

Sept. 27, 1932.

L. E. JOHNSON ET AL

1,879,291

PHONOGRAPH

Filed Sept. 12, 1928

6 Sheets-Sheet 1

FIG. 1.

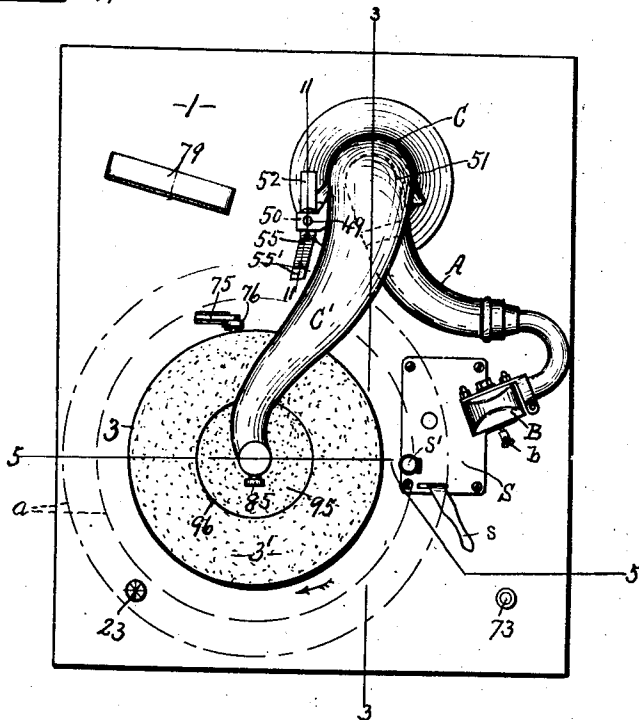
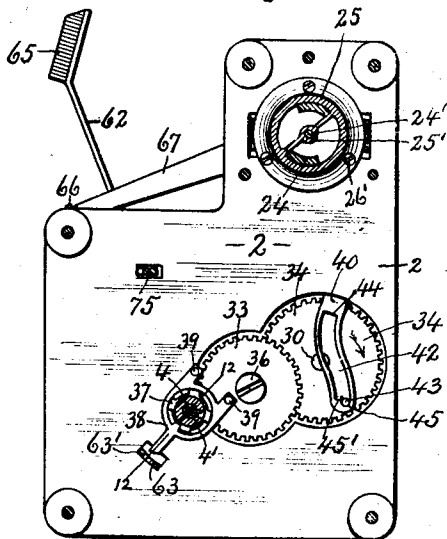


FIG. 2.



WITNESS
H. H. H.

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Benjamin Thompson
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Sept. 27, 1932.

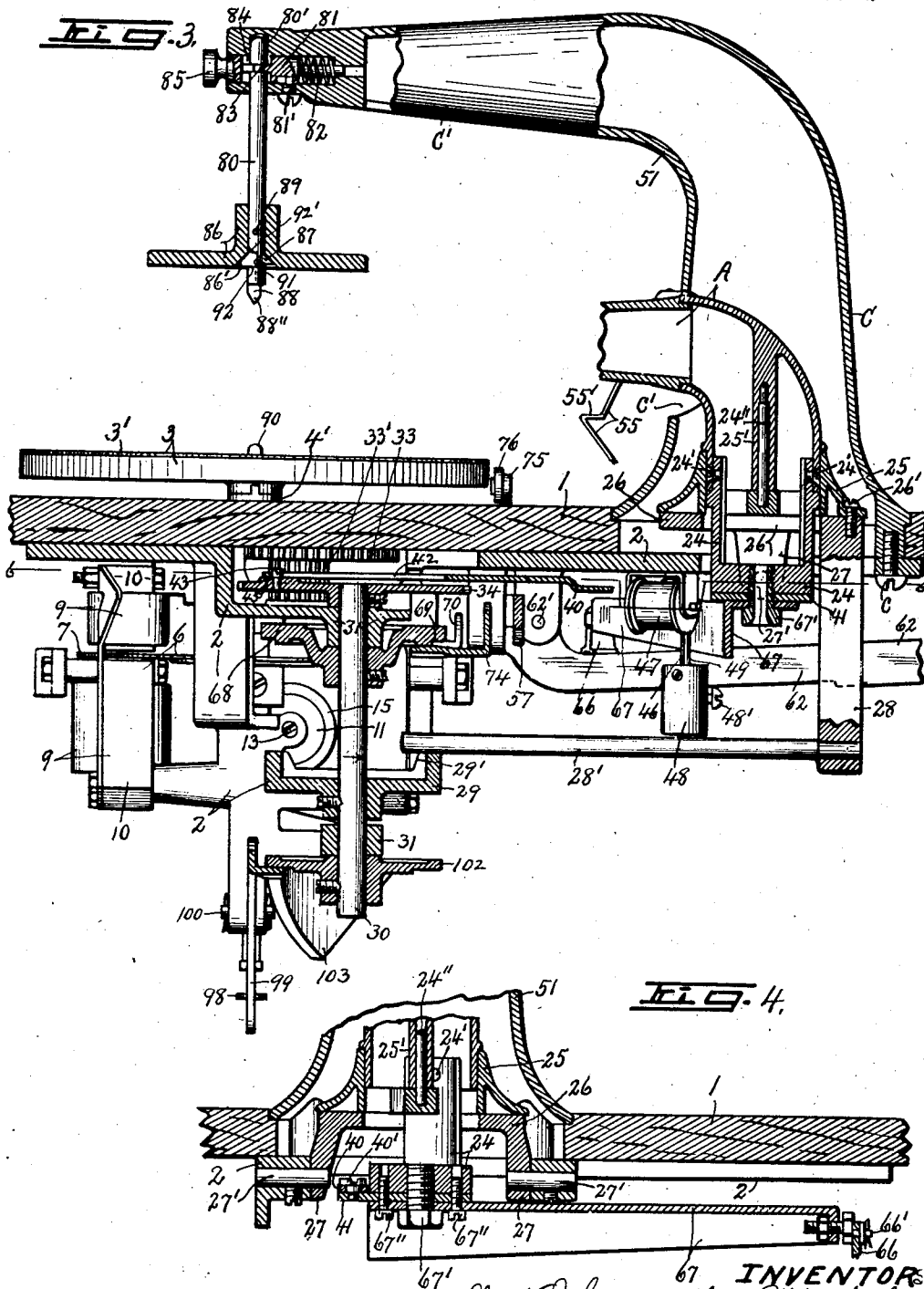
L. E. JOHNSON ET AL

1,879,291

PHONOGRAPH

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6 Sheets-Sheet 2



WITNESS
H. H. H.

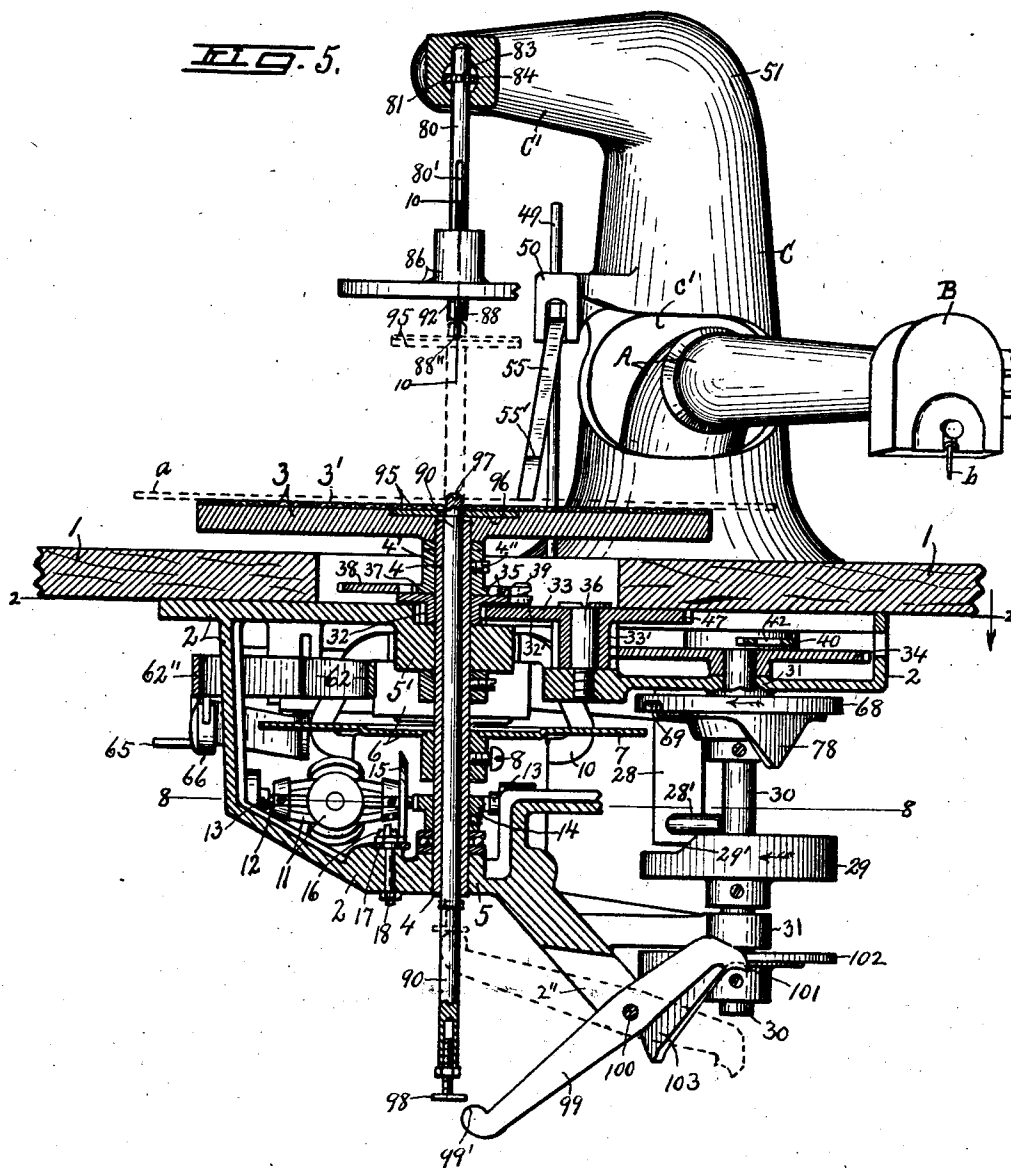
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Filed Sept. 12, 1928

6 Sheets-Sheet 3



WITNESS

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Sept. 27, 1932.

L. E. JOHNSON ET AL

1,879,291

PHONOGRAPH

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6 Sheets-Sheet 4

FIG. 6.

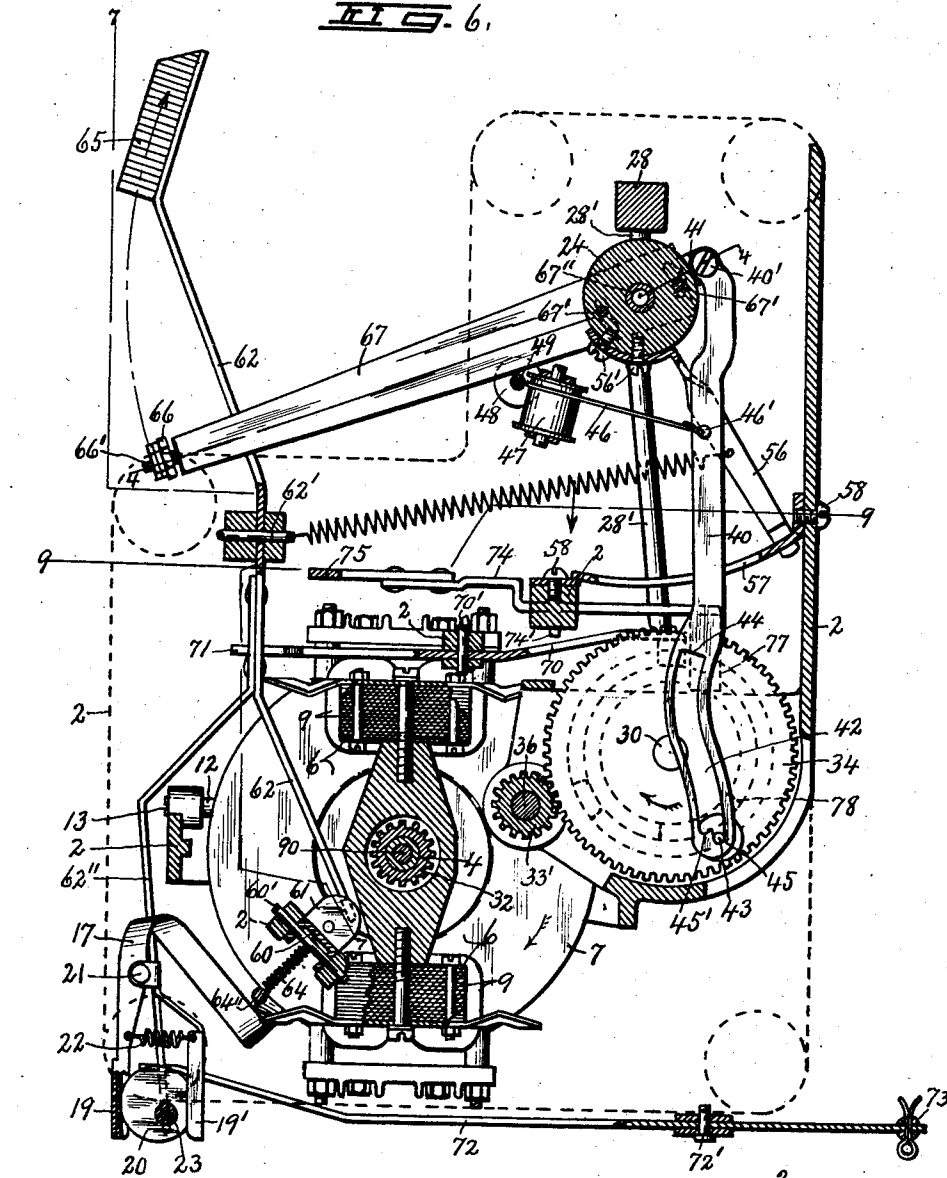
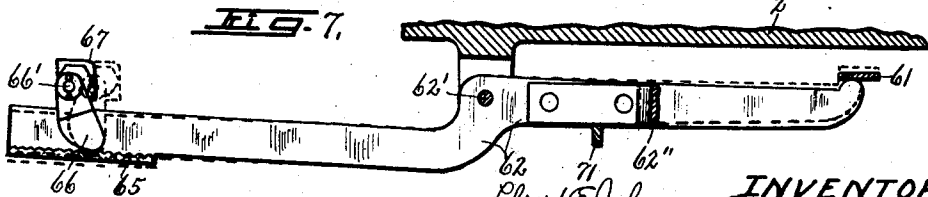


FIG. 7.



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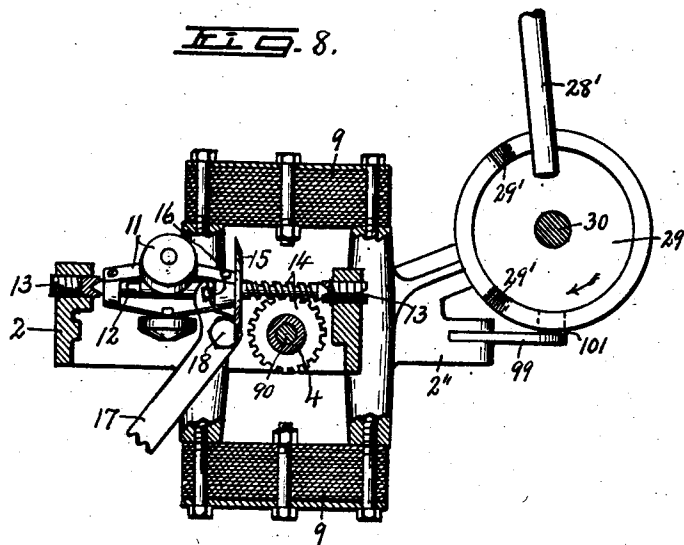
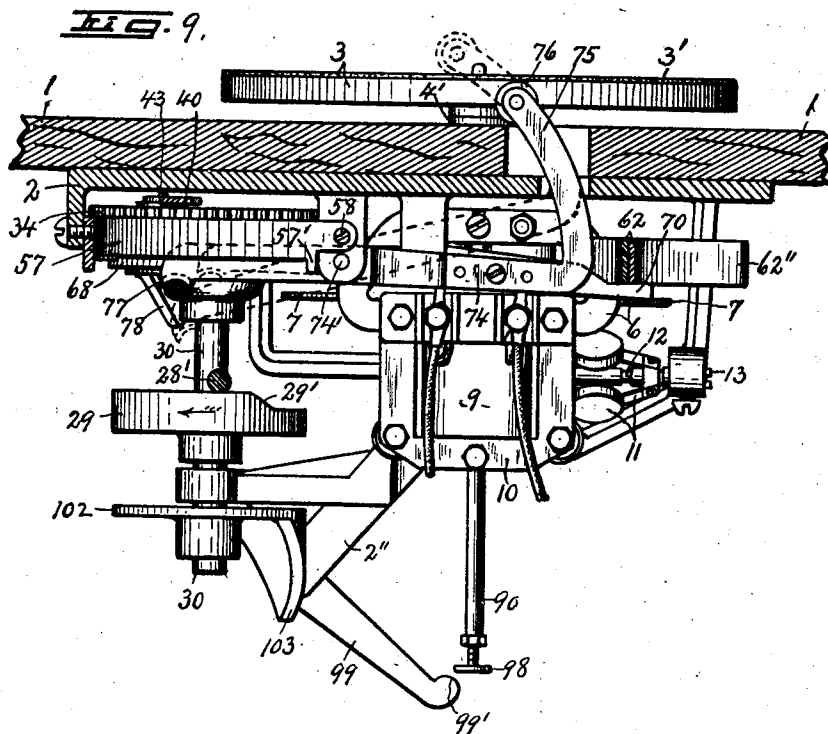
L. E. JOHNSON ET AL

1,879,291

PHONOGRAPH

Filed Sept. 12, 1928

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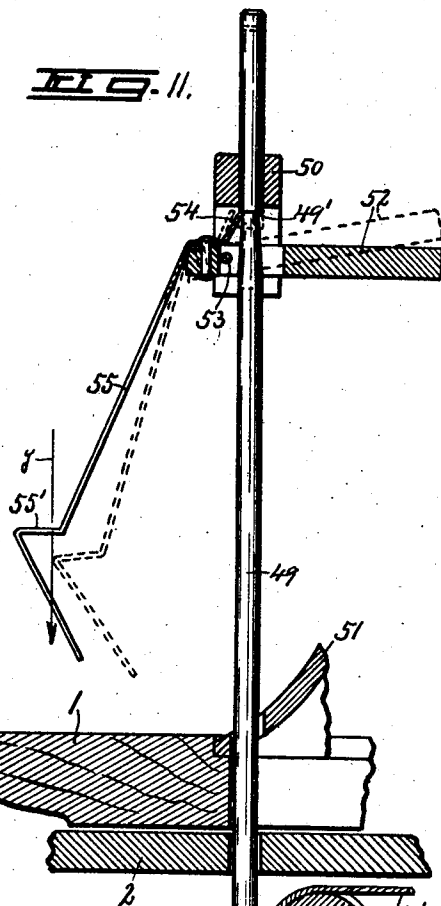
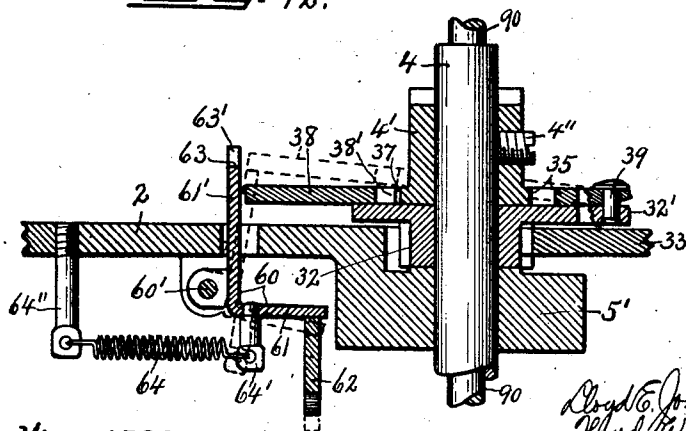


WITNESS.
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1,879,291

6 Sheets-Sheet 6



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UNITED STATES PATENT OFFICE

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PHONOGRAPH

Application filed September 12, 1928. Serial No. 305,380.

This invention relates to a phonograph of the disk-record type and involves broadly; a rotary table for receiving and supporting the individual disks; means for rotating the table with the disk thereon; a tone arm having a suitable reproducer adapted to traverse the record on the disk; means for advancing the tone arm to engage its reproducer with the record on the disk; means for restoring the tone arm to its neutral position; means controlled by the swinging movement of the tone arm at the end of the record for tilting the disk on the revolving table sufficiently to allow said disk to be thrown laterally from the table by centrifugal force; means for supporting one or more additional record disks coaxial with and above the rotary table, and means for transferring the disks one by one from the supporting means to the table, together with other minor but important details of construction coordinated with the mechanisms above described for increasing the efficiency of the machine as a whole.

The main object is to produce a simple, compact and efficient machine of this character in which all of the mechanisms above referred to are entirely automatic in their operations, thus permitting an indefinite number of records to be played in sequence without any manual effort other than the operation of the motor controller at the beginning and ending of the entertainment.

One of the specific objects is to utilize the rotary motion of the table as a part of the means for displacing the records therefrom by centrifugal force immediately following the "run-out" of each record.

Another specific object is to effect the axial transfer of the record-disks from the storage spindle to the table without appreciable noise or impairment of the record.

A further object resides in the production of mechanism automatically actuated by and in accordance with the size of certain record disks for automatically causing the tone-arm to properly adjust itself to the necessary radial distance from the axis of the turn table to bring the needle carried by the tone arm into contact with the beginning of the record

groove, thereby adapting the machine for automatically playing records of varying diameters.

A further object resides in the provision of mechanism brought into operation manually for causing the rejection and discharge of any record from the turn table which the operator does not desire to play, or to continue to play, and to thereby effect the transfer of another record disk to the turn table.

A further advantage resides in the compactness of the apparatus, and more particularly in the fact that the swingable tiltable tone arm is partially positioned within and projects outwardly through the hollow bracket which carries the record-supporting spindle.

A further object resides in the production of a novel clutch mechanism automatically operated at the conclusion of the playing of each record for causing the actuation of mechanism for shifting the tone arm, removing the record, transferring another record to the turn table and then moving the tone arm to initial playing position.

Other objects and uses relating to specific parts of the machine will be brought out in the following description.

In the drawings:

Figure 1 is a top plan of the working unit embodying the various features of the invention.

Figure 2 is a horizontal sectional view on a reduced scale taken in the plane of line 2—2, Figure 5.

Figure 3 is an enlarged vertical sectional view taken in the plane of line 3—3, Figure 1.

Figure 4 is a detail vertical sectional view taken in the plane of line 4—4, Figure 6.

Figure 5 is an enlarged vertical sectional view taken in the plane of line 5—5, Figure 1.

Figure 6 is a horizontal sectional view taken in the plane of line 6—6, Figure 3.

Figure 7 is a detail sectional view, partly in elevation, taken in the plane of line 7—7, Figure 6.

Figure 8 is a detail horizontal sectional

view taken in the plane of line 8—8, Figure 5.

Figure 9 is a vertical sectional view taken in the plane of line 9—9, Figure 6.

Figure 10 is an enlarged detail vertical sectional view taken in the plane of line 10—10, Figure 5, showing a plurality of disks, partly broken away, mounted upon the supporting spindle together with the weighted follower engaging the uppermost disk, the dotted lines indicating the position of the transfer mechanism just after releasing the lowermost disk.

Figure 11 is an enlarged detail vertical sectional view taken in the plane of line 11—11, Figure 1.

Figure 12 is an enlarged detail vertical sectional view taken in the plane of line 12—12, Figure 2.

The associated mechanisms forming the subject matter of the present invention are assembled in properly coordinated relation upon a horizontal supporting plate or shelf —1— to form a unitary article of manufacture capable of being installed in any suitable cabinet or housing, and include in their organization a supporting frame —2— of cast metal or other suitable material having a substantially flat top portion bolted or otherwise secured to the underside of the shelf —1— for receiving and supporting various mechanisms employed in the operation of the machine.

Rotary disk carrier

The individual record disk as —a— to be played is supported upon the upper surface of a rotary circular table —3— which is removably mounted on the upper end of an upright tubular shaft —4— in clutch-engagement with a collar —4'— which is secured to the shaft by a set screw —4''— to rotate the table in a horizontal plane just above the upper surface of the shelf —1—, said table being provided with a padded upper surface —3'— of felt or equivalent material to form a cushion seat to frictionally engage and rotate the disk with the table, the disk —a— being centered upon the table and held against lateral displacement therefrom by a centering pin hereinafter described as a part of the transfer mechanism, see Figures 5 and 12.

The tubular shaft —4— is journaled in vertically spaced lower and upper bearings —5— and —5'— in the frame —2—, Figure 5, and is provided with a central lengthwise guide opening therethrough from end to end for receiving and guiding a vertically reciprocating transfer device hereinafter described.

Any suitable means may be provided for rotating the shaft —4— and for this purpose an electric motor —6—, preferably of the induction type is mounted on the frame —2— and is provided with an armature disk —7—

directly connected to the shaft —4— by means of a set screw —8—, Figure 5, said motor having separate pairs of opposed fields —9— mounted upon the frame —2— at opposite sides of and equal distances from the axis of the shaft —4— with the poles of the fields of each pair in magnetic relation to the armature disk —7— as shown more clearly in Figures 6, 8 and 9.

That is, the motor disk —7— is adapted to revolve in a horizontal plane at right angles to the shaft —4— between the poles of the opposite pairs of field magnets —9— which are mounted in suitable supporting frames —10— adjacent the lower and upper faces of the contiguous portions of the disk —7— as shown more clearly in Figures 3, 5 and 6, the field supporting frames —10— being bolted or otherwise secured to the frame —2— as shown in Figures 6 and 9.

The speed of rotation of the shaft —4— and parts carried thereby is regulated by means of a centrifugal governor —11— operatively mounted upon a horizontal spindle —12— which is journaled in adjustable bearings —13— on the adjacent portion of the frame —2— and is operatively connected by gearing —14— to the upright shaft —4— for receiving rotary motion therefrom as shown more clearly in Figure 8 and partially in Figure 5.

The inner end of the governor —11— is movable axially under the centrifugal movement of governor weights and is provided with a friction disk —15—, adapted to be engaged by a brake shoe —16— on one end of a lever —17— which is pivoted at —18— to the lower portion of the frame —2—, as shown in Figures 5 and 8.

The lever —17— shown more clearly in Figure 6, extends laterally, upwardly and forwardly from the pivot —18— and has its upper forward end bifurcated to form opposite extensions —19— and —19'— for receiving between them an eccentric member —20—, one of the extensions as —19'— being pivoted at —21— to the lever —17— some distance to the rear of the eccentric —20— and is yieldingly connected to the opposite extension by a coil spring —22— for yieldingly holding the extensions —19— and —19'— in engagement with the periphery of the eccentric.

This eccentric is secured to the lower end of a spindle —23— which is journaled in a suitable bearing in the shelf —1— and extends some distance above the upper surface thereof to be operated by hand for rocking the lever —17— about its pivot —18— and thereby varying the position of the brake shoe —16— relatively to the friction disk —15— as may be required to further regulate the speed of rotation of the shaft —4— and table —3— carried thereby.

It is evident, however, that any other suit-

able speed control means may be substituted for that described without departing from the spirit of this invention.

Tone arm

5 A tone-arm —A— of any suitable construction is supported at one end to swing horizontally about a vertical axis and also to swing vertically about a horizontal axis and carries at its other end a reproducer —B—, 10 preferably of the electric vibrator type, adapted to engage the spiral record of the disk on the table —3— thereby causing the tone arm to swing inwardly toward the center of 15 the table in the usual manner as the disk is rotated.

As illustrated, the rear upright portion of the elbow-section of the tone-arm is secured by screws —24'— to an upright hollow extension —24—, both of which are revolvably supported in an upright bearing —25— to permit the tone arm to swing horizontally, said elbow section and bearing being provided with coaxial centering posts —25'— and —24''— 20 telescoping with each other to form additional bearing for the tone arm.

The bearing member —25— is secured by screws —26'— to an underlying coaxial base-ring —26— having diametrically opposite 30 pendant lugs —27— pivoted to adjacent trunnions —27'— on the frame —2— to permit said base and tone-arm carried thereby to tilt vertically for engaging and disengaging the reproducer with and from the record, see 35 Figures 3 and 4.

The upright portion of the tone-arm —A— and its extension —24— together with the bearing member —25— and its supporting base —26— are arranged in relatively larger 40 registering openings in the shelf —1— and frame —2— to permit the compound swinging movements of the tone-arm about the axes of the bearings —25— and —27'— while the opening in the base-ring —26— through 45 which the extension —24— projects is sufficiently large to allow free rotation of the tone arm therein.

The supporting ring —26— for the tone-arm —A— is provided at one side with a 50 pendant arm —28— extending downwardly at the rear and some distance below the lower end of the extension —24— and carrying at its lower end a rigid forwardly projecting rod —28'— adapted to ride upon the upper 55 cam face —29'— of a rotary cam wheel —29— which is secured to the intermediate portion of an upright rotary shaft —30— for controlling the vertical rocking movement of the tone-arm, see Figures 3 and 8.

60 The shaft —30— is journaled in vertically spaced bearings —31— in the frame —2— and is adapted to be driven intermittently by and in synchronism with the shaft —4— through the medium of a train of gears 65 —32—, —33—, —33'— and —34— under the

control of a clutch —35—, Figures 5 and 12.

The gear —32— is loosely mounted on the shaft —4— between the bearing —5'— and collar —4'— to mesh with the gear —33— which, together with the pinion —33'— are 70 loosely mounted on an upright stud —36— on the frame —2— while the gear —34— is secured to the shaft —30— and meshes with the pinion —33'—, Figs. 5 and 12.

The lower end of the collar —4'— is provided with peripheral clutch teeth —37— encircled by a clutch lever —38— which is fulcrumed at one end at —39— to a laterally projecting flange —33'— on the upper end of 75 the pinion —32— at one side of said pinion and its other end extended some distance beyond the opposite side of the pinion and provided with a tooth —38'— movable into and out of engagement with the clutch teeth 80 —37— as the free end of the lever is rocked vertically in a manner presently described, for locking and releasing the pinion —32— to and from the shaft —4— and thereby controlling the rotation of the shaft —30—. 85

The angular movement of the tone arm —A— about its vertical axis is coordinated with its vertical movement in such manner that it is moved from its extreme outer or starting position into position for engaging 90 the needle of its reproducer with the beginning of the record at the time the cam wheel —29— will be in position to allow the tone arm to tilt downwardly to engage the needle with the record which then continues the angular movement of the tone arm to the 95 end of the record.

Immediately preceding the tilting of the tone arm to engage its needle with the record, the clutch lever —38— is disengaged 100 from the clutch teeth —37— of the collar —34'— thereby stopping the rotation of the shaft —30— and parts carried thereby with the rod —28'— resting on the lower side of the cam wheel —29— and this relation is maintained during the playing of the record 105 or until the needle of the tone arm reaches the end of the record at which time the needle automatically rides from the record into engagement with an eccentric groove surrounding the axis of the record thereby causing 110 more or less rapid angular vibration of the tone arm.

This more or less rapid angular vibration of the tone arm brings into action mechanism by which the clutch lever —38— is allowed 115 to drop by its own weight into engagement with the clutch teeth —37— of the collar —4— for again rotating the shaft —30— and parts carried thereby which causes the cam wheel —29— to tilt the tone arm upwardly 120 away from the record ready for returning the tone arm to its starting position by a mechanism presently described.

As illustrated, the means for effecting this angular movement of the tone arm from its 125 130

starting position into position for engaging its needle with the record and for returning the tone arm to its starting position at the end of the run-out of the record comprises a horizontal longitudinally movable pitman-link —40—, Figure 6, having its rear end pivoted at —40'— to a relatively short crank arm —41— on the lower end of the extension —24— Figure 4 of the tone arm and having its other end extended across the upper face of the gear —34— Figure 3 and provided with a lengthwise slot —42— for receiving a pin —43— which is eccentrically secured to the upper face of said gear for orbital movement about the axis thereof, see Figures 2, 3, 4 and 6.

The rear end of the slot —42— is closed to form a shoulder —44— at the rear side of the axis of the shaft —30— to be engaged by the crank pin —43— as the gear —34— is rotated in the direction indicated by the arrow for returning the tone arm from its extreme innermost position at the end of the record to its outer starting position immediately following the lifting of the tone arm from the record by the cam —29—.

The front end of the slot —42— is also closed and provided with transversely spaced shoulders —45— and —45'— at the front side of said axis and at different distances from the shoulder —44— for engagement by the crank pin —43— to vary the arc of movement of the tone arm from its starting position to its record engaging position as may be required for records of different diameters.

That is, the records to be played may vary in diameter from ten inch to twelve inch and vice versa and, therefore, the angular movement of the tone arm from its starting position to its record engaging position for a twelve inch record is less than that required for a ten inch record and the engagement of the crank pin —43— with the shoulder —45— farthest from the shoulder —44— causes less endwise movement of the link —40— and consequently less angular movement of the tone arm than would be the case if the pin —43— engaged the other shoulder —45'— and is used for effecting the lesser angular movement of the tone arm for the twelve inch records.

On the other hand, the engagement of the pin —43— with the shoulder —45'— which is at a less distance from the shoulder —44— than the shoulder —45— causes a greater endwise movement of the link —40— and resultant greater angular movement of the tone arm to conform to the requirements for the ten inch records.

This angular movement of the tone arm takes place only when the shaft —30— with the gear —34— thereon is rotated in the direction indicated by the arrow, Figure 6, the mechanism being normally adjusted to effect the maximum angular movements of the tone

arm for ten inch records in which case the pin —43— is adapted to engage the shoulder —45'— for effecting the maximum lengthwise movement of the link —40— and tone arm —A— from its starting position to its record engaging position but in case the twelve inch record is to be played means is provided for slightly shifting the link —40— upon its pivot —40'— to cause the pin —43— to engage the shoulder —45—.

For this latter purpose a cord or cable —46— is passed over a horizontal drum —47— which is journaled on the underside of the frame —2— some distance to the inner side of the link —40—, said cable having one end attached at —46'— to the intermediate portion of the link —40— between the pivot —40'— and shoulder —44— and its other end operatively connected to a weight —48— which is secured by a set screw —48'— to the lower end of an upright rod —49— as shown more clearly in Figures 6 and 11.

The rod —49— is guided in vertical spaced openings in the frame —2— and a lug —50— on an upwardly projecting hollow bracket —51— which is secured to the shelf —1— to extend upwardly therefrom and around the elbow section of the tone arm —A— as shown more clearly in Figures 1, 3, 5, 6 and 11.

A weighted lever —52— is pivoted near one end at —53— to the lug —50—, Figure 11, to rock vertically to and from a substantially horizontal position and has its shorter arm provided with a detent —54— normally engaging an annular shoulder —49'— on the upper portion of the rod —49—, Figure 11.

The longer arm of the weighted lever —52— is sufficiently heavy to normally hold the detent —54— in engagement with the shoulder —49'—. The shorter arm of the lever —52— is also provided with a downwardly and inwardly projecting spring arm —55— having a horizontal offset portion —55'— in a plane between the top of the table —3— and lowermost record disk —a— on the storage spindle hereinafter described, said offset portion —55— being disposed in the path of movement of the outer edge of the twelve inch records to be engaged thereby as the records are transferred from the storage spindle to the table —3—.

In other words, the offset —55— is disposed in a vertical plane some distance beyond the adjacent edges of the ten inch records to allow the latter to be transferred from the storage spindle to the table —3— without contact therewith, the lower end of the spring arm —55— below the offset portion —55'— being inclined downwardly and outwardly beyond the periphery of the twelve inch records so as to permit the latter to be lifted from the table without abrupt contact with the offset portion —55'—, it being understood that the member —55— is not only resilient but that it is free to move inwardly against

the action of the weighted end of the lever —52—.

When a twelve inch record is being transferred from the storage spindle to the table —33— its outer edge engages the ledge —55'— thereby rocking the weighted end of the lever —52— upwardly resulting in the tripping of the detent —54— and thus permitting the rod —49— with the weight —44— thereon to drop by gravity.

This descent of the rod —49— and weight —48— operates the cord —46— over the roller —47— to draw the slotted end of the link —40— inwardly thereby causing the pin —43— during its rotation with the gear —34— to ride against the outer wall of the slot —42— and thereby to assure the engagement of the pin —43— with the shoulder —45— as the gear continues its rotation.

As the pin —44— continues to rotate from the position shown in Figure 6 in the direction indicated by the arrow it will be brought against the upper end of the outer wall of the slot —42— in the link —40— thereby rocking said link toward the right hand of said figure about its pivot —40'— to cause a corresponding movement of the cord or cable —46— and rod —49— for raising said rod against the action of its weight —48— sufficient to cause its shoulder —49'— to be engaged with the detent —54— which is forced into engagement with said shoulder by the weighted arm —52— thereby placing the shoulder —55'— of the arm —55— in position to receive the twelve-inch records.

On the other hand, when the rod —49— and link —48— are held in their upward position by engagement of the detent —54— with the shoulder —49'— on the rod —49— the tension of the cord —46— will be released thereby releasing the inward draft upon the lever —40— so that as the pin —43— revolves downwardly below the horizontal plane of the axis of the shaft —30— it will engage the inner wall of the slot —42— and then ride into engagement with the shoulder —45'— for effecting the initial angular movement of the tone arm from its starting position into engagement with the record of a ten inch disk.

A stop arm —56— is secured at one end by screws —56'— to the extension —24— of the tone arm, Figure 6, and has its other end extended forwardly and radially upon a curved segment —57— and movable into and out of engagement with stop shoulders —57'— near the ends of the segment as shown in Figure 9 for limiting the angular movement of the tone arm, the segment —57— being concentric with the axis of the extension —24— and secured by screws —58— to the frame —2— as shown in Figure 6.

The shoulders —45— and —45'— are arranged in such relation to the shoulder —44— and to the crank pin —43— as to cause said crank pin to first move the link —40— end-

wise from its starting position shown in Figure 6 and thereby to effect a corresponding angular movement of the tone arm from its starting position into position for engagement with the beginning of the record of the disk —a— on the revolving table —3—, this movement being effected by the engagement of the crank pin —43— with one or the other of the shoulders —45— or —45'— according to the diameter of the disk to be played.

After the crank arm has completed its initial angular movement as just described the shaft —30— and parts carried thereby including the crank pin —43— will be brought to rest by the tripping of the clutch lever —38— and these parts will remain at rest while the record is being played but immediately following the run-out of the record, at which time the tone arm will have reached approximately the limit of its inward movement, the shaft —30— and parts carried thereby will be again rotated to cause the crank pin —43— to engage the shoulder —44— and thereby to restore the tone arm to its starting position ready for a repetition of the operations of the tone arm.

The shaft —30— and parts carried thereby are rotated one revolution at a time and are stopped at the end of such revolution but in Figure 6 the gear —34— is shown as just about to complete its revolution but has not yet been stopped, the remaining part of the revolution being employed for returning the tone arm from its extreme outward position shown in Figure 6 to its record engaging position.

During this initial inward movement of the tone arm the high part of the cam wheel —29— will have moved out of registration and the low side of the cam will have moved into registration with the rod —28'— to permit the downward tilting movement of the rod —28'— thereon and resultant downward tilting movement of the tone arm to bring the needle —b— into engagement with the record.

While the low side of the cam —29— is still registered with the rod —28'— suitable mechanism including the clutch lever —38— will be automatically brought into action to interrupt the further rotation of the shaft —30— during the complete run-out of the record or until the tone arm reaches its extreme limit of inward angular movement.

As the tone arm is moved from its extreme outer position to its extreme inner position the link —40— will be moved forwardly to bring its shoulder —44— nearer to the axis of the gear —34— ready to be engaged by the pin —43— during the next cycle of rotation of the shaft —30— for restoring the tone arm to its record engaging position.

The means for holding and tripping the clutch lever —38— and also the means for locking and releasing the shaft —30— and

parts carried thereby are coordinated in such manner that immediately upon the engagement of the clutch lever —38— with its companion clutch —37— the locking member for the shaft —30— will be released to allow the rotation thereof and parts carried thereby.

Clutch control

A bell crank lever —60—, Figures 6 and 12, is pivoted at 60' to the underside of the frame —2— to swing about a horizontal axis and has one of its arms —61— extended horizontally beneath the frame to be engaged by an operating lever —62— and its other arm —61'— extended through an opening in the frame —2— and movable into and out of the path of movement of the outer end of the clutch lever —38— to automatically trip the latter from its clutch engaging position at the beginning of the playing of the record and to hold said clutch lever in its inoperative position during the playing of said record and also to automatically release the clutch lever to permit it to return to its clutch-engaging position at the end of the run-out of the tone arm on the record.

For this purpose the upper end of the arm —61'— is provided with a curved cam face —63— along and upon which the outer end of the clutch lever —38— is adapted to ride when the arm —61'— is moved into the path of the outer end of the lever —38—, said arm —61'— being provided with a stop shoulder —63'— adapted to be engaged by the outer end of the clutch lever —38— to limit the angular movement of said clutch lever about the axis of the shaft —4— as soon as it has been tripped from its clutch engaging position as shown by dotted lines in Figure 12.

The bell crank arm —61'— is normally spring pressed toward the outer end of the clutch lever —38— by means of a coiled spring —64— having one end connected to a post —64'— on the arm —61— of the lever —60— and its other end connected to a stationary post —64''— on the underside of the frame —2— as shown in Figure 12.

The operating lever —62— extends forwardly and rearwardly of the machine and is pivoted intermediate its ends at —62'—, Figures 6 and 7, to the underside of the frame —2—, the front end of said operating lever being extended directly under the arm —61— of the bell crank lever —60— while the rear end is provided with a laterally projecting flange —65— having a serrated or roughened upper surface adapted to be engaged by a rubber tip cam-shaped rider —66— on the outer end of a crank arm —67— which is secured by clamping screws —67'— to the lower end of the extension —24— of the tone arm as shown more clearly in Figures 4 and 6.

The cam rider —66— is pivoted at —66'— to the outer end of the crank arm —67— to swing freely about a horizontal axis and has

its lower end preferably made of soft rubber which is of sufficient weight to cause it to trail with an oscillatory motion from the roughened upper surface of the flange —65— as the crank arm —67— is oscillated back and forth by the corresponding oscillatory movement of the tone arm when its reproducer needle as —b—, Figure 5, is engaged with the usual eccentric groove in the upper face of the record at the end of the playing operation of each record.

The inner end of the crank arm —67— and also the relatively shorter crank arm —41— are additionally clamped to the lower face of the extension —24— of the tone arm by a central pivotal screw —67''—, the screw holes in the crank arms —67— and —41— for receiving the clamping bolts —67'— being elongated circumferentially to permit limited circumferential adjustments of said crank arms as may be required for properly timing the angular movements of the tone arm and tripping of the clutch lever —38—.

The crank arm —67— is shown in Figure 6 in the position it assumes when the tone arm is at the limit of its outward swinging movement while the serrated flange —65— on the lever —62— is in about the position which the rider —66— on the crank arm —67— assumes when the tone arm is at the limit of its inward movement or at the end of the playing of the record with the needle —b— in engagement with the eccentric groove in the record disk.

This engagement of the needle —b— with the eccentric groove in the revolving record disk causes more or less rapid angular oscillation of the tone arm —A— and crank arm —67— thereby causing the cam —66— to ride upon the serrated upper face of the flange —65— to produce corresponding oscillation of the lever —62— about its pivot —62'—.

This oscillation of the lever —62— causes its front end to engage the arm —61— of the bell crank lever —60— for forcing the other arm —61'— out of the path of the outer end of the clutch lever —38— thereby allowing the clutch lever to drop by its own weight into engagement with the clutch teeth —37— of the collar —4'— for rotating the gear train and thereby rotating the shaft —30— and parts carried thereby for returning the tone arm to its starting position and also effecting the initial angular movement of the tone arm inwardly from its starting position a sufficient distance to engage its needle —b— with the beginning of the record on the table —3— ready for a repetition of the playing operation on another record.

Means is provided for stopping the rotation of the shaft —30— and parts carried thereby as soon as the tone arm has been shifted from its extreme outward position to its record engaging position and for this

purpose the shaft —30— is provided with a disk —68—, Figures 3 and 5, having a notch or recess —69— in its underside opening through the periphery thereof, Figure 5, for receiving one end of a horizontal laterally extending locking lever —70— which is pivoted intermediate its ends at —70'— Figure 6 to the underside of the frame —2— to rock vertically and has its other end —71— extended beneath and in close proximity to the underside of the operating lever —62— between the pivot —62'— and bell crank lever —60— for causing the outer end of the lever —70— to enter the notch —69— in the disk —68— immediately following the operation of the bell-crank-lever —60— to its clutch lever tripping position.

That is, the more or less rapid oscillatory motion of the lever —62— is utilized to transmit similar oscillatory motion to the bell-crank-lever —60— to assure the position of the arm —61'— of the bell-crank-lever in the path of the outer end of the then revolving clutch lever —38— so that the latter may ride upon the cam surface —63— on the arm —61'— to trip the clutch lever.

At the time of the tripping of the clutch lever —38— the front end of the lever —62— will have been forced downwardly by the action of the cam rider —66— on the roughened surface of the flange —65— of the lever —62— thereby causing the intermediate portion of the lever —62— to engage and depress the underlying portion of the locking lever —70— and causing the other end of the locking lever to be forced into the notch —69— as soon as said notch is registered with the locking end of the lever —70—.

These operations are timed to take place at the end of each revolution of the shaft —30— and parts carried thereby or at the instant the tone arm is moved inwardly from its extreme outer position to its record engaging position.

The cam surfaces —29'— Figures 8 and 9 are arranged in circumferentially spaced relation, one of the cam surfaces being arranged to allow the tone arm to drop into engagement with the record as the tone arm approaches its inward movement from its extreme outward position to its record engaging position and to bring the other cam —29'— into close proximity to the rod —28— at about the time the locking lever —70— Figures 3 and 6 is forced into locking engagement with the notch —69— Figures 3 and 5 on the disk —68— so that as soon as the tone arm finishes its record run-out the last-named cam —29'— will be in position to immediately engage the rod —28'— for raising the tone arm out of engagement with the record when the locking lever —70— is released from its locking position in the manner previously described.

The arm —61'— of the bell-crank-lever

—60— is normally in position to trip the clutch lever —38— as shown by dotted lines in Figure 12 during the playing of the record thereby causing the arm —61— of the bell-crank-lever —60— to depress the front end of the operating lever —62— by reason of the action of the spring —64—.

It, therefore, follows that if the bell-crank-lever —60— is rocked from its normal position shown by dotted lines in Figure 12 to the position shown by full lines it will release the clutch lever —38— for engagement with its companion clutch teeth —37— to cause the angular movement of the tone arm through the medium of the gear train and link —40—.

Suitable means is provided for effecting this release operation of the bell-crank-lever —60— at the will of the operator and for this purpose the lever —62— is provided with a forwardly extending branch —62'— adapted to be engaged by one end of a hand lever —72— which is pivoted intermediate its ends at —72'— to the underside of the frame —2— and has its other end provided with operating button —73— extending through an opening in the adjacent portion of the shelf —1— as shown more clearly in Figures 1 and 6 whereby the depression of the button —73— will lift the other end of the lever —72— and front end of the lever —62— to cause the latter to engage and trip the bell-crank-lever —60— out of the path of movement of the clutch lever —38— to allow the latter to drop to its clutch engaging position which, in turn, causes the operation of the gear train and shaft —30— to return the tone arm to its starting position.

Record displacer

Suitable means is provided for automatically displacing the played record from the table —3— immediately following the return of the tone arm —A— to its starting position.

For this purpose a lever —74—, Figure 9, is pivoted intermediate its ends at —74'— to rock vertically about a horizontal axis in a plane at one side of the record supporting table —3— and having one end provided with an upwardly extending arm —75— carrying a roller —76— which is movable across one side of the periphery of the table —3— in slightly spaced relation thereto but in the path of the overhanging portion of the record upon the table, it being understood that the table is of less diameter than the record to enable the roller —76— to engage the underside of the record as the arm —75— is raised from its normal position.

The other arm of the lever —74— is provided with a lateral offset —77— projecting beneath the marginal edge of the disk —68— and adapted to be engaged by a V-shaped cam —78— on the underside of said disk

as shown more clearly in Figures 5, 6 and 9.

The arm —75— of the lever —74— is movable vertically through registering openings in the shelf —1— and frame —2— for tilting
 5 the revolving record disk on the table —3— out of engagement with its centering pin and thereby allowing the record disk to be thrown laterally from the table by centrifugal force against a padded deflector plate —79—
 10 which is secured to the upper surface of the shelf —1— some distance to the rear of the revolving table —3— and record carried thereby Figure 1 so that as the record is thrown from the revolving table by cen-
 15 trifugal force its periphery will roll against the deflecting plate —79— which, in turn, not only checks the centrifugal movement of the disk but deflects it laterally to a suitable receptacle, not shown, for reuse when
 20 desired.

The record-displacing operation of the lever —74— is timed to take place immediately following the run-out of the tone-arm on the record and inasmuch as the displac-
 25 ing of the record is substantially instantaneous the cam —78— is made relatively short but abrupt peripherally to permit the lever —74— to return to its starting position immediately following the displacing opera-
 30 tion.

It, therefore, follows that the movement of the cam —78— which rotates with the shaft —30— will be coordinated with the operating mechanism for the tone arm in
 35 such manner as to effect the displacement of the played record from the table —3— immediately upon the return of the tone arm to its starting position at which time the space above the table —3— is free from ob-
 40 structions to permit free displacement of the record from and the replacement of an additional record upon the table.

Record transfer

Immediately following the displacement
 45 of the played record from the table —3— and while the tone arm is still in its extreme outward position a new record is automatically placed upon the table by a suitable mechanism which is also coordinated with the rec-
 50 ord displacing means and also with the tone arm operating means in a manner presently described.

The hollow bracket —51—, previously
 55 mentioned, is angular and comprises a hollow upright portion —C— and a horizontal portion —C'—, the upright portion —C— being secured by screws —c— to the frame —2— and shelf —1— to extend upwardly
 60 some distance above the shelf and to inclose the elbow section of the tone arm —A— in spaced relation thereto as shown more clearly in Figure 3, the front side of the upright por-
 65 tion —C— being provided with a laterally elongated opening —c'— through which the
 35 horizontal portion of the tone arm —A— ex-

tends, said opening —c'— being of sufficient size to permit free angular movement of the tone arm without contact with any portion of the bracket —51—, see Figure 3.

The upper horizontal portion —C'— of 70 the hollow bracket —51— extends forwardly across the produced axis of the table —3— but in a plane some distance above said table for receiving and supporting a record-sup-
 75 porting spindle —80— which extends down- wardly from the front end of the supporting arm —C'— coaxial with the axis of the work table —3— as shown in Figures 1, 3 and 5.

The record spindle —80— is removably supported in an upright bearing —80'— in 80 the front end of the arm —C'— and is normally held against downward displacement by a sliding pawl —81— movable in a length- wise guide opening in the arm —C'— and normally spring pressed by means of a coiled
 85 spring —82— into an annular groove —83— in the adjacent portion of the spindle —80—, said sliding pawl having a lengthwise slot —84— through which the spindle extends and is provided at its forward end with a
 90 finger piece —85— by which the pawl may be pressed inwardly against the action of the spring —82— to release the pawl —81— from engagement in the groove —80— and thereby
 95 to permit the downward displacement of the spindle —80— when desired, see Figure 3, said plunger being held against outward dis-
 100 placement by a stop screw —81'— engaging in a lengthwise slot in the lower side of the plunger, Figure 3.

A weighted follower —86— is slidably and
 105 rotatably mounted upon the spindle —80— and is provided with a central conical recess —86'— in its lower side adapted to receive a radially projecting stop shoulder —87— on
 110 the lower portion of the spindle to prevent downward displacement of the follower when the records are removed from the storage spindle —80— and also to assist in preventing
 115 displacement of the records downwardly from said spindle until released by a controlling pawl —88—, Figure 10. This pawl —88— is slidable vertically in a lengthwise
 120 groove —80'— in the spindle —80— and is provided with a lengthwise slot —88'—
 125 closed at both ends for receiving a stop pin —89— which serves to limit the vertical sliding movement of the pawl —88— by en-
 130 gagement with the ends of the slot —88'—.

The pawl —88— is arranged to slide freely
 135 in the groove —80'— and to drop by its own weight to its lowermost position with its lower end normally projecting beyond the lower end of the spindle —80— and termi-
 140 nating in a pointed extremity —88''—, Fig- ures 3 and 10, for engagement with the upper end of a transfer spindle —90—, presently described.

The guide groove —80'— for the pawl
 145 —88— is open at one side of the spindle

—80— from the bottom upwardly some distance beyond the upper end of the pawl which is of substantially the same radial width as the width of the groove —80— so that its outer edge may coincide with the corresponding edge of the spindle for engagement with the adjacent wall of the guide opening in the hub of the follower —86— to assist in guiding the pawl in its vertical movement relatively to the spindle.

The lower end of the spindle is adapted to receive and support a plurality of, (any reasonable number) the record disks —a— which are provided with central circular apertures of slightly larger diameter than that of the spindle —80— to permit the record disks to be easily placed upon and displaced from the spindle in a manner presently described, see Figure 10.

The outer side of the spindle —80— opposite the stop shoulder —87— is provided with a recess —91— forming shoulders —92— and —92'— in vertically spaced relation corresponding approximately to the combined thicknesses of three or four of the record disks —a— temporarily stored upon the spindle —80—, for receiving adjacent inner portions of the disks as they are successively displaced downwardly from the spindle, see Figures 3, 5 and 10.

The shoulder —87— projects laterally from the periphery of the spindle a distance corresponding approximately to the radial depth of the recess —91—, Figures 3 and 10, so that the combined radial depths of the projection —87— and inner wall of the recess —91— are approximately equal to the diameter of the spindle, the upper face of the shoulder —87— being beveled upwardly and inwardly while the shoulder —92— at the lower end of the recess is disposed in a plane at substantially right angles to the axis of the spindle for engaging and supporting the lowermost record —a—.

In like manner the edge of the pawl —88— opposite the stop shoulder —87— is provided with the lengthwise recess —93— of substantially the same length and radial depth as the recess —91— to normally register with the last-named recess when the pawl —88— is in its lowermost position, the lower end wall —94— of the recess —93— being beveled outwardly and downwardly to form a cam surface whereby when the pawl —88— is raised the lowermost disk —a— will be shifted laterally to disengage it from the shoulder —92— of the spindle and thereby to allow the lowermost record disk to drop downwardly from the lower end of the spindle while the next succeeding disk will automatically drop into the position occupied by the previously displaced disk.

The cam shoulder —87— is disposed in a plane above the shoulder —92— a distance somewhat greater than the thickness of one

of the record disks and between the lower and upper ends of the recesses —91— and —93— so that as the disks —a— above the shoulder —87— are fed downwardly along the spindle by their own weight aided by the weight of the follower —86— they are automatically deflected laterally by the shoulder —87— thereby causing the opposite walls of the apertures in the disks to enter the recesses —91— and —93—.

Under these conditions the lowermost disk will rest upon the shoulder —92— and will thereby serve to support the superposed disks against relatively downward movement until the pawl —88— is moved upwardly at which time the cam face —94— on the pawl —88— will engage the adjacent wall of the central aperture of the lowermost disk for moving the same laterally until its aperture is registered with the lower end of the spindle thus permitting the automatic downward displacement of the lowermost disk from the spindle, it being understood that the remaining superposed disks will gradually feed downwardly by their own weight aided by the follower —86— and will be successively held against displacement from the lower end of the disk by the stop shoulder —92— until released by successive upward movements of the pawl —88— by the operating spindle —90—, previously mentioned.

The spindle —90— extends entirely through the tubular table-supporting shaft —4— and some distance beyond the lower and upper ends thereof, the upper end of the spindle being provided with a supplemental table —95— of relatively smaller diameter than but coaxial with the main record supporting table —3—, said supplemental table being adapted to normally rest in a central circular recess —96— in the upper face of the table —3— as shown more clearly in Figure 5.

This supplemental table —95— is of substantially the same thickness as the recess —96— and is provided with a padded upper surface similar to the surface —3'— and normally in the same horizontal plane so that the record when being played may rest firmly upon both of the tables —3— and —95—.

The upper end of the spindle —90— projects a sufficient distance above the upper end of the supplemental table —95— to form a centering pin adapted to enter the central apertures of the record disks for holding them coaxial with the table —3— against lateral displacement and is provided with a central V-shaped recess —97— Figure 5 adapted to engage the pointed lower end —88'— of the pawl —88— as the spindle —90— with the supplemental table —95— thereon is raised to its record receiving position shown by dotted lines in Figure 5 and also in Figure 10.

The spindle —90— with the supplemental table —95— carrying a record disk —a— is

adapted to move downwardly to its normal position by its own weight under suitable control of the lifting mechanism presently described.

5 The lower end of the spindle —90— is provided with a vertically adjustable tappet —98— adapted to be directly engaged by one end of a lever —99— which is pivoted at —100— to an extension —2"— of the frame
10 —2—, Figure 5, and has its other end provided with a lateral offset —101— normally bearing against the lower face of a cam plate —102— on the lower end of the shaft —30—
15 and adapted to be engaged by a V-shaped cam —103— projecting downwardly from the cam plate —102— near the periphery thereof as shown in Figures 3, 5 and 9, said cam plate being secured to the shaft —30— to rotate therewith.

20 The inner end of the lever —99— is curved at —99'— to engage the lower face of the tappet —98— as it is rocked upwardly by the action of the cam —103— on the offset —101— on the outer end of the lever as shown
25 by dotted lines in Figure 5.

The cam —103— and lever —99— are arranged to move the spindle —90— with the supplemental table —95— thereon upwardly a distance sufficient to engage the upper recess —97— of the spindle —90— with the lower pointed end of the pawl —88— and to lift said pawl a distance sufficient to release the lowermost record disk —a— from the lower end of the storage spindle —80— in the manner presently described so that the released record can be supported upon the supplemental table —95—.

30 Immediately upon the transfer of the lowermost record from the storage spindle —80— to the supplemental table —95— the spindle —90— and supplemental table —95— with the transferred record thereon are lowered by their own weight but controlled by the recession of the cam —103— from engagement with the offset —101— until the supplemental table —95— and disk carried thereby are brought into engagement with the upper surface of the table —3—.

35 This transfer of the disk is effected almost instantly and immediately following the displacement of the previously displaced record from the table —3— in the manner previously described.

40 The cam —103— is, therefore, arranged and timed to effect the transfer of the record from the storage spindle —80— to the table —3— immediately following the angular movement of the tone arm —A— from the end of its playing position to its extreme outer position so that the transfer may be made without in any way interfering with the tone arm.

45 The motor —6— and vibrator of the reproducer —B— may be electrically connected to any suitable source of current supply not

shown, through the medium of an electric switch —S— shown diagrammatically in Figure 1 is provided with a self-opening operating lever —s— and a detent —s'— for holding the lever —s— in its switch closing position, said detent being adapted to be operated by hand for releasing the switch lever —s—.

Operation

Assuming that the storage spindle —80— 75 is loaded with a plurality of ten inch and twelve inch records, the outlines of which are indicated by the vertical lines —x— and —y— respectively in Figure 11 and that the table —3— with a record thereon is being rotated at a certain speed determined by the position of the governor controlling eccentric —20—, Figure 6, and that the tone arm —A— has been shifted from its extreme outward position shown in Figures 1 and 5 into position to engage its needle —b— with the record of the record disk —a— on the table —3—, then under these conditions the shaft —30— and cam disks —29—, —68— and —102— thereon will be at rest and the tone arm will be gradually shifted by the record to the inner end thereof.

At this time the trailer —66— on the outer end of the crank —67— will have been brought into contact with the flange —65— on the lever —62— and at the same time the needle —b— will have been brought into engagement with the eccentric groove on the revolving disk —a— on the table —3— for producing more or less rapid angular oscillation of the crank arm —67— and incidentally causing the trailer —66— to ride against the roughened surface of the flange —65— for imparting similar vertical oscillation to the lever —62—.

These oscillations of the lever —62— cause the front end of the lever to operate the arm —61'— of the bell-crank lever —60— out of holding engagement with the clutch lever —38— which then drops by its own weight into engagement with the clutch —37— to cause the rotation of the shaft —30— and parts carried thereby through the medium of the interconnecting gear train, it being understood that the raising of the front end of the lever —62— releases the lever —70— and allows it to disengage from the notch or recess —69— in the disk —68—.

Immediately following this tripping of the clutch lever —38— rotary motion is transmitted from the motor shaft —4— to the shaft —30— thereby causing the cam —29— to rock the tone arm upwardly away from the record through the medium of the rod —28'— on the lower extension of the tone arm.

Immediately following this raising of the tone arm the latter will be shifted from its innermost position to its extreme outer posi- 120

tion and return to its record engaging position by the engagement of the eccentric pin —43— with the shoulder —44— of the lever —40— and then the re-engagement of the pin —43— with the shoulder —45— or —45'— according to the diameter of the record which is to be played.

As soon as the tone arm has been returned to its extreme outer position the cam —78— operates the lever —74— to tilt the record upon the table —3— sufficiently to clear the centering pin —97— thus permitting the record to be thrown from the table to one side thereof by centrifugal force, the arm —74— being instantly returned to its starting position.

As soon as the roller —76— on the lever —74— is withdrawn below the top of the table the cam —103— operates the lever —99— to force the spindle —90— upwardly into engagement with the pawl —88— thereby raising said pawl and allowing the lower record —a— to be deposited therefrom on to the upper surface of the supplemental table —95— in the manner previously described, the spindle —90— being then returned to its starting position for depositing the record upon the table —3— ready for a repetition of the operations previously described.

Immediately following the release of the clutch lever —38— to its clutch engaging position at the end of the run-out of the tone arm on the record, said clutch lever is rotated out of the path of the arm —61— of the bell-crank-lever —60— which is then returned to its innermost position shown by dotted lines in Figure 12 by the spring —64—.

Then, as the clutch lever —38— in its clutch engaging position completes one revolution its outer end will ride upon the cam face —63— of the bell-crank-lever —60— to again trip the clutch lever from its clutch engaging position for stopping the further rotation of the train of gears and shaft —30— driven thereby.

This inward rocking movement of the upper arm of the bell-crank-lever —60— by the spring —64— causes the arm —61— of said bell crank lever to engage and depress the front end of the lever —62— which, in turn engages and depresses the outer end of the locking lever —70— to bring its inner end into more or less frictional contact with the underside of the disk —68— ready to engage in the notch or recess —69— of said disk —68— as soon as the shaft —30— completes one revolution or one cycle of operation.

During this cycle of operation of the shaft —30— the tone arm will have been shifted from its extreme inner position at the inner end of the record to its extreme outward position and back again to its record engaging position thus completing the cycle of operation of the tone arm.

While the tone arm is being moved from its extreme outward position to its record engaging position the high side of the cam —29— will have passed the adjacent end of the rod —28'— on the lower end of the extension of the tone arm to allow said tone arm to rock downwardly to engage its needle —b— with the record ready for a repetition of the operations of the tone arm, displacing mechanism, and transfer mechanism as hereinbefore described.

It is evident from the foregoing description that during the run-out of the tone arm on the record the shaft —30— and parts carried thereby will be at rest and that its rotation begins when the tone arm reaches its innermost position on the record and ends with the shifting of the tone arm from its extreme inner position to its extreme outer position and return to its record engaging position during which time the played record will be displaced from the table —3— and replaced by another record from the storage spindle —80— on to the table through the medium of the vertically movable spindle —90— and supplemental table —95—.

The mechanisms shown and described are particularly efficient in carrying out the objects of the invention but various changes may be made in the detail construction of these mechanisms without departing from the spirit of this invention.

What I claim is:

1. In a phonograph of the record disk type, a rotary table for supporting the disk to be played, means for rotating the table, a storage spindle above and co-axial with the table for supporting a plurality of disks one above the other and provided with a shoulder normally holding the lowermost disk against downward displacement from said spindle, and means reciprocally movable between said table and spindle for releasing the lowermost disk from said shoulder and transferring it to the table.

2. In a phonograph of the record disk type, a rotary table for supporting the disk to be played, means for rotating the table, a storage spindle above and co-axial with the table for supporting a plurality of disks one above the other and provided with a shoulder normally holding the lowermost disk against downward displacement from said spindle, a transfer device reciprocally movable vertically between the table and spindle, and means actuated by the upward movement of said device for disengaging the lowermost disk from said shoulder and allowing it to drop onto said transfer device.

3. In a phonograph of the character described, a rotary table for supporting the disk to be played, means for rotating the table, a storage spindle for a plurality of disks spaced above and substantially coaxial with the axis of the table, a transfer device

reciprocally movable vertically through the intervening space between the table and storage spindle for conveying the released disk from said spindle onto the table, and means actuated by the upward movement of the transfer device for releasing the lowermost disk from the spindle and allowing it to drop onto the transfer device.

4. In a phonograph of the character described, a rotary table for supporting the disk to be played, means for rotating the table, opposed lower and upper spindles coaxial with the axis of the table, the lower spindle being movable axially toward and from the upper spindle, means on the upper spindle for supporting a plurality of disks one above the other, means actuated by the approach of the lower spindle toward the upper spindle for releasing the lowermost disk from its supporting spindle, and means on the lower spindle for receiving the released disk and conveying it onto the table.

5. In a phonograph of the character described, a rotary table for supporting the disk to be played, means for rotating the table, a spindle supported in a plane above and coaxial with the axis of the table and provided with means for releasably supporting a plurality of disks one above the other, a cam slidable lengthwise of and upon the lower end of the spindle for releasing the lowermost disk therefrom, and a transferring device reciprocally movable vertically toward and from the spindle and adapted to operate said cam to its record releasing position during its upward movement, said transfer device having means for receiving and supporting the released record for transferring it to the table upon its downward movement.

6. In a phonograph of the character described, a vertically disposed spindle for receiving and supporting a plurality of records, said spindle having a lengthwise recess in one side and a cam projection on its opposite side of approximately the same radial depth as the recess to cause the disks registering therewith to enter the recess and to rest upon the lower end wall of said recess, the lower end of the cam being disposed in a plane above the lower end wall of the recess, and a cam member slidable endwise of and upon the lower end of the spindle for engaging and shifting the lowermost disk out of engagement with the lower end wall of the recess to allow said disk to drop by its own weight from the lower end of the spindle.

7. In a phonograph of the character described, an upright storage spindle adapted to receive and support a plurality of record disks one above the other and provided with a stop shoulder for engaging the lower face of the lowermost disk for holding all of the disks against downward movement, movable means for displacing the lowermost disk

from the stop shoulder and allowing it to drop from the lower end of the spindle and also permitting the lowermost of the remaining disks to drop onto said shoulder, a table rotatable in a plane below and coaxial with the spindle, and vertically movable means for receiving the record displaced from the spindle and conveying it to the surface of the table.

8. In a phonograph of the character described, a rotary table for supporting the disk to be played, a storage spindle for a plurality of disks co-axial with and spaced above the table, means for rotating the table, a transfer device reciprocally slidable vertically in a central opening in the table coaxial therewith for transferring a record from a plane above the table to and upon the upper surface of said table, and means actuated by the transfer device for releasing the lowermost record from said spindle.

9. In a phonograph of the character described, a frame, an upright tubular shaft journaled in the frame, a plurality of record disks, a table mounted on the upper end of the shaft to rotate therewith, a storage spindle for the disks co-axial with and above the table means for rotating the shaft, a vertically slidable spindle guided within the tubular shaft and having its upper end provided with a supplemental record supporting table movable to and from the horizontal plane of the first-named table, means for moving the spindle with the supplemental table thereon upwardly, and means actuated by the upward movement of the second named spindle for releasing the lowermost disk from the storage spindle upon the supplemental table.

10. In a phonograph of the character described, a plurality of record disks, a table rotatable about a vertical axis and provided with a central opening therethrough, a storage spindle for the disks spaced vertically from said table co-axial therewith, a supplemental table reciprocally movable vertically across said space and provided with a guide stem slidable in the central opening in the first-named table, and means actuated by said stem for releasing the lowermost disk from the storage spindle and allowing it to drop upon the supplemental table when the latter is elevated.

11. In a phonograph of the character described, a rotary table adapted to receive and support one record only at a time, means for rotating the table with the record thereon, means for displacing the played record from the table, a storage spindle for supporting a plurality of additional records one above the other in a plane above and coaxial with the axis of the rotation of the table, and vertically slidable means for releasing the lowermost additional record from said supporting means and conveying it to the

table immediately following the displacement of the first-named record from the table.

12. In a phonograph of the record disk type, a rotary turn table for supporting the disk to be played, a tone arm, mechanism for carrying one or more disks, mechanism for transferring the disk from said carrying mechanism to the turn table, and means having a portion in the path of movement of a disk as transferred for determining the initial operating position of the tone arm radially of the turn table, said means including a rod and an arm provided with a latch normally engaging said rod.

13. In a phonograph of the record disk type, a rotary turn table for supporting the disk to be played, a tone arm, mechanism for carrying one or more disks, mechanism for transferring the disk from said carrying mechanism to the turn table, and means having a portion in the path of movement of a disk as transferred for determining the initial operating position of the tone arm radially of the turn table, said means including a link for shifting the tone arm having two shouldered portions, means for engaging either of said shouldered portions, a rod, an arm having a latch normally engaging said rod and connections between said rod and said link whereby the position of the rod determines the shoulder of said link which is engaged by said means.

14. In a phonograph of the record disk type, a supporting plate, a hollow bracket having an upright portion and a horizontal portion extending over the plate, record-supporting means carried by said horizontal portion, a tone arm journaled within the upright portion and projecting outwardly through an opening in one side of the upright portion, said tone arm being adapted to swing laterally in said opening.

15. In a phonograph, a supporting member, a hollow bracket rising from the supporting member and having an opening through its wall, a record-supporting member carried by said hollow arm, a tone arm having a portion positioned within the hollow bracket and another portion projecting outwardly through said opening, and supporting means for said tone arm permitting vertical tilting movement and lateral swinging movement of the tone arm in said opening.

16. A phonograph comprising a constantly rotating shaft, a turn table driven thereby, a storage spindle for the record disks co-axial with the table, a tone arm, a second shaft adapted for intermittent rotation, means including cams carried by the second shaft for effecting removal of a record from said turn table and for effecting the transfer of another record from said spindle onto the turn table, mechanism for driving the second shaft from

the first, including clutch elements, and mechanism for separating said clutching elements after a single rotation of said second shaft.

17. A phonograph comprising a constantly rotating shaft, a turn table driven thereby, a storage spindle for the record disks co-axial with the table, a tone arm, a second shaft adapted for intermittent rotation, means including cams carried by the second shaft for effecting removal of a record from said turn table and for effecting the transfer of another record to the turn table, mechanism for driving the second shaft from the first including clutch elements, mechanism for separating said clutching elements after a single rotation of said second shaft, and means operating in connection with said second shaft for tilting the tone arm.

18. A phonograph comprising a constantly rotating shaft, a turn table driven thereby, a storage spindle for the record disks co-axial with the table, a tone arm, a second shaft adapted for intermittent rotation, cams carried by the second shaft for effecting removal of a record from said turn table and for effecting the transfer of another record to the turn table, mechanism for driving the second shaft from the first shaft including clutching elements, mechanism for separating said clutch elements after a single rotation of said second shaft, and means operating in connection with said second shaft for tilting the tone arm and for moving the tone arm laterally.

In witness whereof we have hereunto set our hands this 30th day of August 1928.

LLOYD ELMER JOHNSON.

ARTHUR BENJAMIN WINCHELL.

FLOYD W. HARDICK.

FRED W. BILLIG.