trip for effecting engagement of the gears to start the cycle of operations in the beginning, and a modification of the record playing supports and tripping means, as modified in Figs. 12 and 13.

Fig. 12 is a preferred modification of one of the three record playing supports secured to the turn table, and adapted to move from beneath the record without lifting it to any degree.

Fig. 13 is a side elevational view of the device of Fig. 12.

And Figure 14 is a partial side elevational view somewhat broken away showing details of a suggested means for automatically stopping the ro-

tation of the turntable when the last record has been played.

Like numerals refer to like parts throughout the several views.

5 In the embodiment disclosed, there is shown a base 20, Fig. 1, or phonograph cabinet, which, together with its hinged top or lid 21, contains the complete phonograph mechanism. Secured near the upper edge of base 20 is a motorboard 22
10 which supports from its under surface (not shown) a small electric motor arranged to rotate the turn table spindle 23, the upper end of which is extended upwardly as shown, and to operate also, of course, the turn table 24 mounted to revolve with said spindle. An electrical supply
15 cable 25, Fig. 1, supplies current to operate the motor, and there would also be provided a convenient switch for turning it on and off. It is of course understood that in lieu of this there may
20 be employed a long-playing spring motor.

Equi-spaced around the outer periphery of turn table 24 are three movable record supports 26 shown in detail in Figs. 8 and 9, and 12 and 13, and to be described later. The record 27 to be
25 played is positioned over spindle 23 and rests upon supports 26 when being played, after which the supports are removed from beneath the record in the manner herebelow explained, permitting it to drop down on to the main turn table 24.
30 The records to be played are suspended from the lower end of an offset pin 28 immediately over spindle 23 and forming a part of a bracket 29 secured to an arm 30 hinged at 31—31 to the motor board 22. While these hinges 31—31 are
35 shown in the drawing, Fig. 1, to be at the front of the motor board, they are preferably arranged at the rear, particularly where the horn opening 32 can be arranged elsewhere than as shown here, as when it is not desirable to utilize the reflecting
40 surface of the top 21 to project the sound.

The tone arm 33, Fig. 1, is of the type that swivels near its supported end, being vertically movable at joint 34 and horizontally movable at joint 35, and supported on a base 36 in such manner that when the needle 37 of reproducer 38
45 rests upon the surface of record 27, tone arm 33 will be in a substantially horizontal position.

Pivoted to tone arm 33 near its swiveled end, is a yoke 39 terminating at its lower end in a vertical pin 40 which is provided with an adjustment member 41 adapted to alter its length, as by being threaded therein. The tone arm 33, carrying its reproducer, is removed from the record, returned to outer position, and then back on to the
55 next record to be played, by the operation of the end surface of a cam lever 42, Fig. 1, lifting and carrying and releasing the lower end of pin 40, which in turn moves tone arm 33 and with it reproducer 38 with its needle 37. A pivoted link 43
60 so connects pin 40 near its upper end with the swiveled tone arm support as to cause pin 40 to always maintain a vertical position.

The driving motor 44 is shown in part in Fig. 6. It drives pinion gear 45 with its concentric gear
65 46, which gear 46 through the gear reduction train of gears 47, 48, and 49, Fig. 2, rotates the turn table spindle 50. Pinion gear 45 meshes with and continuously drives the record-changing mechanism operating gear 51, which is caused to rotate
70 continuously with the rotation of turn table spindle 50 carrying its turn table and record.

The mechanism which effects the changing and disposal of the played record, the positioning of the new record to be played, and the removal and
75 return movement of the tone arm with the repro-

ducer, is surprisingly simple. It consists of a comparatively few parts mounted immediately beneath the bottom of the turn table and on top of the motor board in the positions shown relatively in elevation in Fig. 6, and in plan view in Figs. 2, 3, 4, and 5.

In the operation of this device it is of course necessary to use a record having what is termed a "large pitch spiral groove", which, after the playing of the record will bring the needle to some predetermined point with reference to its center. Mechanism known as a "non-set stop" may also be employed instead of a large pitch spiral grooved record, but since most records on the market today have such a groove, it is desirable to use this simpler mechanism to trip the parts that automatically change the phonograph records.

Fig. 1 shows the end of the cam operating lever 42 immediately below the end of pin 40 which
80 lifts the reproducer from the record, swings it away, and replaces it again. Referring now to Fig. 2, this lever 42 is shown to be shaped somewhat like a reverse L, being pivoted at 52 on a bearing pin having a ball and socket joint, there
85 being an upwardly projecting pin 53 near its other end. The end of pin 40 is shown diagrammatically in several positions of its path of travel during the time that the needle is in the sound groove of a record being played. At this time the cam
90 surface of the lever 42 is somewhat below the lower end of pin 40, there being no engagement between them, and the pin 40 is therefore free to move with the tone arm along its path until it finally engages with the end of operating lever 54,
95 it having been carried that far by its movement into the large pitch spiral groove, and to a predetermined point therein.

Operating lever 54 is pivoted at 55, its longer arm being shaped as shown, and adapted to bear against an upwardly-extending pin 56 secured near the periphery of pinion gear 57, which is mutilated as shown. Gear 57 is adapted to mesh with the main operating gear 58, which rotates around its bearing 59 during the period of operation of the mechanism. Gear 58 is mutilated in two positions as shown, one
100 opposite the continually-rotating driving gear 51 and the other opposite mutilated starting gear 57, when in rest position, as shown in Fig. 2.

When pin 40 has moved to the right against the end of lever 54, through the action of the needle traveling in the large pitch spiral groove of the record, the other end of this lever moves to the left against pin 56, resulting in a slight
105 rotation of gear 57 beyond its non-engaging position between its own mutilated surface and that of gear 58, until there is engagement between the teeth adjoining the mutilated surfaces thereof, causing a slight rotation of gear 58 a distance sufficient to enable the rotating driving gear 51 to mesh with it after its mutilated area opposite thereto has been moved aside. This starts the rotation of gear 58, which continues for one complete revolution. Starting gear 57, also being then in mesh with gear 58, continues to rotate with it, until its mutilated area again gets in the position of non-meshing with gear 58, when it remains stationary, with its pin 56 again substantially in the position shown in Fig. 2.

Gear 58 has now begun its rotation in the direction of the arrow, Fig. 3, and the various parts are in the position shown therein. Pin 53 of cam lever 42 projects upwardly in a slot at the end of lever 60 which is pivoted at 61 with a
110

ball and socket joint similar to that of the bearing 52 of lever 42. The slotted end of lever 60 overlies the pinned end of lever 42, and the bearings of both levers are such that their ends may be moved up and down a short distance, while at the same time being adapted to swing laterally. The upper end of lever 60 contains a lateral slot along one side, with a foreshortened end in manner somewhat as shown in the drawings. Gear 58 has an upwardly-raised cam rail 62, contoured as shown, and having a pin 63 projecting upwardly from it at one end. When the parts are positioned as shown in Fig. 3, gear 58 has just begun to move, and the forward end of cam rail 62, which is its lowest end, is passing beneath the laterally-slotted end of lever 60, while pin 63 is travelling down in the slot thereof.

Thus in this position, during an initial small rotary movement of pin 63, there is no tendency of this pin to swing lever 60 about its pivot 61; but the movement of cam rail 62 (which is lowest in front and highest towards its back or following end) beneath lever 60 raises that end of said lever, which lowers its opposite end, pushing down with it the engaging end of lever 42, and thereby raising its opposite or cam-faced end to engage the lower end of pin 40 to raise it, and with it its tone arm and reproducer, thus lifting the needle off the record.

As gear 58 continues to rotate, pin 63, in its travel around bearing 59 as a center after the cam rail 62 has first lifted the needle from the record, as just described, rotates to a position where it begins to carry with it and swing the engaging end of lever 60, thus moving its opposite end in the other direction and with it pin 53 with its lever 42, which results in a movement to the left of the lower or cam end of said lever. This cam surface 42 has a raised shoulder 64 which engages against the side of pin 40, and as it moves to the left in manner just described, it carries pin 40 with it, thus moving the tone arm, reproducer, and needle toward the outside periphery of the record and away from above the turn table, so as to permit the unobstructed dropping of the next record into position after the played record has been removed, in the manner now to be described.

Gear 58 has an upwardly-extending pin 65 near its periphery and substantially in the position shown. When gear 58 has rotated far enough this pin comes into contacting position with the end of an arm 66 pivoted at 67 and having near one end a shoulder bearing against a stop pin 68 projecting upwardly from the motor board 22, and having near its opposite end a small spiral spring 69 attached to a stationary pin 70 also mounted on motor board 22 and in such manner as to normally hold the upper end of lever 66 in its extreme position to the right, as shown in Fig. 3.

When pin 65 of gear 58 engages with the end of this lever 66 (which end overlies its path of travel) it swings it around toward the position shown in Fig. 4, against the tension of spring 69.

Lever 66 has a projecting shoulder on its forward upper portion as shown, which, as it is swung by means of its engagement with pin 65, bears against a small trigger lever 71 pivoted at 72 to a larger lever 73 pivoted at 74. Lever 71 is formed with a depending lug at its inner end which engages with the edge of lever 73 and remains rigid in the position shown in Fig. 3 while the projecting shoulder of lever 66 en-

gages its outer end, but its surface and that of said projecting shoulder (which also has a depending lug) are so designed that after a certain movement of lever 66 trip 71 pivots against the tension of its spring 75 to clear the engaging edge of the shoulder of lever 66 so that the parts may return to their normal position as shown in Fig. 3.

The original contacting movement between the shoulder of lever 66 and the end of trigger lever 71 moves lever 73, to which it is attached, about its pivot 74 away from its stop 76.

The opposite or left hand end of lever 73 engages against the lower end or shoulder of an inverted U shaped member 77 riding on an inclined rail member 78 attached to motor board 22 in the manner shown in the drawings. Thus, the upper surface of member 77 is moved up the incline 78, bringing it into a progressively higher position until it engages the lower end of pin 79, Figs. 8 and 10.

It will be noted that the record being played, as shown at 27, Fig. 1, rests upon the three equispaced supports 26, previously described, their upper surfaces being preferably covered with felt to engage and cushion the underside of the record, and prevent its slipping thereon. The details of construction of each of these supports 26 are shown in Figs. 8, and 9. This part consists essentially of a supporting member 26, having an extended outer area for engaging along the under periphery of the record 27, and hinged at its lower outer end 80, Fig. 8, to a bracket secured to the turn table 24, near its outer periphery. Depending pin 79 is integral with a side wall of support 26, and arranged in such manner that its lower end projects through a slot beneath the under surface of the turn table an appreciable distance, and in such manner that engagement between the lower end of pin 79 and another or pushing member, (as described below) pivots support 26 about 80 to raise its record engaging surface upwardly and outwardly from beneath the record 27.

Each support 26, as illustrated in Figs. 8 and 9, is also so arranged that its holding screws 81 may be released to permit it to slide radially in grooves 82 in turn table 24 to such a position with reference to the outer edge of the turn table as to permit it to carry the edges of either a 10 inch or 12 inch record, or any other diameter desired. A coiled spring 83 Fig. 8, is arranged between each support 26 and turn table 24 to always return the support to its normal or down position when the cam member 77 is no longer in engagement with the lower end of the support operating pin 79.

Returning now to Fig. 3, we find lever 73 moving cam member 77 upwardly in the direction of the arrow and along its inclined rails 78 until it engages successively—as the turn table rotates—each of the three depending pins 79 which operate the three record supports 26, on which the record being played rests. Pin 65 of gear 58 engages with the end of lever 66 which in turn operates lever 73 to raise member 77 for an interval sufficiently long to permit each of the three depending pins 79 to be raised successively a number of times as the turn table continues to rotate past the member 77, now in raised position. The slanting or cam surface of this member on its inclined rails, as shown in Fig. 10, engages pin 79 in its lowermost position and raises it against the tension of spring 83 and with it the record support 26 to a position somewhat up-

wardly but mostly to one side and out from under the record 27, permitting it to drop below at that point. This movement is repeated at each of the other supports as they in their rotation with the turn table come over the position of member 77; thus the record is dropped first from under one support and then the next and then the third until finally it rests beneath all of them and drops down along spindle 23 to finally rest upon the surface of the main turn table 24 or upon the top of any record or records which have previously been dropped on to the turn table. This completes the operation of getting the played record out of the way beneath the playing supports and on to the main turn table, where it remains while the remaining records are being played.

Fig. 4 shows the position of these several parts at the end of the movement of pin 65 which has moved lever 66 to a position to permit it to operate the record-changing member 77; by this time each support 26 has been tripped out of the way a number of times, assuring that the record has dropped beneath it. Also, pin 40, together with the tone arm and reproducer, have been carried by the shoulder of cam lever 42 to the extreme outer position to one side of turn table 24, and a new record is now about to be dropped into position on to the playing supports of the turn table.

This is accomplished by the continued rotation of gear 58 moving pin 65, which continues to move lever 66 until its lower or right hand end, as shown in Fig. 4, engages with, and moves, the side of a lever 84, pivoted at 85, its opposite end being connected to, and pulling, a cable 86 within a flexible Bowden wire 87.

The Bowden wire 87 extends from lever 84 beneath the turn table, in a loop (to provide for the swinging movement of arm 29, when feeding the records to be played) to a horizontally-flanged plate 88 secured to and positioned beneath arm 29 near its juncture with swinging support 30, as shown in Fig. 6. This flanged plate has adjustably secured to it by means of bolts 89 a record-holding plate 90 adjustably held in position in slots 91—91 in flanged plate 88, Fig. 7. The record 27 overlies the edge of this plate 90 a distance substantially equal to the offset of the center pin which suspends the record.

The outer edge of plate 90 is preferably along the arc of a circle whose radius is somewhat greater than that of the record, so that when the record is later pushed off from this plate, it will clear it at the last moment at its central point, and at the same time that the center of the record clears the offset pin 28. Record-holding plate 90 is sufficiently extended along the record's periphery, so that when the record is resting on it the points of support at the extreme ends of the plate will be sufficiently far apart to keep the record from tilting sideways as it is suspended from it and the offset pin 28 at its center, thus maintaining the record always in a horizontal plane.

Plate 90 carries a small bell-crank lever 92 pivoted at 93 immediately above its surface at 93, and having one end connected to cable 86 in Bowden wire 87. Thus the pulling movement of this cable in manner as previously explained will swing lever 92 and bring its inner end into the position shown by the dotted lines to permit it to press against the edge of the lowermost record suspended on plate 90 and offset pin 28, Fig. 6, and thus the record will be pushed to a position where its center hole will be in line with the off-

set end of pin 28, permitting it to drop down along spindle 23 into playing position on top of playing supports 26 on turntable 24. A spiral spring 94 positioned as shown maintains bell crank lever 92 always in non-engaging position with record 27 until the mechanism as previously explained pulls on cable 86 to move lever 92 against the tension of said spring 94 into position to trip off the next record. The engaging end of lever 92, where it contacts with the edge of record 27, is preferably bevelled off along its lowermost edge to give the record edge a free drop as soon as it simultaneously clears both the edge of plate 90 and the offset pin 28.

Fig. 5 shows the short end of lever 66 engaging lever 84 to pull Bowden wire 86 to trip the next record to be played, as above, and permit it to drop into playing position. At this moment member 77, which was previously in the position shown in Fig. 4, having effected the removal of the record as already explained, has returned to its normal position. The trip lever 71 through the continued movement of lever 73, has finally reached a point where its end can return, by the action of its spring 75, beyond the shouldered surface of lever 66, permitting member 77, now no longer held by the engagement between levers 66 and 71, to be returned to its normal position against stop 76 as shown in Fig. 5. This is effected by the action of a spiral spring 110, Fig. 2 but which is connected between member 77 and motor board 22. It is against the tension of this spring that member 77 has moved up incline 78. Thus the record supports are again at rest in their normal positions, ready to receive the next record, when the parts reach the position shown in Fig. 5, which has tripped the record immediately above the turn table to permit it to fall in place on said supports.

The continued rotation of gear 58 moves its pin 65 until it passes beyond the end of lever 66, when spring 69 returns this lever to its normal position as shown in Figs. 2 and 3. Gear 58 continues to be rotated by gear 51 past the small mutilated portion until the large mutilated portion again comes opposite the teeth of gear 51, when the two gears are again out of mesh, and gear 51—driven by the motor—continues to turn the turn table without affecting the record changing mechanism.

Also, when the parts are in the position shown in Fig. 5, the cam surface of lever 42 in engagement with pin 40 has elevated and carried the needle of the reproducer to its extreme outer position and held it there. This occurs because the cam rail 62 on gear 58 has continued to remain beneath the outer end of lever 60 to elevate it and so depress its opposite end and with it the end of lever 42 which is beneath it, which in turn has caused the cam surface of lever 42 to raise and with it pin 40 connected to the tone arm. Now as gear 58 continues to revolve beyond the position shown in Fig. 5, pin 63 bearing against the slotted edge of lever 60 moves it to the right which moves its opposite end to the left and with it pin 53 of lever 42, which causes the opposite or cam-surface end of lever 42 to move to the right and carry with it and return pin 40, and hence the tone arm, reproducer, and needle. The trailing end of cam rail 62 is bevelled or reduced in elevation (as is its forward end) in such manner that as the tone arm is swung inwardly it lowers slowly and gently until the needle drops with a feather touch upon the plain outer surface of the record, and is gently urged into position in the

first sound groove, after which the cam surface of lever 42 continues to move downwardly until it no longer supports the end of pin 40 which holds the tone arm, and the needle is then fully resting in the sound groove of the phonograph, and the reproduction begins.

It should be noted that the pin-engaging end of starting lever 54 has an arc-shaped surface cut out of its inner edge and in such manner that when pin 56 of gear 57 travels around a part of a revolution it bears against this arc-shaped surface and gently cams that end of lever 54 back into its normal non-engaging position, where it remains until pushed again from its opposite end by the inward movement of pin 40 at the end of playing of a record, when the needle again reaches the large pitch spiral groove and moves inwardly in it to a predetermined point. Gear 57 makes an additional revolution or two (depending upon the gear ratios) and then comes to rest in its initial operating position.

After the complete cycle of operations has taken place, the various parts of this simplified mechanism are back in their original positions, substantially as shown in Fig. 2. Gear 51 continues to rotate continuously without engaging the master gear 58 and therefore without applying movement to the record ejecting device, the record feeding device, or the removal or return of the tone arm.

When the last record has been played, it will be noted that the cycle of operations will proceed as usual as regards moving the tone arm out of the way, and releasing the record which then drops to its position beneath the turn table supports and on to the main turn table, but no new record is there to be fed on to the supports by the movement of the bell-crank lever 92. The reproducer 38 on its tone arm 33 will thereafter be swung back into playing position but since there will be no record there to support the needle 37 the cam surface of lever 42 will continue in engagement with the bottom-most end of pin 40 for an appreciably longer interval, to swing the tone arm into a somewhat more central position than it would be in if there were a record and the needle had dropped into its first tone line. Also, the needle will be somewhat lower down than it would be if it rested upon the record, since, with a record in place, the cam surface of lever 42 moves an appreciable distance away from pin 40, and now, with no record to support the reproducer, the pin will follow it down that distance due to the force of gravity. Either of these movements may be utilized in connection with a suitable electrical switch to cut off the current to the motor and stop the turn table from rotating, thus effecting automatic stopping of the whole mechanism on the playing of the last record. Thus, in Fig. 14, there would be a flexible electrical contact arm 103 beneath cam 42, adapted to be engaged by said cam and make electrical contact therewith. Another contact member 104 would be positioned at the innermost position of swing of pin 40 (which position is shown in full lines, and farther in than the dotted line position which represents the open contact position of pin 40 after each record except the last has been played) when it moved in after the last record had been released, and both contacts would have to be made to complete the electrical circuit, either to a standard solenoid brake 105, acting for instance on the turn table rim, or to complete a short circuit of the main power line to the mo-

tor (not shown), thus in either case stopping the rotation of the turn table.

It will be noted that a group of records of any one size may be played with this mechanism, and by suitable adjustment of the positions of record-holding plate 90, the three playing supports 26, and the height or length of pin 40 a means is provided to quickly adapt the mechanism for use with another size or sizes of records. Thus the mechanism may be designed for twelve inch records and adjusted to quickly play a group of ten inch records. It will be obvious, of course, that the sizes cannot be mixed at any one playing; but some variation in the diameter and thickness of the record is permissible.

It is quite impossible to drop more than one record at a time since the variation in thickness of records is never 100% of their thickness, which would be necessary for the offset pin end to accommodate more than one record, and therefore to permit movement of more than the lowermost record into position to drop by gravity. It will also be noted that a record that is badly warped can still be handled in a positive and never-failing manner, since a small portion of its outer periphery will always rest solidly on plate 90, there being three-point suspension between the extremities of this plate and the offset center pin. This permits positive engagement between the record and the pushing end of bell-crank lever 92.

The number of records that can be played successively is dependent, within practical limits, only upon the space beneath the record supports 26 and the surface of turn table 24, and the length of the offset pin, or distance between the bottom of support 29 and the offset of pin 28.

With this invention there is used a tungsten point needle or other permanent or semi-permanent type, adapted to play the full group of records which the device accommodates. The needle can be changed after each complete playing of all the records, it being impractical to provide mechanism to change it automatically during these operations, and also entirely unnecessary.

Variations in the length of the needle, of the diameter and thickness of the records played, and lost motion due to ultimate slight wear of the various parts of the mechanism, may be compensated for, so far as starting the record at its proper time is concerned, by movement of the adjustment 41 which fixes the height of pin 40.

Figs. 11, 12, and 13 show modifications of features of the device previously described. For instance, there is shown in Fig. 11 a preferred and improved form of starting lever arrangement to take the place of lever 54 and starting gear 57. This consists of a lever 95 pivoted at 96, and shaped as shown, and having a pivoted trip member 97 at its short arm end with a spring 98 adapted to maintain the outer end of trip 97 always in position to the left and in engagement with the teeth of gear 58. The inward movement (or movement to the right) of pin 40, when the needle tracks in the large-pitch spiral groove of the record, moves the lower end of lever 95 to the right, and hence moves trip 97 downwardly, and against the tension of spring 99, which is anchored to the motor board 22, as shown, and which normally tends to pull the lower end of the lever 95 always to the left. Trip 97, also being urged to the left by its spring 98, engages with the edge of the teeth beside the mutilated section of gear 58 at that point, and moves it

slightly until the teeth of rotating gear 51 mesh with its teeth and so continue its rotation. The trip 97 is merely pushed out of the way against the tension of its spring 98 during this rotation.

5 Because of an increase of leverages here, for instance, this arrangement is found to be still more positive and never-failing than that previously described, and has proved to be eminently satisfactory in service.

10 The supports 26 have also been improved in the preferred form shown in Figs. 12 and 13 to permit their upper surfaces to move freely and easily from beneath record 27. This construction embodies a parallel movement from parallel
15 links 100—101 hinged at each end of supports 26 and so arranged as to move the top of support 26 out from beneath record 27, Fig. 13, with practically no upward movement, either of the upper surface of supports 26 or of its operating pin 79 depending beneath it, as was the case in the embodiment previously described. Thus, in order to move the supports 26 laterally from beneath record 27, it is only necessary to effect a side ways movement of pin 79, in Figs. 12 and 13.

20 To effect this lateral movement of arm 79, there is substituted for the parts 71, 73, 77, and 78 of the previous embodiment, a cam lever 102 pivoted at 103, and having its inner surface cam-shaped, so that a movement inwardly to the position shown by dot-and-dash lines in Fig. 11 will engage with and press laterally against the depending arm 79 as it revolves with the turn table, to move said arm to the position shown in dotted lines in Fig. 13. Cam lever 102 is caused to
30 pivot about its center 103 by having a spring-held trigger finger 104 held by spring 105 and pivoted to its opposite end, as shown. A suitable spring tends to keep finger 104 from assuming a position along an extension of lever 102. The lower end of lever 66 has a downwardly-extending pin, which, in its normally-resting position to the left, fits into a semi-circular recess in the upper edge of finger 104. Thus, when lever 66 moves to the right, it carries finger 104 and with
40 it cam lever 102 to a position where arm 79, when moving along its circular path, engages the cammed surface of lever 102 and is pushed inwardly to move the support 26, Fig. 13, outwardly.

A continued movement of finger 104 to the right brings its outer end slantingly against the surface of a cam pin 106, which causes clockwise movement of finger 104 until its semi-circular recess is removed from engagement with the downwardly-extending pin on lever 66, when
50 it returns, together with cam lever 102, by the action of coiled spring 105, Fig. 11, to its normal position to the left. Thus supports 26 are no longer tripped, and they remain stationary, ready to support the next record, which thereafter is released due to the continued movement of lever
60 66 against arm 84 to pull cable 86.

It will be seen from the above that the invention provides an exceedingly simple and practical form of record changing mechanism. The
65 comparatively few levers and gears are all of the simplest form, easy to manufacture and install, and they may be mounted for convenience on an auxiliary plate secured in a predetermined position to the motorboard in such manner that
70 should there be any derangement of the parts the entire plate with its several gears and levers may be discarded and a new one affixed. The device is positive in operation, requires no attention whatever, should last almost indefinitely,
75 is so simple that it will cause little or no trouble,

and is altogether most effective for the purpose intended.

It utilizes the principle of gravity in most efficient manner, the movement of the record and the other steps being effected by the most natural method possible.

It is to be understood that the present disclosure is for the purpose of illustration only, and that the invention is not limited thereto. To those skilled in the art, many modifications of the invention will be readily apparent, and it will also be obvious to such skilled persons that parts of the device and method may be used without other parts thereof, many such combinations readily suggesting themselves. Therefore, it should be, and is to be distinctly understood that for a definition of the limitations of the invention, reference must be had to the appended claims.

Having now described the invention, what is claimed as new, and for which Letters Patent of the United States is desired, is:

1. The combination with a phonograph of means for suspending a plurality of records above rotating surfaces, dropping the records to be played one at a time upon said surfaces, and thereafter removing said surfaces one at a time to permit each record to drop down on to a lower rotating surface.

2. The invention as in claim 1, including power means for rotating the records, means controlled from the power means for effecting these operations automatically and in proper sequence.

3. The invention as in claim 1, including a reproducer, and means for removing and returning the reproducer to the record between record changes.

4. The combination in an automatic phonograph adapted to play a plurality of records successively, of adjustable means adapted to effect the playing of groups of records of different diameters at the will of the operator, said means including a peripheral record-holding plate, record-playing supports, a swinging tone-arm adapted to move vertically, and means for adjusting the position of the peripheral record holding plate, means for adjusting the distance of the record playing supports from the axis of rotation, and means for adjusting the vertical movement of the swinging tone arm.

5. The combination with a rotatable turntable of a phonograph record support comprising three equi-spaced surfaces positioned near the periphery of the turntable and adapted to be individually swung outwardly to permit the record to be dropped beneath them after its playing is complete, including a needle adapted to engage the record groove, and cam means operated automatically by the movement of the needle in the record groove for effecting such lateral movement of the record supporting surfaces.

6. The combination in an automatic phonograph, of means for raising the reproducer from the record at the end of one record and positioning it at the beginning of the next, including two levers each pivoted at an intermediate point in their lengths on a ball-and-socket joint and having their adjoining ends in sliding contact, and means both for swinging the outer end of one of the levers and for raising it to effect an opposite movement to the outer end of the other lever, and means connecting said last-named lever with the tone-arm and reproducer.

7. Means for supporting records to be played above a rotating turn table, including an off-

set pin support for holding the records at their centers, and a peripheral edge support, the first-named support being hinged to permit it to be swung upwardly to a substantially horizontal position for convenience in feeding the records on to it, said support being so positioned that the records are moved downwardly to supporting position.

8. In an automatic phonograph mechanism, means for removing a record after it has been played, including laterally-movable supports on a turn table adapted to support a record, there being a downwardly-extending member attached to each support adapted to move it laterally, and a pivoted cam member adapted to be moved automatically at the proper time into the rotating path of each of said downwardly-extending members to individually force same outwardly and with it the record support, and so permit the record to drop beneath said supports.

9. The invention as in claim 8, including independent spring means associated with each of said record supports to return it to its supporting position after contact with the cam member is broken.

10. The combination with an automatic phonograph, of means for adapting it to play a record of different diameter, including a radially-adjustable member on which the unplayed record rests, a plurality of radially-adjustable supports on which the playing record rests, and means for adjusting the swing of the reproducer to permit its needle to engage with the new position of the first tone line of the record of different diameter.

11. In an automatic phonograph, the combination with means for playing a plurality of records successively including adjustable means adapted to effect the playing of groups of records having a prescribed difference in diameter at the will of the operator, said means comprising a supporting bracket, a record supporting plate slidably mounted thereon and adjustable with respect thereto for supporting the peripheral edge of a record, means for releasing a record therefrom for permitting it to drop into playing position, a reproducer and means for swinging it over the record, an adjustable member for controlling the swinging movement of the reproducer whereby groups of records of different diameters may be supported upon the supporting member and engaged at the beginning of the reproducing groove by the reproducer and means for actuating said reproducer and releasing means in timed relation.

12. In a phonograph, the combination with a turntable and a support for a plurality of records, of a member on said support for releasing records from the support to the turntable, and means for slidably adjusting said member for accommodation to records of varying diameters.

13. In a phonograph, the combination with a turntable and a horizontally slidable supporting member for a plurality of records, of means for releasing records from the supporting member to the turntable, and means for manually sliding said supporting member toward and away from said records to accommodate records having a prescribed difference in diameter.

14. In a phonograph, the combination with a turntable, and means for supporting a plurality of records directly above said turntable including an overhanging bracket, a pin depending therefrom for engaging said records through the center hole thereof and a horizontal plate for sup-

porting their peripheries, a member for releasing said records from the supporting plate onto the turntable, and means for slidably adjusting said plate relative to said bracket to accommodate records having a prescribed difference in diameter.

15. In a phonograph, the combination with a turntable and a support for a plurality of records of either a smaller or larger diameter including a supporting plate for the periphery thereof, and a single movable member thereon for engaging and discharging said records from said plate onto the turntable, said plate with the said movable member being manually adjustable for supporting and releasing records of varying diameters.

16. In a phonograph, the combination with a turntable and a support for a plurality of records, of an arm with a reproducer thereon adapted to swing laterally thereover and be brought into engagement with the record, a member for releasing records from the support to the turntable in position to be engaged by said reproducer, means for manually sliding said support toward and away from said records for accommodating it to records having a prescribed difference in diameter, and means for manually adjusting said arm to swing the reproducer into engagement with records of varying widths of recorded surface.

17. In an electric phonograph, the combination with a turntable and a support for a group of records immediately above said turntable, said support comprising an overhanging bracket having a depending pin for centrally supporting said records through the center holes therein, and a plate for supporting the group of records adjacent their peripheries, a member mounted on said supporting plate for releasing said records therefrom onto said turntable, a swinging arm having sound reproducing means thereon, means for slidably adjusting said supporting plate toward and away from said records to support records of varying diameters, and a manually actuable cam for adjusting the swinging of said arm for positioning said reproducing means at the beginning of said records.

18. A phonograph including a turntable, a pivotally mounted support for engaging in the center hole of a group of records and holding them above said turntable when moved to operative position, and away therefrom when in inoperative position, a side support for supporting the records adjacent the periphery thereof, and means for engaging the bottom record thereon and releasing it for permitting it to fall upon the turntable in playing position, said side support and record engaging means being adjustable to support and release records of varying diameter.

19. In a sound reproducing device, the combination with a turntable and a support for a group of records in horizontal position immediately thereabove, of a swinging bracket provided with a depending pin for extending through and supporting said records adjacent the central openings therein, and a side support associated therewith for supporting the said records near their peripheries when in horizontal position, said bracket being adapted to be swung upwardly for causing said supporting pin to extend in a substantially horizontal plane to permit the records to be positioned thereon in non-supporting position with respect to said side support and swung downwardly into operative and supporting position thereon.

20. In a phonograph, the combination with a turntable and a support for a group of records in horizontal position immediately thereabove, of a swinging bracket provided with a depending pin for extending through and supporting said records adjacent the central openings therein, a side support associated therewith for supporting the said records near their peripheries when in horizontal position, a discharge member mounted on said side support for engaging and releasing a record therefrom and from said pin, said bracket being adapted to swing upwardly, for causing said supporting pin to extend in substantially a horizontal plane to permit the records to be positioned thereon out of releasing position, and to be swung downwardly into releasing position.

21. In a phonograph, the combination with a turntable and a support for a group of records in substantially horizontal position immediately thereabove, of a swinging bracket provided with a depending pin for extending through and supporting said records adjacent the central openings therein, a side support associated therewith for supporting the peripheral surface of said records when in substantially horizontal position, said bracket being adapted to be swung upwardly for causing said supporting pin to extend in a substantially horizontal plane to permit said records to be positioned thereon out of engagement with said side support, and swung downwardly into operative position, and an upwardly extending centering pin in alignment with said supporting pin and adapted to direct the movement of said records onto the turntable.

22. In a phonograph, the combination with a turntable and a support for a plurality of records, said support comprising a swingable bracket, a pin secured to and depending from said bracket having an offset head at the lower end thereof, whereby a plurality of records can be supported upon the pin by said head, a centering pin extending upwardly through said turntable and rotatable therewith upon which said head is engageable, whereby when said bracket is swung to its upper position said supporting pin will be free to receive records thereon over said head, and when swung to lowered position will be supported upon said centering pin, and a supporting plate for supporting the periphery of said records when said bracket is in lowered position.

23. In a phonograph including a turntable, a support for engaging in the center holes of a plurality of records and holding them above said turntable, a horizontal side support for supporting the records adjacent the peripheries thereof, and means for engaging the bottom record thereon and releasing it for permitting it to fall upon the turntable in playing position, said side support and record engaging means being manually slidable toward and away from the records to support and release records of various size.

24. In a sound reproducing device, the combination with a turntable and a support for a

group of records in horizontal position immediately thereabove having central openings therein, of a side support for supporting said records near their peripheries when in horizontal position, a member mounted on said support for engaging the lowermost record supported thereby and shifting it laterally to release it therefrom, said support being associated with a swinging bracket provided with a depending pin for extending through and supporting said records adjacent the central openings therein, said pin being adapted to support the records to be engaged and shifted therefrom by said member when in one position, and when in the other position prevent their being so shifted.

25. In a sound reproducing device, the combination with a turntable and a group of records to be supported in horizontal position immediately thereabove, of a side support for supporting said records near their peripheries when in horizontal position, a movable member thereon for engaging the edge of a record and shifting it laterally from said support, and a member movable with respect to said side support for supporting said records adjacent their central openings to permit said records to be shifted therefrom when said support is in one position and prevent their being so shifted when said support is in another position.

26. In a phonograph, the combination with a turntable and a support for a plurality of records, of a member for releasing records from the support to the turntable, and means for slidably adjusting the position of said member toward and away from the record a substantial distance to accommodate it to records having a prescribed difference in diameter.

27. The combination in an automatic phonograph having a record turntable, of a phonograph tone arm, a needle therefor, a member depending downwardly from said tone arm, cam means engageable with said member and adapted to be moved to in turn move said member and with it said tone arm and needle in a combined lateral and vertical direction to permit the phonograph needle to descend onto the record at its beginning and be lifted therefrom at its conclusion and then swung outwardly, and means for extending said member to vary the lateral position at which said needle descends onto said record.

28. In a phonograph, the combination with a turntable and a support for a plurality of records including a supporting member, a supporting plate adjustably mounted thereon for supporting the periphery of said records and a movable member mounted on said plate for engaging and releasing said records from said plate onto the turntable, said plate with the said movable member being manually slidable toward and away from said records for accommodating records of varying diameters.

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